# Appendix G Geotechnical Recommendations Report

# Appendices

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# GEOTECHNICAL RECOMMENDATIONS
# 850 SAN CLEMENTE DRIVE
# NEWPORT BEACH, CALIFORNIA

Prepared for:

**RELATED CALIFORNIA**
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GDC Project No. IR634
November 10, 2015

November 10, 2015

Related California
18201 Von Karman Avenue, Suite 300
Irvine, CA 92612

Attention: Steven Oh

Subject: Geotechnical Recommendations
850 San Clemente Drive
Newport Beach, California
GDC Project No IR-634

Dear Mr. Oh:

Group Delta Consultants (GDC) submits our geotechnical report for the proposed structure at 850 San Clemente Drive in Newport Beach, California. The work was performed in general accordance with our proposal dated August 18, 2015, and your subsequent authorization. The project will consist of the construction of 26-story residential condominium structure. The proposed structure includes two levels of subterranean parking.

Construction of the proposed structure is feasible from a geotechnical perspective provided the recommendations contained in this report are incorporated into the design.

If you have any questions regarding this report, please feel free to call the undersigned at (949) 450-2100.

Yours Sincerely,
Group Delta Consultants, Inc.

REGISTERED PROFESSIONAL ENGINEER
ANTHONY AUGELLO
C 55314
Exp. 12/31/16
CIVIL
STATE OF CALIFORNIA

Anthony Augello, Ph. D., P. E.
Associate Engineer

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**GEOTECHNICAL RECOMMENDATIONS**
**850 SAN CLEMENTE DRIVE**
**NEWPORT BEACH, CALIFORNIA**

## 1.0 INTRODUCTION

This report presents our recommendations for the foundation design of the proposed improvements consisting of a 26-story, high rise residential structure with two levels of underground parking at 850 San Clemente Drive, Newport Beach, California. The vicinity map and site location are shown on Figure 1. The exploration locations are shown on Figure 2.

### 1.1 Objective of the Geotechnical Evaluation

The objective of this report is to provide site-specific geotechnical recommendations for the final design and construction of the proposed structure.

### 1.2 Scope of Work

Our scope of work for the site addresses the following:

- Existing subsurface and groundwater conditions;
- Geologic and seismic hazards;
- Seismic design parameters and response spectra per CBC 2010;
- Foundation recommendations for bearing capacity and settlement of spread footings and/or mat foundations;
- Design and construction issues related to the excavation ;
- Soil corrosivity with respect to concrete and buried metals;
- Hardscape recommendations; and
- Pavement design.

Our scope of services includes preparing this report documenting our analysis and recommendations.

### 1.3 Project Description

The site is located at 850 San Clemente Drive in the City of Newport Beach, CA. The site is currently occupied by the Orange County Museum of Art. The ground surface elevation at the site varies from about EL 175 feet to EL 180 feet above mean sea level. The site is bounded to the north by San Joaquin Plaza, a new apartment community consisting of 7 four story wood framed structures. San Joaquin Plaza is currently under construction. To the south, the site is bounded by San Clemente Drive. To the east the site is bounded by a multi-story parking structure and to the west by a multi-story office building.

The project consists of development of 26-story high rise building with two basement levels. The proposed building will be 297 feet high. The top of the basement floor is currently planned at Elevation 165 feet.

## 2.0 GEOTECHNICAL INVESTIGATION

### 2.1 Field and Laboratory Investigation

The purpose of the soil borings was to evaluate the subsurface conditions within the proposed project site and collect soil samples for laboratory tests to evaluate the engineering characteristics of the underlying soils. The drilling program was performed on September 14th and September 16th, 2015. The drilling program consisted of advancing two boreholes to a depth of 51.5 feet, and one borehole to a depth of 95.5 feet below the existing ground surface. Boreholes were labeled A-15-001 through A-15-003.

The borings were advanced by ABC Liovin Drilling, Inc. of Signal Hill, California using a truck-mounted CME-85 hollow-stem auger drill rig. The drill rig was equipped with 5-feet long augers of 7.25-inch outside diameter (O.D.) and 3.25-inch inside diameter (I.D.), and a custom-made 4-claw bit. Samples were obtained using an unlined standard penetration test (SPT) sampler consisting of a 2-inch O.D., 1.4-inch I.D. split barrel shaft advanced into the soils at the bottom of the boring a total of 18-inches.

A modified California sampler was also used to obtain samples of the soils encountered. This sampler consists of a three-inch O.D., 2.4-inch I.D. and 24 inch long split barrel driven a total of 18 inches into the soil at the bottom of the borehole. The sampler was lined with three 2.4-inch diameter, 6-inch long rings located inside the split barrel shaft which were used to retain soil for laboratory tests as well as visual classification in the field.

Both samplers were driven into the soil using a 140-pound hammer free-falling a vertical distance of 30 inches. The number of hammer blows required to drive the sampler in three six inch segments, blow count, were recorded during sampling. The combined blow count for the final two six inch segments using the standard sampler is referred to as the SPT N-value. The combined blow count for the final two six inch segments using the modified California sampler has to be corrected to an equivalent the SPT N-value. Sampling procedures employed in the field were generally consistent with those described in ASTM D1586.

Samples were collected at five-foot intervals. Soil collected inside the split barrel shaft was visually classified in the field, placed in sealed plastic bags and stored for future reference and laboratory testing. The logs of the borings are presented in Appendix A. The soils were described in general accordance with ASTM D2487. The boundaries between different soil and rock types shown on the logs are approximate because the actual transition between layers may be gradual.

The two shallow borings were backfilled with soil cuttings. Asphalt pavement where boreholes were advanced was repaired with cold patch asphalt mix. The 95.5-foot deep borehole had a 4-inch diameter PVC casing installed to measure shear wave velocity. The annulus between the casing and the borehole wall was backfilled with cement grout. A well box was placed that the ground surface. Soil cuttings from the deep borings were placed in eight 55-gallon, open-head, steel drums and stored on site for later disposal.

### 2.2 Soil Disposal

The soil cuttings collected at the site and stored in 55-gallon drums where disposed of following standards set by Water Quality Section of the Orange County Department of Environmental Health. Soil cuttings and transported to a landfill and properly disposed of by American Integrated Services of Wilmington, California.

## 3.0 SUBSURFACE CONDITIONS

### 3.1 Regional Geology

The site is located within the Los Angeles Basin which is part of the Peninsular Range Geomorphic Province of California. The Peninsular Ranges are characterized by a series of northwest trending mountain ranges separated by valleys. Range geology consists of granitic rock intruding the older metamorphic rocks. Valley geology is typified by shallow to deep alluvial basins consisting of gravel, sand, silt, and clay.

Specifically, the site is located at the southern margin of the Los Angeles Basin, which ends abruptly with the Newport-Inglewood uplift. The uplift is characterized by costal mesas of late Miocene to early Pleistocene marine sediments and late Pleistocene marine terrace deposits. A Regional Geologic Map is presented in Figure 3.

Based on the geologic maps, the site is situated on marine terrace deposits of late Pleistocene. The near surface soils are characterized by dense to very dense, fine to medium sand. These sediments overlie shallow bedrock of the Monterey Formation. The Monterey Formation consists of sandstone, siltstone and claystone. In this area, the Monterey Formation is primarily claystone and siltstone.

The site is in a seismically active area. A Regional Fault Map is shown in Figure 4. Faults in the site vicinity include the Newport - Inglewood fault (N. Los Angeles Basin and S. Los Angeles Basin Section – Northern and Southern), the San Joaquin Hills Blind Thrust Fault, and the Elsinore Fault (Whittier Section). No active faults are known to cross the project site. The closest fault to the site is the Newport - Inglewood fault, located at a distance of approximately 2.7 miles to the southwest. In this area, the Newport - Inglewood fault is located offshore.

### 3.2 Subsurface Conditions

The soils at the site were marine terrace sand deposits which overlie bedrock of the Monterey Formation. The Marine Terrace deposits are generally medium dense to dense fine to medium sand with varying amounts of gravel. The Monterey Formation stiff to hard claystone. The clay is a highly plastic and expansive.

The bedrock was encountered at approximately EL 155 feet in boring A-15-001, approximately El 158 feet in boring A-15-002, and approximate El 151.5 feet in boring A-15-003. Figure 5 shows several cross sections through the site. The east cross section (second from the top) shows the core of the tower will be founded several feet into the weathered bedrock.

### 3.3 Groundwater

The historic groundwater at the site is deeper than 50 feet. Groundwater at the site is like controlled by the ocean located approximately 2 miles to the south. Perched water was encountered at approximately 42 feet below the site grade (approximate El 136 feet) in boring A-15-002 at the time of drilling. One week after drilling on September 21st, water was encountered at a depth of 23 feet (approximate El 155 feet) in the casing.

Groundwater water was encountered at a depth of 49 feet (approximate El 129 feet) in boring A-15-003. The groundwater pressure was not given time to equalize in the boring as it was backfilled immediately. It is likely that given, the groundwater elevation would have risen in this boring.

Groundwater water was not encountered in boring A-15-001.

The perched groundwater is complex and likely controlled by fractures in the rock. Given the rise in perched groundwater elevation in boring A-15-002, water will impact the construction and need to be controlled during construction.

### 3.4 Seismic Survey

A downhole seismic survey was performed at the site on September 21, 2015 by Subsurface Surveys of Carlsbad, California. The seismic survey was performed to measure the compression (P) and shear wave (S) velocities of the soil and the rock. The results of the seismic survey are included in Appendix B. The seismic survey is performed by lowing a probe into a PVC casing. At 5-foot intervals, a source (steel beam) is struck on the ground surface. The time to the first wave P- and S-wave arrival is measured at depth in the casing. The probe is then lowered an additional 5 feet and the process is repeated. Because of the perched groundwater in the hole, the S-wave velocity could not be measured below 20 feet. The S-wave velocity can be calculated provided the Poisson's ratio of the soil / rock is known or can be estimated.

The shear wave velocity in the upper 20 feet of soil at the site varied from 1,360 feet/second to 1,700 feet per second. The P-wave velocity from 20 to 40 below ground surface ranged from 2,200 to 2,780 feet/second. Assuming a Poisson's ratio equal to 0.5, the shear wave velocity of the rock ranged from 1200 to 1,600 feet/second. Below 60 feet, the bedrock as a shear wave velocity greater than 3,600 feet/second. P-wave measurements were made to a depth of 90 feet below ground surface. Based on the measured and calculated S-wave values, the average S-wave velocity in the upper 90 feet is approximately 2,285 feet/second. This is consistent with Site Class C soils in the 2013 California Building Code. A Site Class C soil profile is considered stiff soil / soft rock. The shear wave velocity of a Site Class C soil profile ranges from 1,200 to 2,500 feet per second. Because the average S-wave velocity in the upper 90 feet is approximately 2,285 feet/second, the site can be considered a soft rock profile.

## 4.0 DISCUSSION AND RECOMMENDATIONS

### 4.1 Potential Seismic Hazards

Potential geologic and seismic hazards for any site include ground rupture, slope stability, liquefaction and seismic compaction, tsunamis/flooding, and seismic shaking.

#### 4.1.1 Ground Surface Rupture

The site is not located within an Alquist-Priolo Earthquake Fault Zone. The closest fault is the Newport-Inglewood Fault Zones are located at distances of about 2.7 miles from the site. Due to lack of any known active fault crossing the site, fault rupture hazard at the site is considered remote.

### 4.2 Seismic Slope Stability

The site is generally level and no post-construction slopes are planned. The site is located at the top of a mesa, however, the site is not located near the mesa slopes adjacent to Upper Newport Bay. Therefore, slope stability is not considered a hazard at the site. This is consistent with the California Seismic Hazard Zone Map for the Newport Beach 7.5-minute Quadrangle shown in Figure 4, which shows that the site is not within a seismic-induced landslide hazard zone area.

#### 4.2.1 Liquefaction Potential

Liquefaction involves the sudden loss in strength of a saturated, cohesionless soil (sand and non-plastic silts) caused by the build-up of pore water pressure during cyclic loading, such as produced by an earthquake. This increase in pore water pressure can temporarily transform the soil into a fluid mass, resulting in vertical settlement and can also cause lateral ground deformations.

Typically, liquefaction occurs in areas where loose to medium dense sands and silts are present, and where the depth to groundwater is less than 50 feet below ground surface.

The site is not located in a State of California designated Liquefaction Hazard Zone. This is reasonable given that the historic high groundwater table is deeper than 50 feet at the site and the soils at the site are dense to very dense. The marine terrace deposits at the site are medium dense to dense. The sands are located about the groundwater table. As a result the marine terrace deposits are not subject to liquefaction.

Strong shaking should be anticipated during the design life of the project and compaction of sands and silty sands may occur during a major seismic event. The estimated seismic compaction at the site is small (less than an inch).

### 4.2.2 Other Seismic Hazards

All low-lying areas along California's coast are subject to potentially dangerous tsunamis. Due to the distance from the ocean and site elevation (EL. 180 feet), tsunamis are not a hazard at the site.

## 4.3 2013 CBC Seismic Design

The bases for the 2013 California Building Code (CBC) seismic design are 5%-damped spectral accelerations for 0.2-seconds ($S_S$) and 1- second ($S_1$) at a rock site (Site Class B). These 5%-damped spectral accelerations are established for a risk-adjusted Maximum Considered Earthquake (MCER). Typically, the MCER spectral accelerations have a mean return period of 2,475 years (2% probability of being exceeded in 50 years). At some locations, the 2,475-year ground motions are capped by deterministic ground motions. The values for $S_S$ and $S_1$ were determined using the US Seismic Design Maps application (http://earthquake.usgs.gov/designmaps/us/application.php) provided by the United States Geological Survey (USGS). Site coefficients ($F_a$ and $F_v$) were used to scale the spectral accelerations as a function of Site Class to develop a Site-specific, 5%-damped acceleration response spectrum. Table 1 provides the recommended 2013 CBC seismic design parameters for the Site based on the available geotechnical information and on Section 1613 of the 2013 CBC. Figure 6 shows the MCER and design

**Table 1: 2013 California Building Code (CBC) Seismic Design Parameters spectral accelerations from**

| 2013 CBC Seismic Design Parameter | Value |
|---|---|
| Site Class | C |
| Site Class B, 5%-damped, 0.2-sec spectral acceleration ($S_S$) | 1.67g |
| Site Class B, 5%-damped, 1-sec spectral acceleration ($S_1$) | 0.61g |
| Site Class B, 5%-damped, maximum considered earthquake geometric mean ($MCE_G$) peak ground acceleration | 0.65g |
| Site Coefficient, $F_a$ | 1.0 |
| Site Coefficient, $F_v$ | 1.3 |
| Site Coefficient, $F_{pga}$ | 1.0 |

Since the height of the proposed building is taller than 250 feet, seismic design may follow the guidelines "An Alternative Procedure for Seismic Analysis and Design of Tall Buildings located in the Los Angeles Region" dated May 8, 2015 and prepared by the Los Angeles Tall Buildings Structural Design Council. The City of Los Angeles Department of Building and Safety has approved this approach in the Information Bulletin P/BC 2011-123. This performance based design approach often results in a reduction in the seismic design loads as compared with the CBC.

## 4.4 Mat Foundations

The proposed structures can be supported on mat foundations. The bedrock is generally highly expansive. However, the weight of the high rise structure should be sufficient to prevent soil expansion.

The modulus of subgrade reaction concept can be used in the mat foundations. The modulus of subgrade reaction is not an intrinsic property of the soil/rock since it also depends on the dimensions and stiffness of the slab and the stress level. The modulus of subgrade reaction can be calculated as follows:

$$k = k_1 \left(\frac{B_1}{B}\right)$$

where:

k = static, vertical modulus of subgrade reaction for the loaded slab;
$k_1$ = static, vertical modulus of subgrade reaction obtained from a plate-load test using a a 1-foot by 1-foot, or other size load plate;
$B_1$= side dimension of the square base used in the load test to produce $k_1$
B = effective width of the slab's reaction area (in feet) calculated using the Vesic's criteria (Scott 1981).

$$B = \frac{4h}{\pi} \sqrt[3]{\frac{E}{E_S}}$$

h = slab thickness (in feet);
E = elastic modulus of concrete slab; and
$E_S$ = elastic modulus of subgrade soil.

The representative plate diameter, B, was derived for the case in which the subgrade can be described by a modulus $E_s$ constant to a depth of about 10 characteristic lengths below the surface. If the value of Es increases, or varies with depth without abrupt changes, the equation for B can still be used provided an average value of $E_s$ is taken for the material to a depth of 2.5 characteristic lengths. This enables a representative value of k to be obtained when the modulus generally increases with depth.

GDC recommends that a $k_1$ of 500 kips per cubic foot (kcf) and a $E_S$ of 6,000 kips per square foot (ksf) be used to evaluate the modulus of subgrade reaction for the mat foundation.

All foundation excavations should be observed and/or tested by GDC before placement of concrete to verify that the foundations will be supported in competent soils. If soft or loose soils are encountered in local areas at the bottom of the excavation, they should be removed and replaced with suitable soils to provide a firm and unyielding bottom.

The structural engineer has informed GDC the maximum anticipated static bearing pressure beneath the building core is approximately 10 ksf. The mat foundation for this part of the building will be founded on bedrock. Based on the modulus of the rock, the settlement of the mat foundation is anticipated to be on the order of one to two inches. The structural engineer has informed GDC bearing pressure beneath the remainder of the building is approximately 6 ksf. The settlement of the mat foundation in this area is expected to be one inch or less. Areas outside the building footprint (the parking structure) will be founded in the dense alluvial soils. The bearing pressure beneath the parking structure is small (approximately 1.5 ksf). In this area the settlements are expected to be minimal.

#### 4.4.1 Subgrade Preparation

Because the soils at the base of the excavation are cohesive, to protect the subgrade during construction, we recommend that the final subgrade excavation be made with a smooth edge bucket. The surface of the excavation should covered with a mud mat / rat slab consisting of two inches of concrete.

Due to the presence of perched groundwater along the soil bedrock interface, existing structures surrounding the site are have permanent subdrains below the foundation. The subdrains consist of trenches approximately 3 feet deep backfilled with granular soils. At the base of the trench is a 4-inch perforated pipe surrounded by a Class II permeable base and wrapped in filer fabric. The trenches are slope to drain to a sump. The structure at 670 Newport Center Drive installed wells to intercept the perched groundwater below the building.

#### 4.4.2 Lateral Resistance

Mat foundations may derive lateral load resistance from passive resistance along the vertical sides of the foundations, we recommend an ultimate passive fluid pressure of 350 pounds per cubic foot (pcf). We recommend an ultimate sliding friction coefficient of 0.45 for design. Passive and sliding resistance may be used in combination without reduction. The required factor of safety is 1.5 for static loads and 1.1 for wind or seismic loads.

#### 4.4.3 Infiltration

Because the basement excavation depth is very close to weathered bedrock elevation, infiltration basins are not feasible at the site. As discussed above. The weathered bedrock is a stiff to hard claystone. The permeability of these soils is low and percolation is not feasible.

### 4.5 Earthwork and Grading

We have assumed that the depth of the excavation will be approximately 20 to 25 feet below current grade. The borings performed at the area of the site were advanced using a track-mounted hollow stem auger drill rig or bucket auger drill rigs. Drilling was completed with moderated effort through the existing soils and rock in the area. Therefore, conventional earth moving equipment (i.e., scrapers, dozers, excavators) will be capable of performing a portion of the excavations required for the development. All surface water should be diverted away from excavations.

Excavation will be readily accomplished with light to heavy effort using conventional heavy-duty grading equipment such as scrapers, loaders, dozers, and excavators. Concrete, brick, old foundations, tanks, or other debris from the previous buildings/basements at the site may be encountered during the excavations.

We recommend foundations be supported on the native bedrock. The subgrade soils should be observed and verified appropriate by GDC for support of mat foundation. If loose disturbed or otherwise unsuitable soils are found at the subgrade level, these soils shall be removed or brought to near-optimum moisture content ($\pm$2%), recompacted, and tested to a minimum of 95% relative compaction prior to placement of fill or footing or floor slab construction. Only granular soils should be used for compacted fill.

### 4.6 Basement Excavation

The current conceptual drawing show the basement excavation extending to the property line, as a result shoring is required to support the excavations. Cantilever, tied-back or internally braced shoring systems may be used for the basement excavation. Cantilever shoring systems are typically limited to a maximum retained height of 15 feet. Tied-back shoring walls will require a temporary or permanent easement from the adjacent property owners and the City of Newport Beach.

The shoring system can be designed to resist a uniform pressure equal to 25 H psf. An allowable passive earth pressure of 200 psf per foot of depth below the bottom of the excavation should be used for design of the shoring system. The allowable passive pressure for each pile can be assumed to act over a horizontal distance of two times the concreted pile diameter or equal to the spacing between adjacent piles, whichever is less. For piles spaced closer than three diameters, a reduction in the allowable passive earth pressure may be necessary. GDC recommends that the upper 1 foot below the bottom of the excavation be neglected in the passive resistance calculations. The passive pressure should not exceed 4,000 psf.

The building is located approximately 26 feet from the property line. In this area it may be possible to excavate to the subgrade elevation without the use of shoring. Temporary slope in the Marine Terrace deposit may be excavated at an inclination of 1H: 1V. Alternatively, sloped excavations may be used to reduce the height of the shored excavation. In the case, the earth pressures above may be increased. The increase in earth pressure will be handled on a case by case basis when the height of the sloped excavation is known.

The shoring recommendations presented above are for level ground behind the shoring system. It is also assumed that no material or equipment will be stockpiled within a distance of one times the excavation depth behind the wall. The shoring walls should be designed for additional lateral pressures if this assumption is not met.

### 4.7 Lateral Earth Pressures for Basement Walls

For design purposes, the at-rest earth pressure exerted on the basement walls can be taken as that exerted by an equivalent fluid having a unit weight of 60 pcf. This recommended values does not include compaction-, truck-, or building-induced wall pressures or water pressures. Additional loads on retaining walls may be imposed by surcharges.

Under earthquake loading, basement retaining walls will be subjected to an additional lateral force equal to $30H^2$ pounds per linear foot of wall, where H is the height of the wall in units of feet. This force should be applied at a point located 0.6H above the base of the wall and it acts in addition to the static lateral pressures discussed above.

The recommended lateral earth pressures provided herein assume that there is no the buildup of hydrostatic pressures. It is recommended that the basement walls be waterproofed. If necessary, a geosynthetic drain can be placed behind the waterproofing.

## 4.8 Utility Trenches

### 4.8.1 Excavation and Shoring

Excavations for utility trenches should be achievable with conventional excavating equipment. All shoring and excavation should comply with current OSHA regulations and observed by the designated competent person on site.

### 4.8.2 Bedding

The bedding zone shall be defined as the area containing the material specified that is supporting, surrounding, and extending to 1 foot above the top of the pipe. The bedding shall satisfy the requirements of the Standard Specifications for Public Works Construction (SSPWC) Section 306-1.2.1. There shall be a 4-inch minimum of bedding below the pipe and 1-inch minimum clearance below a projecting bell. There shall be a minimum side clearance of 6 inches on each side of the pipe. Bedding material shall be sand, gravel, crushed aggregate, or native free-draining material having a sand equivalent of not less than 30, or other material approved by the engineer. We recommend that the materials used for the bedding zone be placed and compacted with light mechanical means to reduce the potential of damaging the pipe. Jetting shall not be allowed.

### 4.8.3 Backfill

Backfill shall be considered as starting 12 inches above the pipe. On-site excavated materials are suitable as backfill. Any boulders or cobbles larger than 3 inches in any dimension should be removed before backfilling. We recommend that all backfill be placed in loose lifts not exceeding 6 to 8 inches in thickness and be compacted to at least 90% relative compaction. The upper 12 inches below pavement should be compacted at least to 95% relative compaction. Mechanical compaction will be required to accomplish compaction above the bedding along the entire pipeline alignments.

In backfill areas, where mechanical compaction of soil backfill is impractical due to space constraints, sand-cement slurry may be substituted for compacted backfill. The slurry should contain one sack of cement per cubic yard and have a maximum slump of 5 inches. When set, such a mix typically has the consistency of hard compacted soil and allows for future excavation.

A lean non-shrink concrete plug with a minimum width length of 3 feet should be placed in the utility trenches at the location where off-site utilities enter the project boundaries to minimize the potential for off-site water traveling along the utility trenches entering the site.

### 4.9 Soil Corrosivity

## 5.0 LIMITATIONS

Our investigation was performed in accordance with generally accepted geotechnical engineering principles and practice. The professional engineering work and judgments presented in this report meet the standard of care of our profession at this time and at this location. No other warranty, expressed or implied, is made.

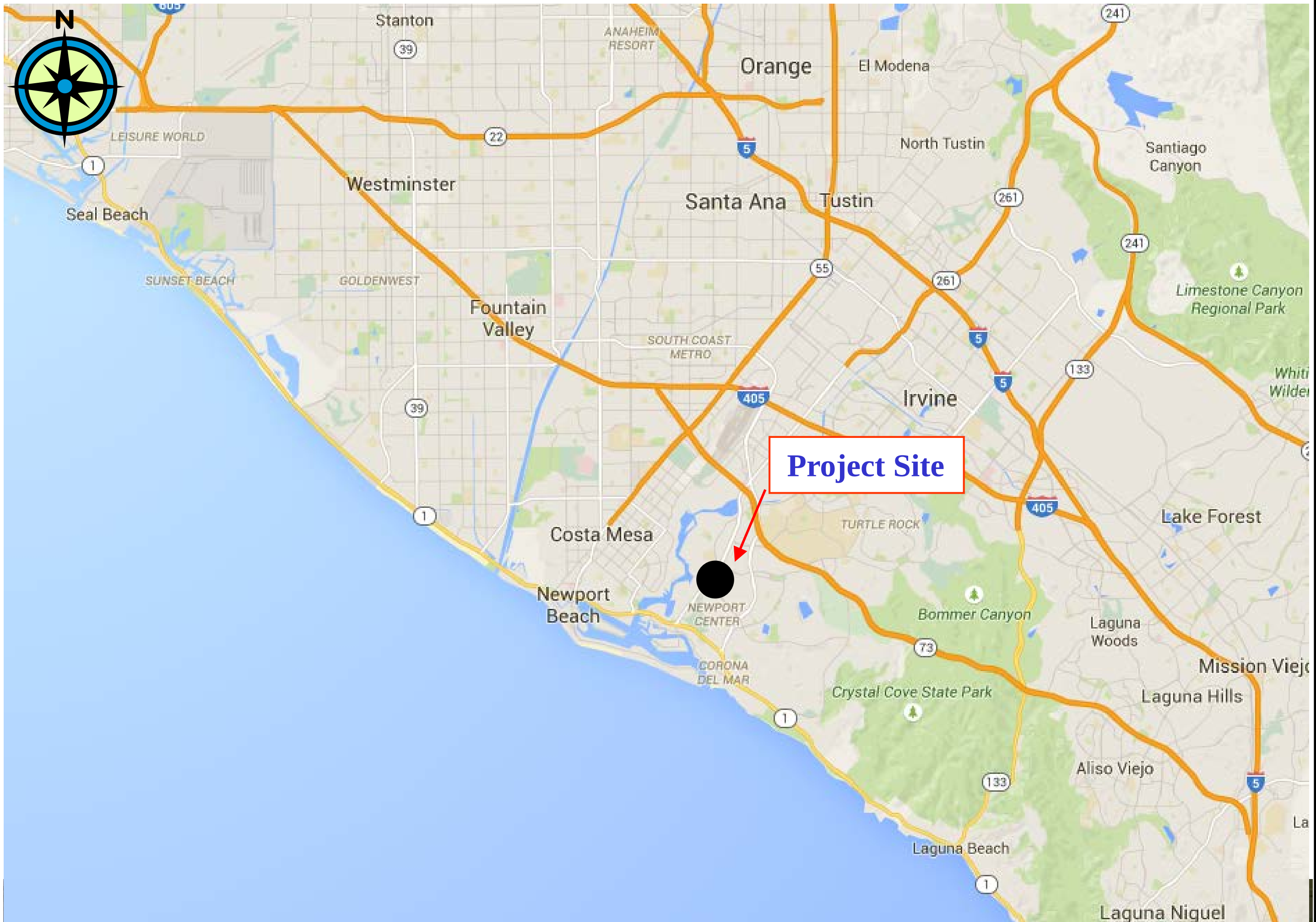
## 6.0 REFERENCES

American Society for Testing and Materials, ASTM International (ASTM), 2008, Annual Book of Standards, Volumes 4.08 and 4.09, Soil and Rock.

Bowles, J.E., "Foundation Analysis and Design," 5th Edition, McGraw Hill, New York, 1996.

California Building Code 2013, California Code of Regulations Title 24, Part 2, Volume 2 of 2.
California Geological Survey (CGS), Department of Conservation," Seismic Hazard Evaluation of the Newport Beach Quadrangle, Anaheim 7.5-Minute Quadrangle and Portions of Adjacent Quadrangles."

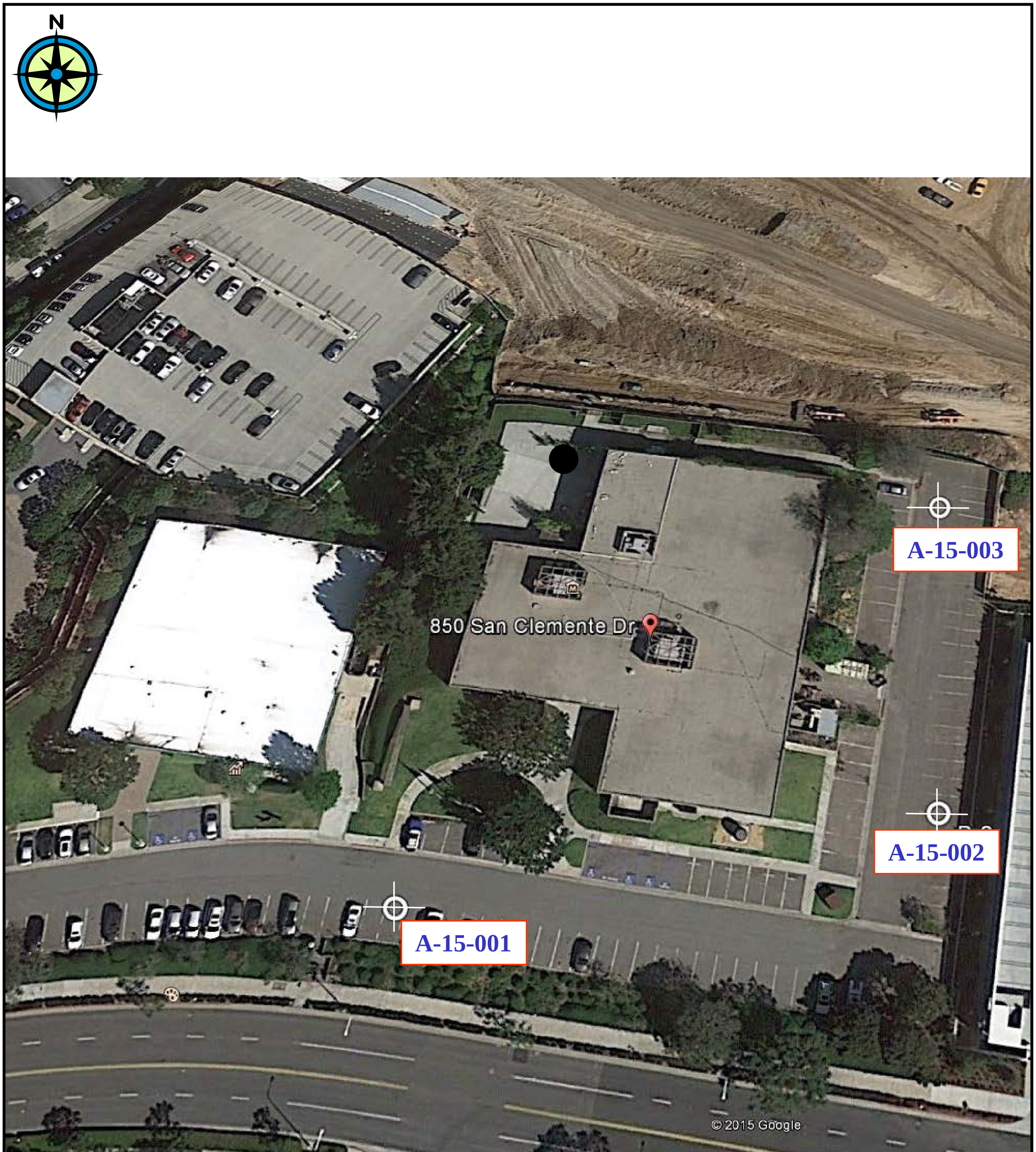
## *Figures*





*Reference: Images taken from Google Maps.*

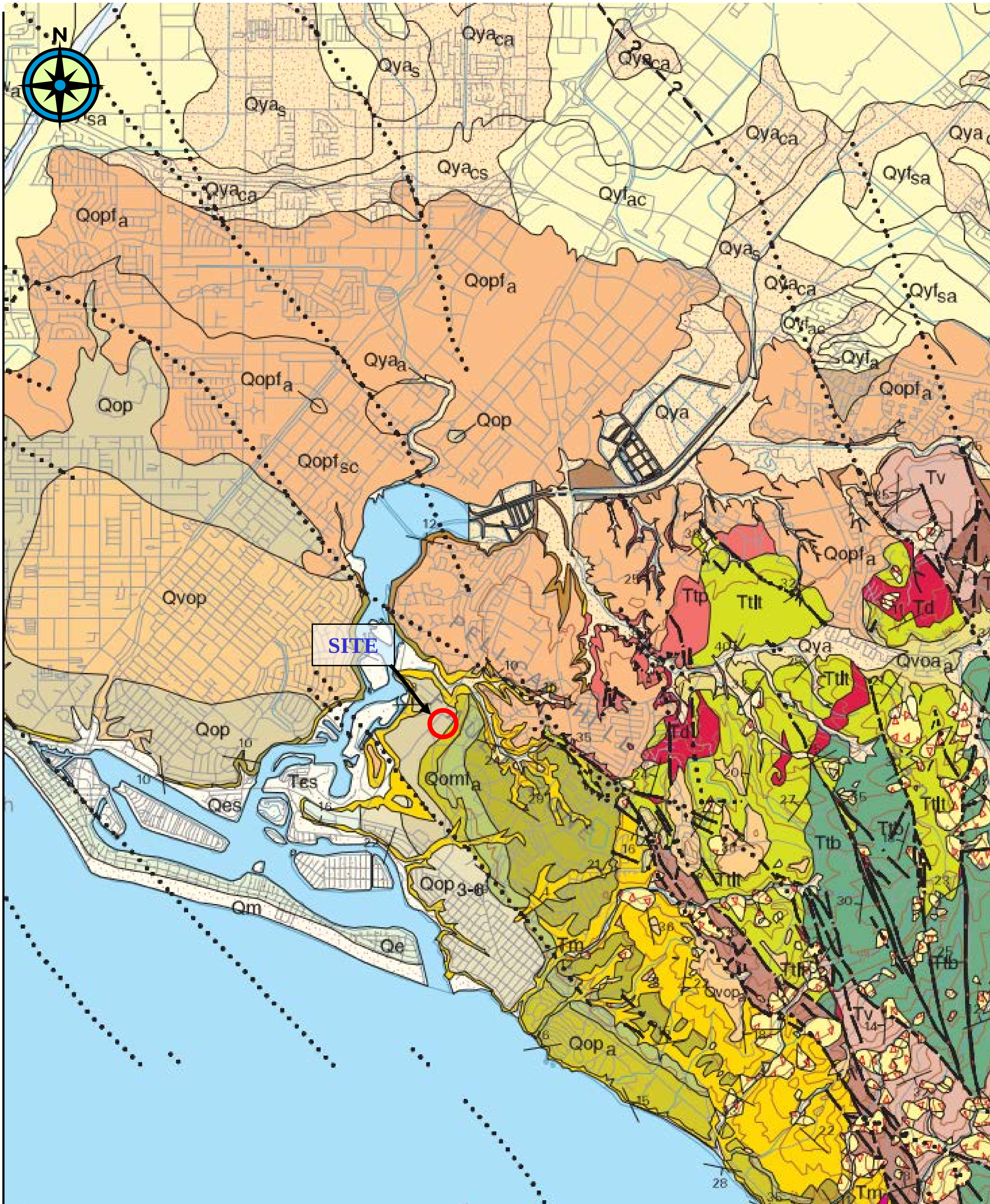
| | | |
|---|---|---|
| GROUP DELTA | GROUP DELTA CONSULTANTS, INC.<br>ENGINEERS AND GEOLOGISTS<br>32 MAUCHLY, SUITE B<br>IRVINE, CA 92618 (949) 450-2100 | Figure Number:<br>1 |
| | Project Name:<br>850 San Clemente Drive | Project Number:<br>IR 634 |
| | **VICINITY MAP** | |




*Reference: Images taken from Google Maps.*

BORING LOCATION

| GROUP DELTA | GROUP DELTA CONSULTANTS, INC.<br>ENGINEERS AND GEOLOGISTS<br>32 MAUCHLY, SUITE B<br>IRVINE, CA 92618 (949) 450-2100 | Figure Number:<br>2 |
|---|---|---|
| | Project Name:<br>850 San Clemente Drive | Project Number:<br>IR 634 |
| | **BORING LOCATION PLAN** | |




**Reference: USGS, Geologic Map of Santa Ana 30’ x 60’ Quadrangles.**

GEOLOGIC LEGEND

Qop3-6: old paralic deposits units 3-6 undivided (late to middle Pleistocene)-silt sand & cobbles on 45-55m terraces.

Tm: Monterey formation. (Miocene) – Marine siltstone & sandstone siliceous & diatomaceous.

Subscripts: a=arenaceous (sand), s=silt, c=clay, g=gravel, b=boulder



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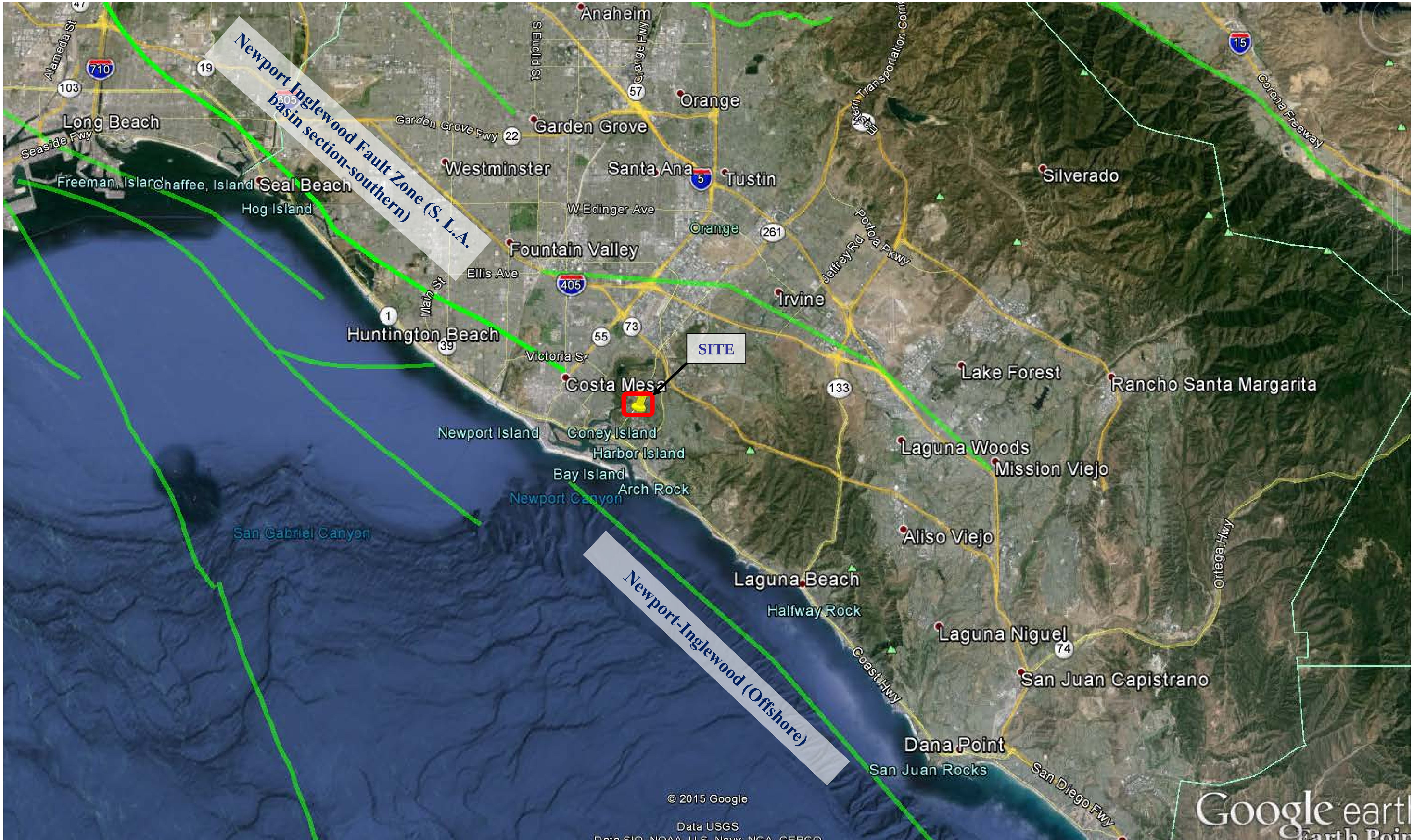
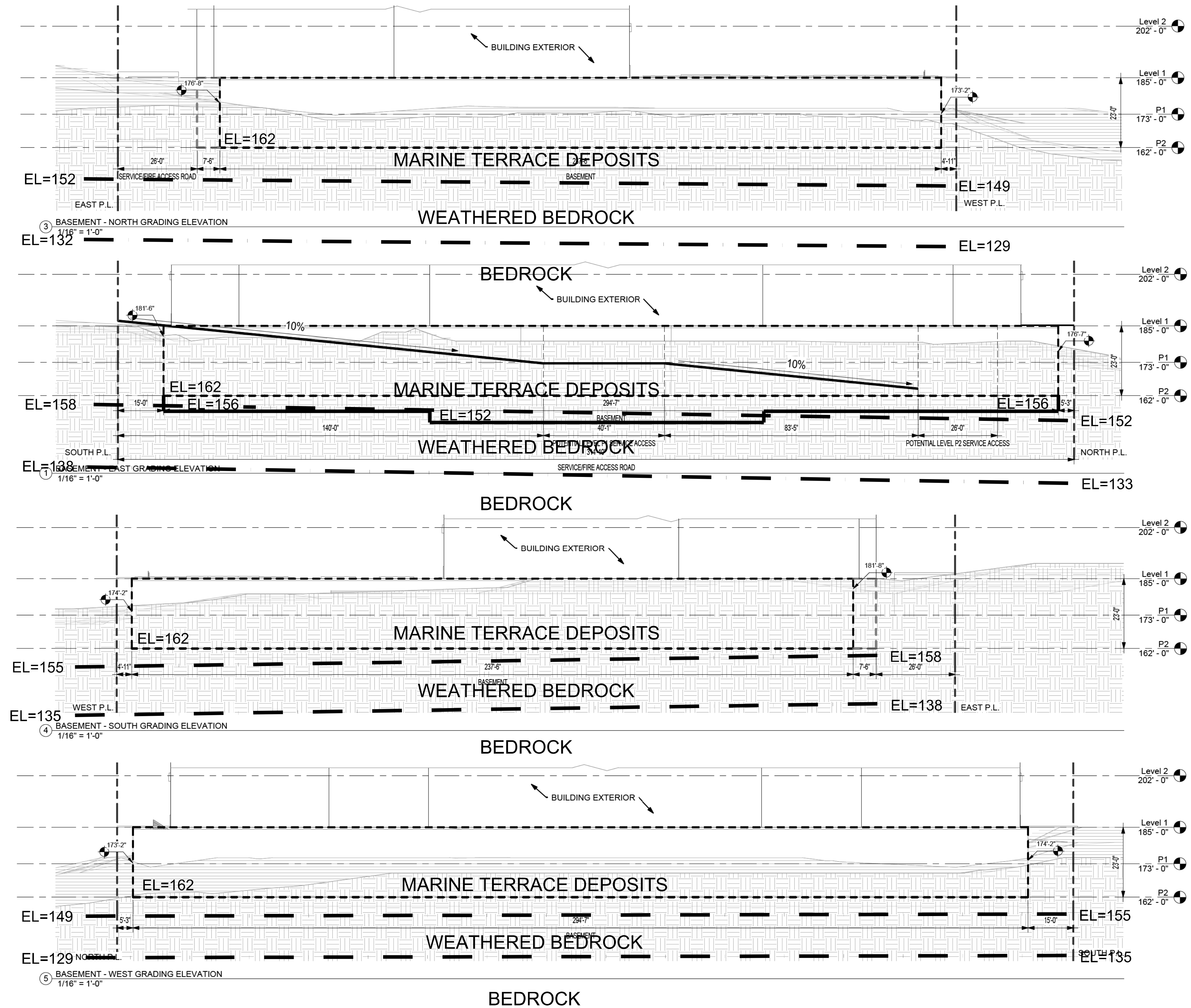
| | |
|---|---|
| Project Name: 850 San Clemente Drive | Figure Number: 3 |
| | Project Number: IR 634 |

**REGIONAL GEOLOGIC MAP**



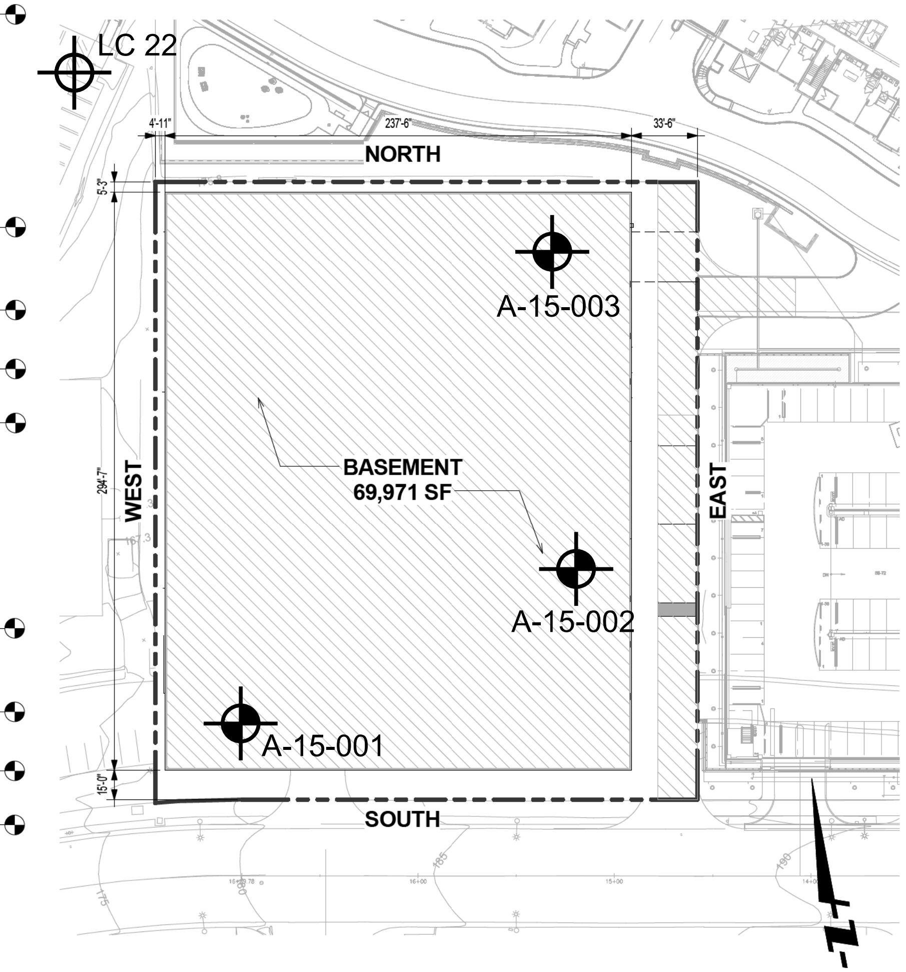

**Reference: Caltrans ARS Online (V2.3.06), 2014**
**USGS Fault and Fold Database**

| GROUP DELTA | GROUP DELTA CONSULTANTS, INC. ENGINEERS AND GEOLOGISTS 32 MAUCHLY, SUITE B IRVINE, CA 92618 (949) 450-2100 | Figure Number: 4 |
|---|---|---|
| | Project Name: 850 San Clemente Drive | Project Number: IR 634 |
| | FAULT MAP | |




# LEGEND

- APPROXIMATE ELEVATION OF GEOLOGIC CONTACT
- APPROXIMATE BOTTOM OF MAT FOUNDATION
- TOP OF BASEMENT FLOOR
- BORING DRILLED ON SEPTEMBER 14TH TO 16TH, BY GROUP DELTA CONSULTANTS
- BORING DRILLED ON APRIL 24TH 1979, BY LEROY CRANDALL AND ASSOCIATES

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| | |
|---|---|
| FIGURE NUMBER | 5 |
| PROJECT NAME | 850 San Clemente Drive |
| PROJECT NUMBER | IR 634 |

CROSS SECTIONS



N:\Projects_AV\I600\IR634 850 San Clemente Drive\1. Proposal, Initiation\EXH_Firgure_1.dgn

# *Appendix A Logs of Test Borings*

# BORING RECORD

| | | |
|---|---|---|
| PROJECT NAME: 850 San Clemente Drive | PROJECT NUMBER: IR 634 | HOLE ID: **A-15-001** |
| SITE LOCATION: 850 San Clemente Drive, Newport Beach, California | START: 9/16/2015 | FINISH: 9/16/2015 |
| SHEET NO.: 1 of 3 | | |
| DRILLING COMPANY: ABC Liovin | DRILL RIG: CME 85 | DRILLING METHOD: Hollow Stem Auger |
| LOGGED BY: A. Wells | CHECKED BY: T. Augello | |
| HAMMER TYPE (WEIGHT/DROP): Hammer: 140 lbs., Drop: 30 in. | HAMMER EFFICIENCY (ERi): 83 | BORING DIA. (in): 10 |
| TOTAL DEPTH (ft): 50 | GROUND ELEV (ft): 175 | DEPTH/*ELEV.* GW (ft): ⊻ NE / *NM* DURING DRILLING; ▼ / *NM* AFTER DRILLING |
| DRIVE SAMPLER TYPE(S) & SIZE (ID): Bulk, SPT (1.4"), CAL (2.4") | NOTES: Asphalt Paved Parking Lot | |

| DEPTH (feet) | ELEVATION (feet) | SAMPLE TYPE | SAMPLE NO. | PENETRATION RESISTANCE (BLOWS / 6 IN) | BLOW/FT "N" | SPT $N^*_{60}$ | RECOVERY (%) | RQD (%) | MOISTURE (%) | DRY DENSITY (pcf) | ATTERBERG LIMITS (LL:PI) | OTHER TESTS | DRILLING METHOD | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | | | | 3.5" ASPHALT |
| | | | | | | | | | | | | | | | SILTY SAND (SM); medium dense; reddish brown; dry to moist; trace GRAVEL; fine to medium; non plastic |
| | | Bulk | B-1 | | | | | | | | | | | | |
| 5 | 170 | SPT | S-1 | 9 9 13 | 22 | 30 | | | | | | | | | |
| 10 | 165 | CAL | R-2 | 10 10 13 | 23 | 21 | | | | | | | | | |
| 15 | 160 | SPT | S-3 | 9 7 7 | 14 | 19 | | | | | | | | | -Trace SILT |
| 20 | 155 | | | | | | | | | | | | | | SILTY CLAY (CL-ML); stiff; olive brown; moist; medium to high plasticity; PP = 1.0 tsf |
| | | CAL | R-4 | 4 5 7 | 12 | 11 | | | | | | | | | |

GDC_LOG_BORING_2013 IR 634 OCMA 850 SAN CLEMENTE DRIVE.GPJ GDC2013.GDT 9/30/15

GROUP DELTA

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-1a

# BORING RECORD

| | | | |
|---|---|---|---|
| **PROJECT NAME** 850 San Clemente Drive | **PROJECT NUMBER** IR 634 | **HOLE ID** A-15-001 | |
| **SITE LOCATION** 850 San Clemente Drive, Newport Beach, California | **START** 9/16/2015 | **FINISH** 9/16/2015 | **SHEET NO.** 2 of 3 |
| **DRILLING COMPANY** ABC Liovin | **DRILL RIG** CME 85 | **DRILLING METHOD** Hollow Stem Auger | **LOGGED BY** A. Wells / **CHECKED BY** T. Augello |
| **HAMMER TYPE (WEIGHT/DROP)** Hammer: 140 lbs., Drop: 30 in. | **HAMMER EFFICIENCY (ERi)** 83 | **BORING DIA. (in)** 10 / **TOTAL DEPTH (ft)** 50 | **GROUND ELEV (ft)** 175 |
| **DEPTH/*ELEV.* GW (ft)** | ∇ NE / *NM* DURING DRILLING | ▼ / *NM* AFTER DRILLING | |
| **DRIVE SAMPLER TYPE(S) & SIZE (ID)** Bulk, SPT (1.4"), CAL (2.4") | **NOTES** Asphalt Paved Parking Lot | | |

| DEPTH (feet) | ELEVATION (feet) | SAMPLE TYPE | SAMPLE NO. | PENETRATION RESISTANCE (BLOWS / 6 IN) | BLOW/FT "N" | SPT $N^*_{60}$ | RECOVERY (%) | RQD (%) | MOISTURE (%) | DRY DENSITY (pcf) | ATTERBERG LIMITS (LL:PI) | OTHER TESTS | DRILLING METHOD | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | Fat CLAY (CH); stiff; olive brown; moist; PP = 2.5 tsf |
| | | | S-5 | 3 3 4 | 7 | 10 | | | | | | | | | |
| 30 | 145 | | | | | | | | | | | | | | -very stiff; grayish brown; PP = 4.0 tsf |
| | | | R-6 | 5 7 10 | 17 | 16 | | | | | | | | | |
| 35 | 140 | | | | | | | | | | | | | | -PP = 2.0 tsf |
| | | | S-7 | 3 4 7 | 11 | 15 | | | | | | | | | |
| 40 | 135 | | | | | | | | | | | | | | CLAY (CL); hard; olive brown; moist; medium to high plasticity; PP >4.5 tsf |
| | | | R-8 | 17 22 37 | 59 | 55 | | | | | | | | | |
| 45 | 130 | | | | | | | | | | | | | | -very stiff; PP = 3.0 tsf |
| | | | S-9 | 2 3 5 | 8 | 11 | | | | | | | | | |

GDC_LOG_BORING_2013 IR 634 OCMA 850 SAN CLEMENTE DRIVE.GPJ GDC2013.GDT 9/30/15

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-1b

# BORING RECORD

| PROJECT NAME | PROJECT NUMBER | HOLE ID |
|---|---|---|
| 850 San Clemente Drive | IR 634 | A-15-001 |

| SITE LOCATION | START | FINISH | SHEET NO. |
|---|---|---|---|
| 850 San Clemente Drive, Newport Beach, California | 9/16/2015 | 9/16/2015 | 3 of 3 |

| DRILLING COMPANY | DRILL RIG | DRILLING METHOD | LOGGED BY | CHECKED BY |
|---|---|---|---|---|
| ABC Liovin | CME 85 | Hollow Stem Auger | A. Wells | T. Augello |

| HAMMER TYPE (WEIGHT/DROP) | HAMMER EFFICIENCY (ERi) | BORING DIA. (in) | TOTAL DEPTH (ft) | GROUND ELEV (ft) | DEPTH/*ELEV.* GW (ft) |
|---|---|---|---|---|---|
| Hammer: 140 lbs., Drop: 30 in. | 83 | 10 | 50 | 175 | ⊻ NE / *NM* DURING DRILLING |

| DRIVE SAMPLER TYPE(S) & SIZE (ID) | NOTES | |
|---|---|---|
| Bulk, SPT (1.4"), CAL (2.4") | Asphalt Paved Parking Lot | AFTER DRILLING ▼ / *NM* |

| DEPTH (feet) | ELEVATION (feet) | SAMPLE TYPE | SAMPLE NO. | PENETRATION RESISTANCE (BLOWS / 6 IN) | BLOW/FT "N" | SPT $N^*_{60}$ | RECOVERY (%) | RQD (%) | MOISTURE (%) | DRY DENSITY (pcf) | ATTERBERG LIMITS (LL:PI) | OTHER TESTS | DRILLING METHOD | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SPT | R10 | 5<br>7<br>9 | 16 | 15 | | | | | | | | | CLAY (CL); stiff; olive brown; moist; medium to high plasticity; PP = 1.5 tsf |
| | | | | | | | | | | | | | | | End of boring at 51.5 feet.<br>No groundwater encountered during drilling.<br>Boring backfilled with bentonite and cement grout mix. |
| 55 | 120 | | | | | | | | | | | | | | |
| 60 | 115 | | | | | | | | | | | | | | |
| 65 | 110 | | | | | | | | | | | | | | |
| 70 | 105 | | | | | | | | | | | | | | |

GDC_LOG_BORING_2013 IR 634 OCMA 850 SAN CLEMENTE DRIVE.GPJ GDC2013.GDT 9/30/15

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FIGURE A-1c

# BORING RECORD

| PROJECT NAME | PROJECT NUMBER | HOLE ID |
|---|---|---|
| 850 San Clemente Drive | IR 634 | **A-15-002** |

| SITE LOCATION | START | FINISH | SHEET NO. |
|---|---|---|---|
| 850 San Clemente Drive, Newport Beach, California | 9/14/2015 | 9/18/2015 | 1 of 4 |

| DRILLING COMPANY | DRILL RIG | DRILLING METHOD | LOGGED BY | CHECKED BY |
|---|---|---|---|---|
| ABC Liovin | CME 85 | Hollow Stem Auger | L. Gomez | T. Augello |

| HAMMER TYPE (WEIGHT/DROP) | HAMMER EFFICIENCY (ERi) | BORING DIA. (in) | TOTAL DEPTH (ft) | GROUND ELEV (ft) | DEPTH/*ELEV.* GW (ft) |
|---|---|---|---|---|---|
| Hammer: 140 lbs., Drop: 30 in. | 83 | 10 | 95 | 178 | ∇ 42.0 / *136.0* DURING DRILLING |

| DRIVE SAMPLER TYPE(S) & SIZE (ID) | NOTES | AFTER DRILLING |
|---|---|---|
| Bulk, SPT (1.4"), CAL (2.4") | Asphalt Paved Parking Lot | ▼ 23.0 / *155.0* 9/18/2015 |

| DEPTH (feet) | ELEVATION (feet) | SAMPLE TYPE | SAMPLE NO. | PENETRATION RESISTANCE (BLOWS / 6 IN) | BLOW/FT "N" | SPT $N^*_{60}$ | RECOVERY (%) | RQD (%) | MOISTURE (%) | DRY DENSITY (pcf) | ATTERBERG LIMITS (LL:PI) | OTHER TESTS | DRILLING METHOD | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | 3.5" ASPHALT |
| | | | | | | | | | | | | | | | SILTY SAND (SM); medium dense; orange brown; dry to moist; trace GRAVEL; fine to medium; non plastic |
| | | | B-1 | | | | | | | | | | | | |
| | 175 | | S-2 | 4 5 12 | 17 | 24 | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | -beige staining |
| | | | R-3 | 7 9 14 | 23 | 21 | | | | | | | | | |
| | 170 | | S-4 | 4 5 7 | 12 | 17 | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | Poorly graded SAND (SP); medium dense; reddish brown; dry to moist; trace of GRAVELS; non-plastic; few SILT; fine to medium |
| | | | R-5 | 7 12 15 | 27 | 25 | | | | | | | | | |
| | 165 | | | | | | | | | | | | | | |
| 15 | | | S-6 | 9 11 12 | 23 | 32 | | | | | | | | | -GRAVELS at 16 feet noticed in cuttings |
| | 160 | | | | | | | | | | | | | | |
| 20 | | | | | | | | | | | | | | | SILTY CLAY (CL-ML); very stiff; olive; moist; medium to high plasticity; PP = 2.5 tsf |
| | | | R-7 | 27 50/3" | 50/3" | 50/3" | | | | | | | | | |
| | 155 | | | | | | | | | | | | | | |

GDC_LOG_BORING_2013 IR 634 OCMA 850 SAN CLEMENTE DRIVE.GPJ GDC2013.GDT 9/30/15

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FIGURE A-2a

# BORING RECORD

| | | | |
|---|---|---|---|
| **PROJECT NAME** 850 San Clemente Drive | **PROJECT NUMBER** IR 634 | **HOLE ID** **A-15-002** | |
| **SITE LOCATION** 850 San Clemente Drive, Newport Beach, California | **START** 9/14/2015 | **FINISH** 9/18/2015 | **SHEET NO.** 2 of 4 |
| **DRILLING COMPANY** ABC Liovin | **DRILL RIG** CME 85 | **DRILLING METHOD** Hollow Stem Auger | **LOGGED BY** L. Gomez / **CHECKED BY** T. Augello |
| **HAMMER TYPE (WEIGHT/DROP)** Hammer: 140 lbs., Drop: 30 in. | **HAMMER EFFICIENCY (ERi)** 83 | **BORING DIA. (in)** 10 / **TOTAL DEPTH (ft)** 95 / **GROUND ELEV (ft)** 178 | **DEPTH/*ELEV.* GW (ft)** ⊻ 42.0 / *136.0* DURING DRILLING; ▼ 23.0 / *155.0* 9/18/2015 AFTER DRILLING |
| **DRIVE SAMPLER TYPE(S) & SIZE (ID)** Bulk, SPT (1.4"), CAL (2.4") | **NOTES** Asphalt Paved Parking Lot | | |

| DEPTH (feet) | ELEVATION (feet) | SAMPLE TYPE | SAMPLE NO. | PENETRATION RESISTANCE (BLOWS / 6 IN) | BLOW/FT "N" | SPT $N^{*}_{60}$ | RECOVERY (%) | RQD (%) | MOISTURE (%) | DRY DENSITY (pcf) | ATTERBERG LIMITS (LL:PI) | OTHER TESTS | DRILLING METHOD | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SPT | S-8 | 7<br>9<br>9 | 18 | 25 | | | | | | | | | CLAYEY SILT (ML-CL); stiff; tan brown with orange staining; moist; medium to low plasticity; PP = 1.0 tsf |
| | 150 | | | | | | | | | | | | | | |
| 30 | | SPT | S-9 | 7<br>9<br>14 | 23 | 32 | | | | | | | | | -hard; PP = 4.0 tsf |
| | 145 | | | | | | | | | | | | | | |
| 35 | | CAL | R-10 | 5<br>7<br>10 | 17 | 16 | | | | | | | | | CLAYEY SAND (SC); medium dense; tan brown with orange staining; moist; medium to high plasticity; fine to medium; little SILT; PP = 1.0 tsf |
| | 140 | | | | | | | | | | | | | | |
| 40 | | SPT | S-11 | 12<br>15<br>17 | 32 | 44 | | | | | | | | | CLAYEY SILT (ML-CL); very stiff; tan brown; moist; low to medium plasticity; PP = 3.0 tsf |
| | 135 | | | | | | | | | | | | | | |
| 45 | | CAL | R-12 | 14<br>27<br>55 | 82 | 76 | | | | | | | | | SILTY CLAY (CL-ML); hard; olive brown with orange staining; moist; medium to high plasticity; PP = 4.0 tsf |
| | 130 | | | | | | | | | | | | | | |

# BORING RECORD

| PROJECT NAME | PROJECT NUMBER | HOLE ID |
|---|---|---|
| 850 San Clemente Drive | IR 634 | **A-15-002** |

| SITE LOCATION | START | FINISH | SHEET NO. |
|---|---|---|---|
| 850 San Clemente Drive, Newport Beach, California | 9/14/2015 | 9/18/2015 | 3 of 4 |

| DRILLING COMPANY | DRILL RIG | DRILLING METHOD | LOGGED BY | CHECKED BY |
|---|---|---|---|---|
| ABC Liovin | CME 85 | Hollow Stem Auger | L. Gomez | T. Augello |

| HAMMER TYPE (WEIGHT/DROP) | HAMMER EFFICIENCY (ERi) | BORING DIA. (in) | TOTAL DEPTH (ft) | GROUND ELEV (ft) | DEPTH/*ELEV.* GW (ft) |
|---|---|---|---|---|---|
| Hammer: 140 lbs., Drop: 30 in. | 83 | 10 | 95 | 178 | ⊻ 42.0 / *136.0* DURING DRILLING |

| DRIVE SAMPLER TYPE(S) & SIZE (ID) | NOTES | AFTER DRILLING |
|---|---|---|
| Bulk, SPT (1.4"), CAL (2.4") | Asphalt Paved Parking Lot | ▼ 23.0 / *155.0* 9/18/2015 |

| DEPTH (feet) | ELEVATION (feet) | SAMPLE TYPE | SAMPLE NO. | PENETRATION RESISTANCE (BLOWS / 6 IN) | BLOW/FT "N" | SPT $N^*_{60}$ | RECOVERY (%) | RQD (%) | MOISTURE (%) | DRY DENSITY (pcf) | ATTERBERG LIMITS (LL:PI) | OTHER TESTS | DRILLING METHOD | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | SPT | S-13 | 5 7 9 | 16 | 22 | | | | | | | | | SILTY CLAY (CL-ML); stiff; olive brown; moist; medium to high plasticity; PP = 1.0 tsf |
| | 125 | | | | | | | | | | | | | | |
| 55 | | CAL | R-14 | 4 4 4 | 8 | 7 | | | | | | | | | |
| | 120 | | | | | | | | | | | | | | |
| 60 | | SPT | S-15 | 4 9 14 | 23 | 32 | | | | | | | | | - Very stiff; PP = 3.5 tsf |
| | 115 | | | | | | | | | | | | | | |
| 65 | | | | | | | | | | | | | | | - Borehole plugged; hard advancing |
| | | CAL | R-16 | 14 17 30 | 47 | 44 | | | | | | | | | Lean CLAY (CL); hard; brownish black; moist; medium to high plasticity; few GRAVELS; mottled white (stong cementation); PP = 4.5 tsf |
| | 110 | | | | | | | | | | | | | | |
| 70 | | SPT | S-17 | 24 27 32 | 59 | 82 | | | | | | | | | SILTY CLAY (CL-ML); hard; dark brown with beige spotting; dry to moist; medium plasticity; strongly cemented; PP = 4.5 tsf<br>- Plugged; hard to drill |
| | 105 | | | | | | | | | | | | | | |

GDC_LOG_BORING_2013 IR 634 OCMA 850 SAN CLEMENTE DRIVE.GPJ GDC2013.GDT 9/30/15

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FIGURE A-2c

# BORING RECORD

| | | | |
|---|---|---|---|
| PROJECT NAME: 850 San Clemente Drive | PROJECT NUMBER: IR 634 | HOLE ID: **A-15-002** | |
| SITE LOCATION: 850 San Clemente Drive, Newport Beach, California | START: 9/14/2015 | FINISH: 9/18/2015 | SHEET NO.: 4 of 4 |
| DRILLING COMPANY: ABC Liovin | DRILL RIG: CME 85 | DRILLING METHOD: Hollow Stem Auger | LOGGED BY: L. Gomez; CHECKED BY: T. Augello |
| HAMMER TYPE (WEIGHT/DROP): Hammer: 140 lbs., Drop: 30 in. | HAMMER EFFICIENCY (ERi): 83 | BORING DIA. (in): 10; TOTAL DEPTH (ft): 95; GROUND ELEV (ft): 178 | DEPTH/*ELEV.* GW (ft): ∇ 42.0 / *136.0* DURING DRILLING |
| DRIVE SAMPLER TYPE(S) & SIZE (ID): Bulk, SPT (1.4"), CAL (2.4") | NOTES: Asphalt Paved Parking Lot | | AFTER DRILLING ▼ 23.0 / *155.0* 9/18/2015 |

| DEPTH (feet) | ELEVATION (feet) | SAMPLE TYPE | SAMPLE NO. | PENETRATION RESISTANCE (BLOWS / 6 IN) | BLOW/FT "N" | SPT $N^*_{60}$ | RECOVERY (%) | RQD (%) | MOISTURE (%) | DRY DENSITY (pcf) | ATTERBERG LIMITS (LL:PI) | OTHER TESTS | DRILLING METHOD | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | R-18 | 15 27 32 | 59 | 55 | | | | | | | | | SILTY CLAY (CL-ML); hard; dark brown with beige spotting; dry to moist; medium plasticity; strongly cemented; PP = 4.0 tsf |
| | 100 | | | | | | | | | | | | | | |
| 80 | | | S-19 | 12 14 17 | 31 | 43 | | | | | | | | | -Very stiff; medium to high plasticity; moderate cementation; PP = 2.0 tsf |
| | 95 | | | | | | | | | | | | | | |
| 85 | | | R-20 | 18 23 27 | 50 | 46 | | | | | | | | | -Sitff; PP = 1.5 tsf |
| | 90 | | | | | | | | | | | | | | |
| 90 | | | S-21 | 12 15 18 | 23 | 32 | | | | | | | | | |
| | 85 | | | | | | | | | | | | | | |
| 95 | | | R-22 | 20 50/2" | 50/2" | 50/2" | | | | | | | | | Lean CLAY (CL); stiff; dark brown; moist; medium to high plasticity; little SILT; PP = 1.5 tsf |
| | | | | | | | | | | | | | | | End of boring at 95.5 feet. Groundwater encountered at 42 feet below ground surface during drilling. Water level encountered at 21 feet below ground surface during geophysical testing. Boring backfilled with bentonite and cement grout |
| | 80 | | | | | | | | | | | | | | |

# BORING RECORD

| PROJECT NAME | PROJECT NUMBER | HOLE ID |
|---|---|---|
| 850 San Clemente Drive | IR 634 | A-15-003 |

| SITE LOCATION | START | FINISH | SHEET NO. |
|---|---|---|---|
| 850 San Clemente Drive, Newport Beach, California | 9/16/2015 | 9/16/2015 | 1 of 3 |

| DRILLING COMPANY | DRILL RIG | DRILLING METHOD | LOGGED BY | CHECKED BY |
|---|---|---|---|---|
| ABC Liovin | CME 85 | Hollow Stem Auger | A. Wells | T. Augello |

| HAMMER TYPE (WEIGHT/DROP) | HAMMER EFFICIENCY (ERi) | BORING DIA. (in) | TOTAL DEPTH (ft) | GROUND ELEV (ft) | DEPTH/*ELEV.* GW (ft) |
|---|---|---|---|---|---|
| Hammer: 140 lbs., Drop: 30 in. | 83 | 10 | 50 | 178 | ∇ 49.0 / *129.0* DURING DRILLING; AFTER DRILLING ▼ / *NM* |

| DRIVE SAMPLER TYPE(S) & SIZE (ID) | NOTES |
|---|---|
| Bulk, SPT (1.4"), CAL (2.4") | Asphalt Paved Parking Lot |

| DEPTH (feet) | ELEVATION (feet) | SAMPLE TYPE | SAMPLE NO. | PENETRATION RESISTANCE (BLOWS / 6 IN) | BLOW/FT "N" | SPT $N^*_{60}$ | RECOVERY (%) | RQD (%) | MOISTURE (%) | DRY DENSITY (pcf) | ATTERBERG LIMITS (LL:PI) | OTHER TESTS | DRILLING METHOD | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 178 | | | | | | | | | | | | | | 2.5" ASPHALT |
| | | Bulk | B-1 | | | | | | | | | | | | SILTY SAND (SM); medium dense; reddish brown; dry to moist; trace GRAVEL; fine to medium; non plastic |
| | 175 | | | | | | | | | | | | | | |
| 5 | | CAL | R-1 | 7 9 11 | 20 | 19 | | | | | | | | | |
| | 170 | | | | | | | | | | | | | | |
| 10 | | SPT | S-2 | 7 7 10 | 17 | 24 | | | | | | | | | |
| | 165 | | | | | | | | | | | | | | |
| 15 | | CAL | R-3 | 4 7 9 | 16 | 15 | | | | | | | | | |
| | 160 | | | | | | | | | | | | | | |
| 20 | | SPT | S-4 | 7 11 12 | 23 | 32 | | | | | | | | | |
| | 155 | | | | | | | | | | | | | | |

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THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED.

FIGURE A-3a

# BORING RECORD

| PROJECT NAME | PROJECT NUMBER | HOLE ID |
|---|---|---|
| 850 San Clemente Drive | IR 634 | **A-15-003** |

| SITE LOCATION | START | FINISH | SHEET NO. |
|---|---|---|---|
| 850 San Clemente Drive, Newport Beach, California | 9/16/2015 | 9/16/2015 | 2 of 3 |

| DRILLING COMPANY | DRILL RIG | DRILLING METHOD | LOGGED BY | CHECKED BY |
|---|---|---|---|---|
| ABC Liovin | CME 85 | Hollow Stem Auger | A. Wells | T. Augello |

| HAMMER TYPE (WEIGHT/DROP) | HAMMER EFFICIENCY (ERi) | BORING DIA. (in) | TOTAL DEPTH (ft) | GROUND ELEV (ft) | DEPTH/*ELEV.* GW (ft) |
|---|---|---|---|---|---|
| Hammer: 140 lbs., Drop: 30 in. | 83 | 10 | 50 | 178 | ⊻ 49.0 / *129.0* DURING DRILLING; AFTER DRILLING ▼ / *NM* |

| DRIVE SAMPLER TYPE(S) & SIZE (ID) | NOTES |
|---|---|
| Bulk, SPT (1.4"), CAL (2.4") | Asphalt Paved Parking Lot |

| DEPTH (feet) | ELEVATION (feet) | SAMPLE TYPE | SAMPLE NO. | PENETRATION RESISTANCE (BLOWS / 6 IN) | BLOW/FT "N" | SPT $N^{*}_{60}$ | RECOVERY (%) | RQD (%) | MOISTURE (%) | DRY DENSITY (pcf) | ATTERBERG LIMITS (LL:PI) | OTHER TESTS | DRILLING METHOD | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | R-5 | 7 12 14 | 28 | 26 | | | | | | | | | SILTY SAND (SM); medium dense; reddish brown; dry to moist; trace GRAVEL; fine to medium; non plastic; (continued) |
| | | | | | | | | | | | | | | | SILTY CLAY (CL-ML); very stiff; olive brown; moist; medium to high plasticity |
| | 150 | | | | | | | | | | | | | | |
| 30 | | | | | | | | | | | | | | | -PP = 3.0 tsf |
| | | | S-6 | 2 3 4 | 7 | 10 | | | | | | | | | |
| | 145 | | | | | | | | | | | | | | |
| 35 | | | | | | | | | | | | | | | -PP = 2.0 tsf |
| | | | R-7 | 6 8 8 | 16 | 15 | | | | | | | | | |
| | 140 | | | | | | | | | | | | | | |
| 40 | | | | | | | | | | | | | | | -PP = 3.5 tsf |
| | | | S-8 | 2 3 4 | 7 | 10 | | | | | | | | | |
| | 135 | | | | | | | | | | | | | | |
| 45 | | | | | | | | | | | | | | | -Stiff; PP = 1.5 tsf |
| | | | R-9 | 9 11 14 | 25 | 23 | | | | | | | | | |
| | 130 | | | | | | | | | | | | | | |

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FIGURE
A-3b

# BORING RECORD

| | | | | | |
|---|---|---|---|---|---|
| **PROJECT NAME** 850 San Clemente Drive | | **PROJECT NUMBER** IR 634 | | **HOLE ID** A-15-003 | |
| **SITE LOCATION** 850 San Clemente Drive, Newport Beach, California | | **START** 9/16/2015 | **FINISH** 9/16/2015 | **SHEET NO.** 3 of 3 | |
| **DRILLING COMPANY** ABC Liovin | **DRILL RIG** CME 85 | **DRILLING METHOD** Hollow Stem Auger | | **LOGGED BY** A. Wells | **CHECKED BY** T. Augello |
| **HAMMER TYPE (WEIGHT/DROP)** Hammer: 140 lbs., Drop: 30 in. | **HAMMER EFFICIENCY (ERi)** 83 | **BORING DIA. (in)** 10 | **TOTAL DEPTH (ft)** 50 | **GROUND ELEV (ft)** 178 | **DEPTH/*ELEV.* GW (ft)** ∇ 49.0 / *129.0* DURING DRILLING |
| **DRIVE SAMPLER TYPE(S) & SIZE (ID)** Bulk, SPT (1.4"), CAL (2.4") | **NOTES** Asphalt Paved Parking Lot | | | | ▼ / *NM* AFTER DRILLING |

| DEPTH (feet) | ELEVATION (feet) | SAMPLE TYPE | SAMPLE NO. | PENETRATION RESISTANCE (BLOWS / 6 IN) | BLOW/FT "N" | SPT $N^*_{60}$ | RECOVERY (%) | RQD (%) | MOISTURE (%) | DRY DENSITY (pcf) | ATTERBERG LIMITS (LL:PI) | OTHER TESTS | DRILLING METHOD | GRAPHIC LOG | DESCRIPTION AND CLASSIFICATION |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | S-10 | 4<br>7<br>9 | 18 | 25 | | | | | | | | | SILTY CLAY (CL-ML); very stiff; olive brown; moist; medium to high plasticity; PP = 3.5 tsf |
| | | | | | | | | | | | | | | | End of boring at 51.5 feet.<br>Groundwater encountered at 49 feet below ground surface during drilling.<br>Boring backfilled with bentonite and cement grout mix. |
| | 125 | | | | | | | | | | | | | | |
| 55 | | | | | | | | | | | | | | | |
| | 120 | | | | | | | | | | | | | | |
| 60 | | | | | | | | | | | | | | | |
| | 115 | | | | | | | | | | | | | | |
| 65 | | | | | | | | | | | | | | | |
| | 110 | | | | | | | | | | | | | | |
| 70 | | | | | | | | | | | | | | | |
| | 105 | | | | | | | | | | | | | | |

# *Appendix B  Laboratory Test Results*

Project Name: 850 San Clemente Dr.
Project NO.: IR634
Tested By: RCV

Date Tested: 10/7/2015
Date Recv'd:

| Sample I.D. | A-15-001 S-1 @ 5' - 6.5' | | | A-15-001 S-3 @ 15' - 16.5' | | | A-15-002 R-3 @ 5' - 6.5' | | |
|---|---|---|---|---|---|---|---|---|---|
| Soil Description: | | | | | | | | | |
| Wt. of Total Sample: | **238.6** | | | **225.3** | | | **222.6** | | |
| Sieve Size | Wt. Retained | Wt. Passing | Total % Passing | Wt. Retained | Wt. Passing | Total % Passing | Wt. Retained | Wt. Passing | Total % Passing |
| 3" | | 238.6 | 100 | | 225.3 | 100 | | 222.6 | 100 |
| 1-1/2" | | 238.6 | 100 | | 225.3 | 100 | | 222.6 | 100 |
| 1" | | 238.6 | 100 | | 225.3 | 100 | | 222.6 | 100 |
| 3/4" | | 238.6 | 100 | | 225.3 | 100 | 0.0 | 222.6 | 100 |
| 1/2" | | 238.6 | 100 | | 225.3 | 100 | 4.5 | 218.1 | 98 |
| 3/8" | 0.0 | 238.6 | 100 | | 225.3 | 100 | 5.1 | 213.0 | 96 |
| #4 | 2.0 | 236.6 | 99 | 0.0 | 225.3 | 100 | 8.8 | 204.2 | 92 |
| | Weight of oven dried sample for fine aggrgate | | X | Weight of oven dried sample for fine aggrgate | | X | Weight of oven dried sample for fine aggrgate | | X |
| | Calculated weight of total sample (adjusted weight / % pass #4) | | X | Calculated weight of total sample (adjusted weight / % pass #4) | | X | Calculated weight of total sample (adjusted weight / % pass #4) | | X |
| | | | | | | | | | |
| #8 | 1.3 | 235.3 | 98.6 | 1.3 | 224.0 | 99.4 | 5.9 | 198.3 | 89.1 |
| #16 | 0.6 | 234.7 | 98.4 | 9.6 | 214.4 | 95.2 | 5.0 | 193.3 | 86.8 |
| #30 | 2.8 | 231.9 | 97.2 | 62.9 | 151.5 | 67.2 | 5.9 | 187.4 | 84.2 |
| #50 | 16.4 | 215.5 | 90.3 | 91.7 | 59.8 | 26.5 | 32.8 | 154.6 | 69.5 |
| #100 | 116.2 | 99.3 | 41.6 | 24.3 | 35.5 | 15.8 | 88.4 | 66.2 | 29.7 |
| #200 | 60.0 | 39.3 | 16.5 | 10.8 | 24.7 | 11.0 | 23.2 | 43.0 | 19.3 |

Project Name: 850 San Clemente Dr.

Project NO.: IR634

Tested By: RCV

Date Tested: 10/7/2015

Date Recv'd:

| Sample I.D. | A-15-001 S-1 @ 5' - 6.5' | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Soil Description: | | | | | | | | | |
| Wt. of Total Sample: | | **235.7** | | | | | | | |
| Sieve Size | Wt. Retained | Wt. Passing | Total % Passing | Wt. Retained | Wt. Passing | Total % Passing | Wt. Retained | Wt. Passing | Total % Passing |
| 3" | | 235.7 | 100 | | | | | | |
| 1-1/2" | | 235.7 | 100 | | | | | | |
| 1" | | 235.7 | 100 | | | | | | |
| 3/4" | 0.0 | 235.7 | 100 | | | | | | |
| 1/2" | 8.7 | 227.0 | 96 | | | | | | |
| 3/8" | 0.0 | 227.0 | 96 | | | | | | |
| #4 | 0.0 | 227.0 | 96 | | | | | | |
| | Weight of oven dried sample for fine aggrgate | | X | Weight of oven dried sample for fine aggrgate | | X | Weight of oven dried sample for fine aggrgate | | X |
| | Calculated weight of total sample (adjusted weight / % pass #4) | | X | Calculated weight of total sample (adjusted weight / % pass #4) | | X | Calculated weight of total sample (adjusted weight / % pass #4) | | X |
| | | | | | | | | | |
| #8 | 4.3 | 222.7 | 94.5 | | | | | | |
| #16 | 7.3 | 215.4 | 91.4 | | | | | | |
| #30 | 31.1 | 184.3 | 78.2 | | | | | | |
| #50 | 83.2 | 101.1 | 42.9 | | | | | | |
| #100 | 53.3 | 47.8 | 20.3 | | | | | | |
| #200 | 27.9 | 19.9 | 8.4 | | | | | | |

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# STANDARD METHOD FOR DETERMINING PERCENT PASSING THE NO. 200 SIEVE (ASTM D1140)

REV. 2, DATED 1/31/15

PROJECT: 850 San Clemente Drive  SAMPLED BY: ____  TESTED BY: RCV

PROJECT NO.: IR634  CHECKED BY: ____  DATE: 10/7/2015

| | A-15-002 | A-15-003 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A) SAMPLE IDENTIFICATION | 35-36.5 | 20-21.5 | | | | | | | | | |
| B) WEIGHT OF DRY SOIL BEFORE WASH | 90.10 | 140.50 | | | | | | | | | [G] |
| C) DRY WEIGHT RETAINED ON NO. 200 | 21.50 | 135.40 | | | | | | | | | [G] |
| D) PERCENT PASSING NO. 200 [(B - C) / B * 100] | 76.1% | 3.6% | | | | | | | | | [%] |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A) SAMPLE IDENTIFICATION | | | | | | | | | | | |
| B) WEIGHT OF DRY SOIL BEFORE WASH | | | | | | | | | | | [G] |
| C) DRY WEIGHT RETAINED ON NO. 200 | | | | | | | | | | | [G] |
| D) PERCENT PASSING NO. 200 [(B - C) / B * 100] | | | | | | | | | | | [%] |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A) SAMPLE IDENTIFICATION | | | | | | | | | | | |
| B) WEIGHT OF DRY SOIL BEFORE WASH | | | | | | | | | | | [G] |
| C) DRY WEIGHT RETAINED ON NO. 200 | | | | | | | | | | | [G] |
| D) PERCENT PASSING NO. 200 [(B - C) / B * 100] | | | | | | | | | | | [%] |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A) SAMPLE IDENTIFICATION | | | | | | | | | | | |
| B) WEIGHT OF DRY SOIL BEFORE WASH | | | | | | | | | | | [G] |
| C) DRY WEIGHT RETAINED ON NO. 200 | | | | | | | | | | | [G] |
| D) PERCENT PASSING NO. 200 [(B - C) / B * 100] | | | | | | | | | | | [%] |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A) SAMPLE IDENTIFICATION | | | | | | | | | | | |
| B) WEIGHT OF DRY SOIL BEFORE WASH | | | | | | | | | | | [G] |
| C) DRY WEIGHT RETAINED ON NO. 200 | | | | | | | | | | | [G] |
| D) PERCENT PASSING NO. 200 [(B - C) / B * 100] | | | | | | | | | | | [%] |

Page ___ of ___

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# STANDARD METHOD FOR ATTERBERG LIMITS
# ASTM D4318

REVISION 0, DATED 1/31/15

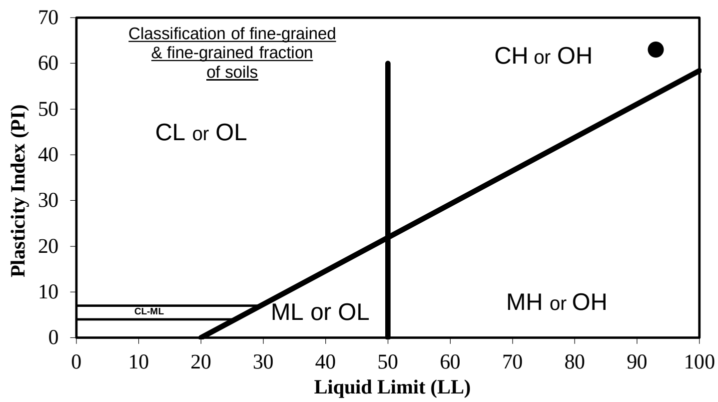
| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | 850 San Clemente Dr. | **Tested By :** | RCV | **Date:** | 10/13/15 |
| **Project No. :** | IR634 | **Data Input By:** | JLK | **Date:** | 10/14/15 |
| **Sample No.:** | A-15-001, R-6 | **Checked By:** | | **Date:** | |
| **Sample Location:** | 30-31.5' | | | Page____ of ____ | |

| | PLASTIC LIMIT | | LIQUID LIMIT | | | |
|---|---|---|---|---|---|---|
| TEST NO. | 1 | 2 | 1 | 2 | 3 | 4 |
| Number of Blows [N] | | | 35 | 25 | 20 | |
| Wet Wt. of Soil + Cont. (gm.) | 17.91 | 18.18 | 19.50 | 20.03 | 20.53 | |
| Dry Wt. of Soil + Cont. (gm.) | 16.41 | 16.59 | 15.51 | 15.91 | 15.80 | |
| Wt. of Container (gm.) | 11.39 | 11.52 | 11.09 | 11.45 | 10.78 | |
| Moisture Content (%) [Wn] | 29.88 | 31.36 | 90.27 | 92.38 | 94.22 | |

| | |
|---|---|
| **LIQUID LIMIT** | **93** |
| **PLASTIC LIMIT** | **30** |
| **PLASTICITY INDEX** | **63** |

PI at "A" - Line = 0.73(LL-20) = **53.3**

One - Point Liquid Limit Calculation $LL=Wn(N/25)^{0.121}$



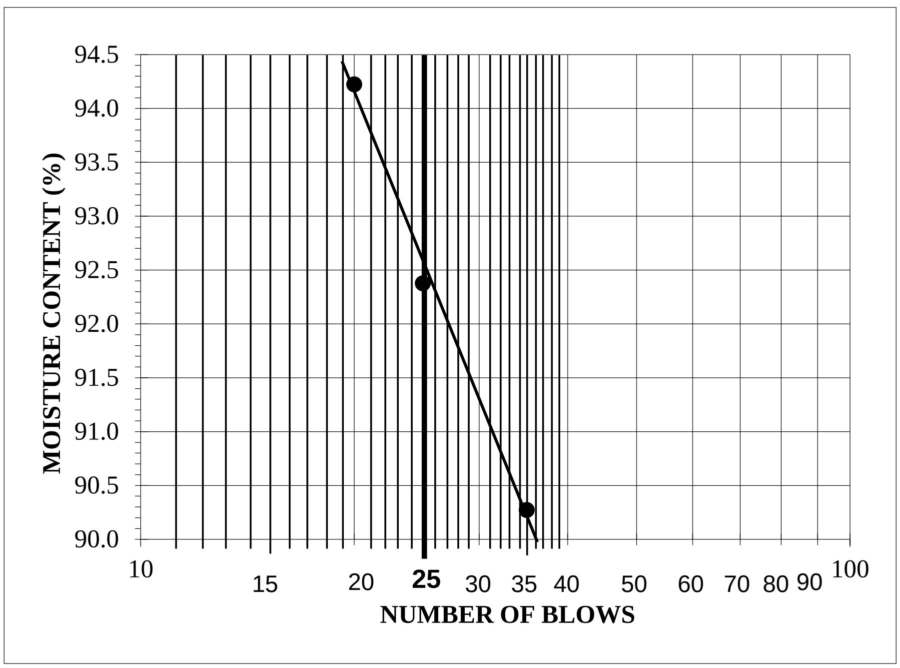

## PROCEDURES USED

☐ Wet Preparation
Multipoint Wet Preparation

☒ Dry Preparation
Multipoint Dry Preparation

☒ Procedure A
Multipoint Test

☐ Procedure B
One-point Test



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SAN DIEGO, CALIFORNIA 92126

# STANDARD METHOD FOR ATTERBERG LIMITS
# ASTM D4318

REVISION 0, DATED 1/31/15

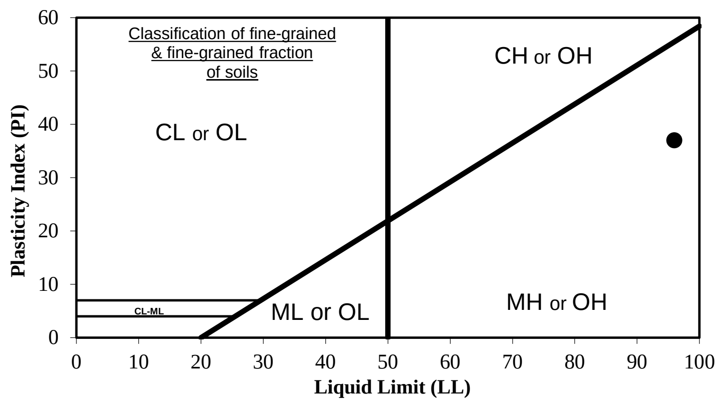
| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | 850 San Clemente Dr. | **Tested By :** | RCV | **Date:** | 10/12/15 |
| **Project No. :** | IR634 | **Data Input By:** | JLK | **Date:** | 10/14/15 |
| **Sample No.:** | A-15-002, R-7 | **Checked By:** | | **Date:** | |
| **Sample Location:** | 20-21.5' | | | Page____ of ____ | |

| | PLASTIC LIMIT | | LIQUID LIMIT | | | |
|---|---|---|---|---|---|---|
| TEST NO. | 1 | 2 | 1 | 2 | 3 | 4 |
| Number of Blows [N] | | | 32 | 23 | 17 | |
| Wet Wt. of Soil + Cont. (gm.) | 17.89 | 18.12 | 19.07 | 19.09 | 20.24 | |
| Dry Wt. of Soil + Cont. (gm.) | 15.47 | 15.70 | 15.37 | 15.45 | 15.75 | |
| Wt. of Container (gm.) | 11.39 | 11.60 | 11.45 | 11.69 | 11.17 | |
| Moisture Content (%) [Wn] | 59.31 | 59.02 | 94.39 | 96.81 | 98.03 | |

| | |
|---|---|
| **LIQUID LIMIT** | **96** |
| **PLASTIC LIMIT** | **59** |
| **PLASTICITY INDEX** | **37** |

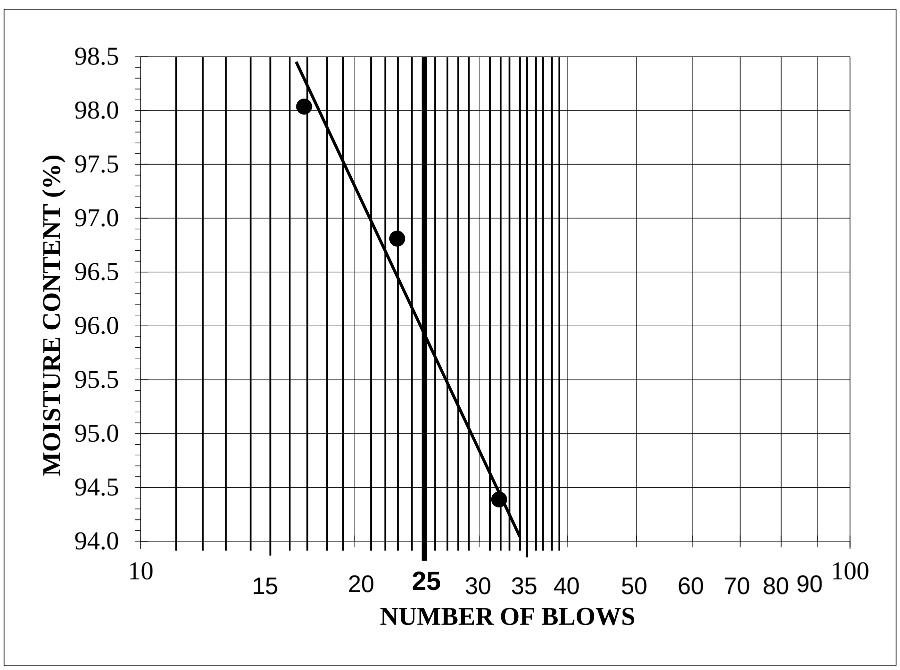
PI at "A" - Line = 0.73(LL-20) = **55.5**

One - Point Liquid Limit Calculation $LL=Wn(N/25)^{0.121}$




## PROCEDURES USED

- [ ] Wet Preparation
  Multipoint Wet Preparation
- [X] Dry Preparation
  Multipoint Dry Preparation
- [X] Procedure A
  Multipoint Test
- [ ] Procedure B
  One-point Test



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# STANDARD METHOD FOR ATTERBERG LIMITS
## ASTM D4318

**REVISION 0, DATED 1/31/15**

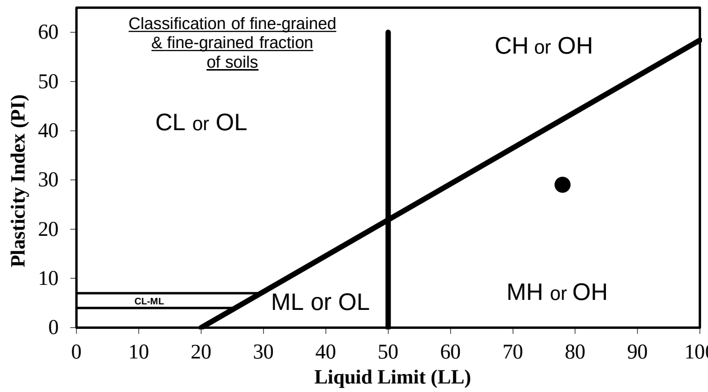
| | | | | | |
|---|---|---|---|---|---|
| **Project Name:** | 850 San Clemente Dr. | **Tested By :** | RCV | **Date:** | 10/12/15 |
| **Project No. :** | IR634 | **Data Input By:** | JLK | **Date:** | 10/14/15 |
| **Sample No.:** | A-15-002, S-8 | **Checked By:** | | **Date:** | |
| **Sample Location:** | 25-26.5' | | | Page____ of ____ | |

| | PLASTIC LIMIT | | LIQUID LIMIT | | | |
|---|---|---|---|---|---|---|
| TEST NO. | 1 | 2 | 1 | 2 | 3 | 4 |
| Number of Blows [N] | | | 34 | 26 | 19 | |
| Wet Wt. of Soil + Cont. (gm.) | 17.52 | 17.95 | 19.64 | 19.87 | 18.88 | |
| Dry Wt. of Soil + Cont. (gm.) | 15.37 | 15.80 | 16.00 | 16.14 | 15.47 | |
| Wt. of Container (gm.) | 11.01 | 11.45 | 11.23 | 11.33 | 11.15 | |
| Moisture Content (%) [Wn] | 49.31 | 49.43 | 76.31 | 77.55 | 78.94 | |

| | |
|---|---|
| **LIQUID LIMIT** | **78** |
| **PLASTIC LIMIT** | **49** |
| **PLASTICITY INDEX** | **29** |

PI at "A" - Line = 0.73(LL-20) = **42.3**

One - Point Liquid Limit Calculation $LL=Wn(N/25)^{0.121}$



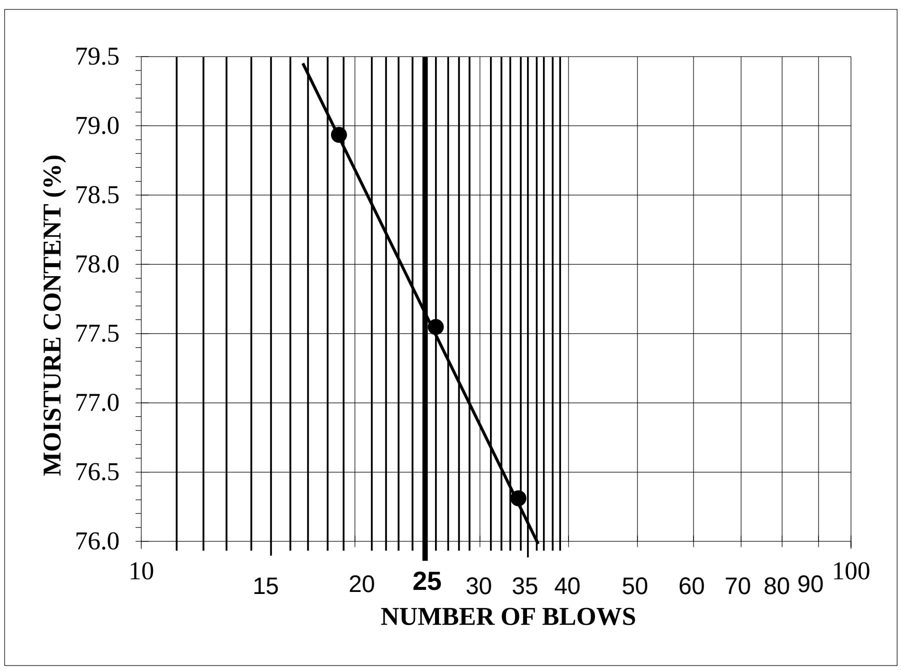

**PROCEDURES USED**

☐ Wet Preparation
Multipoint Wet Preparation

☒ Dry Preparation
Multipoint Dry Preparation

☒ Procedure A
Multipoint Test

☐ Procedure B
One-point Test



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# STANDARD METHOD FOR ATTERBERG LIMITS
## ASTM D4318

REVISION 0, DATED 1/31/15

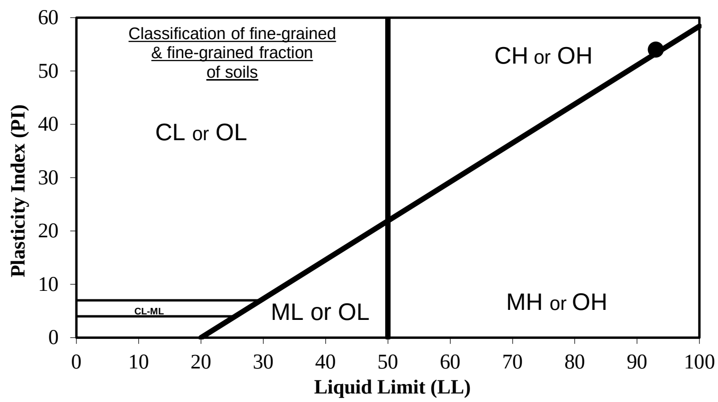
| | | | |
|---|---|---|---|
| **Project Name:** 850 San Clemente Dr. | **Tested By :** RCV | **Date:** 10/08/15 | |
| **Project No. :** IR634 | **Data Input By:** JLK | **Date:** 10/14/15 | |
| **Sample No.:** A-15-002, R-12 | **Checked By:** | **Date:** | |
| **Sample Location:** 45-46.5 | | Page____ of ____ | |

| | PLASTIC LIMIT | | LIQUID LIMIT | | | |
|---|---|---|---|---|---|---|
| TEST NO. | 1 | 2 | 1 | 2 | 3 | 4 |
| Number of Blows [N] | | | 35 | 26 | 19 | |
| Wet Wt. of Soil + Cont. (gm.) | 17.21 | 17.34 | 19.14 | 18.16 | 19.69 | |
| Dry Wt. of Soil + Cont. (gm.) | 15.45 | 15.55 | 15.17 | 14.54 | 15.72 | |
| Wt. of Container (gm.) | 10.94 | 10.88 | 10.77 | 10.63 | 11.56 | |
| Moisture Content (%) [Wn] | 39.02 | 38.33 | 90.23 | 92.58 | 95.43 | |

| | |
|---|---|
| **LIQUID LIMIT** | **93** |
| **PLASTIC LIMIT** | **39** |
| **PLASTICITY INDEX** | **54** |

PI at "A" - Line = 0.73(LL-20) = **53.3**

One - Point Liquid Limit Calculation $LL=Wn(N/25)^{0.121}$



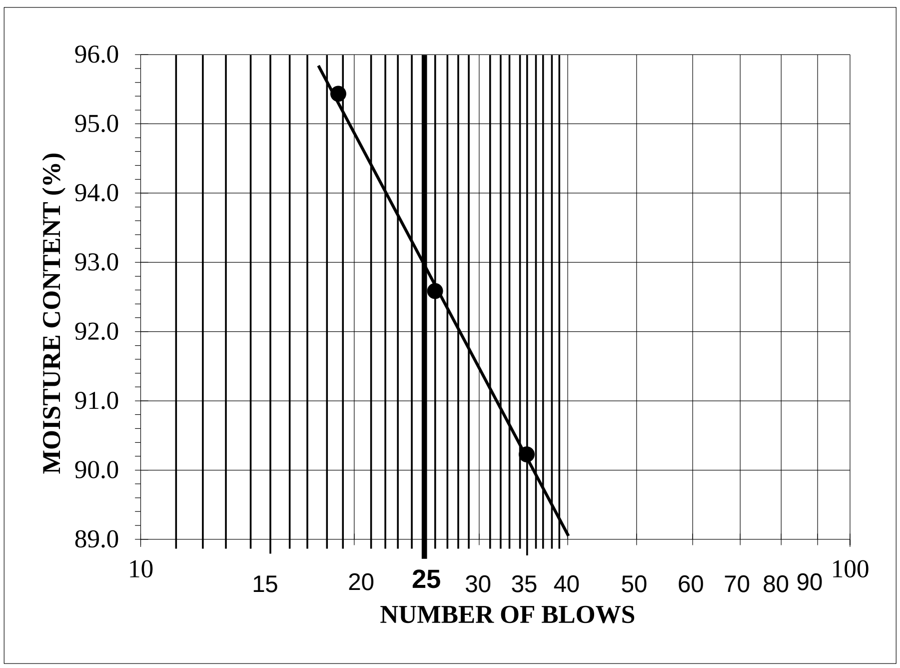

## PROCEDURES USED

☐ Wet Preparation
Multipoint Wet Preparation

X Dry Preparation
Multipoint Dry Preparation

X Procedure A
Multipoint Test

☐ Procedure B
One-point Test



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# STANDARD METHOD FOR ATTERBERG LIMITS
# ASTM D4318

REVISION 0, DATED 1/31/15

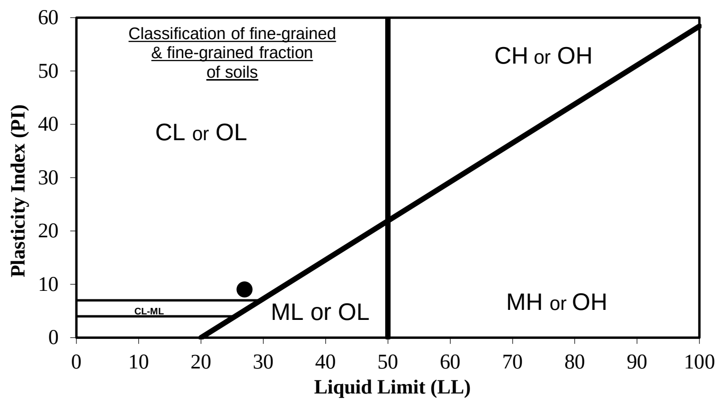
**Project Name:** 850 San Clemente Dr. **Tested By :** RCV **Date:** 10/08/15
**Project No. :** IR634 **Data Input By:** JLK **Date:** 10/14/15
**Sample No.:** A-15-003, R-5 **Checked By:** **Date:**
**Sample Location:** 25-26.5' Page____ of ____

| | PLASTIC LIMIT | | LIQUID LIMIT | | | |
|---|---|---|---|---|---|---|
| TEST NO. | 1 | 2 | 1 | 2 | 3 | 4 |
| Number of Blows [N] | | | 33 | 24 | 19 | |
| Wet Wt. of Soil + Cont. (gm.) | 17.71 | 17.95 | 21.23 | 20.57 | 21.83 | |
| Dry Wt. of Soil + Cont. (gm.) | 16.69 | 16.86 | 19.11 | 18.63 | 19.60 | |
| Wt. of Container (gm.) | 11.01 | 10.67 | 10.94 | 11.45 | 11.53 | |
| Moisture Content (%) [Wn] | 17.96 | 17.61 | 25.95 | 27.02 | 27.63 | |

| | |
|---|---|
| **LIQUID LIMIT** | **27** |
| **PLASTIC LIMIT** | **18** |
| **PLASTICITY INDEX** | **9** |

PI at "A" - Line = 0.73(LL-20) = **5.1**

One - Point Liquid Limit Calculation $LL=Wn(N/25)^{0.121}$



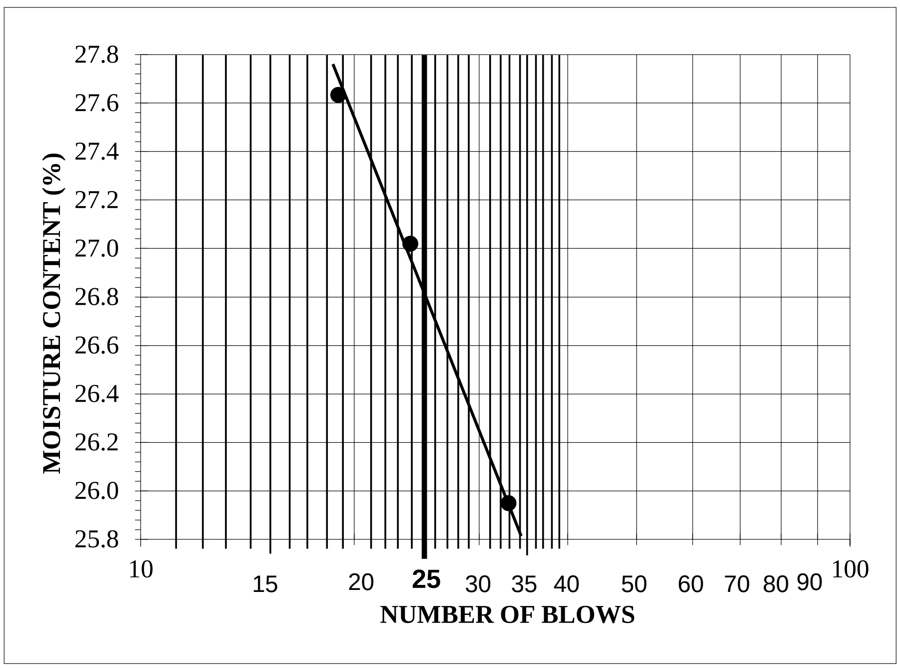

## PROCEDURES USED

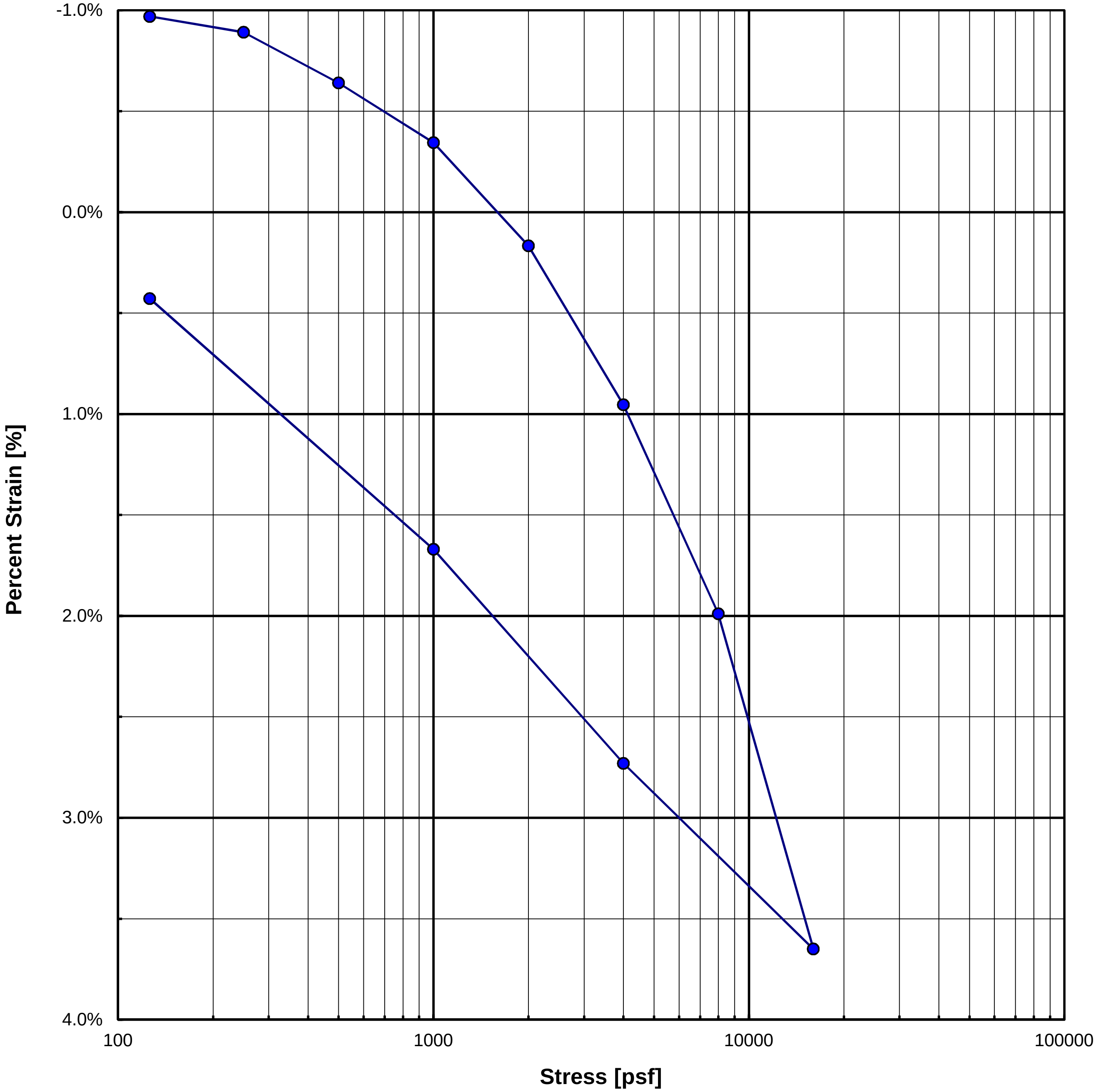
☐ Wet Preparation
Multipoint Wet Preparation

X Dry Preparation
Multipoint Dry Preparation

X Procedure A
Multipoint Test

☐ Procedure B
One-point Test






**A-15-001 @ 30'**

| INITIAL | FINAL | |
|---|---|---|
| 1.0000 | 0.9957 | SAMPLE HEIGHT [IN] |
| 71.5 | 72.6 | DRY DENSITY [PCF] |
| 2.74 | 2.74 | SPECIFIC GRAVITY (ASSUMED) |
| 1.380 | 1.350 | VOID RATIO (e) |
| 31.2 | 49.4 | WATER CONTENT [%] |
| 61.8 | 100.0 | DEGREE OF SATURATION [%] |

CALCULATED SOIL PROPERTIES

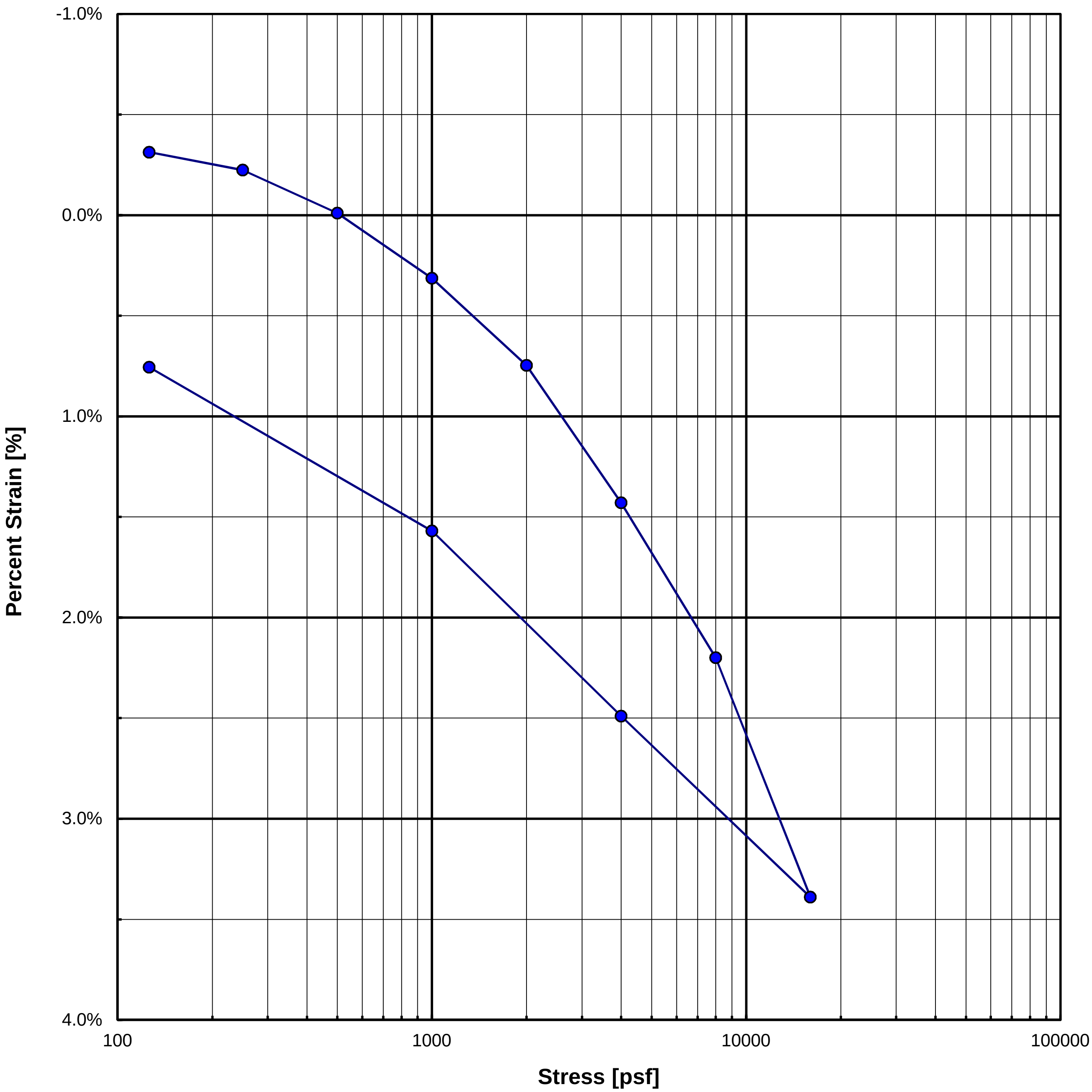
| | |
|---|---|
| 4.5E-04 | AVERAGE Cv [$IN^2$/S] |
| 2.2E-08 | AVERAGE K [CM/S] |

GROUP DELTA

**CONSOLIDATION RESULTS**

Project No. IR634

**FIGURE B-5.1**




**A-15-002 @ 45'**

| INITIAL | FINAL | |
|---|---|---|
| 1.0000 | 0.9924 | SAMPLE HEIGHT [IN] |
| 62.6 | 66.2 | DRY DENSITY [PCF] |
| 2.83 | 2.83 | SPECIFIC GRAVITY (ASSUMED) |
| 1.700 | 1.670 | VOID RATIO (e) |
| 36.8 | 58.9 | WATER CONTENT [%] |
| 61.3 | 100.0 | DEGREE OF SATURATION [%] |

CALCULATED SOIL PROPERTIES

| | |
|---|---|
| 2.4E-03 | AVERAGE Cv [$IN^2$/S] |
| 9.0E-08 | AVERAGE K [CM/S] |

GROUP DELTA

**CONSOLIDATION RESULTS**

Project No. IR634

**FIGURE B-5.2**

## CORROSIVITY TEST RESULTS
## (ASTM D516, CTM 643)

| SAMPLE | Ph | RESISTIVITY (OHM-CM) | SULFATE CONTENT (%) | CHLORIDE CONTENT (%) |
|---|---|---|---|---|
| *A-15-001 / B-1 @ 0-5'* | *7.92* | *7136* | *< 0.01* | *< 0.01* |
| *A-15-002 / B-1 @ 0-5'* | *8.29* | *3111* | *< 0.01* | *< 0.01* |
| *A-15-002 / R-10 / 35-36.5'* | *N/A* | *N/A* | *0.01* | *N/A* |
| | | | | |

## CORROSIVITY PERAMETERS

| SULFATE CONTENT (%) | SULFATE EXPOSURE | CEMENT TYPE |
|---|---|---|
| 0.00 to 0.10 | Negligible | -- |
| 0.10 to 0.20 | Moderate | II, IP(MS), IS(MS) |
| 0.20 to 2.00 | Severe | V |
| Above 2.00 | Very Severe | V plus pozzolan |

| SOIL RESISTIVITY (OHM-CM) | GENERAL DEGREE OF CORROSIVITY TO FERROUS METALS |
|---|---|
| 0 to 1,000 | Very Corrosive |
| 1,000 to 2,000 | Corrosive |
| 2,000 to 5,000 | Moderately Corrosive |
| 5,000 to 10,000 | Mildly Corrosive |
| Above 10,000 | Slightly Corrosive |

| CHLORIDE (Cl) CONTENT (%) | GENERAL DEGREE OF CORROSIVITY TO METALS |
|---|---|
| 0.00 to 0.03 | Negligible |
| 0.03 to 0.15 | Corrosive |
| Above 0.15 | Severely Corrosive |

GROUP DELTA

GROUP DELTA CONSULTANTS
1320 South Simpson Circle
Anaheim, CA 92806
(714) 660-7500 office
(714) 660-7550 fax

Project Name: ***805 San Clemente Drive***
Project Number: ***IR-634***
Laboratory Number: ***SO.3474***
Sampled By / Date: ***Llanet - 9/16/15***
Report Date: ***10/15/2015***

## CORROSIVITY TEST RESULTS
## (ASTM D516, CTM 643)

| SAMPLE | Ph | RESISTIVITY (OHM-CM) | SULFATE CONTENT (%) | CHLORIDE CONTENT (%) |
|---|---|---|---|---|
| *A-15-001 / B-1 @ 0-5'* | *7.92* | *7136* | *< 0.01* | *< 0.01* |
| *A-15-002 / B-1 @ 0-5'* | *8.29* | *3111* | *< 0.01* | *< 0.01* |
| *A-15-002 / R-10 / 35-36.5'* | *N/A* | *N/A* | *0.01* | *N/A* |
| | | | | |

## CORROSIVITY PERAMETERS

| SULFATE CONTENT (%) | SULFATE EXPOSURE | CEMENT TYPE |
|---|---|---|
| 0.00 to 0.10 | Negligible | -- |
| 0.10 to 0.20 | Moderate | II, IP(MS), IS(MS) |
| 0.20 to 2.00 | Severe | V |
| Above 2.00 | Very Severe | V plus pozzolan |

| SOIL RESISTIVITY (OHM-CM) | GENERAL DEGREE OF CORROSIVITY TO FERROUS METALS |
|---|---|
| 0 to 1,000 | Very Corrosive |
| 1,000 to 2,000 | Corrosive |
| 2,000 to 5,000 | Moderately Corrosive |
| 5,000 to 10,000 | Mildly Corrosive |
| Above 10,000 | Slightly Corrosive |

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# *Appendix C  Downhole Seismic Survey*

# Appendix B  Downhole Seismic Survey

**Subsurface Surveys & Associates, Inc.**
2075 Corte Del Nogal, Suite W   Carlsbad, CA 92011
Phone: (760) 476-0492   Fax: (760) 476-0493

Group Delta Consultants
32 Mauchly, Suite B
Irvine, CA 92618

September 25, 2015

Attn: Llanet Gomez

Re: Down-hole Seismic Survey Report
Orange County Museum of Art
Newport Beach, CA

This report covers the results of a down-hole seismic survey performed at the Orange County Museum of Art located on San Clemente Drive in Newport Beach, California. The purpose of the survey was to measure the compressional (P) and shear (S) wave velocity of subsurface soil and bedrock to a depth of 100 feet. This information is to be used for engineering design and construction of a new multi-story building on the property.

The fieldwork was conducted on September 21, 2015. Measurements were made in a cased well located in the east side parking lot. A site location map is provided on Figure 1.

## Geologic Setting

A review of the H-11 boring log from a nearby borehole (provided by Group Delta) indicates the local area is underlain by Quaternary marine terrace deposits that are mainly silt and sand. The terrace deposits are underlain by the Tertiary Monterey Formation that is composed of siltstone and claystone beds.

## Data Acquisition and Field Methods

Prior to starting the survey, a measuring tape was used to confirm a casing depth of 95 feet. Groundwater was observed in the casing at a depth of 23 feet below the ground surface. Apparently, the PVC pipe was not sealed well.

Seismic data were recorded with a Bison 9024 digital seismograph and a triaxial down-hole geophone with 10 Hz elements. Recordings were made at 5-foot intervals down to a depth of 90 feet. The length of geophone case did not allow measurements at the bottom of casing.

Compressional energy for P-wave measurements was generated by sledge hammer impacts on a metal plate. Shear waves were produced by striking the end of an 8-foot wooden plank that was held fixed to the ground by the front wheels of a vehicle. Both the plank and the steel plate were placed five feet from the borehole casing.

Three independent records were made at each depth point: one striking each end of the plank and one hitting the steel plate adjacent to the plank. Each record was reviewed and printed on thermal paper and then stored digitally on an internal hard disk.

In analyzing the data, particular attention is paid to the two horizontal impacts. True shear waves should reverse polarity, and this is the most important identifying characteristic of S-waves.

Vehicle noise from car and truck traffic on San Clemente Drive and vehicles entering and leaving the parking garage adjacent to the survey site was a problem. The S-wave energy produced by the horizontal beam hits is relatively weak so there was a lot of waiting for quiet conditions.

The vertical impacts on the metal plate produced good compressional wave energy for the P-wave measurements. Vertical downward hits with a sledgehammer always produce significantly higher amplitude energy compared to the weaker horizontal hits on wood.

## Borehole Preparation for Seismic Recording

Group Delta was provided with a set of notes for preparing the special grout mixture required for seismic work and instructions for installing the grout. The notes are provided below for future reference.

### **Borehole Preparation Notes for Down-Hole Seismic Surveys**

Standard schedule 40 PVC pipe (or equivalent) with a minimum 3-inch inside diameter (no aluminum or stainless steel).

If in unconsolidated sediments, the borehole needs to be grouted. The specified mixture for seismic down-hole and cross-hole surveys is as follows:

One pound of bentonite
One pound of portland cement
0.75 gallons of water

It is recommended that the grout be installed from the bottom of the casing upwards to the ground surface using a pump or a Tremy tube. This will eliminate bridging that can produce void spaces.

Energy generation works best when the shear wave source is on soil. Concrete and asphalt surfaces are not recommended.

---

Since Subsurface Surveys is not present during the drilling operations, it is our clients responsibility to make sure the drilling crew is knowledgeable and experienced in preparing boreholes for seismic measurements. The grout mixture is especially important. It is designed to be a low velocity material yet produce a good firm bond between the casing and the borehole wall.

Data Reduction and Velocity Determination

P and S-wave first arrival times measured from the down-hole seismic records are plotted on time-distance graphs that show time verses slant distance (from shotpoint to geophone). Based on changes in the slope of the graph, interval distances were divided by interval times to yield velocity in feet/sec.

Summary of Results

Results from the down-hole survey are displayed on time-distance plots and graphs of velocity verses depth. See Figure 2 (S-wave) and Figure 3 (P-wave).

It is our understanding that drilling encountered water at depths of about 30-35 feet, and upon completing the 100-foot hole, the static water level rose to about 25 feet. As previously noted, there was water in the PVC casing at a depth of 23 feet on the day of the survey.

Useable shear wave data was only observed at depths of 5-20 feet. The velocity posted at 20 feet is considered marginal. We suspect the primary factor responsible for the poor results was the installation of grout into a water-bearing borehole. This may have compromised the integrity of the grout mixture and its water content, most likely producing a fluidized slurry that did not harden and would not transmit shear waves.

P-wave transmission is compressional and can travel through air, water, and soft plastic materials. Interpretation of the data shown on Figure 3 indicates the terrace deposits have a velocity range of (2000-3000 ft/sec). Contact with the underlying Monterey Formation (6000-8000 ft/sec) occurs at a depth of about 35 feet.

A summary listing of both Vs and Vp data is provided below

Table 1. Survey Summary Velocity in (ft/sec) Depth in (feet)

| Depth | Vp | Vs |
|---|---|---|
| 5 | 2209 | 1370 |
| 10 | 2753 | 1358 |
| 15 | 2875 | 1703 |
| 20 | 2285 | 1455 |
| 25 | 2227 | no data below |
| 30 | 2227 | below 20 ft depth |
| 35 | 2777 | |
| 40 | 4166 | |
| 45 | 6250 | |
| 50 | 6250 | |
| 55 | 7142 | |

Table 1. Survey Summary    Velocity in (ft/sec)   Depth in (feet)

| Depth | Vp | Vs |
|---|---|---|
| 60 | 7142 | no data below |
| 65 | 6696 | 20 ft depth |
| 70 | 6250 | |
| 75 | 6696 | |
| 80 | 7142 | |
| 85 | 7142 | |
| 90 | 7738 | |

All data acquired during this survey is considered confidential and is available for review by your staff at any time. We appreciate the opportunity to participate in this project.

Please let us know if you have any questions

PAWalen

Phillip A. Walen
Senior Geophysicist
CA Registration No. GP917

Seismic Survey Location Map

850 San Clemente Drive -- Newport Beach, CA

N

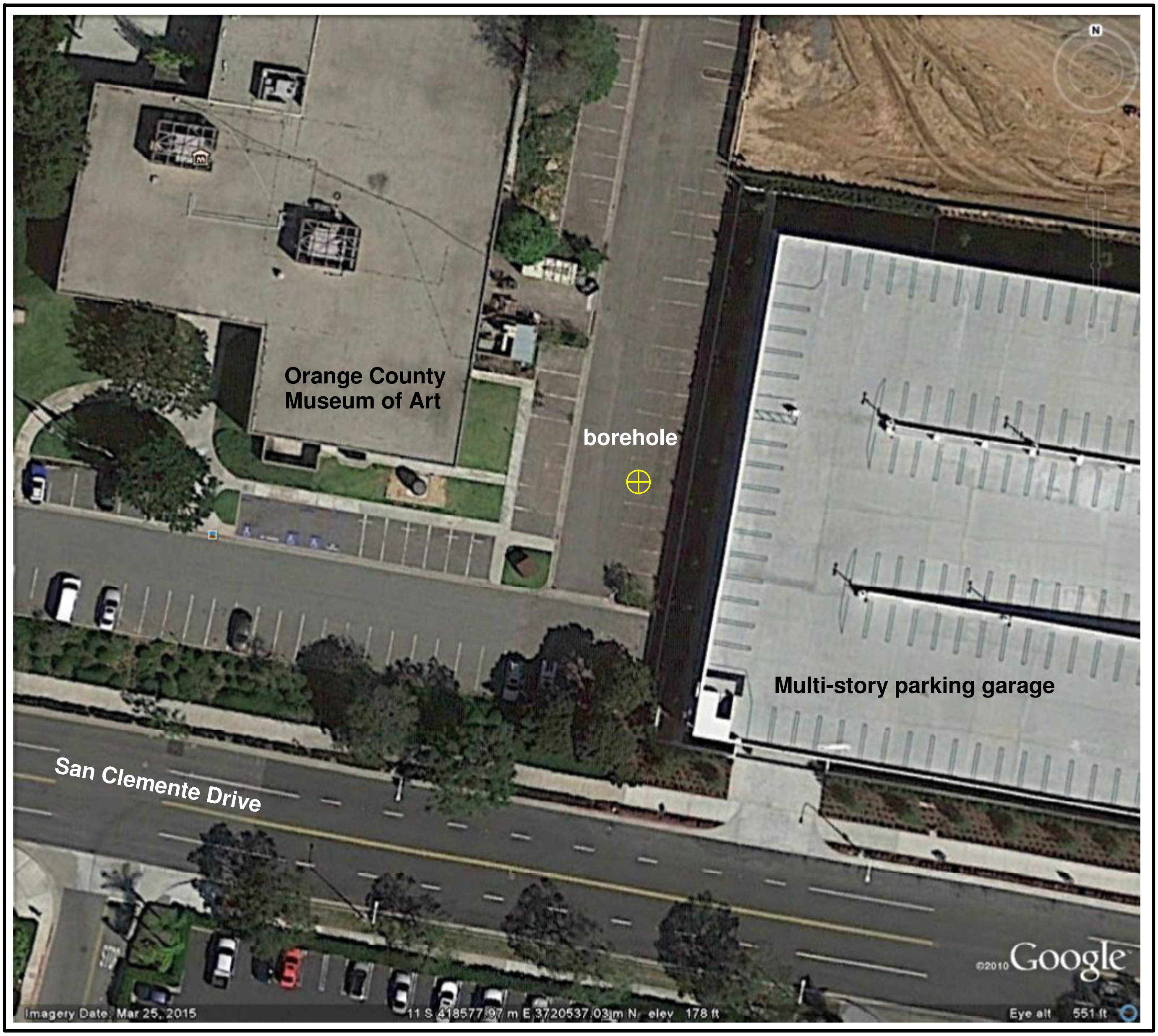


Figure 1

## Shear Wave Velocity Data

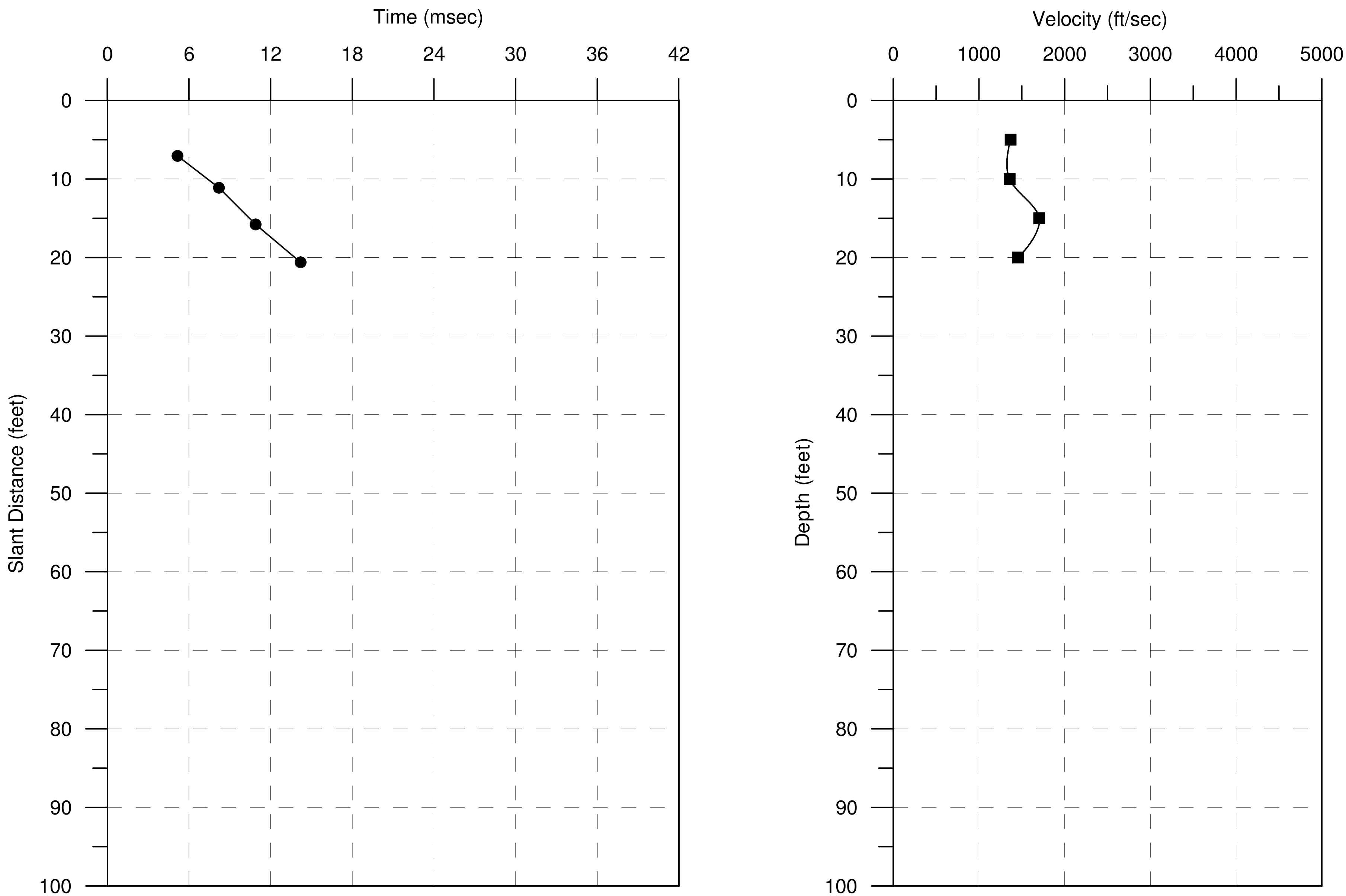


Figure 2