Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Hind Tabbalaee
BUILDING OFFICIAL

ALTA CALIFORNIA GEOTECHNICAL INC.

170 North Maple Street, Suite 108
Corona, CA 92880
www.altageotechnical.com

**DAVID NIETO & SONS TRUCKING AND**
**ECOLOGY AUTO PARTS**
1281 Brea Canyon Road
Brea, California 92821

November 9, 2021
**Project Number 1-0231**

Attention: Mr. David Nieto and Mr. John Porter

Subject: ***UPDATED ADDENDUM FAULT INVESTIGATION***
Menchego and Ecology Auto Parts Lease Sites,
1281 Brea Canyon Road, County of Orange, California

Reference: See Appendix A

Gentleman:

Presented herein is Alta California Geotechnical, Inc.'s (Alta) updated addendum fault investigation for the Menchego and Ecology Auto Parts Lease Sites located at 1281 Brea Canyon Road in the City of Brea, County of Orange, California. The Ecology Auto Parts property was not included in the addendum fault investigation report. This updated report now includes the Ecology Auto Parts lease site.

This investigation was conducted in response to the County of Orange Public Works Department request to update the 2005 Pacific Soils Engineering, Inc. (PSE) Alquist-Priolo Earthquake Fault Zone Investigation (A-P) report, (PSE, 2005). In order to accommodate this request, Alta conducted an addendum fault investigation on October 27 and 28, 2021 at the site.

## 1.0 PURPOSE

The purpose of this investigation is to confirm the location of the south branch of the Whittier fault and establish a habitable structures setback zone in order to relocate two office trailers on the property. An office trailer is considered to be a habitable structure

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



as it will be occupied a minimum of 2,000 man-hours per year per the Alquist-Priolo Earthquake Fault Zoning Act.

## 2.0 BACKGROUND

A complete discussion of the sites regional geologic setting, geomorphology, local geologic setting, geologic structure, fault location, style and activity, and the rational for the establishment of habitable structures setback zones is presented in PSE 2005. Background information discussing the proposed development, geologic conditions, engineering properties and analysis, general earthwork recommendations, and design considerations were presented in Alta 2017 and updated in Alta 2019.

The reader is referred to those referenced reports for the specific information they contain as that information is not repeated in this document.

## 3.0 ADDENDUM FAULT INVESTIGATION

The subsurface investigation of the south branch of the Whittier fault was conducted on October 27 and 28, 2021. An approximately 6 foot deep, 60-foot long trench, labeled AFT-1, was excavated utilizing a track mounted Bobcat Excavator. The trench location is depicted on Plate 1, the 1-inch equals 100-feet scale geologic map from PSE 2005, as well as on a modified version of the 1-inch equals 80-feet scale map contained in Alta 2019, Plate 2. The fault trench profile of AFT-1 was prepared at a scale of 1-inch equals 5 feet, vertically and horizontally, and is attached as Figure 1. Two photographs of the trench are attached as Figures 2 and 3.

## 4.0 FIELD INVESTIGATION

The trench, trending N35E, was excavated approximately perpendicular to the Whittier fault that locally trends N56W. The western side of the trench was cut vertically while the east side was stepped. The western wall was scraped with a shovel to remove the veneer of smeared dirt caused by the bucket, then brushed with a wire brush to expose

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



the underlying sediments and structure. A horizontal string line was then attached to the wall for measurements after vertical lines were spray painted at 5 foot horizontal intervals along the face of the wall.

## 5.0 LITHOLOGY AND STRUCTURE

The Soquel member of the Puente formation was exposed beneath a thin layer of artificial fill and two colluvial wedges at the south end of the trench. The bedrock primarily consisted of a silty, fine to medium grained sandstone with interbeds of siltstone and clayey siltstone and two conglomerate beds/lenses.

The silty sandstone was fine to medium grained, hard, moderately well cemented, massive, and varied in color from “yellow” 10 YR (8/6), to “white” 2.5Y (8/1) to “pale yellow” 2.5Y (8/4).

The siltstone and clayey siltstone interbeds were typically well bedded, slightly sheared and folded/tilted and measured from less than 1 inch to approximately 1-1/2 feet thick. They were soft to moderately hard and ranged in color from “brownish yellow” 10 YR (6/6) to “reddish brown” 5 YR (4/4) to “light olive gray” 5Y (6/2).

The pebble and cobble conglomerate beds contained plutonic, metamorphic and a few volcanic clasts supported in a medium grained sandy matrix that varied in color from “yellowish brown” 10YR (5/4) to “dark grayish brown” 10YR (4/2).

Structurally, the Soquel bedrock is faulted and tilted. As depicted on Figure 1, numerous, thin faults typically dip to the north, display minor offsets and do not have any clay gouge along the fault planes. These faults are considered to be associated with the “flowering” effect of major faults in the near surface.

The south branch of the Whittier fault is located at Station 3+0 on Figure 1. Here a conglomerate bed is highly sheared on both sides of the bed. On the south side a 1/8”

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



to 1/4" thick clay gouge shear plane was observed. To the north a triangular wedge of fault gouge measured up to 1 foot thick. The highly sheared, plastic gouge was observed to extend from top to bottom on the west wall and was also exposed on the east wall. Some of the clasts within the conglomerate bed adjacent to the rupture surfaces had a film of clay coating their surface suggesting they may have been rotated during faulting.

One can observe that bedding south of the fault has northerly dips and bedding north of the fault has southerly dips. As can be seen on both Plates 1 and 2 the Whittier fault is coincident with the mapped trace by PSE.

## 6.0 HABITABLE STRUCTURES SETBACK ZONES.

Based on the PSE study, the south Whittier fault is considered active according to A-P criteria. Also, the PSE report presents the rationale for the establishment of habitable structures setback zones for the south branch of the Whittier fault. Alta concurs with the PSE rationale.

The upper pad where PSE and Alta excavated their trenches was, and still is, at an elevation of 575 and the lower pad where the proposed office trailers will sit was, and still is, at an elevation of 540. This was confirmed using Google Earth images from 2005 and 2021. Minor excavations into the west facing slope on the upper pad have occurred in the interim. The location of the habitable structure setback zone by PSE was established based on existing grades at the time of their investigation. Those existing grades have not changed over time and those grades remain to this day. Therefore, the setback zone as established by PSE is considered to be accurate and in compliance with the latest version of the Alquist-Priolo Earthquake Fault Zoning Act.

The proposed new locations for the Nieto and Ecology Auto Parts office trailers are located outside of the established setback zone for the south branch of the Whittier

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



fault. The proposed Nieto Construction office trailer is located approximately 106-feet north of the northern setback zone and the proposed Ecology Auto Parts trailer is located approximately 8-feet south of the southern setback zone. It is the opinion of Alta that the proposed office trailer locations will not be subjected to the effects of surface fault rupture.

If you have any questions or should you require additional information, please contact the undersigned at our Corona office (951) 509-7090. Alta appreciates the opportunity to provide geotechnical consulting services for your project.

Sincerely,
Alta California Geotechnical, Inc.

THOMAS J. MCCARTHY/CEG 2080
Reg. Exp.: 9-30-24
Engineering Geologist
Vice President

SCOTT A. GRAY/RGE 2857
Reg. Exp.: 12-31-22
Registered Geotechnical Engineer
President

Distribution: (1) Addressee

TJM: SAG: 1-0231, November 9, 2021 (Updated Addendum Fault Investigation, Menchego and Ecology Auto Lease Sites, Brea)

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING SECTION



## APPENDIX A

## Selected References

1. Alta California Geotechnical, Inc., 2019, Summary Fault Investigation and Updated Design Recommendations, Menchego Lease Sites, 1281 Brea Canyon Road, County of Orange, California, dated March 12, 2019 (Project No. 1-0231).

2. Alta California Geotechnical, Inc., 2017, Revised Geotechnical Recommendation Report, Menchego Lease Sites, 1281 Brea Canyon Road, County of Orange, California, dated September 19, 2017 (Project No. 1-0231).

3. Pacific Soils Engineering, Inc., 2005, Alquist-Priolo Earthquake Fault Zone Investigations, Existing Caltrans Fill Site, Northwest Adjacent to the Intersection of Tonner Canyon Road and Brea Boulevard; and Possible Extension of “North Whittier Fault’, Near Harbor Boulevard; Brea Oil Field, Counties of Los Angeles and Orange, California, Aera Master Planned Community, dated October 4, 2005 (Work Order 102280-F).

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170922

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job site at all times. Substitutions, deviations or alterations to these plans or this specification may require approval from OC Public Works/ OC Development Services of County of Orange. The approval of these plans and specifications SHALL NOT be held to permit or be an approval of the violation of any provision of any County Ordinance or State law.
Date: 10/18/2022
Building Official

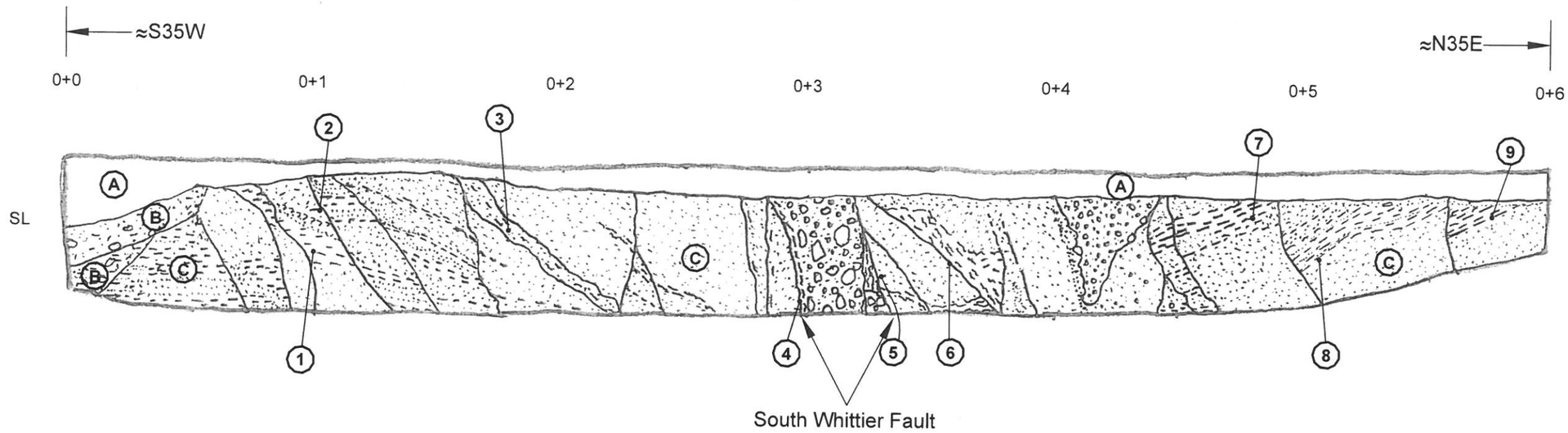
# WHITTIER FAULT

## South Branch

1"=5' (H=V)

Profile of West Wall

AFT-1




Attitudes

1) B: NS 40E
2) F: N45W 58NE
3) F: N70W 53NE
4) F: N70W 78NE
5) F: N53W 72NE
6) F: N35W 47NE
7) B: NS 41W
8) B: N47W 40SW
9) B: N15W 30SW

Legend

- SANDSTONE
- SILTSTONE
- CONGLOMERATE
- (A) - ARTIFICIAL FILL
- (B) - COLLUVIAL WEDGES
- (C) - SOQUEL BEDROCK

FIGURE 1

**ALTA CALIFORNIA GEOTECHNICAL, INC.**
170 N. MAPLE STREET, STE 108, CORONA, CA 92880
TELEPHONE: (951) 509-7090
PROJECT NUMBER: 1-0231 DATE: Oct. 2021

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Non-Transferable
BUILDING DIVISION

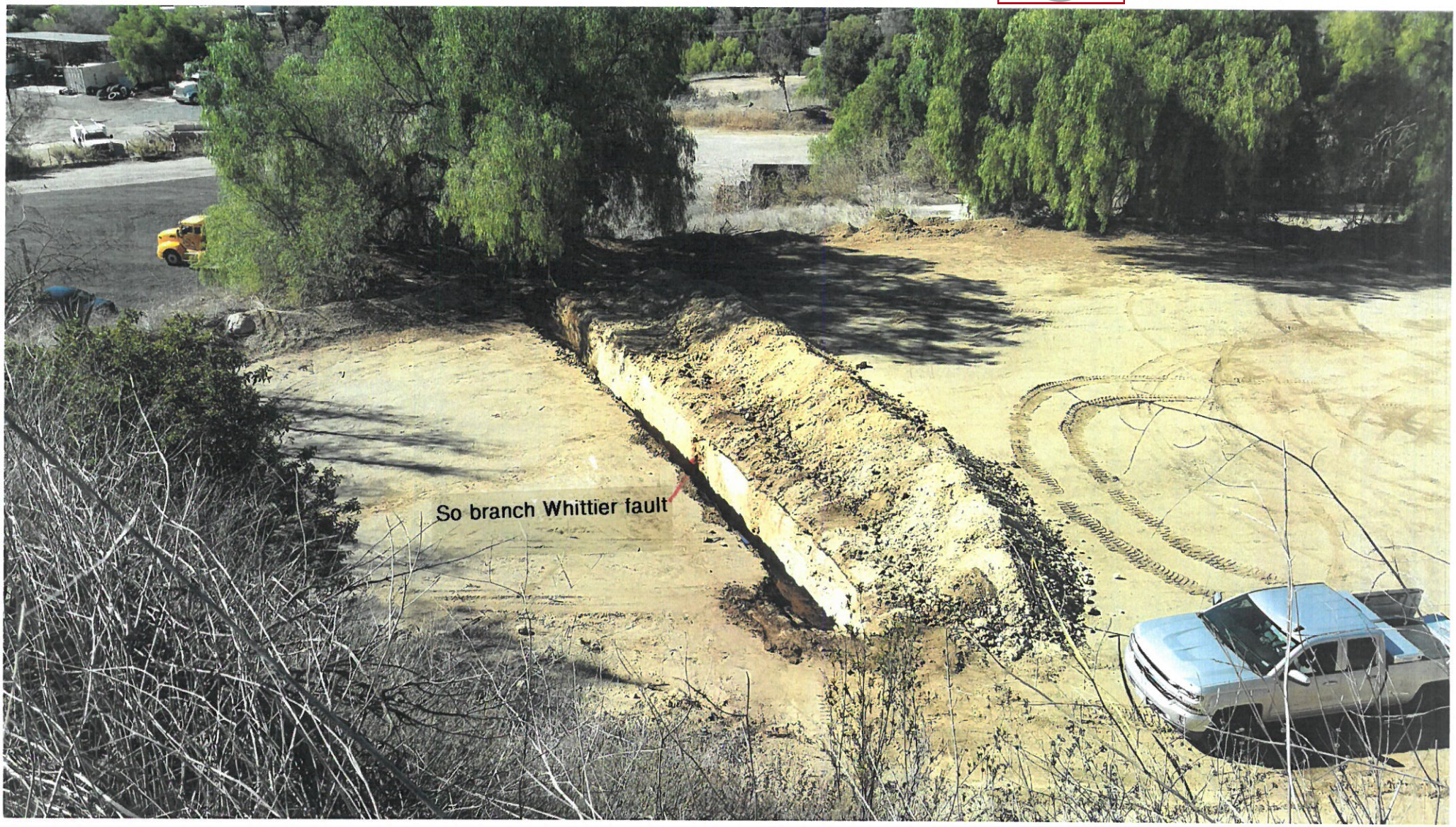



FIGURE 2

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

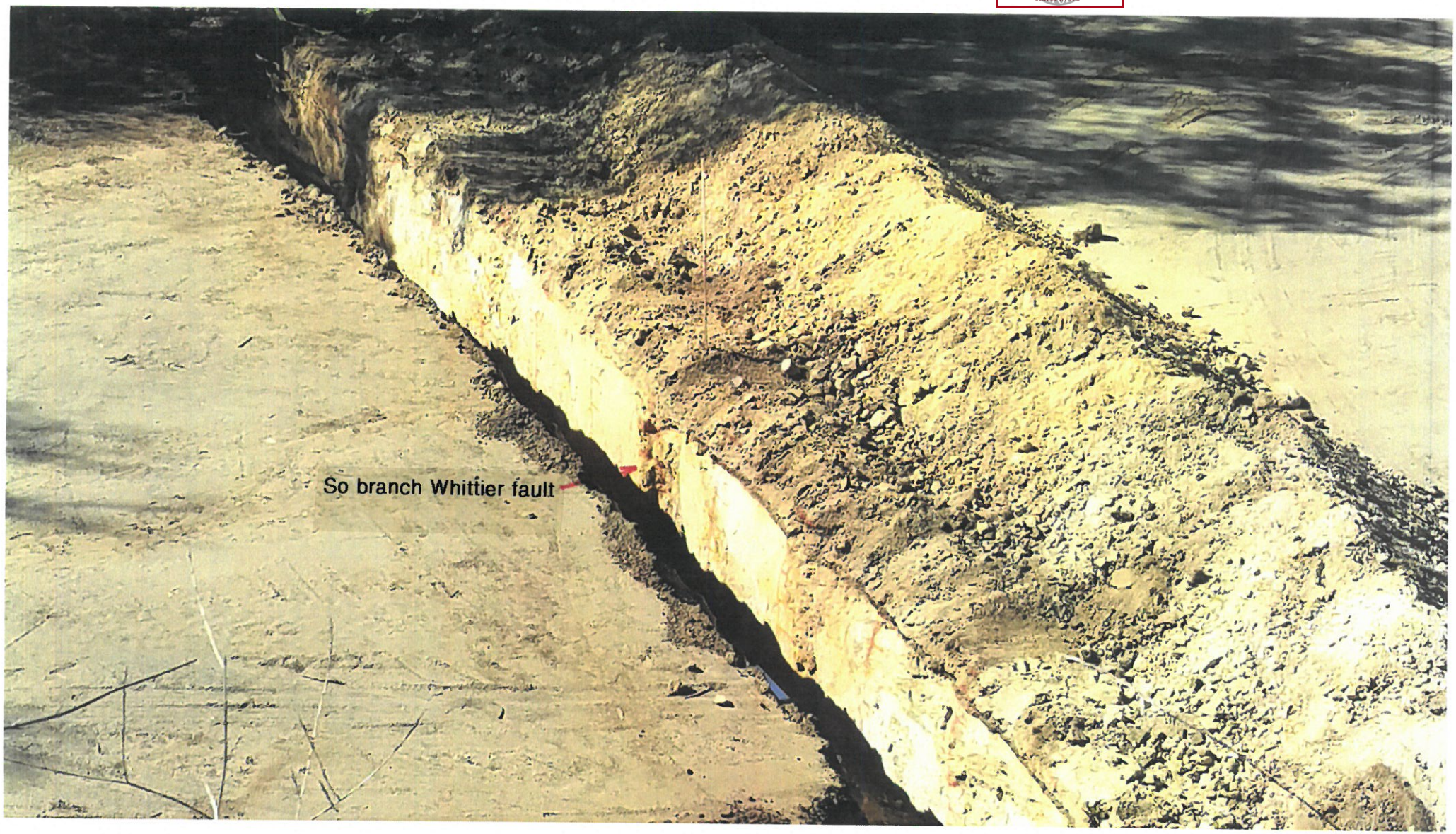



FIGURE 3

Building Safety Plan Review
Approved: Zoning Degree
Permits: 04/19/22

County of Orange - Dr. Public Works
APPROVED
This plan is approved for the purpose of the grading shown. Approval of this plan does not constitute approval of any other work. Approval of this plan does not relieve the permittee of the responsibility to obtain any other approvals required by law. Approval of this plan expires 1 year from the date of approval.
Approved by: [illegible]

**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (951) 582-0170, FAX: (951) 582-0176
W.O. 102280-F DATE: 10/4/05
PATH: S:\drafting\102280-F\FINAL_OF_10-05\PLATE-1.dwg PLATE 1

GEOLOGIC MAP

NORTHERN LIMIT OF AP ZONE
SOUTHERN LIMIT OF AP ZONE
NORTHERN TRACE OF WHITTIER FAULT (NORTH CTFS FAULT)
SOUTHERN TRACE OF WHITTIER FAULT (SOUTH CTFS FAULT)
Conglomerate Bed
Tplv
Tps
Qof
Qal
Qt
Tfu
af
afc
Qal/af(?)
TH-1 af to 80' Tplv Below 80'
TH-2 afc to 112' Tps? Below 112'
TH-3 afc to 65' Tps Below 65'
TH-4 af to 50' Tplv Below 50'
B-1 Tps to 90' afc to 82' T.D.90'
B-2 af to 64' Qt to 93' Tfl to 95' T.D.95'
B-5 af to 55' T.D.55'
B-501
B-502
B-503
B-504
B-505
FT-1
FT-2
FT-3
FT-4A
FT-4AB
FT-5
FT-6
FT-7
FT-8
FT-9
FT-10
FT-11
FT-12
AFT-1
SL-1
SL-2A
SL-2B
SL-3
SL-4
SL-5
T-1
T-2
T-3
T-4
T-5
T-6

## LEGEND

**STRATIGRAPHY**

**HOLOCENE**

- af — ARTIFICIAL FILL
- afc — COMPACTED ARTIFICIAL FILL
- Qal — ALLUVIUM

**PLEISTOCENE**

- Qt — TERRACE DEPOSITS (SOUTH OF WHITTIER FAULT ZONE)
- Qof — OLDER FAN DEPOSITS (NORTH OF WHITTIER FAULT ZONE)

**PLIOCENE**

- Tfu — UPPER FERNANDO FORMATION

**MIOCENE**

- Tps — PUENTE FORMATION – SOQUEL MEMBER
- Tplv — PUENTE FORMATION – LA VIDA MEMBER

**SYMBOLS**

- APPROXIMATELY LOCATED GEOLOGIC CONTACT; QUESTIONED WHERE SURMISED; DOTTED WHERE CONCEALED
- 90 / 65 — APPROXIMATELY LOCATED FAULT; QUESTIONED WHERE SURMISED; DOTTED WHERE CONCEALED; U=UP, D=DOWN, ARROWS INDICATE RELATIVE SLIP; BARB INDICATES DIRECTION AND AMOUNT OF DIP
- 60 — STRIKE AND DIP OF BEDDING
- HORIZONTAL BEDDING
- 75 — STRIKE AND DIP OF JOINTS
- STRIKE OF VERTICAL JOINT
- FT-11 — FAULT TRENCH
- T-2 — EXPLORATION TRENCH
- B-1 — BORINGS BY PSE
- B-505
- TH-1 — BORINGS BY SOUTH COAST GEOLOGIC, INC.
- SL-4 — SEISMIC LINE BY ADVANCED GEOSCIENCE, INC.
- 625 — PRE-CTFS TOPOGRAPHIC CONTOURS

NOTE: REPRESENTATIVE ATTITUDES SHOWN IN SOME TRENCHES OWING TO SPACE LIMITATIONS

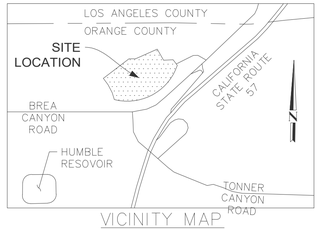
- 78 — STRIKE AND DIP OF FAULT
- AFT-1 — APPROXIMATE LOCATION OF FAULT TRENCH (THIS REPORT)

SCALE: 1"=100'

PLATE 1

**ALTA CALIFORNIA GEOTECHNICAL, INC.**
170 N. MAPLE STREET, STE 108, CORONA, CA 92880
TELEPHONE: (951) 509-7090
PROJECT NUMBER: 1-0231 DATE: 11-9-2021

1-0231 From Stacey




VICINITY MAP
SCALE: NOT TO SCALE

Afc
Tplv
Tps
Qt
Tfu
Nouthern Trace Of Whittier Fault (North CTFS Fault)
Southern Trace Of Whittier Fault (South CTFS Fault)
Nouth CTFS Set Back Zone
South CTFS Set Back Zone
AFT-1
APN: 304-171-08
APN: 304-171-05
PROPOSED NIETO CONSTRUCTION OFFICE TRAILER
Proposed Ecology Auto Parts Trailer
15,000 GALLON REMOTE WATER TANK
METAL RAIN CANOPY
EXISTING STRUCTURE (541.0) FS
EXISTING 24' ACCESS ROAD (COMPACTED NATIVE)
EXISTING OVERHEAD POWERLINE AND POLES
EXISTING LIGHT MOUNTED ON POLE
EXISTING 6' FENCE
EXISTING 6' ACCESS GATE
EXISTING 24' ACCESS ROAD (COMPACTED NATIVE)
ASPHALT CONCRETE PAVING AT SITE ENTRANCE (FIRST 100' OF ACCESS ROAD) 6" AC OVER COMPACTED NATIVE PER GEOTECHNICAL RECOMMENDATIONS (SEE SECTION HEREON)
EXISTING EDGE OF PAVEMENT
R/W
EXISTING CONCRETE V-DITCH
EXISTING DIRT SHOULDER (735' WIDE)
EXISTING PAVEMENT STRIPING (LEFT TURN TO SR 57 WESTBOUND ACCESS RAMP)
EXISTING PAVEMENT STRIPING (LEFT TURN INTO SITE)
VAN ACCESSIBLE ADA PARKING, LOADING ZONE, AND ACCESSIBLE WALKWAY TO NIETO CONSTRUCTION OFFICE TRAILER
ADA RESTROOM
EXISTING DRAINAGE DITCH
FIRE LANE- NO PARKING SIGN TYP.
EXISTING CELL TOWER & STRUCTURES
EXISTING FIRE HYDRANT
EXISTING FIRE WATER STORAGE TANK
BREA CANYON ROAD -EXISTING-
TONNER CANYON ROAD -EXISTING-
57 FREEWAY -EXISTING-
PL
R/W

LEGEND

STRATIGRAPHY
HOLOCENE
Afc — COMPACTED-ARTIFICIAL FILL
PLEISTOCENE
Qt — TERRACE DEPOSITS
PLIOCENE
Tfu — UPPER FERNANDO FM
MIOCENE
Tps — PUENTE FM - SOQUEL *mbr*
Tplv — PUENTE FM - LA VIDA *mbr*

SYMBOLS
APPROXIMATELY LOCATED GEOLOGIC CONTACT
APPROXIMATELY LOCATED FAULT; DOTTED WHERE CONCEALED, QUESTIONED WHERE UNCERTAIN, ARROWS INDICATED RELATIVE MOTION
HABITABLE STRUCTURES SETBACK ZONE
78 — STRIKE AND DIP OF FAULT
AFT-1 — APPROXIMATE LOCATION OF FAULT TRENCH (THIS REPORT)

## GENERAL NOTES

PROPERTY IS LOCATED WITHIN A STATE OF CALIFORNIA SEISMIC HAZARD ZONE SUSCEPTIBLE TO EARTHQUAKE INDUCED LANDSLIDES AND IS DIRECTLY ADJACENT AN AREA IDENTIFIED AS BEING SUSCEPTIBLE TO LIQUEFACTION. FUTURE SITE DEVELOPMENT WILL REQUIRE SITE SPECIFIC LANDSLIDE AND LIQUEFACTION EVALUATION IN ACCORDANCE WITH SP117A.

PROPERTY IS LOCATED WITHIN A STATE OF CALIFORNIA EARTHQUAKE FAULT ZONE. FUTURE SITE DEVELOPMENT WILL REQUIRE SITE SPECIFIC FAULT RUPTURE EVALUATION IN ACCORDANCE WITH SP42.

FINAL DETERMINATION OF THE REQUIRED LEVEL OF GEOTECHNICAL EVALUATION (IF ANY) SHALL BE DETERMINED BY COUNTY STAFF UPON REVIEW OF FINAL PLANS AND CONFIRMATION OF PROJECT SCOPE DURING THE GRADING AND BUILDING PERMIT PROCESS. THE GEOTECHNICAL REPORT AND DESIGN RECOMMENDATIONS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE OC GRADING MANUAL AND THE CURRENT CALIFORNIA BUILDING CODE.

FUTURE SITE DEVELOPMENT (I.E. RESIDENTIAL/COMMERCIAL SITE USE) WILL REQUIRE DETAILED GEOTECHNICAL EVALUATION.

SEPARATE DEMOLITION PERMIT IS REQUIRED TO REMOVE ANY STRUCTURE BUILT WITHOUT PERMIT SUCH AS METAL CANOPY, ETC.

SEPARATE PERMITS ARE REQUIRED FOR ANY PROPOSED STRUCTURE.

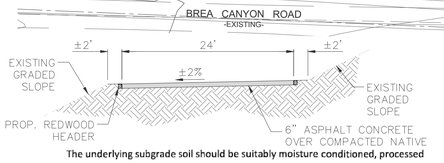
SEPARTE BUILDING PERMIT IS REQUIRED FOR ANY EXISTING STRUCTURE CONSTRUCTED OR MOVED ON SITE WITHOUT PERMIT.

ALL EXISTING ROADS AND PROPOSED LEASE AREAS ARE CURRENTLY COMPACTED NATIVE.

80 0 40 80 160
SCALE 1"= 80'

LEASE AREA INFORMATION

| | BENNETT | HARBOR | ECOLOGY | NIETO |
|---|---|---|---|---|
| LAND USE | A1(O) (VEHICLE STORAGE) | A1(O) (VEHICLE STORAGE) | A1(O) (VEHICLE STORAGE) | A1(O) (VEHICLE STORAGE) |
| VEHICLE DAILY TRIPS | 13-20 | 2-3 | 100 | 15 |
| HOURS OF OPERATION | 5AM - 5PM (MON - FRI) | 5AM - 2:30PM (MON - FRI) | 24/5 (MON - FRI) ½ DAY SAT | 5AM - 5PM (MON - FRI) |
| PARKING | 21 SPOTS | 244 SPOTS | 190 | 49 SPOTS |
| AMOUNT OF ACREAGE TO BE GRADED | N/A | N/A | N/A | N/A |
| NUMBER OF EMPLOYEES | 0 | 0 | 10 | 4 |




The underlying subgrade soil should be suitably moisture conditioned, processed and compacted to a minimum 95 percent of the laboratory maximum density (ASTM: D 1557) to at least twelve (12) inches below subgrade. After subgrade compaction, the exposed grade should then be "proof"-rolled with heavy equipment to ensure the grade does not "pump" and is verified as non-yielding.

Preparation for compaction operations and pavement construction operations should be accomplished in accordance with the current requirements of the County of Orange and under the observation and testing of the project geotechnical consultant.

ASPHALT CONCRETE PAVING AT SITE ENTRANCE
SCALE: 1"=10'

NOTE: SEE SEPARATE DETAILED SITE PLANS FOR TENANT LEASE AREAS.

PLATE 2

**ALTA CALIFORNIA GEOTECHNICAL, INC.**
170 N. MAPLE STREET, STE 108, CORONA, CA 92880
TELEPHONE: (951) 509-7090
PROJECT NUMBER: 1-0231 DATE: 11-9-2021

| NO. | DATE | REVISIONS | APPROVED |
|---|---|---|---|

DESIGNED BY: MDP
DRAWN BY: MDP
CHECKED BY: SMC
DATE: 12/13/18

HUITT-ZOLLARS Irvine
Huitt-Zollars, Inc.
2603 Main Street, Suite 400
Irvine, California 92614
Phone (949) 988-5815 Fax (949) 988-5820

PREPARED UNDER THE SUPERVISION OF R.C.E. EXPIRES DATE 09/30/22 01/26/22

MENCHEGO LEASE SITES
1281 S. BREA CANYON ROAD

OVERALL SITE PLAN

COUNTY OF ORANGE
PUBLIC WORKS DEPARTMENT

JOB NO.: R306930.01
SHEET 1 OF 1

D:\ALTA GEOTECHNICAL\ALTA PROJECTS\1-0231\0-2022\1-0231 PLANS.DWG STACEY BEGAY 10/13/2022 1:56 PM

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

ALTA CALIFORNIA
GEOTECHNICAL INC.

170 North Maple Street, Suite 108
Corona, CA 92880
www.altageotechnical.com

**DAVID NIETO & SONS TRUCKING**
1281 Brea Canyon Road
Brea, California 92821

November 9, 2021
**Project Number 1-0231**

Attention: Mr. David Nieto

Subject: ***ADDENDUM FAULT INVESTIGATION***
Menchego Lease Sites, 1281 Brea Canyon Road
County of Orange, California

Reference: See Appendix A

Dear Mr. Nieto:

Presented herein is Alta California Geotechnical, Inc.'s (Alta) addendum fault investigation for the Menchego Lease Sites located at 1281 Brea Canyon Road in the City of Brea, County of Orange, California.

This investigation was conducted in response to the County of Orange Public Works Department request to update the 2005 Pacific Soils Engineering, Inc. (PSE) Alquist-Priolo Earthquake Fault Zone Investigation (A-P) report, (PSE, 2005). In order to accommodate this request, Alta conducted an addendum fault investigation on October 27 and 28, 2021 at the site.

## 1.0 PURPOSE

The purpose of this investigation is to confirm the location of the south branch of the Whittier fault and establish a habitable structures setback zone in order to relocate an office trailer on the property. The office trailer is considered to be a habitable structure as it will be occupied a minimum of 2,000 man-hours per year per the Alquist-Priolo Earthquake Fault Zoning Act.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



## 2.0 BACKGROUND

A complete discussion of the sites regional geologic setting, geomorphology, local geologic setting, geologic structure, fault location, style and activity, and the rational for the establishment of habitable structures setback zones is presented in PSE 2005. Background information discussing the proposed development, geologic conditions, engineering properties and analysis, general earthwork recommendations, and design considerations were presented in Alta 2017 and updated in Alta 2019.

The reader is referred to those referenced reports for the specific information they contain as that information is not repeated in this document.

## 3.0 ADDENDUM FAULT INVESTIGATION

The subsurface investigation of the south branch of the Whittier fault was conducted on October 27 and 28, 2021. An approximately 6 foot deep, 60-foot long trench, labeled AFT-1, was excavated utilizing a track mounted Bobcat Excavator. The trench location is depicted on Plate 1, the 1-inch equals 100-feet scale geologic map from PSE 2005, as well as on a modified version of the 1-inch equals 80-feet scale map contained in Alta 2019, Plate 2. The fault trench profile of AFT-1 was prepared at a scale of 1-inch equals 5 feet, vertically and horizontally, and is attached as Figure 1. Two photographs of the trench are attached as Figures 2 and 3.

## 4.0 FIELD INVESTIGATION

The trench, trending N35E, was excavated approximately perpendicular to the Whittier fault that locally trends N56W. The western side of the trench was cut vertically while the east side was stepped. The western wall was scraped with a shovel to remove the veneer of smeared dirt caused by the bucket, then brushed with a wire brush to expose the underlying sediments and structure. A horizontal string line was then attached to the wall for measurements after vertical lines were spray painted at 5 foot horizontal intervals along the face of the wall.

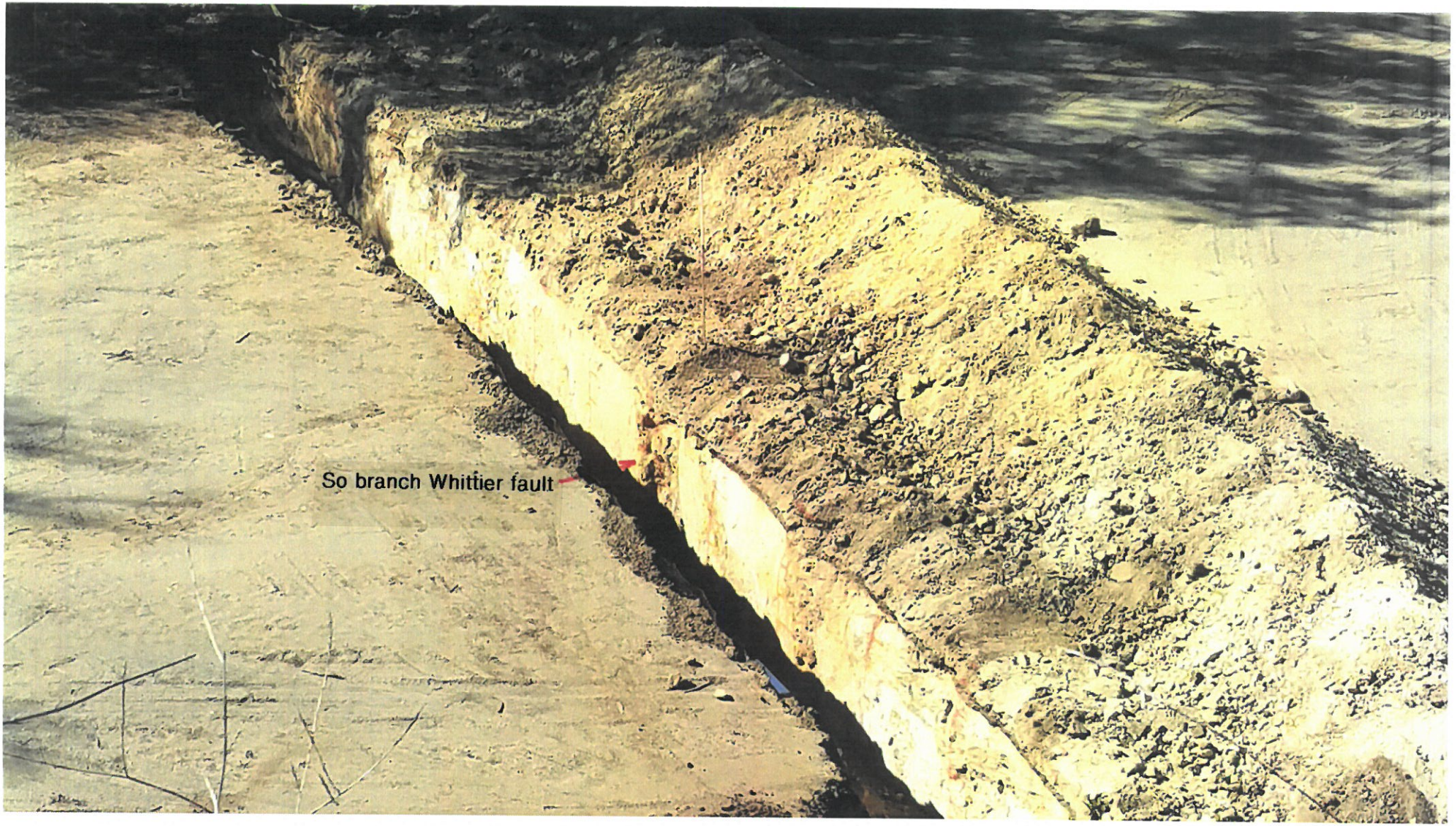



FIGURE

County of Orange - OC Public Works
OC Development Services
APPROVED

Building&Safety: Ryan Rose
Approval: Geology Reports
Permits: PA170022

10/19/2022




FIGURE

County of Orange - OC Public Works
OC Development Services
APPROVED
Building&Safety: Ryan Rose
Approval: Geology Reports
Permits: PA170022
10/18/2022

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



## 5.0 LITHOLOGY AND STRUCTURE

The Soquel member of the Puente formation was exposed beneath a thin layer of artificial fill and two colluvial wedges at the south end of the trench. The bedrock primarily consisted of a silty, fine to medium grained sandstone with interbeds of siltstone and clayey siltstone and two conglomerate beds/lenses.

The silty sandstone was fine to medium grained, hard, moderately well cemented, massive, and varied in color from "yellow" 10 YR (8/6), to "white" 2.5Y (8/1) to "pale yellow" 2.5Y (8/4).

The siltstone and clayey siltstone interbeds were typically well bedded, slightly sheared and folded/tilted and measured from less than 1 inch to approximately 1-1/2 feet thick. They were soft to moderately hard and ranged in color from "brownish yellow" 10 YR (6/6) to "reddish brown" 5 YR (4/4) to "light olive gray" 5Y (6/2).

The pebble and cobble conglomerate beds contained plutonic, metamorphic and a few volcanic clasts supported in a medium grained sandy matrix that varied in color from "yellowish brown" 10YR (5/4) to "dark grayish brown" 10YR (4/2).

Structurally, the Soquel bedrock is faulted and tilted. As depicted on Figure 1, numerous, thin faults typically dip to the north, display minor offsets and do not have any clay gouge along the fault planes. These faults are considered to be associated with the "flowering" effect of major faults in the near surface.

The south branch of the Whittier fault is located at Station 3+0 on Figure 1. Here a conglomerate bed is highly sheared on both sides of the bed. On the south side a 1/8" to 1/4" thick clay gouge shear plane was observed. To the north a triangular wedge of fault gouge measured up to 1 foot thick. The highly sheared, plastic gouge was observed to extend from top to bottom on the west wall and was also exposed on the east wall. Some of the clasts within the conglomerate bed adjacent to the rupture

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



surfaces had a film of clay coating their surface suggesting they may have been rotated during faulting.

One can observe that bedding south of the fault has northerly dips and bedding north of the fault has southerly dips. As can be seen on both Plates 1 and 2 the Whittier fault is coincident with the mapped trace by PSE.

## 6.0 HABITABLE STRUCTURES SETBACK ZONES.

Based on the PSE study, the south Whittier fault is considered active according to A-P criteria. Also, the PSE report presents the rationale for the establishment of habitable structures setback zones for the south branch of the Whittier fault. Alta concurs with the PSE rationale.

The upper pad where PSE and Alta excavated their trenches was, and still is, at an elevation of 575 and the lower pad where the Nieto office trailer sits was, and still is, at an elevation of 540. This was confirmed using Google Earth images from 2005 and 2021. Minor excavations into the west facing slope on the upper pad have occurred in the interim. The location of the habitable structure setback zone by PSE was established based on existing grades at the time of their investigation. Those existing grades have not changed over time and those grades remain to this day. Therefore, the setback zone as established by PSE is considered to be accurate and in compliance with the latest version of the Alquist-Priolo Earthquake Fault Zoning Act.

The proposed new location for the Nieto office trailer is located outside of the established setback zone for the south branch of the Whittier fault. It is the opinion of Alta that the proposed office trailer location will not be subjected to the effects of surface fault rupture.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



If you have any questions or should you require additional information, please contact the undersigned at our Corona office (951) 509-7090. Alta appreciates the opportunity to provide geotechnical consulting services for your project.

Sincerely,
Alta California Geotechnical, Inc.

THOMAS J. MCCARTHY/CEG 2080
Reg. Exp.: 9-30-22
Engineering Geologist
Vice President

SCOTT A. GRAY/RGE 2857
Reg. Exp.: 12-31-22
Registered Geotechnical Engineer
President

Distribution: (1) Addressee

SAG: 1-0231, November 9, 2021 (Revised Addendum Fault Investigation, Mechego Lease Sites, Brea)

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



## APPENDIX A

### Selected References

1. Alta California Geotechnical, Inc., 2019, Summary Fault Investigation and Updated Design Recommendations, Menchego Lease Sites, 1281 Brea Canyon Road, County of Orange, California, dated March 12, 2019 (Project No. 1-0231).

2. Alta California Geotechnical, Inc., 2017, Revised Geotechnical Recommendation Report, Menchego Lease Sites, 1281 Brea Canyon Road, County of Orange, California, dated September 19, 2017 (Project No. 1-0231).

3. Pacific Soils Engineering, Inc., 2005, Alquist-Priolo Earthquake Fault Zone Investigations, Existing Caltrans Fill Site, Northwest Adjacent to the Intersection of Tonner Canyon Road and Brea Boulevard; and Possible Extension of "North Whittier Fault', Near Harbor Boulevard; Brea Oil Field, Counties of Los Angeles and Orange, California, Aera Master Planned Community, dated October 4, 2005 (Work Order 102280-F).

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170922

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job site at all times. It is unlawful to make any changes or alterations. Initials, stamps or seals on this set of plans and specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Dina Tittenhauser
10/18/22 07:53:38

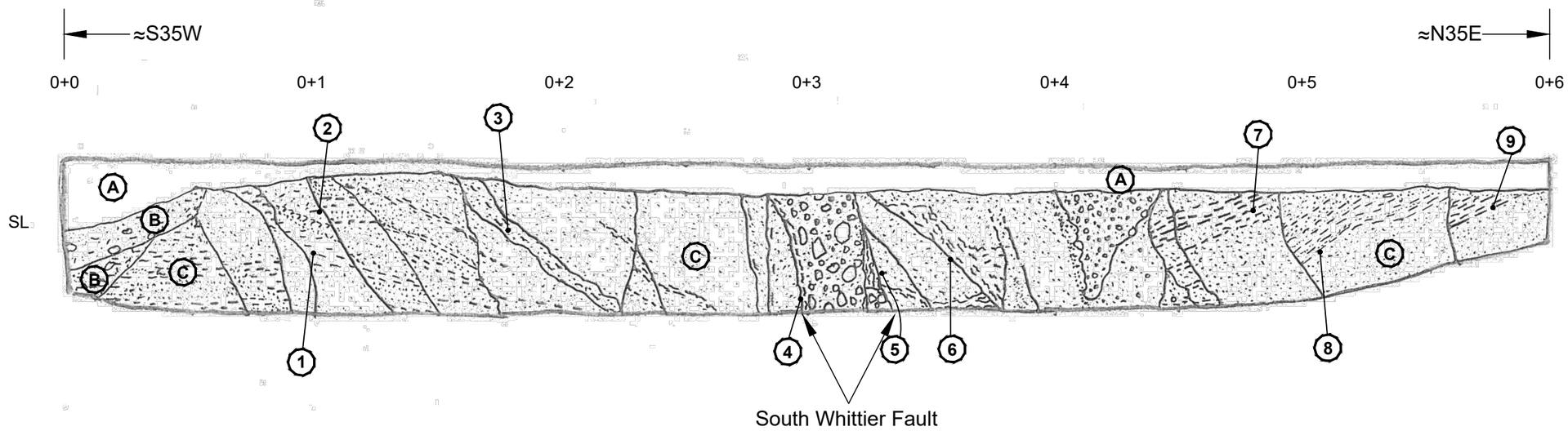
# WHITTIER FAULT

## South Branch

1"=5' (H=V)

Profile of West Wall

AFT-1




Attitudes

1) B: NS 40E
2) F: N45W 58NE
3) F: N70W 53NE
4) F: N70W 78NE
5) F: N53W 72NE
6) F: N35W 47NE
7) B: NS 41W
8) B: N47W 40SW
9) B: N15W 30SW

Legend

- SANDSTONE
- SILTSTONE
- CONGLOMERATE
- (A) - ARTIFICIAL FILL
- (B) - COLLUVIAL WEDGES
- (C) - SOQUEL BEDROCK

FIGURE 1

**ALTA CALIFORNIA GEOTECHNICAL, INC.**
170 N. MAPLE STREET, STE 108, CORONA, CA 92880
TELEPHONE: (951) 509-7090
PROJECT NUMBER: 1-0231 DATE: Nov. 9, 2021

Development Services
Agenda Group Name
Hearing Number

County of Orange - OC Public Works
OC Development Services
APPROVED
This Plan is approved for the purpose of showing the location of the Alquist-Priolo Earthquake Fault Zone and the Seismic Hazard Zone. Approval of this plan does not constitute approval of any grading, building or other development. Approval of this plan does not constitute approval of any grading, building or other development. Approval of this plan does not constitute approval of any grading, building or other development.
Date: 4/2/2021

**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (951) 582-0170, FAX: (951) 582-0176
W.O. 102280-F DATE: 10/4/05

PATH: S:\drafting\102280-F\FINAL_OF_10-05\PLATE-1.dwg

PLATE 1

GEOLOGIC MAP

NORTHERN LIMIT OF AP ZONE

SOUTHERN LIMIT OF AP ZONE

NORTHERN TRACE OF WHITTIER FAULT (NORTH CTFS FAULT)

SOUTHERN TRACE OF WHITTIER FAULT (SOUTH CTFS FAULT)

Conglomerate Bed

U D

Tplv Tps Qof Qal Qt Tfu af afc Qal/af(?)

FT-1 FT-2 FT-3 FT-4A FT-4B FT-5 FT-6 FT-7 FT-8 FT-9 FT-10 FT-11 FT-12 AFT-1

SL-1 SL-2A SL-2B SL-3 SL-4 SL-5

T-1 T-2 T-3 T-4 T-5 T-6

TH-1 af to 80' Tplv Below 80'

TH-2 afc to 112' Tps? Below 112'

TH-3 afc to 65' Tps Below 65'

TH-4 af to 50' Tplv Below 50'

B-1 Tps to 90' afc to 82' T.D.90'

B-2 af to 64' Qt to 93' Tfl to 95' T.D.95'

B-5 af to 55' T.D.55'

B-501 B-502 B-503 B-504 B-505

## LEGEND

STRATIGRAPHY

HOLOCENE

- af — ARTIFICIAL FILL
- afc — COMPACTED ARTIFICIAL FILL
- Qal — ALLUVIUM

PLEISTOCENE

- Qt — TERRACE DEPOSITS (SOUTH OF WHITTIER FAULT ZONE)
- Qof — OLDER FAN DEPOSITS (NORTH OF WHITTIER FAULT ZONE)

PLIOCENE

- Tfu — UPPER FERNANDO FORMATION

MIOCENE

- Tps — PUENTE FORMATION – SOQUEL MEMBER
- Tplv — PUENTE FORMATION – LA VIDA MEMBER

SYMBOLS

- APPROXIMATELY LOCATED GEOLOGIC CONTACT; QUESTIONED WHERE SURMISED; DOTTED WHERE CONCEALED
- 90 / 65 — APPROXIMATELY LOCATED FAULT; QUESTIONED WHERE SURMISED; DOTTED WHERE CONCEALED; U=UP, D=DOWN, ARROWS INDICATE RELATIVE SLIP; BARB INDICATES DIRECTION AND AMOUNT OF DIP
- 60 — STRIKE AND DIP OF BEDDING
- HORIZONTAL BEDDING
- 75 — STRIKE AND DIP OF JOINTS
- STRIKE OF VERTICAL JOINT
- FT-11 — FAULT TRENCH
- T-2 — EXPLORATION TRENCH
- B-1 — BORINGS BY PSE
- B-505 — BORINGS BY PSE
- TH-1 — BORINGS BY SOUTH COAST GEOLOGIC, INC.
- SL-4 — SEISMIC LINE BY ADVANCED GEOSCIENCE, INC.
- 625 — PRE-CTFS TOPOGRAPHIC CONTOURS

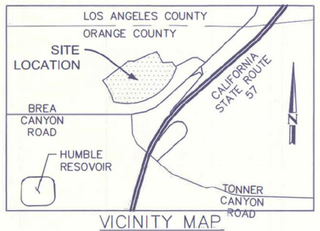
NOTE: REPRESENTATIVE ATTITUDES SHOWN IN SOME TRENCHES OWING TO SPACE LIMITATIONS

- 78 — STRIKE AND DIP OF FAULT
- AFT-1 — APPROXIMATE LOCATION OF FAULT TRENCH (THIS REPORT)

SCALE: 1"=100'

PLATE 1

**ALTA CALIFORNIA GEOTECHNICAL, INC.**
170 N. MAPLE STREET, STE 108, CORONA, CA 92880
TELEPHONE: (951) 509-7090
PROJECT NUMBER: 1-0231 DATE: 11-9-2021




VICINITY MAP
SCALE: NOT TO SCALE

NORTHERN TRACE OF WHITTIER FAULT (NORTH CTFS FAULT)

SOUTHERN TRACE OF WHITTIER FAULT (SOUTH CTFS FAULT)

NORTH CTFS SET BACK ZONE

SOUTH CTFS SET BACK ZONE

Afc Tps Tplv Qt Tfu

EXISTING OVERHEAD POWERLINE AND POLES
EXISTING 24' ACCESS ROAD (COMPACTED NATIVE)
EXISTING 6' ACCESS GATE
EXISTING 6' FENCE
ASPHALT CONCRETE PAVING AT SITE ENTRANCE (FIRST 100' OF ACCESS ROAD)
EXISTING LIGHT MOUNTED ON POLE
METAL RAIN CANOPY
VAN ACCESSIBLE ADA PARKING, LOADING ZONE, AND ACCESSIBLE WALKWAY TO NIETO CONSTRUCTION OFFICE TRAILER
ADA RESTROOM
NIETO CONSTRUCTION OFFICE TRAILER
EXISTING STRUCTURE
EXISTING DRAINAGE DITCH
EXISTING FIRE HYDRANT
EXISTING CELL TOWER & STRUCTURES
EXISTING FIRE WATER STORAGE TANK
EXISTING EDGE OF PAVEMENT
EXISTING CONCRETE V-DITCH
EXISTING DIRT SHOULDER (±35' WIDE)
EXISTING PAVEMENT STRIPING (LEFT TURN TO SR 57 WESTBOUND ACCESS RAMP)
EXISTING PAVEMENT STRIPING (LEFT TURN INTO SITE)
R/W
PL
APN: 304-171-05
APN: 304-171-08
AFT-1
HARBOR LEASE
NIETO LEASE
BENNETT LEASE
BREA CANYON ROAD
TONNER CANYON ROAD
CALIFORNIA STATE ROUTE 57

(535.0) FS
(541.0) FS
(484.0) FS

## LEGEND

STRATIGRAPHY

HOLOCENE
Afc — COMPACTED ARTIFICIAL FILL

PLEISTOCENE
Qt — TERRACE DEPOSITS

PLIOCENE
Tfu — UPPER FERNANDO FM

MIOCENE
Tps — PUENTE FM — SOQUEL mbr
Tplv — PUENTE FM – LA VIDA mbr

SYMBOLS

APPROXIMATELY LOCATED GEOLOGIC CONTACT

APPROXIMATELY LOCATED FAULT; DOTTED WHERE CONCEALED, QUESTIONED WHERE UNCERTAIN, ARROWS INDICATE RELATIVE MOTION

HABITABLE STRUCTURES SETBACK ZONE

78 — STRIKE AND DIP OF FAULT

AFT-1 — APPROXIMATE LOCATION OF FAULT TRENCH (THIS REPORT)

NOTE: SEE SEPARATE DETAILED SITE PLANS FOR TENANT LEASE AREAS.

| LEASE AREA INFORMATION | | | | |
|---|---|---|---|---|
| | BENNETT | HARBOR | TREECO | NIETO |
| LAND USE | A-1 (VEHICLE STORAGE) | A-1 (VEHICLE STORAGE) | A-1 | A-1 |
| VEHICLE DAILY TRIPS | 13-20 | 2-3 | 10-12 | 30 |
| HOURS OF OPERATION | 5AM – 5PM (MON – FRI) | 5AM – 2:30PM (MON – FRI) | 7AM – 4PM (MON – FRI) | 5AM – 5PM (MON – FRI) |
| PARKING | 21 SPOTS | 970 SPOTS | 17 SPOTS | 49 SPOTS |
| AMOUNT OF ACREAGE TO BE GRADED | N/A | N/A | N/A | N/A |
| NUMBER OF EMPLOYEES | 0 | 0 | 24 | 16 |

## GENERAL NOTES

PROPERTY IS LOCATED WITHIN A STATE OF CALIFORNIA SEISMIC HAZARD ZONE SUSCEPTIBLE TO EARTHQUAKE INDUCED LANDSLIDES AND IS DIRECTLY ADJACENT AN AREA IDENTIFIED AS BEING SUSCEPTIBLE TO LIQUEFACTION. FUTURE SITE DEVELOPMENT WILL REQUIRE SITE SPECIFIC LANDSLIDE AND LIQUEFACTION EVALUATION IN ACCORDANCE WITH SP117A.

PROPERTY IS LOCATED WITHIN A STATE OF CALIFORNIA EARTHQUAKE FAULT ZONE. FUTURE SITE DEVELOPMENT WILL REQUIRE SITE SPECIFIC FAULT RUPTURE EVALUATION IN ACCORDANCE WITH SP42.

FINAL DETERMINATION OF THE REQUIRED LEVEL OF GEOTECHNICAL EVALUATION (IF ANY) SHALL BE DETERMINED BY COUNTY STAFF UPON REVIEW OF FINAL PLANS AND CONFIRMATION OF PROJECT SCOPE DURING THE GRADING AND BUILDING PERMIT PROCESS. THE GEOTECHNICAL REPORT AND DESIGN RECOMMENDATIONS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE OC GRADING MANUAL AND THE CURRENT CALIFORNIA BUILDING CODE.

FUTURE SITE DEVELOPMENT (I.E. RESIDENTIAL/COMMERCIAL SITE USE) WILL REQUIRE DETAILED GEOTECHNICAL EVALUATION.

SEPARATE DEMOLITION PERMIT IS REQUIRED TO REMOVE ANY STRUCTURE BUILT WITHOUT PERMIT SUCH AS METAL CANOPY, ETC.

SEPARATE PERMITS ARE REQUIRED FOR ANY PROPOSED STRUCTURE.

SEPARTE BUILDING PERMIT IS REQUIRED FOR ANY EXISTING STRUCTURE CONSTRUCTED OR MOVED ON SITE WITHOUT PERMIT.

ALL EXISTING ROADS AND PROPOSED LEASE AREAS ARE CURRENTLY COMPACTED NATIVE.

80 0 40 80 160
SCALE 1"= 80'

PLATE 2

ALTA CALIFORNIA GEOTECHNICAL, INC.
170 N. MAPLE STREET, STE 108, CORONA, CA 92880
TELEPHONE: (951) 509-7090
PROJECT NUMBER: 1-0231 DATE: 11-9-2021

| NO. | DATE | REVISIONS | APPROVED |
|---|---|---|---|

DESIGNED BY: MDP
DRAWN BY: MDP
CHECKED BY: SMC
DATE: 12/11/18

REGISTERED PROFESSIONAL ENGINEER STEVEN MICHAEL COOK No. 76947 CIVIL STATE OF CALIFORNIA

HUITT-ZOLLARS
Huitt-Zollars, Inc. Irvine
2603 Main Street, Suite 400
Irvine, California 92614
Phone (949) 988-5815 Fax (949) 988-5820

PREPARED UNDER THE SUPERVISION OF — R.C.E. 76947 — EXPIRES 12/31/18 — DATE 12/11/18

MENCHEGO LEASE SITES
1281 S. BREA CANYON ROAD
OVERALL SITE PLAN

COUNTY OF ORANGE
PUBLIC WORKS DEPARTMENT

JOB NO.: R306930.01
SHEET 1 OF 1

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

ALTA CALIFORNIA GEOTECHNICAL INC.

170 North Maple Street, Suite 108
Corona, CA 92880
www.altageotechnical.com

**CONSTRUCTION PLANNING SERVICES**
P.O. Box 487
Dana Point, California 92629

March 12, 2019
**Project Number 1-0231**

Attention: Mr. Joe Lambert

Subject: ***SUMMARY FAULT INVESTIGATION AND UPDATED DESIGN RECOMMENDATIONS***
Menchego Lease Sites
1281 Brea Canyon Road
County of Orange, California

References: See Appendix A

Dear Mr. Lambert:

Presented herein is Alta California Geotechnical, Inc.'s (Alta) summary fault investigation and updated design recommendations for the Menchego Lease Sites, located at 1281 Brea Canyon Road, County of Orange, California. This report is based on a review of the referenced reports, review comments from the County of Orange Public Works Department, and Alta's experience with similar projects in the area.

Alta prepared a geotechnical recommendation report for the site (Alta, 2017) based on its intended continued use as vehicular staging /storage area with limited improvements and no habitable structures (occupied a minimum of 2,000 man-hours per year). Since the preparation of that report, design plans have changed to include an office trailer which is considered a habitable structure per the Alquist-Priolo (A-P) Earthquake Fault Zoning Act. Per County of Orange requirements, a fault investigation has to be conducted to establish habitable structure setback zones.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



## TABLE OF CONTENTS

1.0 INTRODUCTION ..... 1
- 1.1 Purpose ..... 1
- 1.2 Scope of Work ..... 1
- 1.3 Report Limitations ..... 1

2.0 PROJECT DESCRIPTION ..... 2

3.0 PREVIOUS FAULT INVESTIGATION ..... 2

4.0 SETBACK ZONES ..... 3

5.0 UPDATED DESIGN RECOMMENDATIONS ..... 4
- 5.1 Foundation Design ..... 4
- 5.2 Seismic Design ..... 5
- 5.3 Footing Excavations ..... 5
- 5.4 Concrete Design ..... 6

6.0 LIMITATIONS ..... 6

APPENDIX A – References
APPENDIX B – PSE Fault Investigation

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



A fault investigation of the site was prepared by Pacific Soils Engineering, Inc. (PSE) in 2005 (PSE, 2005). We have reviewed and concur with the findings in this report, specifically, their rational for the placement of the habitable structure setback zones. Additionally, updated foundation design recommendations for the office trailer are presented herein. All other geotechnical recommendations and conclusions presented in Alta, 2017 remain applicable.

Included in this report are:

- Discussion of the previous fault investigation.
- A geologic map showing setback zones with respect to the proposed office trailer.
- Updated design recommendations for the office trailer.
- A copy of the previous fault investigation.

If you have any questions or should you require any additional information, please contact the undersigned at (951) 509-7090. Alta appreciates the opportunity to provide geotechnical consulting services for your project.

Sincerely,
Alta California Geotechnical, Inc.

SCOTT A. GRAY/RGE 2857
Reg. Exp.: 12-31-20
Registered Geotechnical Engineer
Vice President

REGISTERED PROFESSIONAL ENGINEER
SCOTT A. GRAY
No. 2857
Exp. 12-31-20
GEOTECHNICAL
STATE OF CALIFORNIA

THOMAS J. MCCARTHY/CEG 2080
Reg. Exp.: 9-30-20
Certified Engineering Geologist
Vice President

CERTIFIED ENGINEERING GEOLOGIST
THOMAS J. McCARTHY
No. CEG 2080
Exp. 9-30-20
STATE OF CALIFORNIA

Distribution: (3) Addressee

SAG: TJM: 1-0231, March 12, 2019 Summary Fault Investigation and Updated Design Recommendations, Menchengo Lease Sites

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



## 1.0 INTRODUCTION

The following report presents a summary fault investigation and updated design recommendations for the Menchego Lease Site, in the County of Orange, California.

### 1.1 Purpose

The purpose of this report is to apply the results of the previous fault investigation to the proposed design and provide geotechnical design recommendations for the proposed office trailer. This report is suitable for submittal to governing agencies and for use in developing plans in conjunction with our previous report for the site (Alta, 2017).

### 1.2 Scope of Work

Alta's scope of work for this report included the following:

- Reviewed the referenced reports for the project;
- Reviewed the report from a previous fault investigation conducted onsite by Pacific Soils Engineering, Inc.
- Prepared an updated geologic map for the site which includes setback zones;
- Evaluated geologic and laboratory data to develop updated recommendations for foundation design;
- Prepared this report and accompanying exhibits.

### 1.3 Report Limitations

The conclusions and recommendations in this report are based on the information generated during investigations presented in the referenced reports. The materials adjacent to or beneath those observed may have different characteristics than those observed, and no representations are made as to the quality or extent of the materials not observed.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



## 2.0 PROJECT DESCRIPTION

A background of the subject site was presented in Alta, 2017. The current design for the project is primarily the same as described in that report, the continued use as staging areas for various vehicle, heavy equipment and constriction operations. However, the proposed office trailer will now be considered a "habitable" structure. The proposed location of the office trailer is depicted on the enclosed Plate 1.

## 3.0 PREVIOUS FAULT INVESTIGATION

The subject site is located within a State of California designated A-P Earthquake Fault Zone. Pacific Soils Engineering, Inc. prepared a fault investigation study in 2005 (PSE, 2005) of the "Main" Whittier Fault Zone (WFZ) for a portion of the overall property identified as the Caltrans Fills Site (CTFS). The report also included an investigation of a "north" Whittier Fault (NWF) located outside of the subject site.

PSE's fault study required a multi-phased approach with the objective of reasonably locating the WFZ beneath about 100-feet (ft) of compacted fill. PSE reviewed stereo-paired aerial photography and placed fault trenches along tops of ridges adjacent to and about perpendicular to the A-P traces of the WFZ. Both refraction and reflection seismic lines were first placed survey-adjacent to PSE fault trenches to calibrate seismic signatures with actual exposed faults. Then, additional seismic lines were placed across the CTFS surface, spanning the entire A-P Zone. Both pre-existing boring's and investigation-specific borings were used to aid interpretation of fault locations.

PSE identified two active strands of the WFZ at the CTFS based on aerial photographic evidence, fault trenches, seismic lines, and borings. Based on the fault investigation, PSE presented the following:

- Two active, well defined traces of the WFZ underlie the CTFS.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



- To satisfy A-P requirements, PSE imposed habitable structures setback zones through the CTFS based on the existing topography over the two faults. The widths of the zones vary based on fault geometry, style of slip, and particularly the depths of fill overlying the faults.

Presented in in Appendix B is the PSE Alquist-Priolo Earthquake Fault Zone Investigation report. This report has been reviewed by Alta and we accept PSE's investigation methods, findings, conclusions and recommendations and their rationale for the placement of the habitable structure setback zones.

## 4.0 SETBACK ZONES

Plate 1 depicts a proposed construction office trailer to be placed on the Nieto Lease area. This trailer is to be occupied a minimum of 2,000 man-hours per year. As mandated by the Alquist-Priolo (A-P) Earthquake Fault Zoning Act, a habitable structure occupied by a minimum of 2,000 man-hours per year is prohibited from being placed directly on an active fault. Alta has superimposed the geologic contacts, fault locations and the habitable structures setback zone from the PSE report onto Plate 1. As can be seen the proposed construction trailer location lies outside of the setback zones and is considered to be in conformance with the intent of the A-P Act.

It should be noted that the existing graded configuration of the property is basically identical to the topographic surface in existence when PSE conducted their investigation. Thus, the setback zone as published by PSE on their Plate II, entitled "Habitable Structures Fault Setback Zones Map" does not require any modification, movement or migration as related to grade changes to the property. However, a change to the setback zone was made to the Northern Whittier fault as a result of the contact between the La Vida and Soquel members of the Puente formation being depicted as a fault contact. Thus, as depicted on Plate I, the southerly end of the setback zone has been moved to the north to accommodate the fault.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



## 5.0 UPDATED DESIGN RECOMMENDATIONS

Geotechnical recommendations concerning grading and construction of the proposed improvements were presented in Alta, 2017 and remain applicable herein, with the exception of the foundation design parameters for the proposed office trailer. The proposed office trailer is now considered a "habitable" structure and therefore the design recommendations for foundations have been updated herein.

The proposed structure onsite is a commercial modular unit. Presented herein are design recommendations for shallow foundations. If alternate foundation systems will be utilized, additional recommendations can be provided.

PSE Fault Study suggested that foundations for structures in the area be enhanced to reduce the potential damage from earth-quake-induced ground motion and that the enhancements will depend on the type of structure and specific siting. The foundation reinforcement and design settlement values presented below have been increased from the typical values given for the expansive conditions onsite.

The design recommendations herein are presented as a minimum standard for the on-site soil conditions. Structural and Building Code requirements should govern final foundation design.

### 5.1 Foundation Design

The foundations for the proposed office trailer at the site can be designed in accordance with the parameters presented in Table 5-1.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



| Table 5-1<br>Foundation Design Parameters* | |
|---|---|
| Allowable Bearing Capacity | 1500 lbs/ft$^2$(assuming a minimum width and embedment of 12-inches). |
| Lateral Bearing | 150 lbs/ft$^2$ at a depth of 12 inches plus 150 lbs/ft$^2$ for each additional 12 inches of embedment to a maximum of 1500 lbs/ft$^2$ |
| Sliding Coefficient | 0.30 |
| Minimum Footing Width | 12 inches for continuous footings and 18 inches for isolated spread footings |
| Minimum Footing Embedment | 12 inches |
| Minimum Footing Reinforcement | Two (2) No. 5 bars, one (1) on top and one (1) on bottom |
| Settlement | Static:<br>Differential = 1/2-inch in 40 feet<br>Dynamic:<br>Differential = 1-inch in 40 feet |

*These values may be increased as allowed by Code to resist transient loads such as wind or seismic. Building code and structural design considerations may govern depth and reinforcement requirements and should be evaluated.

## 5.2 Seismic Design

The site has been identified as "D" site class in accordance with section 1613.3.2 of CBC 2016. Utilizing this information, the computer program ATC Hazards by Location and ASCE 7-10 criterion, the spectral response accelerations that can be utilized for the project are presented on Figure 1. These parameters should be verified by the structural engineer. Additional parameters should be determined by the structural engineer based on the Occupancy Category of the proposed structures.

## 5.3 Footing Excavations

The excavations should be cleaned of all loose/sloughed materials and be neatly trimmed at the time of concrete placement. The Project Geotechnical Consultant should observe the footing excavations prior to the placement of

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

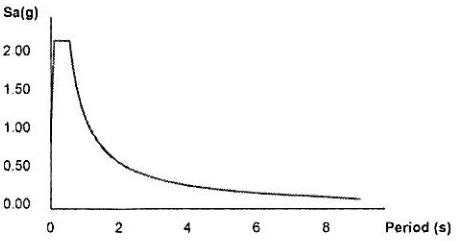
# ATC Hazards by Location

## Search Information

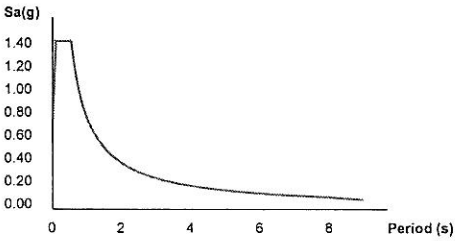
| | |
|---|---|
| **Coordinates:** | 33.9424, -117.8766 |
| **Elevation:** | 541 ft |
| **Timestamp:** | 2019-03-08T18:04:23.781Z |
| **Hazard Type:** | Seismic |
| **Reference Document:** | ASCE7-10 |
| **Risk Category:** | II |
| **Site Class:** | D |




### MCER Horizontal Response Spectrum




### Design Horizontal Response Spectrum




## Basic Parameters

| Name | Value | Description |
|---|---|---|
| $S_S$ | 2.191 | $MCE_R$ ground motion (period=0.2s) |
| $S_1$ | 0.808 | $MCE_R$ ground motion (period=1.0s) |
| $S_{MS}$ | 2.191 | Site-modified spectral acceleration value |
| $S_{M1}$ | 1.212 | Site-modified spectral acceleration value |
| $S_{DS}$ | 1.461 | Numeric seismic design value at 0.2s SA |
| $S_{D1}$ | 0.808 | Numeric seismic design value at 1.0s SA |

## ▾Additional Information

| Name | Value | Description |
|---|---|---|
| SDC | E | Seismic design category |
| $F_a$ | 1 | Site amplification factor at 0.2s |
| $F_v$ | 1.5 | Site amplification factor at 1.0s |
| $CR_S$ | 0.926 | Coefficient of risk (0.2s) |
| $CR_1$ | 0.933 | Coefficient of risk (1.0s) |
| PGA | 0.862 | $MCE_G$ peak ground acceleration |
| $F_{PGA}$ | 1 | Site amplification factor at PGA |
| $PGA_M$ | 0.862 | Site modified peak ground acceleration |
| $T_L$ | 8 | Long-period transition period (s) |
| SsRT | 2.191 | Probabilistic risk-targeted ground motion (0.2s) |
| SsUH | 2.367 | Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years) |
| SsD | 2.814 | Factored deterministic acceleration value (0.2s) |
| S1RT | 0.808 | Probabilistic risk-targeted ground motion (1.0s) |
| S1UH | 0.866 | Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years) |
| S1D | 1.117 | Factored deterministic acceleration value (1.0s) |
| PGAd | 1.085 | Factored deterministic acceleration value (PGA) |

*The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.*

## Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

FIGURE 1

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



concrete to determine that the excavations are founded in suitably compacted material.

### 5.4 Concrete Design

Given the nature of the improvements and discussions presented in the referenced reports, it is anticipated that sulfate-resistant concrete will not be required for the proposed structure. This recommendation should be verified by sulfate content testing during construction.

## 6.0 LIMITATIONS

This report is based on the following: 1) the project as presented on the attached plan; 2) the information presented in the previous subsurface investigations; and 3) from the information presented in the referenced reports. The findings and recommendations are based on the results of the subsurface investigation, laboratory testing, and office analysis combined with an interpolation and extrapolation of conditions between and beyond the subsurface excavation locations. The results reflect an interpretation of the direct evidence obtained. Work performed by Alta has been conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the geotechnical profession currently practicing in the same locality under similar conditions. No other representation, either expressed or implied, and no warranty or guarantee is included or intended.

The recommendations presented in this report are based on the assumption that an appropriate level of field review will be provided by a geotechnical consultant who is familiar with the design and site geologic conditions. That field review shall be sufficient to confirm that geotechnical and geologic conditions exposed during grading are consistent with the geologic representations and corresponding recommendations presented in this report.

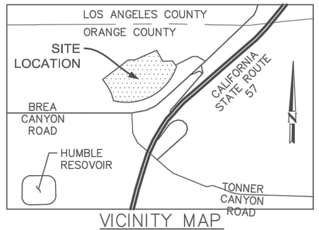
Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



The conclusions and recommendations included in this report are applicable to the specific design of this project as discussed in this report. They have no applicability to any other project or to any other location 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 Alta.

Alta has no responsibility for construction means, methods, techniques, sequences, procedures, safety precautions, programs in connection with the construction, acts or omissions of the CONTRACTOR or any other person performing any of the construction, or for the failure of any of them to carry out the construction in accordance with the final design drawings and specifications.




VICINITY MAP
SCALE: NOT TO SCALE

NORTHERN TRACE OF WHITTIER FAULT (NORTH CTFS FAULT)

SOUTHERN TRACE OF WHITTIER FAULT (SOUTH CTFS FAULT)

NORTH CTFS SET BACK ZONE

SOUTH CTFS SET BACK ZONE

Afc

Tps

Tplv

Qt

Tfu

EXISTING OVERHEAD POWERLINE AND POLES

EXISTING 24' ACCESS ROAD (COMPACTED NATIVE)

EXISTING LIGHT MOUNTED ON POLE

METAL RAIN CANOPY

VAN ACCESSIBLE ADA PARKING, LOADING ZONE, AND ACCESSIBLE WALKWAY TO NIETO CONSTRUCTION OFFICE TRAILER

ADA RESTROOM

NIETO CONSTRUCTION OFFICE TRAILER

EXISTING DRAINAGE DITCH

EXISTING FIRE HYDRANT

EXISTING CELL TOWER & STRUCTURES

EXISTING STRUCTURE

EXISTING 6' FENCE

EXISTING 6' ACCESS GATE

ASPHALT CONCRETE PAVING AT SITE ENTRANCE (FIRST 100' OF ACCESS ROAD)

EXISTING EDGE OF PAVEMENT

R/W

EXISTING CONCRETE V-DITCH

EXISTING DIRT SHOULDER (±35' WIDE)

EXISTING PAVEMENT STRIPING (LEFT TURN TO SR 57 WESTBOUND ACCESS RAMP)

EXISTING PAVEMENT STRIPING (LEFT TURN INTO SITE)

PL

APN: 304-171-08

APN: 304-171-05

HARBOR LEASE

NIETO LEASE

BENNETT LEASE

EXISTING FIRE WATER STORAGE TANK

(535.0) FS

(541.0) FS

(484.0) FS

BREA CANYON ROAD

CALIFORNIA STATE ROUTE 57

TONNER CANYON ROAD

## LEGEND

STRATIGRAPHY

HOLOCENE
- Afc — COMPACTED ARTIFICIAL FILL

PLEISTOCENE
- Qt — TERRACE DEPOSITS

PLIOCENE
- Tfu — UPPER FERNANDO FM

MIOCENE
- Tps — PUENTE FM – SOQUEL mbr
- Tplv — PUENTE FM – LA VIDA mbr

SYMBOLS
- APPROXIMATELY LOCATED GEOLOGIC CONTACT
- APPROXIMATELY LOCATED FAULT; DOTTED WHERE CONCEALED, QUESTIONED WHERE UNCERTAIN, ARROWS INDICATE RELATIVE MOTION
- HABITABLE STRUCTURES SETBACK ZONE

## GENERAL NOTES

PROPERTY IS LOCATED WITHIN A STATE OF CALIFORNIA SEISMIC HAZARD ZONE SUSCEPTIBLE TO EARTHQUAKE INDUCED LANDSLIDES AND IS DIRECTLY ADJACENT AN AREA IDENTIFIED AS BEING SUSCEPTIBLE TO LIQUEFACTION. FUTURE SITE DEVELOPMENT WILL REQUIRE SITE SPECIFIC LANDSLIDE AND LIQUEFACTION EVALUATION IN ACCORDANCE WITH SP117A.

PROPERTY IS LOCATED WITHIN A STATE OF CALIFORNIA EARTHQUAKE FAULT ZONE. FUTURE SITE DEVELOPMENT WILL REQUIRE SITE SPECIFIC FAULT RUPTURE EVALUATION IN ACCORDANCE WITH SP42.

FINAL DETERMINATION OF THE REQUIRED LEVEL OF GEOTECHNICAL EVALUATION (IF ANY) SHALL BE DETERMINED BY COUNTY STAFF UPON REVIEW OF FINAL PLANS AND CONFIRMATION OF PROJECT SCOPE DURING THE GRADING AND BUILDING PERMIT PROCESS. THE GEOTECHNICAL REPORT AND DESIGN RECOMMENDATIONS SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF THE OC GRADING MANUAL AND THE CURRENT CALIFORNIA BUILDING CODE.

FUTURE SITE DEVELOPMENT (I.E. RESIDENTIAL/COMMERCIAL SITE USE) WILL REQUIRE DETAILED GEOTECHNICAL EVALUATION.

SEPARATE DEMOLITION PERMIT IS REQUIRED TO REMOVE ANY STRUCTURE BUILT WITHOUT PERMIT SUCH AS METAL CANOPY, ETC.

SEPARATE PERMITS ARE REQUIRED FOR ANY PROPOSED STRUCTURE.

SEPARTE BUILDING PERMIT IS REQUIRED FOR ANY EXISTING STRUCTURE CONSTRUCTED OR MOVED ON SITE WITHOUT PERMIT.

ALL EXISTING ROADS AND PROPOSED LEASE AREAS ARE CURRENTLY COMPACTED NATIVE.

| LEASE AREA INFORMATION | | | | |
|---|---|---|---|---|
| | BENNETT | HARBOR | TREECO | NIETO |
| LAND USE | A-1 (VEHICLE STORAGE) | A-1 (VEHICLE STORAGE) | A-1 | A-1 |
| VEHICLE DAILY TRIPS | 13-20 | 2-3 | 10-12 | 30 |
| HOURS OF OPERATION | 5AM – 5PM (MON – FRI) | 5AM – 2:30PM (MON – FRI) | 7AM – 4PM (MON – FRI) | 5AM – 5PM (MON – FRI) |
| PARKING | 21 SPOTS | 970 SPOTS | 17 SPOTS | 49 SPOTS |
| AMOUNT OF ACREAGE TO BE GRADED | N/A | N/A | N/A | N/A |
| NUMBER OF EMPLOYEES | 0 | 0 | 24 | 16 |

80 0 40 80 160
SCALE 1"= 80'

NOTE: SEE SEPARATE DETAILED SITE PLANS FOR TENANT LEASE AREAS.

PLATE 1

ALTA CALIFORNIA GEOTECHNICAL, INC.
170 N. MAPLE STREET, STE 108, CORONA, CA 92880
TELEPHONE: (951) 509-7090
PROJECT NUMBER: 1-0231 DATE: 3/12/19

| NO. | DATE | REVISIONS | APPROVED |
|---|---|---|---|

DESIGNED BY: MDP
DRAWN BY: MDP
CHECKED BY: SMC
DATE: 12/11/18

REGISTERED PROFESSIONAL ENGINEER STEVEN W. COOK No. 76947 CIVIL STATE OF CALIFORNIA

HUITT-ZOLLARS Irvine
Huitt-Zollars, Inc.
2603 Main Street, Suite 400
Irvine, California 92614
Phone (949) 988-5815 Fax (949) 988-5820

PREPARED UNDER THE SUPERVISION OF R.C.E. 76947 EXPIRES 12/31/18 DATE 12/11/18

MENCHEGO LEASE SITES
1281 S. BREA CANYON ROAD
OVERALL SITE PLAN

COUNTY OF ORANGE
PUBLIC WORKS DEPARTMENT

JOB NO.: R306930.01
SHEET 1 OF 1

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



## APPENDIX A

## Selected References

1. Alta California Geotechnical, Inc., 2017, Revised Geotechnical Recommendation Report, Menchego Lease Sites, 1281 Brea Canyon Road, County of Orange, California, dated September 19, 2017 (Project No. 1-0231).

2. F. Beach Leighton and Associates, Inc., 1970, In-Grading Geologic Report of Fill Site, Shell Oil Property, Brea Canyon, County of Orange, California, dated September 20, 1990 (Project No. 1055).

3. Pacific Soils Engineering, Inc., 2008, Second Addendum Geological and Geotechnical Engineering Assessment, In Support of an Environmental Impact Report, 2935± Acre AERA-Master Planned Community (AMPC) Northwesterly Adjacent to the Intersection of Tonner Canyon Road and Brea Canyon Road, Counties of Los Angeles and Orange, California, dated May 6, 2008 (Work Order 102280).

4. Pacific Soils Engineering, Inc., 2007, Addendum Geological and Geotechnical Engineering Assessment, In Support of an Environmental Impact Report, 2935± Acre AERA-Master Planned Community (AMPC) Northwesterly Adjacent to the Intersection of Tonner Canyon Road and Brea Canyon Road, Counties of Los Angeles and Orange, California, dated September 25, 2007 (Work Order 102280).

5. Pacific Soils Engineering, Inc., 2005a, Geological and Geotechnical Engineering Assessment, In Support of an Environmental Impact Report, 2935± Acre AERA-Master Planned Community (AMPC) Northwesterly Adjacent to the Intersection of Tonner Canyon Road and Brea Canyon Road, Counties of Los Angeles and Orange, California, dated November 1, 2005 (Work Order 102280).

6. Pacific Soils Engineering, Inc., 2005b, Alquist-Priolo Earthquake Fault Zone Investigations, Existing Caltrans Fill Site, Northwest Adjacent to the Intersection of Tonner Canyon Road and Brea Boulevard; and Possible Extension of "North Whittier Fault', Near Harbor Boulevard; Brea Oil Field, Counties of Los Angeles and Orange, California, Aera Master Planned Community, dated October 4, 2005 (Work Order 102280-F).

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

# APPENDIX B

# PSE FAULT INVESTIGATION

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tiberti-Lee
BUILDING OFFICIAL

**PACIFIC SOILS ENGINEERING, INC.**
710 E. PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (951) 582-0170, FAX: (951) 582-0176

**AERA ENERGY LLC**
3030 Saturn Street, Suite 101
Brea, California 92821

October 4, 2005
**Work Order 102280-F**

Attention: Mr. George Basye

Subject: **ALQUIST-PRIOLO EARTHQUAKE FAULT ZONE INVESTIGATIONS**
Existing Caltrans Fill Site, Northwest Adjacent To the Intersection of Tonner Canyon Road and Brea Boulevard; and Possible Extension of "North Whittier Fault", Near Harbor Boulevard; Brea Oil Field
Counties of Los Angeles and Orange, California,
Aera Master Planned Community.

References: See Appendix A

## EXECUTIVE SUMMARY

Gentlemen:

At your request, Pacific Soils Engineering (PSE) has completed Alquist-Priolo (A-P) level investigations of the "main" Whittier Fault Zone (WFZ) at the Caltrans Fills Site (CTFS) in the southeast corner of the Aera Master Planned Community (AMPC). In addition, the same investigation was made of a "north" Whittier Fault (NWF) mapped by others offsite to the west of the Western Ridge area (WRSA). Both the WRF and the NWF are in the State of California A-P Earthquake Fault Zones, thereby triggering the A-P level investigations.

The WFZ is a major active fault that is part of the Whittier-Elsinore Fault Zone extending from Baja California on the southeast to the northern Los Angeles Basin on the northwest. Locally, the WFZ is part of a system that forms the northeast boundary of the Los Angeles Basin. The NWF was mapped during the previous exploration and grading of Fullerton Road west of the WRSA. The investigators, Leighton and Associates, mapped the NWF as a single-strand and reported that possibly tilted alluvium and disturbed alluvium suggested that the faults slipped in the Holocene (last 11,000 years). Thus, by State of California A-P definitions, the NWF would be considered active if indeed the aforementioned evidence was resultant from seismotectonic

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tabassian
BUILDING OFFICIAL



fault rupture, rather than landsliding or secondary earthquake effects such as ground shaking. Leighton and Associates did note some ambiguity of attribution of the effects. In sum, PSE was retained by Aera to: 1) locate and characterize the WFZ and to determine the kind and extent of development feasible for the CTFS from an A-P standpoint; and 2) to analyze and investigate the location and character of the NWF and to assess its impact on development of the WRSA.

**Investigative Methods**

The A-P Investigation of the CTFS required a multi-phased approach to the objective of reasonably locating the WFZ beneath about 100-feet (ft) of compacted fill. PSE first reviewed stereo-paired aerial photography and placed fault trenches along tops of ridges adjacent to and about perpendicular to the A-P Traces of the WFZ. Those trenches intercepted and helped locate splays of the WFZ: the "North CTFS Fault" and the "South CTFS Fault". Both refraction and reflection seismic lines were placed survey-adjacent to PSE fault trenches to calibrate seismic signatures with actual exposed faults. Seismic lines were also placed on the CTFS surface spanning the entire A-P Zone. Both pre-existing boring and investigation-specific borings were used to aid interpretation of fault locations.

The investigation of the NWF at WRSA included review of aerial photographs and "as-graded" geological reports by the geologic consultants for Fullerton Road—the investigators that originally suggested the presence of the NWF. PSE also placed trenches on the WRSA that would have intercepted eastern projections of the NWF onto AMPC. The trenches did not span the entire A-P Zone, but the Leighton and Associates detailed geological mapping did.

**Findings**

PSE identified two active strands of the WFZ at the CTFS based on aerial photographic evidence, fault trenches, seismic lines, and borings. The north strand juxtaposes Pleistocene fanglomerate deposits and the La Vida Member of the Puente Formation to the north against the Soquel Member of the Puente Formation to the south. In the three trenches exposing the fault, the faulted zone was narrow, yet still a few feet wide. The seismic lines produced signatures with sufficient clarity to trace the zones beneath the CTFS. Geologic relationships suggest a

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



strong horizontal component to this fault, although geomorphic features are not particularly well defined. The "South CTFS Fault", conversely, has strong geomorphic features that point to recent movement. For example, both large and small streams have been deflected in a right-lateral manner consistent with regional slip along the WFZ.

The South CTFS Fault was also encountered in trenches where, characteristically, Pleistocene terrace deposits and north-dipping Puente Formation on the north are juxtaposed against south-dipping Fernando Formation on the south. Seismic lines, borings, and mapped regional geologic evidence also depict the same relationship. The seismic line and boring information particularly "located" the State CTFS Fault below existing artificial fill.

At the WRSA, PSE observed a fault that did not displace a latest Pleistocene carbonate horizon. This fault is about parallel to the trace of the previously mapped NWF. No other PSE trench intercepted post-depositional faults, although penecontemporaneous deformation in the form of folding abounds (when the sediments were not yet lithified).

Similarly, detailed mapping by the Fullerton Road geologic consultants across and beyond the NWF A-P Zone revealed no faults other than the NWF.

**Conclusions and Recommendations**

Based on the fault investigations of both the CTFS and WRSA, PSE presents the following:

- Two active, well defined traces of the WFZ underlie the southern part of the CTFS.
- To satisfy A-P requirements, PSE imposes habitable structures setback zones at and near the CTFS for existing grades along the two faults. The widths of the zones vary based on accuracy of location, geometry, style of slip, and particularly the depths of CTFS overlying the faults.
- Near the CTFS, where grades are planned to be lowered or raised, the setback zones must be adjusted by widening, narrowing, or laterally shifting.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



- Owing to the relative complexity of adjustments, relevant conceptual, tentative and grading plans should be reviewed by the project geologist and geotechnical engineer for "setback conformance" prior to the finalization and submittal to the governing agency.

- In general, as is the case throughout Southern California, the possibility of strong ground motion induced by the WFZ or other regional faults is a significant geotechnical issue. As a minimum, structures must be designed in accordance with prevailing Code standards for strong ground motion. The use of stiffened foundations, post-tensioned slab/foundations, and/or remedial grading will be necessary.

- Utilities that cross the setback zones should include automatic shutoffs and/or flexible connections, owing to the possibility of disruption.

- No active faulting was observed within the WRSA study area during this phase of investigation. These trenches were excavated easterly adjacent to the State A-P Zone owing to access to current oil field activities, active pipelines, existing topography, and depth of existing artificial fill. As such, further studies may be required within the A-P Zone. However, available evidence indicates that for planning purposes the fault is not active, if extant, in the AMPC.

- Areas planned for passive uses such as open space, parks, or recreational development would not normally require A-P Level investigations. Conversely, where planned development and habitable structures encroaching into A-P Zones or areas suspected to contain acting faulting, future investigations will be necessary.

- A Certified Engineering Geologist should map exposed fault conditions during grading and make appropriate recommendations based on those field exposures. In addition, the exposed fault traces should be identified and surveyed upon exposure. It is possible that some adjustments of setbacks may be required after actual field conditions are exposed.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



The opportunity to be of service is appreciated. If you have any questions or require additional information, please contact the undersigned at (951) 582-0170.

Respectfully submitted,
PACIFIC SOILS ENGINEERING, INC.

MICHAEL F. MILLS/CEG 994
Reg. Exp.: 2-28-06
Geologist

Reviewed by:

JAMES B. CASTLES/RGE 192
RCE 30280/Reg. Exp.: 3-31-06
Chief Operations Officer




Distribution: (6) Addressee

MFM/TMW/JBC:eem-102280-F, October 4, 2005

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



# TABLE OF CONTENTS

1.0 INTRODUCTION ..... 1
2.0 PURPOSE AND SCOPE OF WORK ..... 2
3.0 ATTACHMENTS ..... 3
4.0 SITE DESCRIPTION ..... 4
5.0 INVESTIGATIVE METHODS ..... 6
5.1 Rationale ..... 6
5.2 Trenching ..... 7
5.2.1 Methodology ..... 7
5.2.2 Location ..... 8
5.3 Seismic Lines ..... 9
5.3.1 Methodology ..... 9
5.3.2 Location ..... 10
5.4 Borings ..... 11
5.5 Surveying ..... 11
5.6 Aerial Photographs ..... 12
6.0 REGIONAL GEOLOGIC SETTING ..... 12
6.1 Whittier Fault Zone ..... 13
6.1.1 History ..... 13
6.1.2 Holocene Activity Level ..... 16
7.0 GEOMORPHOLOGY ..... 17
7.1 Regional ..... 17
7.2 Local ..... 18
8.0 LOCAL GEOLOGIC SETTING ..... 21
8.1 Stratigraphy ..... 21
8.1.1 Bedrock ..... 21
8.1.1a Puente Formation ..... 21
8.1.2 Fernando Formation, Lower Member (Map Symbol: Tfl) ..... 23
8.1.3 Terrace Deposits (map symbol: Qt) ..... 23
8.1.4 Older Fanglomerate (map units: Qof1 and Qof2) ..... 25
8.1.5 Artificial Fill ..... 26
8.1.6 Surficial Soils/Colluvium ..... 27
9.0 GEOLOGIC STRUCTURE ..... 27
9.1 Surface Faults ..... 29
10.0 FAULT LOCATION, STYLE, AND ACTIVITY ..... 30
10.1 North CTFS Fault Trace ..... 30
10.1.1 Trenches ..... 30
10.1.2 Seismic Lines ..... 32
10.1.3 Borings ..... 34
10.1.4 Summary ..... 34
10.2 South CTFS Fault Trace ..... 35
10.2.1 Trenches/Outcrops ..... 35

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



10.2.2 Seismic Lines ..... 36
10.2.3 Borings ..... 37
10.2.4 Summary ..... 38
10.3 WRSA Fault Trace ..... 38
11.0 HABITABLE STRUCTURES SETBACK ZONES ..... 40
11.1 Setback for Present Grades at Existing Deep CTFS Fills ..... 41
11.1.1 Rationale ..... 41
11.1.2 North Fault ..... 42
11.1.3 South Fault ..... 43
11.1.4 Post-Grading Setbacks in Areas Now Underlain by Bedrock/Terrace Deposits ..... 44
11.1.5 Fill Added to Existing Bedrock Surfaces ..... 44
11.1.6 Lowering of Grade at Existing Bedrock Surfaces ..... 44
11.1.7 Increased or Lowered Grades at Existing CTFS Deep Fills ..... 44
12.0 FOUNDATION ENHANCEMENTS ..... 45
13.0 CONCLUSIONS AND RECOMMENDATIONS ..... 46
14.0 CLOSURE ..... 47

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



## LIST OF FIGURES

1. CTFS area location and lineament map.
1A. NWF area location and photo geologic map.
2. Regional southern California fault map.
3. Path of reverse fault rupture through stiff earth materials.
4. Path of strike-slip fault through stiff earth materials.
5. Schematic cross-section A-A': setback requirements for north WFZ fault.
6. Schematic cross-section B-B': setback requirements for south WFZ fault.
7. Schematic cross-section C-C' and D-D': setback requirements in areas of existing bedrock/terrace deposits.

## LIST OF PHOTOS

1. Typical, unfaulted, north-dipping La Vida member of the Puente Formation in FT-1.
2. Contact relationships among the La Vida member of the Puente Formation and older fanglomerates.
3. North WFZ trace in FT-2.
4. South WFZ trace in FT-4A

## LIST OF PLATES

1. Location of seismic lines for fault investigation NE corner Tonner and Brea Canyon
1A. Reproduction of Plate 1.
2. Roads for Pacific Soils Engineering.
3. Seismic Line 1.
4. Seismic Line 2A.
5. Seismic Line 2B.
6. Seismic Line 3.
7. Seismic Line 4.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



8. Seismic Line 5

I. 100-scale geologic map of the CTFS area: includes PSE trench locations, seismic lines, borings, and faults.

II. 100-scale topographic map with habitable structure setback zones.

III. 100-scale geologic map of the WRSA area: includes PSE trench locations and the NWF A-P Zone.

IV. Fault trench log FT-1.

V. Fault trench log FT-2.

VI. Fault trench log FT-3, west wall.

VII. Fault trench logs FT-4A, 4B, 5, 6, and 7.

VIII. Fault trench logs FT-8, 9, 10, 11, and 12.

IX. Fault trench logs FT-101 and 102.

X. Fault trench logs FT-103A, 103B, 103C, and 104.

XI. Trench log T-1

XII. Trench log T-2, 3, 4, 5, and 6.

## LIST OF APPENDICES

A. Selected References.

B. Logs of Borings.

C. Geophysical Report by Advanced Geoscience, Inc.

D. Geomorphic and Soil-Stratigraphic Assessment by Dr. R. J. Shlemon.

E. Description of Units, Attitudes, and Symbols used in Trench Logs.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



## 1.0 INTRODUCTION

At your request, Pacific Soils Engineering, Inc. (PSE) has completed a multi-discipline fault rupture hazard study of the Whittier fault zone (WFZ) at the Caltrans fill site (CTFS and Figure 1) in the southeast corner of the Aera-Master Planned Community (AMPC); as mandated by the Alquist-Priolo (A-P) Earthquake Fault Zoning Act (Chapter 7.5, Division 2 of the California Public Resources Code). Additionally, PSE conducted an initial A-P fault investigation in the northwesterly part of AMPC, where a "north Whittier Fault" (NWF) had been suggested and mapped by Leighton and Associates (1990) westerly offsite (Figure 1A). That fault was subsequently placed in an A-P Zone by the State of California (1991).

Provisions and policies of the A-P Act require that the State Geologist impose "study" (A-P) Zones along well-located, active ("sufficiently active and well-defined") faults: and that the local building official "must withhold development permits for sites within the zones until geologic investigations demonstrate that the sites are not threatened by surface displacements from future faulting" (Hart and Bryant, 1997). "Sufficiently active" typically refers to faults that have presumably ruptured the ground surface within about the last 11,000 years (Holocene Epoch). Specifically, the intent of the act is to prohibit the placing of habitable structures (2,000 man-hours per year) directly on those active faults and that setbacks are established from same. A "site" is defined as a development of four or more residences.

Much of the CTFS is within an A-P Zone placed by the California Division of Mines and Geology (CDMG, 1980, 1991) along the WFZ in the La Habra and Yorba Linda Quadrangles, Orange County, California (Figure 1). Owing to the presence of the approximate 100-feet (ft) thick fill section, a multi-discipline approach using three exploration methods was judged best for the CTFS investigation. An initial A-P investigation that included only fault trenches was carried out in the West Ridge Study Area (WRSA) (Figure 1A) to determine if an active fault (the NWF) is present on the study site. This report documents the findings of those A-P level investigations.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permit: 5A018830

CAL-TRANS FILL SITE (CTFS)

APPROXIMATE AMPC BOUNDARY

Note: Recently active traces have not been located offshore west of Carbon Canyon

1" = 2000'

ALQUIST-PRIOLO ZONE

## LEGEND

- RIGHT-DEFLECTED HIGH ORDER ANTECEDENT CANYON
- RIGHT-DEFLECTED LOW TO MEDIUM ORDER ANTECEDENT CANYON
- (2) NUMBER REFERRED TO IN TEXT
- WEAK TONAL LINEAMENT
- APPARENT LITHOLOGIC CHANGE (BEDDED ON NORTH, MASSIVE ON SOUTH)

MAP TAKEN FROM CDMG (1991, 1980) AND AERIAL PHOTOGRAPHS LISTED IN APPENDIX I OF THIS REPORT.

# FIGURE 1

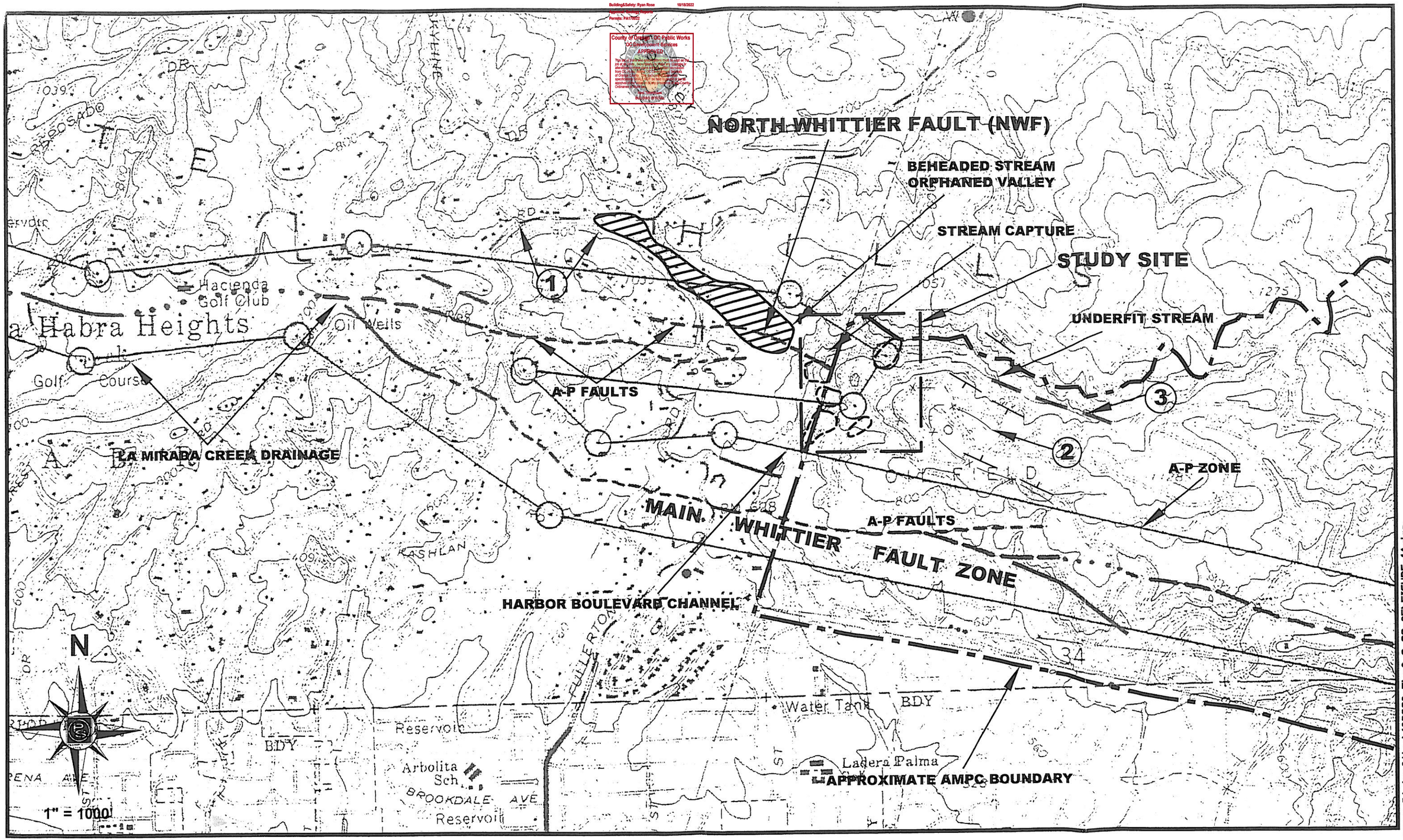
## LOCATION / LINEAMENT MAP

PACIFIC SOILS ENGINEERING, INC
710 E. PARKRIDGE AVE. SUITE 105, CORONA CALIFORNIA 92879
TELEPHONE: (951) 582-0170, FAX: (951) 582-0176

W.O. 102280-F DATE: 10/4/05

Building&Safety: Ryan Rose 10/18/2022
Permit Application Number:
Permits: P#17892

County of Orange/OC Public Works
OC Development Services
APPROVED
This Plan is approved as noted. Approval of this plan or plans, specifications or calculations shall not be construed to be a permit for, nor an approval of any violation of any provisions of the County Ordinance or State law.
Ryan Rose
Building & Safety




**LEGEND**

- POSSIBLE LANDSLIDE
- PHOTO LINEAMENT; LENGTH OF DASH INDICATES STRENGTH
- PROMINENT OUTCROPS PATTERN
- DIPPING BEDS
- (1) NUMBER REFERRED TO IN TEXT

# NWF AREA LOCATION AND PHOTO GEOLOGIC MAP

FIGURE 1A

PACIFIC SOILS ENGINEERING, INC.
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (951) 582-0170, FAX: (951) 582-0176
W.O. 102280-F DATE: 10/4/05

PATH: S:\drafting\102280-F\of 9-23-05\FIGURE-1A.dwg

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



## 2.0 PURPOSE AND SCOPE OF WORK

The main purposes of the CTFS investigation were three-fold: 1) to locate and assess the activity levels of strands or splays of the WFZ, if present, beneath the fill area; 2) to provide Aera with practical opinions and recommendations regarding the absence or presence of active faults and their constraints on project development and siting of facilities at the CTFS, including establishment of structural setbacks; and 3) to provide geologic documentation to support any future investigations that may be undertaken within the A-P zone. The main purpose of the A-P level investigation of the West Ridge Study Area (WRSA) within the westerly portions of AMPC is to physically evaluate hypothesized projections of the NWF into the AMPC. Accordingly, PSE completed the following tasks:

- Review of available literature including summaries of the rationale used to place the A-P zones, consultants reports on nearby properties, and published articles about regional geology in general and the WFZ in particular.
- Interpretation of stereo-pair aerial photographs, emphasizing possible tectonic geomorphic (surficial) evidence for the presence or absence of active faults on-site, and to the evidence cited by the State Geologist for placing the local strands of the WFZ within an A-P zone. PSE assessed 16 flights of stereo-pair photographs archived at Whittier College, as well as a set of "color-shift" infrared stereo-pair photographs supplied by Aera Energy.
- Development of preliminary "photo lineament" maps to identify possible local and regional faults and tectonic geomorphology (Figures 1 and 1A).
- Excavation and logging of trenches, over 3,000 lineal feet in total, to expose subsurface geology parallel to the east and west boundaries, and to the central part of the CTFS within the mapped A-P zone; and to investigate possible extension of the NWF onto the site. Trenches were up to 400-feet long and about 25-ft. deep.
- Excavation and logging of five (5) bucket-auger borings to constrain fault locations at the CTFS.
- Completion of six (6) refraction/reflection seismic lines totaling about 3700 lineal feet by Advanced Geoscience, Inc. Three lines were placed to obtain geophysical signatures of geology/faults near the trenches where surficial geology was known. Three lines were then placed on the CTFS to locate WFZ traces below the existing fill. These lines spanned the entire A-P zone within the CTFS.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



- Fencing of the trench sites.
- Field geologic mapping of well-exposed bedrock and surficial deposits to "close" gaps between some trenches.
- Meetings with the local building officials during the field investigation.
- Backfilling of trenches.
- Field and office review of regional and local geomorphology relative to faults and their ages by Dr. Roy J. Shlemon, a noted and well-respected soil-stratigrapher and Quaternary geologist. Dr. Shlemon also offered internal review of PSE work at the CTFS.
- Preparation of this report that summarizes PSE's findings and recommendations. This includes Geologic Maps, a Habitable Structures Setback Zones Map, all at a scale of one-inch (in) equals 100-ft, detailed graphic trench logs drawn at a scale of one-in equals five-ft, a report by Advanced Geophysics Inc (Appendix C) replete with seismic profiles, pertinent boring logs from this and earlier investigations (Appendix B), and a report by Dr. Shlemon, (Appendix D).

## 3.0 ATTACHMENTS

This document consists of a narrative text with five (5) page-size illustrations (Figures 1 and 1A through 4), 4 color photographs, 4 schematic cross-sections (Figures 5 through 7), a list of references (APPENDIX A), logs of borings by PSE (this study) and South Coast Geologic Services (1987) (APPENDIX B), a geophysical report and seismic cross-sections by Advanced Geophysics, Inc. (APPENDIX C), and a geomorphic/soils stratigraphy report by Dr. Roy Shlemon (APPENDIX D). Appendix E contains the description of geologic units shown in the Trench Logs. The pockets contain: 1) Plate I, a 100-scale geologic map of the CTFS that includes the surveyed (Hunsaker and Associates, Inc.) locations of the recent trenches, seismic lines, borings, and faults , 2) Plate II, also a 100-scale topographic map, portraying habitable structure setback zones based on the findings of this investigation, 3) Plate III, a 100-scale geologic map of the WRSA study area that also shows recent PSE trenches and the NWF A-P Zone, and 4) Graphic trench logs as Plates IV through XII.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



Please note that the "pre-Caltrans fill" topography has been transferred onto Plate I from an untitled topographic map, dated 1971. That topography was essential to locating the WFZ faults and for establishing setback zones at the CTFS.

This report is organized so that separate discussions of the CTFS and the NWF investigations appear as separate items under major headings.

## 4.0 SITE DESCRIPTION

### *CTFS*

CTFS is located on the south flank of the Puente Hills, within the Brea oil field, immediately west of the 57 Freeway and north and east of a sinuous Brea Canyon Road/Brea Boulevard and its intersection with Tonner Canyon Road (Plate I; Figure 1). The south and west parts of the study area are operating oil fields. The CTFS is within the County of Orange and the north boundary of the A-P zone coincides with the Orange-Los Angeles County line.

The CTFS study area occupies parts of three south-draining incised canyons separated by steep-sided ridges (interfluves). For much of their lengths, the canyons are repositories for up to about 120-ft of compacted fill placed by Caltrans during grading of the 57 Freeway in the early 1970's. The south end of the central of the three bedrock interfluves has been flattened to the surrounding fill grades, presumably during Caltrans fill placement (Plate I). The flanks of the bounding ridges rise from the flat fill surfaces at ratios of about one (horizontal)-to-one (vertical) to two-to-1 with local gentler and steeper elements. Total relief near the CTFS is on the order of 400-ft.

The CTFS is, in essence, a three-tiered prism of fill; that is, a lower large fill pad was constructed at about elevation 535-ft above sea level (asl). A small central pad at about elevation 620-ft. asl separates the lower pad from a large upper pad. The upper pad elevation is about 680-ft asl. The north-south axis of the fill is about 2200-ft long, and the narrower east-west axis is about 1500-ft (maximum) wide, although it varies

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



considerably. Finished, engineered, 2:1 south-facing fill slopes, replete with gunite terrace drains, separate the three fill-pad tiers.

At the time of exploration (1998-1999), the flat areas of the CTFS were occupied by several enterprises, including a pump truck service, a backhoe operator, a brush-chipping facility, and a County of Orange car-impound service on the lowest tier. A truck-body storage lot occupies nearly all of the central tier, and the upper pad was vacant at the time of exploration except for beehives, a cattle water trough, and an abandoned tank.

From about 1920, the site has been part of the Brea-Olinda Oil Field, which is but one of many long-exploited oil repositories that mark the trace of the WFZ (California Division of Oil and Gas, 1991). Accordingly, the entire study site has been strongly modified by oil field operations. Numerous uncertified shallow fill pads and associated pads/slopes were created to accommodate oil wells, pump stations, tanks, and associated facilities. Many more service roads were carved into ridge flanks and canyon bottoms.

Despite the ongoing oil operations, the site afforded sufficient access to obtain geological and geophysical information on which to base well-documented opinions and recommendations about the presence and relative activity of on-site faults and their impact on future planning and development.

***WRSA***

The West Ridge Study Area is located immediately east of Harbor Boulevard approximately 1 ½ miles north of the intersection of Harbor and Whittier Boulevards. The site is on an east-west trending ridgeline bordered by a west-draining, deeply incised canyon on the north, and by broad hills and intervening drainages on the south (Plate III; Figure 1A). Compacted fill, placed under the observation and testing of Leighton and Associates (1990) in conjunction with the extension of Harbor Boulevard borders the western part of the site at the toe of an approximate 150-ft high, about 1 ¼ to 1 ½ (horizontal: vertical), natural slope.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



## 5.0 INVESTIGATIVE METHODS

### 5.1 Rationale

***CTFS***

Fault trenching is the usual method to determine if near-surface faults are active according to A-P criteria (McCalpin and Shlemon, 1996). Faults and displaced strata are observed on the trench walls, and fault-activity levels can thus be directly determined. At CTFS, however, the crux of the subject task was to identify faults beneath up to about 120-ft of fill -- with enough confidence to establish A-P level habitable structures setbacks. Those fill depths, of course, ruled out a simple fault-trench approach. Rather, PSE carried out multi-discipline direct and indirect field investigations, as well as aerial photographic/literature studies, to establish the presence and locations, or absence thereof, of active faults beneath and adjacent to the CTFS.

Investigative methods included: 1) placing and logging of fault trenches, and mapping of natural and artificial exposures on ridges that border the CTFS fill prisms, and run perpendicular to the trend of the WFZ A-P zone; 2) placing both refraction and reflection seismic lines near and approximately parallel to the fault trenches in order to calibrate seismic signatures with the known subsurface geology/faults, and then to complete seismic lines placed across the CTFS to locate those same seismic signatures of bedrock/terrace deposits/faults below the fill; and finally, 3) complete four (4) borings (B-502 through B-505) in the lowermost fill tier to more accurately locate an important fault trace. One boring (B-501) was placed north of those borings in order to establish the depth of a Quaternary fanglomerate and to better constrain the north CTFS fault location (Plate 1). PSE used the three methods to obtain the best data possible beneath the fill. Taken together, the methods yielded good models of site geology, sufficient to make well-founded conclusions and recommendations about the on-site WCF. This multifaceted approach has proven successful on other sites where direct

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



observation was neither practical nor even feasible (for example, Grant et al., 1995; PSE, 1996).

***WRSA***

Previous studies by others had determined the WFZ to be active. An apparent active fault trace (NWF) was mapped westerly offsite of the study area by Leighton and Associates (1990) during grading operations for the extension of Harbor Boulevard (Fullerton Road). This information was reviewed by the State Geologist who then imposed an A-P Zone (CDMG, 1991). Part of this zone encompasses approximately 3200 square feet in the northwestern portion of the AMPC. PSE excavated six (6) trenches to investigate a possible easterly extension of the mapped fault. These excavations were accomplished utilizing a rubber-tired backhoe and a track-mounted excavator. Much of the discussion contained herein uses the Leighton and Associates (1990) final grading geologic maps to supplement the PSE exploration.

## 5.2 Trenching

### 5.2.1 Methodology

***CTFS***

Trenches FT-1 through FT-9 were excavated to about 25 ft using a Caterpillar 320C excavator. All other trenches were excavated with either Ford rubber-tired or John Deere track-mounted backhoes.

Trenches were excavated in accordance with both OSHA and Aera safety policies. Specifically, the excavations were benched to slope ratios of 1:1 or flatter and fenced, with ladders provided for emergency egress. Trenches were up to 400-ft long and were generally about 15-ft deep, but locally were as deep as about 25-ft. Trench walls were cleaned, string reference lines were placed on one wall (usually the west), and each of those walls was then logged at a scale of one-inch equals five-ft,

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tiemstra
BUILDING OFFICIAL



horizontal and vertical, by engineering geologists (Plates IV through VII, in pockets). All trenches exposed deposits suitable for identifying the presence or absence of faults, and some allowed relative dating of last slip along fault strands.

### 5.2.2 Location

Fault Trenches FT-1, FT-2, FT-3, FT-8, and FT-12, were excavated on ridges westerly adjacent to CTFS (Plate I). These trenches were placed to intercept mapped A-P faults or similar unmapped parallel faults trending toward the fill, and where near-parallel seismic lines could be placed for calibration of known near-surface geology with seismic signatures. Fault Trenches FT-1, FT-2, FT-8, and FT-12 either overlapped or were contiguous. A gap that exists between FT-2 and FT-3, owing to steep topography, environmental sensitivity, local landsliding, and oil field facilities was "closed" to the east by a combination of other trenches, surface exposures, and geophysical arrays.

Fault Trenches FT-4A through FT-9 were placed on a central bedrock ridge (Plate I) and were located to close the aforementioned "gap" as well as expose the southernmost mapped A-P fault trace (CDMG, 1991; Treiman, 1991). These trenches were generally short and *en echelon* owing to artificial barriers such as active roads, steep cut slopes, and wedges of oil field fill.

Trenches FT-10 and FT-11 were placed on a cut part of the central ridge separating the two deep CTFS canyon fills (Plate I) in order to positively locate the north WFZ trace (CDMG, 1991) exposed in FT-2 west of those two trenches. These trenches proved very useful for positively locating that fault trace.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



Trenches T-1 through T-6 served two purposes: 1) to provide information about whether the easternmost of the ridges bounding the CTFS was in-place and therefore not a landslide; and 2) to determine the south limits of the La Vida Member of the Puente Formation that forms the north block of the northernmost A-P fault.

***WRSA***

The approximate 500 linear feet of trenches near the NWF (Plate III) were excavated adjacent to or along existing access roads and or drill pads. These trenches (FT-101, FT-102, FT-103A through FT-103C and FT-104) trend north to northeast and "cover" the southern portion of the AP Zone imposed by the State of California. These trenches are located easterly adjacent to the State AP Zone owing to topography, artificial fill, and oilfield operational considerations.

## 5.3 Seismic Lines

### 5.3.1 Methodology

PSE contracted with Advanced Geoscience, Inc., to complete six (6) shallow refraction and reflection seismic lines (S-1, S-2A, S-2B, and S-3 through S-5). The refraction and reflection surveys were done concurrently, using the methodology described in APPENDIX C. Both reflection and refraction data were gathered in order to maximize information about subsurface geology. The reflection seismic procedure, on the one hand, records sonic reflections "bounced off" subsurface discontinuities such as bedding planes and formational contacts; and is thus useful for constructing "seismic cross-sections" that represent the geologic structural and stratigraphic relationships in the upper few hundred feet of the subsurface. Refraction seismic sections on the other hand indicate the velocity of sound within the subsurface deposits. Lateral disruptions and velocity juxtapositions often identify faults, where the

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



deposits on either side possess differential velocity characteristics. Advanced Geoscience therefore provided PSE with cross-sections along each line for both reflection and refraction methodologies (see Appendix C).

### 5.3.2 Location

Seismic Line S-1 was approximately parallel to Fault Trenches FT-1, FT-2, FT-8, and FT-12 on the west marginal bedrock/terrace deposit interfluve (Plate I). This line was 950-feet long, and was positioned to provide seismic (both refraction and reflection) cross-sections where trenches exposed local geology in general and a north trace of the WFZ in particular. This line thus served to "calibrate" specific seismic signatures of faults and local geology with actual subsurface exposures, leading to well-founded interpretations of seismic signatures of faults/geology underlying the CTFS, and ultimately establishing confidence in fault placements beneath the CTFS. Lines S-2A and S-2B were placed on the central bedrock interfluve where the subsurface geology, including the south A-P fault, was well exposed in trenches and cut slopes. These lines proved useful to locate the south fault signature beneath the CTFS. These lines crossed the east projection of a pronounced right bend in the canyon between the west and central interfluves -- a kind of feature that many times results from geologically recent strike-slip fault movement.

Seismic Line S-3 extended for 800-ft across the upper pad of the CTFS (Plate I). This line was placed to intercept the north splay (as well as any other subparallel splay) of the WFZ surmised to be present below the 120-ft fill section. Seismic Lines S-4 and S-5 were likewise placed on the CTFS fill pads. Seismic Line S-4 was on the medial pad, and Seismic Line S-5 was on the lowest pad. Line 5 was particularly located to intercept the south (and, if extant, associated) fault(s) of the WFZ.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



In sum, the seismic lines overlapped and spanned the entire width of the A-P zone (Plate I). Further, the seismic survey yielded cross-sections replete with well-defined, unique signatures that correlate well with direct trench, boring and cut slope observations, such that the seismic data and direct observations confirm one another. The survey is constituted by "parallel coverage" of two ridges, thereby affording good coverage of the A-P zone.

## 5.4 Borings

Because of lack of exposures and presence of deep fills that are not amenable to fault trenching in the southeast part of the study area -- in particular the lowest fill pad -- PSE placed four (4) bucket-auger borings, up to 95-ft deep, across a fault trace identified on Seismic Line 5. The linear array of borings (Plate I) confirmed PSE conclusions (derived from comparison of seismic signatures and trenches) about the south WFZ fault trace.

The borings were logged by representatives of this firm, and representative samples of the earth materials were collected and delivered to our laboratory for pertinent testing. The logs of borings and laboratory results follow this text as Plates II-1 through II-7 in APPENDIX B. Also, logs of borings generated by this firm and others (South Coast Geologic Services, Inc., 1987) during previous studies of the CTFS follow the logs of borings generated during this study. The locations of all pertinent borings are shown on Plate I.

## 5.5 Surveying

Poorly constrained locations of exploratory excavations and faults can lead to inaccurate placements of required setback zones. PSE therefore arranged to have trenches, seismic lines, borings and exposed fault locations within the CTFS surveyed by Hunsaker and Associates, Inc. The base map for Plates I (geologic map) and II (setback zones) depict the surveyed locations. No evidence of active

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tiberti-Lee
BUILDING OFFICIAL



faulting was observed in this firm's investigation of NWF, thus, these trenches and exploratory pits were not survey located. The approximate locations of the trenches are shown on the accompanying geologic map of the WRSA (Plate 3).

### 5.6 Aerial Photographs

PSE reviewed 16 flights of vintage aerial photographs archived at Whittier College. These photographs, dating from 1927, proved useful for: 1) analyzing regional geomorphology prior to modification by on-going urbanization or oil-field activities; 2) making judgements about topographic features that might suggest the presence of local active faults; and 3) interpreting the Pleistocene and Holocene geological history of the region. Figure 1 portrays lineaments suggestive of faults that PSE interpreted from the aerial photographs at the CTFS. Figure 1A portrays the same for the WRSA.

## 6.0 REGIONAL GEOLOGIC SETTING

Both the CTFS and WRSA occupy small parts of the south flank of the Puente Hills, Orange County, California (Figure 2). Part of the eastern Los Angeles basin, the hills are underlain by about 17,000-feet of Cretaceous (?) through Pleistocene sedimentary rocks that were laid down upon pre-Cretaceous crystalline basement rocks and have been faulted, folded, and uplifted by on-going tectonism to their present configuration. Exposed near the CTFS are several thousand feet of upper Miocene Puente Formation sandstones and siltstones and Pliocene Fernando Formation sandstones, conglomerates and siltstones. These sedimentary rocks have been elevated relative to adjacent lowlands by Pleistocene transpressional slip along regional faults (Figure 2) that mainly include the Whittier and Chino right-reverse-oblique faults (Wright, 1991, Yerkes, 1972). Alternatively, other studies suggest that quite possibly slip along a blind (buried) thrust fault, stemming from regional compression, underlying northeast Los Angeles, has given rise to the Puente Hills. That fault has variously been named the Puente segment of the Elysian Park (blind thrust) fault (Dolan et al., 1995) or the Puente Hills fault (Shaw and Shearer, 1999). Nonetheless, the foci of this fault investigation are surface traces of the

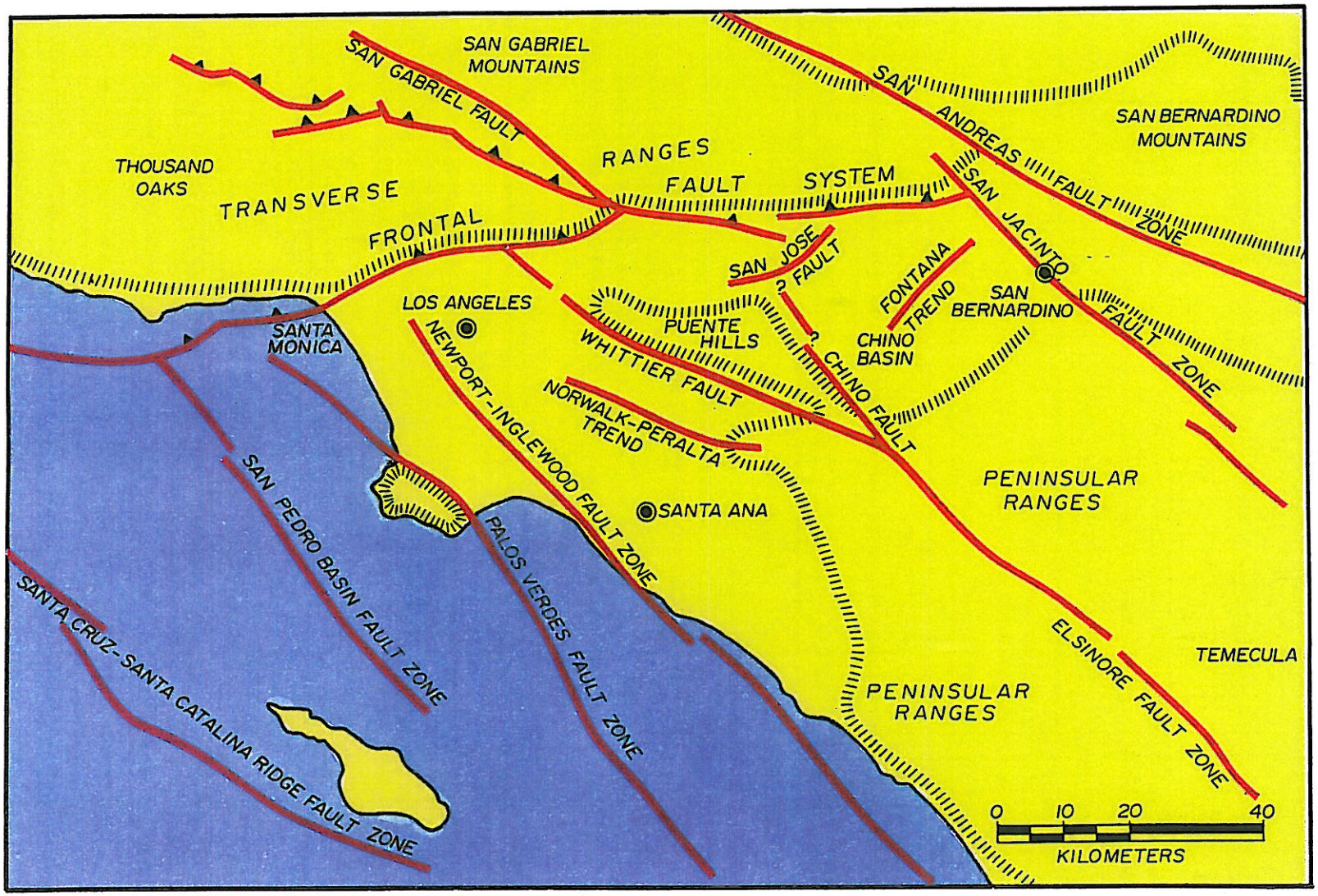



FIGURE 2

# REGIONAL FAULTS

County of Orange - OC Public Works
OC Development Services
APPROVED
Building&Safety: Ryan Ross
Approval: Geology Reports
Permits: PA170022
10/19/2022

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



Whittier Fault Zone (WFZ) that have been mapped on-site (for example, California Division of Mines and Geology, 1980, 1991; Treiman, 1991; Morton and Miller, 1981; Yerkes, 1972). Indeed, the WFZ is considered a major southern California active fault that is capable of causing strong earthquakes and tectonic ground rupture (Dolan et al, 1995; Treiman, 1991).

## 6.1 Whittier Fault Zone

### 6.1.1 History

Many geological investigations have been carried out along the WFZ. Early investigations dealt mainly with the petroleum-geological aspects of the zone and the potential for exploitation of same (for example, Davis, 1975; Yerkes, 1972; Durham and Yerkes, 1964; Daviess and Woodford, 1949; and many more proprietary oil company investigations). As oil production declined and as Orange County has increasingly urbanized in the late 20$^{th}$ Century, geological investigations of the fault zone have principally focused on the possible effects and associated mitigation of earthquakes and ground rupture (for example, Rockwell, et al., 1992; Treiman, 1991; Leighton and Associates, 1990; Davis, et al., 1989; Lamar, 1982).

The WFZ, the Palos Verdes, and the Transverse Range frontal faults bound the Los Angeles basin, (Figure 2, Wright, 1991; Davis, et al., 1989). The WFZ is a northwest-trending right-reverse (oblique) slip zone that extends from the Elsinore fault zone on the southeast to eastern Los Angeles, near Whittier Narrows on the northwest where it seemingly "dies out" or where its slip is transferred to west-trending reverse and left-oblique slip faults along the southern Transverse Ranges (Bullard and Lettis, 1993). The WFZ, to some degree, parallels the southwest base of the Puente Hills and for most of its length displays complex and youthful surface patterns (Wright, 1991; Davis, et al., 1975; Yerkes, 1972).

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



The history and style of WFZ are yet controversial. Some judge the zone to have been active as a right-normal fault zone (southwest block down) at least as early as the middle to late Miocene (for example, Davis, et al., 1989) resulting from then-active continental extension. The WFZ presumably was -- along with the Chino Hinge Line fault of Wright (1991) -- the eastern boundary of a rapidly subsiding trough that received as much as 17,000-feet of detritus that now compose the sedimentary rocks of the Los Angeles basin (Wright, 1991; Yerkes, et al., 1965).

Changes in regional stress at the onset of convergence of the North American and Pacific Ocean crustal plates in the Pliocene (about 3 to 5-million years before present) led to ongoing compression of the Los Angeles basin (Shaw and Suppe, 1996), accompanied by continuing right-lateral and dip slip along existing faults such as the WFZ. However, the Los Angeles basin boundary faults were at that time *inverted* from right-normal to right-reverse faults (Shaw and Suppe, 1996; Wright, 1991; Davis, et al., 1989). For example, the WFZ was probably reoriented from a south-dipping to a vertical or north-dipping zone, although the southwestern block has continued to "drop" relative to the northeastern block. Traditionalists have then argued that the Puente Hills continued to be elevated as a transpressional "pop-up" structure bounded on the southwest by the WFZ and on the northeast by the Chino fault (Figure 2).

Stemming from the 1987 5.9 $M_w$ Whittier Narrows earthquake that occurred along an east Los Angeles basin blind thrust fault, some recent investigators surmise that Puente Hills uplift is mainly a result of compression along west-trending blind reverse faults (Shaw and Shearer, 1999; Davis, et al., 1989). This class of faults includes the postulated Elysian Park blind thrust of Davis, et al., (1989) and the Puente Hills fault of Shaw and Shearer (1999). Many current and future studies will

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tiberti-Lewis
BUILDING OFFICIAL



probably continue to assess various east Los Angeles basin fault models. Therefore, agreement as to the style and history of Puente Hills uplift is yet forthcoming. Nonetheless, investigations conclude that slip along the WFZ is taking place, although the amounts of and predominance of strike-slip over reverse-slip is not yet resolved. For example, at one extreme Rockwell, et al., (1992) posit that virtually all Holocene (last ~ 11,000 years) slip is right-lateral based on trenches placed in the Olinda Oil Field. On the other extreme, Davis et al. (1989) suggest that Holocene slip is mainly reverse and accompanied by but a small lateral component; and that the WFZ may be truncated at depth by blind thrust faults.

Vertical stratigraphic separation along the WFZ is clearly documented. For example, Yerkes (1972) pointed out that the basement complex-sedimentary rock contact is separated 6000- to 12,000-ft (northeast side up). Ironically, however, Yerkes also concludes that younger, upper Miocene strata are separated by about 14,000-ft. Irregular basement/sedimentary rock profiles and obfuscatory strike slip may account for the apparent discrepancy.

Yerkes (1972), Wright (1991), Treiman (1991), and Rockwell, et al. (1992) cite both stratigraphic and geomorphic evidence that 4,000- to 15,000-ft of right-lateral slip has taken place on the WFZ. A possible 15,000-ft offset of a regional Paleocene (Silverado Formation) shoreline, as well as several truncated and offset cross-faults, are cited as geologic evidence of major strike-slip (Yerkes, 1972; Wright, 1991). Geomorphic evidence suggests that about 4,000 to 10,000-ft of apparent right-lateral stream deflection has taken place at Brea, Turnbull, and Tonner Canyons (Treiman, 1991). However, Davis, et al. (1989) argues that such lateral offsets are "questionable" because the drainage deflections may not be fault related. For example, many deflections do not lie along any mapped

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tiemstra
BUILDING OFFICIAL



faults or they are only partly along hypothesized faults that have not been substantiated by "abundant" oil field data. Thus the deflections could stem from differential erosion along steeply dipping fault-parallel beds. Davis et al (1989) also notes that not all large southwest-draining canyons are deflected at mapped surface traces of the WFZ. Indeed, they suggest that detailed isopach and stratigraphic maps of the eastern Los Angeles basin do not "allow right lateral offset to be greater than 0.8-km (~2500-ft) since earliest Pliocene time". However, at least a few tens of feet of post-late Pleistocene lateral slip are well documented (Treiman, 1991), and in this report PSE demonstrates that at least at CTFS, right-lateral stream channel deflections exactly coincide with an active strand of the WFZ.

### 6.1.2 Holocene Activity Level

Many WFZ surface faults are considered active according to A-P criteria; that is, they are judged to have displaced the ground surface in the last ~ 11,000 years (Treiman, 1991; Rockwell, et al., 1992; Working Group, 1995). Treiman (1991) particularly summarizes many investigations that brought forth evidence of Holocene ground rupture. Rockwell, et al. (1992) interpret about 2.5- to 3-mm/yr. of late Quaternary lateral slip based on about 1,200-ft lateral separation of an upper Pleistocene terrace deposit at Yorba Linda, and 90-ft offset of a 12,000 to 15,000 year old fluvial channel at the nearby Olinda Oil Field. Lamar (1982) documents historic earthquakes along the WFZ. The zone is thus also seismically active.

Leighton and Associates (1990) suggest that sediments in a closed depression along the trace of the NWF west of AMPC dated at about 12,000 ka "are disturbed". They note tilting as evidence of fault displacements.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tiemstra
BUILDING OFFICIAL



## 7.0 GEOMORPHOLOGY

### 7.1 Regional

Many geomorphic features of the Puente Hills and their southern flank bear particular importance to the study of the Quaternary history of the Whittier Fault Zone (WFZ). Prior to uplift along either the WFZ or blind thrusts, the Puente Hills region was a lowland across which several large rivers drained the San Bernardino/San Gabriel regions. As uplift of the hills began and continued during the Quaternary, incision of and capture of lesser streams by the largest Puente Hills drainage courses (e.g. Tonner and Brea Canyons) kept pace with the rising block and resulted in those now-present large, antecedent drainage courses incised through the Puente Hills. Remnants of the uplifted lowlands areas are now typified by scattered elevated terraces or flat-topped ridges. Uplift through the Pleistocene and Holocene gave rise to consequent smaller slope-flank channels and ravines.

The canyons and ravines carved into the south flank of the Puente Hills provide many geomorphic markers useful to assess the location, style, and rate of Quaternary slip of the WFZ and its individual surface strands. The most impressive apparent geomorphic markers of the WFZ are large right-lateral deflections of the major antecedent canyons along the south flank of the hills. For example, Brea Canyon is offset about 4,000 to 5,000 ft, and Tonner Canyon up to about 10,000 ft (Treiman, 1991; Yerkes, 1972). Many smaller, younger consequent and subsequent drainages are similarly right-laterally offset, but to a lesser degree, owing to their youthfulness as compared to the major antecedent canyons. All attest to strong Quaternary right-lateral slip. As mentioned above, the usefulness of these apparent stream offsets for fault location/slip rate judgements has at times been questioned (for example, Davis, et al., 1989). However, remarkably consistent right-lateral deflections and their linear alignments, as well as recent site-specific fault explorations (Treiman, 1991; PSE, this study), strongly point to a tectonic slip

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tiberti-Lee
BUILDING OFFICIAL



origin for at least many such deflections. Additionally, other tectonic geomorphic features such as shutter ridges, linear drainage, and tonal lineaments also mark the traces of WFZ surface faults (Treiman, 1991; Rockwell, et al., 1992). The attached geomorphic/lineament maps (Figures 1 and 1A) illustrate both stream offsets and other interpreted aerial photographic lineaments that probably are attributable to surface faults.

## 7.2 Local

### *CTFS*

The tectonic geomorphology of the CTFS generally reflects the regional. All 16 sets of vintage aerial photographs, as well as all available pre-CTFS topographic maps, show three local canyons (Locations 1 through 3 on Figure 1) that have right-lateral drainage deflections. The amount of offset seems to be proportional to the length, depth, and width of the channels, thereby implying relative geomorphic (not temporal) age of the channels. That is, seemingly the oldest, largest channel exhibits the largest offset, and the younger and smaller exhibit correspondingly less offset. These deflections are aligned in a west-northwest fashion and mark the trace of a WFZ splay mapped by Yerkes (1972), partly by Tan et al (1984), Treiman (1991) and PSE (this study). The easternmost of the three deflected drainage channels is now occupied by the west part of the CTFS, and as demonstrated below is associated with an active fault (Plate I). A fluvial terrace deposit most likely associated with an ancestral Brea Canyon alluvial plain, and also fed partly by side-slope colluvium, occurs in the south part of the CTFS, north adjacent to the intersection of Brea Boulevard/Brea Canyon Road and Tonner Canyon Road (Plate I).

Very weak lineaments are associated with a north CTFS fault that trends nearly east west (Plate I, Figure 1). Mainly vegetation changes and a change from easily recognizable well-bedded rock (siltstone) on the north to apparently massive rocks (sandstone) on the south give rise to this lineament. It is about coincident

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



with the north fault. No local drainage deflections or other youthful "fault topography" are associated with the north lineament.

Very strong lineaments coincide with the south A-P fault; in particular, the alignment of the three right-laterally deflected channels (Figure 1). The easternmost of the three deflected channels (the one at CTFS) is offset about 300 feet, the central about 250 feet, and the westernmost about 3,000- to 4,500 feet. The west stream channel is a high-order drainage that probably dates well back into the Pleistocene, whereas the other two are no more than second order consequent or subsequent features that may well be no older than latest Pleistocene. This lineament apparently merges with the north lineament about 1,000 feet west of the CTFS, beyond the limits of the subject investigation.

In sum, local tectonic geomorphology marks two major CTFS lineaments that indicate the possible presence of two WFZ strands -- as mapped by Treiman (1991) and as synthesized from Yerkes (1972), Morton and Miller (1981) and Tan et al. (1984). Thus, although the entire A-P Zone width was investigated, particular attention was paid to areas near the lineaments in order to compare site-specific evidence of faulting with regional fault patterns. Such is usually a useful tool for assessing the importance and the regional context of site-specific fault features, and for planning fault explorations.

***WRSA***

Tectonic geomorphic evidence of active faults near the WRSA study site is not as pronounced as near the CTFS and the "main" WFZ. The most prominent feature is a broad, west-trending linear trough west of Harbor Boulevard that has by inference (Treiman, 1991; Leighton and Associates, 1990) been associated with the NWF. PSE suggests that the lineament (1 on Figure 1A) is to some degree a vestige of a now-captured, west-draining Late Pleistocene drainage incised along an anticlinal axis within the Puente Formation.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tiberti-Lee
BUILDING OFFICIAL



Stream capture has been an on-going process during the upwarping of the Puente Hills. Of particular interest is the apparent capture of the V-shaped, west-trending canyon along the north margin of the WRSA (Figure 1A). Review of aerial photographs and regional geologic maps strongly suggest that this now underfit stream once flowed westerly into the La Mirada Creek drainage system. Relatively low relief, aligned valleys, and now-closed depressions mark its ancestral trace west of Harbor Boulevard (Figure 1A) where it joins the severely underfit La Mirada drainage. The alluvium-filled, stranded depression may, in part, reflect that abandoned drainage. Capture by the now south flowing "Harbor Boulevard" channel during uptilting of the south flank of the Puente Hills likely stranded the west part of the La Mirada drainage, diverting current flow to the south. This was accompanied by continued downcutting of the rising V-shaped canyon north of the WRSA; whereas, the "abandoned" run of the stream west of Harbor Boulevard canyon remains little incised owing to that diversion. Regional geologic relationships suggest that the V-shaped stream probably formed along a regional west-trending anticline whose axis about coincides with the canyon (Yerkes, 1972).

The abandoned channel west of "Harbor Boulevard" canyon forms a particularly prominent west trending lineament on aerial photographs that is about coincident with the Leighton (1990) and Treiman (2001) mapping of the NWF. Local landsliding also could have enhanced that lineament and caused tilting of closed-depression alluvial infills.

A class of moderately developed lineaments include topographic alignments of resistant limestone beds within the Puente Formation. Typical examples are shown as Item 2 on Figure 1A. Field observations confirmed their presence. One such occurrence approximates the outcrop pattern of a mapped syncline (Yerkes, 1972). Another weak lineament (3) approximates the north V-shaped canyon, as well as the aforementioned anticline. Geologic structure relations reported by

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



Leighton and Associates (1990) do not indicate a fault along the projection of that lineament, but rather define the anticline (Plate III).

## 8.0 LOCAL GEOLOGIC SETTING

In this section PSE first presents an overview of the CTFS and WRSA geology, including various interpretations of faults at or near the study sites, including the interpretations of Yerkes (1972) Morton and Miller (1981); Tan, et al. (1984); and Treiman (1991) who set forth the criteria establishing an A-P zone along the CTFS section of the WFZ. This is followed by detailed descriptions and analyses of the recent PSE field investigation. Finally, PSE presents the interpretation of fault locations, style, and age (relative activity).

### 8.1 Stratigraphy

The CTFS is underlain by the La Vida and Soquel Members of the upper Miocene Puente Formation, and the siltstone, conglomerate and sandstone of the informal lower member of the Pliocene-aged Fernando Formation. The WRSA area is underlain by only the La Vida Member. Those bedrock formations are commonly mantled by Quaternary deposits, ranging from terrace deposits, conglomerate, alluvium, colluvium, local landslide deposits, and local prisms of uncompacted oil field road and pad fills, and the Caltrans fill (CTFS).

#### 8.1.1 Bedrock

##### 8.1.1a Puente Formation

***La Vida Member (map unit: $Tp_{lv}$):*** Composed mainly of thinly bedded siltstone, claystone with occasional limestone and sandstone interbeds, this lowermost member of the Puente Formation occurs exclusively on the north wall of the north on-site trace of the WFZ (Plate I). The literature also indicates that the southern limit of the La Vida Member delimits the northern boundary of the WFZ near CTFS.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



Generally gray where relatively fresh and becoming yellowish red where weathered, the upper few feet of the La Vida Member are generally very weathered and creep-affected (Photograph 1). Usually this member bears dark clayey soils and gives rise to generally gentle, smooth slopes that are occasionally punctuated by spine-like gray ledges and lag boulders of resistant limestone that grossly mark local bedding plane orientations, and serve as "first cut" identifiers of geologic structure.

This unit is easily recognizable in outcrop and fault trenches owing to its fine-grained and fissile nature. Further, the well-defined beds provide an "open book" for defining structural orientations and relationships.

***Soquel Member (Map Unit: $Tp_s$):*** The Soquel is younger than, and regionally typically overlies, the La Vida Member. However, at CTFS, the Soquel is everywhere in fault contact with the La Vida. It typifies the south block of the on-site north WFZ trace, and hence the hanging wall of the south trace (Plate I). The consistent north-dipping Soquel is *structurally lower* than the similarly north-dipping La Vida, a relationship that clearly defines the north fault trace both regionally and locally.

On- and near-site, the Soquel is composed of thin to massive arkosic sandstone beds that vary from gray where fresh to white or yellowish red where weathered. In many places internally massive sandstone beds are separated by gray to olive to brown yellow siltstone/shale/claystone beds that range from a few inches to several feet thick. These fine-grained interbeds are bedding-plane indicators, and are sufficiently common such that the structural orientations of Soquel Member can almost always be identified in outcrop, in trenches, or on reflection seismic profiles.

The Soquel commonly has internal structure indicative of soft-sediment deformation and short, several-inch offsets that die out within various

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION





**Photograph 1:** Trench FT-1; Typical, unfaulted, north-dipping La Vida Member of the Puente Formation (A).

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



units (for example, Trench FT-2). Similarly, a Miocene penecontemporaneous liquefaction structure was identified in Trench FT-4A. These features clearly represent Miocene, not Holocene (active), deformation.

### 8.1.2 Fernando Formation, Lower Member (Map Symbol: Tfl)

These sediments were laid down in a shallow, early Pliocene marine environment. The rocks lack the well-defined characteristics of the La Vida and Soquel members of the Puente Formation. The south-dipping Fernando crops out exclusively south of the on-site WFZ elements (Plate I). This youngest bedrock formation is thus *structurally below* the older Puente Formation. As a result it typifies the footwall of the south WFZ fault at the CTFS.

Where observed in outcrop, the Fernando Formation consists of brownish to yellowish, silty fine- to coarse-grained, medium-bedded sandstone with occasional grayish siltstone interbeds. The sandstone is usually only lightly cemented and generally friable. A very well cemented 5- to 20-ft. thick limy conglomerate bed marks the lowermost Fernando Formation. This prominent bed is identifiable and traceable immediately south of the south WFZ fault. That bed is shown on Plate I.

Unoxidized dark gray to dark grayish green, laminated, soft silty sandstone and siltstone typifies the Fernando Formation beneath the terrace deposits in the south part of the CTFS.

### 8.1.3 Terrace Deposits (map symbol: Qt)

These partly consolidated Quaternary deposits cap the low, "flat-topped" ridges south of the WFZ (Plate 1) and north of Brea Canyon Road/Brea Boulevard. The terrace deposits vary from locally cross-bedded, gravelly, coarse-grained sand in the deeper parts of fault Trench FT-3 to

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



interbedded silty sands to sandy clays with a few locally derived sedimentary rock clasts in their upper parts. Occasional lenticular or shoestring gravels seemingly occur throughout the deposits, probably laid down by alluvial channels tributary to the main, ancestral Brea Canyon alluvial plain.

Owing to their areal and stratigraphic distribution, and as typified by their cross-bedding, the lower coarse-grained sands of FT-3 probably were laid down by a robust Pleistocene ancestor of presently ephemeral Brea Creek, for they are clearly moderate to high energy alluvial deposits. Ancestral Brea Creek may have deposited some of the finer overlying sediments in FT-3, but more likely these were shed from the hanging wall of the WFZ onto the foot slopes of ancestral Brea Canyon. Their deposition was apparently slow and interrupted long enough to allow formation of multiple buried paleosols. Typically, these beds are strata of locally derived sand, silt, clay with occasional sedimentary rock clasts. Each unit is internally massive owing to a combination of depositional, biological, and pedological processes. Most sequences bear moderately to well developed paleosols typified by rubification, blocky peds, and at least partial clay lining of root tubules and ped faces. Some soils (pedogenic profiles) are several feet thick. These are cumulic soil profiles that formed as pedogenesis kept pace with slow sedimentation rates. These sequences gradually thicken from north to south away from the WFZ down slope toward Brea Canyon, typical of sediments shed from a rising block. These terrace deposits were not identified north of the WFZ. Of importance, the accumulation of these sequences gives rise to a distinctly stratified group of paleosols, useful for determining the presence or absence of late Quaternary fault slip.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



Approximate or relative ages of the terrace deposits are afforded by the degrees of pedogenesis borne by palesols within the various sequences, and by comparison with the oxygen isotope chronology of Shackleton and Opdyke (1973). For example at FT-3 and at the westerly tank battery, the paleosols represent a weathering period of at least 100,000 years (Appendix D).

### 8.1.4 Older Fanglomerate (map units: Qof1 and Qof2)

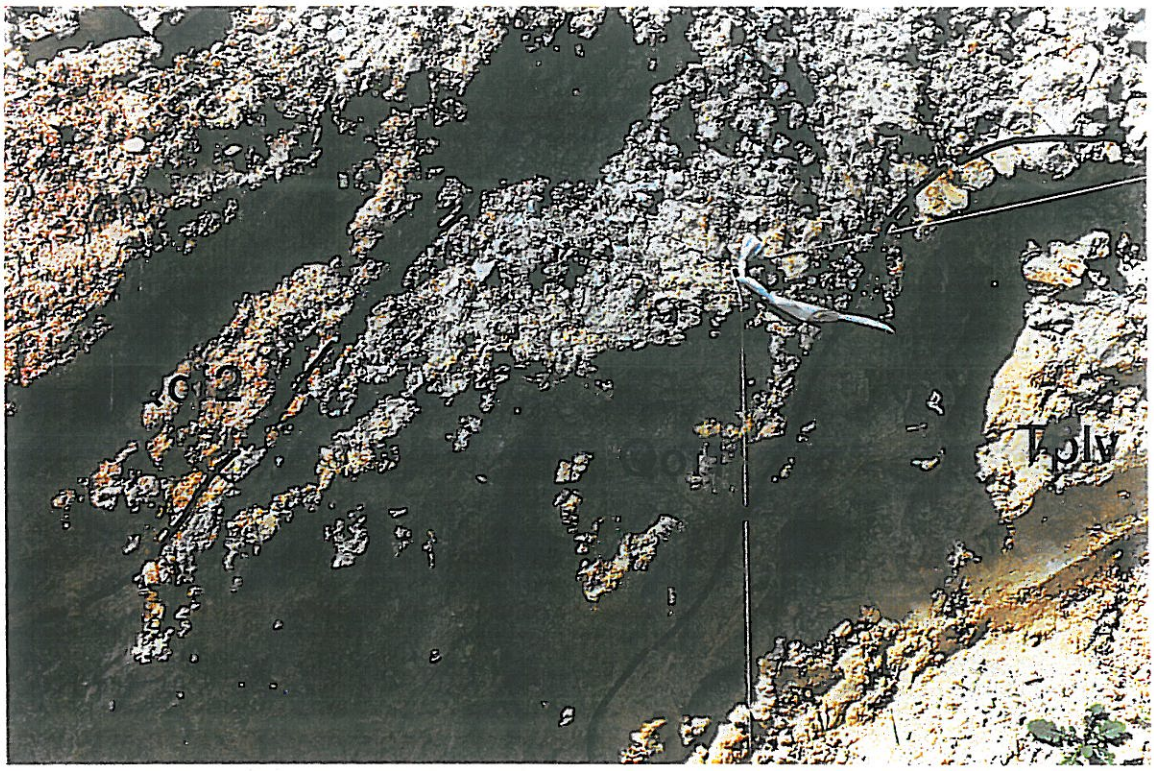
Trenches FT-1, FT-2, FT-8, FT-10, FT-11, and FT-12 exposed two nested Quaternary fanglomerates truncated on the south by the WFZ north fault. Angular to subangular clasts of local sandstone and siltstone are supported in both deposits by sandy silt to sandy matrices. The older unit ($Qof_1$) generally is mottled olive yellow to light grayish brown and is devoid of stratification except where clasts are sub-parallel to its contact with the underlying La Vida Member of the Puente Formation (Trench FT-1, Station 3+30). The upper or younger fanglomerate, generally reddish brown, but otherwise similar to $Qof_1$, is nested within $Qof_1$ and is separated from that unit by a distinct, locally dentiform, ¼- to 1-in thick red iron-oxide crust (Photograph 2).

Carbonate stringers and local well-cemented zones (carbonate stage III) are common throughout both units. A 2-foot to 3-ft thick calcrete (carbonate stage IV) caps both these deposits. The thickness and intensity of the carbonate cement attests to the antiquity of the unit. Dr. Shlemon (Appendix D, herein) suggests that the calcrete could be 100,000 years to perhaps 200,000 years old, and may well predate and be unrelated to the aforementioned terrace deposits south of the WFZ. The fanglomerates where observed in FT-2, FT-10, and FT-11 are truncated by the north trace of the WFZ. Boring B-501 indicates that the fanglomerate is at least 36 feet deep immediately north of the WFZ. Its "match" has not yet been

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL






**Photograph 2:** Trench FT-1; Contact relationships among the La Vida Member of the Puente Formation (Tplv) and older fanglomerates ($Qof_1$ and $Qof_2$).

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



found south of the fault. Locating the orphan deposits, if extant, south of the WFZ could yield additional evidence about local WFZ slip history and rates, but is beyond the scope of this investigation.

An alternative hypothesis to explain the geometry and location of the fanglomerate deposits is that they may have filled a fault-parallel trough, rather than cross-fault channels, and were in turn truncated by fault movement along their southern boundary. However the lack of apparent fault-parallel fanglomerate continuity across the region argues against this hypothesis. Rather, these deposits appear to be remnants of sediments shed from the rising Puente block in a high energy, channeled environment.

### 8.1.5 Artificial Fill

Artificial fill abounds at the CTFS, and can be placed into two broad categories: 1) undocumented, shallow, oil-field-related fill, and 2) the CTFS proper (Plate I). Debris-ridden pads and road shoulders, typical of oil field fill, occur throughout the site and presented local difficulty for trenching. The larger deposits are shown on Plate I, others, either smaller or undetected (e.g. sumps), certainly exist, but the scope of work did not entail the specific search for artificial fill. Also, several feet of apparently undocumented and petroleum-stained fill occupy part of the northcentral CTFS as intercepted by FT-10.

It is beyond the scope of this report to discuss in detail the engineering qualities of CTFS. However future geotechnical reports will address fill quality and extent, and will provide recommendations for necessary geotechnical remediation. Engineered Harbor Boulevard fill obscures geology west of the study site near WRSA. Geological maps prepared during widespread "cleanouts" of surficial cover prior to placement of that

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



fill fully documented bedrock geology and thus proved essential to this study.

### 8.1.6 Surficial Soils/Colluvium

Thin residual soils (alluvium) mantle many natural slopes. These soils are composed of products of underlying parent materials, and are no more than about a few feet thick. Colluvium composed of residual soils and bedrock debris that has crept or been washed downslope occurs in and on draws and toe slopes. In general, these colluvial deposits have been modified by oil field activities.

***WRSA***

This area is underlain by the La Vida Member of the upper Miocene Puente Formation. Varying amounts of soil/colluvium flank the ridgeline and upper canyon draws. Non-engineered artificial fill associated with oil field activities abounds, and varies from a few to perhaps 10 or greater feet thick.

## 9.0 GEOLOGIC STRUCTURE

***CTFS***

At the CTFS, the WFZ traditionally is considered to be a complex zone of steeply north-dipping to vertical, mainly right-lateral, anastomosing strike-slip faults (Wright, 1991; Morton and Miller, 1981). However, many individual fault strands also have post-upper-Miocene reverse (north-side-up) separation of up to about 14,000-ft (Wright, 1991; Yerkes, 1972). Yerkes (1972, cross-section H-H') and Wright (1991, p.54) both show fault groups that flower upward to the surface. Even though individual strands between north-south boundary faults show both normal and reverse separation of Miocene and Pliocene rocks, the overall sense of separation is reverse. Namely, Puente Formation on the north is juxtaposed against Fernando Formation on the south. The apparent normal separations (in cross-section) may be accounted for as relicts of pre-Pliocene extension,

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



or, alternatively, as separations resulting from predominant right-slip along a variety of faults. For example, the northernmost WFZ fault shown by Wright (1991) is in cross-section normal, as is the north WFZ fault of Morton and Miller (1981). As we can now demonstrate, these apparent normal juxtapositions may owe their origins solely to right-lateral slip that has continued from the late Miocene into the Quaternary.

The local hanging wall of WFZ or Puente Block is composed of the La Vida Member of the Puente Formation (Wright, 1991). Structurally, the CTFS hanging wall is characterized by a fault-parallel syncline adjacent to the fault (Plate I). Thus, the bedding within the La Vida dips consistently to the north immediately adjacent to the CTFS north fault of the WFZ. Usually, folds associated with major strike-slip are oblique to the causative fault (Harding, 1973). The fault-parallel fold suggests either compression, hence thrusting, at the WFZ or it is a relict drag fold from extension prior to Pliocene "inversion" of the WFZ.

The area south of the north CTFZ WFZ has been informally deemed the Whittier Fault Block; and as such is bordered on the north by that fault. The south margin of this block may be marked at the surface by the south WFZ fault, for south of that fault bedding within the outcropping Fernando Formation dips steeply south. The presence of south-dipping Fernando Formation characterizes the south flank block which forms the footwall of the WFZ (for example, Bjorkland, 2003; Wright; 1991), whereas, the Whittier fault block includes the Soquel Member of the Puente Formation that consistently dips steeply north along the CTFS and WFZ faults. In sum, a typical CTFS geological cross-section shows a hanging wall of north-dipping La Vida juxtaposed against north-dipping Soquel of the central (Whittier fault) block, which is in turn faulted against steeply south-dipping Fernando Formation.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



***WRSA***

WRSA is on the Puente block. The geologic structure in the WRSA is typified by a distinct east-west trending anticline to the north and a complementary syncline to the south (Plate 3; Yerkes, 1972).

## 9.1 Surface Faults

***CTFS***

The literature shows many purported surface trace(s) of the WFZ at CTFS. For example, Yerkes (1972) mapped one west-northwest trending fault in approximately the same location as the north WFZ fault shown on Plate I (in pocket) of this report. The Yerkes fault juxtaposes La Vida on the north against Soquel on the south, as does the recently explored north WFZ fault strand. Yerkes (1972) did not map a south CTSF fault strand. In contrast, Morton and Miller (1981) depicted a fault similar to Yerkes (1972), but surmised that the apparent vertical separation is north side down, despite the presence of an older (La Vida) member of the Puente Formation in the north block. Truncated upper Pleistocene La Habra Formation in the northern fault block most likely led to that interpretation. That scenario is similar to that presented herein where north block older fanglomerates are truncated by the same fault.

Treiman (1991) researched the geological literature pertaining to the WFZ, as well as vintage aerial photographs, in order to locate and determine fault activity for placement of Alquist-Priolo Earthquake Fault zones. Treiman mapped two "active" surface faults at the CTFS based upon his analyses of both geomorphic and geologic evidence (Figure 1). These traces coincide with the CTFS north and south WFZ fault traces shown on Plate I, herein.

***WRSA***

Leighton and Associates (1990) investigated the NWF westerly adjacent to the WRSA during a grading plan review for the extension of Harbor Boulevard. Here

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



a fault was inferred based on an aerial photographic lineament. Those investigators postulated that this trace also served as the northern limits of a landslide. After partial removal of the landslide (their Landslide No. 1) during subsequent grading operations, Leighton and Associates (1990) mapped a fault trace westerly adjacent to the WRSA (Plate III). This fault trace was continuously exposed in bedrock on both sides of the existing main canyon. It was reported that this trace apparently "disturbed" about 12,000 ka alluvial materials "ponded" behind the landslide. Reported disturbance included "tilting" and disruption by liquefaction of the alluvium. However, Leighton and Associates (1990) suggested local landsliding had also disturbed alluvial materials. As such, Leighton and Associates were unable to ascertain the relation between faulting and landsliding at the site. Nonetheless, they deemed this fault trace active, and the State Geologist subsequently imposed an A-P Zone along the fault.

## 10.0 FAULT LOCATION, STYLE, AND ACTIVITY

***CTFS***

Based on our site-specific investigation, we identify two traces of the Whittier Fault, labeled "North CTFS fault", and "South CTFS fault" on Plate I, in about the locations depicted by Treiman (1991). This section sets forth our findings about both CTFS fault traces, assessing information obtained from field mapping, fault trenches, seismic lines, and borings.

### 10.1 North CTFS Fault Trace

#### 10.1.1 Trenches

Trenches FT-1, FT-2, FT-8, and FT-12, all located on a natural ridge immediately west of the CTFS, revealed older fanglomerate and underlying La Vida Member on the north faulted against the Soquel Member on the south. Local outcrops and cut slopes also exposed only La Vida north of this fault trace. FT-1, excavated north of the mapped North CTFS fault, exposed generally steeply north-dipping, thin-bedded siltstone

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



and minor sandstone unbroken by faults and older fanglomerate nested on the La Vida beginning at about Station 3+30. Boring B-501 shows that older fanglomerate is at least 36-ft deep, and has as an irregular, cut-and-fill depositional contact with the underlying La Vida Member. No evidence of Holocene, or even late Pleistocene, faults was encountered in FT-1, FT-8, and FT-12.

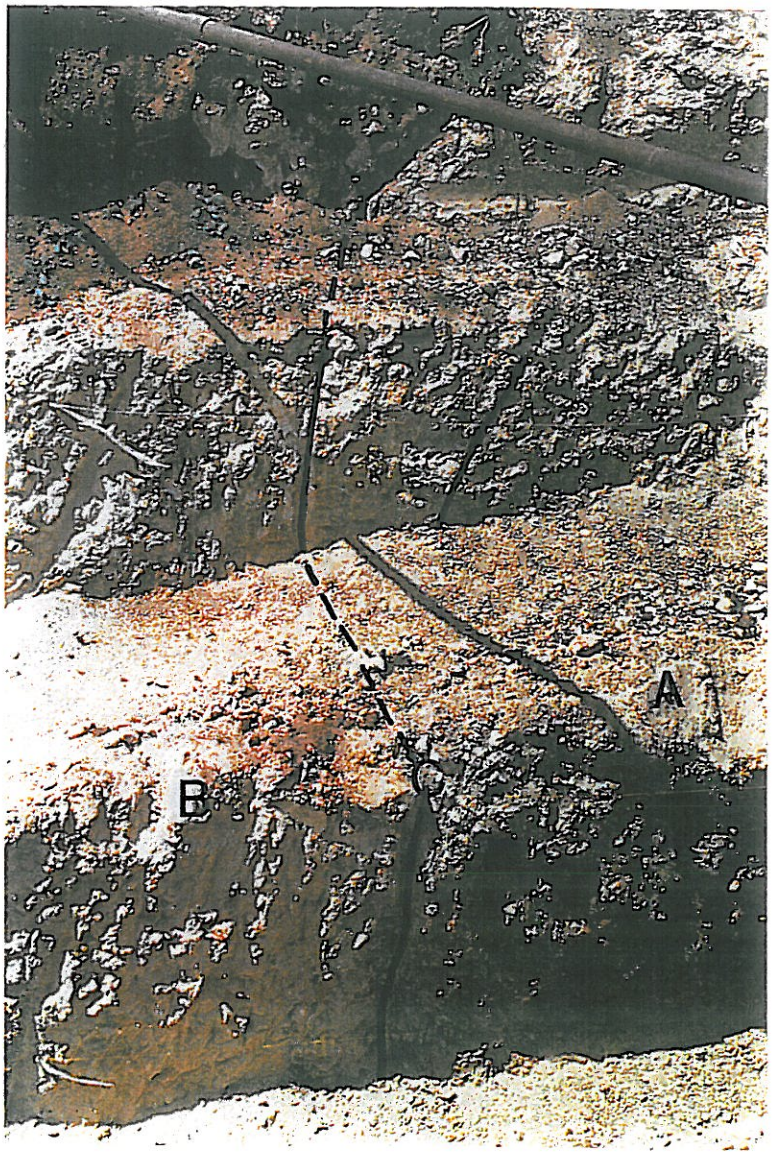
The North CTFS fault was clearly identified at about Station 0+35 in FT-2. Here, the older fanglomerate is in fault contact with the Puente Formation Soquel Member (Photograph 3). The fault "zone" proper is no more than about 5-ft thick, with a sheared zone only a few inches thick (Plate VIII, in pocket). The older fanglomerate is not faulted away from the narrow zone in this trench or those enumerated in the previous paragraph. Likewise, the Soquel south of the fault is neither particularly sheared nor heavily faulted. Minor faults, some but a few feet long displacements of only a few inches, are found south of the North CTFS fault. These minor faults do not extend completely through the exposed Soquel, and may be the results of soft sediment deformation. Similar minor faults that do seemingly extend across the exposed Soquel a few feet from the North CTFS fault are captured in recommended setback zones. As logged in FT-2, the North CTFS fault dips nearly vertical.

FT-10 and FT-11 were placed on an artificially flattened ridge between the two canyon fills that compose the CTFS (Plate 1). Here, as at FT-2, older fanglomerate on the north is faulted against Soquel Member. Again, the North CTFS fault "zone" is very narrow –only a few inches wide. Steep near-surface dips were evident. These particular trenches proved useful for projecting the North CTFS fault across the CTFS, particularly when combined with other trench, outcrop, seismic line, and boring information.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL






**Photograph 3:** Trench FT-2; North WFZ fault trace. Note the older fanglomerate (A) juxtaposed against the Soquel Member of the Puente Formation (B); and the narrow fault zone (C).

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



Trenches T-1 through T-6, excavated on the south-trending ridge that forms the east boundary of the CTFS, were placed to determine the presence of a previously mapped landslide (PSE, 1997) (Plate 1). T-1 and T-2 revealed positive evidence for the absence of landslides, as the trenches exposed unbroken La Vida Member over their entire lengths. Those two trenches also revealed a syncline north of the WFZ (Plate I). In sum, the south part of T-1, T-2 and local outcrops exposed north-dipping La Vida siltstone exhibiting occasional hard, limy beds. Differential erosion on an anti-dip slope underlain by La Vida Member produced the pseudo-landslide topography.

Trenches T-3 through T-6 and local outcrops/cut slopes also provided information useful to the fault investigation (Plate I). The trenches consistently exposed north-dipping La Vida beds. Trench T-3, exposing north-dipping La Vida, was placed at the southeast ridge margin, adjacent to and directly above an outcrop of Soquel Member. Trees and a fence line prevented the southern extension of T-3; nonetheless, its location relative to that of the Soquel outcrop constrains the eastern limit of the North CTFS in the east (Plate I).

### 10.1.2 Seismic Lines

Seismic Line S-1 (refraction and reflection) was placed down the ridge immediately west of the CTFS, about parallel to Trenches FT-1, FT-2, FT-8, and FT-12, in order to "calibrate" known geology across the North CTFS fault (Plate I). The line was placed to determine whether the geology on this ridge has a unique seismic signature to identify faults under the CTFS fill. Both refracted and reflected seismic surveys at S-1 yielded identifiable geological characteristics (Plate 2, Appendix C). For example, on the reflection line, strong reflections off north-dipping La Vida are particularly evident at depth. Between about 400 and 490 ft

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tiemstra
BUILDING OFFICIAL



along the line, reflections are "garbled," possibly by the North CTFS fault at depth. The near-surface "young" fault (which displaces the older fanglomerate) is a very narrow (few feet at the most) zone. At about 490 ft, a particularly strong suite of truncated, north-dipping reflectors are recorded. This location coincides with the mapped surface trace of the north fault, and with a major increase in velocity of the second refractor from about 5,500 ft/sec to about 7,000 to 8,000 ft/sec on the refraction survey profile. These data indicate that the lower velocity siltstones on the north are juxtaposed against the denser sandstone on the south. Thus, by inspection, the change in reflector patterns at about 490-ft are interpreted to be the active North CTFS fault.

The presence and truncation of the fanglomerate in the reflection line is vague. However it is interpreted to be a prism of nearly flat reflectors and second returns, beginning at about 240- to 250-ft and truncating at about 490 ft. In sum, S-1 recorded a unique seismic signature of the North CTFS fault.

Seismic Line S-3 was placed on the "east" canyon fill prism, approximately perpendicular to the estimated trace of the North CTFS fault (Plate I). The reflection line clearly displays a "mirror image" of the signatures of the S-1 bedrock fault geology. That is, a near-vertical termination of north dipping Soquel sandstone is recorded at about 575 ft along S-3. This is interpreted as the signature of the North CTFS fault.

The fill/bedrock contact, complete with second returns is also identifiable. The refraction survey did not penetrate below the fill along its entire length. However, nearby borings (Plate I, Boring Logs in Appendix B) corroborate the fault location, as do Trenches FT-10 and FT-11, and geological mapping/trenching on the ridge at the east edge of CTFS. Seismic Line S-4 was placed across the CTFS south of S-3 and north of S-

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



2 in order to close gaps in coverage. No anomalies suggestive of faults were recorded, only the anticipated north-dipping reflectors.

### 10.1.3 Borings

Six borings, TH-1 through TH-4 (South Coast Geological Consultants, 1991) and B-1 and B-5 by this firm (PSE, 1999), loosely constrain the location of the north fault and provide information about fill depths useful to project setbacks and fault locations from the underlying bedrock up to the CTFS surface. The South Coast boring logs do not indicate formational names of the bedrock encountered beneath the fill; thus interpretation is required. The borings and the 100-scale pre-fill topographic map constrain fill depths.

### 10.1.4 Summary

Latest slip along the North CTFS fault juxtaposed the La Vida Member of the Puente Formation, locally capped by Pleistocene fanglomerate, against Soquel Member of the Puente Formation to the south. That relationship argues mainly for strike-slip displacement, as *both older and younger beds* are faulted against the Soquel Member. The relationship also rules out significant, simple, post-Quaternary fanglomerate dip slip.

Where encountered in the trenches and as depicted in seismic Lines S-1 and S-3, the North CTFS fault is very steeply dipping near the ground surface. Because the actual dip, although very steep, is not completely constrained, we assumed steep north and south dips, to establish the setbacks proposed in following sections of this report. As a result, possible surface rupture zones on the CTFS are captured by the PSE habitable structures setback zones.

Although clearly of late Quaternary age as evidenced by a minimum of 36-ft. of vertical separation, the North CTFS fault has probably not been as

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



active recently as the South CTFS fault. The fault lacks the youthful tectonic geomorphology -- for example, displaced drainages, scarps – that the South CTFS fault displays. Nonetheless, the North CTFS fault is at least as young as late Quaternary, is intimately associated with the Holocene south fault, and locally lacks sufficient Holocene cover to prove or disprove Holocene displacements. As such, the North CTFS fault is considered capable of giving rise to ground surface rupture.

## 10.2 South CTFS Fault Trace

### 10.2.1 Trenches/Outcrops

Trenches FT-4A and FT-4B intercepted the South CTFS fault immediately east of a right-lateral displacement (bend) of a north-south stream channel (Plate I). Here, the Soquel Member of the Puente Formation is juxtaposed both against and over Quaternary terrace deposits by a surface fault that is a few inches wide and dips about 65 degrees to the north (Photograph 4). Based on exposures in FT-5 and FT-7, minimum vertical separation of the terrace deposit-bedrock contact is at least 25-ft. Oil-field grading and erosion have removed natural deposits, which, if present, might better constrain vertical separation.

As identified in Fault Trenches FT-3 through FT-9, neither the bedrock nor the terrace deposits are faulted away from the South CTFS fault. The south fault is therefore but "pen width" when plotted on Plate I. Several local outcrops exposed small throw (up to about 1-ft) faults (joints) that are healed with carbonate linings, and are thus judged to be pre-Holocene. These are shown as joints on Plate I.

FT-3 was placed south of the South CTFS fault and bottomed in the aforementioned Quaternary terrace deposits composed of distinctly stratified sequences of sediments and paleosols. Based on soil-

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL






**Photograph 4:** Trench FT-4A; South WFZ fault trace. Note the terrace deposits (A) juxtaposed against the Soquel Member of the Puente Formation (B).

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



stratigraphic age elements, these deposits are, at a minimum, 100,000 years old (Appendix D). The log of FT-3 shows that the terrace deposits are unfaulted, thereby providing positive evidence of no Holocene faults for the 300-ft trench length south A-P zone boundary (Plate II).

Outcrops on the central CTFS ridge (near FT-4A through FT-9) were useful for filling gaps between trenches and by supplementing the continuous and overlapping seismic lines. These outcrops exposed no significant faults. Artificial cuts at a tank battery and at an oil field structure west of the CTFS expose Soquel Member in the north, terrace deposits in the central, and lower Fernando Formation in the south. Thickening of the terrace deposits, inferred to approximate the location of the South CTFS fault, is "in-line" with the right-lateral drainage displacement and FT-4A and FT-4B (Plate 2).

### 10.2.2 Seismic Lines

Seismic Lines S-2A and S-2B were located on the south part of the ridge separating the two CTFS canyon fills, approximately parallel to Trenches FT-3 through FT-9 and to outcrops 0-2, 0-3, and 0-4, and in-line with a drainage (Location 1 in Figure 1) judged to be right-laterally displaced by the south fault trace. Based on literature review, geological mapping, and trench exposures, the South CTFS fault separates the north-dipping Soquel on the north from the south-dipping lower Fernando Formation and fault-truncated Quaternary alluvial terrace deposits on the south. Thus, S-2A and S-2B were placed to record the seismic signature of the south fault trace. The reflection survey along S-2A (Plate 3, Appendix C) has recorded north-dipping reflections north of about the 480-ft mark separated from south-dipping reflectors by a steep north-dipping interface (fault). The terrace deposits on the footwall are not clearly marked. The refraction profile, however, shows the low-velocity upper horizon

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



truncated at about the near-surface location of the reflection fault. This horizon is about 10 to 50-ft thick on the seismic line, and is most likely the faulted footwall terrace deposit. These strong seismic signatures coincide almost exactly with the mapped trace of the south fault. This permitted confident placement of Seismic Line S-5 on the CTFS fill surface across the approximate projection of the fault, the intent of which was to detect the fault below the fill.

The reflection profile at S-5 clearly depicts gently (apparent dip) north-dipping reflectors on the north separated from steeply (near fault) to gently south-dipping reflectors. The interface is moderately steep and is judged to be the South CTFS fault. North of the fault, near-horizontal upper reflectors represent the CTSF fill. South of the fault, the near-horizontal reflectors are much thicker than on the north, representing both fill and fault-truncated terrace deposits.

Seismic Line S-5 almost exactly replicated S-2A and S-2BA, and is consistent with local geology. Based on the foregoing, the confidence level for fault placement at S-5 is high, but owing to the lack of nearby surface or trench exposures, closely spaced borings were drilled across the "seismic" fault to provide an even higher confidence level.

In sum, the seismic lines are useful for locating the CTFS faults beneath the CTFS, and the results were uniformly confirmed by direct methods of observation.

### 10.2.3 Borings

A line of bucket-auger borings (B-502 through B-505 on Plate 1) was placed about perpendicular to the fault on the lowest or southernmost CTFS fill pad. The northern boring, B-503 encountered about 40 feet of fill underlain by Soquel sandstone capped with a few-feet thick residual

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



paleosol. Borings B-504 and B-505 encountered 52 and 58 ft., respectively of CTFS fill placed on 20- to 40-ft of terrace deposits -- both underlain by lower Fernando Formation. B-502, nearest S-5, penetrated fill and a thin veneer of terrace deposits underlain by very sheared and polished Fernando Formation. Thus, the South CTFS fault was well constrained by borings B-502 and B-503. Its location coincided with the fault signature on S-5.

### 10.2.4 Summary

The South CTFS fault clearly displaces Soquel Member on the north against and over the Quaternary terrace deposits and Pliocene lower Fernando Formation on the south (Plate 1; Plates 2 and 5, Appendix C). Based on field measurements, seismic profiles, and literature review, the South CTFS fault dips about 65 degrees to the north.

Slip on this fault is seemingly right-lateral reverse oblique, for aligned, low order, local stream channels are displaced about 300-ft in right-laterally, and Trenches FT-4A and FT-4B clearly show a south-vergent thrust component of at least 25-ft. As noted, the well-expressed tectonic geomorphology strongly suggests Holocene displacement along the South CTFS fault.

## 10.3 WRSA Fault Trace

Leighton and Associates (1990) depicted the NWF as a west-northwest-trending fault dipping from nearly vertical to 79 degrees northeast. In their "as-built" report, Leighton and Associates described the NWF that was exposed in bedrock as displaying "some evidence that faulting also displaced the alluvium ponded by landslide No. 1". This alluvium was also noted to be disturbed by the movement of landslide 2A, so the relationship between faulting and movement of the slide could not be determined. Thus, some uncertainty regarding causation of the

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tiemstra
BUILDING OFFICIAL



"disturbance" remained after mapping the area during grading. The "disturbance" could not be directly associated with the trace of the NWF. The Leighton and Associates (1990) discussion of the NWF is vague owing to their discussion of a north and south "main" Whittier fault and the north trace of the Whittier Fault (NWF). The observations of the north trace of the "main" Whittier Fault Zone and the NWF are not clearly distinguishable. Nonetheless, the State of California (1991) imposed an A-P Zone along the NWF (Figure 2; Plate III).

During the 1998 and 1999 PSE investigation, PSE placed six fault trenches immediately southeast of the A-P Zone and along possible projections of the fault onto the AMPC property (Plate III).

PSE did encounter one relatively minor bedrock fault in Trench FT-102 that is along a reasonable projection of the NWF. As shown on the Trench log, the fault does not displace a well-developed Pleistocene stage IV calcic horizon. The pedagogical development as typified by the well-developed calcic horizon, points to pre-Holocene orgin of the material capping the fault. This evidence positively demonstrates that the FT-102 fault is pre-Holocene and thus not active according to A-P standards (Hart and Bryant, 1997). Further, tectonic geomorphic evidence suggestive of Holocene activity of the NWF is absent on the AMPC (Figure 1A). This condition contrasts with the active strands of the main WFZ, which typically exhibit displaced drainages, closed and linear depressions and scarps. The linear topography west of the alluvium elevated above Harbor Boulevard are judged to be resultant from the aforementioned abandonment of part of the La Mirada drainage probably in Late Pleistocene to Holocene time.

PSE did not place trenches perpendicular to the northern part of the NWF owing to oil field and topographic constraints in place during the exploration. However, the Leighton and Associates (1990) mapping of continuous exposures across the entire A-P zone during road grading shows no faults other than the NWF. Moreover, the

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



extension of the aforementioned west-trending anticline is clearly recorded in the Leighton and Associates map (Plate III).

Based on this evidence, PSE has concluded that the North Whittier Fault is but a single strand and that the fault does not encroach into the AMPC property where explored by PSE. If the FT-102 is indeed the NWF, it is not active according to A-P policies. All other PSE fault trenches in the WRSA encountered unfaulted Puente Formation thus precluding the presence of faults at those locations. Therefore, no setbacks or other geotechnical restrictions are recommended for the WRSA portion of AMPC based on the recent exploration.

## 11.0 HABITABLE STRUCTURES SETBACK ZONES

Based on these investigations, both the north and south CTFS faults are active according to A-P criteria (Hart and Bryant, 1997), thereby requiring A-P-consistent habitable structures setback zones as spelled out in the following sections. Plate II depicts the footprints of the setback zones that apply **only** to the topographic surface shown on Plate II. Because the South CTFS fault, in particular, is not vertical and because fault rupture does not propagate vertically from natural ground up through artificial fill, but rather as an upwardly increasing cone, widths and locations of the setback zones will vary ("migrate") where grades are lowered or raised by future grading. Therefore, the following section assesses the various design scenarios that would affect the placements and widths of the zones. Each assessment is accompanied by a summary of the methodology used to derive the locations and widths of the zones. Three possible, final grade setbacks are assessed: 1) now-present grades on existing deep fills; 2) post-grading grade changes in areas now or that will be underlain by bedrock/terrace deposits, or which will be buried by 10-ft or less of fill; and 3) increased or lowered grades at existing CTFS deep fill locations. Assessment of Item 1 also includes the rationale used to determine the setbacks shown on Plate II, for that is the geometry from which each of the zones is derived. We emphasize that the setback locations are preliminary. Final

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



adjustments may be necessary at completion of rough grading, depending on actual fault configurations observed during and after grading.

## 11.1 Setback for Present Grades at Existing Deep CTFS Fills

The multidiscipline investigation conducted by PSE provides sufficient information to reasonably constrain fault locations beneath the CTFS fill. Recent studies and case histories (for example, Bray, 1990; Bray, et al., 1993, 1994a, 1994b) developed industry-accepted methodologies for predicting the propagation geometry of fault ruptures from bedrock-fill interfaces to fill surfaces. Accordingly, the setback zones shown on Plate II are based on the known geology and those recent studies.

### 11.1.1 Rationale

Projection of the potential fault rupture zones from the underlying natural ground to the existing fill surface depends upon several variables including: fault location, width and dip, fill thickness, type of slip (strike-slip vs. dip-slip), and shear strengths of the fill materials (Bray, 1990; Bray, et al., 1994a, 1994b). Within soils classified generally as stiff according to their shear strength, (e.g. CTFS fill), thrust or reverse faults typically rupture through the overlying fills at about the same angle as their dip, with perhaps minor flattening of the dip very near surface (Bray, et al., 1994a, 1994b; Figure 3). Strike-slip fault rupture generally propagate vertically up through overlying stiff soils, although sometimes accompanied by near-surface "flowering" (Figure 4). That flowering often produces a narrow fracture zone, seemingly less than a ½:1 projection from the fault/fill interface to the fill surface (Bray, et al., 1994am 1994b). Displacements on such ruptures generally decrease upward through the stiff soils, so that, depending on amount of fault displacement and fill depth, the ruptures might not even reach the fill surface. In addition, displacements on individual "flower" strands also

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



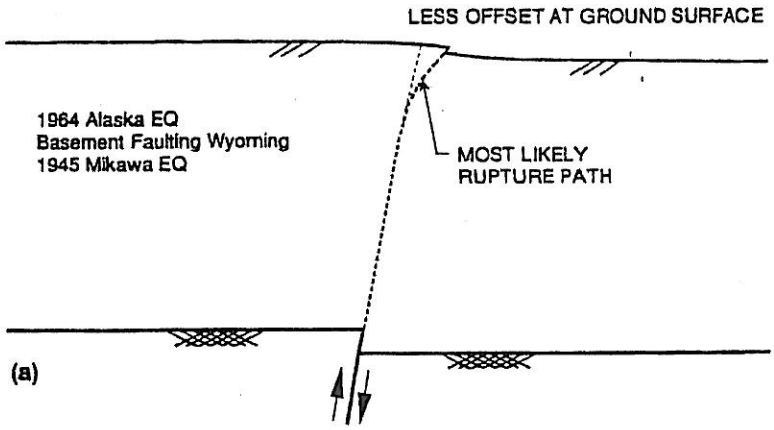



**Figure 3:** Path of reverse fault rupture through stiff earth materials, Figure 6a of Bray, et al. (1994a).

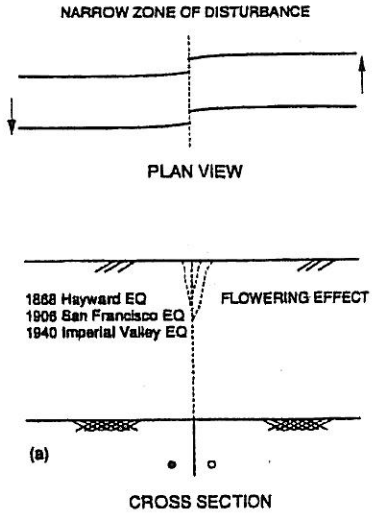



**Figure 4:** Path of strike-slip fault through stiff earth materials, Figure 8a of Bray, et al. (1994a).

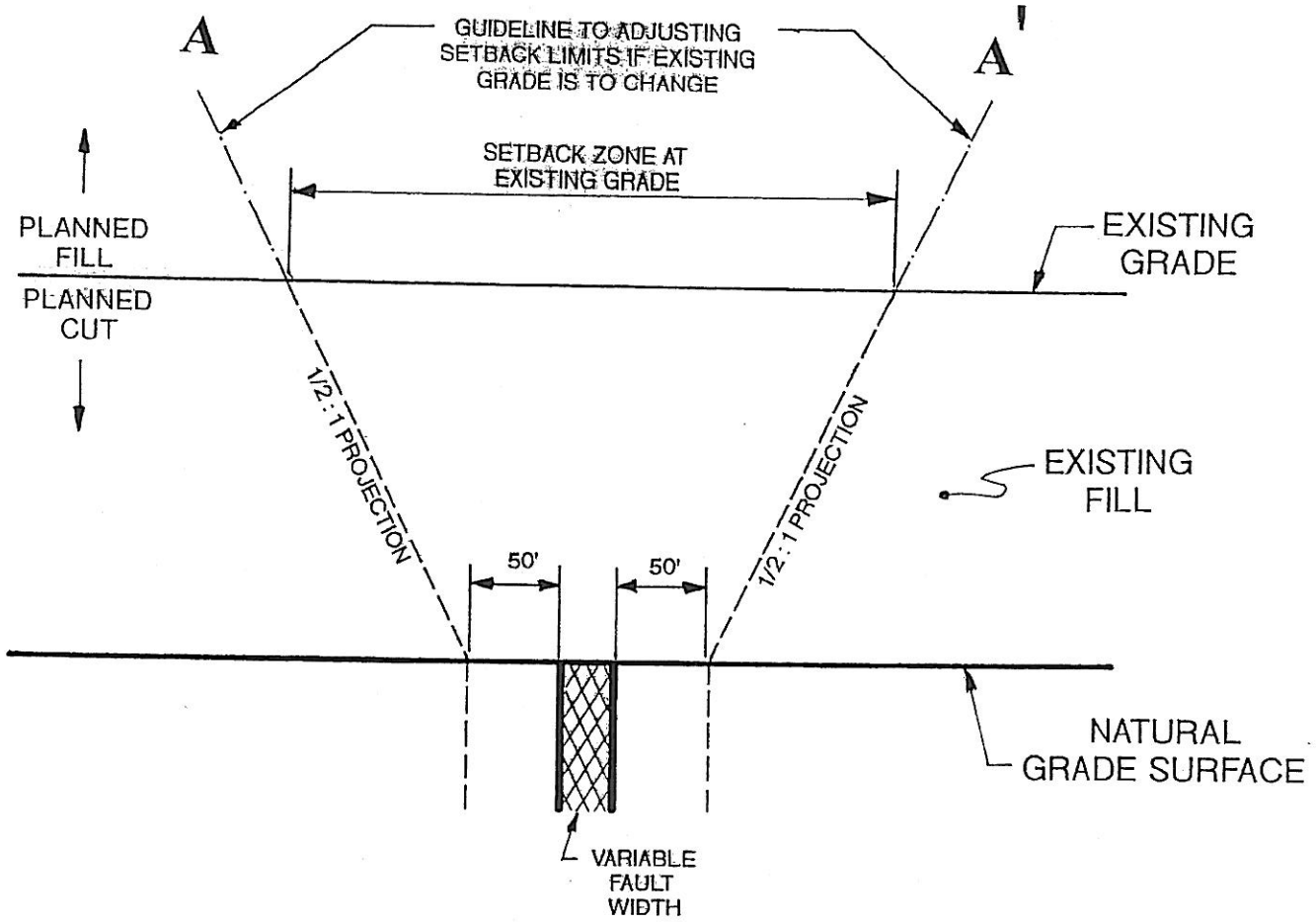



**Figure 5.**

# SCHEMATIC CROSS-SECTION A-A'

## SETBACK REQUIREMENTS FOR NORTH WFZ FAULT

NOT TO SCALE

County of Orange - OC Public Works
OC Development Services
APPROVED
Building&Safety: Ryan Rose
Approval: Geology Reports
Permits: PA170022
10/19/2022

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

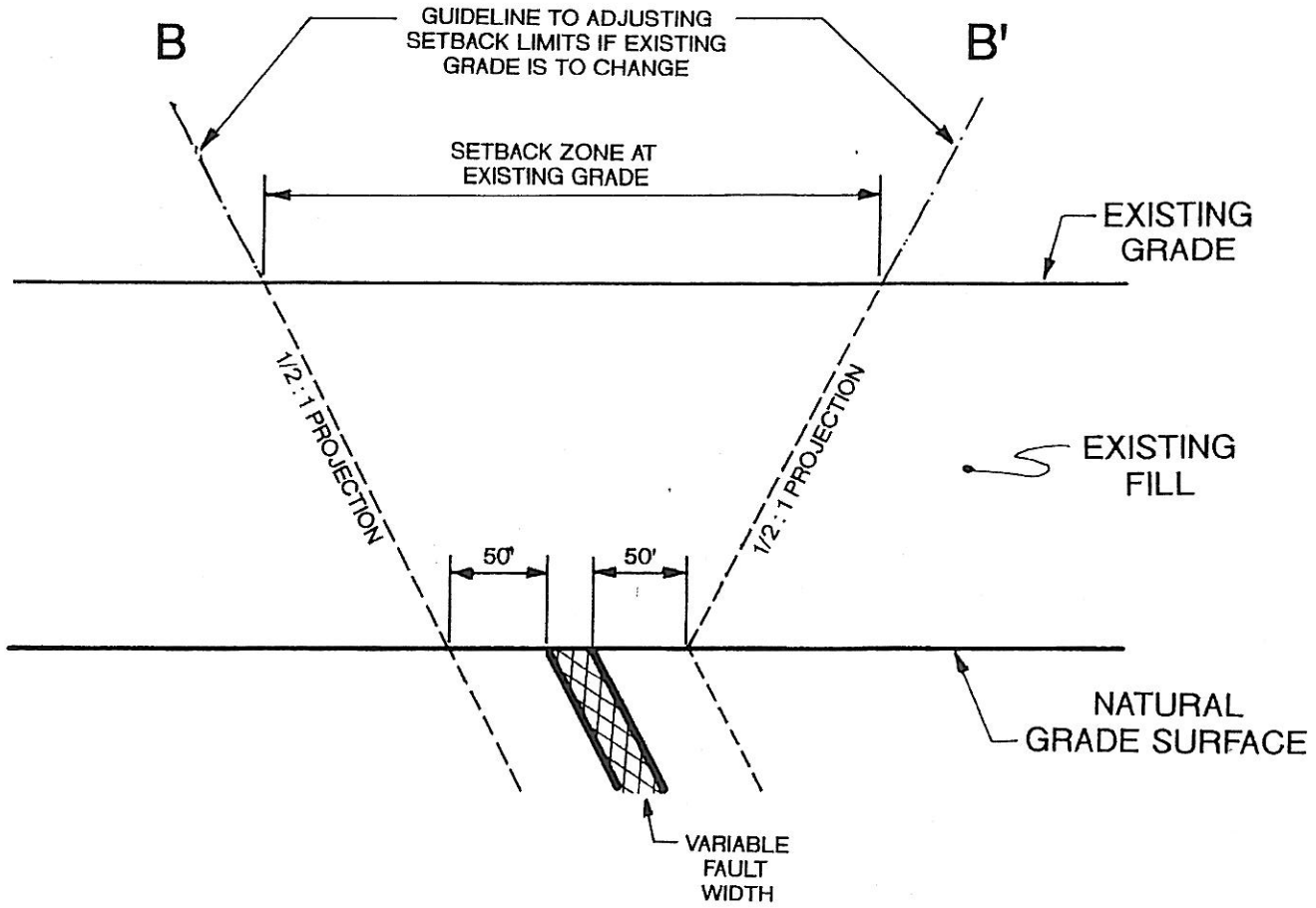


decrease away from the main surface rupture trace. For planning, this assessment does not account for decreased displacements above the mapped WFZ faults. Depending on proposed future development, additional quantification may be appropriate to the project.

### 11.1.2 North Fault

PSE constructed Schematic Cross-Section A-A' on the North CTFS fault assuming both vertical and very steep south dips. Those dips measured near the surface were essentially vertical, with local very steep south components. Seismic lines S-1 and S-3 also show a vertical dip at depth. The location of the fault under the fill is well constrained on the south by the seismic lines independent of any measured surface dips. Trenches FT-1, FT-2, FT-8, FT-10, FT-11, FT-12, and T-3 also constrain its location. Borings B-1 and Th-3 help constrain the southeastern position of the north fault. However, resolution of the boring data is less than that of the trenches and seismic lines. Similarly, Borings TH-2 and TH-4 help constrain the northwest part of the North CTFS fault position, but with less certainty than trenches and seismic lines.

The trenches confirm that the North CTFS fault is a narrow fault zone no more than a few feet wide -- a "pen-line" on the map -- despite a wider zone of interference shown on reflection profiles S-1 and S-3 in bedrock below the overlying Pleistocene-fanglomerate deposits. The fault zone was projected from the fill-bedrock surface up through the fill to the existing surface at ½:1 both north and south of the fault in order to account for potential upward-dispersion of rupture planes and associated flower strands. This configuration *also* captures reverse displacements along the fault dipping ½:1 either to the north or to the south. The width of the area included by the upward projection varies according to estimated fill depth. An additional 50-ft width was added on each side of the surface footprint




# Figure 6.

# SCHEMATIC CROSS-SECTION B-B'

NOT TO SCALE

SETBACK REQUIREMENTS FOR SOUTH WFZ FAULT

County of Orange - OC Public Works
OC Development Services
APPROVED
Building&Safety: Ryan Rose
Approval: Geology Reports
Permits: PA170022
10/19/2022

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



of the projected fault zone to account for perturbations in the bedrock fault location, fault dip, fill depth, and possible flattening of potential rupture surfaces through the fill.

The preponderance of evidence indicates that the North CTFS fault is near vertical, but because the northern possible limit of the fault is not as well constrained as the southern, and to account for sub-fill topographic irregularities, an assumed trace of a fault dipping about ½:1 was projected from bedrock to the existing fill surface both north and south. The north fault setback zone footprint on Plate II was then adjusted to capture assumed dip- and strike-slip surface projections of that assumed trace. In sum, the footprint on Plate II is conservative and consistent with the available data regarding location, width, and style of the North CTFS fault.

### 11.1.3 South Fault

The setback for the South CTFS fault was determined in a manner similar to that for the north fault (Schematic Cross Section B-B'). PSE modeled a right-reverse fault dipping about 60 to 65 degrees to the north. Trenches FT-4A and FT-4B, and Seismic Lines S-2A and S-5, revealed a ½:1 north-dipping fault. Seismic Line S-5 and the line of borings B-502 through B-505 constrained the location of the South CTFS fault particularly well below the southernmost CTFS pad; and boring B-502 apparently penetrated the fault plane. A 25- to 30-ft. zone was established to account for sub-fill topographic irregularities and fault location perturbations. Both strike-slip and reverse-slip displacements were projected to the fill surface following the method of Bray et al (1994a, 1994b). The habitable structures setback zone, shown on Plate II, incorporates both the projected fault zone and an additional 50-ft setback on either side of the fault. Schematic Cross-Section B-B' illustrates the setback geometry.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



### 11.1.4 Post-Grading Setbacks in Areas Now Underlain by Bedrock/Terrace Deposits

Placement of the setback zones is relatively straightforward in bedrock/terrace deposits, and is based on direct observation of the local geology and faults. Both the north and south faults are very narrow (almost "pen-width") zones. Plate II depicts the setback zones encompassing the North and South CTFS faults, plus a zone 50-ft wide on either side of the mapped faults. Based on trench/outcrop exposures, those widths clearly capture the narrow fault zones, and allow for some variation in actual fault location/width to provide adequate setbacks of habitable structures. The setback zone shown on Plate II is valid only for the grades shown on that plate. If grades are lowered or raised (by cutting or placement of fill greater than 10-ft), the setback footprints will vary as noted below.

### 11.1.5 Fill Added to Existing Bedrock Surfaces

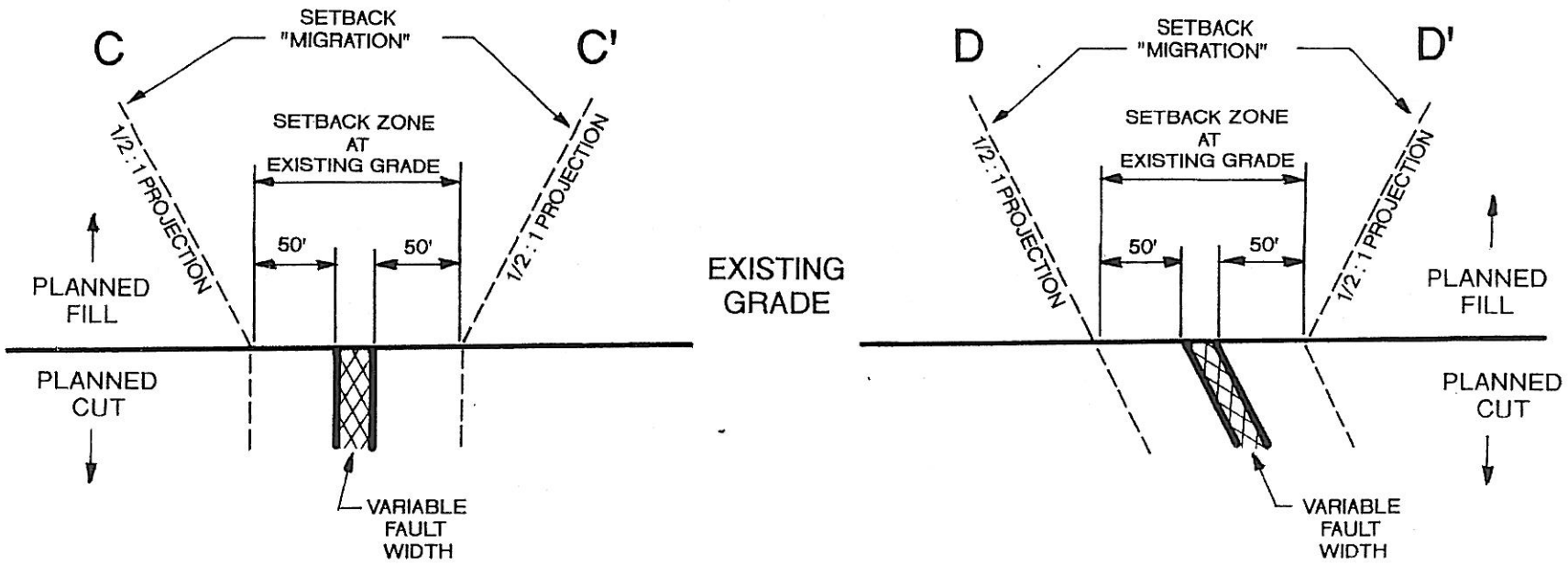
Owing to increased fill depths, the setback zone footprint would increase as shown in Schematic Cross-Section C-C' for the north fault and in Schematic Cross-Section D-D' for the south fault. This methodology is similar to that to determine setbacks for the existing fill.

### 11.1.6 Lowering of Grade at Existing Bedrock Surfaces

For the north fault, Schematic Cross-Section C-C' illustrates the relative minor change in footprints, whereas schematic Cross-Section D-D' depicts the same for the south fault. Note, that owing to the ½:1 dip of the south fault, the footprint location varies laterally.

### 11.1.7 Increased or Lowered Grades at Existing CTFS Deep Fills

Schematic Cross-Sections A-A' and B-B' illustrate the effects of grade changes of existing CTFS fill surfaces and the limits of the setback zone. These changes are dependent on the upward or downward projection of




**NORTH FAULT**

**SOUTH FAULT**

# Figure 7.

## SCHEMATIC CROSS-SECTION C-C' & D-D'

SETBACK REQUIREMENTS IN AREAS OF
EXISTING BEDROCK / TERRACE DEPOSITS

NOT TO SCALE

County of Orange - OC Public Works
OC Development Services
APPROVED
Building&Safety: Ryan Rose
Approval: Geology Reports
Permits: PA170022
10/19/2022

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



the hypothetical setback footprints. That is, the thicker the fill above the bedrock/ terrace deposits the wider the setback zone.

## 12.0 FOUNDATION ENHANCEMENTS

In terms of tectonic ground rupture, the setback zones shown on Plate II are judged to be sufficient because the PSE trenches, seismic lines, and borings document very little slip or deformation away from the north and south faults, and because the locations of the faults are well constrained. The CTFS, however, because of its proximity to the seismically active WFZ, could be subject to very strong seismic ground shaking, lurching, or local ground cracking related not to slip along the faults, but to strong ground motion (for example, Murbach, 1994). Areas of particular concern are between the North and South CTFS faults, near fill to bedrock transitions, and near the tops of slope faces. Mitigation of possible effects outside the setback zones may include deep foundation elements and structural slabs, incorporation of post-tensioned foundations, placement of geofabrics below structures and, locally, over-excavation and replacement with compacted fill, possibly augmented with geofabrics.

PSE has reviewed published literature regarding structural performance adjacent to surface fault ruptures (Lazarte, et al., 1994; Bray et al., 1994a, 1994b; Murbach, 1994). Based on that review, the use of post-tensioned slabs away from surface rupture could reduce structural damage. Lazarte, et al., (1994) and Murbach (1994) indicated that unreinforced slabs near or across segments of the Landers 1992 surface faults were greatly distressed, whereas other nearby structures with slab reinforcement (of unknown specifications) sustained minimal damage. PSE therefore strongly suggests that the design of structures and foundations consider these issues when specific structure types, loadings, and sitings become available. Such would improve the ductility, hence, resistance of the slabs. Also, as noted above, implementation of architectural/structural designs could reduce the potential damage from earthquake-induced ground motion on the structures themselves. Similarly, utility lines within the project should be specially

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



designed where they cross setback zones; such could include automatic shut-off valves. These issues, however, are the purview of the project design engineers/architects.

**Because the kinds of structures and specific sitings to be built are not now known, the precise combination of mitigative design elements cannot now be set forth. Accordingly, the geotechnical and design consultants need to develop jointly cost- and technically-effective designs.**

## 13.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information gathered during the subject investigation, the Caltrans Fill Site (CTFS) can be developed, providing the following recommendations, based on the analyses contained herein, are incorporated into design and construction.

1. CTFS consists of up to about 120-ft of compacted artificial fill placed on bedrock of the Puente and Fernando Formation, and, locally, terrace deposits that have been displaced by two faults within the active Whittier fault zone (WFZ).

2. The North and South CTFS faults are within a State of California-imposed Alquist-Priolo Earthquake Fault Zone. Based on a multidiscipline geological-geophysical investigation, PSE located the faults west of, in the center of, and east of the CTFS with a series of trenches and existing outcrops, and beneath the fill with seismic lines and borings. To satisfy APZ requirements, PSE imposed habitable structures setback zones, for existing grades along the two faults (Plate II) based on their location, geometry, style of slip and the depths of overlying fill.

3. Habitable structures as defined by the State of California (see Page 1, herein) may not be located within the zones shown on Plate II -- *at the existing elevations shown on Plate 2.*

4. Where grades are planned to be either lowered or raised during development, the setback zones shown on Plate II must be adjusted as shown on Schematic Cross-Sections A-A' through D-D', and as discussed in the body of this document. Owing to the relative complexity of the adjustments, relevant conceptual, tentative, and grading plans should be reviewed by the project engineering geologist and geotechnical engineer for "setback conformance" prior to finalization and submittal to the governing agency.

5. Because of the possibility of very strong ground motion, lurching and associated ground cracking during a future local large earthquake, habitable structures at the CTFS will most likely require foundation/subsoil mitigation such as deep

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



foundations, post-tensioned slabs, or overexcavation and placement of geofabrics. The nature and extent of such measures must await formulation of grading and structural designs.

6. In general, the possibility of strong ground motion induced by the WFZ or other regional faults is a significant geotechnical issue. As a minimum, structures must be designed in accordance with prevailing Code standards for strong ground motion.

7. Utilities that cross the setback zones should include automatic shutoffs and/or flexible connections, owing to the possibility of disruption.

8. No active faulting was observed within the WRSA study area during this phase of preliminary investigation. These trenches were excavated easterly adjacent to the State A-P Zone owing to access to current oil field activities, active pipelines, existing topography, and depth of existing artificial fill. As such, further studies may be required within the A-P Zone. However, available evidence indicates that for planning purposes the fault is not active, if extant in the AMPC.

9. A Certified Engineering Geologist should map exposed fault conditions during grading and make appropriate recommendations based on those field exposures. In addition, the exposed fault traces should be identified and surveyed upon exposure. It is possible that some adjustments of setbacks may be required after actual field conditions are exposed.

## 14.0 CLOSURE

This study is intended to provide planning information for structural setbacks and special foundation design along the recognized on-site active faults. The findings and recommendations contained in this report are based upon the specific excavations and observations as noted. The materials and conditions immediately adjacent to or beneath those observed may have different characteristics, and no representations are made as to the quality or extent of materials not observed.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# APPENDIX A

# Selected References

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



# APPENDIX A

## Selected References

1. Bjorkland, T., 2003, The Whittier Fault trend: Cross Sections, Structure maps and well taps in the major oil producing area of northeastern Los Angeles: Search and Discovery CD-Rom Series #1.

2. Bray, J.D., 1990, The effects of tectonic movements on stresses and deformations in earth embankments; Ph.D. Thesis, Univ. Calif.

3. Bray, J.D., Ashmay, A., Mukhopadhyay, G., and Gath, E.M., 1993, Use of geosynthetics to mitigate earthquake fault rupture propagation through compacted fill: Geosynthetic 1993, Vancouver, Canada, p. 379-392.

4. Bray, J.D., Seed, R.B., Cluff, L.S., and Seed, H.B., 1994a, Earthquake fault rupture propagation through soil: Amer. Soc. Civil Eng. Jour. Geotech. Eng. V. 120, n. 3, p. 543-561.

5. Bray, J.D., Seed, R.B., and Seed, H.B., 1994b, Analysis of earthquake fault rupture propagation through cohesive soil: Amer. Soc. Civ. Eng., Jour. Geotech. Eng., v. 120, n. 3, p. 562-580.

6. Bullard, T.F., and Lettis, W,.R., 1993, Quaternary fold deformation associated with blind thrust faulting, Los Angeles basin, California: Jour. Geophy. Res. 98:8349-8369.

7. California Division of Mines and Geology, 1991, Special Studies Zones, La Habra Quadrangle, Official Map: effective November 1, 1991, map scale: 1:24,000.

8. California Division of Mines and Geology, 1980, Special Studies Zones, Yorba Linda Quadrangle, Official Map: effective January 1, 1980, map scale: 1:24,000.

9. California Division of Oil and Gas (CDOG), 1991, California oil and gas fields, Volume II, southern, central coastal and offshore California; third edition: Div. Oil and Gas Pub. TR-12, unpaginated.

10. Daviess, S.N., and Woodford, A.O., 1949, Geology of the northwestern Puente Hills, Los Angeles County, California: U.S. Geol. Surv. Oil and Gas Investigations Preliminary Map OM-83, 1:12,000.

11. Davis, R.A., Jr., 1975, Brea Olinda oil field, in Truex, J.N., editor, A tour of the oil fields of the Whittier fault zone, Los Angeles basin, California: Pacific section, Amer. Assoc. Pet. Geol. Joint Annual Field Trip, April 26, 1975, p. 47-56.

12. Davis, T.L. Namson, J., and Yerkes, R.F., 1989, A cross-section of the Los Angeles area: Seismically active fold and thrust belt, the 1987 Whittier Narrows earthquake, and earthquake hazard: Journal of Geophysical Research, Vol. 94, No. B7, p. 9644-9664.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



13. Dolan, J.F., Sieh, K., Rockwell, T.K., Yeats, R.S., Shaw, J., Suppe, J., Huftile, G.J., and Gath, E.M., 1995, Prospects for larger or more frequent earthquakes in the Los Angeles metropolitan region: Science, v. 267, p. 199-205.

14. Durham, D.L., and Yerkes, R.F., 1964, Geology and oil resources of the eastern Puente Hills area, southern California: U.S. Geol. Surv. Prof. Papers 420-B, 62 p.

15. Grant, L.B., Waggoner, J.T., Rockwell, T.K., and Von Stein, C.R., 1997, Paleoseismicity of the North Branch of the Newport-Inglewood fault in Huntington Beach, California; from Cone Penetrometer Test Data: Seism: Soc. Amer. Bull., v. 87, n. 2, p. 277-293.

16. Harding, T.P., 1973, Newport-Inglewood trend, California – an example of wrenching style of deformation: Amer. Assoc. Pet. Geol. Bulletin, v. 72, p. 738-757.

17. Hart, E.W., and Bryant, W.A., 1997, Fault-rupture hazard zones in California, Alquist-Priolo Earthquake Fault Zoning Act with index to Earthquake Fault Zone Maps: Calif. Div. Mines and Geol. Spec. Pub. 42, 38 p.

18. Lamar, D.L., 1982, Microseismicity and recent tectonic activity in the Whittier fault area: Technical report to USGS under Contract 14-08-00001-12288, 40 p.

19. Lazarte, C.A., Bray, J.D., Johnson, A.M., and Lammer, R.E., 1994, Surface breakage of the 1992 Landers earthquake and its effects on structures: Bull. Seis. Soc. Amer., v. 84, n. 3, p. 547-561.

20. McCalpin, J.P., and Shlemon, R.J., 1996, Trenching as a tool in geologic investigation: The Professional Geologist, November 1996, p. 19-22.

21. Morton, P.K., and Miller, R.V., 1981, Geologic map of Orange County, California, showing mines and mineral deposits; Calif. Div. Mines and Geol. Bull. 204, Plate 1, 1:48,000.

22. Murbach, D., 1994, Characteristics of the 1992 fault rupture adjacent to distressed structures, Landers, California: Earthquake Engineering Research Institute, 1994 NEHRP Professional Fellowship report PF-3/94, 73 p.

23. Pacific Soils Engineering, Inc., 1996, Alquist-Priolo earthquake fault zone investigation, north branch of the Newport-Inglewood fault zone, Tract No. 15109, southeast of the intersection of Beach Boulevard and Adams Avenue, City of Huntington Beach, California: Consultant's Technical report, dated April 5, 1996, Work Order 102167-GG, 27 p.

24. Rockwell, T.K., Gath, E.M., and Gonzales, T., 1992, Sense and rate of slip on the Whittier fault zone, eastern Los Angeles basin: Assoc. Eng. Geol., 35th Annual Meeting Proceedings, October 2-9, 1992, p. 679-680.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



25. Shackleton, N.J., and Opdyke, N.D., 1973, Oxygen isotope and paleomagnetic stratigraphy of equatorial Pacific Core V28-238: oxygen isotype temperature and ice volumes on a $10^5$ and $10^6$ years scale: Quaternary Research, v. 3, n. 1, p. 39-55.

26. Shaw, J.H., and Shearer, P.M., 1999, An elusive blind thrust fault beneath metropolitan Los Angeles: Science, v 283, p. 1516-1518.

27. Shaw, J.H., and Suppe, J., 1996, Earthquake hazards of active blind-thrust faults under the central Los Angeles basin, California: Jour. Geophys. Res., v. 101, n. B4. P. 8623-8642.

28. South Coast Geologic Services, 1987, Geotechnical report for a proposed disposal site at Shell Oil Field, Brea, California: Consultant's Technical Report, date March 6, 1987, 7p.

29. Tan, S.S., Miller, R.V., and Evans, J.R., 1984, Environmental geology of parts of the La Habra, Yorba Linda and Prado Dam quadrangles, Orange County, California: California Division of Mines and Geology, open file report 84-24LA.

30. Treiman, J.A., 1991, Whittier fault zone, Los Angeles and Orange Counties, California: Calif. Div. Mines and Geol. Fault Evaluation report FER-222, 17 p.

31. Working Group on California Earthquake Probabilities, 1995, Seismic hazards in southern California: Probable earthquakes, 1994 to 2024: Seism. Soc. Amer. Bull., v. 85, no. 2, p. 379-439.

32. Wright, T.L., 1991, Structural geology and tectonic evolution of the Los Angeles basin, California in Biddle, K.T., ed., Active Margin Basins: Am. Assoc. Pet. Geol. Memoir 52, p. 35-134.

33. Yerkes, R.F., 1972, Geology and Oil Resources of the Western Puente Hills Area, southern California: U.S. Geol. Survey Prof. Paper 420-C, 63 p.

34. Yerkes, R.F., McCulloh, T.H., Schoellhamer, J.E., and Vedder, J.G., 1965, Geology of the Los Angeles Basin, California – an introduction: U.S. Geol. Surv. Prof. Paper 420-A, 57 p.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# APPENDIX B

# Logs of Borings

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# GEOTECHNICAL BORING LOG



| | | | |
|---|---|---|---|
| PROJECT NO. | 102280-P | PROJECT NAME | Aera Energy |
| DATE STARTED | 5/27/98 | GROUND ELEV. | 623 |
| DATE FINISHED | 5/27/98 | GW DEPTH (FT) | |
| DRILLER | LEDEZMA | DRIVE WT. | VARIES |
| TYPE OF DRILL RIG | 30" BUCKET | DROP | 12 in. |

BORING DESIG. B-01
LOGGED BY DJE
NOTE

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT. URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **COMPACTED ARTIFICIAL FILL (Caf):** CLAYEY SILT with pebbles, gray to blue gray, moist, firm | | | | |
| 5 | 618 | R | 1 | | | CLAYEY SILT with pebbles, gray to blue gray and brown, moist, firm | 20.9 | 105.1 | 93 | |
| 10 | 613 | R | 1 | | | CLAYEY SILT, gray to blue gray, moist, firm, slight hydrocarbon odor | 17.4 | 108.6 | 85 | CON HY |
| 15 | 608 | R | 2 | | | SILTY CLAY, brown to gray, moist, firm, cobbles | 17.3 | 111.2 | 91 | |
| | | B | | | | | | | | MAX HY EI |
| 20 | 603 | R | 6 | | | SILTY fine to coarse SAND, pebbles, dark gray to brown, damp to moist, medium dense<br>boulders to 18" | 9.6 | 124.3 | 73 | CON HY |
| 25 | 598 | R | 9 | | | SILTY fine to coarse SAND, dark brown to brown, moist, medium dense, boulders to 18" | 8.9 | 114.0 | 50 | |
| 30 | 593 | R | 9 | | | SILTY fine to coarse SAND, dark brown to brown, moist, medium dense, some cobbles | 6.7 | 124.8 | 52 | |
| 35 | 588 | R | 4 | | | SILTY fine to coarse SAND, gray to gray brown, moist, medium dense | 12.9 | 114.8 | 75 | |

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-1

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

# GEOTECHNICAL BORING LOG



PROJECT NO. 102280-P
DATE STARTED 5/27/98
DATE FINISHED 5/27/98
DRILLER LEDEZMA
TYPE OF DRILL RIG 30" BUCKET

PROJECT NAME Aera Energy
GROUND ELEV. 623
GW DEPTH (FT)
DRIVE WT. VARIES
DROP 12 in.

BORING DESIG. B-01
LOGGED BY DJE
NOTE

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | R | 2 | | | SILTY fine SAND, trace CLAY, gray to olive gray, moist, firm | 14.7 | 113.1 | 81 | CON HY |
| 45 | 578 | R | 4 | | | SILTY fine to coarse SAND with pebbles, dark brown, moist, loose to medium dense | 13.2 | 111.3 | 69 | |
| 50 | 573 | R | 9 | | | SILTY fine to coarse SAND with pebbles (to 1"), dark gray, moist, medium dense, slight hydrocarbon odor | 9.4 | 118.0 | 59 | |
| 55 | 568 | R | 9 | | | SILTY fine to coarse SAND with pebbles (to 1/2"), dark gray to brown, moist, medium dense | 8.7 | 109.9 | 44 | |
| 60 | 563 | R | 13 | | | SILTY fine to coarse SAND with pebbles (to 3/4"), dark gray, moist, medium dense | 9.1 | 117.8 | 57 | CON HY |
| | | B | | | | | | | | MAX HY |
| 65 | 558 | R | 16 | | | SILTY fine to coarse SAND with pebbles (to 1/2"), brown, moist, medium dense | 8.7 | 122.7 | 63 | |
| 70 | 553 | R | 15 | | | SILTY fine to coarse SAND with pebbles (to 1/2"), brown, moist, medium dense | 8.6 | 117.9 | 54 | CON HY |
| 75 | 548 | R | 35 | | | SILTY fine to coarse SAND with pebbles (to 1/2"), brown, moist, medium dense, contains fine roots, 1/8" layer of CLAYEY SILT, dark brown | 8.4 | 118.9 | 54 | |

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tabassian
Date 10/18/2022

# GEOTECHNICAL BORING LOG



PROJECT NO. 102280-P
DATE STARTED 5/27/98
DATE FINISHED 5/27/98
DRILLER LEDEZMA
TYPE OF DRILL RIG 30" BUCKET

PROJECT NAME Aera Energy
GROUND ELEV. 623
GW DEPTH (FT)
DRIVE WT. VARIES
DROP 12 in.

BORING DESIG. B-01
LOGGED BY DJE
NOTE

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | R | 35 | | | SILTY fine to coarse SAND with pebbles and angular fragments of SANDSTONE, brown and light gray, moist, medium dense | 9.6 | 117.7 | 60 | |
| | | | | | | **PUENTE FORMATION, SOQUEL MEMBER (Tps):** SANDSTONE, very fine to fine with some coarse, light gray to yellow gray, moist, moderately hard to hard | | | | |
| 85 | 538 | R | 50 for 5" | | | | 7.5 | 108.7 | 37 | |
| | | B | | | | | | | | |
| 90 | 533 | | | | | TOTAL DEPTH = 90 FEET<br>NO WATER<br>NO CAVING<br>Kelly Bar Wts.:<br>0 - 24' 3548#<br>24 - 47' 2577#<br>47 - 73' 1648#<br>73 - 95' 810#<br>95 - 106' 1110#<br>106 - 119' 1260#<br>119 - 130' 1560# | | | | |

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-3

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plans specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

# GEOTECHNICAL BORING LOG



PROJECT NO. 102280-P
DATE STARTED 5/27/98
DATE FINISHED 5/27/98
DRILLER LEDEZMA
TYPE OF DRILL RIG 30" BUCKET

PROJECT NAME Aera Energy
GROUND ELEV. 543
GW DEPTH (FT)
DRIVE WT. VARIES
DROP 12 in.

BORING DESIG. B-02
LOGGED BY DJE
NOTE

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **COMPACTED ARTIFICIAL FILL (Caf):** SANDY SILT, very fine to coarse, tan to brown, moist, medium dense | | | | |
| 5 | 538 | R | 3 | | | SANDY SILT, very fine to coarse, tan to brown, moist, medium dense to dense | 8.1 | 119.7 | 54 | |
| 10 | 533 | R | 2 | | | SANDY SILT, very fine to coarse, tan to brown, moist, medium dense to dense | 15.9 | 92.6 | 52 | |
| | | B | | | | | | | | MAX HY |
| 15 | 528 | R | 1 | | | SANDY SILT, very fine to fine, gray brown, moist, medium dense to dense | 24.6 | 95.2 | 86 | CON HY |
| 20 | 523 | R | 1 | | | SANDY SILT with pebbles (to 1/2"), very fine to medium, brown, moist, medium dense | 25.0 | 95.2 | 88 | |
| 25 | 518 | R | 3 | | | SANDY SILT, very fine, brown, moist, medium dense | 15.4 | 103.1 | 65 | |
| 30 | 513 | R | 1 | | | SANDY SILT, very fine, brown, moist, stiff | 27.0 | 91.5 | 87 | CON HY |
| 35 | 508 | R | 2 | | | SANDY SILT, very fine, olive brown, moist, stiff | 25.2 | 93.0 | 84 | |

SAMPLE TYPES:
[R] RING (DRIVE) SAMPLE
[S] SPT (SPLIT SPOON) SAMPLE
[B] BULK SAMPLE [T] TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
1RS set of approved plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# GEOTECHNICAL BORING LOG



| | | | |
|---|---|---|---|
| PROJECT NO. | 102280-P | PROJECT NAME | Aera Energy |
| DATE STARTED | 5/27/98 | GROUND ELEV. | 543 |
| DATE FINISHED | 5/27/98 | GW DEPTH (FT) | |
| DRILLER | LEDEZMA | DRIVE WT. | VARIES |
| TYPE OF DRILL RIG | 30" BUCKET | DROP | 12 in. |
| BORING DESIG. | B-02 | | |
| LOGGED BY | DJE | | |
| NOTE | | | |

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | R | 3 | | | SANDY SILT, very fine, yellow brown, moist, stiff | 22.4 | 97.1 | 82 | |
| 45 | 498 | R | 1 | | | SANDY SILT, very fine, gray brown, moist, stiff | 26.2 | 93.4 | 88 | |
| 50 | 493 | R | 3 | | | CLAYEY SILT, very fine with few clasts to 5 mm, gray brown, moist, stiff | 35.2 | 84.4 | 95 | OCN HY |
| 55 | 488 | R | 3 | | | SANDY SILT, very fine, gray brown, moist, stiff | 29.7 | 91.2 | 95 | |
| | | B | | | | | | | | MAX HY |
| 60 | 483 | R | 5 | | | SANDY SILT, very fine, gray with brown, moist, stiff | 18.6 | 96.6 | 67 | CON HY |
| 65 | 478 | R | 4 | | | SANDY SILT, very fine to medium, reddish brown, moist, medium dense, caliche | 12.0 | 114.3 | 68 | |
| | | B | | | | | | | | MAX HY |
| 70 | 473 | R | 3 | | | SANDY SILT, very fine to fine, reddish brown, moist, medium dense, caliche | 14.9 | 111.7 | 79 | CON HY |
| 75 | 468 | R | 30 | | | SANDY SILT with CLAY, very fine to fine, reddish brown, moist, medium dense, pebbles to 5 mm | 14.7 | 115.4 | 86 | |

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-5

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# GEOTECHNICAL BORING LOG



| | | | | | |
|---|---|---|---|---|---|
| PROJECT NO. | 102280-P | PROJECT NAME | Aera Energy | | |
| DATE STARTED | 5/27/98 | GROUND ELEV. | 543 | BORING DESIG. | B-02 |
| DATE FINISHED | 5/27/98 | GW DEPTH (FT) | | LOGGED BY | DJE |
| DRILLER | LEDEZMA | DRIVE WT. | VARIES | NOTE | |
| TYPE OF DRILL RIG | 30" BUCKET | DROP | 12 in. | | |

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | R | 20 | | | CLAYEY SILT with SAND, very fine, reddish brown to gray brown, moist, stiff | 14.9 | 114.6 | 86 | |
| 85 | 458 | R | 20 | | | Pebbly SILTY fine to coarse SAND, brown to gray, moist, medium dense, rounded pebbles to 1/2" | 10.0 | 117.2 | 62 | |
| 90 | 453 | | | | | cobbly fine to coarse SAND, brown, very moist to wet, medium dense, cobbles to 6" | | | | |
| 95 | 448 | R | 15 | | | **FERNANDO FORMATION LOWER MEMBER (Tfl):** SANDSTONE interbedded with SILTSTONE, medium to dark gray (unoxidized), wet, medium dense | 56.2 | 65.9 | 97 | |
| | | | | | | TOTAL DEPTH = 96 FEET<br>SEEPAGE AT 93 FEET<br>NO CAVING<br>Kelly Bar Wts.:<br>0 - 24' 3548#<br>24 - 47' 2577#<br>47 - 73' 1648#<br>73 - 95' 810#<br>95 - 106' 1110#<br>106 - 119' 1260#<br>119 - 130' 1560# | | | | |

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-6

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# GEOTECHNICAL BORING LOG



| | | | | | |
|---|---|---|---|---|---|
| PROJECT NO. | 102280-P | PROJECT NAME | Aera Energy | | |
| DATE STARTED | 6/1/98 | GROUND ELEV. | 680 | BORING DESIG. | B-05 |
| DATE FINISHED | 6/1/98 | GW DEPTH (FT) | | LOGGED BY | DJE |
| DRILLER | LEDEZMA | DRIVE WT. | VARIES | NOTE | |
| TYPE OF DRILL RIG | 30" BUCKET | DROP | 12 in. | | |

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 675 | B | | | | **COMPACTED ARTIFICIAL FILL (Caf):** SILTY SAND with some CLAY, dark gray, moist, loose to medium dense, slight hydrocarbon odor | | | | MAX HY |
| 10 | 670 | R | 1 | | | CLAYEY SILT, dark gray, moist, firm, slight hydrocarbon odor | 13.2 | 113.8 | 74 | |
| 15 | 665 | | | | | | | | | |
| 20 | 660 | R | 3 | | | CLAYEY SILT with pebbles (to 3/8"), dark gray, moist, firm to stiff, moderate hydrocarbon odor | 12.7 | 116.0 | 76 | |
| 25 | 655 | | | | | | | | | |
| 30 | 650 | R | 4 | | | CLAYEY SILT, dark gray, moist, firm, moderate hydrocarbon odor | 12.1 | 108.4 | 59 | |
| | | | | | | large boulder - unable to remove<br>TOTAL DEPTH = 33 FEET<br>NO WATER<br>NO CAVING<br>Kelly Bar Wts.:<br>0 - 24' 3548#<br>24 - 47' 2577#<br>47 - 73' 1648#<br>73 - 95' 810#<br>95 - 106' 1110#<br>106 - 119' 1260#<br>119 - 130' 1560# | | | | |

SAMPLE TYPES:
[R] RING (DRIVE) SAMPLE
[S] SPT (SPLIT SPOON) SAMPLE
[B] BULK SAMPLE [T] TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tabassian
Date 10/18/2022

# GEOTECHNICAL BORING LOG



PROJECT NO. 102280-P
DATE STARTED 4/14/99
DATE FINISHED 4/14/99
DRILLER Ledezma Drilling
TYPE OF DRILL RIG 30" Bucket Auger

PROJECT NAME Aera Energy
GROUND ELEV. 685
GW DEPTH (FT)
DRIVE WT. Varies
DROP 12 in.

BORING DESIG. B-501
LOGGED BY MFM/MP
NOTE

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | ▼ **TOPSOIL:** Silty Clay, dark reddish brown, moist, soft, and porous. | | | | |
| | | | | | | **OLDER ALLUVIUM (Qoa):** Cobbly Sandy Silt, light brown, moist, stiff, locally porous. Cobbles subrounded to angular composed of local bedrock of the Puente Formation. | | | | |
| 5 | 680 | | | | | | | | | |
| 10 | 675 | | | | | | | | | |
| 15 | 670 | | | | | | | | | |
| 20 | 665 | | | | | | | | | |
| 25 | 660 | | | | | Silty Sand, pale olive, moist, dense, with cobbles from local bedrock, Fernando Formation (Tf). | | | | |
| 30 | 655 | | | | | | | | | |
| 35 | 650 | | | | | **PUENTE FORMATION, LA VIDA MEMBER (Tpl):** Siltstone, light olive gray, damp, firm, very fractured with no good bedding. Contact with overlying older alluvium is irregular, no slip plane, and no slicks. | | | | |

SAMPLE TYPES:
[R] RING (DRIVE) SAMPLE
[S] SPT (SPLIT SPOON) SAMPLE
[B] BULK SAMPLE [T] TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-8

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
To see grading and drainage sections must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without written permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tabassian
Date 10/18/2022

# GEOTECHNICAL BORING LOG



PROJECT NO. 102280-P
DATE STARTED 4/14/99
DATE FINISHED 4/14/99
DRILLER Ledezma Drilling
TYPE OF DRILL RIG 30" Bucket Auger

PROJECT NAME Aera Energy
GROUND ELEV. 685
GW DEPTH (FT)
DRIVE WT. Varies
DROP 12 in.

BORING DESIG. B-501
LOGGED BY MFM/MP
NOTE

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | R | 9 | | | Total Depth 40 feet.<br>No water. No caving.<br>Kelly Bar Wts.:<br>0 - 24' 3548#<br>24 - 47' 2577#<br>47 - 73' 1648#<br>73 - 95' 810#<br>95 - 106' 1110#<br>106 - 119' 1260#<br>119 - 130' 1560# | | | | |
| 45 | 640 | | | | | | | | | |
| 50 | 635 | | | | | | | | | |

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-9

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

# GEOTECHNICAL BORING LOG



| | | | |
|---|---|---|---|
| PROJECT NO. | 102280-P | PROJECT NAME | Aera Energy |
| DATE STARTED | 4/15/99 | GROUND ELEV. | 540 |
| DATE FINISHED | 4/15/99 | GW DEPTH (FT) | |
| DRILLER | Ledezma Drilling | DRIVE WT. | Varies |
| TYPE OF DRILL RIG | 30" Bucket Auger | DROP | 12 in. |

BORING DESIG. B-502
LOGGED BY MFM/MP
NOTE

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | **COMPACTED ARTIFICIAL FILL (Caf):** Pebbly Silty Sand, dark brown, moist, moderately dense, angular clasts to 10 cm of gray to dark gray Claystone. | | | | |
| 5 | 535 | | | | | | | | | |
| 10 | 530 | R | 3 | | | Fine-grained Silty Sand, yellowish brown, moist, moderately dense with angular clasts of Sandstone and Claystone. | | | | |
| 15 | 525 | | | | | | | | | |
| 20 | 520 | | | | | Alternating Silty Sand, dark brown to yellowish brown, moist, moderately dense, with angular clasts of gray to dark gray Siltstone. | | | | |
| 25 | 515 | | | | | | | | | |
| 30 | 510 | R | 2 | | | Silty Sand alternating, dark brown to yellowish brown, moist, dense, with clasts of Siltstone. Soil compact around rock fragments | | | | |
| 35 | 505 | | | | | | | | | |

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-10

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
The use of alternate procedures must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# GEOTECHNICAL BORING LOG



PROJECT NO. 102280-P
DATE STARTED 4/15/99
DATE FINISHED 4/15/99
DRILLER Ledezma Drilling
TYPE OF DRILL RIG 30" Bucket Auger

PROJECT NAME Aera Energy
GROUND ELEV. 540
GW DEPTH (FT)
DRIVE WT. Varies
DROP 12 in.

BORING DESIG. B-502
LOGGED BY MFM/MP
NOTE

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 495 | R | 1 | | | Clayey Silt, dark brown,moist, dense, few pores, appears to have compactive effort. | | | | |
| | | | | | | OLDER ALLUVIUM (Qoa): Clayey Silt, yellowish brown, moist, moderately dense, with minor amounts of roots. | | | | |
| 50 | 490 | | | | | | | | | |
| 55 | 485 | | | | | Clayey Sandy Silt, yellowish brown, moist, firm with large angular clasts of Sandstone and Claystone. | | | | |
| | | | | | | Silty Sand, yellowish brown, moist, soft. | | | | |
| | | | | | | Fault. | | | | |
| 60 | 480 | R | 5 | | | Silty Clay, yellowish brown,moist, soft, masticated, with light gray carbonate nodules. | | | | |
| | | | | | | FERNANDO FORMATION (Tf)?: Siltstone and Claystone, yellowish brown, moist to very moist, soft, very masticated with carbonate filled joints, bedding is discontinuous. | | | | |
| 65 | 475 | | | | | Silty Clay, mottled brownish yellow and olive. Masticated probably footwall of fault, slicks. | | | | |
| 70 | 470 | | | | | | | | | |
| 75 | 465 | | | | | Silty Clay, brownish yellow to olive, moist, becoming less masticated bedrock highly fractured with slicks. | | | | |
| | | | | | | Total Depth 77 feet.<br>No water. No caving.<br>Kelly Bar Wts.:<br>0 - 24' 3548# | | | | |

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-11

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Need Inspections
BUILDING OFFICIAL

# GEOTECHNICAL BORING LOG



PROJECT NO. 102280-P
DATE STARTED 4/15/99
DATE FINISHED 4/15/99
DRILLER Ledezma Drilling
TYPE OF DRILL RIG 30" Bucket Auger

PROJECT NAME Aera Energy
GROUND ELEV. 540
GW DEPTH (FT)
DRIVE WT. Varies
DROP 12 in.

BORING DESIG. B-502
LOGGED BY MFM/MP
NOTE

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 24 - 47' 2577#<br>47 - 73' 1648#<br>73 - 95' 810#<br>95 - 106' 1110#<br>106 - 119' 1260#<br>119 - 130' 1560# | | | | |

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# GEOTECHNICAL BORING LOG



| | | | |
|---|---|---|---|
| PROJECT NO. | 102280-P | PROJECT NAME | Aera Energy |
| DATE STARTED | 4/14/99 | GROUND ELEV. | 540 |
| DATE FINISHED | 4/14/99 | GW DEPTH (FT) | |
| DRILLER | Ledezma Drilling | DRIVE WT. | Varies |
| TYPE OF DRILL RIG | 30" Bucket Auger | DROP | 12 in. |

BORING DESIG. B-503
LOGGED BY MFM/MP
NOTE

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **COMPACTED ARTIFICIAL FILL (Caf):** Gravelly Silty Sand, grayish orange, moist, moderately dense, clean, occasional gray shale clasts. | | | | |
| 5 | 535 | | | | | | | | | |
| | | | | | | Piece of concrete at 8 feet. | | | | |
| 10 | 530 | R | 3 | | | | | | | |
| 15 | 525 | | | | | | | | | |
| 20 | 520 | R | 1 | | | | | | | |
| | | B | | | | | | | | |
| 25 | 515 | | | | | | | | | |
| 30 | 510 | R | 2 | | | | | | | |
| 35 | 505 | | | | | Sandy Clay, dusty yellowish brown, moist, dense, not porous. Possibly old colluvium. | | | | |
| | | | | | | **OLDER ALLUVIUM (Qoa):** Silty Sand, yellowish brown, moist, dense. | | | | |
| | | R | 3 | | | | | | | |

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-13

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
As set forth herein and conditions must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# GEOTECHNICAL BORING LOG



| | | | |
|---|---|---|---|
| PROJECT NO. | 102280-P | PROJECT NAME | Aera Energy |
| DATE STARTED | 4/14/99 | GROUND ELEV. | 540 |
| DATE FINISHED | 4/14/99 | GW DEPTH (FT) | |
| DRILLER | Ledezma Drilling | DRIVE WT. | Varies |
| TYPE OF DRILL RIG | 30" Bucket Auger | DROP | 12 in. |
| BORING DESIG. | B-503 | | |
| LOGGED BY | MFM/MP | | |
| NOTE | | | |

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Gravelly Silty fine-grained Sand, yellowish brown, moist, dense and cobbly. | | | | |
| | | | | | | **PUENTE FORMATION, SOQUEL MEMBER (Tps):** Fine to medium-grained Sandstone, strong yellow, moist, moderately hard, lightly cemented with gray Siltstone stringers. | | | | |
| 45 | 495 | R/B | 3 | | | | | | | |
| 50 | 490 | | | | | Siltstone stringers, dark yellowish brown with carbonate nodules, moist, soft. | | | | |
| 55 | 485 | | | | | Total Depth 55 feet.<br>No water. No caving.<br>Kelly Bar Wts.:<br>0 - 24' 3548#<br>24 - 47' 2577#<br>47 - 73' 1648#<br>73 - 95' 810#<br>95 - 106' 1110#<br>106 - 119' 1260#<br>119 - 130' 1560# | | | | |
| 60 | 480 | | | | | | | | | |

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-14

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# GEOTECHNICAL BORING LOG



| | | | | | |
|---|---|---|---|---|---|
| PROJECT NO. | 102280-P | PROJECT NAME | Aera Energy | | |
| DATE STARTED | 4/15/99 | GROUND ELEV. | 540 | BORING DESIG. | B-504 |
| DATE FINISHED | 4/15/99 | GW DEPTH (FT) | | LOGGED BY | MFM/MP |
| DRILLER | Ledezma Drilling | DRIVE WT. | Varies | NOTE | |
| TYPE OF DRILL RIG | 30" Bucket Auger | DROP | 12 in. | | |

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **COMPACTED ARTIFICIAL FILL (Caf):** Gravelly Silty Sand, dark yellow brown, moist, medium dense with angular clasts of Sandstone and Siltstone. | | | | |
| 5 | 535 | | | | | Silty Sand, dark yellow brown, moist, medium dense with large angular clasts of light gray Sandstone and pebbly conglomerate. | | | | |
| 10 | 530 | | | | | | | | | |
| 15 | 525 | | | | | | | | | |
| 20 | 520 | R | 1 | | | | | | | |
| 25 | 515 | | | | | | | | | |
| 30 | 510 | | | | | | | | | |
| 35 | 505 | | | | | Sandy Silt, alternating dark yellowish brown and yellowish brown layers, moist, dense. | | | | |

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-15

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# GEOTECHNICAL BORING LOG



| | | | | | |
|---|---|---|---|---|---|
| PROJECT NO. | 102280-P | PROJECT NAME | Aera Energy | | |
| DATE STARTED | 4/15/99 | GROUND ELEV. | 540 | BORING DESIG. | B-504 |
| DATE FINISHED | 4/15/99 | GW DEPTH (FT) | | LOGGED BY | MFM/MP |
| DRILLER | Ledezma Drilling | DRIVE WT. | Varies | NOTE | |
| TYPE OF DRILL RIG | 30" Bucket Auger | DROP | 12 in. | | |

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 45 | 495 | R | 2 | | | Clayey Silt, very dark grayish brown, moist, dense, with angular clasts of Claystone. | | | | |
| 50 | 490 | | | | | **OLDER ALLUVIUM (Qoa):** Clayey Silt, dark yellowish brown, moist, moderately dense, weathered with abundant very small roots/rootlets. | | | | |
| 55 | 485 | R | 8 | | | Clayey Silt, dark yellowish brown, moist, dense, with angular clasts of Claystone and abundant rootlets. | | | | |
| 60 | 480 | | | | | Sandy Silt, dark yellow brown, moist, dense with some yellow Silt lenses containing angular clasts of gray and yellowish Siltstone. | | | | |
| | | | | | | Medium-grained Sand, dark yellowish brown, moist, dense, with abundant angular clasts of Sandstone and cherty/limy nodules. Clasts possibly derived from the Soquel Member of the Puente Formation (Tps). | | | | |
| 65 | 475 | | | | | | | | | |
| 70 | 470 | | | | | Very Silty fine-grained Sand, yellowish brown, moist, dense. | | | | |
| 75 | 465 | R | 25 | | | **FERNANDO FORMATION (Tf):** Clayey Silt, dark greenish gray, moist, dense. | | | | |
| | | | | | | Total Depth 78 feet.<br>No water. No caving.<br>Kelly Bar Wts.: | | | | |

SAMPLE TYPES:
- [R] RING (DRIVE) SAMPLE
- [S] SPT (SPLIT SPOON) SAMPLE
- [B] BULK SAMPLE
- [T] TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
Typed or printed name and corrections must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# GEOTECHNICAL BORING LOG



PROJECT NO 102280-P
DATE STARTED 4/15/99
DATE FINISHED 4/15/99
DRILLER Ledezma Drilling
TYPE OF DRILL RIG 30" Bucket Auger

PROJECT NAME Aera Energy
GROUND ELEV. 540
GW DEPTH (FT)
DRIVE WT. Varies
DROP 12 in.

BORING DESIG. B-504
LOGGED BY MFM/MP
NOTE

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 0 - 24' 3548#<br>24 - 47' 2577#<br>47 - 73' 1648#<br>73 - 95' 810#<br>95 - 106' 1110#<br>106 - 119' 1260#<br>119 - 130' 1560# | | | | |

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-17

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tabassian
Date 10/18/22

# GEOTECHNICAL BORING LOG



| | | | | | |
|---|---|---|---|---|---|
| PROJECT NO. | 102280-P | PROJECT NAME | Aera Energy | | |
| DATE STARTED | 4/14/99 | GROUND ELEV. | 540 | BORING DESIG. | B-505 |
| DATE FINISHED | 4/14/99 | GW DEPTH (FT) | | LOGGED BY | MFM/MP |
| DRILLER | Ledezma Drilling | DRIVE WT. | Varies | NOTE | |
| TYPE OF DRILL RIG | 30" Bucket Auger | DROP | 12 in. | | |

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 535 | | | | | **COMPACTED ARTIFICIAL FILL (Caf):** Gravelly Silty Sand, dark yellow brown, moist, medium dense with occasional Sandstone and Claystone clasts. | | | | |
| 10 | 530 | | | | | | | | | |
| | | | | | | Silty Sand, brownish yellow, moist, medium dense, with angular clasts of gray to dark gray Claystone. | | | | |
| 15 | 525 | | | | | Clayey Silt, yellowish brown, moist, medium dense, with angular clasts of gray Claystone. | | | | |
| 20 | 520 | R | 1 | | | | | | | |
| | | | | | | Minor amounts of grass and roots. | | | | |
| 25 | 515 | | | | | | | | | |
| 30 | 510 | | | | | Silty Sands, dark yellowish brown, moist, medium dense, with angular Clasts of gray to dark gray Claystone. | | | | |
| 35 | 505 | | | | | | | | | |

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

▼ Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-18

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# GEOTECHNICAL BORING LOG



PROJECT NO. 102280-P
DATE STARTED 4/14/99
DATE FINISHED 4/14/99
DRILLER Ledezma Drilling
TYPE OF DRILL RIG 30" Bucket Auger

PROJECT NAME Aera Energy
GROUND ELEV. 540
GW DEPTH (FT)
DRIVE WT. Varies
DROP 12 in.

BORING DESIG. B-505
LOGGED BY MFM/MP
NOTE

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| | | R | 2 | | | Clayey Silty Sands, dark yellowish brown, moist, medium dense, with angular clasts of tan Siltstone and dark gray Claystone. | | | | |
| 45 | 495 | | | | | | | | | |
| 50 | 490 | | | | | Sandy Clay, yellowish brown, moist, medium dense, no pores. | | | | |
| 55 | 485 | | | | | Clayey Silt, very dark grayish brown, moist, dense, gray to red modeling with angular clasts of gray Claystone.<br>Clayey Silt, very dark gray, moist, dense, with angular clasts of gray Claystone. | | | | |
| | | | | | | **BURIED SOIL HORIZON:** Clayey Silt, dark brown, moist, medium dense, with rootlets and is oderiferous. | | | | |
| 60 | 480 | R | 5 | | | **OLDER ALLUVIUM (Qoa):** Fine-grained Silty Sand, dark brown, moist, medium dense, with minor amounts of angular gray claystone clasts and rootlets.<br>Silty Sand, dark brown, moist, medium dense, with abundant angular clasts of Sandstone and Claystone to 2" in length. Minor occurance of larger clasts to 12" in length. | | | | |
| 65 | 475 | | | | | | | | | |
| 70 | 470 | | | | | | | | | |
| 75 | 465 | | | | | | | | | |

SAMPLE TYPES:
R RING (DRIVE) SAMPLE
S SPT (SPLIT SPOON) SAMPLE
B BULK SAMPLE T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

PLATE B-19

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

# GEOTECHNICAL BORING LOG



| | | | | | |
|---|---|---|---|---|---|
| PROJECT NO. | 102280-P | PROJECT NAME | Aera Energy | BORING DESIG. | B-505 |
| DATE STARTED | 4/14/99 | GROUND ELEV. | 540 | LOGGED BY | MFM/MP |
| DATE FINISHED | 4/14/99 | GW DEPTH (FT) | | NOTE | |
| DRILLER | Ledezma Drilling | DRIVE WT. | Varies | | |
| TYPE OF DRILL RIG | 30" Bucket Auger | DROP | 12 in. | | |

| DEPTH (feet) | ELEV. | SAMPLE TYPE | BLOWS/FT | LITHOLOGY | GROUP SYMBOL | GEOTECHNICAL DESCRIPTION | MOISTURE CONT. (%) | DRY (pcf) DENSITY | SAT-URATION (%) | OTHER TESTS |
|---|---|---|---|---|---|---|---|---|---|---|
| 85 | 455 | | | | | **FERNANDO FORMATION (Tf):** Silty Sand to Clayey Silt, dark greenish gray, moist, dense, and massive. | | | | |
| | | | | | | Sandy Siltstone, dark greenish gray, moist, dense, laminae and weakly fossiliferous, oderiferous. | | | | |
| 90 | 450 | | | | | Clayey Siltstone, dark greenish gray, moist, dense with laminae, strongly oderiferous. | | | | |
| 95 | 445 | | | | | Total Depth 95 feet.<br>Water seepage at 85 feet.<br>No caving.<br>Kelly Bar Wts.:<br>0 - 24' 3548#<br>24 - 47' 2577#<br>47 - 73' 1648#<br>73 - 95' 810#<br>95 - 106' 1110#<br>106 - 119' 1260#<br>119 - 130' 1560# | | | | |
| 100 | 440 | | | | | | | | | |

SAMPLE TYPES:
- R RING (DRIVE) SAMPLE
- S SPT (SPLIT SPOON) SAMPLE
- B BULK SAMPLE
- T TUBE SAMPLE

Ground Water Seepage
MAX - Max. Density/Opt. Moist.
DS - Direct Shear
HYDR - Hydrometer Analysis
ASCE - Expansion Index
CONS - Consolidation

PACIFIC SOILS ENGINEERING, INC.

County of Orange - OC Public Works
OC Development Services
APPROVED
Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170622

September 30, 2005
Work Order 102280



# TABLE B–1

## SUMMARY OF LABORATORY TEST DATA

| Boring | Depth (ft.) | Description | ASTM D-1557 | | | Direct Shear | | | Expansion Index (UBC 18-2) | Grain Size Analysis | | | | Other Tests |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Group Symbol, Soil Classification System | Maximum Dry Density (%) | Optimum Moisture Content (%) | Cohesion (psf) | Friction Angle, Ø, (degrees) | Test Conditions | | % + No. 4 Screen | % Sand | % Silt | % Clay | |
| B-01 | 10 | Clayey Silt (Caf) | ML | | | | | | | 18 | 23 | 32 | 27 | Consol.: Plate B-1 |
| B-01 | 17 | Silty Clay (Caf) | CL | 118.1 | 11.4 | | | | 70 | 3 | 28 | 41 | 28 | |
| B-01 | 20 | Silty Sand (Caf) | SM | | | | | | | 8 | 67 | 17 | 8 | Consol: Plate B-2 |
| B-01 | 40 | Silty Sand (Caf) | SM | | | | | | | 20 | 36 | 24 | 20 | Consol: Plate B-3 |
| B-01 | 60 | Silty Sand (Caf) | SM | | | | | | | 21 | 63 | 12 | 4 | Consol: Plate B-4 |
| B-01 | 63 | Silty Sand (Caf) | SM | 125.0 | 10.1 | | | | | 10 | 67 | 15 | 8 | |
| B-01 | 70 | Silty Sand (Caf) | SM | | | | | | | 16 | 64 | 10 | 10 | Consol: Plate B-5 |
| B-02 | 13 | Sandy Silt (Caf) | ML | 105.6 | 17.8 | | | | 39 | 1 | 47 | 37 | 15 | |
| B-02 | 15 | Sandy Silt (Caf) | ML | | | | | | | 2 | 32 | 41 | 25 | Consol: Plate B-6 |
| B-02 | 30 | Sandy Silt (Caf) | ML | | | | | | | 21 | 24 | 31 | 24 | Consol: Plate B-7 |
| B-02 | 50 | Clayey Silt (Caf) | ML | | | | | | | 0 | 18 | 45 | 37 | Consol: Plate B-8 |
| B-02 | 59 | Sandy Silt (Caf) | ML | 96.7 | 22.0 | | | | | 0 | 37 | 35 | 28 | |
| B-02 | 60 | Sandy Silt (Caf) | ML | | | | | | | 9 | 40 | 28 | 24 | Consol: Plate B-9 |
| B-02 | 68 | Sandy Silt (Caf) | ML | 120.5 | 11.2 | | | | | 0 | 47 | 29 | 24 | |
| B-02 | 70 | Sandy Silt (Caf) | ML | | | | | | | 0 | 45 | 30 | 25 | Consol: Plate B-10 |
| B-05 | 8 | Silty Sand (Caf) | SM | 118.8 | 12.1 | | | | | 4 | 49 | 33 | 14 | |
| | | | | | | | | | | | | | | |

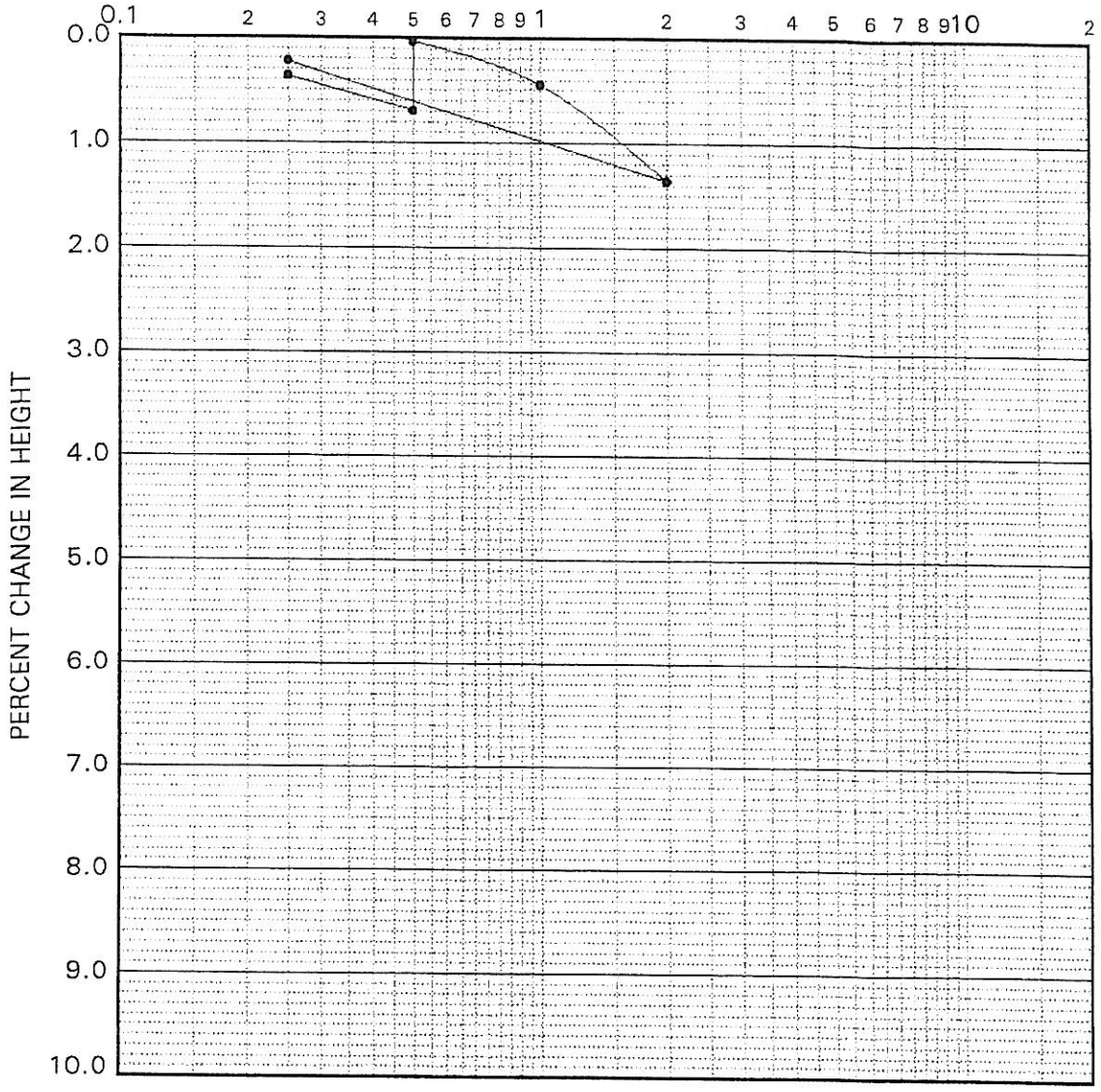
Direct Shear Test Conditions: R = Remolded; U = Undisturbed
S = Saturated

22800009A

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Ryan Thomas Rose
BUILDING OFFICIAL

COMPRESSIVE STRESS IN TSF




| boring | depth (ft.) | dry density | in situ moist. | -200 sieve | group symbol | typical names |
|---|---|---|---|---|---|---|
| B-01 | 10.0 | 108.6 | 17.4 | 59 | ML | CLAYEY SILT |

REMARKS: WATER ADDED AT .5 TSF

CONSOLIDATION CURVE

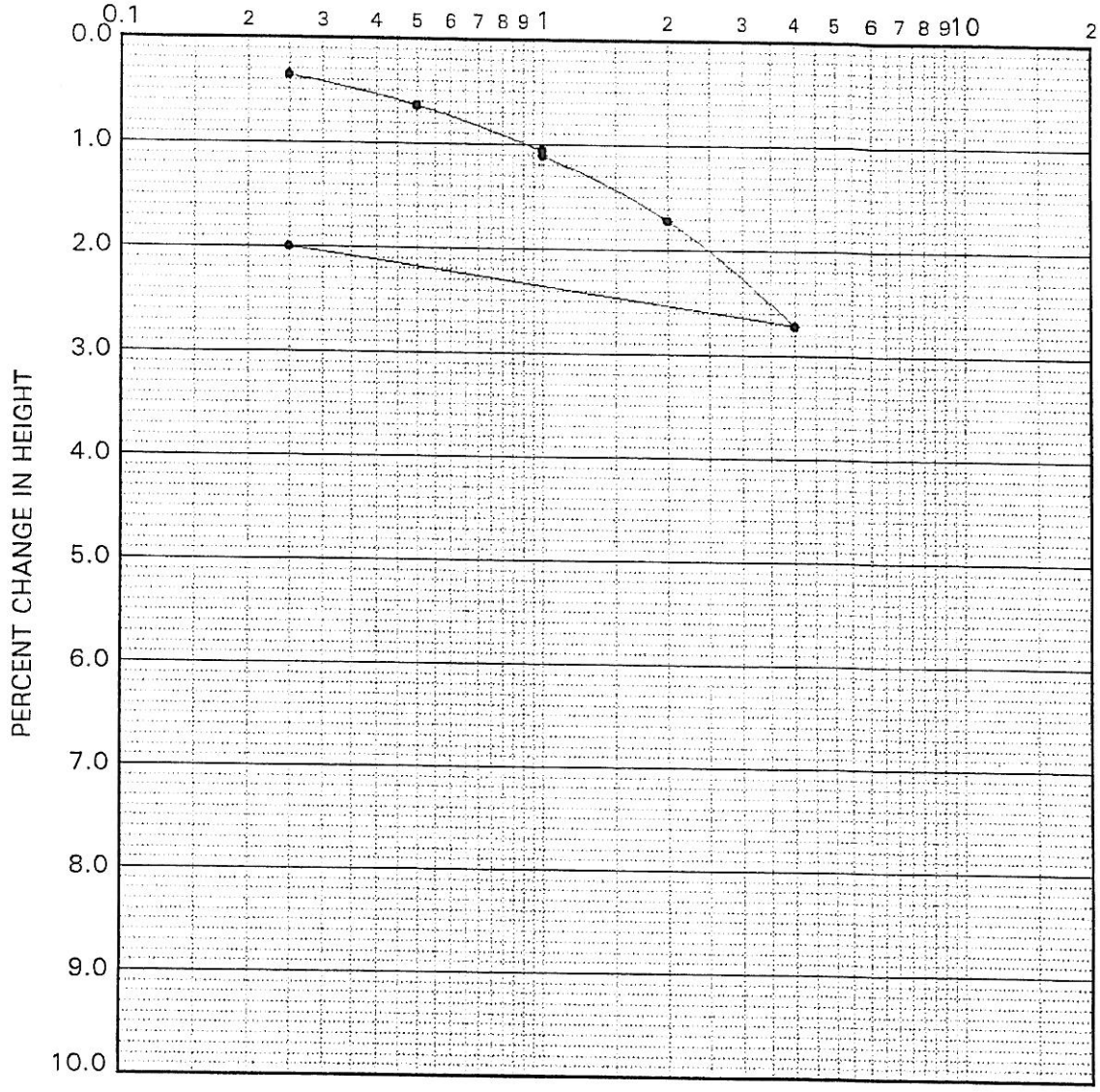
PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122

W.O. 102280P PLATE B-21

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

COMPRESSIVE STRESS IN TSF




| boring | depth (ft.) | dry density | in situ moist. | -200 sieve | group symbol | typical names |
|---|---|---|---|---|---|---|
| B-01 | 20.0 | 124.4 | 9.6 | 25 | SM | SILTY SAND |

REMARKS: WATER ADDED AT 1.0 TSF

CONSOLIDATION CURVE

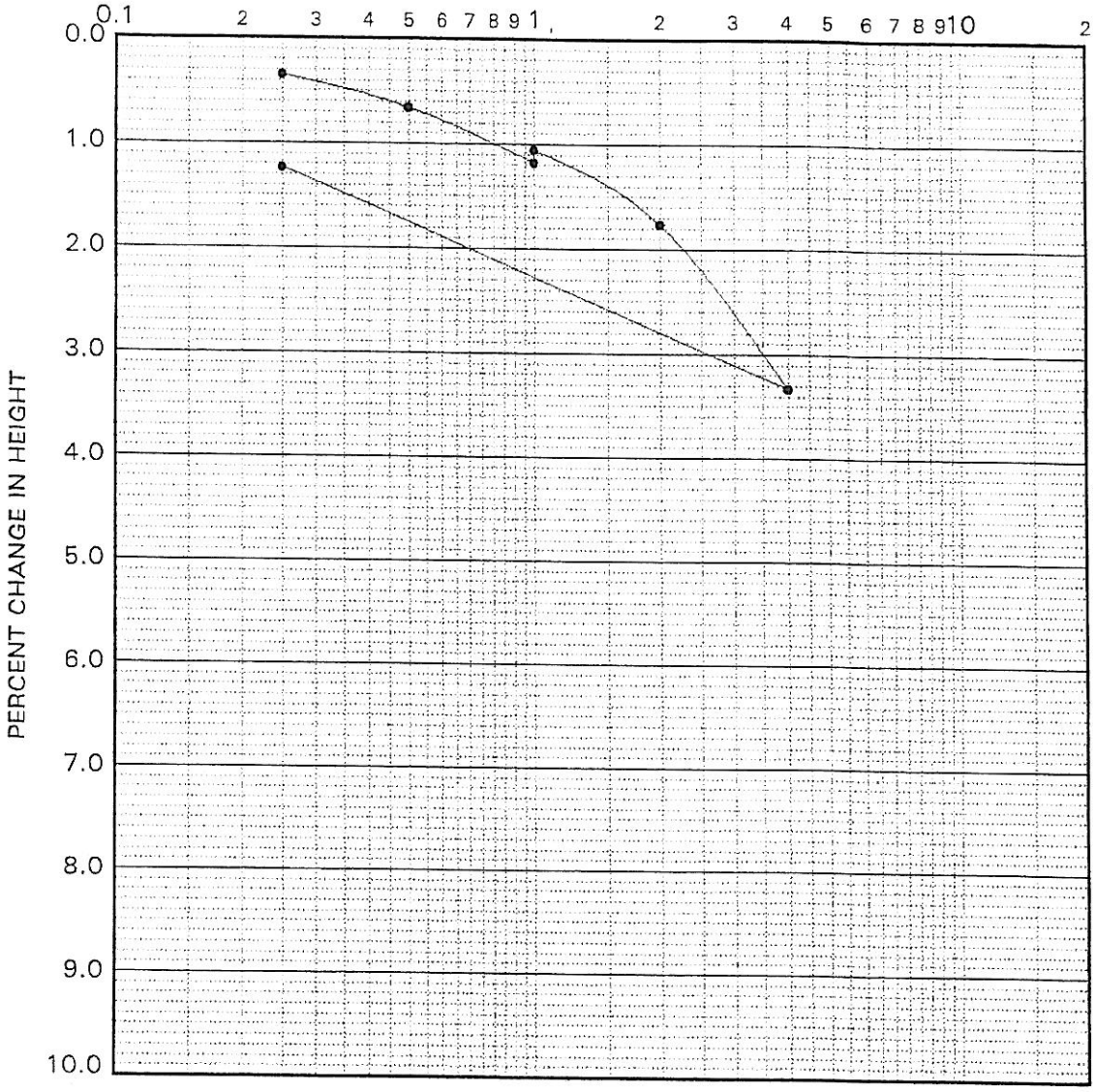
PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122

W.O. 102280P PLATE B-22

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Ryan Tabone
BUILDING OFFICIAL

COMPRESSIVE STRESS IN TSF




| boring | depth (ft.) | dry density | in situ moist. | -200 sieve | group symbol | typical names |
|---|---|---|---|---|---|---|
| B-01 | 40.0 | 113.2 | 14.7 | 44 | SM | SILTY SAND |

REMARKS: WATER ADDED AT 1.0 TSF

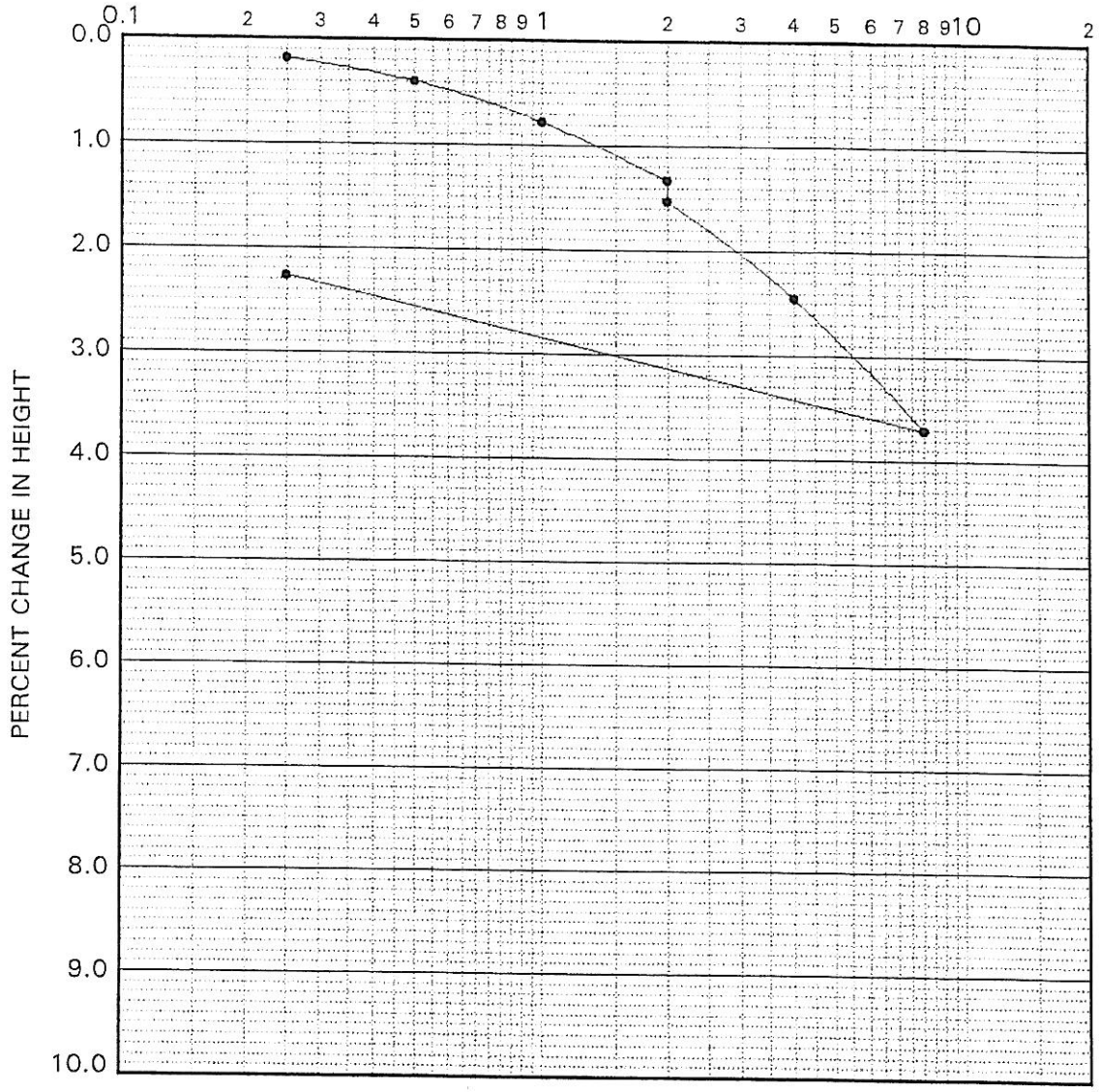
CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122
W.O. 102280P PLATE B-23

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or Building Law.
Paul Tsamtsaris
BUILDING OFFICIAL

COMPRESSIVE STRESS IN TSF




| boring | depth (ft.) | dry density | in situ moist. | -200 sieve | group symbol | typical names |
|---|---|---|---|---|---|---|
| B-01 | 60.0 | 117.9 | 9.1 | 16 | SM | SILTY SAND |

REMARKS: WATER ADDED AT 2.0 TSF

CONSOLIDATION CURVE

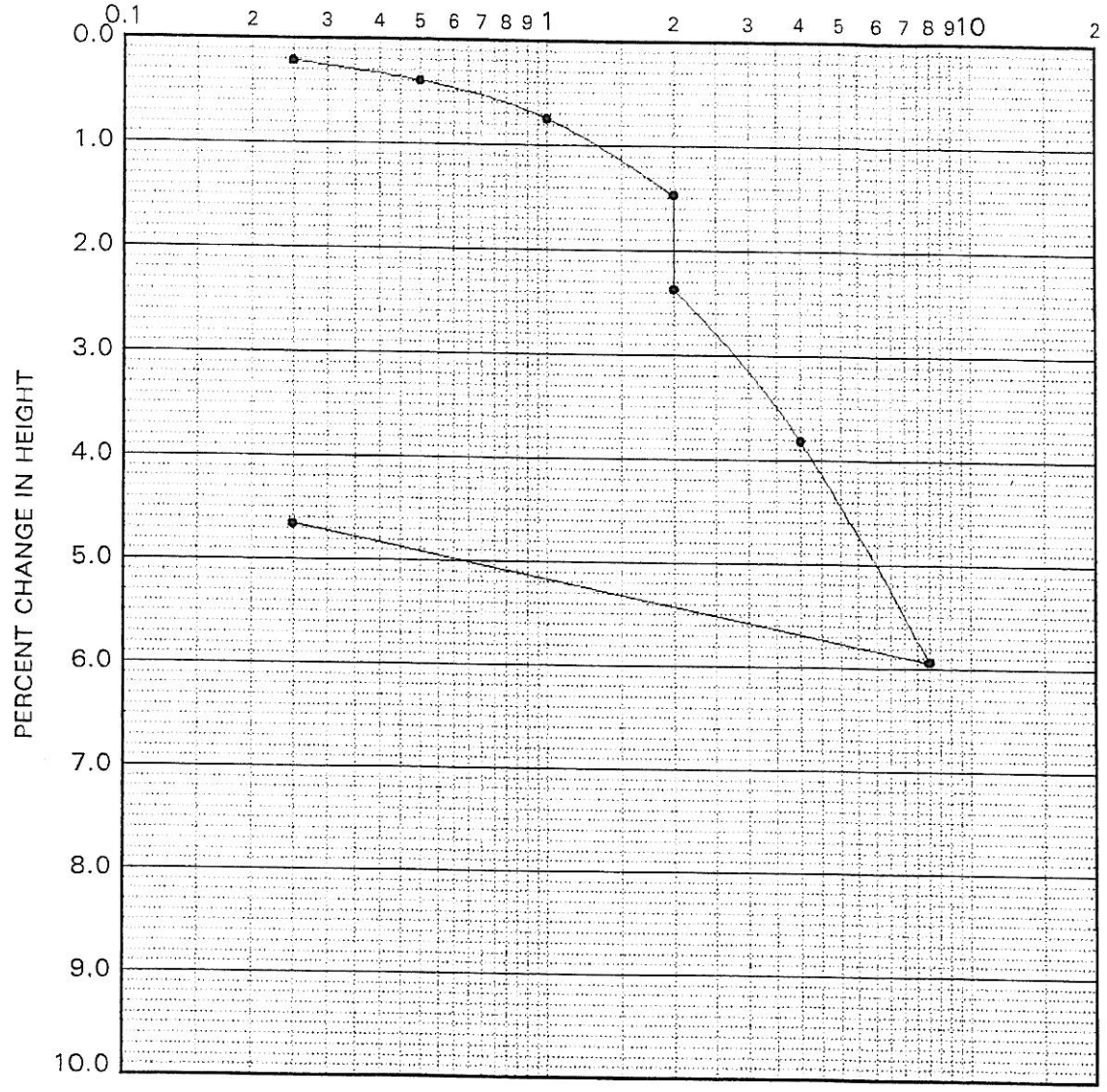
PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122

W.O. 102280P PLATE B-24

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Paul Tabbert, Jr.
BUILDING OFFICIAL

COMPRESSIVE STRESS IN TSF




| boring | depth (ft.) | dry density | in situ moist. | -200 sieve | group symbol | typical names |
|---|---|---|---|---|---|---|
| B-01 | 70.0 | 118.0 | 8.6 | 20 | SM | SILTY SAND |

REMARKS: WATER ADDED AT 2.0 TSF

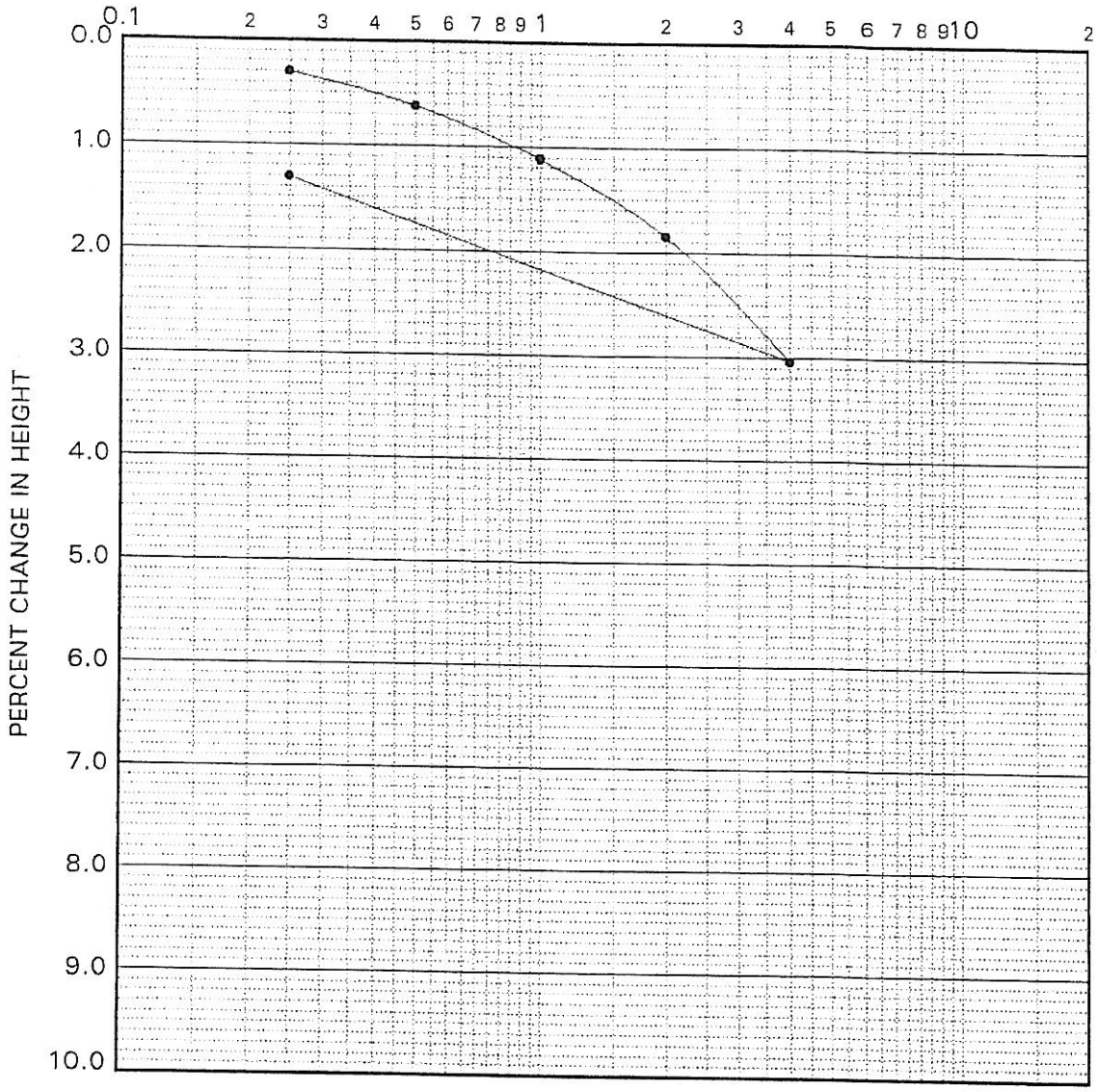
CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122
W.O. 102280P PLATE B-25

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations on these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Ryan Thomas Rose
BUILDING OFFICIAL

COMPRESSIVE STRESS IN TSF




| boring | depth (ft.) | dry density | in situ moist. | -200 sieve | group symbol | typical names |
|---|---|---|---|---|---|---|
| B-02 | 15.0 | 95.2 | 24.6 | 66 | ML | SANDY SILT |

REMARKS: WATER ADDED AT 1.0 TSF

CONSOLIDATION CURVE

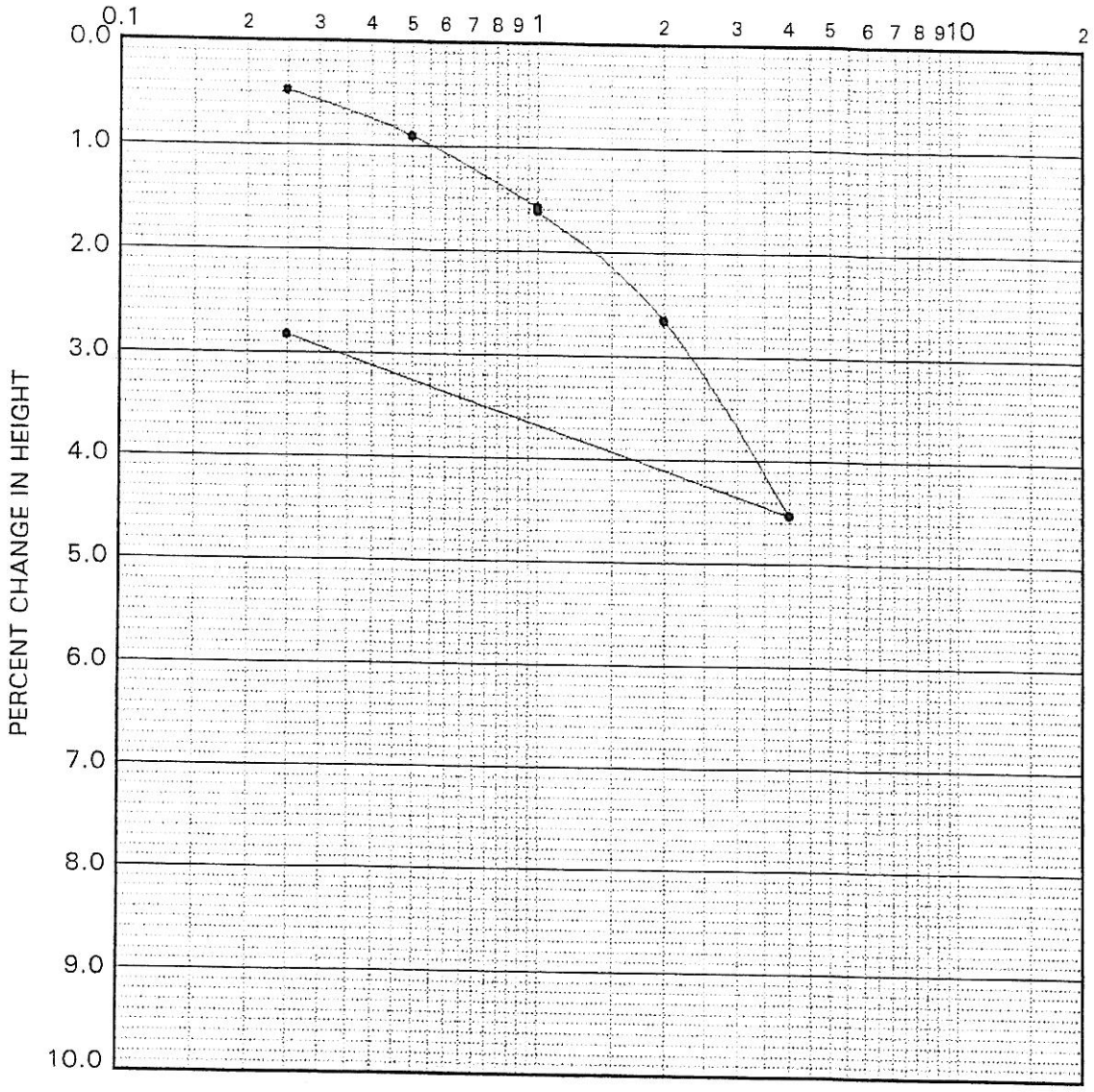
PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122

W.O. 102280P PLATE B-26

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Paul Tabbasnejad
BUILDING OFFICIAL

COMPRESSIVE STRESS IN TSF




| boring | depth (ft.) | dry density | in situ moist. | -200 sieve | group symbol | typical names |
|---|---|---|---|---|---|---|
| B-02 | 30.0 | 91.5 | 27.0 | 55 | ML | SANDY SILT |

REMARKS: WATER ADDED AT 1.0 TSF

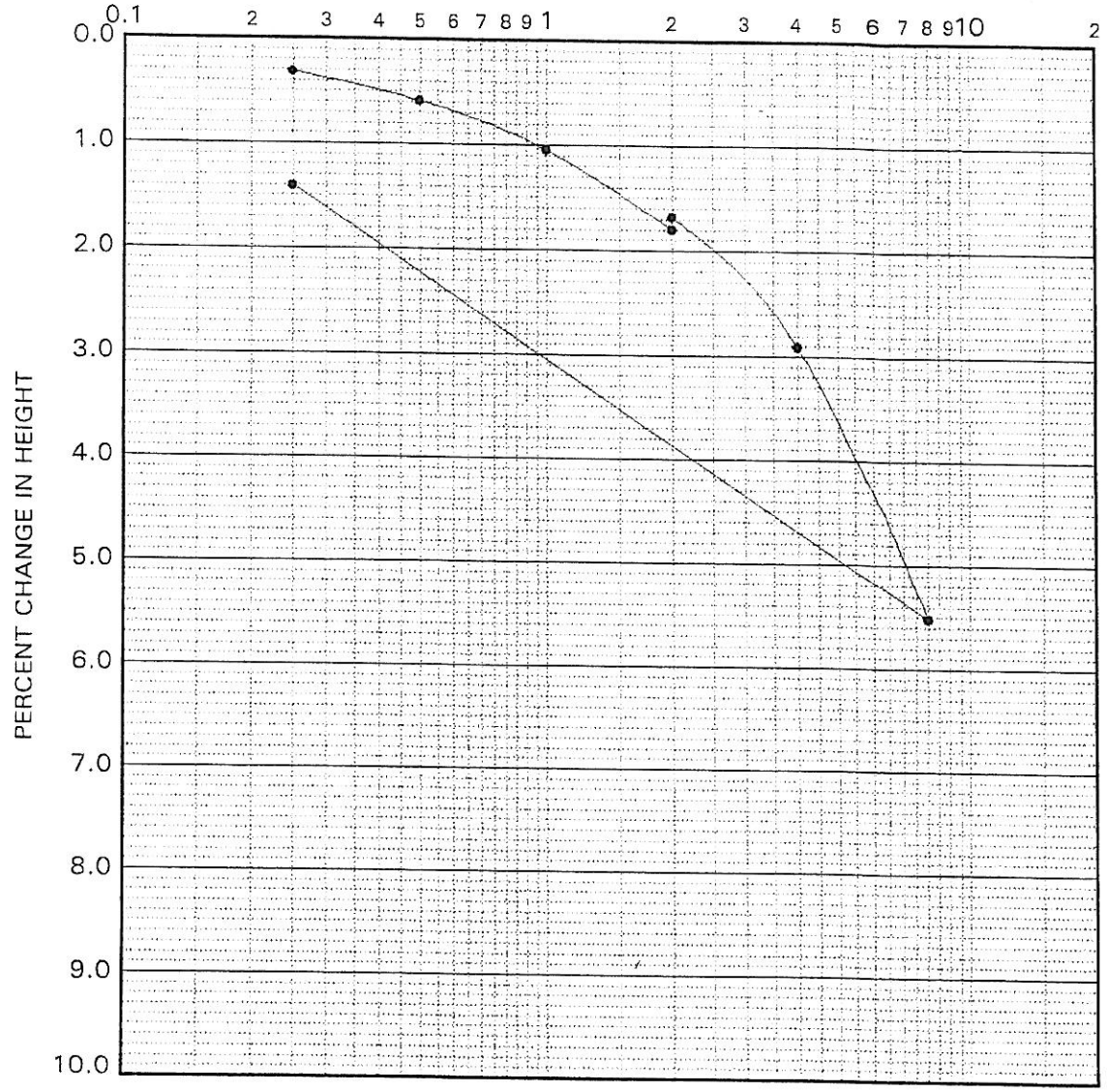
CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122
W.O. 102280P PLATE B-27

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or Building
Paul Tabbert, Jr.
BUILDING OFFICIAL

COMPRESSIVE STRESS IN TSF




| boring | depth (ft.) | dry density | in situ moist. | -200 sieve | group symbol | typical names |
|---|---|---|---|---|---|---|
| B-02 | 50.0 | 84.4 | 35.2 | 82 | ML | CLAYEY SILT |

REMARKS: WATER ADDED AT 2.0 TSF

CONSOLIDATION CURVE

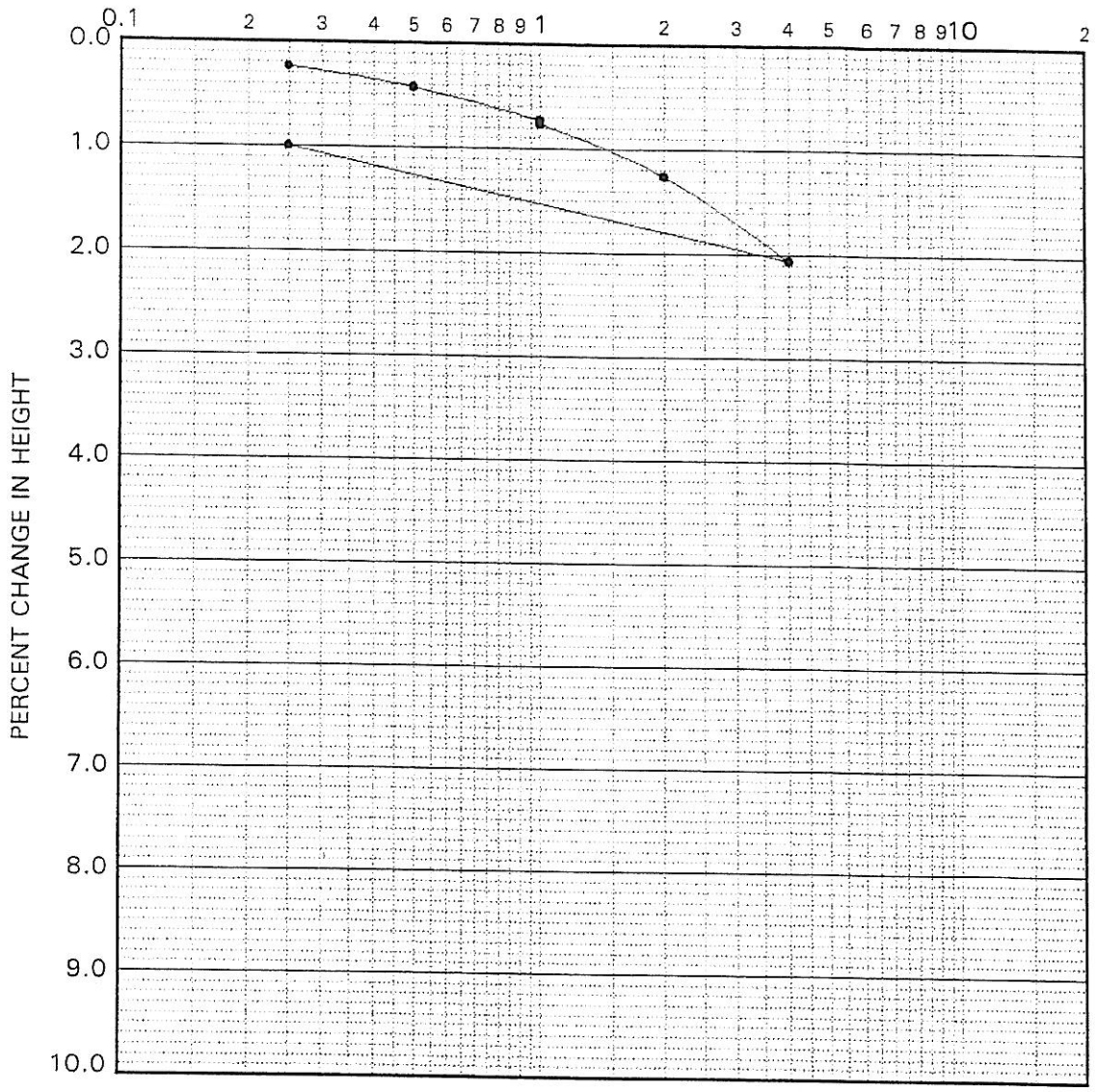
PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122

W.O. 102280P PLATE B-28

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works, OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Ryan Thomas Rose
BUILDING OFFICIAL

COMPRESSIVE STRESS IN TSF




| boring | depth (ft.) | dry density | in situ moist. | -200 sieve | group symbol | typical names |
|---|---|---|---|---|---|---|
| B-02 | 60.0 | 96.6 | 18.6 | 52 | ML | SANDY SILT |

REMARKS: WATER ADDED AT 1.0 TSF

CONSOLIDATION CURVE

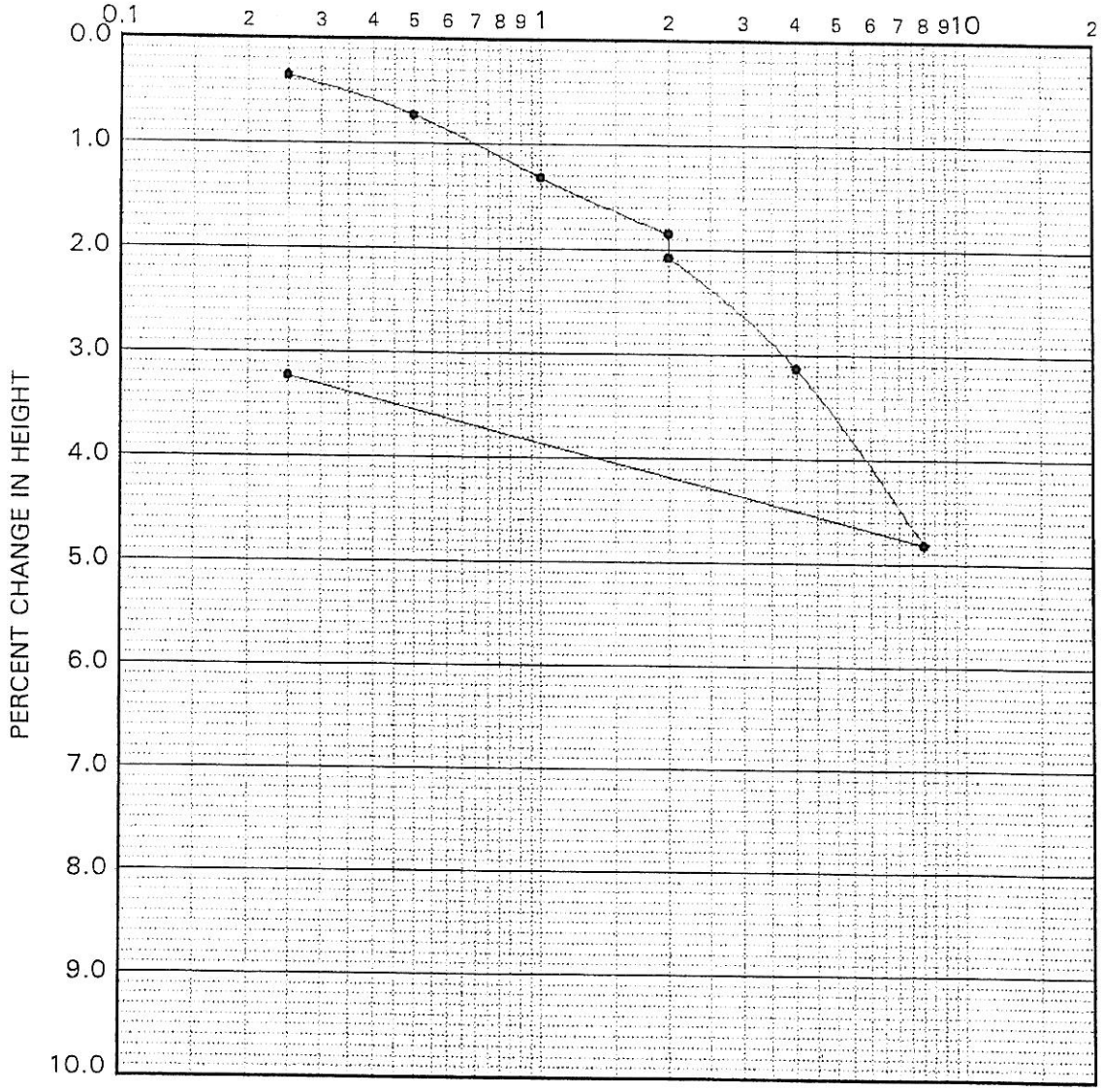
PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122

W.O. 102280P PLATE B-29

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or Building
Paul Tsamtsis
BUILDING OFFICIAL

COMPRESSIVE STRESS IN TSF




| boring | depth (ft.) | dry density | in situ moist. | -200 sieve | group symbol | typical names |
|---|---|---|---|---|---|---|
| B-02 | 70.0 | 111.8 | 14.9 | 55 | ML | SANDY SILT |

REMARKS: WATER ADDED AT 2.0 TSF

CONSOLIDATION CURVE

PACIFIC SOILS ENGINEERING, INC.
3002 DOW AVE., TUSTIN, CA 92680 714-730-2122

W.O. 102280P PLATE B-30

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tiemstra
Building Official

| | | | |
|---|---|---|---|
| 11-13-96 | JW | None | 1 |
| TYPE OF EXPLORATION EQUIPMENT | | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
| Hollow Stem Flight Auger | | ±33' | Grading Plan |

| GRAPHIC LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | BLOWS PER FOOT | ENGINEERING CLASSIFICATION/ DESCRIPTION | MOISTURE CONTENT (%) |
|---|---|---|---|---|---|---|
| | Fill | 1 | | | | |
| | | 2 | S | 24 | Silty sand, medium brown,mottled, contains occ gravel, dry, medium dense. | 9.2 |
| | | 3 | | | | |
| | | 4 | | | | |
| | | 5 | S | 67 | Silt,dark brown,mottled with occ cobbles and gravel, dry, medium dense. | 5.3 |
| | | 6 | | | | |
| | | 7 | S | 13 | Clayey sand, dark grey underlain by a medium brown sand layer,approx 2"thick, moist, medium dense. | 15.6 |
| | | 8 | | | | |
| | | 9 | | | | |
| | | 10 | S | 21 | Clayey sand,medium brown,mottled w/grey silt,moist, medium dense. | 14.7 |
| | | 11 | | | | |
| | | 12 | | | | |
| | | 13 | | | | |
| | | 14 | | | | |
| | | 15 | S | 27 | Silty sand,dark brown,with occ cobbles and gravel,mottled, moist, dense. | 23.4 |
| | | 16 | | | | |
| | | 17 | | | | |
| | | 18 | | | | |
| | | 19 | | | | |
| | | 20 | S | 25 | Sandy silt,medium brown, w/occ gravel,moist medium dense. | 23.4 |
| | | 21 | | | | |
| | | 22 | | | | |
| | | 23 | | | | |
| | | 24 | | | | |
| | | 25 | | | | |

PRELIMINARY - SUBJECT TO CHANGE

DRAFT

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
M MOISTURE CONTENT (%)
d IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987 Figure 3

SOUTH COAST GEOLOGIC SERVICES

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations on same, or to deviate therefrom without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tiemstra
Building Official

| 11-13-86 | JW | None | 1 (cont) |
|---|---|---|---|
| TYPE OF EXPLORATION EQUIPMENT | | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
| Hollow Stem Flight Auger | | 682' | Grading Plan |

| GRAPHIC LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | BLOWS PER FT | ENGINEERING CLASSIFICATION/ DESCRIPTION | w | δ |
|---|---|---|---|---|---|---|---|
| | Fill | 25 | | | | | |
| | | 26 | | | | | |
| | | 27 | | | | | |
| | | 28 | | | | | |
| | | 29 | | | | | |
| | | 30 | S | 39 | Silt,w/clay binder,blue-grey,mottled w/ sandier soil, moist,dense. | | |
| | | 31 | | | | | |
| | | 32 | | | | | |
| | | 33 | | | | | |
| | | 34 | | | | | |
| | | 35 | | | | | |
| | | 36 | | | | | |
| | | 37 | | | | | |
| | | 38 | | | | | |
| | | 39 | | | | | |
| | | 40 | S | 51 | Silt, reddish brown,with occ gravel,mottled, moist, very dense. | 12.3 | |
| | | 41 | | | | | |
| | | 42 | | | | | |
| | | 43 | | | | | |
| | | 44 | | | | | |
| | | 45 | | | | | |
| | | 46 | | | | | |
| | | 47 | | | | | |
| | | 48 | | | | | |
| | | 49 | | | | | |
| | | 50 | S | 87 | Silt,w/clay binder, olive-grey brown, mottled,w/coarser medium brown sand, occ gravel, moist, very dense. | 10.4 | |

PRELIMINARY - SUBJECT TO CHANGE

DRAFT

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
w MOISTURE CONTENT (%)
δ IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987

Figure 3

JOINT COAST EXPLORATION SERVICES

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the work at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

| EXPLORATION DATE | LOGGED BY | WATER LEVEL | TEST HOLE NUMBER |
|---|---|---|---|
| 11-13-86 | JW | None | 1 (cont) |
| TYPE OF EXPLORATION EQUIPMENT | | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
| Hollow Stem Flight Auger | | 682' | Grading Plan |

| LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | SPT N | ENGINEERING CLASSIFICATION/ DESCRIPTION | w | δ |
|---|---|---|---|---|---|---|---|
| | Fill | 51 | | | | | |
| | | 52 | | | | | |
| | | 53 | | | | | |
| | | 54 | | | | | |
| | | 55 | | | | | |
| | | 56 | | | | | |
| | | 57 | | | | | |
| | | 58 | | | | | |
| | | 59 | | | | | |
| | | 60 | S | 34 | silt,w/clay binder, dark brown,mottled /w lighter colored silts, moist,dense. | 13.4 | |
| | | 61 | | | | | |
| | | 62 | | | | | |
| | | 63 | | | | | |
| | | 64 | | | | | |
| | | 65 | | | | | |
| | | 66 | | | | | |
| | | 67 | | | | | |
| | | 68 | | | | | |
| | | 69 | | | | | |
| | | 70 | S | 33 | Silt, w/clay binder, reddish brown,contains grasses, moist dense. | 17.0 | |
| | | 71 | | | | | |
| | | 72 | | | | | |
| | | 73 | | | | | |
| | | 74 | | | | | |
| | | 75 | | | | | |

PRELIMINARY - SUBJECT TO CHANGE

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
w MOISTURE CONTENT (%)
δ IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

DRAFT

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987 Figure 3

SOUTH COAST GEOLOGICAL SERVICES

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

| EXPLORATION DATE | LOGGED BY | WATER LEVEL | TEST HOLE NUMBER |
|---|---|---|---|
| 11-13-86 | JW | None | 1 (cont) |
| TYPE OF EXPLORATION EQUIPMENT | | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
| Hollow Stem Flight Auger | | 682' | Grading Plan |

| LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | STANPEN | ENGINEERING CLASSIFICATION/ DESCRIPTION | w | d |
|---|---|---|---|---|---|---|---|
| | Fill | 76 | | | | | |
| | | 77 | | | | | |
| | | 78 | | | | | |
| | | 79 | | | | | |
| | Bedrock, Puente Formation<br>Well-bedded siltstone, fractured, with some organic material. | 80 | S | 61 | Silt, dark brown to light brown, moist, very dense. | 13.3 | |
| | | 81 | | | | | |
| | | 82 | | | | | |
| | | 83 | | | | | |
| | | 84 | | | | | |
| | | 85 | | | | | |
| | | 86 | | | | | |
| | | 87 | | | | | |
| | | 88 | | | | | |
| | | 89 | | | | | |
| | | 90 | S | 102 | Silt, dark brown, fractured, moist, very dense. | | |

PRELIMINARY - SUBJECT TO CHANGE

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
w MOISTURE CONTENT (%)
d IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

DRAFT

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987

Figure 3

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

| EXPLORATION DATE | LOGGED BY | WATER LEVEL | TEST HOLE NUMBER |
|---|---|---|---|
| 11-11-86 | JW | None | 2 |
| TYPE OF EXPLORATION EQUIPMENT | | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
| Hollow Stem Flight Auger | | 682' | Grading Plan |

| GEOLOGIC DESCRIPTION | DEPTH | SAMPLE TYPE | SPT N | ENGINEERING CLASSIFICATION/ DESCRIPTION | M | δ |
|---|---|---|---|---|---|---|
| Fill | 1 | | | | | |
| | 2 | D | 40 | Sand,grey-brown.contains gravel,mottled with lenses of silt, dry, dense. | | |
| | 3 | | | | | |
| | 4 | | | | | |
| | 5 | D | 40 | Silty sand,yellow brown, with gravel, mottled,with fine to coarse sand. moist, medium dense. | | |
| | 6 | | | | | |
| | 7 | SD | 21 | Sandy silt, grey brown to yellow-brown mottled, moist, medium dense. | 18.6 | 109.3 |
| | 8 | | | | | |
| | 9 | | | | | |
| | 10 | S | 15 | Silt, dark grey, mottled with sand and clay,moist, medium dense. | 19.0 | |
| | 11 | | | | | |
| | 12 | | | PRELIMINARY - SUBJECT TO CHANGE | | |
| | 13 | | | | | |
| | 14 | | | | | |
| | 15 | D | 42 | Silt w/clay binder, grey to grey brown. | | |
| | 16 | | | | | |
| | 17 | | | | | |
| | 18 | | | | | |
| | 19 | | | | | |
| | 20 | S | 18 | Silt, dark grey, interbedded grey clay layers, mottled, moist, medium dense. | 20.4 | |
| | 21 | | | | | |
| | 22 | | | | | |
| | 23 | | | | | |
| | 24 | | | | | |
| | 25 | | | | | |

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
M MOISTURE CONTENT (%)
δ IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

DRAFT

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987

Figure 3a

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plans/ specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

| EXPLORATION DATE | LOGGED BY | WATER LEVEL | TEST HOLE NUMBER |
|---|---|---|---|
| 11-11-86 | JW | None | 2 (cont) |
| TYPE OF EXPLORATION EQUIPMENT | | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
| Hollow Stem Flight Auger | | 682' | Grading Plan |

| LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | SPT AN | ENGINEERING CLASSIFICATION/ DESCRIPTION | w | δ |
|---|---|---|---|---|---|---|---|
| | Fill | 26 | | | | | |
| | | 27 | | | | | |
| | | 28 | | | | | |
| | | 29 | | | | | |
| | | 30 | D | 60 | Silt black to reddish brown, mottled, moist, very dense. | 11.3 | 109.3 |
| | | 31 | | | | | |
| | | 32 | | | | | |
| | | 33 | | | | | |
| | | 34 | | | | | |
| | | 35 | | | | | |
| | | 36 | | | | | |
| | | 37 | | | | | |
| | | 38 | | | | | |
| | | 39 | | | | | |
| | | 40 | S | 27 | Silt, grey brown w/ lenses of clayey silt, moist, medium dense. | 7.9 | |
| | | 41 | | | | | |
| | | 42 | | | | | |
| | | 43 | | | | | |
| | | 44 | | | | | |
| | | 45 | | | | | |
| | | 46 | | | | | |
| | | 47 | | | | | |
| | | 48 | | | | | |
| | | 49 | | | | | |
| | | 50 | D | 86 | Sandy silt, dark brown, contains occ gravel mottled, one foot clay layer at 50', moist, very dense. | 15.2 | 105.9 |

PRELIMINARY - SUBJECT TO CHANGE

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
w MOISTURE CONTENT (%)
δ IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987

Figure 3a

SOUTH COAST GEOLOGICAL SERVICES

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications shall NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

| EXPLORATION DATE | LOGGED BY | WATER LEVEL | TEST HOLE NUMBER |
|---|---|---|---|
| 11-11-86 | JW | None | B (cont.) |

| TYPE OF EXPLORATION EQUIPMENT | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
|---|---|---|
| Hollow Stem Flight Auger | 582' | Grading Plan |

| LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | SPT N | ENGINEERING CLASSIFICATION/ DESCRIPTION | w | δ |
|---|---|---|---|---|---|---|---|
| | Fill | 51 | | | | | |
| | | 52 | | | | | |
| | | 53 | | | | | |
| | | 54 | | | | | |
| | | 55 | | | | | |
| | | 56 | | | | | |
| | | 57 | | | | | |
| | | 58 | | | | | |
| | | 59 | | | | | |
| | | 60 | S | 21 | Silty sand,w/clay binder, yellow brown, mottled, moist, dense. | 19.7 | |
| | | 61 | | | | | |
| | | 62 | | | | | |
| | | 63 | | | | | |
| | | 64 | | | | | |
| | | 65 | | | | | |
| | | 66 | | | | | |
| | | 67 | | | | | |
| | | 68 | | | | | |
| | | 69 | | | | | |
| | | 70 | D | 58 | Silt, grey black, mottled, moist, very, dense. | | |
| | | 71 | | | | | |
| | | 72 | | | | | |
| | | 73 | | | | | |
| | | 74 | | | | | |
| | | 75 | | | | | |

PRELIMINARY - SUBJECT TO CHANGE

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
w MOISTURE CONTENT (%)
δ IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

DRAFT

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987

Figure 3a

SOUTH COAST GEOLOGIC SERVICES

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations on these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING SECTION

| EXPLORATION DATE | LOGGED BY | WATER LEVEL | TEST HOLE NUMBER |
|---|---|---|---|
| 11-11-86 | JW | None | 2 (cont.) |
| TYPE OF EXPLORATION EQUIPMENT | | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
| Hollow Stem Flight Auger | | 682' | Grading Plan |

| LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | SPT AN | ENGINEERING CLASSIFICATION/ DESCRIPTION | w | δ |
|---|---|---|---|---|---|---|---|
| | Fill | 76 | | | | | |
| | | 77 | | | | | |
| | | 78 | | | | | |
| | | 79 | | | | | |
| | | 80 | S | 63 | Silty sand, reddish brown, w/occ coarse sand approx 2 mm in diameter, dry, very dense. | 7.5 | |
| | | 81 | | | | | |
| | | 82 | | | | | |
| | | 83 | | | | | |
| | | 84 | | | | | |
| | | 85 | | | PRELIMINARY - SUBJECT TO CHANGE | | |
| | | 96 | | | | | |
| | | 97 | | | | | |
| | | 88 | | | | | |
| | | 89 | | | | | |
| | | 90 | D | 135 | Silty sand, yellow brown,w/cobbles and gravel,dark brown mottling, moist, very dense. | | |
| | | 91 | | | | | |
| | | 92 | | | | | |
| | | 93 | | | | | |
| | | 94 | | | | | |
| | | 95 | | | | | |
| | | 96 | | | | | |
| | | 97 | | | | | |
| | | 98 | | | | | |
| | | 99 | | | | | |
| | | 100 | S | 50 | Silty sand, yellow brown, mottled with coarse sand,moist very dense. | 13.6 | |

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
w MOISTURE CONTENT (%)
δ IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987

Figure 3a

SOUTH COAST GEOLOGIC SERVICES

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plans and specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Fina Tomaselli
BUILDING SECTION

| EXPLORATION DATE | LOGGED BY | WATER LEVEL | TEST HOLE NUMBER |
|---|---|---|---|
| 11-11-86 | JW | None | 3 (cont.) |

| TYPE OF EXPLORATION EQUIPMENT | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
|---|---|---|
| Hollow Stem Flight Auger | 382' | Grading Plan |

| LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | SPT AN | ENGINEERING CLASSIFICATION/ DESCRIPTION | % | $ |
|---|---|---|---|---|---|---|---|
| | Fill | 101 | | | | | |
| | | 102 | | | | | |
| | | 103 | | | | | |
| | | 104 | | | | | |
| | | 105 | | | | | |
| | | 106 | | | | | |
| | | 107 | | | | | |
| | | 108 | | | | | |
| | | 109 | | | | | |
| | | 110 | D | 101 | Silty sand, yellow brown w/coarse sand, moist, very dense. | 16.2 | 104.3 |
| | | 111 | | | | | |
| | Bedrock, Puente Formation, Sandstone and siltstone, finely laminated. | 112 | | | Sand, yellow-tan, well-bedded, moist, very dense. | | |
| | | 113 | | | | | |
| | | 114 | | | | | |
| | | 115 | S | 103 | Silt, yellow-tan to brown, well-bedded, moist, very dense. | 14.0 | |
| | | 116 | | | | | |
| | | 117 | | | | | |
| | | 118 | | | | | |
| | | 119 | | | | | |
| | | 120 | | | | | |
| | | 121 | | | | | |
| | | 122 | | | | | |
| | | 123 | | | | | |
| | | 124 | | | | | |
| | | 125 | S | 52 | Silt, medium brown, interbedded sand, very moist, very dense. | | |

PRELIMINARY - SUBJECT TO CHANGE

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
w MOISTURE CONTENT (%)
$ IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987

Figure 3a

SOUTH COAST GEOLOGIC SERVICES

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This approval of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

| EXPLORATION DATE | LOGGED BY | WATER LEVEL | TEST HOLE NUMBER |
|---|---|---|---|
| 11-17-86 | JW | None | 3 |
| TYPE OF EXPLORATION EQUIPMENT | | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
| Hollow Stem Flight Auger | | 682' | Grading Plan |

| GRAPHIC LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | PEN STA | ENGINEERING CLASSIFICATION/ DESCRIPTION | δ | w |
|---|---|---|---|---|---|---|---|
| | Fill | 1 | | | | | |
| | | 2 | D | 23 | Sandy silt, orange brown, with occ cobbles, and gravels, mottled, dry, medium dense. | | |
| | | 3 | | | | | |
| | | 4 | | | | | |
| | | 5 | S | 14 | Sandy silt, orange brown, mottled, moist, medium dense | 17.6 | |
| | | 6 | | | | | |
| | | 7 | BD | 24 | Sandy silt,meduim brown, mottled, contains occ gravel, moist, medium dense. | 16.5 | 107.6 |
| | | 8 | | | | | |
| | | 9 | | | | | |
| | | 10 | S | 22 | Silt, olive brown w/fine gravel, mottled with dark grey silt, moist, medium dense. | 12.5 | |
| | | 11 | | | | | |
| | | 12 | | | | | |
| | | 13 | | | | | |
| | | 14 | | | | | |
| | | 15 | D | 21 | Sandy silt, medium brown, grading into grey silt, moist, medium dense. | | |
| | | 16 | | | | | |
| | | 17 | | | PRELIMINARY - SUBJECT TO CHANGE | | |
| | | 18 | | | | | |
| | | 19 | | | | | |
| | | 20 | S | 17 | Clay, dark grey grading into grey silt moist, medium dense. | 13.5 | |
| | | 21 | | | | | |
| | | 22 | | | | | |
| | | 23 | | | | | |
| | | 24 | | | | | |
| | | 25 | | | | | |

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
w MOISTURE CONTENT (%)
δ IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

DRAFT

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987

Figure 3b

SOUTH COAST GEOLOGIC SERVICES

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

| EXPLORATION DATE | LOGGED BY | WATER LEVEL | TEST HOLE NUMBER |
|---|---|---|---|
| 11-17-86 | JW | None | 3 (cont) |

| TYPE OF EXPLORATION EQUIPMENT | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
|---|---|---|
| Hollow Stem Flight Auger | 632' | Grading Plan |

| GRAPHIC LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | SPT N | ENGINEERING CLASSIFICATION/ DESCRIPTION | W | γ |
|---|---|---|---|---|---|---|---|
| | Fill | 26 | | | | | |
| | | 27 | | | | | |
| | | 28 | | | | | |
| | | 29 | | | | | |
| | | 30 | D | 18 | Sandy silt w/clay binder, orange brown to medium brown, mottled, moist, medium dense. | | |
| | | 31 | | | | | |
| | | 32 | | | | | |
| | | 33 | | | | | |
| | | 34 | | | | | |
| | | 35 | | | | | |
| | | 36 | | | | | |
| | | 37 | | | | | |
| | | 38 | | | | | |
| | | 39 | | | | | |
| | | 40 | S | 32 | Silty sand, reddish brown, w/fine gravel, moist, dense. | 9.8 | |
| | | 41 | | | | | |
| | | 42 | | | | | |
| | | 43 | | | | | |
| | | 44 | | | | | |
| | | 45 | | | | | |
| | | 46 | | | | | |
| | | 47 | | | | | |
| | | 48 | | | | | |
| | | 49 | | | | | |
| | | 50 | D | 60 | Sandy silt, medium brown, with occ cobbles grading into dark grey clayey silt, moist, very dense. | 21.7 | 105.1 |

PRELIMINARY - SUBJECT TO CHANGE

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
W MOISTURE CONTENT (%)
γ IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

DRAFT

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987 Figure 9b

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations on these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plans and specifications SHALL NOT be held to permit or be an approval of the violation of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

| EXPLORATION DATE | LOGGED BY | WATER LEVEL | TEST HOLE NUMBER |
|---|---|---|---|
| 11-17-86 | JW | None | 3 (cont) |

| TYPE OF EXPLORATION EQUIPMENT | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
|---|---|---|
| Hollow Stem Flight Auger | 682' | Grading Plan |

| GRAPHIC LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | SPT AN | ENGINEERING CLASSIFICATION/ DESCRIPTION | w | δ |
|---|---|---|---|---|---|---|---|
| | Fill | 51 | | | | | |
| | | 52 | | | | | |
| | | 53 | | | | | |
| | | 54 | | | | | |
| | | 55 | | | | | |
| | | 56 | | | | | |
| | | 57 | | | | | |
| | | 58 | | | | | |
| | | 59 | | | | | |
| | | 60 | S | 39 | Silty sand, dark brown, oily to touch, moist, dense. | | |
| | | 61 | | | | | |
| | | 62 | | | | | |
| | | 63 | | | | | |
| | | 64 | | | | | |
| | Bedrock, Puente Formation, well-bedded silty sandstone. | 65 | D | 40/ 2.5" | Silty sand, dark brown, well-bedded, light brown to dark brown laminations, moist, very dense. | | |
| | | 66 | | | | | |
| | | 67 | | | | | |
| | | 68 | | | | | |
| | | 69 | | | | | |
| | | 70 | | | | | |

PRELIMINARY - SUBJECT TO CHANGE

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
w MOISTURE CONTENT (%)
δ IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

DRAFT

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987 Figure 3b

SOUTH COAST GEOLOGIC SERVICES

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
By/Date 07/10/24

| EXPLORATION DATE | LOGGED BY | WATER LEVEL | TEST HOLE NUMBER |
|---|---|---|---|
| 11-17-86 | JW | None | 3 (cont) |

| TYPE OF EXPLORATION EQUIPMENT | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
|---|---|---|
| Hollow Stem Flight Auger | 682' | Grading Plan |

| GRAPHIC LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | SPT AN | ENGINEERING CLASSIFICATION/ DESCRIPTION | w | δ |
|---|---|---|---|---|---|---|---|
| | Bedrock, Puente Formation, well-bedded siltstone and sandstone. | 51 | | | | | |
| | | 52 | | | | | |
| | | 53 | | | | | |
| | | 54 | | | | | |
| | | 55 | S | 40/ 1.5' | Silt, reddish brown, laminated, moist, very dense. | 9.0 | |

PRELIMINARY - SUBJECT TO CHANGE

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
w MOISTURE CONTENT (%)
δ IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

SUBSURFACE EXPLORATION LOG

DRAFT

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987

Figure 3b

SOUTH COAST GEOLOGIC SERVICES

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations on same, unless authorized in writing from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

| EXPLORATION DATE | LOGGED BY | WATER LEVEL | TEST HOLE NUMBER |
|---|---|---|---|
| 11-17-86 | JW | 30' | 4 |
| TYPE OF EXPLORATION EQUIPMENT | | ELEVATION AT TOP OF HOLE | REFERENCE OR DATUM |
| Hollow Stem Flight Auger | | 682' | Grading Plan |

| GRAPHIC LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | SPT AN | ENGINEERING CLASSIFICATION/ DESCRIPTION | δ | w |
|---|---|---|---|---|---|---|---|
| | Fill | 1 | | | One foot petroleum sludge, black, unconsolidated, strong oil smell. | | |
| | | 2 | S | 10 | Sandy silt, medium brown mottled with light grey silt, moist, loose. | | |
| | | 3 | | | | | |
| | | 4 | | | | | |
| | | 5 | S | 20 | Silt, medium to dark brown, w/ cobbles and gravel, moist,medium dense. | 17.9 | |
| | | 6 | | | | | |
| | | 7 | S | 20 | Silt, w/clay binder, dark brown,mottled, with medium brown silt, moist, medium dense | 16.9 | |
| | | 8 | | | | | |
| | | 9 | | | | | |
| | | 10 | S | 29 | Sandy silt, medium brown, to light brown, mottled, moist, medium dense | 15.4 | |
| | | 11 | | | | | |
| | | 12 | | | | | |
| | | 13 | | | | | |
| | PRELIMINARY - SUBJECT TO CHANGE | 14 | | | | | |
| | | 15 | S | 32 | Silt, dark purplish brown, mottled with grey brown clay, moist, dense. | 11.1 | |
| | | 16 | | | | | |
| | | 17 | | | | | |
| | | 18 | | | | | |
| | | 19 | | | | | |
| | | 20 | S | 48 | Sandy clay, dark grey, mottled with brown sand. Moist, dense. | 22.3 | |
| | | 21 | | | | | |
| | | 22 | | | | | |
| | | 23 | | | | | |
| | | 24 | | | | | |
| | | 25 | | | | | |

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
w MOISTURE CONTENT (%)
δ IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987

Figure 3c

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/OC Development Services. Keeping a copy of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
949-644-3276(V)

| LOGGED BY | WATER LEVEL | TEST HOLE NUMBER |
|---|---|---|
| 11-17-86 JW | 30' | 4 (cont) |
| **TYPE OF EXPLORATION EQUIPMENT** | **ELEVATION AT TOP OF HOLE** | **REFERENCE OR DATUM** |
| Hollow Stem Flight Auger | 682' | Grading Plan |

| GRAPHIC LOG | GEOLOGIC DESCRIPTION | DEPTH | SAMPLE | PEN | ENGINEERING CLASSIFICATION/ DESCRIPTION | w | δ |
|---|---|---|---|---|---|---|---|
| | Fill | 26 | | | | | |
| | | 27 | | | | | |
| | | 28 | | | | | |
| | | 29 | | | | | |
| | | 30 | S | 61 | Sand, dark brown to medium brown, coarse to fine grained, saturated, very dense. | 12.3 | |
| | | 31 | | | | | |
| | | 32 | | | | | |
| | | 33 | | | | | |
| | | 34 | | | | | |
| | | 35 | | | PRELIMINARY - SUBJECT TO CHANGE | | |
| | | 36 | | | | | |
| | | 37 | | | | | |
| | | 38 | | | | | |
| | | 39 | | | | | |
| | | 40 | S | 60 | Sand, medium brown, occ gravel, very dense. | | |
| | | 41 | | | | | |
| | | 42 | | | | | |
| | | 43 | | | | | |
| | | 44 | | | | | |
| | | 45 | | | | | |
| | | 46 | | | | | |
| | | 47 | | | | | |
| | | 48 | | | | | |
| | | 49 | | | | | |
| | Bedrock, Puente Formation, Well-bedded siltstone and sandstone. | 50 | S | 40/3" | Silt, reddish brown, thinnly laminated, roots, very dense. | | |

S STANDARD SPLIT SPOON SAMPLER
D DRIVE SAMPLE
B BULK SAMPLE
T THIN WALL SAMPLER
GROUNDWATER SURFACE
w MOISTURE CONTENT (%)
δ IN-PLACE DRY DENSITY

B-BEDDING J-JOINT S-SLIDE PLANE

SUBSURFACE EXPLORATION LOG

Disposal Site
Brea Field, Shell California Production, Inc.
Brea, CA.

February 1987

Figure 3c

SOUTH COAST GEOLOGIC SERVICES

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# APPENDIX C

## Geophysical Report by Advanced Geoscience, Inc.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

*ADVANCED GEOSCIENCE, INC.*

*Specializing in Engineering Geophysics and Geology*
*Subsurface Exploration • Non-Destructive Evaluation*

*1711 Via El Prado, Suite 301*
*Redondo Beach, California 90277*
*USA*
*(310) 316-8192 Telephone*
*(310) 316-9441 Fax*

May 13, 1999

RECEIVED
MAY 20 1999
PACIFIC SOILS

Pacific Soils Engineering, Inc.
10653 Progress Way
Cypress, California 90630

Attention: Mr. Mike Mills, R.G.

**Report on Seismic Surveys**
**For Investigation of Subsurface Faulting**
**At Proposed Development Site**
**Northeast Corner of Tonner Canyon and Brea Canyon Roads**
**Puente Hills, California**

## INTRODUCTION

This report summarizes the seismic surveys performed by Advanced Geoscience at the referenced site. These surveys were conducted as part of Pacific Soils Engineering's investigation of the Whittier fault. The subsurface profiles from these surveys were used together with geologic information from trenching to help evaluate the locations of the north and south branches of this fault.

Seismic reflection and refraction surveys were performed along a total of six "seismic lines". These lines were positioned by Pacific Soils Engineering at the locations shown on Plate 1. The total lineal coverage of these lines was 3,750 feet.

The seismic surveys were conducted in two phases of field operations. The first phase was performed on December 30 and January 8, 1999. During this period surveys were recorded along Lines 1, 2A and 2B. These lines were positioned near trenches that located the north and south branches of the Whittier fault. The seismic reflection sections from these lines were used to establish the type of reflection patterns associated with the two branches of the fault. The second phase of field operations was performed on March 9, 10, and 11, 1999. During this period surveys were performed along Lines 3, 4 and 5 to investigate the locations of the two fault branches in areas where deeper fill deposits prohibited investigation by trenching.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tiberti-Lee
BUILDING OFFICIAL



The following provides a summary of our field procedures and methods of data processing and evaluation. A discussion is also provided of the seismic profiles and their evidence for subsurface faulting.

## PROCEDURES

### Field Procedures

Line 1 was setup along the first trench made by Pacific Soils across the northern branch of the Whittier fault. The Miocene bedrock units along this trench were found to be dipping to the north on both sides of this fault. Therefore, the reflection survey was recorded with the energy source positioned to the north of the geophone array. This "end-on configuration" with the geophone array positioned up dip enhanced the ability of the reflection survey to detect these dipping beds. Line 3, which was positioned further to the east, across the expected trend of the north branch of the fault, was also recorded using this end-on configuration with the energy source positioned to the north.

Line 2A was setup west of a second trench that intersected the south branch of the fault. This trench revealed that the bedrock units on the south side of this fault were dipping to the south. To better detect this change in dip across the south branch of the fault, the reflection survey along Line 2A was first recorded starting from the north with an end-on configuration with source positioned to the north. The southern half Line 2A was then repeated with an end-on configuration with source positioned to the south. The seismic records from the two recording configurations were later merged during data processing.

Portions of Lines 4 and 5 were also recorded, with north and south end-on configurations, to detect possible dip reversals. Line 2B, which was anticipated to be south of the southern branch of the fault, was recorded with an end-on configuration with the source to the south.

The seismic energy source for reflection surveys along Lines 1, 2A and 2B was generated by pounding a 20-pound sledge hammer on a metal plate. The energy source for the reflection survey along Lines 3, 4 and 5 was generated using the Digipulse AWD-1180, truck-mounted, accelerated weight-drop system. This system forced a heavy steel beam on to a steel plate placed on the ground. Accelerometers mounted to each of these sources were used to trigger the start of recording on the seismograph.

A Bison model 9024, 24-channel, engineering seismograph was used to record the seismic data. The seismograph was connected to a receiving array consisting of a "spread" of forty-eight, 40-Hertz, geophone groups. The geophone group intervals along the line were placed at 10-feet apart. Each group consisted of two geophones spaced two-feet apart perpendicular to the line. A 96-Hertz low cut filter was applied to the vibrations recorded from each geophone. Line 1 was recorded with a 0.5 second record length. The record length for all other lines was 0.375 seconds.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL



The reflection surveys were recorded with 10-foot shot intervals to provide nominal 12-fold subsurface coverage. Increased coverage of 24 fold was obtained along sections of the lines recorded with both north and south end-on configurations. The minimum offset (from the source to nearest geophone) was set at 10 feet for Line 1 and 30 feet for Lines 2A, 2B, 3, 4 and 5.

The overall quality of the reflection data was generally fair considering the amount of ambient vibrations from oil well pump stations, woodcutters, freeway traffic and source-generated ground roll.

During the reflection survey, additional source positions were used to record seismic refraction data. These data were collected along Lines 1, 2A, 3 and 5. The refraction data were used to provide subsurface velocity information for the processing and evaluation of faulting.

Each refraction spread was 230 feet in length and consisted of 24 geophone groups spaced 10-feet apart. The shot locations were generally offset 5 to 120 feet from both ends of the spread, and at the midpoint of the spread. Other longer offsets were also recorded.

The energy source for the refraction surveys was generated using either the Digipulse AWD-1180, Betsey seismic shotgun (with 400-grain blanks), or 20-pound sledge hammer and metal plate.

The refraction data ranged in quality from good to poor, and often varied along a given spread. The later arrivals at the far-offset channels were often degraded by ambient noise vibrations.

All phases of the field work (including the selection of the shooting and recording parameters) were directed by a California-registered geophysicist from Advanced Geoscience. Advanced Geoscience subcontracted Ryland Associates, Inc. (Pasadena, California) to supply and operate the Digipulse AWD-1180 and seismic recording equipment. Ryland Associates downloaded the seismic records from the seismograph into files archived on floppy disks in the Bison SEG-2 format.

**Data Processing and Evaluation**

The SPW (Seismic Processing Workshop) data processing software was obtained from Parallel Geoscience Corporation (Austin, Texas). Advanced Geoscience used SPW to perform a standard digital processing sequence on the seismic reflection data. This sequence included the definition of the complex trace geometry for the variable shot configurations used, and the selected application of F-K filtering to attenuate the affect of ground roll.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tabassian
BUILDING OFFICIAL



Elevation differences along each seismic line were accounted for in the processing by introducing a datum shift correction to the reflection data. Pacific Soils provided Advanced Geoscience with the surveyed elevations along each line.

The SPW processing system was used to generate reflection sections along each line. These displays consisted of common midpoint (CMP) stack sections shown in Plates 2 through 7. Migrated reflection sections were not generated, because this processing tended to de-emphasize the presence of the dipping layers within the bedrock.

Advanced Geoscience used the seismic refraction data collected along Lines 1, 2A, 3 and 5 to prepare plots of first-arrival times versus distance. These plots which are referred to as "travel time curves" are shown on Plates 2, 3, 5 and 7. Along each line, various segments of the curves were assigned to refracting layers which approximated two and three-layer velocity profiles.

The velocity-depth profiles for the first refractors were primarily interpreted using the generalized reciprocal method (reference: Palmer, 1980, The Generalized Reciprocal Method of Seismic Refraction Interpretation, Society of Exploration Geophysicists, Tulsa, Oklahoma). The GRM is the preferred method in engineering geophysics for estimating the approximate depth profile of a subsurface refractor with undulating topography. The GRM is also capable of estimating lateral velocity changes along the refracting surfaces. To apply this method, we used the computer program GREMIX™ developed by Interpex, Ltd. This program was also used to correct for the variations in ground surface elevation.

For the second refractor and portions of the first refractor without sufficient overlapping forward and reverse coverage, GREMIX used the standard intercept time method (ITM) to interpret refractor velocities and depth. The ITM assumes the refracting surfaces are horizontal and planar with a constant velocity.

The subsurface velocity-depth profiles interpreted from the refraction surveys along Lines 1, 2A, 3 and 5 are shown on Plates 2, 3, 5, and 7.

## DISCUSSION OF RESULTS

The seismic reflection sections along Lines 1 and 2A detected evidence of the positions of the north and south branches of the Whittier fault consistent with findings of the trench investigations. This evidence was provided by the termination of reflection patterns from dipping layers within the Miocene bedrock units.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tabassian
BUILDING OFFICIAL



The seismic reflection section along Line 1 (Plate 2) shows a pattern of north dipping reflections that correlate with sequences of north dipping layers within the bedrock. These dipping reflectors occur below a sequence of nearly horizontal reflections associated with the upper surface of the bedrock. Between stations 350 and 500, these north-dipping patterns appear to terminate within a "zone" associated with the north branch of the fault. The refraction section along this line also shows evidence of a bedrock velocity anomaly near station 500.

The reflection section along Line 2A (Plate 3) shows a similar pattern of north dipping reflections that terminates near the center of the line at approximately station 350. South of this point a different sequence of reflection patterns is observed. Based on the findings of the trench investigation, the south branch of the fault crosses near the center of this line. Line 2B (Plate 4), which was positioned immediately south of Line 2A, shows evidence of reflections from south dipping bedrock layers. These reflections occur below a sequence of horizontal reflection patterns terminating at about 180 msec.

Line 3 crosses a flat lying area of the site above a bedrock valley covered by dense fill deposits. This line was positioned on the eastside of the site across the expected trend of the north branch of the Whittier fault. The seismic reflection section along this line (Plate 5) shows a sequence of reflections that indicate the upper surface of the bedrock valley. Below these reflection patterns there are indications of north dipping reflections near stations 350 and 575. Between these stations the absence of north dipping reflections may indicate a zone similar to that discovered along Line 1. This zone appears to coincide with the expected trend of the north branch of the fault.

Line 4 was positioned south of the anticipated trend of the north branch of the fault. The reflection section for this line (Plate 6) shows evidence of north dipping reflections which occur below more horizontal reflection patterns associated with the bedrock surface.

Line 5 was positioned in the southeast corner of the site across the expected trend of the south branch of the Whittier fault. The reflection section along this line (Plate 7) shows a sequence of reverberating, near-surface reflection patterns that terminate near station 400. These stronger-amplitude reflections dip to the south. Below these reflections there are other patterns of reflections that dip more steeply to the south that appear to be due to dipping layers within the bedrock. These deeper reflection patterns also terminate near station 400. The refraction section along this line also shows an estimated bedrock depth profile that becomes much shallower north of station 400. Based on these results, exploratory borings were positioned by Pacific Soils in the vicinity of station 400 to investigate the location of the south branch of the fault.

§

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tabassian
BUILDING OFFICIAL



Advanced Geoscience appreciates the opportunity to be of service to Pacific Soils Engineering and their clients. Please call the undersigned if you have any questions or additional requests concerning the seismic surveys.

Sincerely,

**Advanced Geoscience, Inc.**



Mark G. Olson, R.Gp., R.G., C.H.G.
Principal Geophysicist

Enclosures: Plates 1 through 7

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

# APPENDIX D

## Geomorphic and Soil-Stratigraphic Assessment

## By Dr. R.J. Shlemon

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

ROY J. SHLEMON & ASSOC., INC.
Geological and Environmental Consultants

Post Office Box 3066
Newport Beach, California
92659 - 0620 U.S.A.
Tel: (949) 675-2696
Fax: (949) 675-5088

Quaternary Geology
Economic Geomorphology
Soil Stratigraphy
Geoarchaeology

# APPENDIX IV

## GEOMORPHIC AND SOIL-STRATIGRAPHIC ASSESSMENT OF FAULT ACTIVITY, CALTRANS FILL SITE, NW OF INTERSECTION OF TONNER CANYON ROAD AND BREA BOULEVARD, PUENTE OIL FIELD LEASE, ORANGE COUNTY, CALIFORNIA

by

Roy J. Shlemon

for

Pacific Soils Engineering, Inc.
(Cypress, California)

on behalf of

AERA ENERGY
(Brea, California)

January 2000

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

ROY J. SHLEMON & ASSOC., INC.
Geological and Environmental Consultants

Post Office Box 3066
Newport Beach, California
92659 - 0620 U.S.A.
Tel: (949) 675-2696
Fax: (949) 675-5088

Quaternary Geology
Economic Geomorphology
Soil Stratigraphy
Geoarchaeology

# APPENDIX IV

## GEOMORPHIC AND SOIL-STRATIGRAPHIC ASSESSMENT OF FAULT ACTIVITY, CALTRANS FILL SITE, NW OF INTERSECTION OF TONNER CANYON ROAD AND BREA BOULEVARD, PUENTE OIL FIELD LEASE, ORANGE COUNTY, CALIFORNIA

## INTRODUCTION

This Appendix summarizes geomorphic and soil-stratigraphic field observations and critique of a draft technical report prepared by Pacific Soils Engineering, Inc. (PSE) to which this document is attached. The study was commissioned by PSE on behalf of AERA Energy (Brea, California) and focused on the presence and relative activity (time of last displacement) of two splays of the Whittier Fault Zone (WFZ) within the Puente Oil Field Lease in Orange County, California (PSE Fig. 2).

Field observations were carried out in December 1988; the PSE draft was received and reviewed in December 1999. Conclusions were previously discussed with PSE geotechnical personnel, but are here restated as formal documentation. Location and geological maps, as well as trench logs, are given in the PSE narrative and hence are referred to, but not replicated in this Appendix. Logistical support was kindly provided by PSE, particularly by Senior Engineering Geologist, Michael F. Mills.

## TECHNICAL ISSUES

On behalf of AERA Energy, PSE was retained to identify active faults in the Puente Oil Field Lease area and to establish setback zones in accordance with requirements of the Alquist-Priolo Fault-Zone Act (A-P Zones). The intent of the law is to ensure that habitable structures are not constructed in zones subject to potential ground-rupture generated by an active (Holocene) fault.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION



Based on previous work, two branches of active WFZ pass through the Puente Oil Field Lease. However, the location of these faults branches has heretofore been poorly constrained, owing to burial by uncertified fill emplaced during highway construction by the California Department of Transportation. Accordingly, in order to establish appropriate setback zones in the fill site (CTFS), PSE undertook several complimentary geotechnical investigations: review of pertinent literature, interpretation of aerial photographs, on-site geological mapping, reflection and refraction seismic surveys, and emplacement and logging of trenches and drill holes (borings).

The PSE investigations now show that the WFZ in the Puente Oil Field Lease consists of two distinct branches, informally deemed the "North Fault Strand" and the "South Fault Strand," respectively (PSE Plate I). Further, these faults are now reasonably located under the CTFS, and setback zones can therefore be established (PSE Plate II).

## THE PSE FAULT TRENCHES

The PSE trenches provide the most reliable information about WFZ locations in the study area. The trenches exposed both distinct fault zones and adjacent sediments demonstrably free of faults or covered by unbroken pre-Holocene soils (pedogenic profiles). The trenches also provided "calibration" for seismic signatures and drill hole data, and thereby increased confidence for projecting the WFZ into and through the CTFS.

### The North Fault Strand

To supplement interpretation of seismic data, PSE exposed the NFS in several trenches adjacent to the CTFS: continuous trenches FT-1, -8, and -12, and trench FT-2 on the west, and trenches FT-10, and FT-11 on a bedrock ridge in the center (Plate I).

The NFS was clearly exposed in FT-2 at station 0+35 (Plate I). Here, older Quaternary fanglomerate on the north is directly juxtaposed against the Soquel Member of the Tertiary Puente formation. The trench logs also show that the fault zone is generally less than about 5-ft wide, and is nearly vertical. Hence, the fault can be reasonably projected to the

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Tina Tippetts
BUILDING OFFICIAL



east under the CTFS (Plate I). Trench FT-2T also shows that that no faults are present for at least 250-ft south of the NFS, thus supporting interpretation of seismic-line data that the fault can be well constrained in this area.

Sediments north of the NFS are well exposed in the continuous exposures of FT-1, -8, and -12 (PSE Plate I). These trenches, in total over 500-ft long, expose unbroken fan and bedrock deposits north of the NFS, thus likewise constraining fault trend across the CTFS.

PSE emplaced Trenches FT-10 and -11 on a bedrock ridge that crops out almost in the middle of the CTFS (Plate I). These trenches similarly exposed a well-defined NFS, which here juxtaposes Quaternary fanglomerate again the Soquel member of the Tertiary Puente formation. In essence, all the PSE trenches show that the NFS is narrow, and can be projected into and under the CTFS where the trace is confirmed by seismic and drill-log data.

**The South Fault Strand**

Apparent stream deflection provided only a general location for the South Fault Strand (SFS). Accordingly, PSE emplaced several trenches at and near the geomorphic anomalies. And similar to the NFS, the SFS, where projected under the CTFS, was located by interpretation of boring and seismic data. Specifically relevant were trenches FT-4A and FT-4B, which exposed the fault north and west of the CTFS; and FT-3, which exposed a strongly developed relict paleosol (pedogenic profile) useful to date Quaternary terrace sediments (PSE Plate I).

Trenches FT-4A and FT-4B exposed SFS juxtaposing the Puente formation against Quaternary terrace deposits. The amount of tectonic separation is yet uncertain, owing to substantial removal of sediments and other modification caused by oil field operation. However, as pointed out in the PSE narrative (p. 27), minimum vertical displacement is at least ~25 ft. The SFS is therefore a major tectonic component of the WFZ and is well expressed geomorphically by deflection of stream channels. There is, therefore, little doubt as to its Holocene activity.

Particularly relevant to constraining the width and trend of the SFS were exposures in the ~320-ft long FT-3 (Plate I). Here exposed, south of the SFS, was a strongly developed capping relict paleosol. Based on soil

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tabassian
BUILDING OFFICIAL



thickness, reddish color, pedogenic structure and presence of many, moderately thick clay films and carbonate stringers, this paleosol is an estimated ~100 ka old. The underlying terrace deposits (parent material) are inherently older. This age assessment shows other bedrock faults are demonstrably pre-Holocene in age; and that the width of the active SFS is narrow where projected into and under the CTFS (Plate I).

## SUMMARY AND CONCLUSIONS

A thick sequence of artificial fill was previously placed by CALTRANS within the Puente Oil Field Lease area. The fill (CTFS) overlies the North and the South Fault Strands of the of the active Whittier Fault Zone. In order to provide building setbacks in accordance with requirements of the Alquist-Priolo Act, Pacific Soils Engineering emplaced borings and trenches on and near the CTFS. Additionally, PSE ran and interpreted both seismic refraction and seismic reflection lines.

Based on interpretation of aerial photographs, on critique of published literature, and on site-specific investigations, PSE now shows that both the NFS and the SFS are narrow, and nearly vertical. Accordingly, these faults can be readily projected into and underneath the CTFS. The trenches and seismic data verify these projections, and also show that bedrock and Quaternary terrace deposits adjacent to the NFS and the SFS are either demonstrably unbroken or are overlain by undisplaced, strongly developed soils (pedogenic profiles) at least ~100 ka old. Accordingly, PSE has now reasonably located the NFS and the SFS beneath the CTFS and, in the interest of public safety, can recommend appropriately conservative setback zones.

Roy J. Shlemon, Ph.D.

RG 2867
CPG 1766
CPESC 2167

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# APPENDIX E

## Description of Units, Attitudes, and Symbols used in Trench Logs

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

# APPENDIX E

## Table 1

*Note: This list follows deposits in stratigraphic order (i.e. youngest to oldest) rather than listing units as they were revealed in the trenches.*

## FAULT TRENCH DESCRIPTIONS

### Surficial Deposits

A) **Residual Soil/ Colluvium**
Mixtures of sand, silt, and gravel derived from underlying or upslope parent materials; typically loose, organic rich, fragments of parent material; generally not useful for fault assessments.

$A_1$) **Plow Pan**
Anthropically disturbed surface material.

$A_2$) **Colluvium**
Gravelly sandy silt, dark grayish brown (10yr 4/2), damp to moist, soft, porous, fragments of local bedrock.

### Artificial Fill

$A_f$) Varied anthropic mixtures of gravel and displaced local sediments; generally porous, soft, and moist, common debris; not useful for fault assessments.

### Pleistocene Deposits

E) **Older Fanglomerate-North of WFZ**
Calcrete, carbonate stage IV, well cemented, matrix composed of underlying deposits.

F) Sandy to sandy silty gravel, matrix varies from light reddish brown (5yr 6/4) to reddish brown (5yr 4/4), damp, dense, clasts are mainly angular to subangular sandstone, siltstone, and limestone, poorly stratified, lower contact is typified by an iron-oxide, dentiform "crust", locally well-cemented zones (carbonate stage III) throughout; local relict and buried moderately to mature paleosols.

G) Similar to F, but mottled olive yellow (5yr 6/8) to light grayish brown (2.5yr 6/2), rip-up clasts of underlying host lower sharp near contact, massive except near base where rip-up clasts approximately parallel lower contact.

### Terrace Deposits- South of WFZ

K) Relict paleosol, silty to clayey sand, reddish brown (5yr 4/3), clay lined, pores, grains and peds; irregular bocky pads, sharp lower contact.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING OFFICIAL

L) Silty sand, brown (7.5 yr 4/4), damp, dense, very sharp lower contact, some pedogenesis.

M) Buried paleosol, sandy clay, yellowish red, (5 yr 4/6), distinct blocky peds, abundant clay coating of ped faces, grains and pores, clay bridges, sharp contacts.

N) Silty sand, strong brown (7.5 yr 4/6), damp, dense, some pedogenic clay, cumulic horizon.

O) Buried paleosol, sandy clay, reddish brown, (5 yr 7/3), hard, distinct blocky peds, abundant clay coatings of ped faces, and grains, clay bridges; calcic horizon cut base, very sharp contacts.

P) Gravelly sand, brown (7.5 yr 5/3), dense, crudely stratified, hard, cross bedding.

**Fernando Formation**

Q) **Upper Member**
Sand siltstone, yellowish brown to greenish gray, damp, weathered, massive.

**Puente Formation**

**La Vida Member**

B) Interbedded siltstone, minor sandstone and shale, occasional pebble conglomerate and limestone beds; varies from reddish yellow (5yr 6/6) and grayish orange (10yr 7/4) where weathered to brown (10yr 8/7) to various shades of gray, laminated to thick bedded, generally fissile, upper few feet are usually extremely weathered and creep-affected.

$B_1$) **Soft Sediment Deformation**
Common in the La Vida Member; non-cylindrical folds, flow structures, small faults; penecontremporaneous events.

$B_2$) **Calcrate**
Pre-Holocene stage and IV Carbonate Formed over fault in Puente Formation.

C) **Limestone/Limy Beds**
Commonly cream-colored with reddish yellow (5yr 6/6) stains. Resistant but brittle and fractured, locally "disjointed in a weathered zone up to a few feet thick; forms resistant "ledge" outcrops.

D) Sandstone, grayish orange (10yr 7/4), sharp contacts, generally weathered.

**Soquel Member**

H) Silty sandstone, pale yellow (2.5yr 8/1) and brownish yellow (10yr 6/8), fine-to medium-grained, silty matrix, irregular fractures and joints, iron-oxide stains where weathered; hard where fresh.

I) Siltstone, yellow (10yr 8/8) to brownish yellow (10yr 6/6), moderately well-indurated, locally sheared, and polished, locally contorted,

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

J) Interbedded sandstone and siltstone, comprised of (H) and (I,) moderately thick to thick beds, seemingly "rhythmic bedded".

$J_1$) Calcrete Cap, Stage III and IV, "plugged", hard.

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tabassian
BUILDING OFFICIAL

## Table II
Attitudes Taken in Trenches

**FT-1**

| | |
|---|---|
| 1 | B: N71E, 45NW |
| 2 | B: N80E, 38NW |
| 3 | B: N10E, 35NW |
| 4 | B: N80E, 32NW |
| 5 | B: N32E, 37NW |
| 6 | B: N49E, 38NW |
| 7 | B: N30W, 40E |
| 8 | J: N80E, 90 |
| 9 | J: EW, 90 |
| 10 | B: N40E, 40NW |
| 11 | B: N46E, 40WW |
| 12 | B: N63E, 40NW |
| 13 | B: N60E, 40NW |
| 14 | B: N60E, 43NW |
| 15 | B: N60E, 35NW |
| 16 | B: HORIZONTAL |

**FT-2**

| | |
|---|---|
| 1 | F: N85W, 69SW |
| 2 | F: EW, 84S |
| 3 | F: EW, 90 |
| 4 | B: N62E, 58SE |
| 5 | J: N38W, 575W |
| 6 | J: N40W, 60SW |
| 7 | B: N44E, 76NW |
| 8 | J: N40W, 75SW |
| 9 | J: N79W, 52SW |
| 10 | B: N38E, 58NW |
| 11 | B: N58E, 63NW |
| 12 | J: N52W, 47SW |
| 13 | B: N67E, 63NW |
| 14 | B: N52E, 60NW |
| 15 | J: N23W, 70SW |
| 16 | J: N25W, 40SW |

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tabassian
BUILDING OFFICIAL

**FT-4A**

1 B: N88W, 58NE
2 B: N88W, 51NE
3 B: N85W, 58NE
4 B: N74W, 53NE
5 B: N65W, 70NE

**FT-4B**

1 F: N72W, 65NE

**FT-8**

1 F: N65W, 60NE

**FT-9**

1 B: N82W, 55NE
2 B: N81W, 50NE
3 B: N83W, 55NE

**FT-10**

1 B: N25E, 35NW
2 B: N30E, 50NW
3 B: N71W, 60NE
4 F: EW, 75S
5 B: N75W, 50NE
6 B: N82W, 56NE
7 B: EW, 50N
8 F: N80W, 85-90NE

**FT-11**

1 F: N70W, 85-90NE
2 F: N59W, 75-85SW

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tabassian
BUILDING OFFICIAL

**T-1**

| | |
|---|---|
| 1 | B: EW, 8N |
| 2 | B: N50W, 55SW |
| 3 | B: HORIZONTAL |
| 4 | B: HORIZONTAL |
| 5 | J: N50W, 70SW |
| 6 | J: N50W, 60SW |
| 7 | B: N71E, 10SE |
| 8 | B: N26W, 15SW |
| 9 | J: N85W, 70SW |
| 10 | J: N5W, 70SW |
| 11 | B: N39W, 55W |
| 12 | B: N39W, 18SW |
| 13 | B: N56W, 15SW |
| 14 | J: N50W, 65SW |
| 15 | J: N60W, 70NE |
| 16 | B: N59W, 28NE |
| 17 | B N71W, 40SW |
| 18 | J: N19W, 90 |
| 19 | B: N80W, 25SW |
| 20 | B: N60E, 15SE |
| 21 | B: N70E, 15SE |
| 22 | B: NW, 18NE |
| 23 | B: N35W, 20NE |

**T-2**

| | |
|---|---|
| 1 | B: N70SE, 20NW |
| 2 | J: N38W, 75SW |
| 3 | B: N80W, 15NE |
| 4 | J: N62W, 70SW |
| 5 | J: N62W, 90 |
| 6 | B: N89W, 20N |
| 7 | B: EW, 20N |

**T-3-6**

| | |
|---|---|
| 1 | B: N53E, 55NW |
| 2 | B: N53E, 55NW |
| 3 | B: N59E, 50NW |
| 4 | B: N54E, 53NW |
| 5 | B: N53E, 50NW |
| 6 | B: N20E, 55NW |
| 7 | B: N51E, 38NW |
| 8 | B: N67E, 56NW |
| 9 | B: N71E, 49NW |
| 10 | B: N72E, 50NW |

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Nina Tabassian
Date 10/18/2022

**FT-101**

1 B: N40W, 88NE
2 B: N30W, 85NE
3 B: N28E, 48NW
4 B: NS, 50W
5 B: N10E, 60NW
6 B: N10E, 40NW
7 B: N50E, 70NW
8 B: N10W, 65SW
9 B: N10E, 50NW
10 B: N36E, 50NW (South Wall)
11 B: N23E, 60NEW 0+88
12 B: NS, 80W
13 B: N10E, 50NW

**FT-102**

1 F: N70W, 80SW
2 B: N80W, 5-10NE
3 B: N55W, 30NE
4 B: N20W, 8SE
5 B: N10W, 50SW
6 B: N45W, 25-30SW
7 B: N65W, 25NE
8 B: N10E, 30NE
9 B: N50W, 44SW
10 B: N50W, 30SW
11 B: N25E, 90
12 B: N20W, 40SW
13 B: N40W, 30SW
14 B: N43W, 28SW
15 F: N20W, 80SW

**FT-103A**

1 B: N80W, 49NE
2 J: N10W, 85NE
3 B: N48W, 60NE
4 B: N50W, 56NE
5 B: N50W, 48NE
6 B: N35W, 40NE
7 B: N40W, 50NE
8 B: N40W, 55NE
9 B: N50W, 50NE

**FT-103B**

1 B: N25W, 53NE

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

County of Orange : OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

**FT-103C**

1 B: N40W, 50NE
2 B: N80W, 60NE

**FT-104**

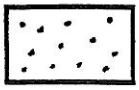
1 B: N74W, 54SW
2 B: N50W, 45SW
3 B: N50W, 50SW
4 B: N50W, 50SW

Note: B=Bedding; J=Jointing; F=Fault

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170022

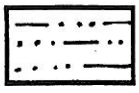
County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations to these plans without permission from OC Public Works/ OC Development Services of Orange County. The stamping of these plan specifications SHALL NOT be held to permit or be an approval of the violation of any provisions of any County Ordinance or State law.
Final Inspection
BUILDING DIVISION

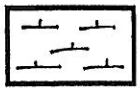
# Graphic Legend for Symbols Used in Trench Logs

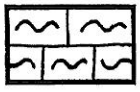

sandstone/sand

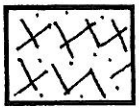

mudstone

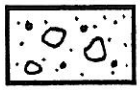

siltstone/silt

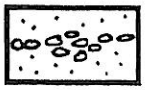

silty sandstone/silty sand

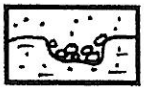

limestone

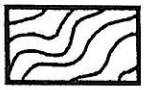

limy beds

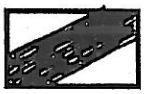

interbedded siltstone, sandstone, and shale with occassional limestone beds/calcrete


cobbly sandstone/gravelly sand

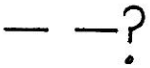

sandstone with gravel lense/gravelly sand

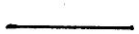

scour-fill with gravel and sand


soft sediment deformation


cemented material

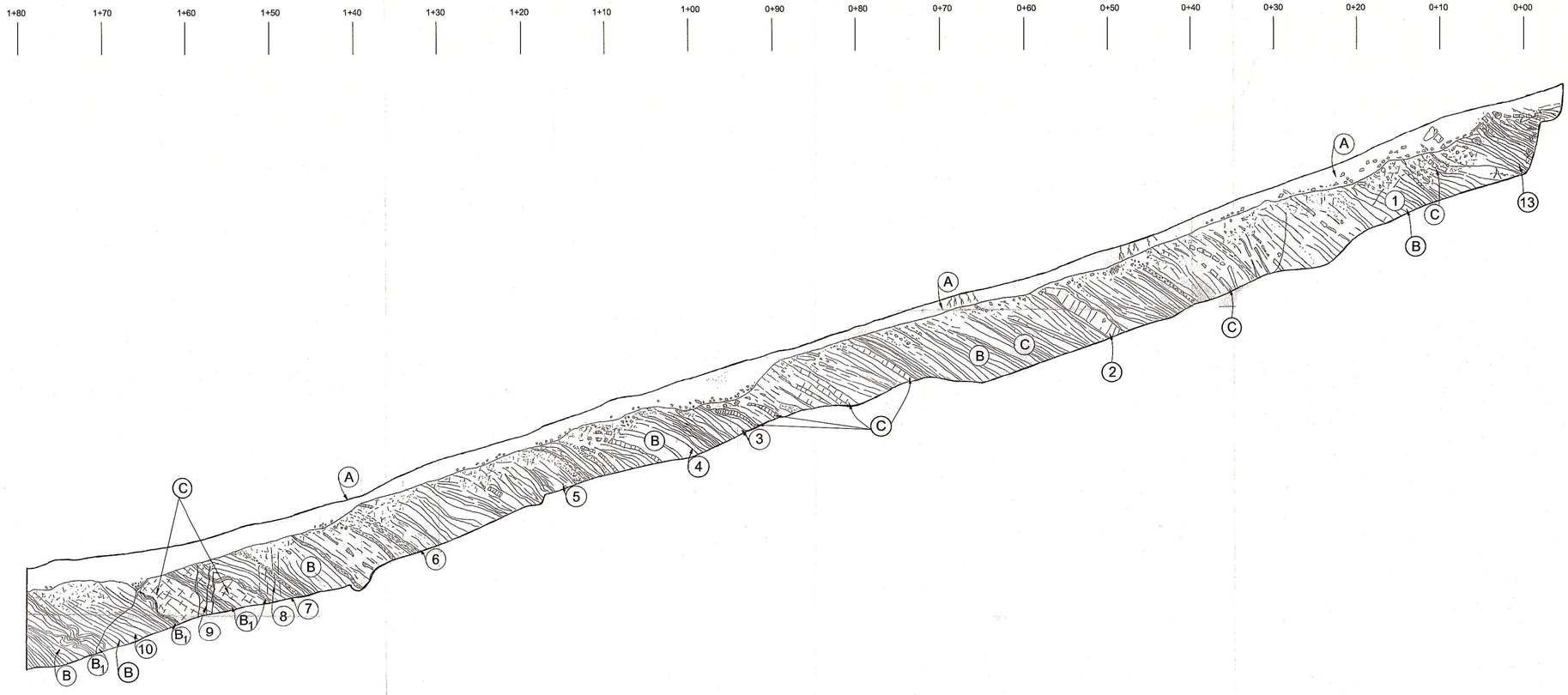

roots from vegetation

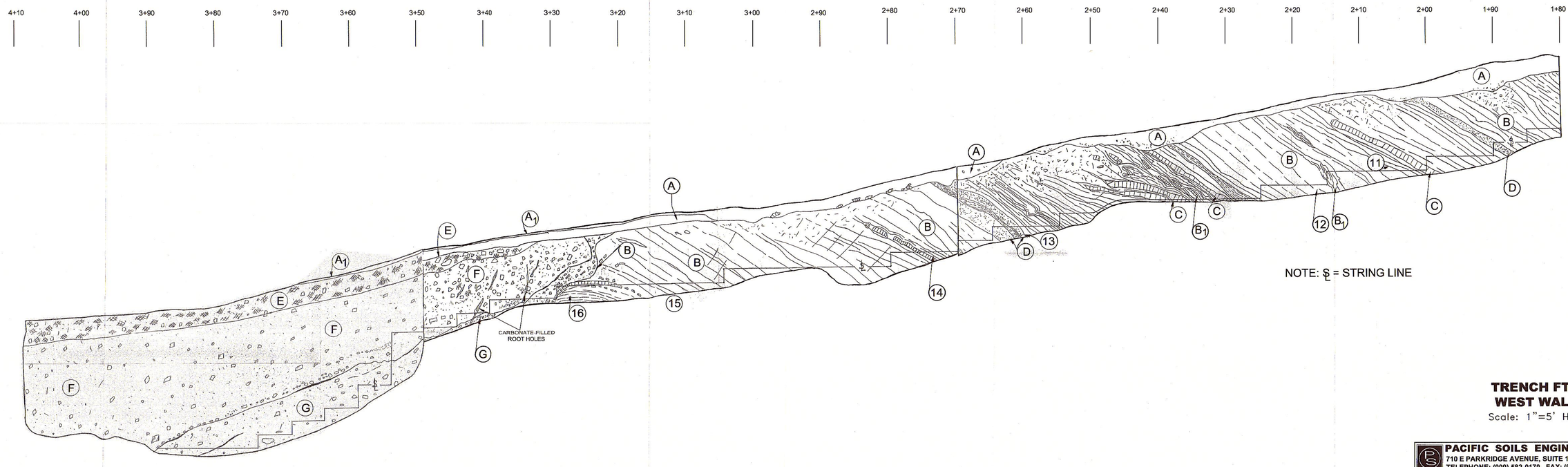

stratigraphic contact; question marks where vague


bench line


string line


paleosol



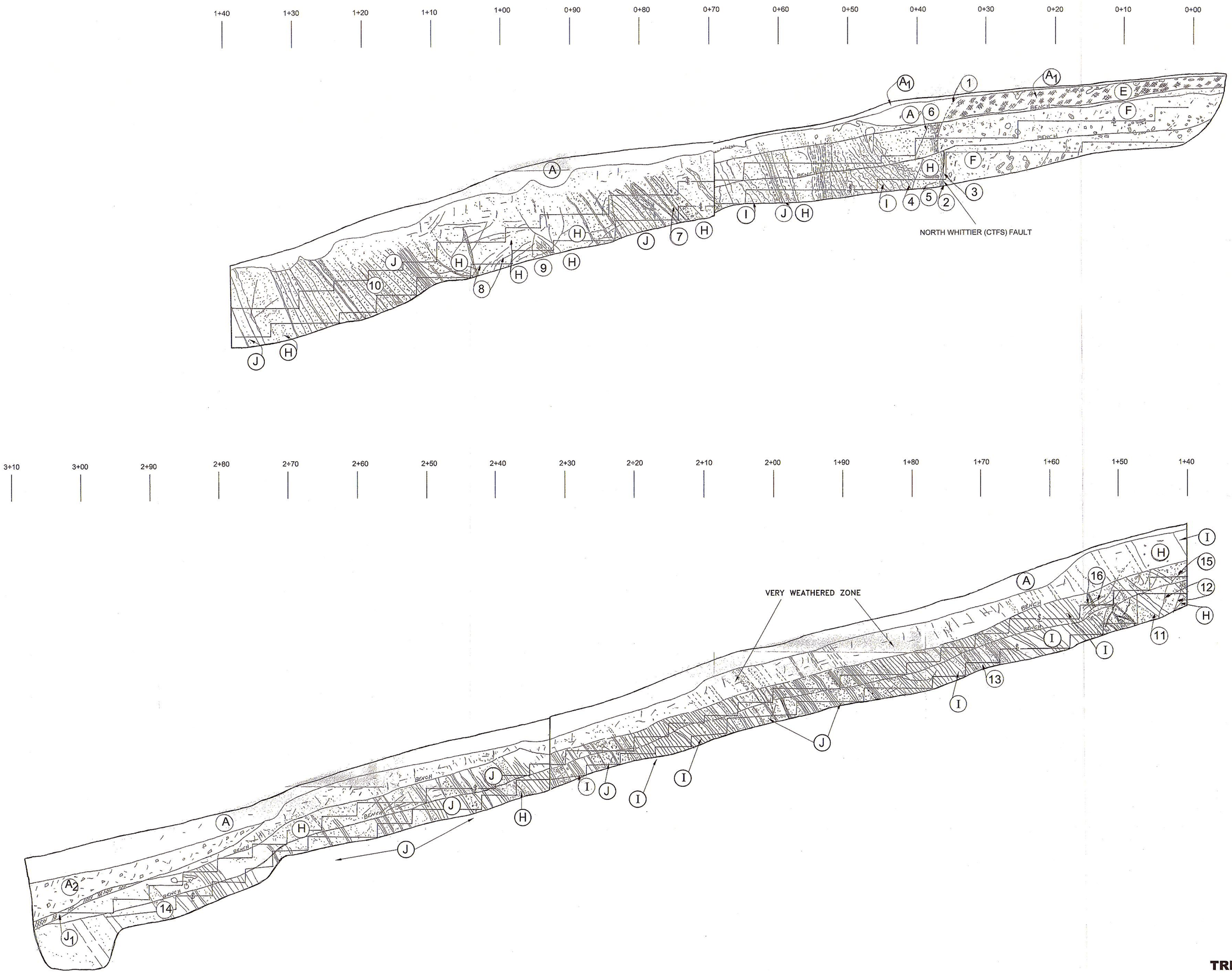




NOTE: ℄ = STRING LINE

**TRENCH FT-1**
**WEST WALL**
Scale: 1"=5' H&V

PLATE IV

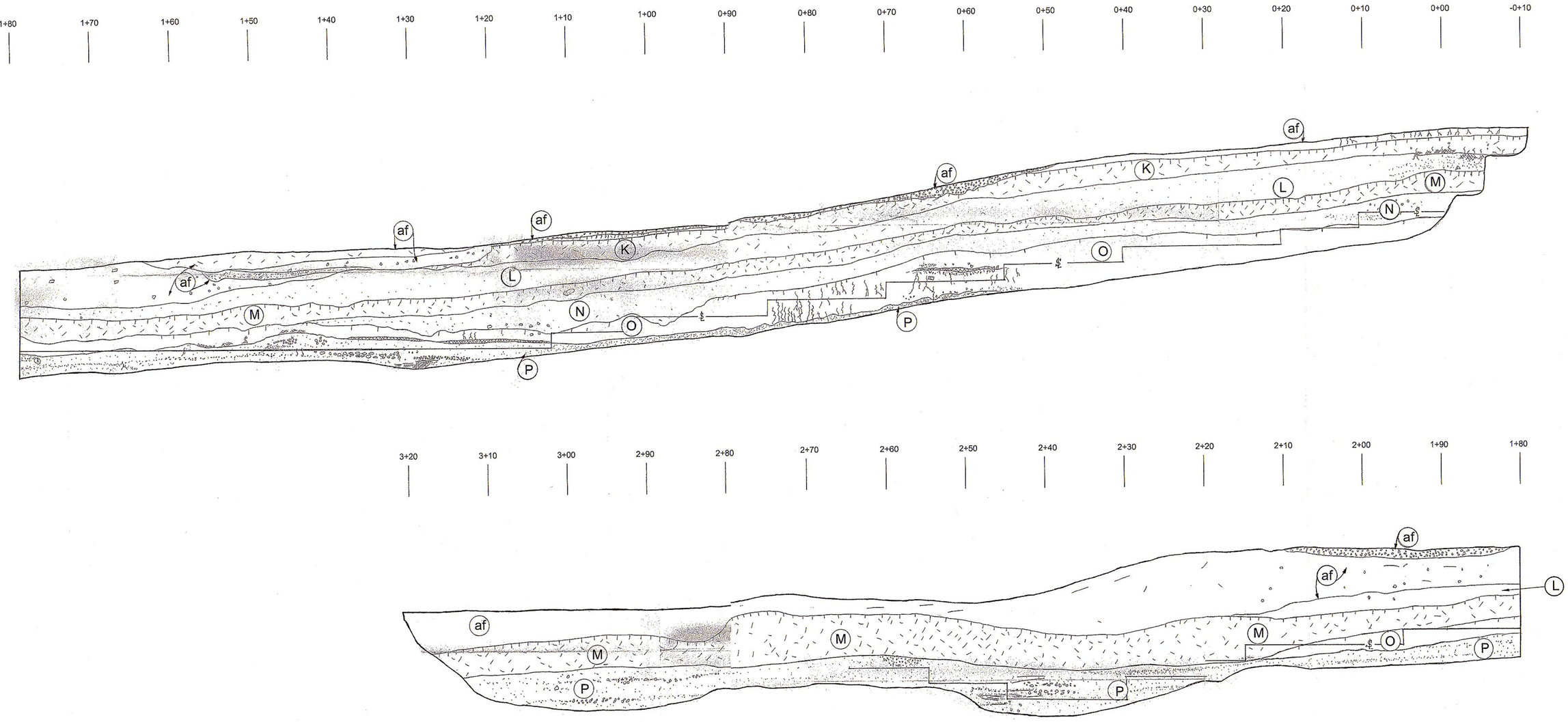
**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (909) 582-0170, FAX: (909) 582-0176
W.O. 102280-F DATE: 10/14/05
S:\drafting\102280-F\FINAL_OF_10-05\TRENCHES\trenches FT-1-2-3.dwg




**TRENCH FT-2**
**WEST WALL**
Scale: 1"=5' H&V

PLATE V

**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (909) 582-0170, FAX: (909) 582-0176
W.O. 102280-F DATE: 10/14/05
S:\drafting\102280-F\FINAL_OF_10-05\TRENCHES\trenches FT-1-2-3.dwg




**TRENCH FT-3**
**WEST WALL**
Scale: 1"=5' H&V

PLATE VI

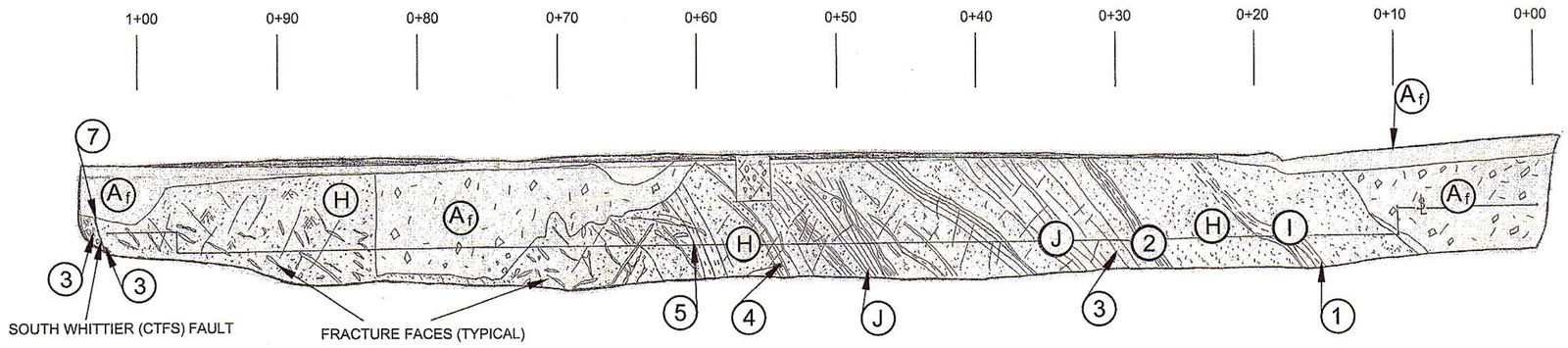
**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (909) 582-0170, FAX: (909) 582-0176

W.O. 102280-F DATE: 10/14/05

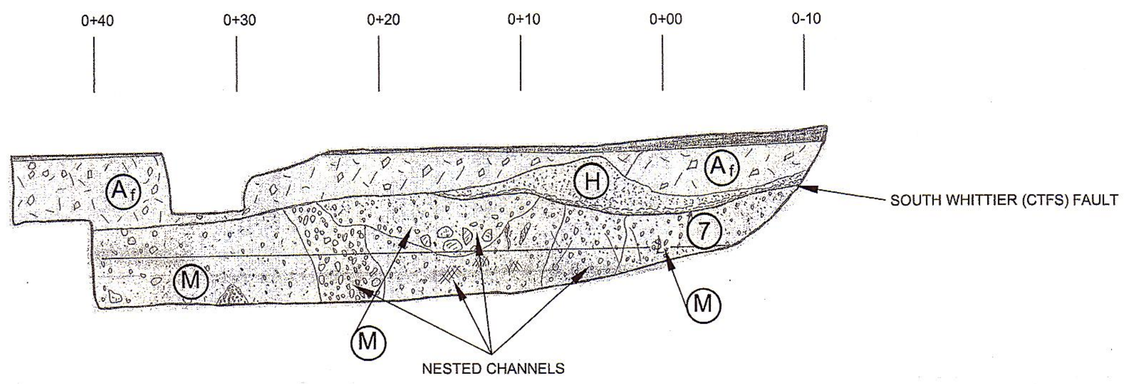
S:\drafting\102280-F\FINAL_OF_10-05\TRENCHES\trenches FT-1-2-3.dwg

Building Division Form Revs 9/19/2002
Approved Geology Reports
Permits 10/1/2002
County of Orange - Public Works
Subdivision Review
APPROVED
The grading plan/document must be signed by the preparer with a statement of responsibility and dated before any approval will be granted. Approval does not include the public right of way or any structure. Public right of way requires a separate permit. Approval is valid for 24 months unless otherwise noted.
Manager, Subdivision and Grading
Date 10/1/2002

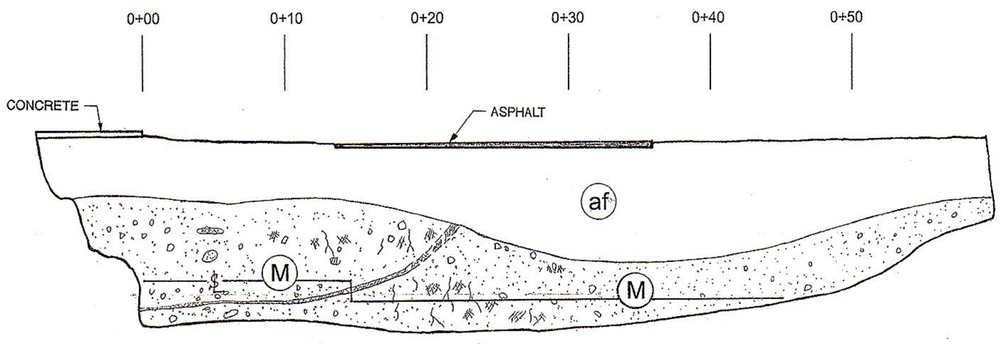
# FT-4A
## WEST WALL



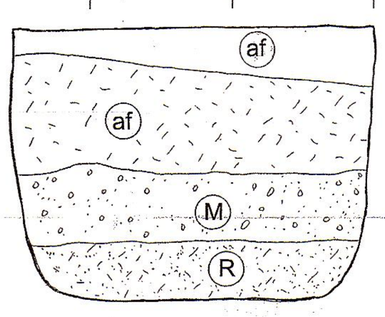

# FT-4B
## NORTH WALL



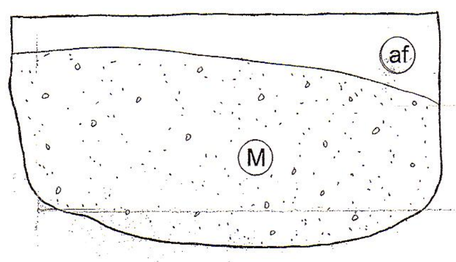

# FT-5
## EAST WALL




# FT-6
## EAST WALL




# FT-7
## EAST WALL

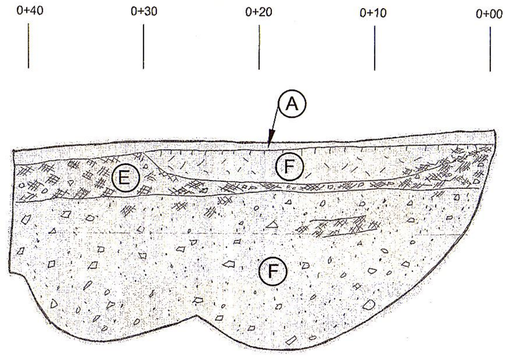



**TRENCHES**
**FT-4A, FT-4B**
**FT-5, FT-6, FT-7**
Scale: 1"=5' H&V

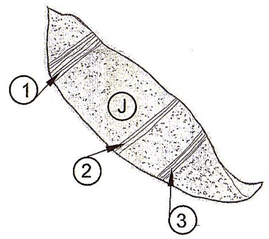
PLATE VII

**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (909) 582-0170, FAX: (909) 582-0176
W.O. 102280-F DATE: 10/4/05
S:\drafting\102280-F\FINAL_DF_10-05\TRENCHES\TRECHES_FT-8-12&FT-4A&4B.dwg

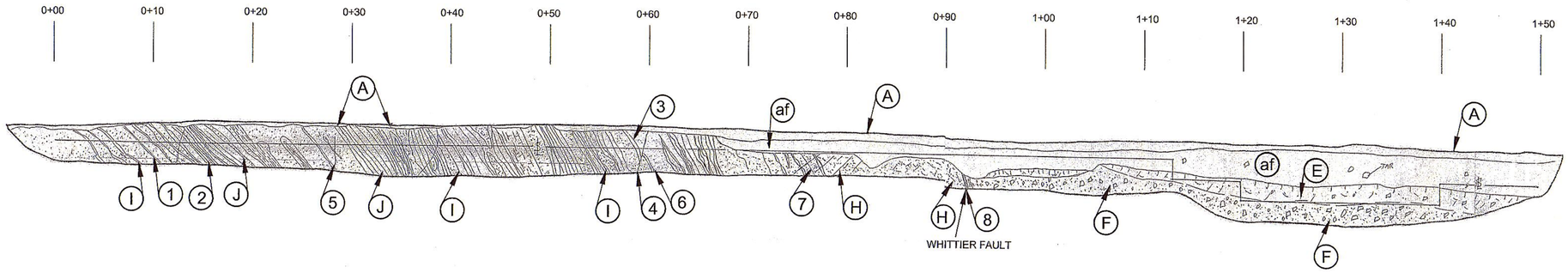
## FT-8
### WEST WALL



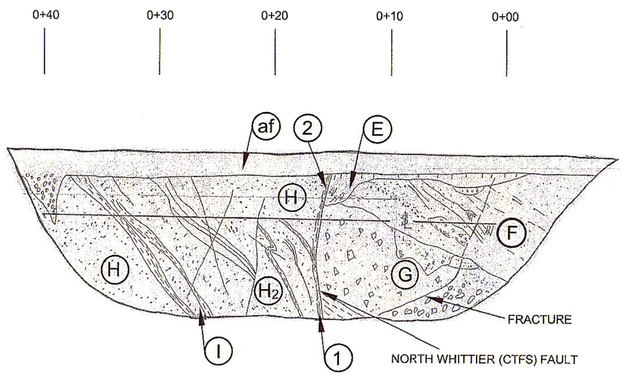

## FT-9
### EAST WALL



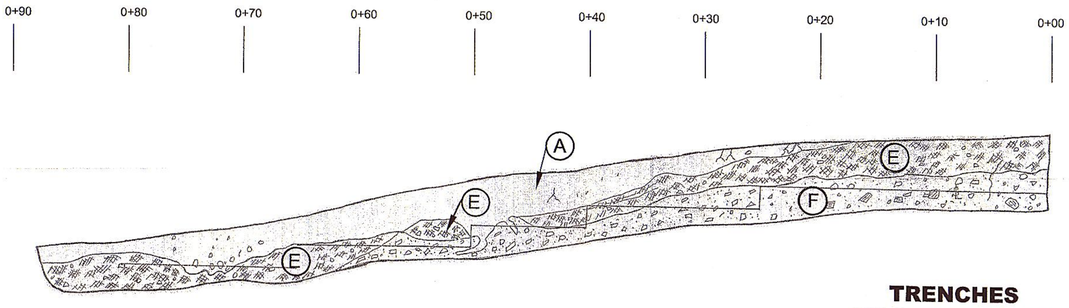

## FT-10
### WEST WALL




## FT-11
### WEST WALL




## FT-12
### WEST WALL




**TRENCHES**
**FT-8, FT-9, FT-10**
**FT-11, FT-12**
Scale: 1"=5' H&V

PLATE VIII

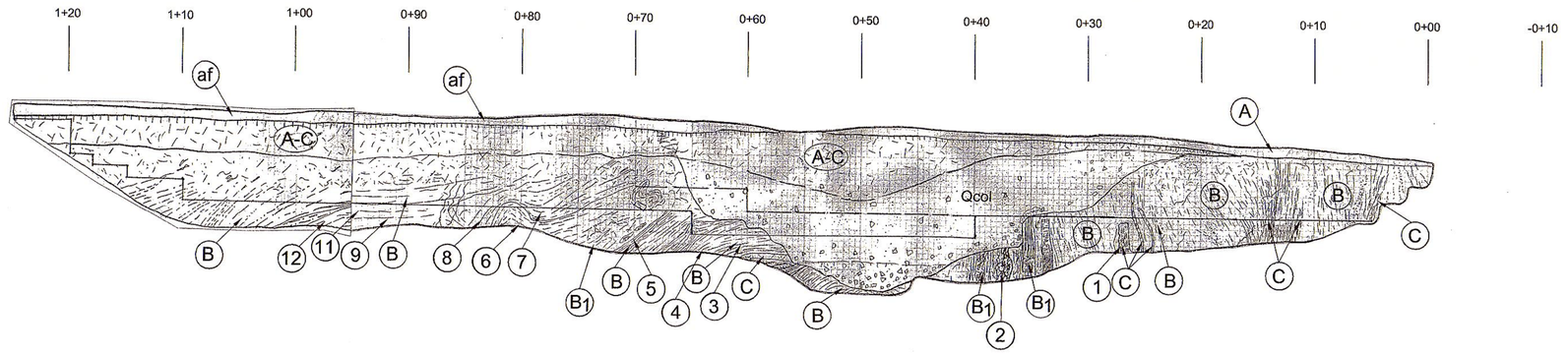

**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (909) 582-0170, FAX: (909) 582-0176

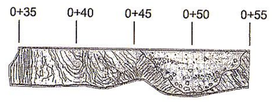

W.O. 102280-F DATE: 10/4/05

S:\drafting\102280-F\FINAL_OF_10-05\TRENCHES\TRECHES_FT-8-12&FT-4A&4B.dwg

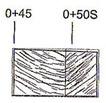
## TRENCH FT-101
## NORTHWEST WALL

N38°E



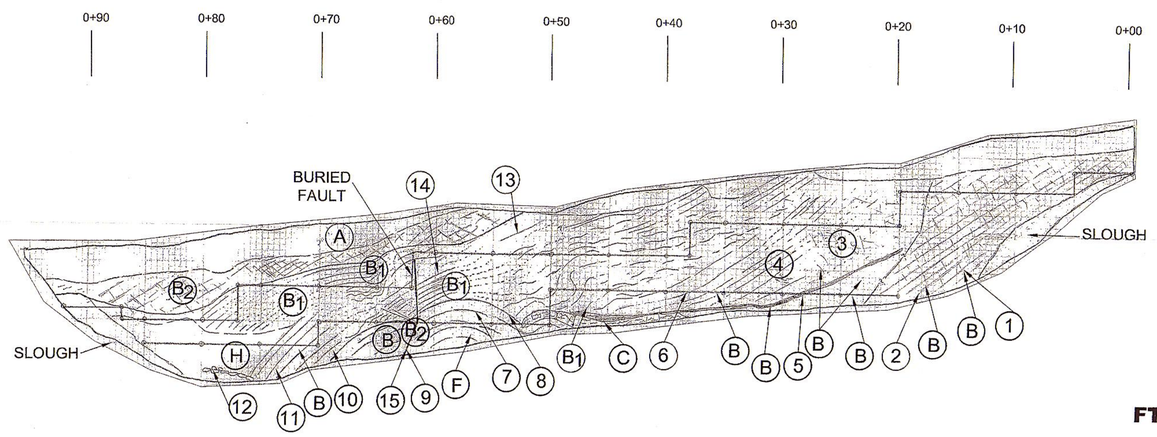

## BOTTOM OF SOUTHEAST WALL




## TRENCH BOTTOM

## TRENCH FT-102
## NORTH WEST WALL

N46°E




## TRENCHES
## FT-101 AND FT-102

Scale: 1"=5' H&V

PLATE IX


**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (909) 582-0170, FAX: (909) 582-0176

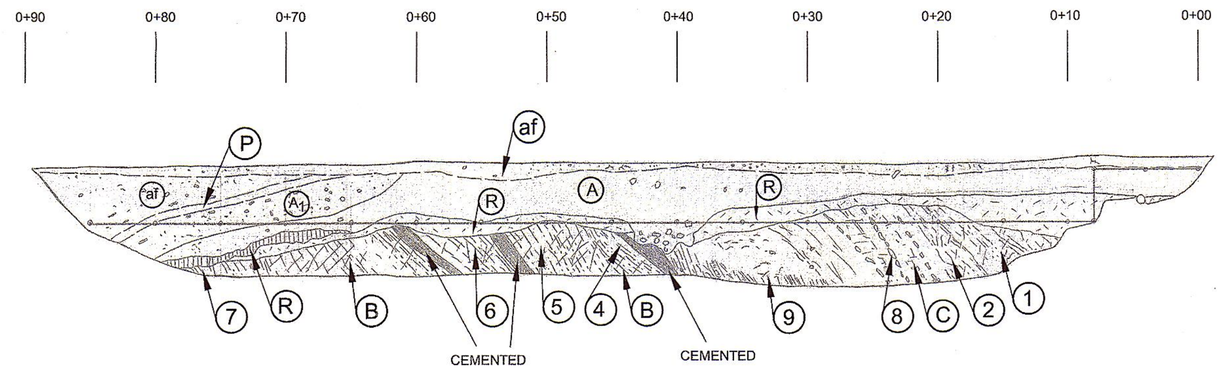

W.O. 102280-F DATE: 10/4/05

S:\drafting\102280-F\DRAFT_of_9-23-05\trenches\trench FT-101 FT-102.dwg

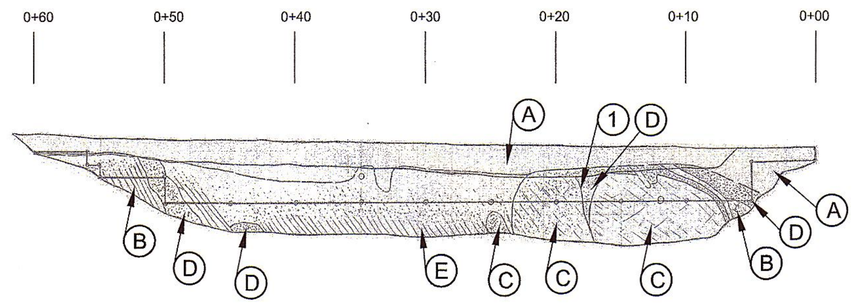
Ashby&Ashby Surveying
Approved Analog Reports
Permits 1617883

County of Orange - OC Public Works
ENCROACHMENT PERMIT
Permit Number
This permit is issued subject to the terms and conditions set forth in the application for this permit. Any violation of any condition shall be cause for revocation of this permit. The permittee shall comply with all applicable laws and regulations. Specific exceptions to this must be noted in writing. The permittee shall not begin any work under this permit until he has obtained all necessary permits and licenses.
Date Issued
Permittee or Agent

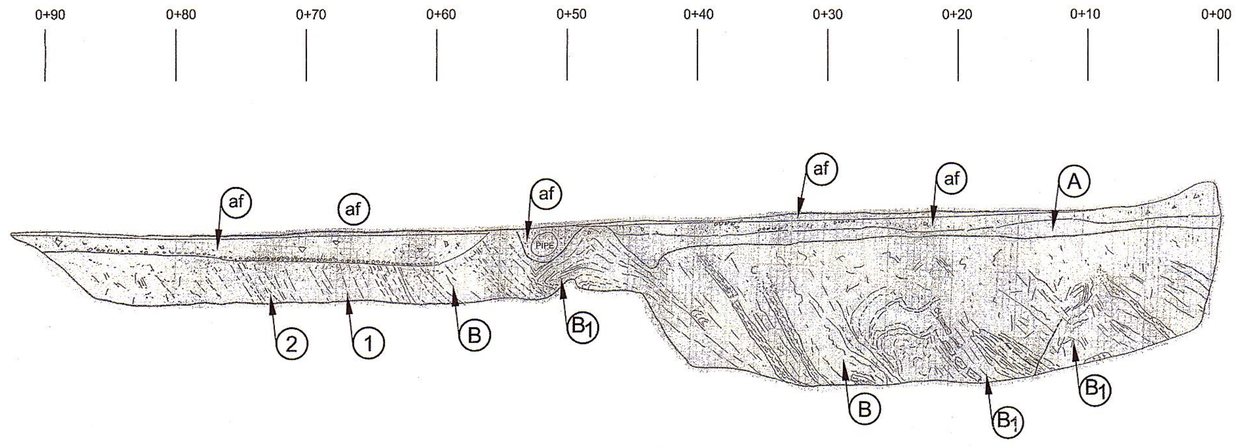
# FT-103A
## NORTHWEST WALL



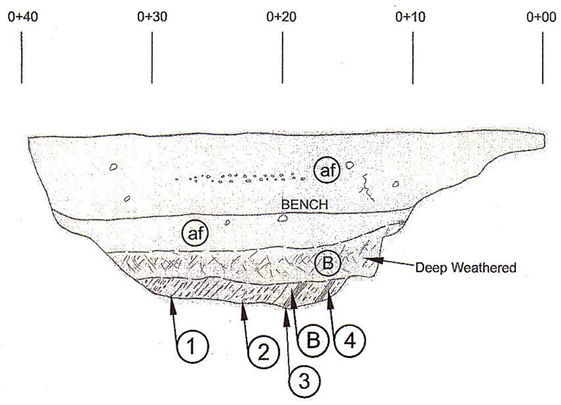

# FT-103B
## WEST WALL




# FT-103C
## NORTHWEST WALL




# FT-104
## NORTHWEST WALL




**TRENCHES FT-103A**
**FT-103B - FT-103C**
**FT-104**

Scale: 1"=5' H&V

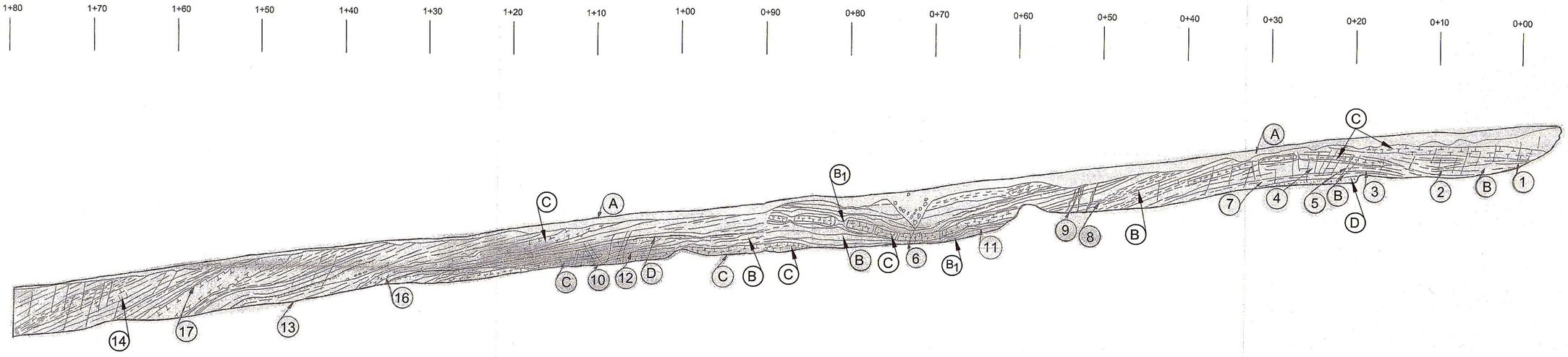
PLATE X

**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (909) 582-0170, FAX: (909) 582-0176

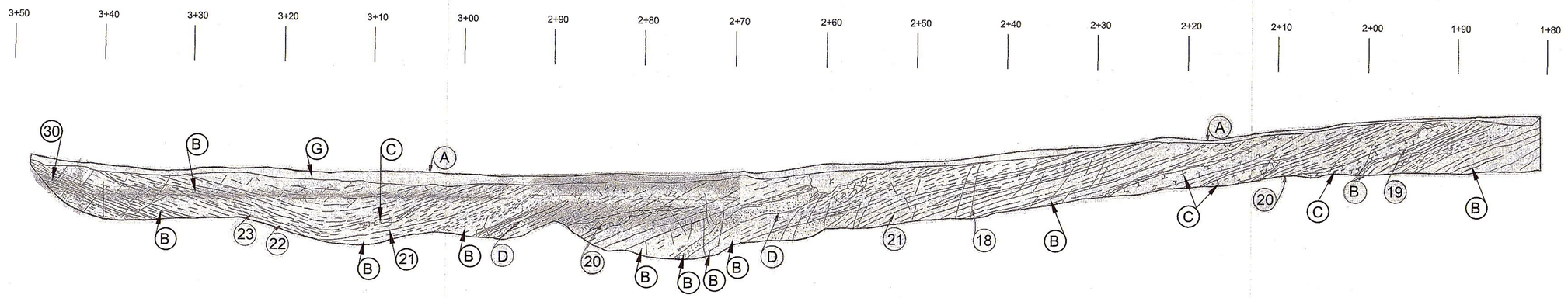
W.O. 102280-F DATE: 10/4/05

S:\drafting\102280-F\FINAL_OF_10-05\TRENCHES\TRENCH_T-1&2-FT-103A-C.dwg

# T-1
## WEST WALL




# T-1 (CONTINUED)
## WEST WALL




**TRENCH T-1**

Scale: 1"=5' H&V

PLATE XI


**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (909) 582-0170, FAX: (909) 582-0176

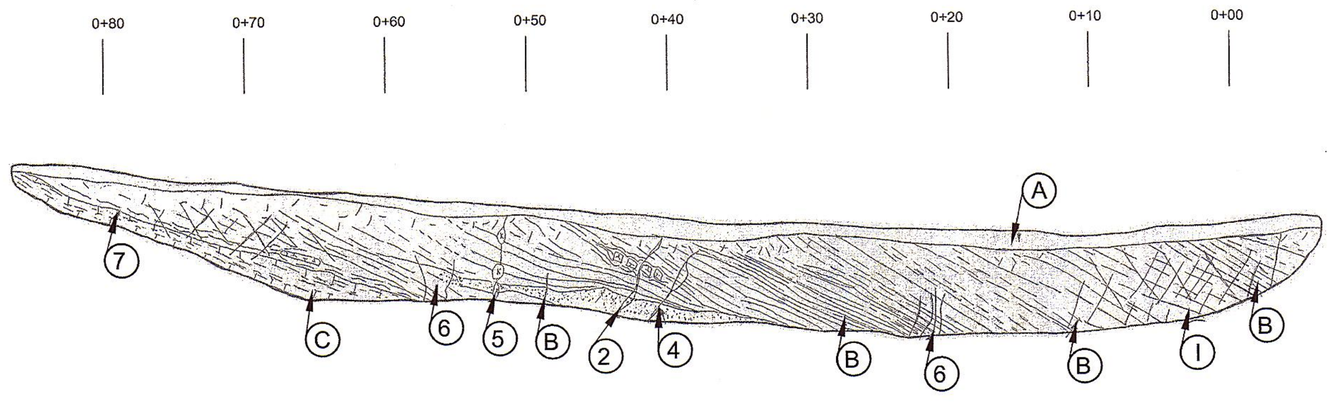

W.O. 102280-F DATE: 10/4/05

S:\drafting\102280-F\FINAL_OF_10-05\TRENCHES\TRENCH_T-1&2-FT-103A-C.dwg

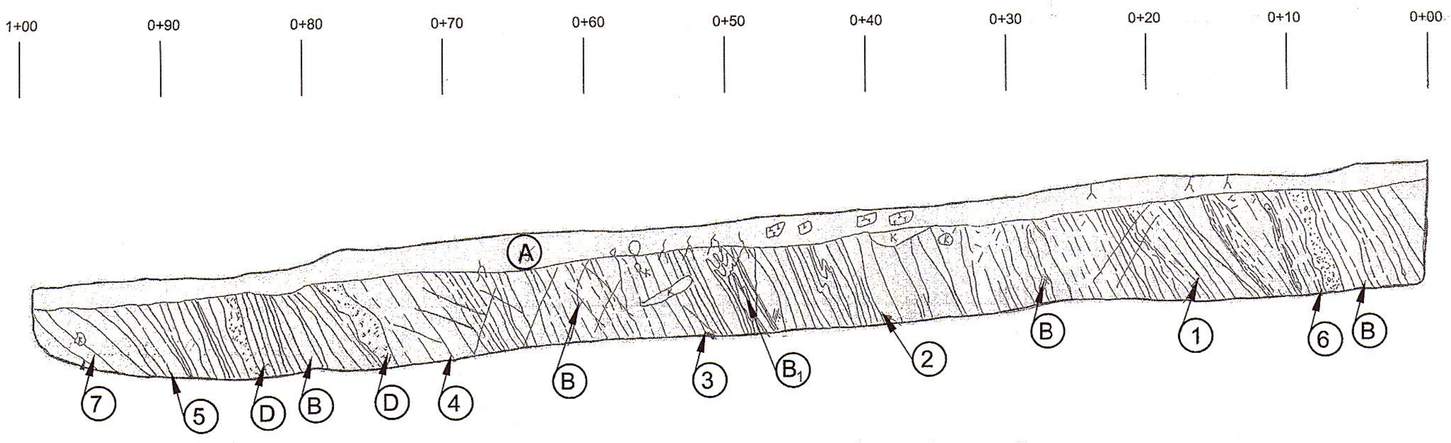
Building Safety Plan Rev 9/16/2022
Approved Zoning Boards
Permits: 04/19/2022

County of Orange - OC Public Works
OC Development Services
APPROVED
This plan is approved for compliance with applicable codes and ordinances. Approval of this plan does not authorize violation of any codes or ordinances. Approval of this plan does not relieve the applicant of responsibility for compliance with applicable codes and ordinances. Approval of this plan does not relieve the applicant of responsibility for errors or omissions in this plan.
Approved By
Date of Approval

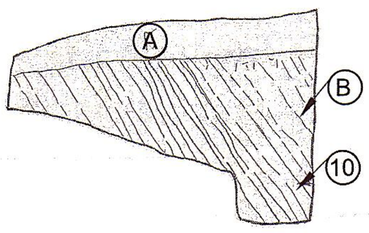
## T-2
### WEST WALL



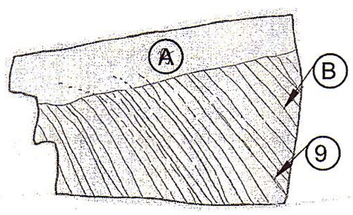

## T-3
### WEST WALL



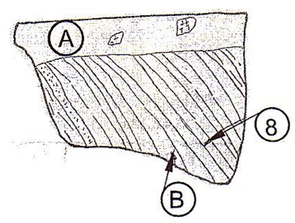

## T-6
### WEST WALL




## T-5
### WEST WALL




## T-4
### WEST WALL




## TRENCHES
## T-2 - T-6

Scale: 1"=5' H&V

PLATE XII

**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (909) 582-0170, FAX: (909) 582-0176

W.O. 102280-F DATE: 10/4/05

S:\drafting\102280-F\FINAL_OF_10-05\TRENCHES\TRENCH_T-1&2-FT-103A-C.dwg

Building/Safety Plan Rev. 9/18/00
Approval Stamp Reports
Permit: 0019882

County of Orange - Dr./Public Works
Subdivision/Grading
APPROVED
The Grading Plans and Specifications have been found to be in conformance with the Grading Ordinance and are approved subject to the conditions noted on the Grading Permit. Grading shall not commence until the Grading Permit is issued. Approval of these plans does not relieve the permittee of responsibility for obtaining other permits required by law.
Date: 10/18/00
Permit #0019882

LINE 1

780.43 LINE 1 0+00
741.45 FT-1A
745.99 LINE 1 1+00
710.43 LINE 1 2+00
716.52 FT-1B
701.32 FT-1C
681.40 LINE 1 3+00
690.04 FT-1 SOUTH
664.33 LINE 1 4+00
678.83 FT-8 NORTH
676.65 FT-2 NORTH
672.57 FT-8 SOUTH
674.95 FT-2 0+00
650.94 LINE 1 5+00
671.10 FT-2F
641.54 LINE 1 6+00
635.69 FT-2A
617.76 LINE 1 7+00
611.42 FT-2B
599.00 LINE 1 8+00
598.42 FT-2 SOUTH
580.41 LINE 1 9+00
566.25 LINE 1 9+50

LINE 3

689.42 LINE 3 0+00
688.17 LINE 3 1+00
686.45 LINE 3 2+00
694.98 LINE 3 3+00
684.17 LINE 3 4+00
741.93 T-10 NORTH
741.32 T-11 NORTH
741.17 F-10
741.68 F-12
741.13 F-11
741.31 T-11 SOUTH
735.56 T-10 SOUTH
682.92 LINE 3 5+00
683.26 LINE 3 6+00
685.81 LINE 3 6+50
674.04 LINE 3 7+00
669.21 LINE 3 8+00

LINE 2A

653.80 LINE 2A 0+00
637.97 LINE 2A 1+00
613.55 LINE 2A 2+00
591.42 LINE 2A 3+00
574.78 LINE 2A 4+00
563.25 LINE 2A 5+00
553.15 LINE 2A 6+00

LINE 4

623.62 LINE 4 0+00
622.43 LINE 4 1+00
622.34 LINE 4 2+00
622.95 LINE 4 3+00
623.05 LINE 4 4+00
615.49 LINE 4 4+70
579.4 FT-4A NORTH
577.51 FT-4A 0+00
572.77 FT-3 NORTH
576.53 FT-9 SOUTH
576.41 FT-4B
576.24 FT-4B 0+60
576.16 FT-4A SOUTH
576.33 FT-4BF
576.29 FT-4B EAST
553.24 FT-3 NORTH
553.19 FT-3 0+00
553.12 LINE 2B 3+00
557.18 FT-9 NORTH
566.52 FT-6 NORTH
568.20 FT-6 SOUTH
556.6 FT-5A
565.85 FT-7 NORTH
554.62 FT-5 SOUTH
576.78 FT-7 SOUTH

LINE 2B

540.84 LINE 2B 2+00
527.75 LINE 2B 1+00
517.57 FT-3 SOUTH
515.22 LINE 2B 0+00

LINE 5

540.17 LINE 5 6+00
539.39 LINE 5 5+00
540.31 LINE 5 4+00
540.71 LINE 5 3+00
540.85 LINE 5 2+00
541.55 LINE 5 1+00
541.80 LINE 5 0+00

SCALE: 1" = 100'

TRENCH LOCATIONS
W.O. Number: 2256-2T
Tracts:

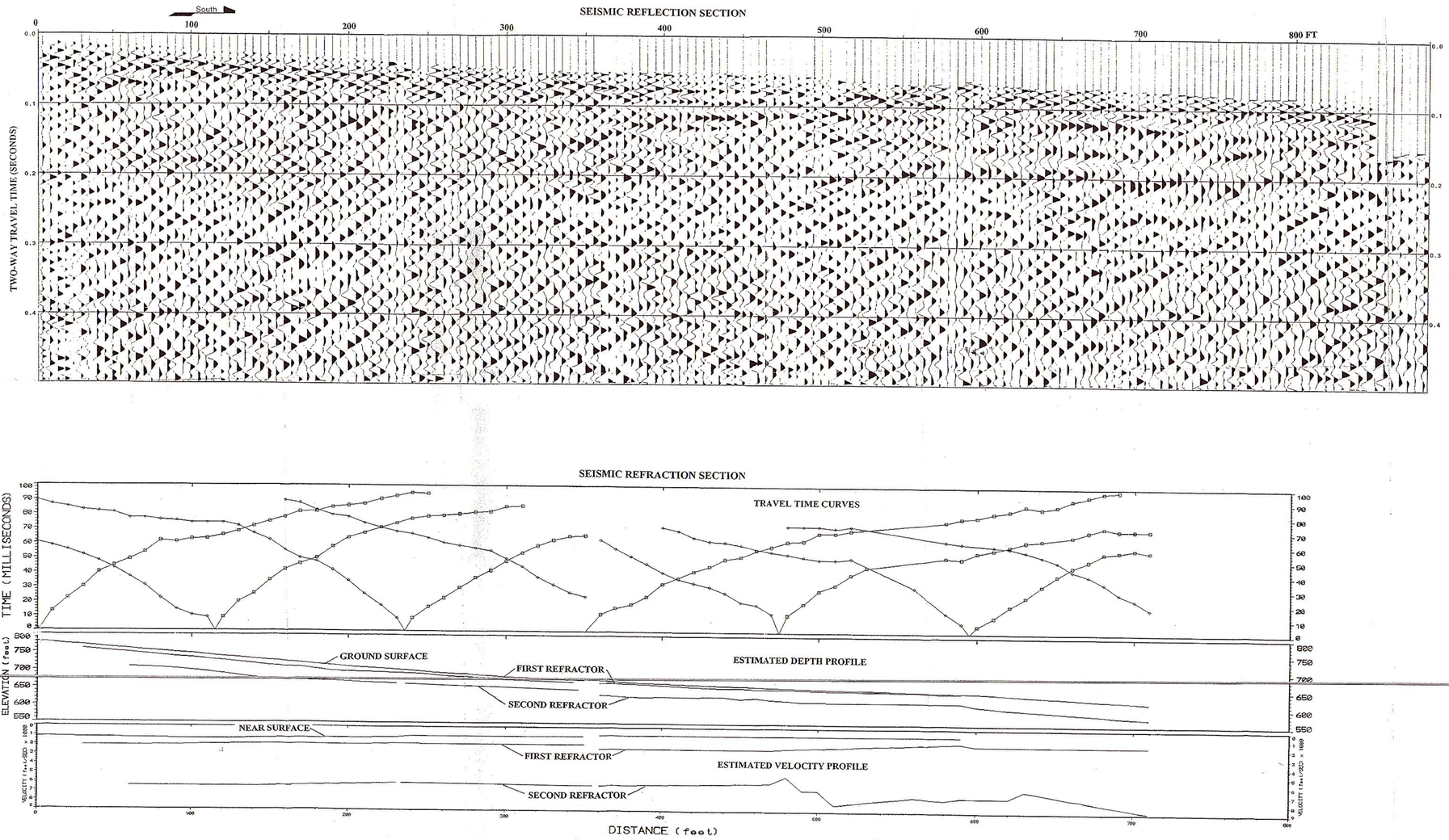
Prepared by: BOB EPSTEIN
Path: M:\BREACYN\TOPO\TOPO
Plot Date: 03-23-99 Sheet 1 of 1

Project: BREACYN
Party Chief: BEN GENTRY
Survey Date: 1/12/99 & 3/12/99

***LOCATION OF SEISMIC LINES***
***FOR FAULT INVESTIGATION***
***NE CORNER TONNER AND BREA CANYON ROADS***
***FOR PACIFIC SOILS ENGINEERING***

***PLATE 1***
***ADVANCED GEOSCIENCE***

RECEIVED
MAY 20 1999
PACIFIC SOILS







# Line 1

Puente Hills

Brea Canyon, California

## Pacific Soils Engineering

PUENTE1 CMP Stack
Normal Polarity

**Field Parameters**

Spread Configuration: End-on Shots with 24 Groups in Line.
Source Interval: 10 Feet  Group Interval: 10 Feet
Sources: 20-Pound Sledge Hammer and Metal Plate
Seismograph: Bison 9024
Receiver Groups: two 40-Hz Geophones
Record Length: 500 msec  Sample Rate: 0.25 msec
Field Filter: 96 Hz Low Cut

Data Recorded by Advanced Geoscience and Ryland Associates
12/30/98

**Processing Parameters**

SEG-2 Input
Geometry Definition
Apply Mute
Time Variant Bandpass
Apply Static Shifts
CMP Sort
Velocity Analysis
NMO Correction
Apply Mute
CMP Stack
Automatic Gain Control

Data Processed by Advanced Geoscience 4/99

**Display Parameters**

| | |
|---|---|
| Inches/second | 15.0 |
| Traces/inch | 6.0 |
| Plot Polarity | Normal |
| Direction | South |

Processed using SPW™ from Parallel Geoscience Corporation

South

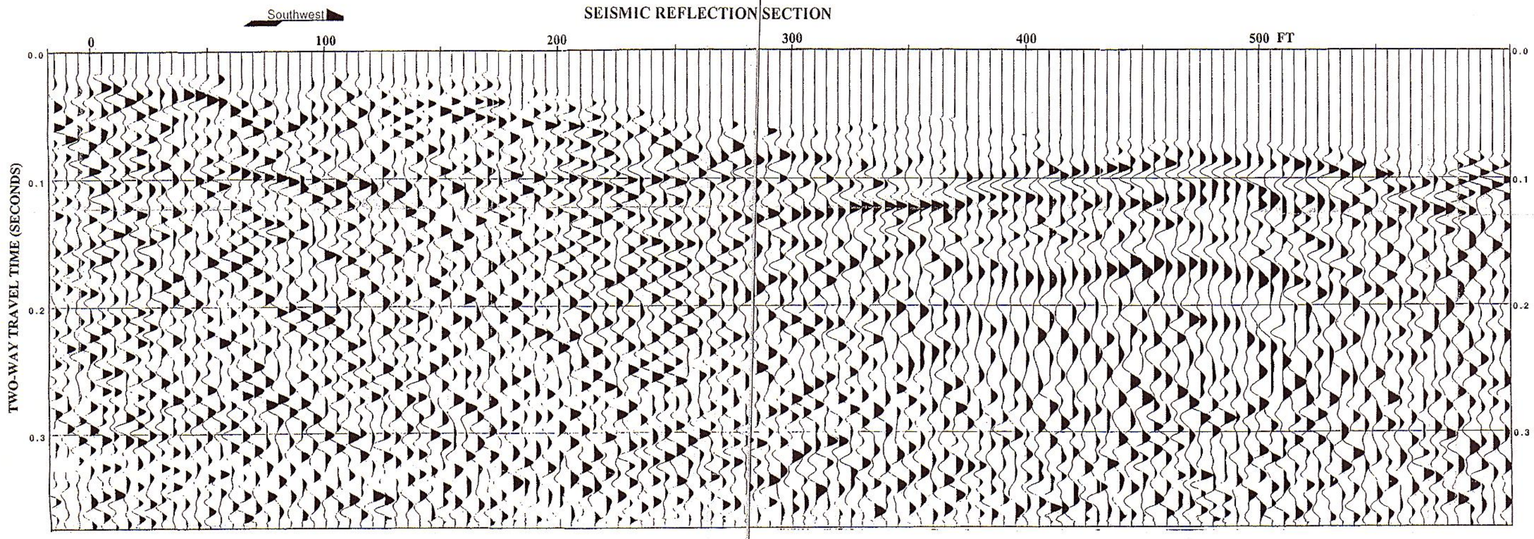
RECEIVED
MAY 25 1999
PACIFIC SOILS

*PLATE 2*
*ADVANCED GEOSCIENCE*

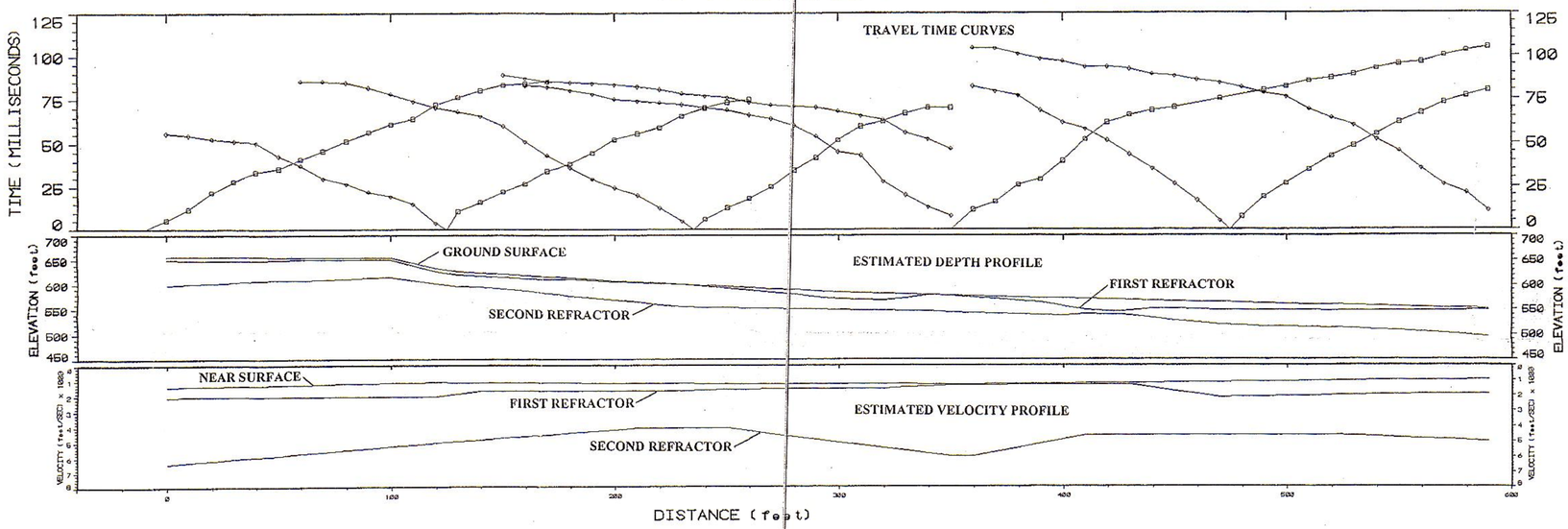
Building/Safety Plan Review
Approved Working Drawings
Permit: 5/5/1999

County of Orange - Public Works
Subdivision/Grading
APPROVED
This plan is approved subject to the conditions noted on the permit. Approval of this plan does not relieve the permittee of responsibility for compliance with all applicable laws, ordinances, regulations and standards.
5/5/1999

## SEISMIC REFLECTION SECTION




## SEISMIC REFRACTION SECTION




# Line 2A

Puente Hills

Brea Canyon, California

## Pacific Soils Engineering

PUENTE2A Mean Stack
Normal Polarity

### Field Parameters

Spread Configuration: End-on Shots with 24 Groups in Line
Source Interval: 10 Feet  Group Interval: 10 Feet
Source: 20-Pound Sledge Hammer and Metal Plate
Seismograph: Bison 9024
Receiver Groups: two 40-Hz Geophones
Record Length: 375 msec  Sample Rate: 0.25 msec
Field Filter: 96 Hz Low Cut

Data Recorded by Advanced Geoscience and Ryland Associates
1/8/99

### Processing Parameters

SEG-2 Input
Geometry Definition
Time Variant Bandpass
Apply Static Shifts
Apply Mute
CMP Sort
Time Variant Bandpass
Velocity Analysis
NMO Correction
Apply Mute
CMP Stack
Bandpass Filtering
Automatic Gain Control

Data Processed by Advanced Geoscience 4/99

### Display Parameters

| | |
|---|---|
| Inches/second | 18.0 |
| Traces/inch | 6.0 |
| Plot Polarity | Normal |
| Direction | Southwest |

Processed using SPW™ from Parallel Geoscience Corporation

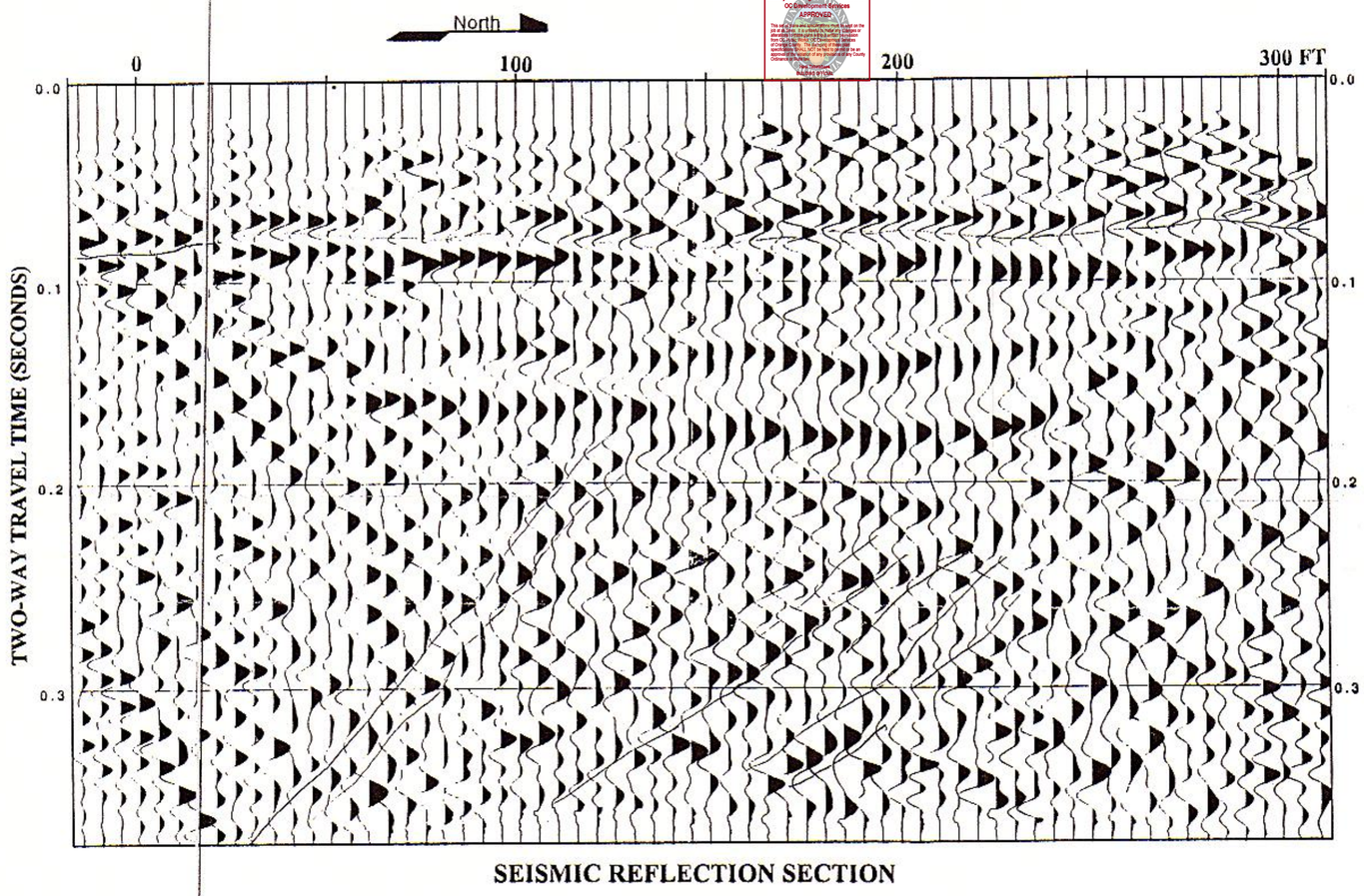
South

RECEIVED
MAY 28 1999
PACIFIC SOILS

*PLATE 3*
*ADVANCED GEOSCIENCE*

Building&Safety: Ryan Rose 10/18/2022
Approval: Geology Reports
Permits: PA170822

County of Orange - OC Public Works
OC Development Services
APPROVED
This set of plans and specifications must be kept on the job at all times. It is unlawful to make any changes or alterations on same, or to deviate therefrom without the approval of the building official, evidenced by the signature of construction. This approval is limited to the specific plans, specifications and/or model listed and is not an approval or authorization to violate any provisions of any County Ordinance or State law.
Chief Building Official




SEISMIC REFLECTION SECTION

# Line 2B

Puente Hills

Brea Canyon, California

## Pacific Soils Engineering

**PUENTE2B CMP Stack**
**Normal Polarity**

### Field Parameters

Spread Configuration: End-on Shots with 24 Groups in Line
Source Interval: 10 Feet Group Interval: 10 Feet
Source: 20-Pound Sledge Hammer and Metal Plate
Seismograph: Bison 9024
Receiver Groups: two 40-Hz Geophones
Record Length: 375 msec Sample Rate: 0.25 msec
Field Filter: 96 Hz Low Cut

Data Recorded by Advanced Geoscience and Ryland Associates 1/8/99

### Processing Parameters

SEG-2 Input
Geometry Definition
Apply Mute
Time Variant Bandpass
Apply Static Shifts
CMP Sort
Time Variant Bandpass
Velocity Analysis
NMO Correction
CMP Stack
Bandpass Filtering
Automatic Gain Control

Data Processed by Advanced Geoscience 4/99

### Display Parameters

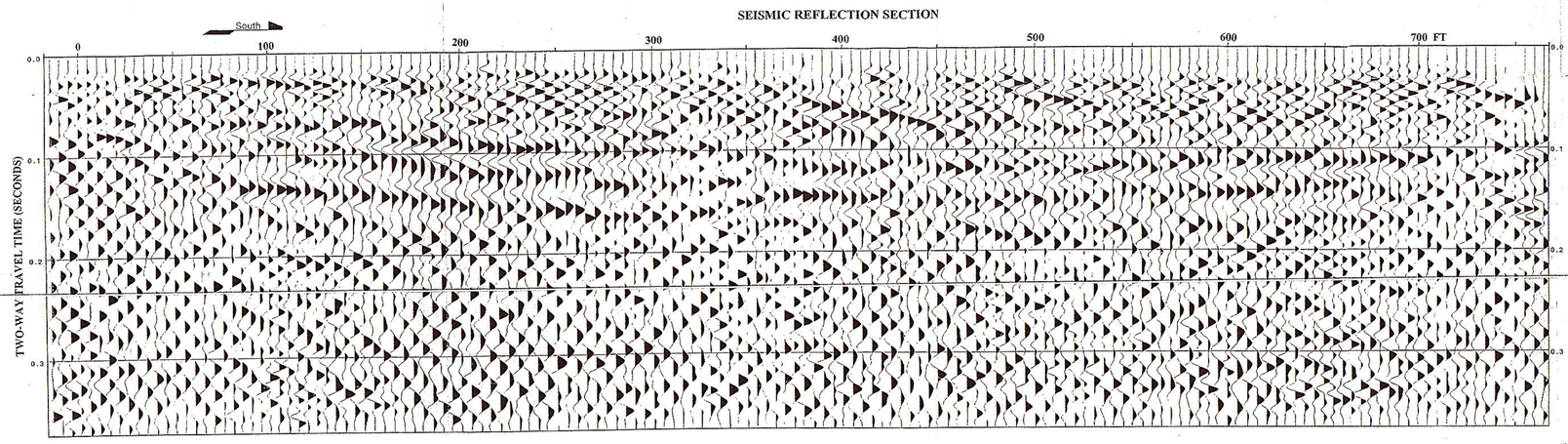
| | |
|---|---|
| Inches/second | 10.0 |
| Traces/inch | 6.0 |
| Plot Polarity | Normal |
| Direction | North |

Processed using SPW™ from Parallel Geoscience Corporation

North

RECEIVED
MAY 2 6 1999
PACIFIC SOILS

***PLATE 4***
***ADVANCED GEOSCIENCE***




# Line 3

Puente Hills

Brea Canyon, California

## Pacific Soils Engineering

PUENTE3 Mean Stack
Normal Polarity

**Field Parameters**

Spread Configuration: End-on Shots with 24 Groups in Line
Source Interval: 10 Feet Group Interval: 10 Feet
Source: DIGIPULSE Accelerated Weight Drop
Seismograph: Bison 9024
Receiver Groups: two 40-HZ Geophones
Record Length: 375 msec Sample Rate: 0.25 msec
Field Filter: 96 Hz Low Cut

Data Recorded by Advanced Geoscience and Ryland Associates
3/9/99

**Processing Parameters**

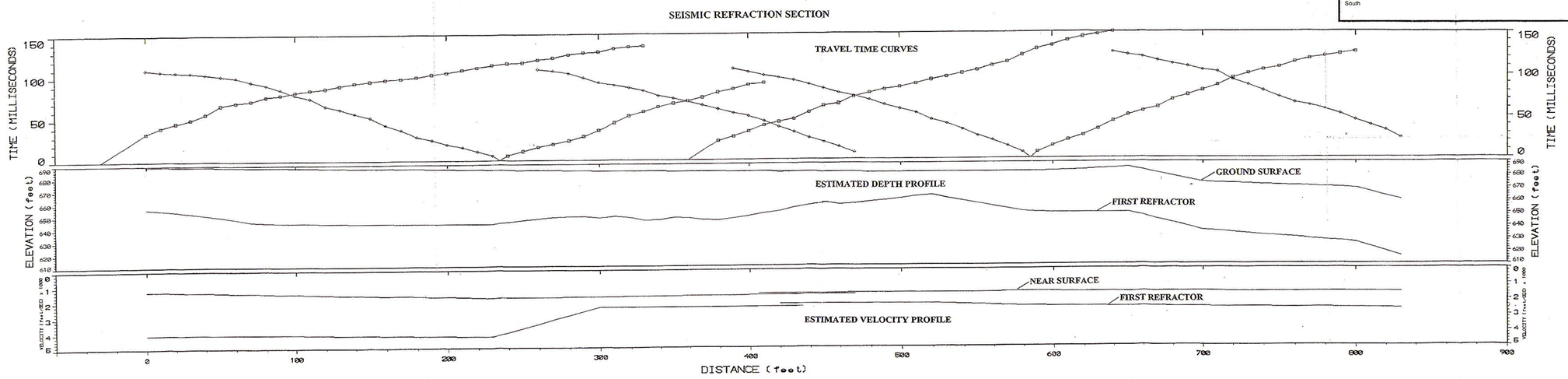
SEG-2 Input
Geometry Definition
Apply Mute
Apply Static Shifts
CMP Sort
Time Variant Bandpass
Velocity Analysis
NMO Correction
CMP Stack
Bandpass Filtering
Automatic Gain Control

Data Processed by Advanced Geoscience 4/99

**Display Parameters**

| | |
|---|---|
| Inches/second | 18.0 |
| Traces/inch | 6.0 |
| Plot Polarity | Normal |
| Direction | South |

Processed using SPW™ from Parallel Geoscience Corporation

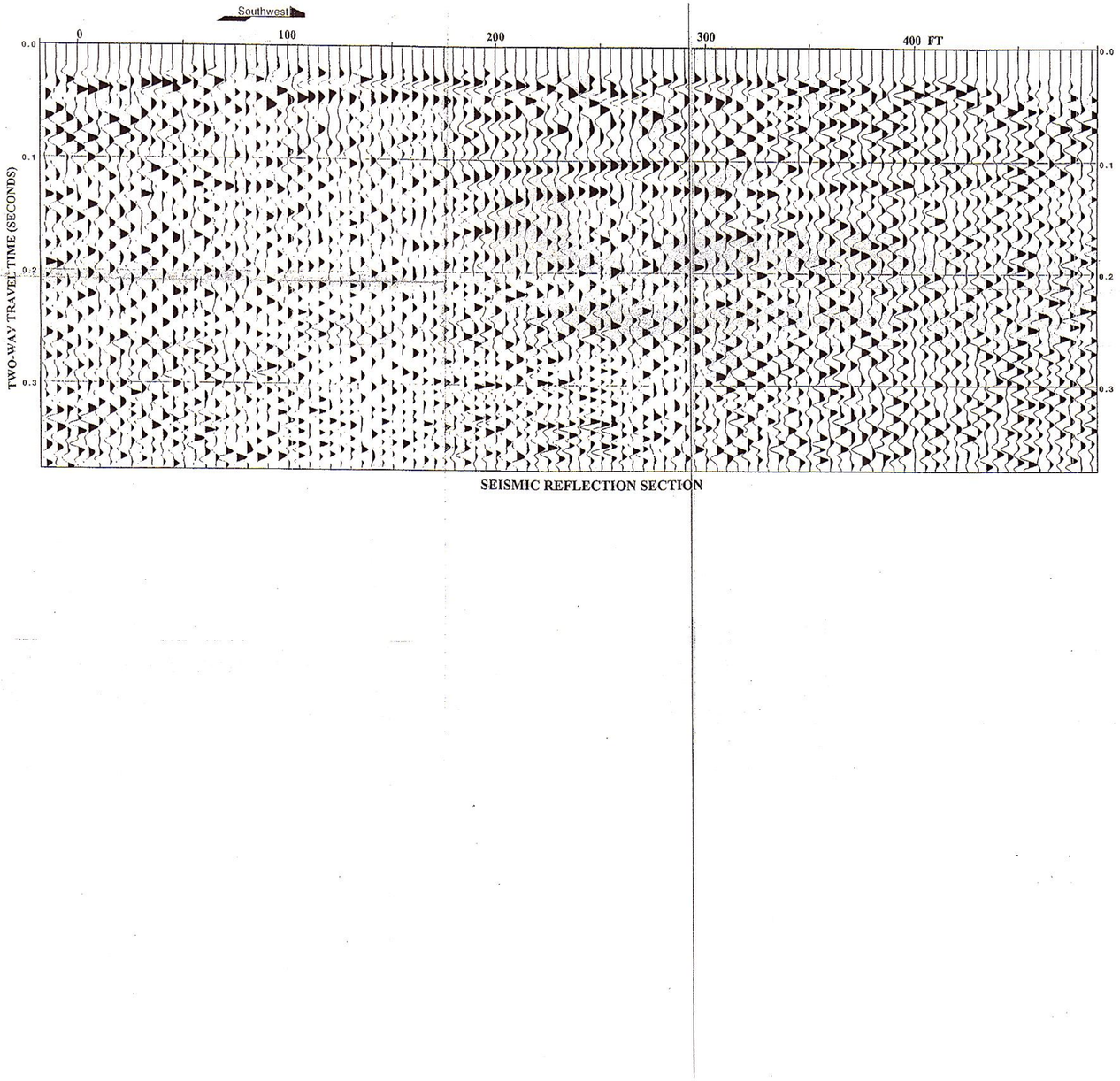



RECEIVED
MAY 20 1999
PACIFIC SOILS

*PLATE 5*
*ADVANCED GEOSCIENCE*

Authorization Expires
Approval Stamp Applies
Permits: 5178982

County of Orange - OC Public Works
Subdivision Notice
APPROVED
The Orange County Subdivision Code requires that the Final Map be recorded within two years after approval or conditional approval of the Tentative Map. Extensions of time may be granted as provided by Section 66452.6 of the Subdivision Map Act.
Failure to record the Final Map within the time limit specified above shall terminate all proceedings.
Public Works




SEISMIC REFLECTION SECTION

# Line 4

Puente Hills

Brea Canyon, California

## Pacific Soils Engineering

**PUENTE4 Mean Stack**
**Normal Polarity**

### Field Parameters

Spread Configuration: End-on Shots with 24 Groups In Line
Source Interval: 10 Feet Group Interval: 10 Feet
Source: DIGIPULSE Accelerated Weight Drop
Seismograph: Bison 9024
Receiver Groups: two 40-Hz Geophones
Record Length: 375 msec Sample Rate: 0.25 msec
Field Filter: 96 Hz Low Cut

Data Recorded by Advanced Geoscience and Ryland Associates
3/10/99

### Processing Parameters

SEG-2 Input
Geometry Definition
Apply Mute
Apply Static Shifts
CMP Sort
Time Variant Bandpass
Velocity Analysis
NMO Correction
CMP Stack
Bandpass Filtering
Automatic Gain Control

Data Processed by Advanced Geoscience 4/99

### Display Parameters

| | |
|---|---|
| Inches/second | 18.0 |
| Traces/inch | 6.0 |
| Plot Polarity | Normal |
| Direction | Southwest |

Processed using SPW™ from Parallel Geoscience Corporation

Southwest

RECEIVED
MAY 20 1999
PACIFIC SOILS

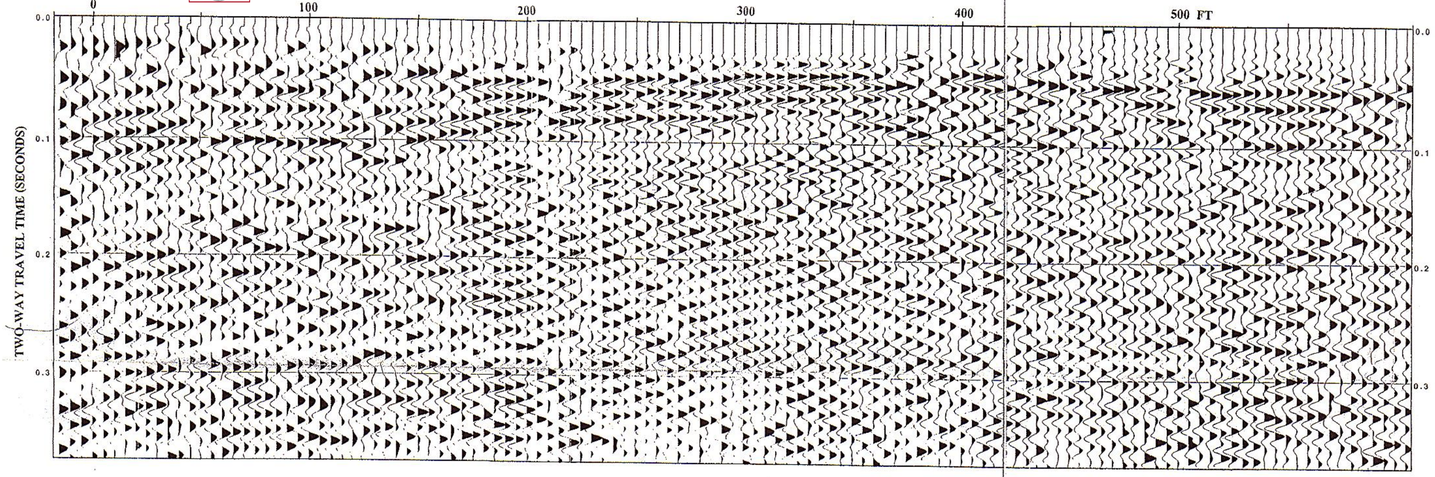
*PLATE 6*
*ADVANCED GEOSCIENCE*

Acknowledgment Date Stamp
Approved Survey Monitor
Permits: 5170/83

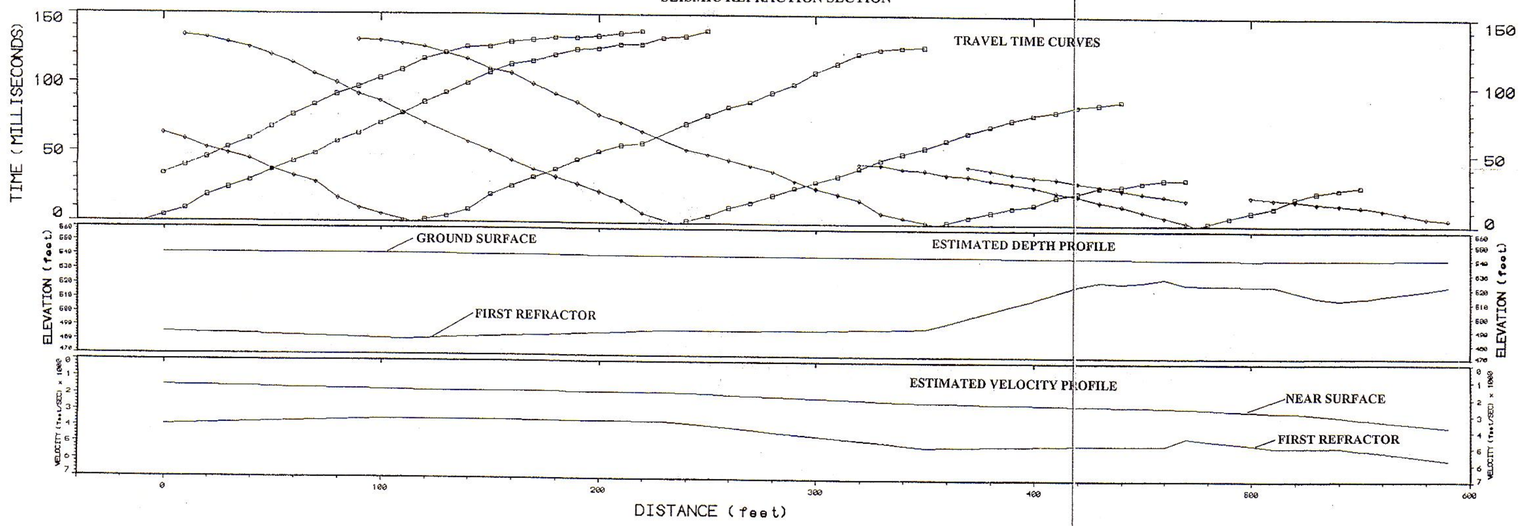
County of Orange - OC Public Works
OC SURVEY
Approved
This approval is limited to the survey monitor
requirements of Section 8771 of the Business
and Professions Code. This approval does not
authorize the violation of any law, ordinance,
regulation or standard. The County of Orange
assumes no responsibility for the completeness
or accuracy of the contents of this document.
Date: 5/20/99
Chief Surveyor

Northeast

SEISMIC REFLECTION SECTION




SEISMIC REFRACTION SECTION




# Line 5

Puente Hills

Brea Canyon, California

## Pacific Soils Engineering

PUENTE5 CMP STACK
Normal Polarity

### Field Parameters

**Spread Configuration:** End-on Shots with 24 Groups in Line
**Source Interval:** 10 Feet — **Group Interval:** 10 Feet
**Source:** Digipulse AWG
**Seismograph:** Bison 9024
**Receiver Groups:** two 40 Hz Geophones
**Record Length:** 375 msec — **Sample Rate:** 0.25 msec
**Field Filter:** 96 Hz Low Cut

**Data Recorded by Advanced Geoscience and Ryland Associates 3/11/99**

### Processing Parameters

**SEG-2 Input**
**Geometry Definition**
**Apply Mute**
**Apply F-K Filter**
**Time Variant Bandpass**
**Deconvolution**
**CMP Sort**
**Velocity Analysis**
**NMO Correction**
**CMP Stack**
**Bandpass Filtering**
**Automatic Gain Control**

**Data Processed by Advanced Geoscience 4/99**

### Display Parameters

| | |
|---|---|
| Inches/second | 18.0 |
| Traces/inch | 6.0 |
| Plot Polarity | Normal |
| Direction | Northeast |

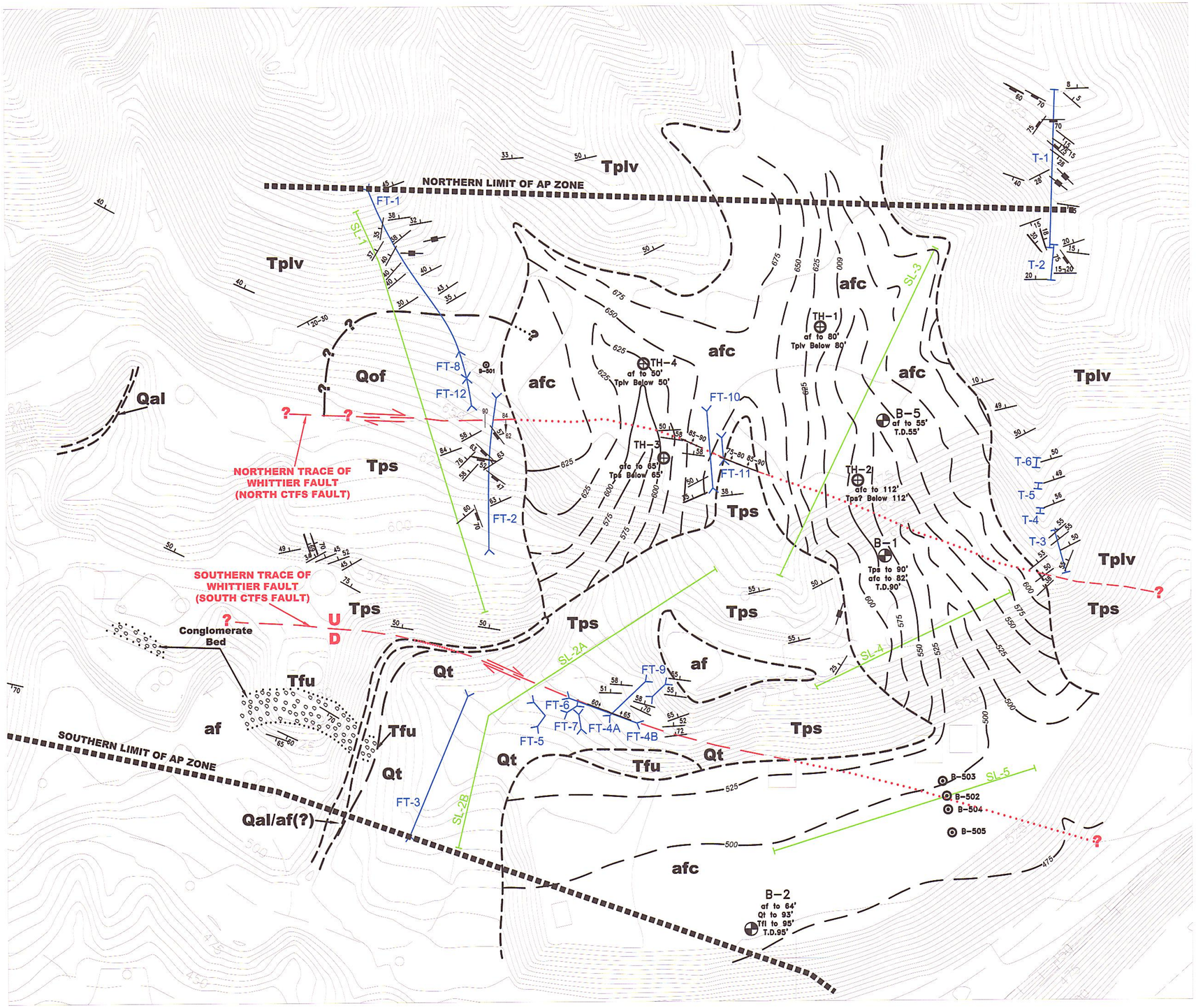
Processed using SPW™ from Parallel Geoscience Corporation

Northeast

RECEIVED
MAY 20 1999
PACIFIC SOILS

*PLATE 7*
*ADVANCED GEOSCIENCE*

Building Safety Plan Review
Approved, Zoning Review
Permits Not Issued
County of Orange - OC Public Works
OC Development Services
This Plan has been reviewed for compliance with applicable codes and ordinances. Approval of this plan does not authorize violation of any codes or ordinances. Approval of this plan does not authorize violation of any codes or ordinances. Approval of this plan does not authorize violation of any codes or ordinances.
Date:




**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (951) 582-0170, FAX: (951) 582-0176
W.O. 102280-F DATE: 10/4/05

PATH: S:\drafting\102280-F\FINAL_OF_10-05\PLATE-1.dwg

PLATE I

GEOLOGIC MAP

## LEGEND

STRATIGRAPHY

HOLOCENE

| | |
|---|---|
| af | ARTIFICIAL FILL |
| afc | COMPACTED ARTIFICIAL FILL |
| Qal | ALLUVIUM |

PLEISTOCENE

| | |
|---|---|
| Qt | TERRACE DEPOSITS (SOUTH OF WHITTIER FAULT ZONE) |
| Qof | OLDER FAN DEPOSITS (NORTH OF WHITTIER FAULT ZONE) |

PLIOCENE

| | |
|---|---|
| Tfu | UPPER FERNANDO FORMATION |

MIOCENE

| | |
|---|---|
| Tps | PUENTE FORMATION – SOQUEL MEMBER |
| Tplv | PUENTE FORMATION – LA VIDA MEMBER |

SYMBOLS

- APPROXIMATELY LOCATED GEOLOGIC CONTACT; QUESTIONED WHERE SURMISED; DOTTED WHERE CONCEALED
- APPROXIMATELY LOCATED FAULT; QUESTIONED WHERE SURMISED; DOTTED WHERE CONCEALED; U=UP, D=DOWN, ARROWS INDICATE RELATIVE SLIP; BARB INDICATES DIRECTION AND AMOUNT OF DIP
- STRIKE AND DIP OF BEDDING
- HORIZONTAL BEDDING
- STRIKE AND DIP OF JOINTS
- STRIKE OF VERTICAL JOINT
- FAULT TRENCH
- EXPLORATION TRENCH
- BORINGS BY PSE
- BORINGS BY SOUTH COAST GEOLOGIC, INC.
- SEISMIC LINE BY ADVANCED GEOSCIENCE, INC.
- PRE-CTFS TOPOGRAPHIC CONTOURS

NOTE: REPRESENTATIVE ATTITUDES SHOWN IN SOME TRENCHES OWING TO SPACE LIMITATIONS

SCALE: 1"=100'

Acknowledged, Kyle Ross 10/19/22
Approved, Geology Reports
Permits 2127802

County of Orange - OC Public Works
OC Development Services
Approved
Permit Number
Date Issued
Issued By
This permit is issued subject to the conditions and limitations set forth in the applicable Orange County Codes, ordinances, and regulations governing the work performed under this permit. Any violation of these conditions, limitations, codes, ordinances, or regulations may result in the suspension or revocation of this permit.
Date Expires
Permit Fee
Valuation




**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (951) 582-0170, FAX: (951) 582-0176
W.O. 102280-F DATE: 10/4/05
PATH: S:\drafting\102280-F\FINAL_OF_10-05\PLATE-1A.dwg

PLATE 1A

## LEGEND

SYMBOLS

0+00 4+00
SL-4

SEISMIC LINE BY ADVANCED GEOSCIENCE, INC. SHOWING END POINT STATION NUMBERS

SCALE: 1"=100'

Bedrock

CTFS

Bedrock

Bedrock

CTFS

Bedrock

CTFS

NORTH FAULT SETBACK ZONE

SOUTH FAULT SETBACK ZONE

NOTE: SETBACK FOOTPRINTS ARE VALID ONLY FOR EXISTING GRADES. SEE TEXT FOR METHODOLOGY FOR "MIGRATING" ZONES AS FINAL GRADES CHANGE.

SCALE: 1" = 100'

# HABITABLE STRUCTURES
# FAULT SETBACK ZONES MAP

PLATE II


PACIFIC SOILS ENGINEERING, INC.
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (951) 582-0170, FAX: (951) 582-0176


W.O. 102280-F DATE: 10/4/05

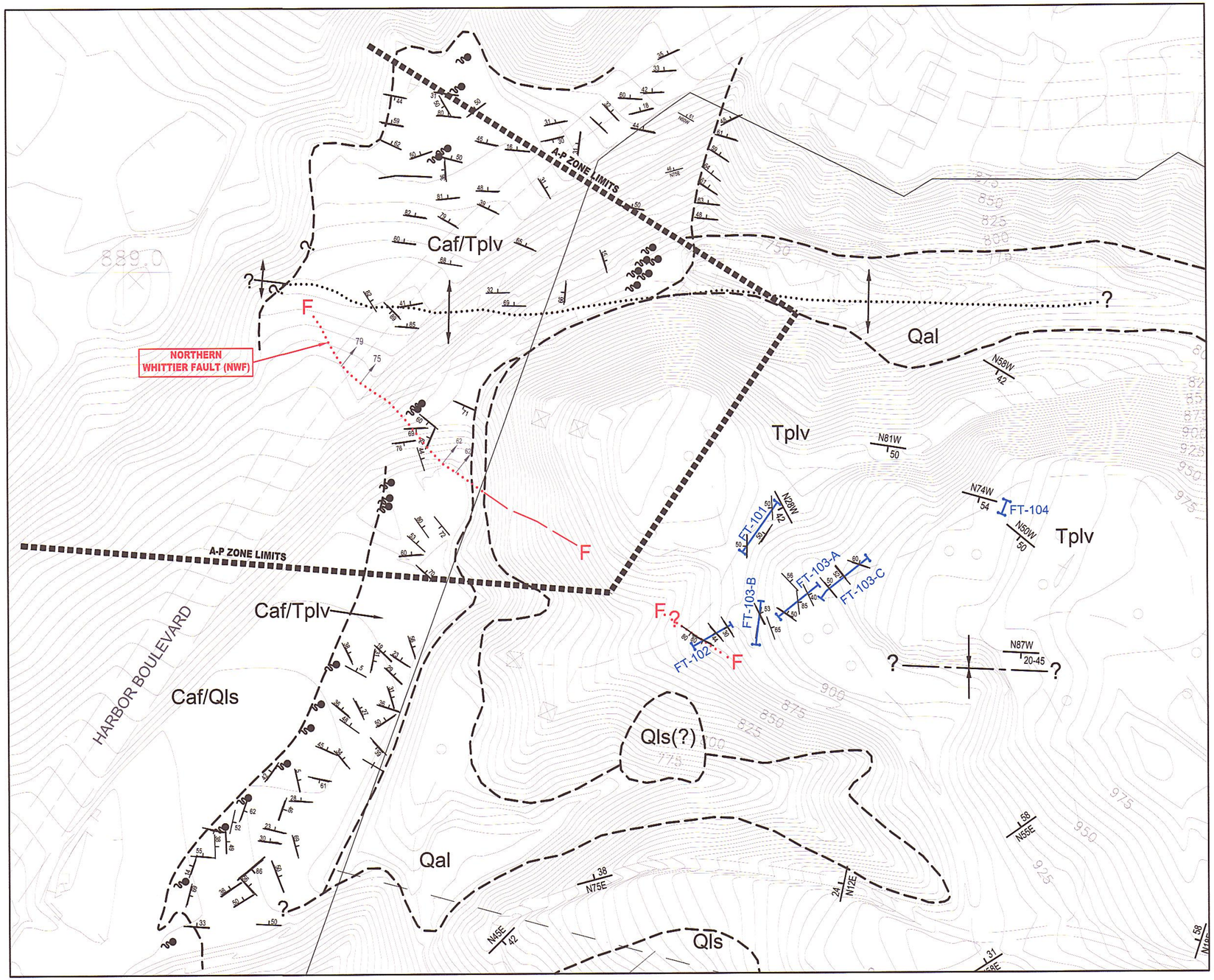
PATH: S:\drafting\102280-F\DRAFT_of_9-23-05\plate 2.dwg

TRENCH LOCATIONS
W.O. Number: 2256-2T
Tracts:

Prepared by: BOB EPSTEIN
Path: M:\BREACYN\TOPO\TOPO
Plot Date: 09-23-99 Sheet 1 of 1

Project: BREACYN
Party Chief: BEN GENTRY
Survey Date: 1/12/99 & 3/12/99

Acknowledgments Date Prep
Approved Geology Reports
Permits 2107000
County of Orange - OC Public Works
OC Development Services
Approved
Subject to the requirements of the Orange County Grading Ordinance and other applicable regulations. Approval does not authorize violation of any laws. Approval shall become void unless work is commenced within 180 days of approval date.
Expiration




**PACIFIC SOILS ENGINEERING, INC.**
710 E PARKRIDGE AVENUE, SUITE 105, CORONA, CA 92879
TELEPHONE: (951) 582-0170, FAX: (951) 582-0176
W.O. 102280-F DATE: 10/4/05

PATH: S:\drafting\102280-F\FINAL_OF_10-05\PLATE-3.dwg

PLATE III

SCHEMATIC GEOLOGIC MAP SHOWING
PSE EXPLORATION, LEIGHTON AND ASSOCIATES (1990)
GEOLOGY ALONG HARBOR BLVD. AND GENERALIZED GEOLOGY

## LEGEND

STRATIGRAPHY

| | |
|---|---|
| Caf | COMPACTED ARTIFICIAL FILL |
| Qal | ALLUVIUM |
| Qls/Qls(?) | LANDSLIDE DEBRIS/QUESTIONED WHERE SURMIZED |
| Tplv | PUENTE FORMATION – LA VIDA MEMBER |
| ?..... | APPROXIMATELY LOCATED GEOLOGIC CONTACT; DOTTED WHERE CONCEALED |
| N12E / 24 | STRIKE AND DIP OF BEDDING (THIS STUDY)/ LEIGHTON AND ASSOCIATES (1990) |
| | STRIKE OF VERTICAL BED |
| F-?-F | NORTH WHITTIER FAULT OF LEIGHTON (1990); QUESTIONED WHERE INFERRED, DOTTED WHERE CONCEALED; BARB INDICATES DIRECTION OF DIP |
| ?..? | APPROXIMATELY LOCATED MAJOR SYNCLINE/ANTICLINE; QUESTIONED WHERE INFERRED, DOTTED WHERE CONCEALED |
| FT-104 | PSE FAULT TRENCH, ONLY REPRESENTATIVE ATTITUDES SHOWN OWING TO SPACE LIMITATIONS |
| | SPRING ENCOUNTERED DURING GRADING |

NOTE: LEIGHTON AND ASSOCIATES (1980) ATTITUDES ARE NOW BURIED BY Caf

SCALE: 1"=100'