APPENDIX C

GEOTECHNICAL REPORT

REVISED PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT

For

4302 Ford Road
Newport Beach, California

Prepared For:
Ford Road Holdings, LP

Prepared By:
Langan Engineering & Environmental Services
32 Executive Park, Suite 130
Irvine, California 92614

26 October 2017
Revised 13 December 2018
700048801

LANGAN

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1. INTRODUCTION

As requested by Hines (the Client), we have updated our preliminary geotechnical engineering investigation report for the proposed construction of a three-story building with a one-story below grade parking garage (the Project) at 4302 Ford Road in the city of Newport Beach, Orange County, California (the Site). The purpose of this updated report is to address changes in the design of the proposed Project, and update our geotechnical recommendations.

The recommendations provided herein are based on the 2016 California Building Code (2016 CBC), City of Newport Beach's Title 15 - Buildings and Construction Code, specifically Excavation and Grading Code (Chapter 15.10), and the updated preliminary plans of the Project titled, "Ford Road Residential, Newport Beach" dated 31 July 2018 prepared by MVE + Partners. Elevations referenced herein are with respect to Northern American Vertical Datum of 1988 (NAVD88), unless otherwise noted.

Environmental issues (such as potentially contaminated soil) are outside the scope of this study and should be addressed in a separate study, if applicable.

2. PROJECT DESCRIPTION

2.1 Site Description

The Site is an approximate 1 acre trapezoidal-shaped parcel located at the southeast corner of MacArthur Boulevard and Bonita Canyon Drive at 4302 Ford Road in the city of Newport Beach, California. The Site is bounded by MacArthur Boulevard to the west, Bonita Canyon Drive to the north, Bonita Canyon Sports Park to the south and an existing AT&T building to the east, as shown on Figure 1.

The central and western part of the Site is currently vegetated with ground cover, shrubs, and mature trees. The southern site limits run parallel with an existing concrete pedestrian jogging path, in addition to ascending upwards to the concrete jogging path with an approximate 2H:1V (horizontal:vertical) fill slope from el. 192 to approximate el. 200.

The eastern part of the Site slopes upward at approximately a 2H:1V fill slope that ascends from el. 192 to approximate el. 200 and existing AT&T employee only parking lot. The natural slope is vegetated with ground cover, shrubs, and cactus.

2.2 Proposed Construction

Based on proposed site plans and elevation sections provided by the Client on 30 November 2018, we understand the Project will consist of construction of a three-story above grade multi-family building built on top of a one-story below grade parking structure with mechanical, electrical, and plumbing rooms. Proposed construction footprint is approximately 16,600 square feet.

At the time of this updated preliminary geotechnical investigation report, column and wall loads have not been develop yet.

3. GEOLOGIC REVIEW

3.1 Regional Geology

The Site is located within the Peninsular Ranges Geomorphic Province of Southern California. The Peninsular Ranges Geomorphic Province consists of a series of mountain ranges separated by northwest trending valleys subparallel to faults that branch from the San Andreas Fault.

Specifically, the Site is located on the western margin of the Los Angeles Basin, an extensive sediment-filled depression bound by the Santa Monica and San Gabriel Mountains to the north, the Pacific Ocean to the west, the Palos Verdes Peninsula to the southwest, San Jose Hills to the south, Santa Ana Mountains to the southeast, and the Puente and Chino Hills to the east. The structural history of the Los Angeles Basin includes extension and strike-slip faulting followed by oblique contraction via thrusting and strike-slip faulting.

3.2 Site Geology

According to the California Geological Survey (CGS), "Seismic Hazard Zone Report for the Tustin 7.5-Minute Quadrangle, Orange County, California (SHZR 012)", the site is underlain by Pleistocene marine deposits (Qvoma+aa). In general, the deposit consist of dense to very dense sand and silty sand with local looser fine sands and silty layers. Underlying the Pleistocene marine deposits is Capistrano Formation. In general the Capistrano formation consists of grey fine sandy siltstone with local clay layers.

3.3 Geologic Hazards

Our geologic hazard review was performed in general accordance with California Geological Survey (CGS) "Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California", the 2006 City of Newport Beach (City) General Plan - Safety Element, 2015 County of Riverside (County) General Plan, Safety Element, and the 2016 edition of California Building Code (2016 CBC). The following subsections present the results of our review of geologic hazards as they pertain to the Site.

<u>Regional Faulting</u> – Recognized and mapped faults that are located within a 100 kilometer (km) radius of the Site based on the CGS "2010 Fault Activity Map of California" (Fault Activity Map) and "An Explanatory Text to Accompany the Fault Activity Map of California" (Explanatory Text) are shown on Figures 3A and 3B, respectively. Based on our review, the closest known currently established Holocene-age faults to the Site are the North Branch Fault, approximately 5.2 miles west of the Site, and an unnamed fault, approximately 13.4 miles west of the Site.

The Site is located in a seismically active area that has historically been affected by generally moderate to occasionally high levels of ground motion. Due to the Site's close proximity to several active faults, the proposed development will probably experience similar moderate to occasionally high ground shaking from these fault as well as ground shaking from other seismically active faults of the southern California region.

<u>Regional Seismicity</u> – A search of the CGS earthquake catalogue using the computer program EQSearch found that 64 earthquakes with magnitude 5.0 or greater have occurred within a 100-km radius of the Site between 1800 and 2017. In addition, a search of the USGS ANSS Comprehensive Earthquake Catalog, updated through 22 October 2017 using a web-based Earthquake Archive Search and URL builder tool, found that 25 earthquakes with magnitudes

between 5.0 or greater have occurred within a 100-km radius of the Site between 1900 and 2017. Summaries of the EQSearch and USGS ANSS reported earthquakes are provided in Appendix A.

Surface Rupture – The Site is not within a mapped Alquist-Priolo Earthquake Fault Zones as defined by the Alquist-Priolo Earthquake Fault Zoning (AP) Act. Geologic review does not indicate the presence of active surface faulting within the Site.

Liquefaction – Liquefaction is a transformation of soil from a solid to a liquefied state during which saturated soil temporarily loses strength resulting from the buildup of excess pore water pressure, during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium dense sand and gravel, low-plasticity silt, and some low-plasticity clay deposits.

Based on the CGS, "Earthquake Zones of Required Investigation Tustin Quadrangle (SHZ Tustin 7.5 Minute Quadrangle)" (2001), – the site is not located within a currently established area that is susceptible to liquefaction. Based on the City of Newport Beach's "General Plan, Safety Element" (2006), the Site is not located within a currently established area that is susceptible to liquefaction. Refer to Figure 4.

Lateral Spreading – Lateral spreading is a phenomenon in which a surficial soil displaces along a shear zone that has formed within an underlying liquefied layer. The surficial blocks are transported downslope or in the direction of a free face, such as a slope, by earthquake and gravitational forces. The Site is not located within a currently established liquefaction hazard zone; therefore, lateral spreading is not anticipated. Refer to Figure 4.

Seismic-Induced Ground Deformations – Seismic-induced ground deformations include ground surface settlement and differential settlement resulting from liquefaction-induced ground deformation and cyclic densification of unsaturated sands and gravels due to earthquakes. The Site is not located within a liquefaction hazard zone and groundwater is about 50 feet below grade; therefore, liquefaction-induced ground deformations are not anticipated. The Site will be underlain by engineered fill overlying competent marine deposits; therefore, significant differential settlement due to cyclic densification is not anticipated.

Landslides – Based on the City's Safety Element, the Site is not located within an earthquake-induced landslide hazard zone or a landslide potential hazard zone. Refer to Figure 4.

Historic High Groundwater – Based on the City's Safety Element – Geology and Seismic Hazards Section and site-specific data, the historically highest groundwater is estimated to be about 50 feet below ground surface.

Flood Mapping - Based on City's Safety Element – Flood Hazard Section and related Exhibit S-5 Flood Hazards, the Site is not located within a currently established flood hazard area. Refer to Figure 6.

Based on Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) Number 06059C0288J, dated 3 December 2009, and revised to reflect 11 July 2014 Letter Of Map Revision, the Site is within a currently established 'Zone X; areas of 0.2% annual flood, areas of 1% annual change of flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and are protected by levees from 1% annual chance flood.

Tsunami and Seiche – A tsunami is a long high sea wave caused by an earthquake, submarine landslide, or other disturbance. A seiche is oscillation of surface water in an enclosed or semi-enclosed basin such as a lake, bay, or harbor. The Site is not located near a coastline and the Site is not within the immediate vicinity an enclosed body of water therefore; potential for a tsunami or seiche to affect the Site does not exist.

Expansive Soils – Expansive soils can result in differential movement of structures including slab heave and cracking, differential movement of foundations, and cracking of pavements and sidewalks. The 2016 CBC defines potentially expansive soils as soils with expansion indices (EI) greater than 20. Site-specific EI testing was not performed as part of our investigations, and should be performed upon completion of recommended grading if cohesive materials are encountered at the bottom of the proposed excavation.

Collapsible Soils – Collapsible soils, or soils susceptible to hydroconsolidation, are geologically young, unconsolidated, low-density, loose, dry soils commonly present in arid to semi-arid regions, such as Southern California. These soils generally occur within wind deposited sands or silts, alluvial fans, colluvial soils, stream banks, or residual mudflow soils. Collapsible soils have granular particles that are chemically cemented in place creating a porous structure. Once water is introduced, the porous structure collapses and the granular particles are rearranged. A rise in groundwater or increase in surface-water infiltration, combined with the weight of a structure, can cause rapid settlement, resulting in cracking of foundations and walls. Based on the reported Site geologic conditions and subsurface information reviewed for the Site, soils potentially susceptible to hydroconsolidation are not anticipated.

4. SUBSURFACE INVESTIGATION & LABORATORY TESTING

4.1 Subsurface Investigation

Our field investigation consisted of drilling 3 borings, identified as B-1 through B-3 and performing 2 cone penetrometer tests (CPTs). Borings B-1 and B-3 were drilled to 50 feet below ground surface (bgs). Boring B-2 was drilled to a depth of 70 feet bgs and CPT-1 and CPT-2 were advanced to depths of 70 feet bgs. Ground surface elevations at the boring and CPT locations have been inferred from elevations shown on the site survey with respect to NAVD88. Refer to Figure 2 for approximate boring and CPT locations.

In preparation for drilling, the boreholes and CPTs were located in the field by a Langan Engineer, DigAlert Underground Service Alert was contacted to markout known utilities within the public right-of-way, and a private utility locating subcontractor performed a subsurface utility check at the boring locations to check the locations for subsurface utilities or anomalies.

The borings were drilled on 5 and 6 October 2017 by 2R Drilling under the full-time observation of a Langan field engineer. A limited-access drill rig with an 8-inch outer diameter hollow stem auger was used to advance the boreholes.

Sampling using a 3-inch-outer-diameter split barrel California sampler lined with 2.42-inch-inner-diameter brass rings and a 2-inch outer diameter split-spoon sampler was performed at select depths. Soil materials were visually examined and classified in the field in accordance with the

Unified Soil Classification System (USCS). A copy of the Boring Logs is provided in Appendix B. Upon completion of drilling and logging, the borings were backfilled with a bentonite grout mixture.

Two (2) CPTs, identified as LCPT-1 and LCPT-2 were performed on 5 October 2017 by Kehoe Testing and Engineering under full-time engineering observation of a Langan field engineer. The CPTs were advanced to approximately 70 feet below existing grade. CPT holes were backfilled with bentonite and patched with concrete upon completion.

The CPTs were performed in accordance with ASTM D5778 by hydraulically pushing a 1.4-inch-diameter cone-tipped probe into the ground. Electrical strain gauges within the cone continuously measured soil data for the entire depth advanced, including tip resistance at the cone tip and frictional resistance on the friction sleeve behind the cone. Copies of the CPT logs are provided in Appendix C.

4.2 Percolation Testing

Two (2) percolation tests were performed in borings at depths of approximately 10 feet below existing ground surface. The percolation tests were performed in general accordance with the methods presented in the "Technical Guidance Document", prepared by Santa Ana Regional Quality Control Board, dated 19 May 2011 (updated December 2013). Percolation test results are attached in Appendix E.

4.3 Laboratory Testing

Soil samples obtained from the geotechnical borings were visually examined in the field, and classifications were confirmed by re-examination in our Irvine, California office. The following tests were performed on select samples:

- Moisture Content and Density – ASTM D2937
- Direct Shear – ASTM D3080
- Consolidation - ASTM D 2435
- Atterberg Limits – ASTM D 4318
- Sieve Analysis Passing No. 200 – ASTM D 422
- Sulfate Content – DOT CA Test 417-B
- Electrical Resistivity – DOT CA Test 532
- Chloride Content – DOT CA Test 422
- Soil pH – DOT CA 643

The laboratory test results are provided in Appendix D.

5. SUBSURFACE CONDITIONS

Based on our review of the geologic and subsurface information, and available information obtained to date, the Site has ascending fill slopes on the eastern and southern portion is generally underlain by Pleistocene marine terrace deposits. Our interpretation of the subsurface conditions based on borings, and laboratory test results is summarized below. Refer to Figures 8 and 9, and Boring Logs (Appendix B) and CPT Logs (Appendix C) for additional subsurface information.

- Fill (af) – The fill generally consisting of tan to brown, medium dense, silty fine to medium sands with trace amounts of clay.

- Pleistocene marine terrace deposits (Qvoma+aa) – Marine terrace deposits generally consisting of tan to red-brown, medium dense to very dense, silty and clayey fine to medium sands with varying amounts of silt and clay; as well as grey/brown-red to black, stiff to hard, silty clay with varying amounts of fine sand.

- Capistrano Formation (Tcs) - Underlying the Pleistocene marine deposits is Capistrano Formation. In general the formation consists of grey fine sandy siltstone with local clay layers. A interlayer of hard light grey siltstone was also encountered at boring location B-2 at an approximate depth of 66 to 71 feet below existing ground surface.

- Groundwater - Groundwater was not observed within our borings or measured within the cone penetrometer test locations.

6. FOUNDATION EVALUATION AND RECOMMENDATIONS

The available boring data indicates that materials beneath the proposed building consist of Pleistocene marine terrace deposits which are generally suitable for support of the proposed development on shallow foundations (i.e. spread or strip footings).

6.1 Shallow Foundations

Shallow footings bearing on Pleistocene marine terrace deposits (Qvoma+aa) may be designed with an allowable bearing pressure of ranging from 3,000 to 4,000 pounds per square foot (psf) per for continuous and spread footings embedded a minimum depth of 24 inches below the lowest adjacent grade and having a minimum width of 12 inches. The recommended bearing pressures can be increased by up to 33 percent for temporary transient loading such as earthquake or wind.

Footing excavations should be performed using a backhoe bucket fitted with a smooth steel plate welded across the bucket teeth to minimize disturbance during excavation and to provide a smooth bearing surface.

The foundation bearing level excavation subgrade should be observed and approved by a qualified Geotechnical Engineer prior to steel or concrete placement.

Foundations should be constructed as soon as possible following subgrade approval. The contractor shall be responsible for maintaining the subgrade in its as approved condition (i.e. free of water, debris, etc.) until the footing is constructed.

Shallow foundations designed in accordance with the above parameters are anticipated to settle less than one (1) inch under static loading and less than one (1) inch under dynamic (cyclic) loading with differential settlements less than 0.5 inch over 50 feet.

6.2 Lateral Resistance

Foundations bearing on appropriately prepared subgrade at the basement level and first floor level can be designed to resist lateral sliding using a coefficient of friction equal to 0.35. If sliding resistance is deemed insufficient, shear keys can be introduced to provide supplemental sliding resistance. Should additional lateral resistance be required, we should be notified in order to perform additional analyses and develop supplemental recommendations to resist the intended loads.

6.3 Seismic Design Parameters

For design of the project in accordance with the seismic provisions of the 2016 California Building Code (2016 CBC), we recommend the following parameters be used:

- Mapped Spectral Accelerations S_s and S_1 of 1.630g and 0.594g, respectively.
- Site Class D
- Site Coefficients F_A and F_V of 1.0 and 1.5, respectively.
- Maximum Considered Earthquake (MCE) spectral response acceleration parameters at short periods, S_{MS}, and at one-second period, S_{M1}, of 1.630g and 0.891g, respectively.
- Design Earthquake (DE) spectral response acceleration parameters at short period, S_{DS}, and at one-second period, S_{D1}, of 1.086g and 0.594g, respectively.
- MCE Geometric Mean Peak Ground Acceleration PGA_m of 0.651g.

6.4 Corrosion Considerations

Chemical analyses performed on existing surficial material are summarized in the following table.

Boring ID (Depth)	Resistivity (ohm-cm)	pH	Sulfate (ppm)	Chloride (ppm)
B-1 @ 0-5'	2,400	8.1	1,111	73

Based on the minimum resistivity, pH, sulfate and chloride contents, the upper 5 feet of existing surface material are considered to be non-corrosive (Caltrans 2012) to concrete. The sulfate concentration, pH, and chloride concentrations indicate soils are moderately to severly corrosive to ferrous metals. Per American Concrete Institute's (ACI), Type II cement (minimum) can be used for concrete exposed non- corrosive soil. Additional corrosion testing should be performed on actual subgrade materials and recommendations prepared during grading as needed to mitigate concrete corrosion and protect ferrous pipes, structures, valves, and fittings to be installed underground at the Site. A copy of the corrosion test results is provided in Appendix C.

6.5 Floor Slabs

Expansive soils are not anticipated to impact the slabs or foundations; therefore, we preliminarily recommend the slab on grade located at parking level B1 slab can be designed using a modulus of subgrade reaction of 175 pounds per cubic inch (pci). Slab reinforcement should be designed by a Structural Engineer to include sufficient reinforcement for shrinkage at a minimum. Upon completion of the recommended grading, an evaluation of the expansion potential of the foundation-bearing materials should be made, at which time, final recommendations should be presented.

A moisture barrier consisting of 4 inches of clean sand with 6-mil polyethylene capillary break with joints lapped not less than 6 inches is recommended below the basement slab.

If expansive soils are encountered within the foundation and/or slab areas, methods commonly used to reduce the effects of expansive soils include: controlling the moisture content of the soils through effective site grading and types of planting, moisture conditioning the soils prior to placement of surface finishes, use of impermeable barriers around foundations, confinement of expansive soils through the use of non-expansive soil caps and chemical stabilization. If isolated areas of clays are identified beneath the proposed slab, we recommend removal and replacement with sandier material.

7. PERMANENT BELOW-GRADE WALLS

Below-grade walls can be designed to resist soil and surcharge pressures using the parameters below and pressure distributions in Figure 7.

- Soil Unit Weight = 120 pounds per cubic foot (pcf)
- Friction Angle = 30 degrees
- At-rest Earth Pressure (restrained wall) = 55 psf / foot
- Active Earth Pressure (unrestrained wall) = 35 psf / foot
- Ultimate sliding resistance coefficient = 0.35
- The vertical distance between the proposed final grade and the proposed top of foundation is anticipated to be greater than 6 feet for the proposed development, and the design peak ground acceleration at the Site is greater than 0.6g; therefore, additional earth pressures caused by seismic ground shaking should be considered in design. Below-grade and site retaining walls should be designed for seismic loading conditions using the active earth pressure plus the seismic force increment of 20 psf / foot.
- Lateral loads from surcharges on the retaining wall backfill may be considered to impart surcharge to the restrained walls presuming a rectangular pressure distribution. Surcharge loading from adjacent foundations should be considered where the adjacent foundations are supported on soil above a 1H:1V theoretical influence line projecting upwards from the base of the below grade wall. Lateral loading from neighboring foundations need not be considered if these foundations bear below the above-mentioned influence line.
- Surcharge loading should consider adjacent streets, vehicular traffic, and sidewalks. Where vehicular traffic will pass within 10 feet of below-grade walls, temporary traffic loads should be considered in the design of walls. Traffic loads such as a fire truck or car parked on the street beyond the sidewalk may be modeled by a minimum uniform pressure of 100 psf / foot applied on the upper 10 feet of the walls.

Because groundwater was not encountered, and historical information associated with adjacent structures indicates its depth to be substantially below the lowest proposed finished level, special provisions for waterproofing below-grade areas do not appear to be warranted at this time. As a minimum, we recommend damp-proofing (such as Grace Water Shield water barrier membrane or equivalent) be used in below-grade closed areas that may house equipment, finishes, or occupants that could be adversely impacted by moisture intrusion. A final choice regarding moisture or vapor protection and mitigation for enclosed below-grade areas should be made after reviewing environmental site conditions and below-grade space use and performance criteria. To avoid undesired vapor accumulation behind walls, prefabricated drainage panels (such as MiraDRAIN or equivalent) are recommended to be placed in uniformly spaced strips behind the walls; for typical 4-foot-wide drainage panel rolls, we recommend a 4-foot edge-to-edge spacing at this time. In addition, a perimeter foundation drain should be installed to collect and route any accumulated water to the site drainage system. Perimeter foundation drains could consist of perforated, Schedule 40 PVC, minimum 4-inch diameter, PVC pipe surrounded with clean gravel and completely encased in geosynthetic filter fabric.

The above values assume backfill materials will consist of compacted fill comprised of excavated on-site soils including silty sands and fine to coarse-grained sands. If conditions other than those covered herein are anticipated, the lateral earth pressures should be provided on an individual basis by the Geotechnical Engineer.

If trees with deep-rooted or widespread rooted systems or vegetation are to be planted within 30 feet of the below-grade walls, the client and the Geotechnical Engineer should consult with the Project Landscape Architect to discuss landscaping alternatives that will not impact the adjacent walls and foundations.

8. CONSTRUCTION RECOMMENDATIONS

8.1 Excavation and Grading

Before beginning excavation and grading, a meeting should be held at the Site with the Owner, City Inspector, excavation/grading Contractor, Civil Engineer, and Geotechnical Engineer to discuss the work schedule and geotechnical aspects of the grading.

All pavement, vegetation, and deleterious materials should be disposed of offsite before beginning grading operations.

Any foundation and abandoned utility remnants or construction debris associated with former site structures encountered within excavations should be fully removed, where practical, and any void spaces that may be created should be backfilled with approved compacted structural fill. If utility pipes are too deep to be removed economically in proposed pavement areas, they should be filled with cement and sand grout or equivalent material that will prevent future collapse of the pipe.

After completion of excavation, including removal of all below-grade remnants, stripping, grubbing, removal of asphalt, base course material, and the soil subgrade should be compacted in place by proofrolling with at least 6 passes of a vibratory roller compactor having a minimum static drum weight of 5 tons. Any areas exhibiting rutting or pumping should be removed and replaced with compacted engineered fill material.

Any soft, loose, or unsuitable soils identified by the Geotechnical Engineer during subgrade preparation should be removed and replaced with approved compacted fill.

Any environmentally unsuitable soils encountered during the excavation process should be removed and properly disposed of off-site in accordance with all state and local regulations.

Surface site elements, such as site pavers, planters, and walkways can be supported on subgrade soils comprised of compacted fill or native alluvial soils prepared in accordance with the recommendations provided herein.

8.2 Site Drainage and Temporary Construction Dewatering

Proper drainage should be maintained at all times. Ponding or trapping of water in localized areas can cause differing moisture levels in the subsurface soil. Drainage should be directed away from the tops of excavations. Erosion protection and drainage control measures should be implemented during periods of inclement weather. During rainfall events, backfill operations may need to be restricted to allow for proper moisture control during fill placement. Based on our subsurface investigation, groundwater was not encountered within the Site and a dewatering permit during construction is not anticipated. However, during periods of inclement weather water may become trapped at bottom of excavations and require dewatering. In this instance a dewatering permit may be necessary for storm water.

8.3 Fill Material and Compaction Criteria

Fill material (imported or reused) should be free of organic and other deleterious materials and should have a maximum particle size no greater than 3 inches. The on-site soils are suitable for use as compacted fill. All fills should be placed in accordance with the placement and compaction criteria discussed in this report. Imported fill should contain no more than 12 percent passing the #200 sieve by dry weight and have a plasticity index less than 7. Grain size distributions, corrosivity, maximum dry density, and optimum water content determinations should be made on representative samples of the proposed fill material.

All structural backfill and fill beneath building slabs and pavements should be placed in uniform lifts (maximum 8 inches thick before compaction) and compacted to a minimum of 95 percent of the maximum dry density at a moisture content within 2 to 3 percent of optimum moisture content, as determined by ASTM D1557 (Modified Proctor compaction).

Non-structural backfill should be placed in uniform lifts (maximum 8 inches thick before compaction) and compacted to at least 90 percent of its maximum dry density at a moisture content within 3 percent of optimum moisture content, as determined by the ASTM D1557 (Modified Proctor compaction).

Non-structural fill having less than 15 percent finer than #200 sieve should be compacted to at least 95 percent of its maximum dry density at a moisture content within 3 percent of optimum moisture content, as determined by the ASTM D1557 (Modified Proctor compaction).

8.4 Utility Support

Utilities can be supported on compacted fill or on approved native soils. The bedding material should extend at least 12 inches over the top of the utility unless otherwise required by the utility owner. Utility subgrade should be confirmed to be free of standing water, firm, and unyielding prior to placement of bedding material. Utility trenches above pipe bedding should be backfilled in accordance with the recommendations provided herein for fill compaction requirements using either previously excavated soil (if suitable), or with approved imported material. Utility trench backfill in non-structural areas should be compacted to a minimum of 90 percent of the maximum dry density and moisture conditioned to within 3 percent of the optimum moisture content, as determined by ASTM D1557 (Modified Proctor). Utility trench backfill within the building and pavement footprints should be compacted to a minimum of 95 percent of the maximum dry density and moisture conditioned to within 3 percent of the optimum moisture content, as determined by ASTM D1557 (Modified Proctor).

8.5 Stormwater Infiltration

Percolation test P-1 is comprised of clayey fine grained sands and percolation test P-2 is comprised of silty fine grained sands. Percolation test P-1 was performed in marine terrace deposits and percolation test P-2 was performed in the existing fill slope on the eastern site limits. The measured percolation rates from P-1 and P-2 are 0.06 and 0.6 inches per hour at test depths of 5 to 10 feet below ground surface and 7 to 10 feet below ground surface, respectively. The corrected infiltration rates are 0.1 and 2.3 inches per hour at test depths of 5 to 10 feet and 7 to 10 feet, respectively.

8.6 Temporary Excavation Support

Temporary excavations are anticipated for the proposed development. The alluvial soils can be classified as Cal/Osha Type C soils. Temporary excavations will be required to facilitate below-grade excavation for the proposed development and will need to be constructed in accordance with Cal/OSHA requirements. Based on our evaluation of subsurface data, and conceptual site plans, we anticipate excavations to be up to 12 feet max. Temporary slopes may be excavated no steeper than 1.5H:1V (horizontal:vertical).

It is anticipated that a 1.5H:1V temporary slope may require encroachment permits on the southern limits of the Site. If areas where 1.5H:1V temporary slopes are deemed not feasible, we anticipate a cantilever shoring wall (up to 12 feet) could be used. See Figure 10 for design earth pressures

Cantilever Shoring Wall:

- The soil pressure distribution for excavation support is a function of the type of excavation support system and the any bracing used. For design, the shoring system should be designed using a triangular pressure distribution having a maximum pressure of 35H reducing to zero towards the top of the wall, where H is the height of the wall in feet. Cantilever shoring adjacent to public right-of-ways should be designed for at-rest conditions with a maximum pressure of 55H.
- The design earth pressure on the lagging can be 0.6 times the earth pressure or a maximum of 400 psf in accordance with California Department of Transportation (2011), "Trenching and Shoring Manual," Revision 1, August 2011.
- Surcharge loading due to adjacent structures, traffic and construction loading within a distance of 30 feet from the wall top should be designed as a constant load equal to 1/3 the applied surcharge. Heavy concentrated construction surcharges (i.e. cranes, material storage, etc.) should be kept a minimum distance of 10 feet away from the wall.
- Passive resistance against soldier beams below the excavated level should be based on an equivalent fluid weight of 175 psf/foot beginning 3 feet below the lowest subgrade level in front of the soldier beams. This passive resistance includes a factor of safety of 2.0. A maximum of 3 times the width of the soldier beam can be considered as contributing to passive resistance. Care must be taken during construction so as not to excavate any soil providing lateral restraint to the shoring system's toe. To minimize vibration and avoid adversely impacting neighboring structures, we recommend placing soldier piles in predrilled and cleaned-out holes that are subsequently backfilled with grout or concrete.

9. PROTECTION OF NEIGHBORING STRUCTURES AND SITE FEATURES

All new construction work should be performed so as not to adversely impact or cause loss of support to structures, hardscape and landscape elements, paving, or utilities to remain. At a minimum, a preconstruction conditions documentation comprised of photographic and videographic documentation of accessible and visible areas of neighboring landscaped, and hardscaped areas including pavements and sidewalks should be considered before beginning construction at the Site.

10. FUTURE STUDIES

At this time, we recommend performing the following supplemental studies:

1. A confirmation design geotechnical investigation and evaluation should be performed to satisfy future project and city of Newport Beach requirements, including:
    a. Review structural loading, and confirm or refine preliminary foundation recommendations including types, bearing capacities, and anticipated settlements.
    b. Review final civil and grading plan, structural plans and loads, perform final foundation analyses, and develop final foundation and temporary excavation recommendations.

To maintain our continuity of responsibility on this project, we recommend the above work be performed by LANGAN.

10. CONSTRUCTION DOCUMENTS AND QUALITY CONTROL

Technical specifications and design drawings should incorporate Langan's recommendations. When authorized, Langan will assist the design team in preparing specification sections related to geotechnical issues such as earthwork, ground improvement, shallow foundations, and backfill. Langan should also, when authorized, review foundation drawings prepared by the Structural Engineer, as well as Contractor submittals relating to materials and construction procedures for geotechnical work.

Langan has investigated and interpreted the site subsurface conditions and developed the foundation design recommendations contained herein, and is therefore best suited to perform quality assurance observation and testing of geotechnical-related work during construction. This work requiring quality assurance confirmation includes, but is not limited to, earthwork, backfill, ground improvement, shallow and deep foundations, and excavation support. Recognizing that construction is essentially the completion of design, Langan's quality assurance observation and testing during construction is necessary to maintain our continuity of responsibility on this project.

11. OWNER AND CONTRACTOR OBLIGATIONS

The Contractor is responsible for construction quality control, which includes satisfactorily constructing the foundation system and any associated temporary works to achieve the design intent while not adversely impacting or causing loss of support to neighboring structures. Construction activities that can alter the existing ground conditions such as excavation, fill placement, foundation construction, ground improvement, etc. can also potentially induce stresses, vibrations, and movements in nearby structures and utilities, and disturb occupants of nearby structures. Contractors working at the Site must ensure that their activities will not adversely affect the performance of the structures and utilities, and will not disturb occupants of nearby structures. Contractors must also take all necessary measures to protect the existing structures during construction. By using this report, the Owner agrees that Langan will not be held responsible for any damage to adjacent structures.

12. LIMITATIONS

The conclusions and recommendations provided in this report are based on subsurface conditions inferred from a limited number of borings, as well as architectural information provided by the Client. Recommendations provided are dependent upon one another and no recommendation should be followed independent of the others.

Any proposed changes in structures or their locations should be brought to Langan's attention as soon as possible so that we can determine whether such changes affect our recommendations. Information on subsurface strata and groundwater levels shown on the logs represent conditions encountered only at the locations indicated and at the time of investigation. If different conditions are encountered during construction, they should immediately be brought to Langan's attention for evaluation, as they may affect our recommendations.

This report has been prepared to assist the Owner, Architect, and Structural Engineer in the design process and is only applicable to the design of the specific project identified. The information in this report cannot be utilized or depended on by engineers or contractors who are involved in evaluations or designs of facilities (including underpinning, grouting, stabilization, etc.) on adjacent properties which are beyond the limits of that which is the specific subject of this report.

Environmental issues (such as potentially contaminated soil) are outside the scope of this study and should be addressed in a separate study.

\\langan.com\data\IRV\data8\700048801\Office Data\Reports\Geotechnical\Updated Preliminary GIR 2018\700048801 Updated Preliminary Geotechnical Investigation Report.docx

13. REFERENCES

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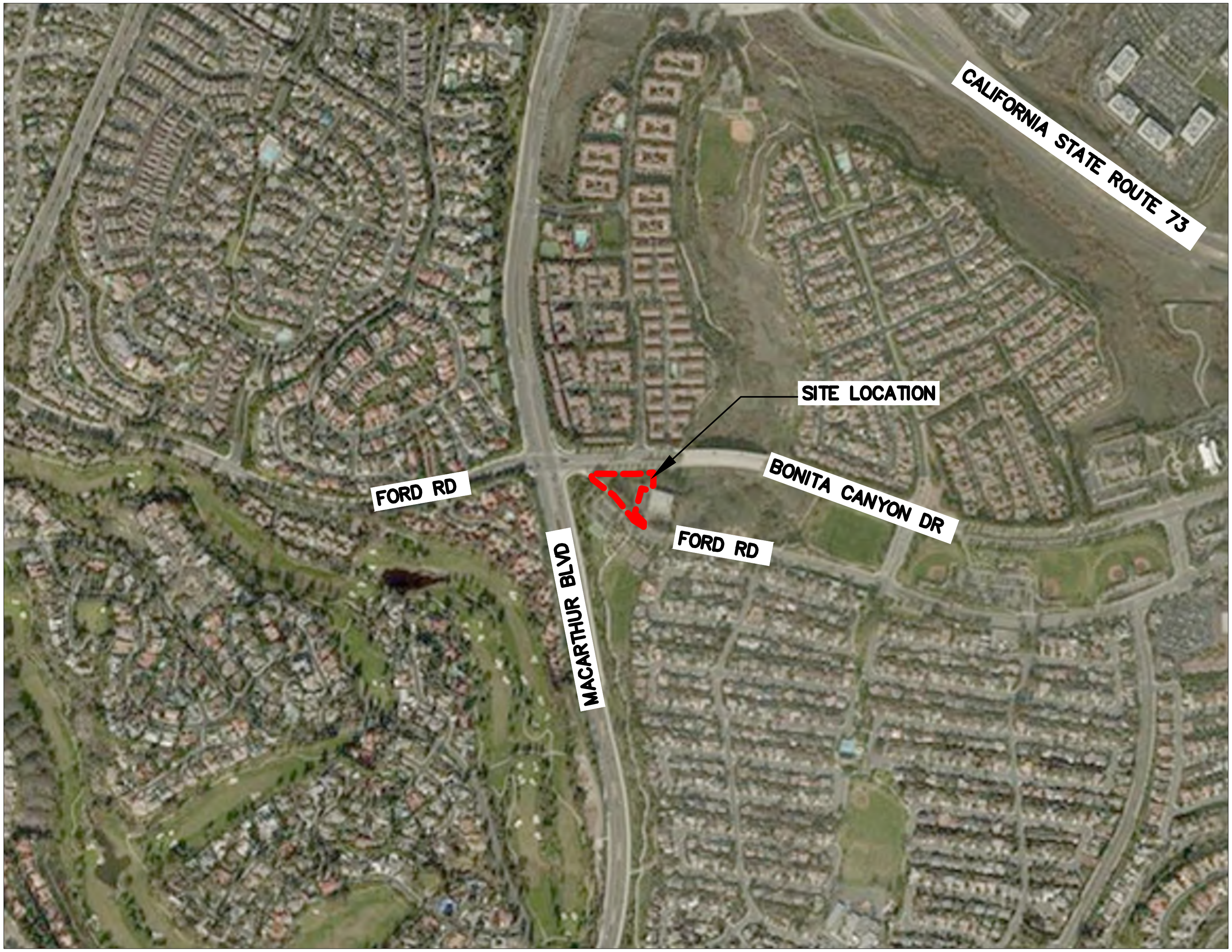
FIGURES



MAP LEGEND:

APPROXIMATE SITE LIMITS

NOTES:

1. BACKGROUND IMAGE FROM DATADOORS DATED 24 OCTOBER 2017.

1000 0 500 1000

SCALE IN FEET

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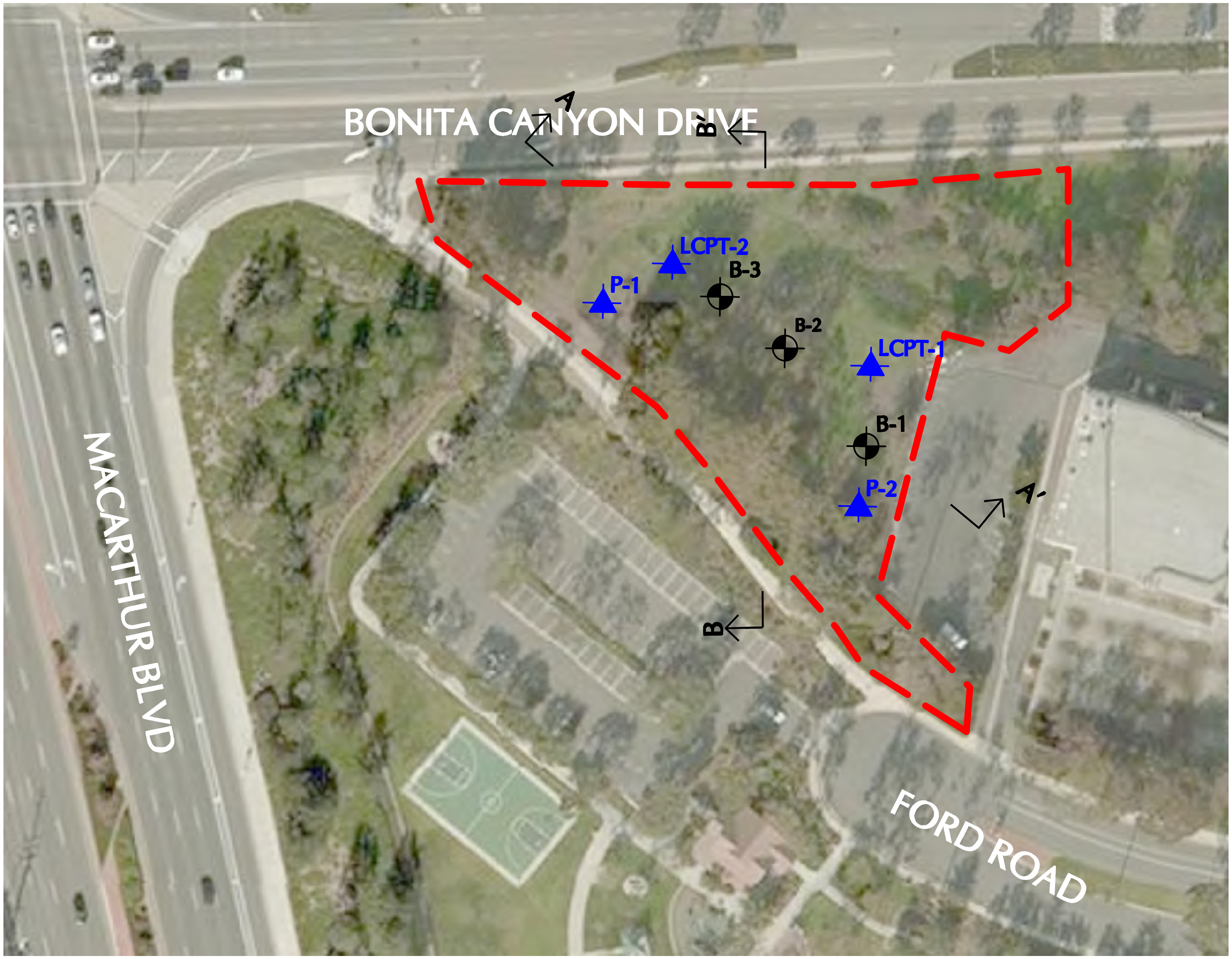
Project	Figure Title	Project No. 700048801	Figure No.
4302 FORD ROAD NEWPORT BEACH ORANGE COUNTY CALIFORNIA	**SITE VICINITY MAP**	Date OCTOBER 2017	1
		REVISED DECEMBER 2018	
		Scale AS SHOWN	
		Drawn By BY / Checked By DJJS	

Filename: \\langan.com\data\IRV\data8\700048801\Cadd Data - 700048801\2D-DesignFiles\Figures (2014.1.10).dwg Date: 12/12/2018 Time: 08:01 User: djudge Style Table: Langan.stb Layout: 1 - Site Vicinity Map



NOTES:

1. BORING LOCATIONS ARE APPROXIMATE.
2. HOLLOW STEM AUGER BORINGS AND CONE PENETROMETER TESTS WERE PERFORMED 5 AND 6 OCTOBER 2017 AND WERE DRILLED UNDER FULL-TIME OBSERVATION OF A LANGAN FIELD ENGINEER.
3. BASE FIGURE REPRODUCED FROM DATADOORS AERIAL IMAGERY OBTAINED 24 OCTOBER 2017.

LEGEND:

LCPT-2	LANGAN CPT
B-3	LANGAN SOIL BORING
	APPROXIMATE SITE LIMITS
B B'	CROSS SECTION LOCATION

100 0 50 100

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Project	Figure Title	Project No. 700048801	Figure No.
4302 FORD ROAD NEWPORT BEACH ORANGE CALIFORNIA	**BORING LOCATION PLAN**	Date OCTOBER 2017	**2**
		REVISED DECEMBER 2018	
		Scale AS SHOWN	
		Drawn By BY / Checked By DJJS	

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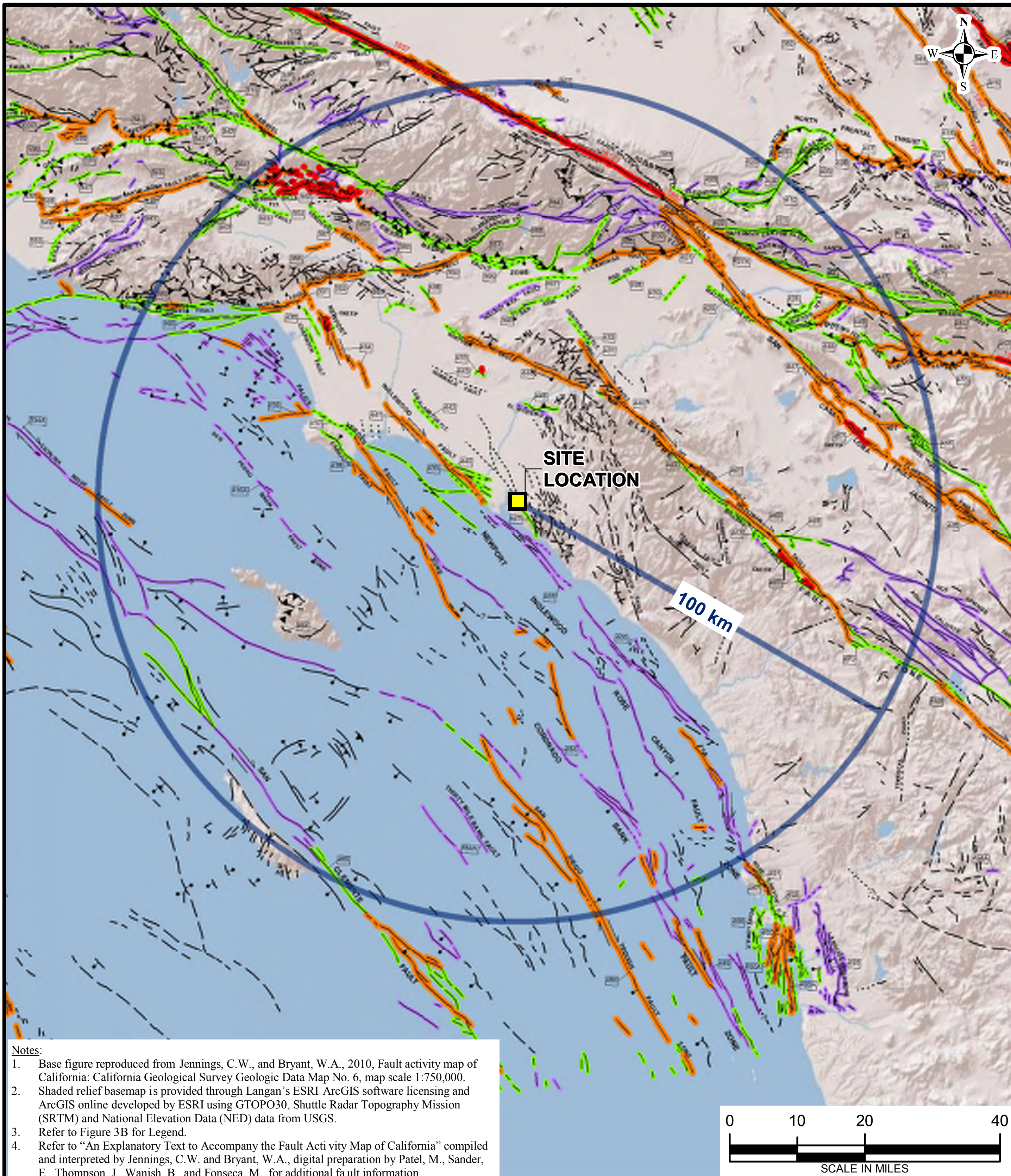

Notes:

1. Base figure reproduced from Jennings, C.W., and Bryant, W.A., 2010, Fault activity map of California: California Geological Survey Geologic Data Map No. 6, map scale 1:750,000.
2. Shaded relief basemap is provided through Langan's ESRI ArcGIS software licensing and ArcGIS online developed by ESRI using GTOPO30, Shuttle Radar Topography Mission (SRTM) and National Elevation Data (NED) data from USGS.
3. Refer to Figure 3B for Legend.
4. Refer to "An Explanatory Text to Accompany the Fault Acti vity Map of California" compiled and interpreted by Jennings, C.W. and Bryant, W.A., digital preparation by Patel, M., Sander, E., Thompson, J., Wanish, B., and Fonseca, M., for additional fa ult information.

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Path: \\langan.com\data\IRV\data8\700048801\ArcGIS\ArcMap_Documents\Fault_Map\CGS_Fault_Map.mxd Date: 10/19/2017 User: bsaylor Time: 10:24:12 AM

LEGEND:

Site Location

Fault Age

The age classifications are based on geologic evidence to determine the youngest faulted unit and the oldest unfaulted unit along each fault of fault seciton

- Historic
- Holocene
- Late Quaternary
- Quaternary
- 100 km

Pre Quaternary Faults

- fault, certain
- fault, approx. located
- fault, concealed
- thrust fault, certain
- thrust fault, approx. located
- thrust fault, approx. located, queried
- fault, certain, barball
- fault, concealed, barball
- fault, approx. located, barball

Quaternary Faults

- fault, certain
- fault, approx. located
- fault, approx. located, queried
- fault, inferred, queried
- fault, concealed
- fault, concealed, queried
- thrust fault, certain
- thrust fault, approx. located
- thrust fault, concealed
- dextral fault, certain
- dextral fault, approx. located
- dextral fault, concealed
- sinistral fault, certain
- sinistral fault, approx. located
- sinistral fault, concealed
- thrust fault, certain (2)
- thrust fault, approx. located (2)
- thrust fault, concealed (2)
- fault, solid, barball
- fault, dashed, barball
- fault, dotted, barball
- dextral fault, solid, barball
- fault, dotted, queried, ballbar
- fault, dotted, queried, ballbar (2)
- fault, solid, dip
- fault, dashed, dip
- fault, dotted, dip
- reverse fault, solid
- reverse fault, dashed
- reverse fault, dotted

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Project	Figure Title	Project No.	Figure
4302 FORD ROAD NEWPORT BEACH ORANGE COUNTY, CALIFORNIA	CGS FAULT ACTIVITY MAP OF CALIFORNIA LEGEND	700048801 Revised Date: DECEMBER 2018 Scale: NOT TO SCALE Drawn By: BJS	3B

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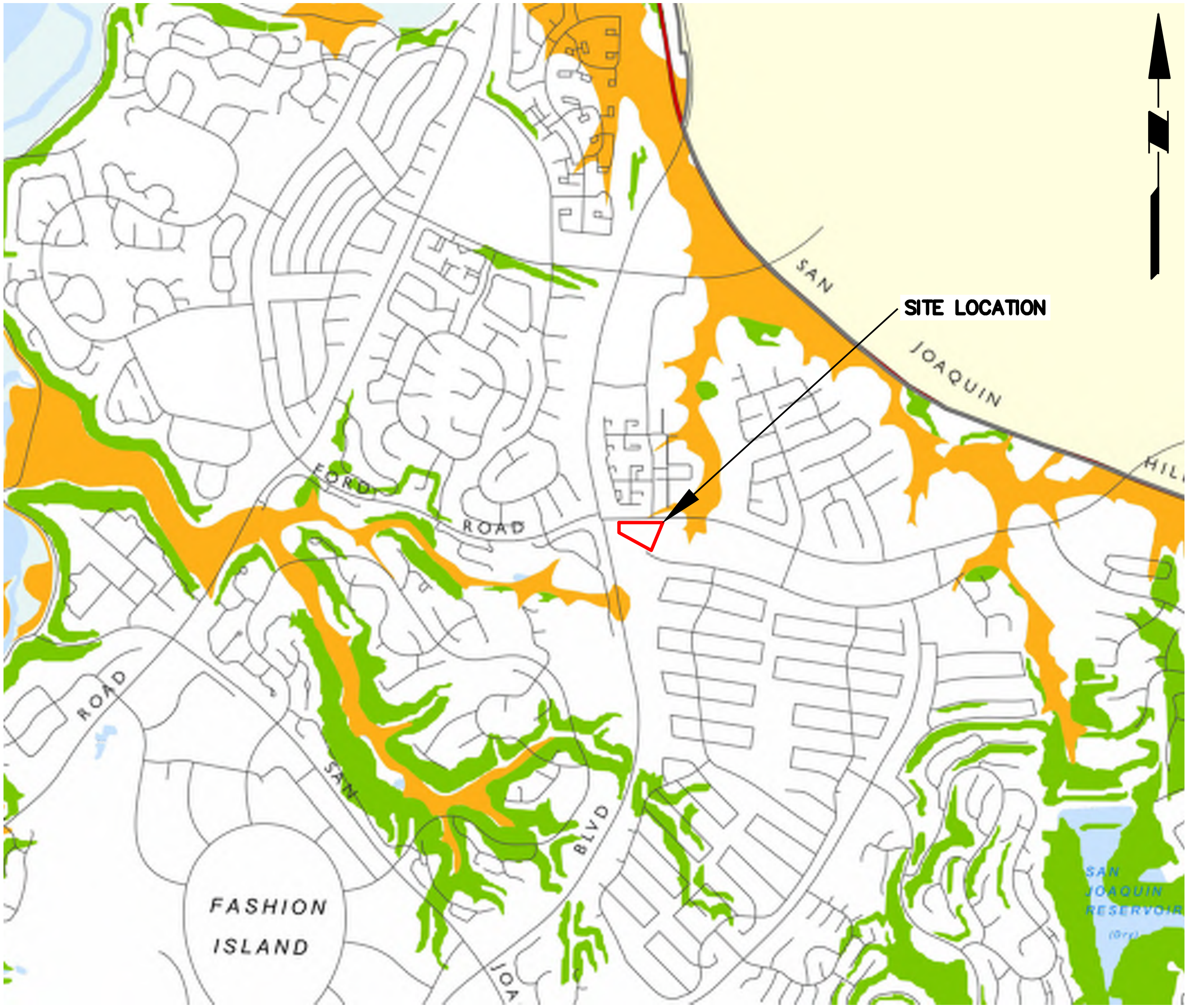

MAP LEGEND:

- APPROXIMATE SITE LIMITS
- AREAS WITH LIQUEFACTION POTENTIAL
- AREAS WITH LANDSLIDE POTENTIAL
- MAJOR FAULT TRACES AS MAPPED BY MORTON, 1999. PRESUMED ACTIVE, EXCEPT WHERE SHOWN OTHERWISE BASED ON GEOLOGIC STUDIES

NOTES:

1. BACKGROUND MAP REFERENCED FROM CITY OF NEWPORT BEACH, GENERAL PLAN, SAFETY ELEMENT, DATED 7 NOVEMBER 2006.

2000 0 1000 2000

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4302 FORD ROAD

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Figure Title

CITY OF NEWPORT BEACH SEISMIC HAZARDS MAP

Project No.	Figure No.
700048801	4
Date: OCTOBER 2017	
REVISED: DECEMBER 2018	
Scale: AS SHOWN	
Drawn By: BY / Checked By: DJJS	

Filename: \\langan.com\data\IRV\data8\700048801\Cadd Data - 700048801\2D-DesignFiles\Figures (NPB Maps).dwg Date: 12/12/2018 Time: 07:57 User: djudge Style Table: Langan.stb Layout: 4 - Newport Beach Seismic Hazards

MAP LEGEND:

- APPROXIMATE SITE LIMITS
- SANDSTONE MEMBER OF MONTEREY FORMATION; MOST RESISTANT BLUFF-FORMING UNIT. PRONE TO LANDSLIDING OR MASS WASTING WHERE UNDERCUT BY WAVE ACTION, ESPECIALLY AT POINTS. FAILS AS LARGE BLOCKS
- SILTSTONE MEMBER OF MONTEREY FORMATION; VERY FISSILE AND FRACTURED; TENDS TO FORM AN APRON OF TALUS AT THE BASE OF SLOPES
- PLEISTOCENE MARINE TERRACE DEPOSITS; PRONE TO LANDSLIDING ALONG STEEP CUTS (I.E. HIGHWAY 1), AND TO EROSION BY RILLING AND GULLYING ALONG BLUFFTOPS
- BEACH AND EOLIAN SAND COVERING THE GENTLY SLOPING TO LEVEL BEACHES. CONTINUOUSLY REWORKED BY WAVE AND WIND ACTION
- 100-YEAR TSUNAMI ZONE (INUNDATION ELEVATION=13.64 FEET)

NOTES:

1. BACKGROUND MAP REFERENCED FROM CITY OF NEWPORT BEACH, GENERAL PLAN, SAFETY ELEMENT, DATED 7 NOVEMBER 2006.

2000 0 1000 2000

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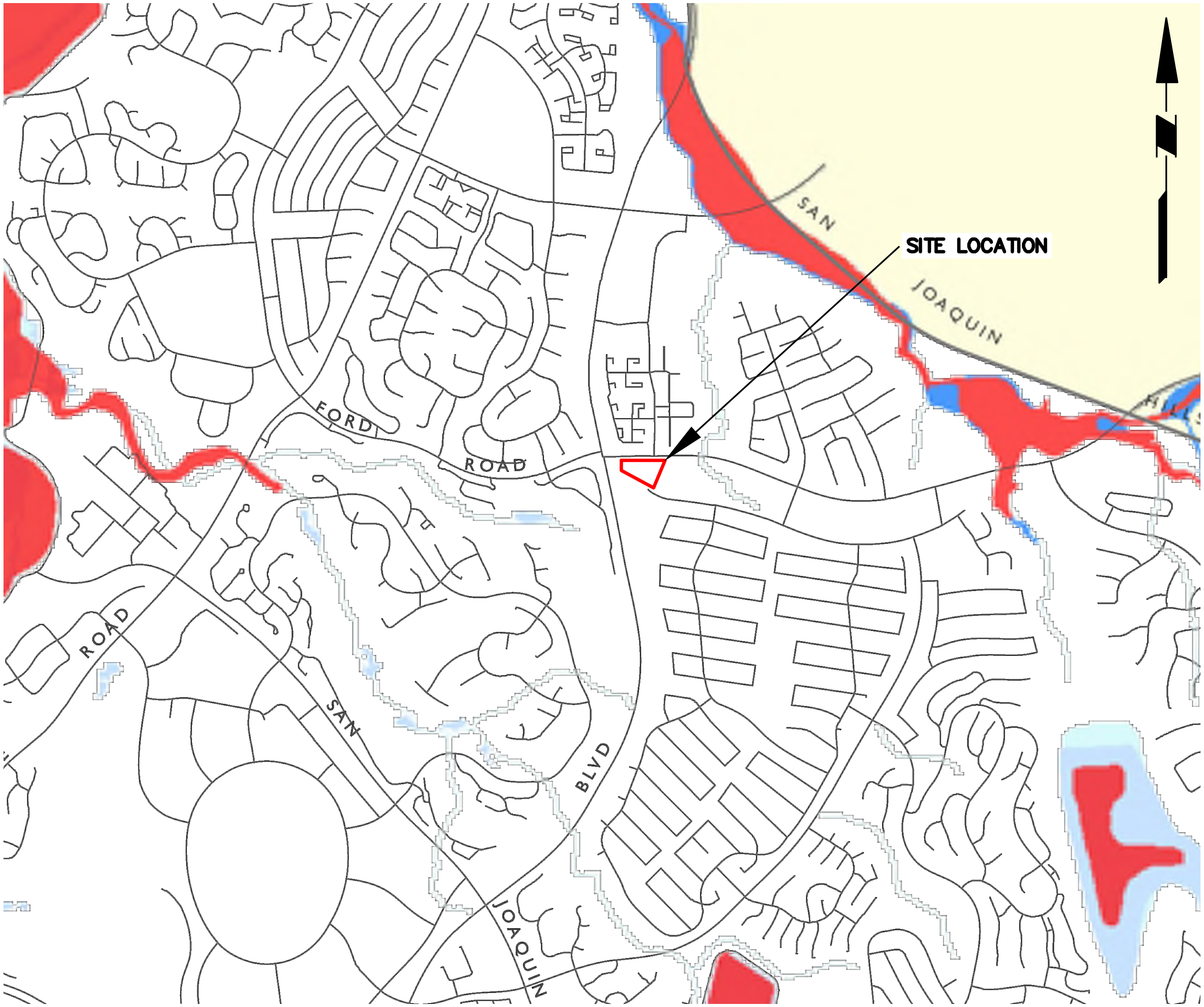
Project	Figure Title	Project No. 700048801	Figure No.
4302 FORD ROAD NEWPORT BEACH ORANGE COUNTY CALIFORNIA	CITY OF NEWPORT BEACH COASTAL HAZARDS MAP	Date OCTOBER 2017 REVISED DECEMBER 2018 Scale AS SHOWN Drawn By BY / Checked By DJJS	5



MAP LEGEND:

APPROXIMATE SITE LIMITS

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

AREAS OF 500-YEAR FLOOD; AREAS OF 100-YEAR FLOOD WITH AVERAGE DEPTHS OF LESS THAN 1 FOOT OR WITH DRAINAGE AREAS LESS THAN 1 SQUARE MILE; AND AREAS PROTECTED BY LEVEES FROM 100-YEAR FLOOD

ZONE VE, COASTAL FLOOD ZONE WITH VELOCITY HAZARD (WAVE ACTION); BASE FLOOD ELEVATIONS DETERMINED

NOTES:

1. BACKGROUND MAP REFERENCED FROM CITY OF NEWPORT BEACH, GENERAL PLAN, SAFETY ELEMENT, DATED 7 NOVEMBER 2006.

2000 0 1000 2000

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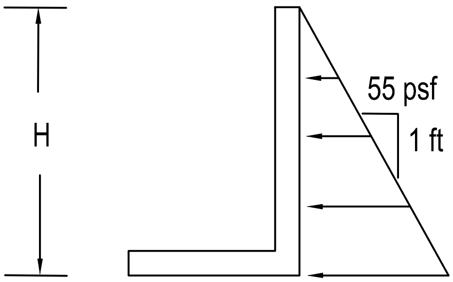
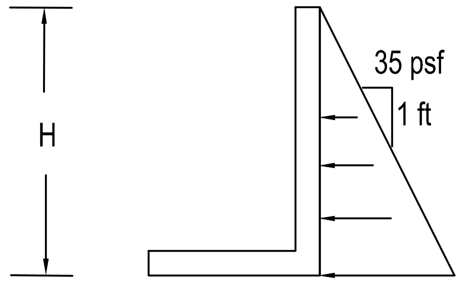
Project	Figure Title	Project No. 700048801	Figure No.
4302 FORD ROAD	CITY OF NEWPORT BEACH FLOOD HAZARDS MAP	Date OCTOBER 2017	6
NEWPORT BEACH		REVISED DECEMBER 2018	
ORANGE COUNTY CALIFORNIA		Scale AS SHOWN	
		Drawn By BY / Checked By DJJS	

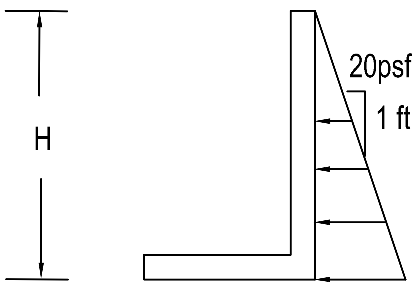
Filename: \\langan.com\data\IRV\data8\700048801\Cadd Data - 700048801\2D-DesignFiles\Figures (NPB Maps).dwg Date: 12/12/2018 Time: 07:59 User: djudge Style Table: Langan.stb Layout: 6 - Newport Beach Flood Hazards



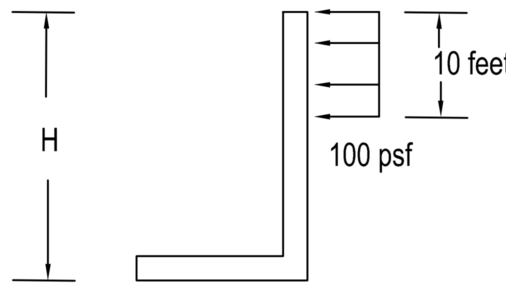
At-Rest Earth Pressure (P_O)



Active Earth Pressure (P_a)



Seismic Earth Pressure Increment (ΔP_{ae})



Minimum Surcharge (q_s)

Symbols:
H = Height of Wall (feet)
psf = pounds per square foot
P_O = At-Rest Earth Pressure (Restrained Walls)
P_a = Active Earth Pressure (Unrestrained Walls)
ΔP_{ae} = Earth Pressure Increment
q_s = surcharge

Notes:
1. Dynamic Pressure Increment should be added to the Active Earth Pressure and any applicable surcharges
2. Minimum surcharge shown is based on a fire truck or car parked 10 feet beyond the wall. If higher surcharge loads are anticipated (e.g., adjacent buildings, heavy construction equipment, etc.) The surcharge loading should be evaluated on a case by case basis.

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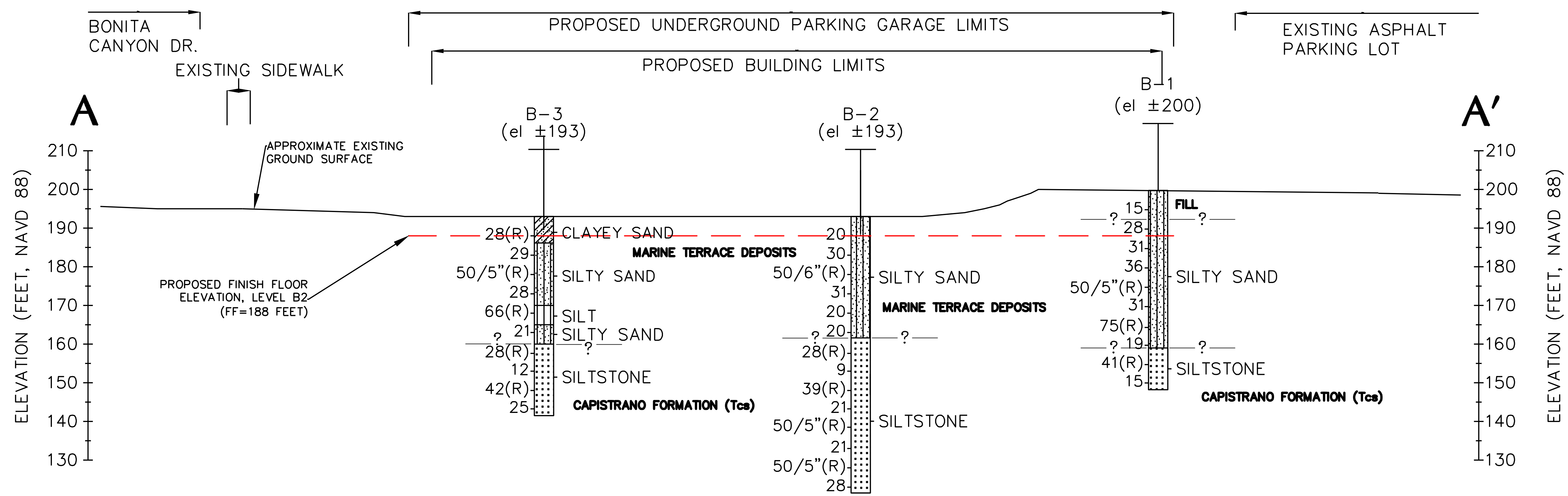
Project	Figure Title	Project No.	Figure No.
4302 FORD ROAD NEWPORT BEACH ORANGE COUNTY CALIFORNIA	DESIGN EARTH PRESSURES FOR BELOW-GRADE WALLS	700048801 Date: OCTOBER 2017 REVISED: DECEMBER 2018 Scale: AS SHOWN Drawn By: BY; Checked By: DJJS	7



30 0 15 30

SCALE IN FEET

LEGEND:

B-3 (el±200)	B-3	BORING IDENTIFICATION
	(el±200)	INFERRED GROUND SURFACE ELEVATION (FEET), SEE NOTE 3.
	N	STANDARD PENETRATION RESISTANCE; NUMBER OF BLOWS OF A 140 LB AUTOMATIC HAMMER FREE FALLING 30 INCHES TO DRIVE A 2-INCH-O.D. SPLIT SPOON SAMPLER 12 INCHES AFTER 6 INCHES OF INITIAL PENETRATION.
N(R)	N(R)	NUMBER OF BLOWS A 140 LB AUTOMATIC HAMMER FREE FALLING 30 INCHES TO DRIVE A 3-INCH-O.D. CALIFORNIA MODIFIED SAMPLER 12 INCHES AFTER 6 INCHES OF INITIAL PENETRATION.

KEY TO SYMBOLS:

SILTY SAND CLAYEY SAND

SILT SILTSTONE

NOTES:

1. THIS PROFILE REPRESENTS A GENERALIZED SOIL CROSS SECTION INTERPRETED FROM WIDELY SPACED BORINGS. SOIL AND GROUNDWATER MAY VARY IN TYPE, LOCATION, AND ELEVATION, AND ENVIRONMENTAL AND ENGINEERING PROPERTIES BETWEEN POINTS OF EXPLORATION. VARIATIONS IN SUBSURFACE CONDITIONS SHOULD BE EXPECTED BETWEEN BORINGS.
2. LANGAN BORINGS B-1, B-2, AND B-3 WERE DRILLED ON 5 AND 6 OCTOBER 2017 UNDER THE FULL-TIME OBSERVATION BY A LANGAN FIELD ENGINEER.
3. APPROXIMATE EXISTING GROUND SURFACE AND BORING ELEVATIONS ARE REFERENCED FROM PLAN TITLED, "CONCEPT GRADING" BY PSOMAS DATED 7 SEPTEMBER 2017
4. APPROXIMATE FINISH FLOOR ELEVATIONS REFERENCED FROM PLANS TITLED "BUILDING SECTION" BY MVE PARTNERS DATED 31 JULY 2018 FOR SITE DEVELOPMENT REVIEW.
5. FOR A DETAILED DESCRIPTION OF BORINGS B-1, B-2, AND B-3, REFER TO APPENDIX B FOR BORING LOGS.
6. NAVD 88 = NORTH AMERICAN VERTICAL DATUM 1988.

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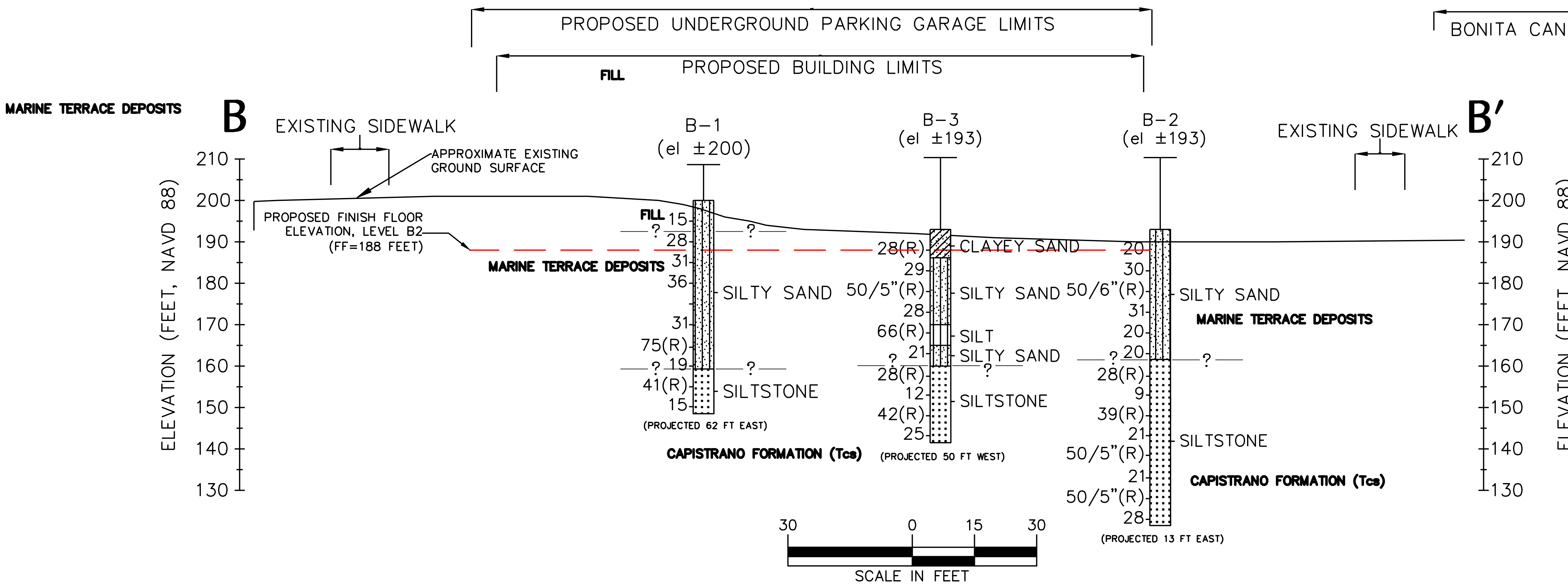
Project	Drawing Title	Project No.	Figure No.
4302 FORD RD NEWPORT BEACH ORANGE COUNTY CALIFORNIA	SUBSURFACE CROSS-SECTION A-A'	700048801	8
		Date: OCTOBER 2017	
		REVISED: DECEMBER 2018	
		Scale: AS SHOWN	
		Drawn By: BY / Checked By: DJJS	

Filename: \\langan.com\data\IRV\data8\700048801\Cadd Data - 700048801\2D-DesignFiles\Subsurface Cross Sections.dwg Date: 12/12/2018 Time: 07:48 User: djudge Style Table: Langan.stb Layout: Section A-A'



LEGEND:

B-3 (el±193)	B-3	BORING IDENTIFICATION
	(el±193)	INFERRED GROUND SURFACE ELEVATION (FEET), SEE NOTE 3.
	N	STANDARD PENETRATION RESISTANCE; NUMBER OF BLOWS OF A 140 LB AUTOMATIC HAMMER FREE FALLING 30 INCHES TO DRIVE A 2-INCH-O.D. SPLIT SPOON SAMPLER 12 INCHES AFTER 6 INCHES OF INITIAL PENETRATION.
N(R)	N(R)	NUMBER OF BLOWS A 140 LB AUTOMATIC HAMMER FREE FALLING 30 INCHES TO DRIVE A 3-INCH-O.D. CALIFORNIA MODIFIED SAMPLER 12 INCHES AFTER 6 INCHES OF INITIAL PENETRATION.

KEY TO SYMBOLS:

SILTY SAND
CLAYEY SAND
SILT
SILTSTONE

NOTES:

1. THIS PROFILE REPRESENTS A GENERALIZED SOIL CROSS SECTION INTERPRETED FROM WIDELY SPACED BORINGS. SOIL AND GROUNDWATER MAY VARY IN TYPE, LOCATION, AND ELEVATION, AND ENVIRONMENTAL AND ENGINEERING PROPERTIES BETWEEN POINTS OF EXPLORATION. VARIATIONS IN SUBSURFACE CONDITIONS SHOULD BE EXPECTED BETWEEN BORINGS.
2. LANGAN BORINGS B-1, B-2, AND B-3 WERE DRILLED ON 5 AND 6 OCTOBER 2017 UNDER THE FULL-TIME OBSERVATION BY A LANGAN FIELD ENGINEER.
3. APPROXIMATE EXISTING GROUND SURFACE AND BORING ELEVATIONS ARE REFERENCED FROM PLAN TITLED, "CONCEPT GRADING" BY PSOMAS DATED 7 SEPTEMBER 2017
4. APPROXIMATE FINISH FLOOR ELEVATIONS REFERENCED FROM PLANS TITLED "BUILDING SECTION" SHEET A3.02 BY MVE PARTNERS DATED 31 JULY 2018 FOR SITE DEVELOPMENT REVIEW.
5. FOR A DETAILED DESCRIPTION OF BORINGS B-1, B-2, AND B-3, REFER TO APPENDIX B FOR BORING LOGS.
6. NAVD 88 = NORTH AMERICAN VERTICAL DATUM 1988.

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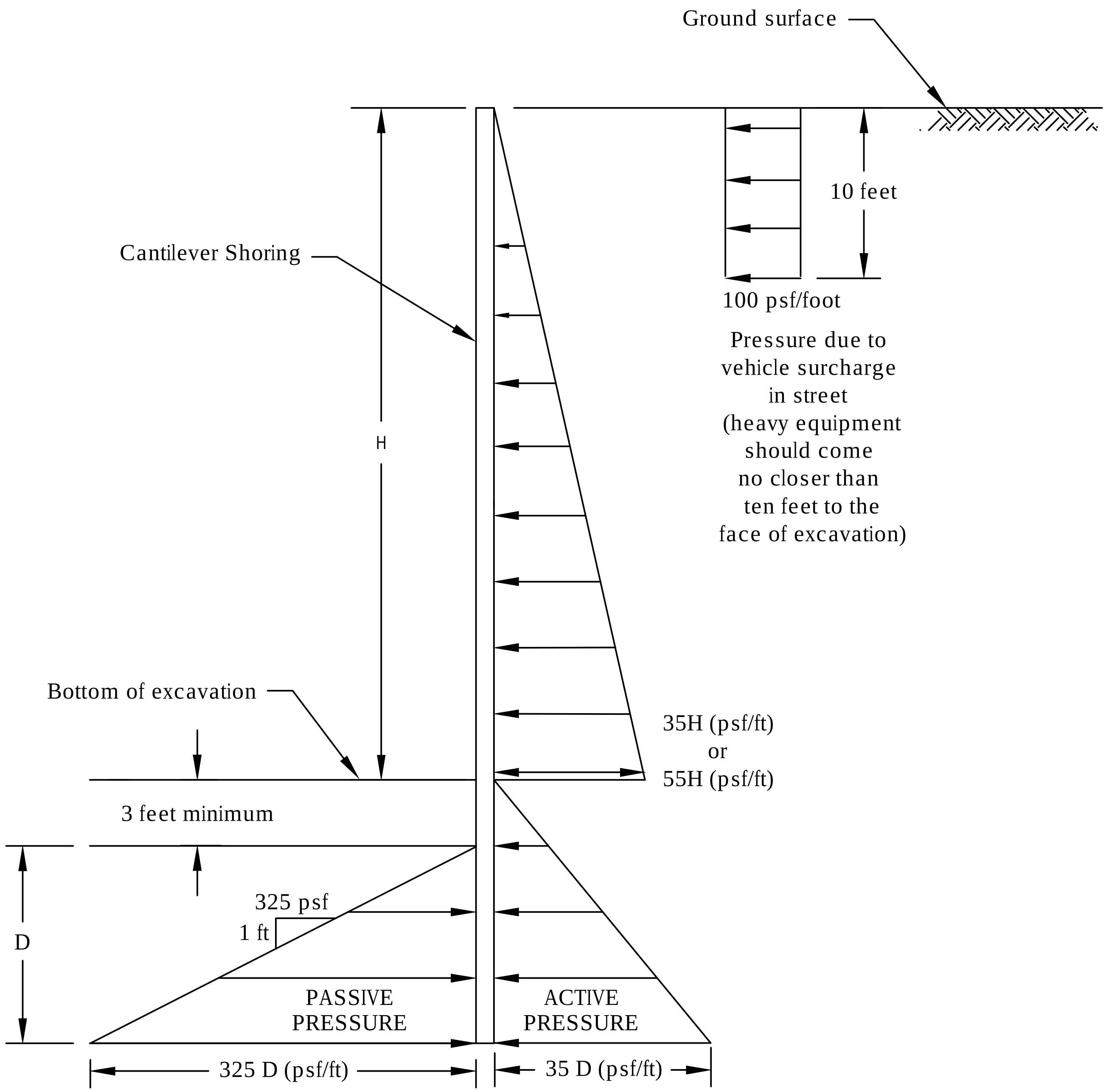
Project	Drawing Title	Project No.	Figure No.
4302 FORD RD NEWPORT BEACH ORANGE COUNTY CALIFORNIA	SUBSURFACE CROSS-SECTION B-B'	700048801	9
		Date: OCTOBER 2017	
		REVISED: DECEMBER 2018	
		Scale: AS SHOWN	
		Drawn By: BY / Checked By: DJJS	



Notes:

1. Passive pressure should be assumed to act over the soldier pile spacing or three pile diameters, whichever is smaller.
2. Cantilever Shoring Wall should be designed with at-rest conditions when adjacent to public right-of-way. See Figure 7.
3. Active pressure below the excavation should be assumed to act over one pile diameter.
4. The recommended pressures do not include surcharges from adjacent structures. Surcharge from adjacent structures should be added to the above shoring pressures, as appropriate.
5. pcf denotes pounds per cubic foot; psf denotes pounds per square foot.

Symbol:
H = wall height (feet)
D = penetration depth (feet)
psf/ft = pounds per square foot per linear foot along the wall

LANGAN	Project	Figure Title		Figure No.
32 Executive Park, Suite 130, Irvine, CA 92614 T: 949.255.8640 F: 949.255.8641 www.langan.com NEW JERSEY NEW YORK CONNECTICUT PENNSYLVANIA TEXAS OHIO VIRGINIA WASHINGTON DC FLORIDA NORTH DAKOTA CALIFORNIA ABU DHABI ATHENS DOHA DUBAI ISTANBUL PANAMA Langan Engineering & Environmental Services, Inc.	4302 FORD ROAD NEWPORT BEACH ORANGE COUNTY CALIFORNIA	DESIGN EARTH PRESSURES FOR CANTILEVER SHORING WALL	Project No. 700048801 Date OCTOBER 2017 REVISED DECEMBER 2018 Scale AS SHOWN Drawn By BY / Checked By DJJS	10

APPENDIX A
EQSEARCH & USGS ANSS RESULTS

Table A.1 – USGS ANSS Comprehensive Catalog Search Results

Date[1,3]	Latitude[1,3]	Longitude[1,3]	Approximate Magnitude (Magnitude Type) [1, 2,3]	Approximate Distance from Project Site[1,3] (km)
3/29/2014	33.9325	-117.91583	5.1 (M_w)	34
7/29/2008	33.9485	-117.76633	5.44 (M_w)	37
3/20/1994	34.231	-118.475	5.24 (M_L)	88
1/17/1994	34.275	-118.493	5.89 (M_L)	93
1/17/1994	34.213	-118.537	6.7 (M_L)	90
6/28/1991	34.27	-117.993	5.8 (M_L)	72
2/28/1990	34.144	-117.697	5.51 (M_L)	59
12/3/1988	34.151	-118.13	5.02 (M_L)	63
10/4/1987	34.074	-118.098	5.25 (M_L)	54
10/1/1987	34.061	-118.079	5.9 (M_L)	52
7/13/1986	32.971	-117.874	5.45 (M_L)	73
1/1/1979	33.9165	-118.68717	5.21 (M_L)	83
9/12/1970	34.2548333	-117.53433	5.22 (M_L)	76
9/23/1963	33.7036667	-116.93817	5.29 (M_w)	86
12/26/1951	32.9161667	-118.30517	5.75 (M_L)	89
11/14/1941	33.7906667	-118.26367	5.12 (M_L)	41
5/31/1938	33.6993333	-117.51117	5.23 (M_w)	33
3/11/1933	33.6238333	-118.00117	5.29 (M_h)	13
3/11/1933	33.7666667	-117.985	5.02 (M_h)	19
3/11/1933	33.6308333	-117.9995	6.4 (M_h)	13
4/21/1918	33.647	-117.433	6.7 (M_w)	40

Notes:

1. Earthquake Catalog search results obtained from USGS ANSS Comprehensive Catalog on 12 December 2018.
2. Refer to USGS ANSS Comprehensive Catalog and USGS Earthquake Hazards Program for additional information on magnitude types.
3. Earthquake Catalog search results include earthquake events within 100 km of the Project Site with magnitudes of 5.0 or greater since 1900.

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                         ************************
                         *                      *
                         *     E Q S E A R C H  *
                         *                      *
                         *      Version 3.00    *
                         *                      *
                         ************************

                               ESTIMATION OF
                          PEAK ACCELERATION FROM
                      CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: 700048801
                                                     DATE: 10-24-2017

JOB NAME: 4302 Ford Road

EARTHQUAKE-CATALOG-FILE NAME: C:\Program Files (x86)\EQSEARCH\February 2016
Update\ALLQUAKE.DAT

MAGNITUDE RANGE:
   MINIMUM MAGNITUDE:  5.00
   MAXIMUM MAGNITUDE:  9.00

SITE COORDINATES:
   SITE LATITUDE:  33.6290
   SITE LONGITUDE:  117.8610

SEARCH DATES:
           START DATE:   1800
           END DATE:   2017

SEARCH RADIUS:
           62.6 mi
           100.7 km

ATTENUATION RELATION:  14) Campbell & Bozorgnia (1997 Rev.) - Alluvium
   UNCERTAINTY (M=Median, S=Sigma): S       Number of Sigmas:  1.0
   ASSUMED SOURCE TYPE:  SS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
   SCOND:   0  Depth Source:  A
   Basement Depth:  5.00 km     Campbell SSR:  0     Campbell SHR:  0
   COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km):  3.0
```

EARTHQUAKE SEARCH RESULTS

Page 1

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.6170	117.9670	03/11/1933	154 7.8	0.0	6.30	0.411	X	6.1(9.9)
DMG	33.5750	117.9830	03/11/1933	518 4.0	0.0	5.20	0.149	VIII	7.9(12.8)
DMG	33.6170	118.0170	03/14/1933	19 150.0	0.0	5.10	0.123	VII	9.0(14.5)
DMG	33.6830	118.0500	03/11/1933	658 3.0	0.0	5.50	0.136	VIII	11.5(18.5)
DMG	33.7000	118.0670	03/11/1933	51022.0	0.0	5.10	0.085	VII	12.8(20.6)
DMG	33.7000	118.0670	03/11/1933	85457.0	0.0	5.10	0.085	VII	12.8(20.6)
DMG	33.7500	118.0830	03/13/1933	131828.0	0.0	5.30	0.083	VII	15.2(24.5)
DMG	33.7500	118.0830	03/11/1933	2 9 0.0	0.0	5.00	0.063	VI	15.2(24.5)
DMG	33.7500	118.0830	03/11/1933	910 0.0	0.0	5.10	0.069	VI	15.2(24.5)
DMG	33.7500	118.0830	03/11/1933	323 0.0	0.0	5.00	0.063	VI	15.2(24.5)
DMG	33.7500	118.0830	03/11/1933	230 0.0	0.0	5.10	0.069	VI	15.2(24.5)
DMG	33.7830	118.1330	10/02/1933	91017.6	0.0	5.40	0.070	VI	18.9(30.4)
MGI	33.8000	117.6000	04/22/1918	2115 0.0	0.0	5.00	0.048	VI	19.1(30.7)
DMG	33.6990	117.5110	05/31/1938	83455.4	10.0	5.50	0.069	VI	20.7(33.3)
GSG	33.9325	117.9172	03/29/2014	040942.3	4.8	5.10	0.046	VI	21.2(34.1)
GSG	33.9530	117.7610	07/29/2008	184215.7	14.0	5.30	0.050	VI	23.1(37.2)
DMG	33.7830	118.2500	11/14/1941	84136.3	0.0	5.40	0.050	VI	24.7(39.8)
MGI	34.0000	118.0000	12/25/1903	1745 0.0	0.0	5.00	0.031	V	26.8(43.2)
DMG	33.7000	117.4000	05/13/1910	620 0.0	0.0	5.00	0.031	V	26.9(43.3)
DMG	33.7000	117.4000	05/15/1910	1547 0.0	0.0	6.00	0.077	VII	26.9(43.3)
DMG	33.7000	117.4000	04/11/1910	757 0.0	0.0	5.00	0.031	V	26.9(43.3)
DMG	33.8500	118.2670	03/11/1933	1425 0.0	0.0	5.00	0.030	V	27.9(44.8)
PAS	34.0610	118.0790	10/01/1987	144220.0	9.5	5.90	0.055	VI	32.3(52.0)
MGI	34.0000	117.5000	12/16/1858	10 0 0.0	0.0	7.00	0.138	VIII	32.9(53.0)
PAS	34.0730	118.0980	10/04/1987	105938.2	8.2	5.30	0.031	V	33.5(54.0)
T-A	34.0000	118.2500	01/10/1856	0 0 0.0	0.0	5.00	0.023	IV	34.0(54.7)
T-A	34.0000	118.2500	09/23/1827	0 0 0.0	0.0	5.00	0.023	IV	34.0(54.7)
T-A	34.0000	118.2500	03/26/1860	0 0 0.0	0.0	5.00	0.023	IV	34.0(54.7)
MGI	34.1000	118.1000	07/11/1855	415 0.0	0.0	6.30	0.071	VI	35.3(56.8)
MGI	34.0000	118.3000	09/03/1905	540 0.0	0.0	5.30	0.028	V	35.9(57.8)
GSP	34.1400	117.7000	02/28/1990	234336.6	5.0	5.20	0.025	V	36.5(58.7)
MGI	34.0800	118.2600	07/16/1920	18 8 0.0	0.0	5.00	0.019	IV	38.6(62.2)
DMG	34.2000	117.9000	08/28/1889	215 0.0	0.0	5.50	0.030	V	39.5(63.5)
DMG	33.9000	117.2000	12/19/1880	0 0 0.0	0.0	6.00	0.043	VI	42.3(68.1)
DMG	34.0000	117.2500	07/23/1923	73026.0	0.0	6.25	0.052	VI	43.4(69.9)
GSP	34.2620	118.0020	06/28/1991	144354.5	11.0	5.40	0.023	IV	44.4(71.5)
DMG	34.0000	118.5000	08/04/1927	1224 0.0	0.0	5.00	0.016	IV	44.7(72.0)
MGI	34.0000	118.5000	11/19/1918	2018 0.0	0.0	5.00	0.016	IV	44.7(72.0)
PAS	32.9710	117.8700	07/13/1986	1347 8.2	6.0	5.30	0.021	IV	45.4(73.1)
MGI	34.1000	117.3000	07/15/1905	2041 0.0	0.0	5.30	0.021	IV	45.7(73.6)
DMG	34.2000	117.4000	07/22/1899	046 0.0	0.0	5.50	0.023	IV	47.5(76.4)
DMG	34.2700	117.5400	09/12/1970	143053.0	8.0	5.40	0.021	IV	47.9(77.1)
PAS	33.9190	118.6270	01/19/1989	65328.8	11.9	5.00	0.015	IV	48.3(77.7)

DMG	34.3000	117.6000	07/30/1894	512 0.0	0.0	6.00	0.036	V	48.7(78.3)
DMG	33.9500	118.6320	08/31/1930	04036.0	0.0	5.20	0.017	IV	49.5(79.6)
DMG	33.7500	117.0000	04/21/1918	223225.0	0.0	6.80	0.070	VI	50.2(80.7)
DMG	33.7500	117.0000	06/06/1918	2232 0.0	0.0	5.00	0.014	IV	50.2(80.7)
DMG	34.3000	117.5000	07/22/1899	2032 0.0	0.0	6.50	0.053	VI	50.7(81.6)
DMG	33.8000	117.0000	12/25/1899	1225 0.0	0.0	6.40	0.048	VI	50.8(81.8)
PAS	33.9440	118.6810	01/01/1979	231438.9	11.3	5.00	0.013	III	51.8(83.4)
DMG	34.3700	117.6500	12/08/1812	15 0 0.0	0.0	7.00	0.078	VII	52.6(84.6)
DMG	33.7100	116.9250	09/23/1963	144152.6	16.5	5.00	0.013	III	54.1(87.0)
DMG	33.0000	117.3000	11/22/1800	2130 0.0	0.0	6.50	0.048	VI	54.2(87.2)

EARTHQUAKE SEARCH RESULTS

Page 2

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
GSP	34.2310	118.4750	03/20/1994	212012.3	13.0	5.30	0.016	IV	54.4(87.6)
GSP	34.2130	118.5370	01/17/1994	123055.4	18.0	6.70	0.055	VI	55.9(90.0)
DMG	34.3080	118.4540	02/09/1971	144346.7	6.2	5.20	0.014	III	57.9(93.1)
DMG	34.2000	117.1000	09/20/1907	154 0.0	0.0	6.00	0.028	V	58.8(94.6)
GSB	34.3010	118.5650	01/17/1994	204602.4	9.0	5.20	0.013	III	61.5(98.9)
DMG	33.9500	116.8500	09/28/1946	719 9.0	0.0	5.00	0.010	III	62.1(99.9)
GSP	34.3050	118.5790	01/29/1994	112036.0	1.0	5.10	0.011	III	62.2(100.1)
DMG	34.4110	118.4010	02/09/1971	14 244.0	8.0	5.80	0.021	IV	62.2(100.1)
DMG	34.4110	118.4010	02/09/1971	141028.0	8.0	5.30	0.014	III	62.2(100.1)
DMG	34.4110	118.4010	02/09/1971	14 041.8	8.4	6.40	0.037	V	62.2(100.1)
DMG	34.4110	118.4010	02/09/1971	14 1 8.0	8.0	5.80	0.021	IV	62.2(100.1)

****
-END OF SEARCH- 64 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 2017

LENGTH OF SEARCH TIME: 218 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 6.1 MILES (9.9 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.0

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.411 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
  a-value= 0.973
  b-value= 0.345
  beta-value= 0.794

TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	64	0.29358

4.5	64	0.29358
5.0	64	0.29358
5.5	22	0.10092
6.0	15	0.06881
6.5	6	0.02752
7.0	2	0.00917

APPENDIX B
BORING LOGS

LANGAN

Project: 4302 Ford Road		Project No.: 700048801	
Location: 4302 Ford Road, Newport Beach, CA		Elevation and Datum: Approximately 200 feet (NAVD 88)	
Drilling Company: 2R Drilling		Date Started: 10/6/17	Date Finished: 10/6/17
Drilling Equipment: Limited Access Rig		Completion Depth: 51.5 ft	Rock Depth: -
Size and Type of Bit: 8" diameter Hollow Stem Auger		Number of Samples: Disturbed 10; Undisturbed -; Core -	
Casing Diameter (in): -	Casing Depth (ft): -	Water Level (ft.): First -; Completion -; 24 HR. -	
Casing Hammer: -	Weight (lbs): -; Drop (in): -	Drilling Foreman: Jeff	
Sampler: 3" O.D. Cal. Mod. & 2" O.D. Split Spoon		Field Engineer: Daniel Judge	
Sampler Hammer: Automatic	Weight (lbs): 140 lbs.; Drop (in): 30 inches		

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+200.0		0						
		1						Hand augered 0 to 5 feet.
	Tan-brown, silty fine to medium SAND, trace clay, (SM), dry. [FILL]	2–3	B-1	HA				
	Medium dense, tan-brown, silty fine to medium SAND, trace clay, (SM), dry [FILL]	5–6.5	S-1	SPT	18	3 / 7 / 8	15	
+192.5	**Marine Terrace Deposits (Qvoma+aa)**	7.5						
	Medium dense, tan-brown, silty fine to medium SAND, (SM), dry.	10–11.5	S-2	SPT	18	4 / 14 / 14	28	
	Dense, brown-red, silty fine SAND, (SM), moist.	15–16.5	S-3	SPT	18	9 / 15 / 16	31	
		20						

LANGAN

Log of Boring **B-1** Sheet 2 of 3

Project	Project No.
4302 Ford Road	700048801
Location	**Elevation and Datum**
4302 Ford Road, Newport Beach, CA	Approximately 200 feet (NAVD 88)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+180.0	Dense, tan, silty fine SAND, (SM), dry.	20–21.5	S-4	SPT	18	7 / 17 / 19	36	
		Dense, grey/brown-red, silty fine SAND, (SM), moist.	25–26	S-5	CR	11	20 / 50/5"	50/5"	
		Dense, grey/brown-red, silty fine SAND, (SM), moist.	30–31.5	S-6	SPT	18	7 / 11 / 20	31	
		Dense, brown-red, silty fine SAND, (SM), moist.	35–36.5	S-7	CR	18	16 / 35 / 40	75	
	+159.3	Medium dense, brown-red, silty fine SAND, trace coarse sand, (SM), moist	40–41.5	S-8	SPT	18	3 / 9 / 10	19	
		Capistrano Formation [Tcs]	42–45						

Project	Project No.
4302 Ford Road	700048801
Location	**Elevation and Datum**
4302 Ford Road, Newport Beach, CA	Approximately 200 feet (NAVD 88)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+155.0	Very stiff, grey/brown-red, fine sandy SILTSTONE, moist.	45–46.5	S-9	CR	18	10 / 17 / 24	41	
		Very stiff, grey/brown-red, fine sandy SILTSTONE, moist.	50–51.5	S-10	SPT	18	3 / 6 / 9	15	
	+148.5	End boring at 51.5 feet. No groundwater encountered. Boring backfilled with bentonite-grout mixture tremie style.							

LANGAN

Project: 4302 Ford Road		Project No.: 700048801	
Location: 4302 Ford Road, Newport Beach, CA		Elevation and Datum: Approximately 193 feet (NAVD 88)	
Drilling Company: 2R Drilling		Date Started: 10/5/17	Date Finished: 10/5/17
Drilling Equipment: Limited Access Rig		Completion Depth: 71.5 ft	Rock Depth: -
Size and Type of Bit: 8" diameter Hollow Stem Auger		Number of Samples: Disturbed 14; Undisturbed --; Core -	
Casing Diameter (in): -	Casing Depth (ft): -	Water Level (ft.): First --; Completion --; 24 HR. -	
Casing Hammer: -	Weight (lbs): -; Drop (in): -	Drilling Foreman: Jeff	
Sampler: 3" O.D. Cal. Mod. & 2" O.D. Split Spoon		Field Engineer: Daniel Judge	
Sampler Hammer: Automatic	Weight (lbs): 140 lbs.; Drop (in): 30 inches		

Elev. (ft): +193.0

Depth Scale (ft)	Sample Description	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
0–5	**Marine Terrace Deposits (Qvoma+aa)** Brown, silty fine SAND, (SM), dry.	B-1	HA				Hand augered 0 to 5 feet.
5–6.5	Medium dense, tan, silty fine SAND, (SM), dry.	S-1	SPT	15	6 / 10 / 10	20	
10–11.5	Medium dense, tan, silty fine SAND, trace clay, (SM), dry.	S-2	SPT	15	10 / 14 / 16	30	
15–16	Medium dense, tan, silty fine SAND, (SM), dry.	S-3	CR	11	16 / 50/6"	50/6"	

Depth scale: 0 to 20 ft

LANGAN

Log of Boring **B-2**

Project	Project No.
4302 Ford Road	700048801
Location	**Elevation and Datum**
4302 Ford Road, Newport Beach, CA	Approximately 193 feet (NAVD 88)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+173.0	Dense, tan-brown-red, silty fine to medium SAND, (SM), dry.	20	S-4	SPT	18	8 / 15 / 16	31	
		Medium dense, silty fine SAND, (SM), moist.	25	S-5	SPT	18	6 / 9 / 11	20	
		Medium dense, brown-red, silty fine SAND, trace clay, (SM), moist.	30	S-6	SPT	16	7 / 10 / 10	20	
	+161.6	**Capistrano Formation [Tcs]**							
		Stiff, grey, fine sandy SILTSTONE, moist.	35	S-7	CR	18	7 / 12 / 16	28	
		Firm, grey, fine sandy SILTSTONE, moist.	40	S-8	SPT	18	3 / 4 / 5	9	
			45						

Project	Project No.
4302 Ford Road	700048801
Location	**Elevation and Datum**
4302 Ford Road, Newport Beach, CA	Approximately 193 feet (NAVD 88)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+148.0	Very stiff, grey, fine sandy SILTSTONE, moist.	45	S-9	CR	18	8 17 22	39	
			46						
			47						
			48						
			49						
		Very stiff, dark grey, fine sandy SILTSTONE, moist.	50	S-10	SPT	18	5 9 12	21	1" fine to coarse brown-red clayey sand layer mid-way in sampler.
			51						
			52						
			53						
			54						
		Very stiff, dark grey, fine sandy SILTSTONE, moist.	55	S-11	CR	11	10 50/5"	50/5"	Hammer pinging noise during sampling, possible cobble.
			56						
			57						
			58						
			59						
		Very stiff, dark grey, fine sandy SILTSTONE, moist.	60	S-12	SPT	18	5 7 14	21	
			61						
			62						
			63						
			64						
		Hard, dark grey, fine sandy SILTSTONE, moist.	65	S-13	CR	5	50/5"	50/5"	Collected sample within the full length of the California Modified Sampler, however driving the sampler only recorded 50 blows for the first 5-inches.
		Hard, grey, fine sandy SILTSTONE, dry.	66						
			67						
			68						
			69						
			70						

LANGAN

Log of Boring B-2 Sheet 4 of 4

Project	Project No.
4302 Ford Road	700048801
Location	**Elevation and Datum**
4302 Ford Road, Newport Beach, CA	Approximately 193 feet (NAVD 88)

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft) 10 20 30 40	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+123.0	Very stiff, grey, fine sandy SILTSTONE, dry.	70	S-14	SPT	18	12 / 12 / 16	28	
	+121.5		71						
			72 – 95						

LANGAN

Log of Boring **B-3** Sheet 1 of 3

Project: 4302 Ford Road		Project No.: 700048801	
Location: 4302 Ford Road, Newport Beach, CA		Elevation and Datum: Approximately 193 feet (NAVD 88)	
Drilling Company: 2R Drilling		Date Started: 10/5/17	Date Finished: 10/5/17
Drilling Equipment: Limited Access Rig		Completion Depth: 51.5 ft	Rock Depth: -
Size and Type of Bit: 8" diameter Hollow Stem Auger		Number of Samples: Disturbed 10; Undisturbed -; Core -	
Casing Diameter (in): -	Casing Depth (ft): -	Water Level (ft.): First -; Completion -; 24 HR. -	
Casing Hammer: -	Weight (lbs): -; Drop (in): -	Drilling Foreman: Jeff	
Sampler: 3" O.D. Cal. Mod. & 2" O.D. Split Spoon			
Sampler Hammer: Automatic	Weight (lbs): 140 lbs.; Drop (in): 30 inches	Field Engineer: Daniel Judge	

Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
+193.0		0						
	Marine Terrace Deposits (Qvoma+aa)	1						Hand augered 0 to 5 feet.
	Brown, clayey fine to medium SAND, (SC), moist.	2–5	B-1	HA				
	Medium dense, brown-yellow-white, clayey fine SAND, some silt, (SC), moist.	5–6.5	S-1	CR	18	6 / 12 / 16	28	
+185.5		7.5						
	Medium dense, brown, silty fine SAND, (SM), dry.	10–11.5	S-2	SPT	18	10 / 13 / 16	29	
	Very dense, tan-brown, silty fine SAND, (SM), dry.	15–16.5	S-3	CR	17	15 / 35 / 50/5"	50/5"	
		20						

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Log of Boring **B-3** Sheet 2 of 3

Project	Project No.
4302 Ford Road	700048801
Location	**Elevation and Datum**
4302 Ford Road, Newport Beach, CA	Approximately 193 feet (NAVD 88)

Depth (ft)	Elev. (ft)	Material Symbol / Sample Description	Sample Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
20 – 23	+173.0 – +170.0	Medium dense, tan-light brown, silty fine to medium SAND, (SM), dry.	S-4 (20–21.5)	SPT	18	9, 14, 14	28	
23 – 28	+170.0 – +165.0	Hard, brown, fine sandy SILT, (ML), moist.	S-5 (25–26.5)	CR	18	12, 30, 36	66	
28 – 33	+165.0 – +160.0	Medium dense, brown, silty fine SAND, (SM), moist.	S-6 (30–31.5)	SPT	18	5, 8, 13	21	
33 – 45	+160.0	**Capistrano Formation [Tcs]**						
35		Very stiff, grey, fine sandy SILTSTONE, moist.	S-7 (35–36.5)	CR	18	6, 11, 17	28	
40		Stiff, grey, fine sandy SILTSTONE, moist.	S-8 (40–41.5)	SPT	18	3, 5, 7	12	

Project	Project No.
4302 Ford Road	700048801
Location	**Elevation and Datum**
4302 Ford Road, Newport Beach, CA	Approximately 193 feet (NAVD 88)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Number	Type	Recov. (in)	Penetr. resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+148.0	Very stiff, grey, fine sandy SILTSTONE, moist.	45	S-9	CR	18	7 / 12 / 30	42	
		Very stiff, grey, fine sandy SILTSTONE, moist.	50	S-10	SPT	18	5 / 10 / 15	25	
	+141.5	End boring at 51.5 feet. No groundwater encountered. Boring backfilled with bentonite-grout mixture tremie style.	52						

Depth scale: 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70

N-Value scale: 10 20 30 40

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Log of Boring **P-1** Sheet 1 of 1

Project: 4302 Ford Road			Project No.: 700048801		
Location: 4302 Ford Road, Newport Beach, CA			Elevation and Datum: Approximately 193 feet (NAVD 88)		
Drilling Company: 2R Drilling			Date Started: 10/5/17	Date Finished: 10/5/17	
Drilling Equipment: Limited Access Rig			Completion Depth: 10 ft	Rock Depth: -	
Size and Type of Bit: 8" diameter Hollow Stem Auger			Number of Samples	Disturbed: -	Undisturbed: - / Core: -
Casing Diameter (in): -		Casing Depth (ft): -	Water Level (ft.)	First: -	Completion: - / 24 HR.: -
Casing Hammer: -	Weight (lbs): -	Drop (in): -	Drilling Foreman: Jeff		
Sampler: -			Field Engineer: Daniel Judge		
Sampler Hammer: -	Weight (lbs): -	Drop (in): -			

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+193.0		0					
		Brown, clayey fine SAND, (SC), moist	0–10					
	+183.0	End drilling at 10 feet below ground surface. Boring was backfilled with soil cuttings upon completion of Percolation Test. No groundwater was encountered.	10–20					

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Log of Boring **P-2** Sheet 1 of 1

Project: 4302 Ford Road		Project No.: 700048801		
Location: 4302 Ford Road, Newport Beach, CA		Elevation and Datum: Approximately 200 feet (NAVD 88)		
Drilling Company: 2R Drilling		Date Started: 10/5/17	Date Finished: 10/5/17	
Drilling Equipment: Limited Access Rig		Completion Depth: 10 ft	Rock Depth: -	
Size and Type of Bit: 8" diameter Hollow Stem Auger		Number of Samples	Disturbed: -	Undisturbed: - / Core: -
Casing Diameter (in): -	Casing Depth (ft): -	Water Level (ft.)	First: -	Completion: - / 24 HR.: -
Casing Hammer: - / Weight (lbs): -	Drop (in): -	Drilling Foreman: Jeff		
Sampler: -				
Sampler Hammer: - / Weight (lbs): -	Drop (in): -	Field Engineer: Daniel Judge		

MATERIAL SYMBOL	Elev. (ft)	Sample Description	Depth Scale	Number	Type	Recov. (in)	Penetr. resist BL/6in	Remarks (Drilling Fluid, Depth of Casing, Fluid Loss, Drilling Resistance, etc.)
	+200.0	Brown, silty fine SAND, (SM), moist	0					
	+190.0	End drilling at 10 feet below ground surface. Boring was backfilled with soil cuttings upon completion of Percolation Test. No groundwater was encountered.	10					
			20					

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APPENDIX C
CPT LOGS

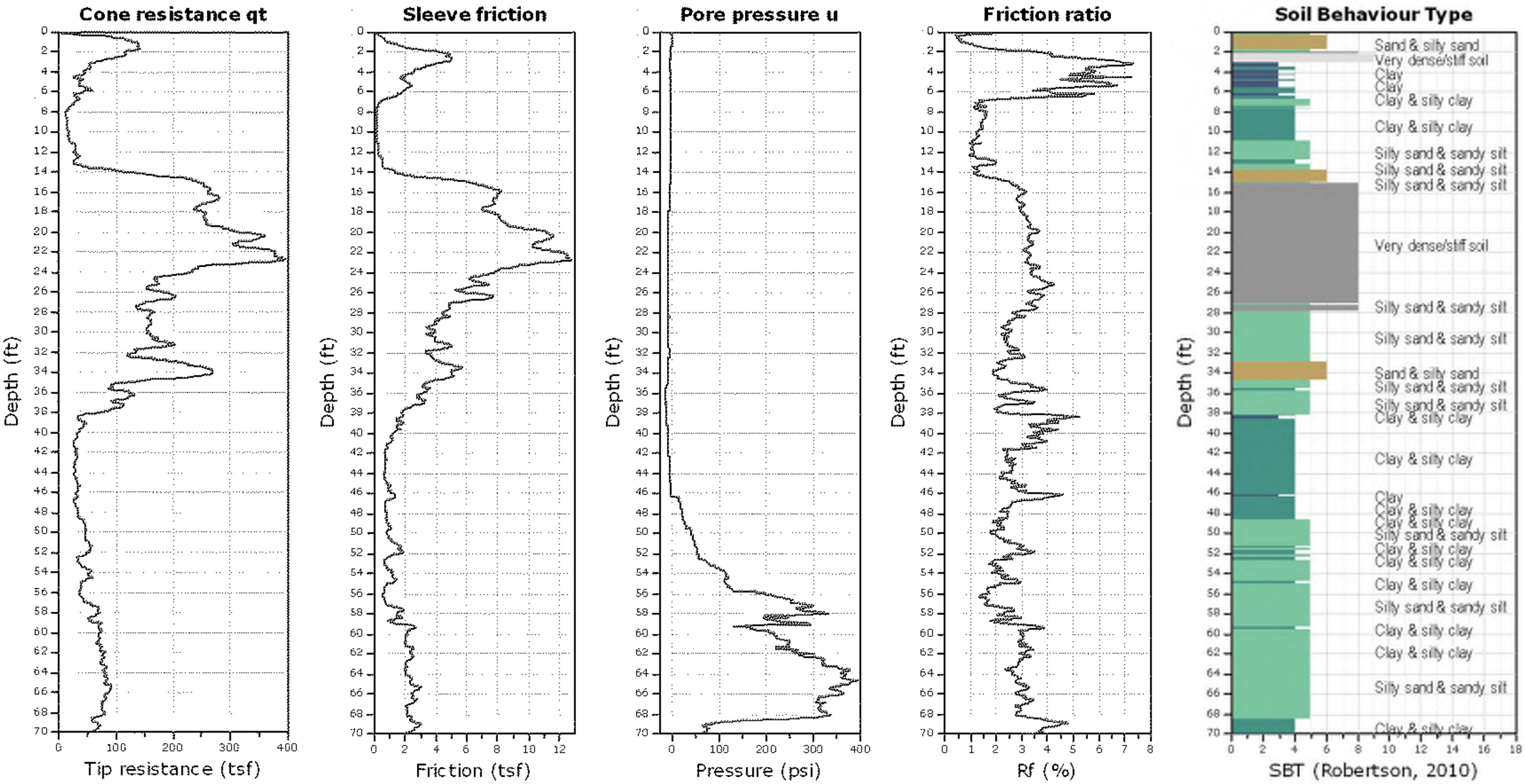
Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

CPT-1

Project: **Langan Eng. & Environmental Services**

Location: **Bonita Canyon Dr & MacArthur Blvd Newport Beach, CA**

Total depth: 70.41 ft, Date: 10/5/2017
Cone Type: Vertek



Kehoe Testing and Engineering
714-901-7270
rich@kehoetesting.com
www.kehoetesting.com

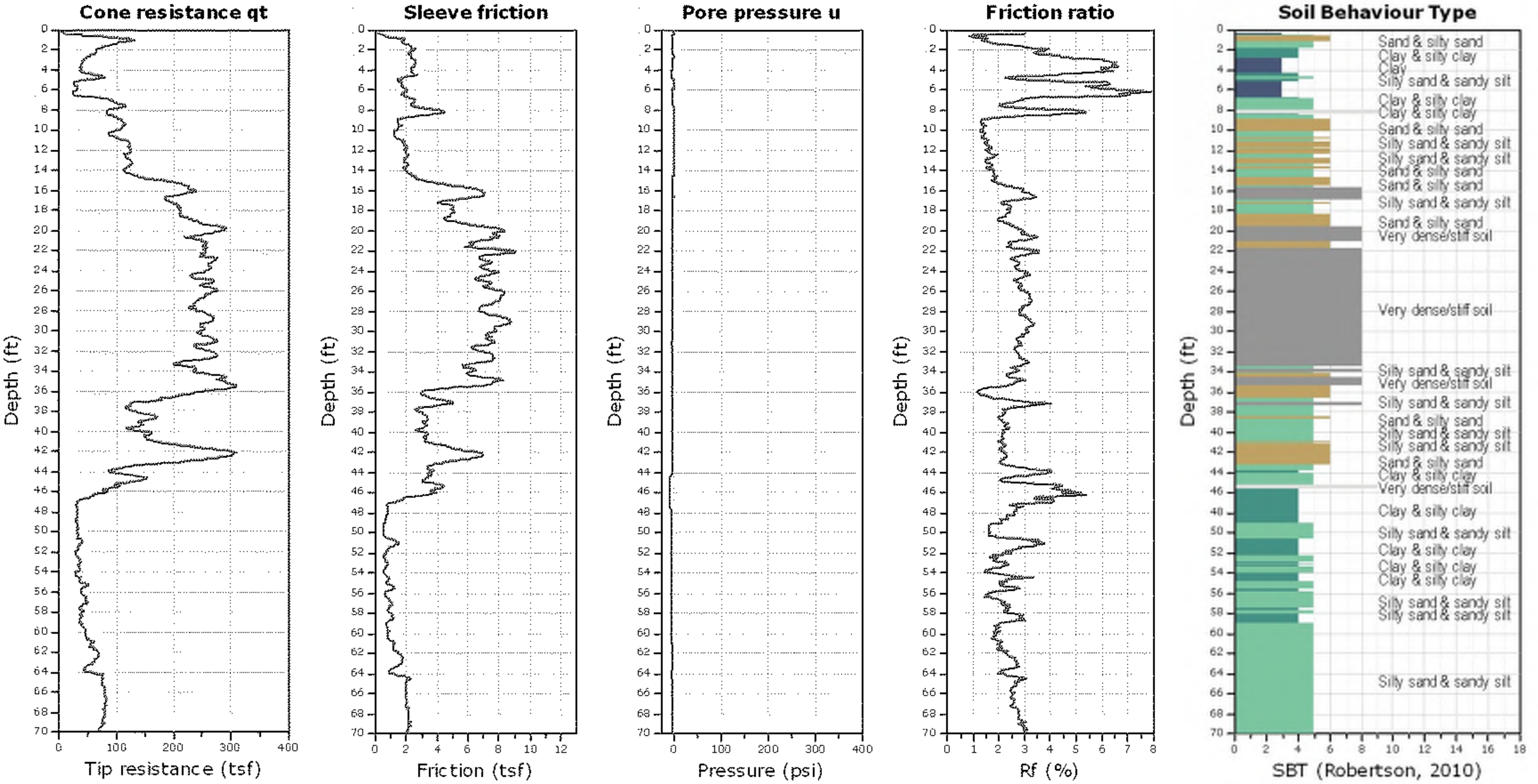
CPT-2

Project: **Langan Eng. & Environmental Services**

Total depth: 70.41 ft, Date: 10/5/2017

Location: **Bonita Canyon Dr & MacArthur Blvd Newport Beach, CA**

Cone Type: Vertek



APPENDIX D
LABORATORY TEST RESULTS

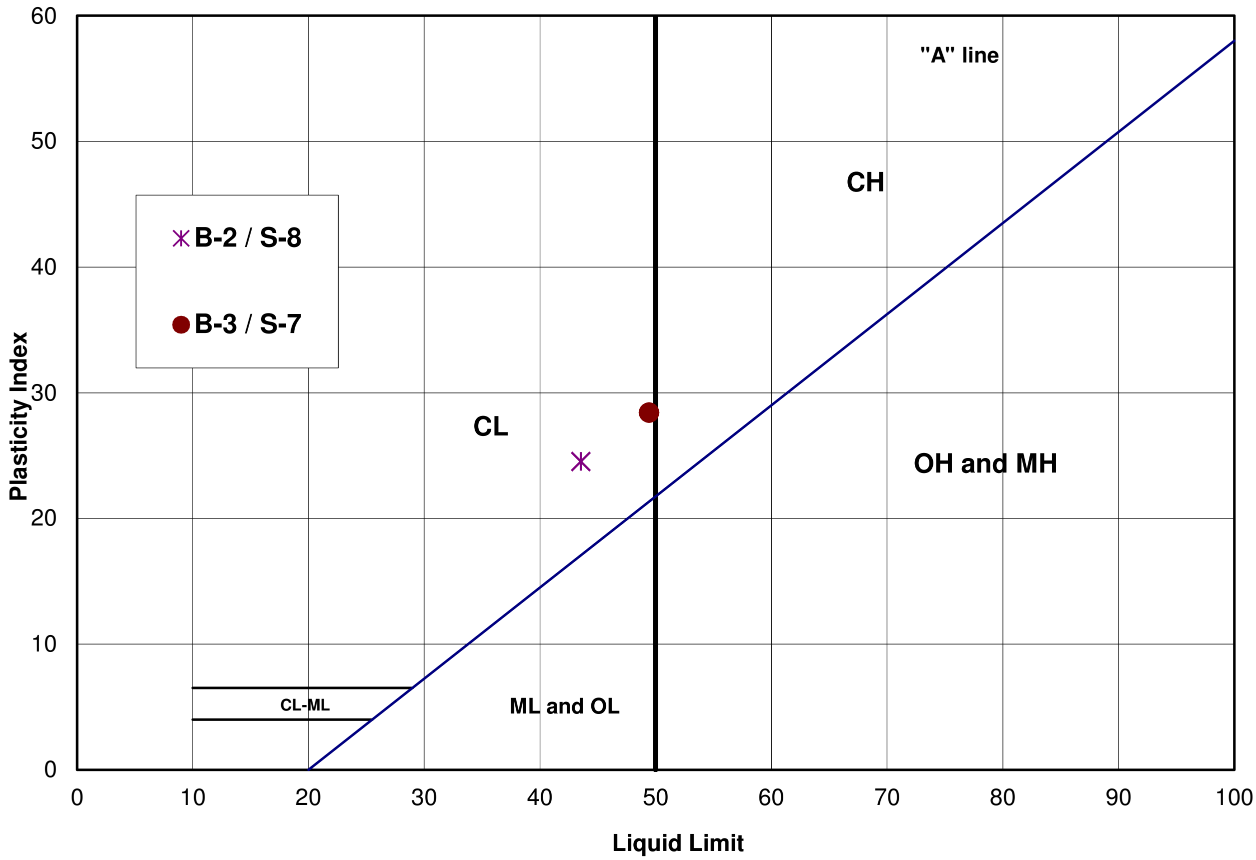
MOISTURE DENSITY TESTS

PROJECT Langan # 700048801 **JOB NO.** 2012-0057 **BY** LD **DATE** 10/14/17

Sample No.	B-1 / S-5	B-2 / S-3	B-3 / S-3					
Depth (ft)								
Testing								
Soil Type	Brown, Silty Sand	Brown, Silty Sand	Brown, Silty Sand					
Wet+Tare	848.8	850.2	889.3					
No. Ring	5	5	5					
Wet Weight								
Dry Weight								
Wet density	103.7	105.5	105.1					
% Water	9.4	6.0	8.0					
Dry Density	94.7	99.5	97.3					
O.B.Press(psf)								
Sample No.								
Depth (ft)								
Testing								
Soil Type								
Wet+Tare								
No. Ring								
Wet Weight								
Dry Weight								
Wet density								
% Water								
Dry Density								
O.B.Press(psf)								

Geo-Logic ASSOCIATES

PLASTICITY INDEX _ ASTM D4318



Sample	Depth	LL	PL	PI	USCS	Material Description
B-2 / S-8		44	19	25	CL	
B-3 / S-7		49	21	28	CL	
					.	

Job Name: Langan # 700048801 Date: 10/14/17

Job No.: 2012-0057

Geo-Logic ASSOCIATES

WASH #200 SIEVE - ASTM D 1140-92

Job Name Langan # 700048801 Date 10-15

Job No. 2012-0057 By LD

Sample	B-1 / S-1	**Sample**	B-1 / S-6	**Sample**	B-2 / S-5
Soil Type		Soil Type		Soil Type	
% water	6.8	% water	10.6	% water	14.1
Wet weight	211.4	Wet weight	210.1	Wet weight	207.6
Dry weight	197.9	Dry weight	190.0	Dry weight	181.9
+ 200 sieve	159.3	+ 200 sieve	131.7	+ 200 sieve	95
% Retained	80.5	% Retained	69.3	% Retained	52.2
%Pass. #200	**20**	**%Pass. #200**	**31**	**%Pass. #200**	**48**

Sample	B-3 / S-5	**Sample**		**Sample**	
Soil Type		Soil Type		Soil Type	
% water	12.7	% water		% water	
Wet weight	213.3	Wet weight		Wet weight	
Dry weight	189.3	Dry weight		Dry weight	
+ 200 sieve	95	+ 200 sieve		+ 200 sieve	
% Retained	50.2	% Retained		% Retained	
%Pass. #200	**50**	**%Pass. #200**		**%Pass. #200**	

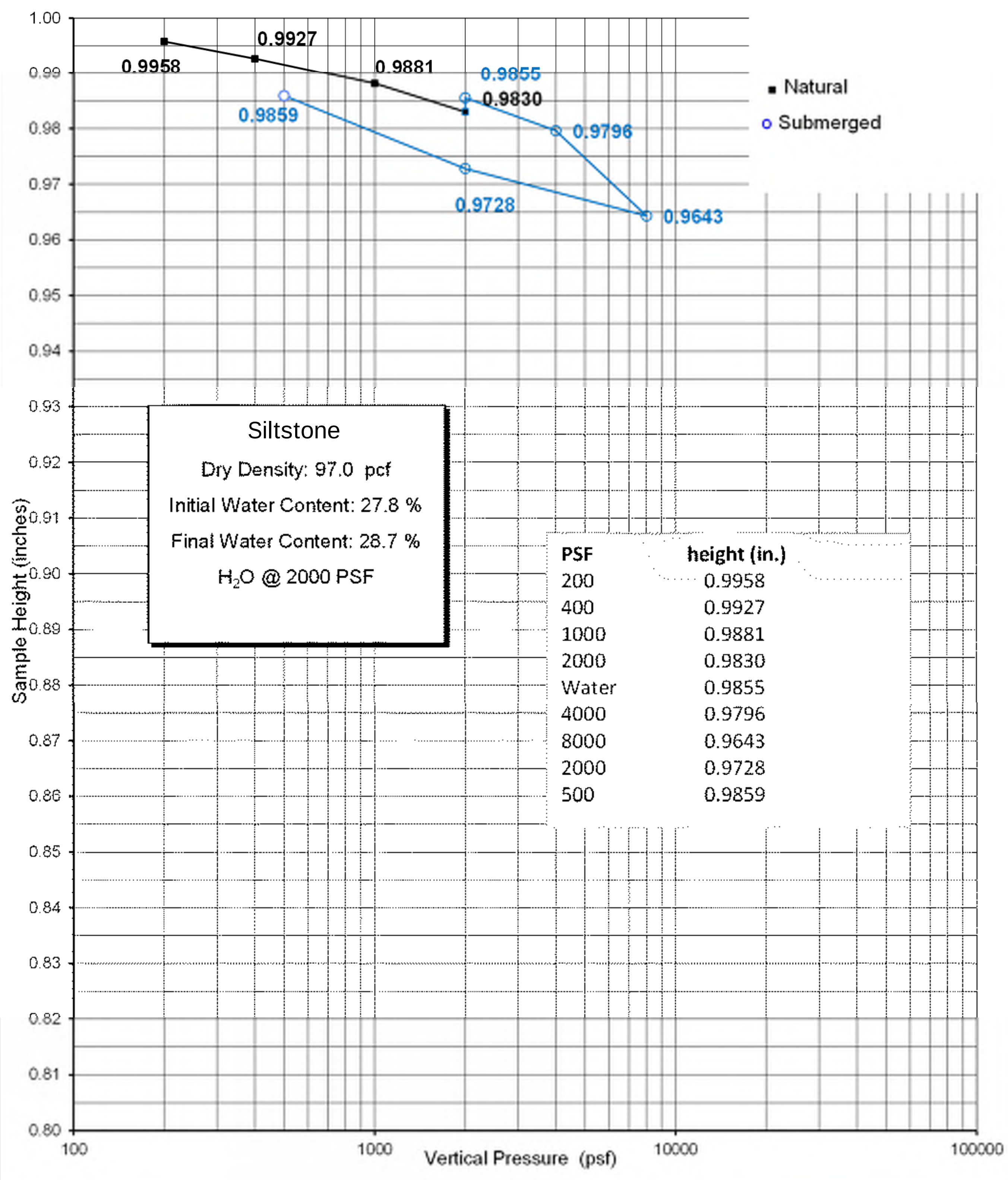
Sample		**Sample**		**Sample**	
Soil Type		Soil Type		Soil Type	
% water		% water		% water	
Wet weight		Wet weight		Wet weight	
Dry weight		Dry weight		Dry weight	
+ 200 sieve		+ 200 sieve		+ 200 sieve	
% Retained		% Retained		% Retained	
%Pass. #200		**%Pass. #200**		**%Pass. #200**	

Sample		**Sample**		**Sample**	
Soil Type		Soil Type		Soil Type	
% water		% water		% water	
Wet weight		Wet weight		Wet weight	
Dry weight		Dry weight		Dry weight	
+ 200 sieve		+ 200 sieve		+ 200 sieve	
% Retained		% Retained		% Retained	
%Pass. #200		**%Pass. #200**		**%Pass. #200**	

Geo-Logic ASSOCIATES

CONSOLIDATION TEST - ASTM D2435

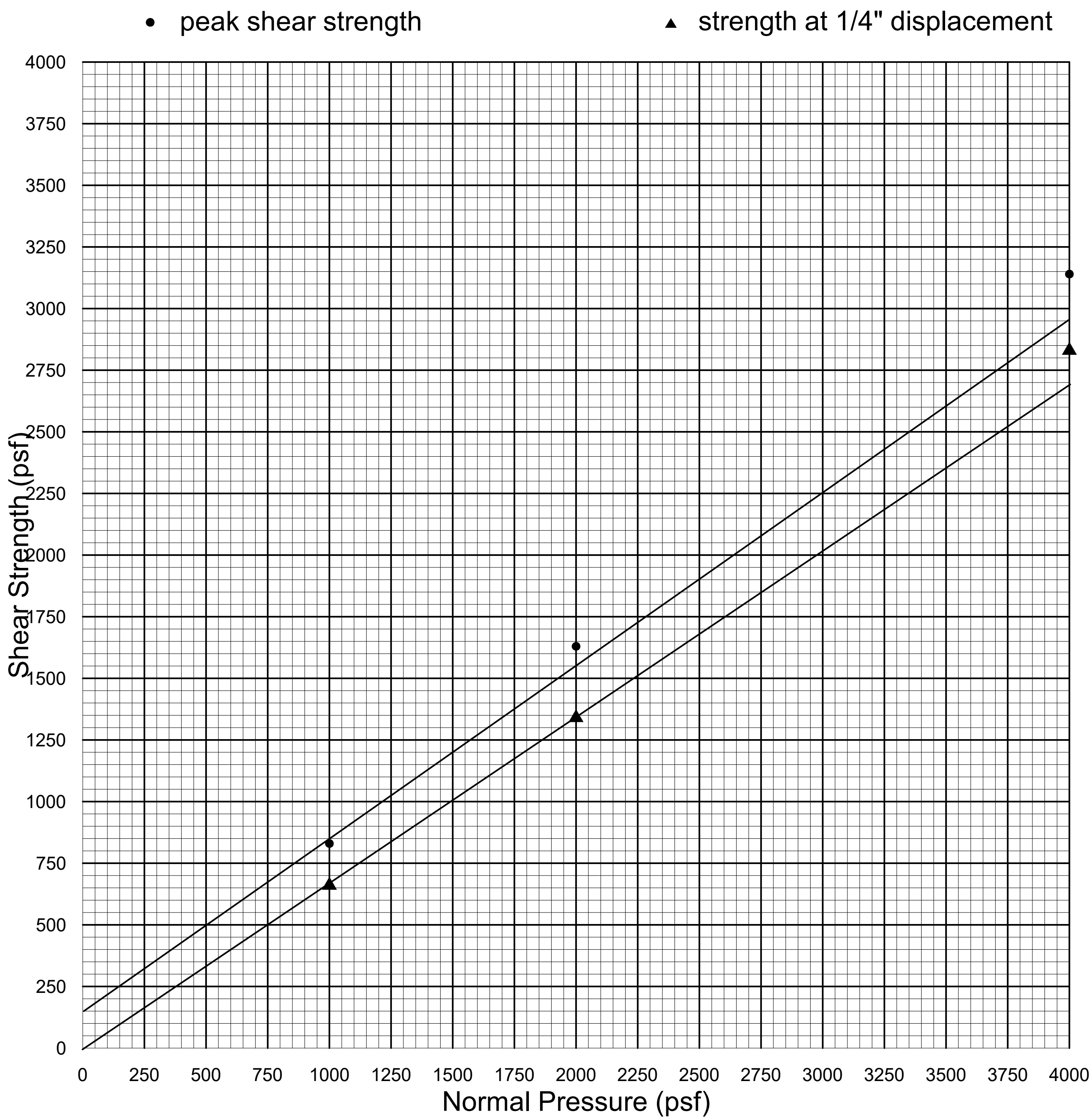
Boring / Sample No. B-2 / S-7	Depth: 35.0'	Date 10-11-17



PSF	height (in.)
200	0.9958
400	0.9927
1000	0.9881
2000	0.9830
Water	0.9855
4000	0.9796
8000	0.9643
2000	0.9728
500	0.9859

Geo-Logic ASSOCIATES

DIRECT SHEAR TEST - ASTM D-3080



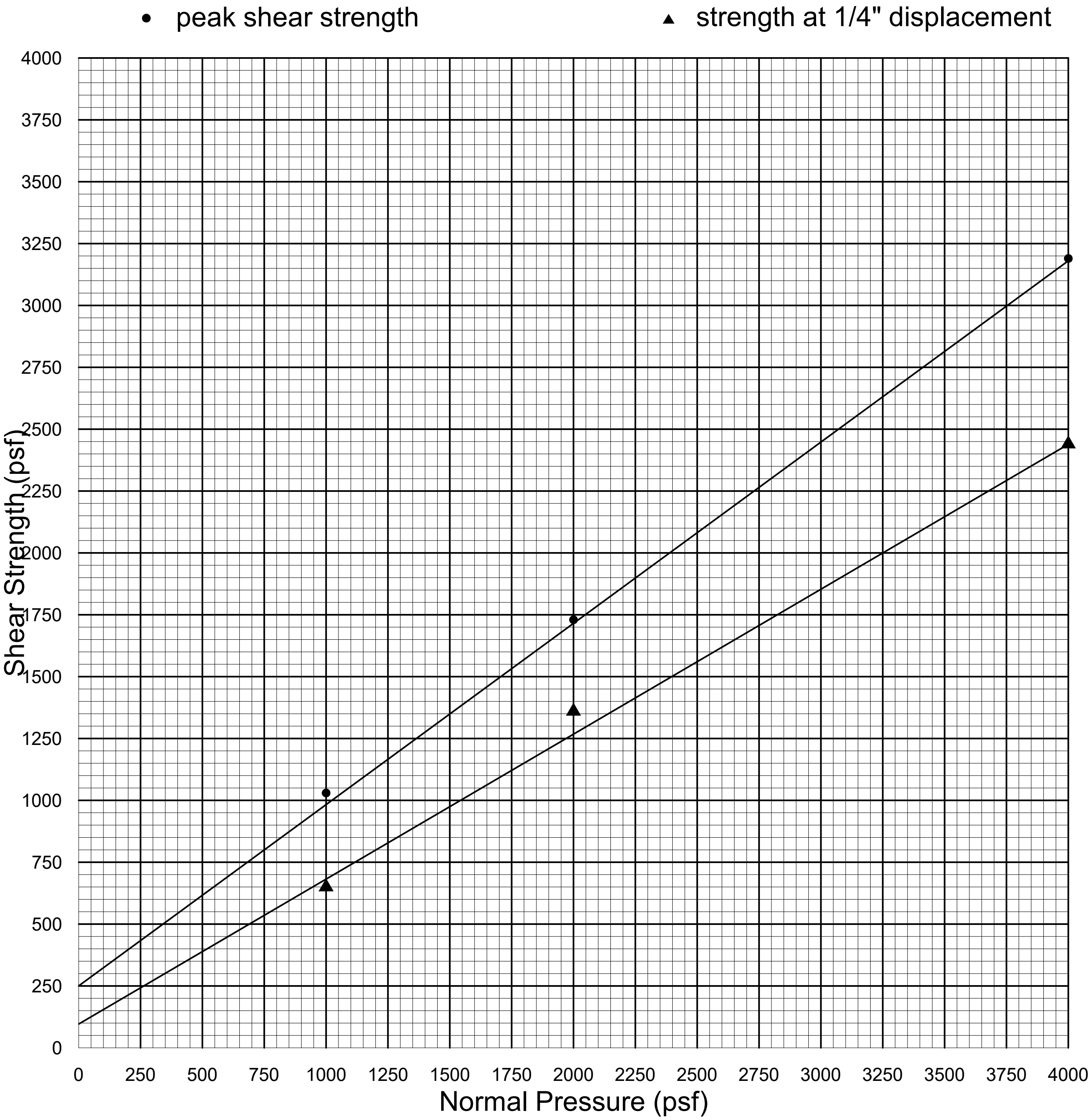
Strain Rate: 0.0084 in. / min.

Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
B-1/S-5	Undisturbed & Saturated	Silty Sand	94.7	9.4	28.0

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	830 @ 0.0700"	660
2000	1630 @ 0.0800"	1340
4000	3140 @ 0.0950"	2830
	C = 150 psf	C = 0 psf
	ϕ = 35 deg.	ϕ = 34 deg.

Date: 10-14-17

DIRECT SHEAR TEST - ASTM D-3080



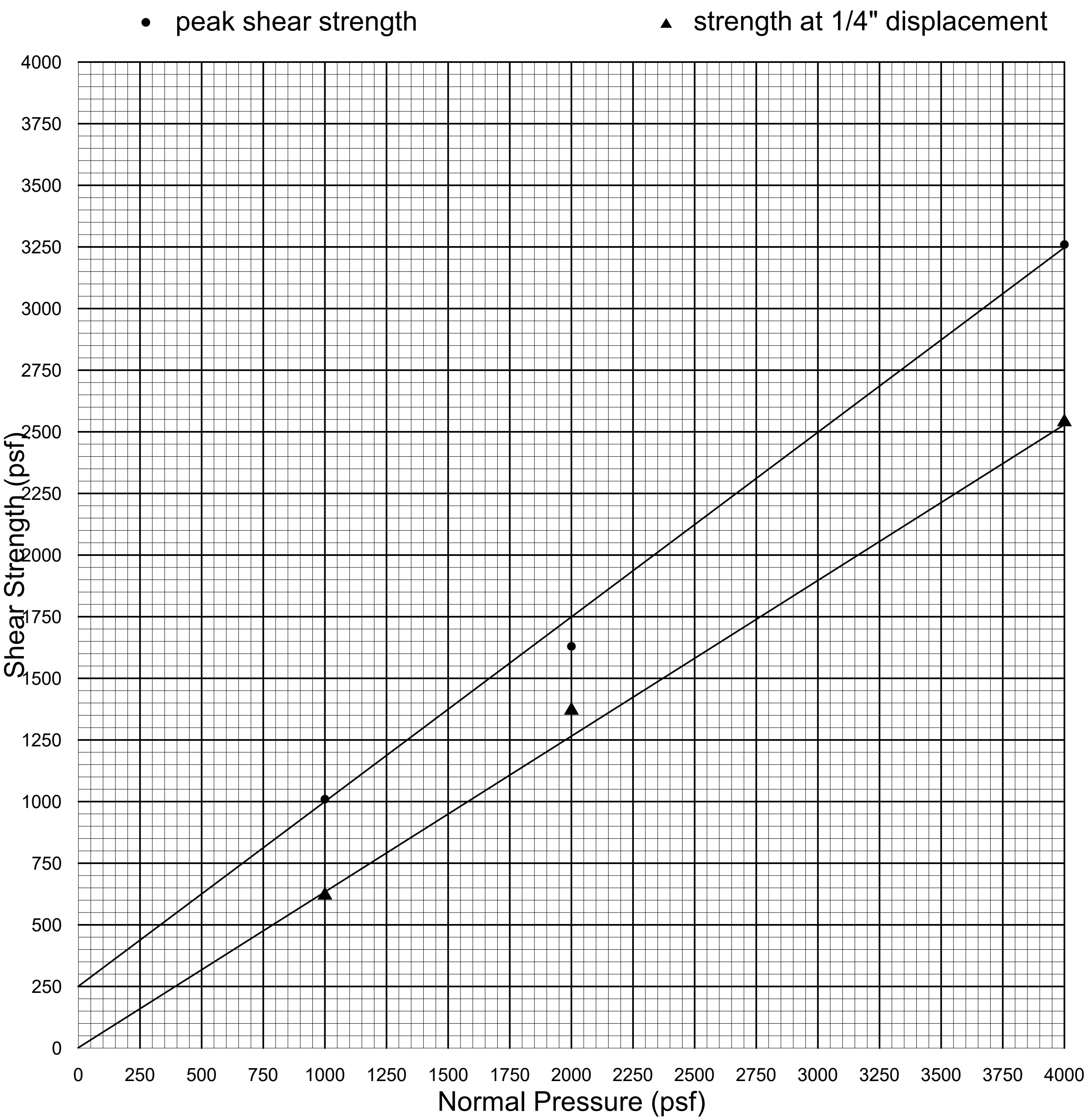
Strain Rate: 0.0084 in. / min.

Sample	Type	Description	Dry Density (pcf)	Initial W.C. (%)	Final W.C. (%)
B-2/S-3	Undisturbed & Saturated	Silty Sand	99.5	6.0	25.6

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	1030 @ 0.0555"	650
2000	1730 @ 0.0755"	1360
4000	3190 @ 0.1055"	2440
	C = 250 psf	C = 100 psf
	ϕ = 36 deg.	ϕ = 30 deg.

Date: 10-14-17

GeoLogic Associates



Strain Rate: 0.0084 in. / min.

Sample	**Type**	**Description**	**Dry Density (pcf)**	**Initial W.C. (%)**	**Final W.C. (%)**
B-3/S-3	Undisturbed & Saturated	Silty Sand	97.3	8.0	24.8

Normal Pressure (psf)	Peak Shear Strength (psf)	Ultimate Shear Strength (psf)
1000	1010 @ 0.0505"	620
2000	1630 @ 0.0955"	1370
4000	3260 @ 0.0900"	2540
	C = 250 psf	C = 0 psf
	ϕ = 37 deg.	ϕ = 33 deg.

Langan Engineering # 700048801 SOIL TEST RESULTS *Job No. 2012-0057*

SAMPLE NO.:	B-1 / B-1 @ 0 - 5'				
DESCRIPTION	Silty Sand				
DIRECT SHEAR TEST (type)					
Initial Moisture Content %					
Dry Density (pcf)					
Normal Stress (psf)					
Peak Shear Stress (psf)					
Ultimate Shear Stress (psf)					
Cohesion (psf)					
Internal Friction Angle (degrees)					
EXPANSION TEST UBC STD 18-2					
Initial Dry Density (pcf)					
Initial Moisture Content %					
Final Moisture Content %					
Pressure (psf)					
Expansion Index / Swell %					
CORROSIVITY TEST					
Resistivity (CTM643) (ohm-cm)	2,400				
pH (CTM643)	8.1				
CHEMICAL TESTS					
Soluble Sulfate (CTM 417) (ppm)	1,111				
Chloride Content (CTM 422) (ppm)	73				
Wash #200 Sieve (ASTM-1140) %					
Sand Equivalent (ASTM D2419)					

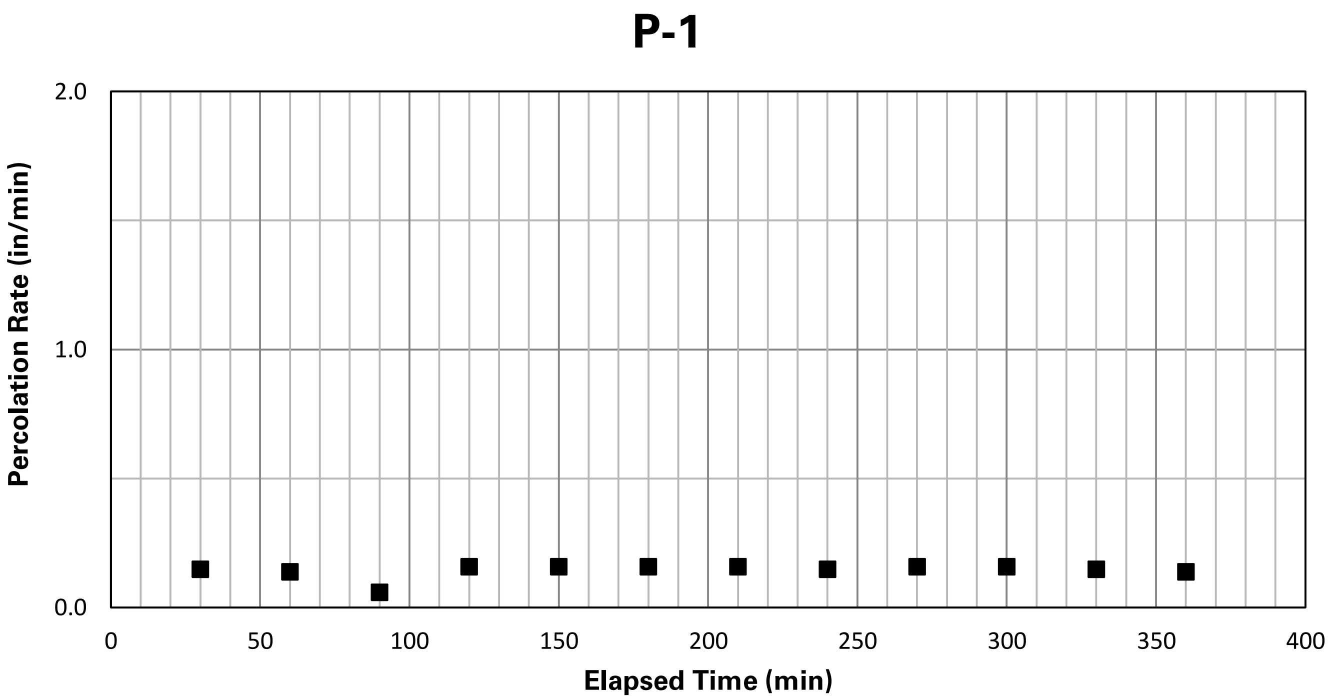
Geo-Logic
ASSOCIATES

APPENDIX E
PERCOLATION TEST RESULTS

PERCOLATION TEST DATA SHEET

LANGAN

Project:	4302 Ford Road, Newport Beach, California				Project No.:	700048801	Date of Test:	10/5/2017	
Test Hole No.:		P-1			Tested By:	DJJ			
Depth of Test Hole (ft):		10			USCS Soil Classification:		clayey fine SAND (SC)		
Casing Depth (ft):		10.0' PVC Pipe; Perforated entire length of pipe			Test Hole Diameter (in):		8		
Trial No.	Date	Time of Measurement	Initial Depth to Water (Feet)	Time of Measurement	Final Depth to Water (Feet)	Time Interval (min)	Change in Water Level (Feet)	Percolation Rate (in/min)	Infiltration Rate (in/hr)
Sandy soil criteria 1	10/5/2017	12:00 PM	4.00	12:25 PM	4.11	25	0.11	0.05	
Sandy soil criteria 2	10/5/2017	12:25 PM	4.11	12:50 PM	4.20	25	0.09	0.04	
1	10/6/2017	6:40 AM	4.20	7:10 AM	4.35	30	0.15	0.06	
2	10/6/2017	7:11 AM	4.35	7:41 AM	4.49	30	0.14	0.06	
3	10/6/2017	7:42 AM	4.49	8:12 AM	4.55	30	0.06	0.02	
4	10/6/2017	8:13 AM	4.55	8:43 AM	4.71	30	0.16	0.06	
5	10/6/2017	8:44 AM	4.72	9:14 AM	4.88	30	0.16	0.06	
6	10/6/2017	9:15 AM	4.88	9:45 AM	5.04	30	0.16	0.06	
7	10/6/2017	9:46 AM	5.04	10:16 AM	5.2	30	0.16	0.06	
8	10/6/2017	10:17 AM	5.20	10:47 AM	5.35	30	0.15	0.06	
9	10/6/2017	10:48 AM	5.35	11:18 AM	5.51	30	0.16	0.06	
10	10/6/2017	11:19 AM	5.51	11:49 AM	5.67	30	0.16	0.06	
11	10/6/2017	11:50 AM	5.67	12:20 PM	5.82	30	0.15	0.06	
12	10/6/2017	12:21 PM	5.82	12:51 PM	5.96	30	0.14	0.06	0.1
Comments:	1. Percolation test was performed in accordance with the Orange County - Technical Guidance Document dated 20 December 2013. 2. Infiltration Rate was calculated using Porchet Method.								
	3. Per the procedures for shallow percolation tests in non-sandy soils, a minimum of twelve measurements were taken in 30-minute intervals for six hours after sandy soil criteria was not met.								
	4. Weather: Sunny, 65-80°F								
	5. Measurements were collected from the Top of PVC Pipe								



1. LP-1 percolation test was performed approximately 10 feet below existing grade.
2. Refer to Figure 1 for percolation test locations.

LANGAN 32 Executive Park, Suite 130 Irvine, CA 92614 P: 949.255.8640 F: 949.255.8641 www.langan.com Langan Engineering & Environmental Services, Inc.	Project **4302 Ford Road, Newport Beach, California** NEWPORT BEACH ORANGE COUNTY CALIFORNIA	Title **PERCOLATION TEST RESULTS: P-1**	Project No. 700048801 Date OCTOBER 2017 Scale N/A Prepared By: DJJ

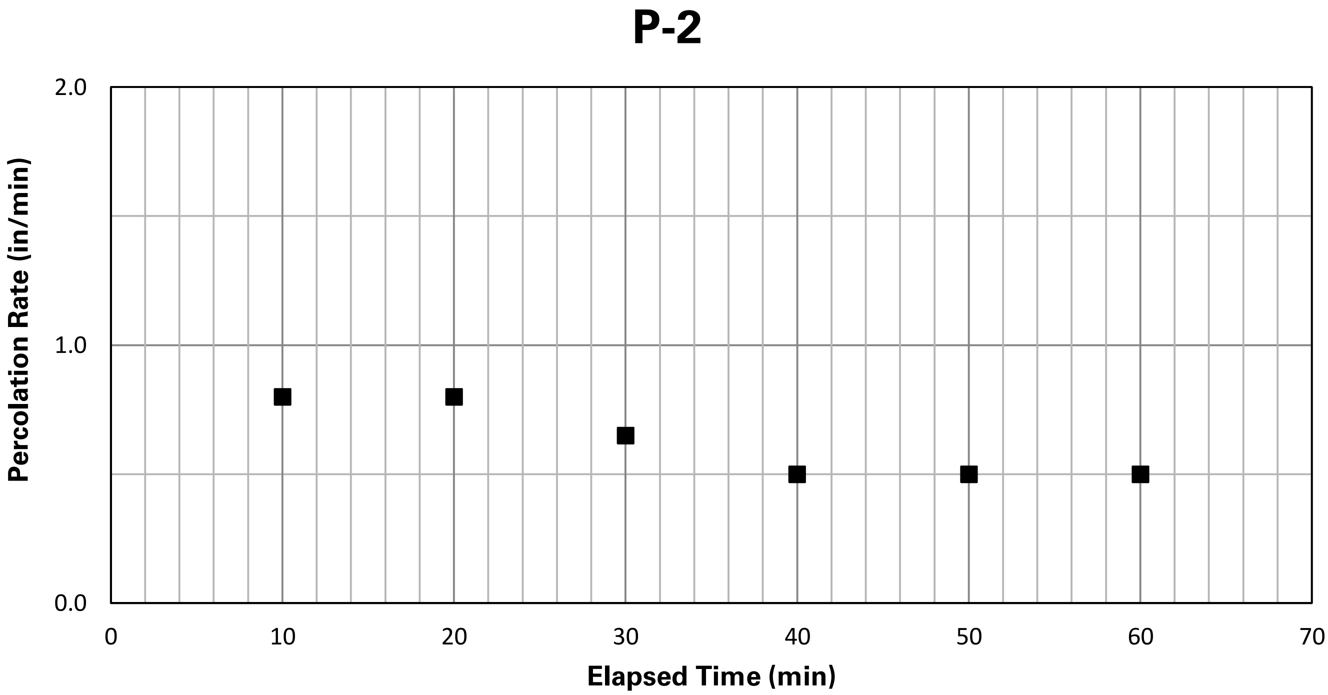
PERCOLATION TEST DATA SHEET

LANGAN

Project:	4302 Ford Road, Newport Beach, California				Project No.:	700048801	Date of Test:	10/6/2017	
Test Hole No.:		P-2			Tested By:	DJJ			
Depth of Test Hole (ft):		10			USCS Soil Classification:		silty SAND (SM)		
Casing Depth (ft):		10.0' PVC Pipe; Perforated entire length of pipe			Test Hole Diameter (in):		8		
Trial No.	Date	Time of Measurement	Initial Depth to Water (Feet)	Time of Measurement	Final Depth to Water (Feet)	Time Interval (min)	Change in Water Level (Feet)	Percolation Rate (in/min)	Infiltration Rate (in/hr)
Sandy soil criteria 1	10/6/2017	9:00 AM	5.35	9:25 AM	8.80	25	3.45	1.66	
Sandy soil criteria 2	10/6/2017	9:26 AM	7.40	9:51 AM	8.45	25	1.05	0.50	
1	10/6/2017	9:52 AM	7.00	10:02 AM	7.80	10	0.80	0.96	
2	10/6/2017	10:03 AM	6.60	10:13 AM	7.40	10	0.80	0.96	
3	10/6/2017	10:14 AM	6.65	10:24 AM	7.30	10	0.65	0.78	
4	10/6/2017	10:25 AM	7.30	10:35 AM	7.80	10	0.50	0.60	
5	10/6/2017	10:36 AM	7.40	10:46 AM	7.90	10	0.50	0.60	
6	10/6/2017	10:47 AM	7.30	10:57 AM	7.80	10	0.50	0.60	2.3

Comments:

1. Percolation test was performed in accordance with the Orange County - Technical Guidance Document dated 20 December 2013.
2. Infiltration Rate was calculated using Porchet Method.
3. Per the procedures for shallow percolation tests in sandy soils, a minimum of twelve measurements were taken in 30-minute intervals for six hours after sandy soil criteria was met.
4. Weather: Sunny, 65-80°F
5. Measurements were collected from the Top of PVC Pipe



1. P-2 percolation test was performed approximately 10 feet below existing grade.
2. Refer to Figure 1 for percolation test locations.

LANGAN 32 Executive Park, Suite 130 Irvine, CA 92614 P: 949.255.8640 F: 949.255.8641 www.langan.com Langan Engineering & Environmental Services, Inc.	Project **4302 Ford Road, Newport Beach, California** NEWPORT BEACH ORANGE COUNTY CALIFORNIA	Title **PERCOLATION TEST RESULTS: P-2**	Project No. 700048801 Date OCTOBER 2017 Scale N/A Prepared By: DJJ