GEOTECHNICAL INVESTIGATION REPORT
for
CRC Huntington Beach
20101 Goldenwest Street
Huntington Beach, California

Prepared For:

California Resources Corporation
1 World Trade Center, Suite 1500
Long Beach, CA 90831

Prepared By:

Langan CA, Inc.
18575 Jamboree Road, Suite 150
Irvine, CA 92612

28 February 2025
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Irvine, CA 92612

CERTIFIED ENGINEERING GEOLOGIST
SHAUN H. WILKINS
No. 2665
exp 3/31/26
STATE OF CALIFORNIA

Shaun Wilkins, PG, CEG
Senior Project Geologist, CEG #2665

REGISTERED PROFESSIONAL ENGINEER
ENRIQUE A. RIUTORT
GE2683
exp 12/31/26
GEOTECHNICAL
STATE OF CALIFORNIA

Enrique Riutort, PE, GE
Senior Project Manager, GE #2683

REGISTERED PROFESSIONAL ENGINEER
DIANE M FIORELLI
No. GE 3042
exp 6/30/27
GEOTECHNICAL
STATE OF CALIFORNIA

Diane Fiorelli, PE, GE
Principal, GE #3042

28 February 2025
700152701

LANGAN

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1. INTRODUCTION

As requested by the California Resources Corporation, and in accordance with our Proposal for Geotechnical Consulting Engineering Services dated 15 March 2024, Langan CA, Inc. has completed a geotechnical and geological evaluation to provide to support planning and entitlement efforts for the property at 20101 Goldenwest Street in Huntington Beach, Orange County, California (proposed Project).

Our scope of services for this study included:

1. a review of available geotechnical and geologic maps and references for the site
2. a limited field exploration and laboratory testing program, and
3. evaluation of the data obtained, and preliminary recommendations related to the geotechnical aspects of proposed project.

2. PROJECT UNDERSTANDING

2.1 Existing Site Description

The site encompasses two parcels in Huntington Beach, California identified as Orange County Assessor Parcel Numbers (APNs) 023-181-53 and 023-181-54 (see Figure 1), The approximately 93 acres site is bounded by Goldenwest Street on the southeast Pacific Coast Highway on the southwest, Palm Avenue, Beachview Drive, a park and residential properties on the north and northeast, and the Bolsa Chica Wetlands and oil fields on the northwest. Seapoint Street separates the two parcels (see Figure 2).

The site is an active oil-and-gas facility that contains operations to support exploration and production from the Huntington Beach Oil Field and offshore Platform Emmy. Facilities on the site include an oil-dehydration and water-processing area, a tank farm, a hydrogen sulfide gas-processing unit, a gas plant, a carbon dioxide processing unit, active wells, and various support structures including warehouse and pipelines[1]. The majority of the active wells are on the southwest side of the property adjacent to Pacific Coast Highway. In addition to supporting gas processing and production onshore, the site produces oil and gas extracted from Platform Emmy and from the Bolsa Chica oil field. Evaluation of Platform Emmy and any associated offshore pipelines is not part of this project.

The site is graded generally flat with ground surface gently sloping down to the southeast. Site elevations (el) vary between approximately 40 and 37. Elevations referenced herein are in feet and with respect to the North American Vertical Datum of 1988 (NAVD 88).

2.2 Proposed Development Plan

Our understanding of the proposed development is based on a plan by JZMK dated December 2024. The site is being evaluated for future development of approximately 53 acres of residential properties, and 16 acres of commercial uses which could include a hotel. Landscape promenades and parks are proposed throughout the site. The northwestern parcel is planned to remain open space and undeveloped. For the purpose of our evaluation, we have assumed that the residential buildings will be generally low rise, two to three-story maximum height. We anticipate

[1] California State Lands Commission. May 2015. Safety and Oil Spill Prevention Audit. SoCal Holding, LLC Huntington Beach Onshore Facility

that the hotel will be fifty feet in height with below grade parking and may have a pool. We have assumed that site grading will be generally consist of cuts and fills of less than 5 feet.

3. REVIEW OF AVAILABLE INFORMATION

We reviewed publicly available geotechnical and geologic information at or near the site, publicly available geologic reports, and historical aerial images for the site. Referenced information included reports, maps, and websites from the agencies listed below:

- United States Geological Survey (USGS),
- California Geological Survey (CGS),
- California Department of Conservation Division of Mines and Geology,
- Federal Emergency Management Agency (FEMA),
- California Department of Water Resources (DWR) and Flood Emergency Response Information Exchange (FERIX),
- California Geologic Energy Management Division (CalGEM) previously known as the Division of Oil, Gas & Geothermal Resources (DOGGR)
- City of Huntington Beach.

3.1 Regional and Local Geologic Setting

The site is situated along the southwesterly margin of the Orange County Coastal Plain, a relatively broad lowland area that was formed through alluvial aggradations and the formation of coalescing alluvial fans which were deposited along the ancestral Santa Ana River during late Quaternary time. The Coastal Plain is bounded on the northeast by an alignment of highland areas and foothills (including the Puente and Coyote Hills), and on the southwest by a succession of low coastal hills and mesas that are topographic expressions of deformation along the Newport-Inglewood structural zone. Between these coastal topographic highs occur a total of six gaps through which continuations of the central lowland extend to the Pacific Ocean shoreline.

Published regional geologic information indicates that the subject site is underlain by late to middle Pleistocene aged old shallow marine (terrace) deposits (map symbol Qom, Saucedo et al, 2016). These deposits are situated on the now exposed wave-cut abrasion platforms, which have been preserved due to regional uplift.

Based on regional mapping, site soils are anticipated to consist of poorly sorted, moderately permeable, reddish-brown, interfingered strandline, beach, estuarine, and colluvial deposits. See Figure 3 for the regional Geologic Map.

3.2 Geologic Hazards Review

Langan's geologic-hazard review was conducted in general accordance with CGS "Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California" and the City of Huntington Beach General Plan. The following subsections present the results of Langan's review of geologic hazards as they pertain to the site.

- Regional Faulting – We reviewed the CGS 2010 Fault Activity Map of California (see Figure 4A) and the accompanying document, "An Explanatory Text to the Fault Activity Map of California" (see Figure 4B) to identify mapped faults within 100 kilometers of the site. The site is within the Newport Inglewood fault zone. A late Quaternary fault termed the Olive Street fault is located along the northern portion of the site, and roughly parallels Palm Avenue, trending northwest / southeast. A second late

Quaternary fault locally called the South Branch fault is located approximately 0.4 miles northeast of the site. The closest known active fault to the site is the North Branch fault segment of the Newport Inglewood Newport-Inglewood fault zone, located 0.85-mile northeast of the site.

The site is in a seismically active area that has historically been affected by generally moderate to occasionally high levels of ground motion. Because of the site's proximity to several currently mapped active faults, the proposed project will likely experience moderate to occasionally high ground shaking from these faults, and ground shaking from other seismically active areas of southern California. A summary of the reported earthquake events is provided in Appendix A.

- Regional Seismicity – A search of the USGS ANSS Comprehensive Earthquake Catalog (ComCat), using a web-based Earthquake Archive Search and URL Builder tool, found that as of 24 January 2025, 52 earthquakes with magnitudes greater than 5.0 have occurred within a 100-kilometer radius of the site since 1800. A summary of the USGS ANSS ComCat reported earthquake events are provided in Appendix A. These earthquake epicenters relative to the site are displayed graphically on Figure 4A.

- Surface Rupture – Alquist-Priolo Earthquake Fault Zones (APEFZ) are regulatory zones established by California's state geologist around active faults with the potential to cause surface rupture. The zones vary in width; however, they average approximately 1/4 mile wide. According to the CGS map titled "Earthquake Zones of Required Investigation Seal Beach Quadrangle" revised on 17 January 2006 and the 2017 "City of Huntington Beach Geologic Hazards," the site is not mapped within a currently established zone of required investigation for Alquist-Priolo Earthquake Fault Zone (Figure 5). The onsite portion of the Olive Street fault is identified by the USGS as Fault number 127b and is designated as late Quaternary, with an inferred location (Treiman, 1999). Based on Fault Evaluation Report 172, the onsite portion of the Olive Street fault is designated as late Quaternary, meaning that it is not considered an active fault, and does not require investigation in accordance with the Alquist-Priolo act (Bryant, 1985). Because the site is not located in an Alquist-Priolo Fault Zone and there are no reported active faults on the site, potential for ground rupture is considered low.

  Note that the City of Huntington Beach Emergency Operations Center (EOC) has published earthquake fault trace buffer zones for Essential Service Facilities on late Quaternary faults, including what are called the Olive Street and Walnut Street Fault strands. Since the proposed development is not an essential services facility, it should not require a fault rupture hazard investigation.

- 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, especially during earthquake-induced cyclic loading. Soil susceptible to liquefaction includes loose to medium-dense sand and gravel and low-plasticity silts. According to the CGS map "Earthquake Zones of Required Investigation Seal Beach Quadrangle," revised on 17 January 2006, the site is not mapped in a zone of required investigation for liquefaction. According to the 2017 "City of Huntington Beach General Plan" the site is mapped to have a liquefaction potential from "high to medium"

to "very high" (Figure 6). Details of our liquefaction evaluation are discussed later in this report.

- Earthquake-Induced Landslide Areas – Based on CGS map "Earthquake Zones of Required Investigation Seal Beach Quadrangle" revised on 17 January 2006, the site is not mapped in a zone of required investigation for earthquake-induced landslides. Similarly, the 2017 "City of Huntington Beach General Plan", the site is not mapped in an earthquake-induced landslide zone (Figure 6).
- Historically High Groundwater – According to the 1998 CGS report "Seismic Hazard Zone Report for the Seal Beach 7.5-Minute Quadrangle, Los Angeles and Orange Counties, California," the historical high groundwater near the site is mapped the approximately 10 and 30 feet contour within the limits of the site (Figure 7).
- Seismic-Induced Ground Deformations – Seismic-induced ground deformations include ground-surface settlement and differential settlement resulting from (1) liquefaction of saturated cohesionless soils, and (2) seismic densification, or differential compaction, of unsaturated sands and gravels caused by earthquakes. According to the 2017 "City of Huntington Beach General Plan" the site is mapped to have a liquefaction potential from "high to medium" to "very high" (Figure 6). The potential for liquefaction and cyclic densification is evaluated later in this report.
- Lateral Spreading – Lateral spreading is a phenomenon in which 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 liquefaction-hazard zone according to CGS but is in a liquefaction-hazard zone per the City of Huntington Beach. However, there are no free faces present within or near the site; therefore, we judge that the potential for lateral spreading is negligible. Details of our liquefaction evaluation are discussed in Section 6.2 of this report.
- Flood Maps – According to the FEMA Flood Insurance Rate Map (FIRM) Numbers 06059C0241K and 06059C0242K, both dated 21 March 2019, the site is mapped with Zone X, area of minimal flood hazard. According to the "City of Huntington Beach General Plan," dated 2 October 2017, the site is mapped outside of the 100- and 500-year flood zones. According to the "City of Huntington Beach General Plan," dated 2 October 2017, the site is not mapped to be in a 2050 potential flooding zone caused by sea level rise. See Figures 8 and 9 for the flood-hazard areas and Figure 10 for the potential sea-level-rise hazard areas.
- Tsunami and Seiche – A tsunami is a long high sea wave caused by an earthquake, submarine landslide, or other underwater disturbance. A seiche is an oscillation of surface water in an enclosed or semi-enclosed basin such as a lake, bay, or harbor. According to information and maps available from CGS, and the City of Huntington Beach General Plan (2017), the site is not within a mapped tsunami-inundation hazard zone or flood-control basin (Figure 11).
- Inundation from Dam Failure – Based on a review of the California Department of Water Resources Flood Emergency Response Information Exchange (FERIX) Dam Breach Inundation Map Web Publisher, the site is not mapped within an inundation area.

According to the "City of Huntington Beach General Plan," dated 2 October 2017, the site is not mapped in the Prado Reservoir inundation area. See Figure 12.

- Subsidence – Land subsidence may be induced from withdrawal of oil, gas, or water from wells. According to a search of the Cal GEM (formerly the Division of Oil, Gas & Geothermal Resources (DOGGR)) Well Finder online tool, the site is mapped within an oil or gas field. Based on the Huntington Beach subsidence map, the site is in a zone of approximately -0.1 to -0.8 inches of subsidence per year. See Figure 13 for the subsidence map.

  The subsidence in this area is historically associated with oil extraction activities within the property. Based on the proposed development, the oil wells will be decommissioned which is expected to reduce long-term subsidence.

- Expansive Soils – Expansive soils are soils that change in volume when the soil's moisture content changes. The volume change occurs when the moisture content in the soil causes swelling or shrinking because of cyclic wet/dry weather cycles, installation of irrigation systems, change in landscape plantings, or changes in grading. Swelling and shrinking soils can result in differential movement of structures including floor slabs and foundations, and site work including hardscape, utilities, and sidewalks. The 2022 CBC defines potentially expansive soils as soils with expansion indices (EI) greater than 20. The expansion potential of near-surface soils at the site is discussed in Section 6.4.

- Methane – According to the 2017 "City of Huntington Beach General Plan", the site is mapped to be within Methane District 2. Therefore, future development at the site within the boundaries of the oil field must be tested for elevated levels of methane in the soil prior to construction and may be required to include vent systems and/or barriers to reduce the level of methane to a safe concentration.

3.3 Historical Use

Based on our review of aerial photographs from 1896 to 2024, obtained from the Historic Aerials website on 24 February 2025, the site has been actively used as an oil field production facility since the early 1920s. Historical maps indicate that oil and gas exploration began during this period, with the establishment of production infrastructure, including oil wells, derricks, and processing facilities. While some changes in surface infrastructure have occurred—such as the removal of older storage tanks and the emergence of warehouse-type structures by the late 20th century—the primary land use has remained consistent through 2024.

4. SUBSURFACE INVESTIGATION

4.1 LANGAN Borings

Langan's field investigation consisted of drilling 10 geotechnical borings, LB-1 through LB-10. Three percolation tests, LB-1/P-1, LB-3/P-2, and LB-10/P-3, were performed. The borings were advanced to a maximum depth of approximately 51.5 feet below ground surface (bgs) at accessible locations within the site. See Figure 14 for the approximate boring locations.

Borings LB-1 through LB-10 were drilled between 15 and 17 January 2025 by ABC Liovin Drilling, Inc., using a limited-access track-mounted drill rig equipped with hollow-stem auger drilling equipment under the full-time observation of a Langan field engineer. The borings were hand-

augered to a depth of approximately 5 feet and subsequently advanced with the drill rig by using conventional drilling techniques.

Before conducting the subsurface investigation, boring locations were located and marked in the field by a Langan field engineer. Underground Service Alert of California (DigAlert) was contacted to locate, and mark known public underground utilities present within the public right-of-way. A private utility-locating subcontractor also performed checks for detectable underground utilities at the boring locations using geophysical techniques to confirm that the locations were clear of subsurface utilities and obstructions.

Standard Penetration Tests (SPT)[2] were generally performed at 5-foot intervals. SPT N-values were recorded to identify the relative density or stiffness of the cohesionless and cohesive soils, respectively. Modified California ring samples were taken at select locations using a 3.0-inch-outer-diameter thick-walled split barrel sampler lined with 2.42-inch-inner-diameter rings. Soil samples were visually examined and classified in the field in accordance with the Unified Soil Classification System (USCS). Subsurface conditions encountered within the borings are summarized below. The boring logs are included in Appendix B.

Upon completion, borings LB-1through LB-10 were backfilled with grout using the tremie method. Borings LB-6 through LB-8 were surface patched with asphalt concrete. Soil cuttings from the borings were temporarily stored on-site in a roll-off bin for subsequent characterization and disposal.

4.2 Percolation Testing

Percolation testing was performed in borings LB-1/P-1, LB-3/P-2, and LB-10/P-3 at a depth of approximately 10 to 15 feet. The tests were performed on 17 January 2025 under the full-time observation of a Langan field engineer. The percolation test consisted of measuring the drop in water over time in a 2-inch-outer-diameter slotted polyvinyl chloride (PVC) pipe with a solid end cap. A sand filter pack was poured around the PVC pipe.

The percolation tests were performed in general accordance with the North Orange County Department of Public Works "Exhibit 7.III Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs)" dated 20 December 2013. Percolation test results are provided in Appendix C. See Section 6.7 for design recommendations for storm water infiltration.

4.3 Geotechnical Laboratory Testing

Soils samples obtained from the borings were visually examined in the field, and classifications were confirmed by reexamination in our office. Geotechnical laboratory testing was performed on select soil samples for the following testing regime:

- Moisture Content and Density – ASTM D2216 & D7263
- Direct Shear – ASTM D3080
- Expansion Index – ASTM D4829

[2] The Standard Penetration Test is a measure of the soil density and consistency. The SPT N-value is defined as the number of blows required to drive a 2-inch outer diameter split-barrel sampler 12 inches, after an initial penetration of 6 inches, using a 140-pound automatic hammer free falling from a height of 30 inches.

- Consolidation – ASTM D2435
- Sieve Analysis – ASTM D422
- Percent Fines – ASTM D1140
- Corrosion Tests
    - Resistivity and pH – CA Test 643
    - Sulfate Content – CA Test 417
    - Chloride Content – CA Test 422

Copies of the laboratory test results are provided in Appendix D.

5. SUBSURFACE CONDITIONS

Langan's interpretation of the subsurface conditions is based on soils encountered during our field investigation. In general, subsurface conditions within the site consisted of undocumented fill underlain by Deposits Terrace Deposits consisting of Old Lacustrine, Playa, and Estuarine (Paralic) Deposits (Qol) and Quaternary old marine deposits (Qom). Our interpretation of the subsurface conditions based on the borings and laboratory test results is summarized below.

- **Undocumented Fill**: Undocumented fill was encountered at 2 to 5 feet bgs and generally consisted of silty sands and clayey sands with varying amounts of gravel. Deeper fill deposits are anticipated in areas where historic sumps, well cellars and pipeline were present.

  Laboratory tests of a bulk sample collected within the upper 5 feet from boring LB-5 indicated that the fill has an expansion index (EI) of 10, indicating a low potential. Corrosion tests of fill were performed on composite bulk samples obtained from borings LB-2 and LB-9. Refer to Section 6.5 for corrosion results and considerations.

- **Terrace Deposits**: Underlying the fill, terrace deposits were encountered in all borings to the maximum depth explored. Terrace deposits consisted of three generalized layers.
    - Layer 1: Underlying the fill, the soils typically consisted of soft to very stiff, moist, approximately 5-feet to 12-feet-thick layer of low-plasticity clays and fine sandy silts. SPT N-values of silt were from 4 to 16 blows/foot. A softer clay layer with an SPT N-value of 2 blows/foot was encountered in the northwestern part of the site and an SPT of 1blows/foot was encountered near a historic basin.
    - Layer 2: Layer 1 is underlain by an approximately 10-feet to 18-feet-thick layer of medium-dense to very-dense, moist to wet, sands, silty sands, and stiff to very-stiff clay and silts. SPT N-values of silt were 18 to 31 blows/foot. SPT N-values of the sands and silty sands typically were 17 to 86 blows/foot.
    - Layer 3: Layer 2 is underlain by very-dense, wet, sands to the maximum depth explored (approximately 51.5 feet bgs). SPT N-values of the sands were 51 to 81 blows/foot.

  Laboratory tests indicated liquid limits and plasticity indices of low-plasticity clays in Layer 1 to range from 35 to 40 and 14 to 23, respectively. Moisture contents ranged from 9% to 18%. Fine contents of the sandy soils typically ranged from 6% to 16%. One sample was submitted for consolidation testing. Direct shear testing of a sample from

LB-4 (S-1) resulted in a friction angle of 32 degrees and cohesion of 800 and 100 pounds per square feet (psf) for peak and ultimate values, respectively. Direct shear testing of a sample from LB-9 (S-1) resulted in a friction angle of 32 degrees and cohesion of 250 psf for peak values, and a friction angle of 30 degrees and cohesion of 150 psf for ultimate values.

- Groundwater – Groundwater was encountered in LB-2 at the depth of 35.5 feet bgs (el 4.5), in LB-5 at the depth of 36.3 feet bgs (el 4.7), in LB-7 at the depth of 35.9 feet bgs (el 1.1). Historical high groundwater was mapped as 10 to 30 feet. See Figure 15 for a detailed subsurface profile and Langan boring logs in Appendix B.

6. PRELIMINARY GEOTECHNICAL EVALUATION AND DESIGN RECOMMENDATIONS

The site is considered suitable for the proposed development from a geologic and geotechnical point of view if mitigation for the undocumented fills as described herein is implemented. Our geotechnical evaluation and recommendations for seismic design, liquefaction, foundation support for the buildings, floor-slab support, corrosion and site design are provided below.

6.1 Seismic Design Parameters

Preliminary seismic design parameters in accordance with the 2022 California Building Code (2022 CBC) and ASCE 7-16 are listed below. The seismic design criteria assume the structure meets the exceptions of ASCE 7-16 Chapter 12.

Table 1 - Seismic Design Parameters

Criteria	Mapped Value (Site Class D)
MCE_R Spectral response acceleration at Short Periods, S_S	1.404g
MCE_R Spectral response acceleration at 1 second period, S_1	0.509g
Short Period Site Coefficient, F_a	1.2
Site Coefficient at 1 second period, F_v	1.8
Site-modified MCE_R Spectral Response Acceleration at Short Periods, S_{MS}	1.404g*
Site-modified MCE_R Spectral Response Acceleration at 1 second period, S_{M1}	0.916g*
Design Spectral Response Acceleration at short periods, S_{DS}	0.936g
Design Spectral Response Acceleration at 1 second period, S_{D1}	0.611g
MCE_G Peak Ground Acceleration, PGA_M	0.736g

Notes:
1. Values based on Site Class D - Default.
2. MCE = Maximum Considered Earthquake
3. MCE_R = Risked-Targeted Maximum Considered Earthquake

Seismic design parameters were determined for a Site Class D, assuming that the proposed structures have fundamental periods of vibration equal to or less than 0.5 seconds.

The structural engineer should confirm the structural fundamental period of vibration and the seismic design approach. The structural engineer should provide the fundamental period of vibration to Langan and confirm if Exception No. 2 of Section 11.4.8 of ASCE 7-16 and if simplified design procedures in accordance with Section 12.14 of ASCE 7-16 will be used for seismic design. If the exception is not being used a site-specific seismic site response analysis will be required for final design.

6.2 Liquefaction-Induced Settlement

A liquefaction analysis was performed using the data from the 50 feet deep borings (LB-2, LB-5 and LB-11) based on the Boulanger and Idriss (2010) SPT-N method. We analyzed two separate cases, one with an in-situ groundwater depth of 35.5 feet at the time of drilling and one with a historical high groundwater depth of 10 feet. Blow counts collected with a California Modified Sampler were factored with a value of 0.63. For the analysis, an acceleration of 0.683g and magnitude earthquake of 6.84 was used based on deaggregation of the 2,475-year return period hazard level. Listed below are the results of the liquefaction analysis.

Table 2 – Liquefaction Settlement Analysis Results

Boring	Approximate Liquefaction Settlement (Inches) at Groundwater depth of 35 feet	Approximate Liquefaction Settlement (Inches) at Historical High Groundwater depth of 10 feet
LB-2	<0.5	2.1
LB-5	<0.5	2.0
LB-7	<0.5	1.2

6.3 Foundation Design

Undocumented fills are unsuitable for support of the proposed structure and should be improved via overexcavation and recompaction. The proposed development is generally underlain by approximately 2 to 5 feet of undocumented fills and localized deeper undocumented fill areas may be encountered. All undocumented fills below proposed fills should be removed and replaced as compacted fill. The proposed development should be overexcavated to a depth of 5 feet, including 5 feet laterally. The excavation bottom should be scarified and proofrolled prior to placing fill. Overexcavated material can be used as engineered fill in accordance with Section 7.3. Additional recommendations for foundations are summarized below.

Light loaded structures (townhouse, single family residence) and heavier loaded structures (hotel) are proposed. Light loaded proposed structures may be supported on a shallow foundations bearing on compacted fill. Footings can be designed with an allowable bearing of 2,000 to 3,000 psf, have a minimum embedment depth of 24 inches and minimum width of 24 inches.

Heavier loaded proposed structure may be supported on improved ground or deep foundation type, depending on the final structure load.

Recommended allowable bearing values include both dead and live loads and may be increased by one-third for transient loads, such as wind and seismic forces.

6.4 Expansive Soil Considerations

Potentially expansive soils are defined by the 2022 CBC as soils with expansion indices (EI) greater than 20. Expansive soils swell or shrink when the moisture content of the soil changes. A soil's moisture content can change through cyclic wet/dry weather cycles, variations in the groundwater level, installation of irrigation systems, change in landscape plantings, and changes in site grading. Leaking utilities can also drastically change soil moisture content. Expansion index testing of the near-surface material indicates the soil exhibits a "low" expansion potential (EI of 10).

The site should be designed to promote positive drainage away from the pavements and landscaping should consist of mainly drought-tolerant native planting that requires limited irrigation. Confirmatory expansion index tests should be performed in a design-level final geotechnical investigation to confirm expansion potential of soils near proposed foundation level.

6.5 Corrosion Considerations

Chemical analyses of select samples are summarized below.

Table 3 – Chemical Analytical Results

Sample	Depth (feet)	Resistivity (ohm-cm)	pH	Sulfate Content (ppm)	Chloride Content (ppm)
LB-2 & LB-9 (Composite Bulk)	1-5	1300	7.7	687	217

Notes:
1. ppm = parts per million
2. NT = not tested for the select sample

Based on the minimum resistivity and pH results, the soil at these sampled locations and depths is considered severely corrosive to ferrous metals.

All subsurface structures and utilities in contact with the native soils should be protected against corrosion. Based on the samples collected to date, ACI 318-14 classified the soil as Exposure Class S1 for sulfate and Exposure Class C1 for chloride. A corrosion expert should be consulted if metal pipe is proposed to be in contact with soil. Based on the laboratory data summarized here, ACI 318-14 requires that concrete should be designed using Type II cement (ASTM C150), a maximum water-to-cement ratio of 0.5, and a minimum specified compressive strength (f'c) of 4,000 pounds per square inch (psi). A copy of the corrosion results is provided in Appendix D.

Confirmatory corrosion testing should be performed in a design-level final geotechnical investigation to confirm corrosivity of native soils at proposed foundation level.

6.6 Pavement Recommendations

Recommendations provided herein are in accordance with the 2020 CalTrans Highway Design Manual. The appropriate pavement section depends on the type and strength of subgrade soil, traffic load, and planned pavement life.

We assumed a pavement design life span of 20 years, a Traffic Index (TI) value of 6 for drive aisles and parking stalls, and an increased Traffic Index value of 8 for auto driveways at the site.

We also assumed an R-Value of 25 for the subgrade soil, which was used as a key parameter in determining the appropriate pavement section to ensure durability and performance.

Recommended designs for flexible pavement sections for the proposed parking lot and driveway are summarized on the following tables below:

Table 4 – Flexible Pavement Layer Thicknesses

Pavement Area	Assumed Traffic Index	R-value (estimated)	Asphalt Concrete (AC) Thickness	Class 2 Aggregate Base (AB) Thickness
Parking	6.0	25	4-inches	9-inches
Driveway	8.0	25	4-inches	14-inches

Prior to placement of asphalt concrete and aggregate base, the upper 12 inches of subgrade soils should be scarified, and then moisture-conditioned within 2% of the optimum moisture content, and then compacted to at least 95% of the laboratory-determined maximum dry density (ASTM D1557). Areas observed to pump or yield under vehicle traffic should be removed and replaced with firm and unyielding compacted soil or aggregate base materials (described below). The subgrade soil should be kept moisture-conditioned to prevent it from shrinking and swelling.

Aggregate base materials should be Crushed Aggregate Base or Crushed Miscellaneous Base conforming to Section 200-2 of the Standard Specification for Public Works Construction (Greenbook) or Class 2 Aggregate Base conforming to the Caltrans' Standard Specifications. The materials should be moisture conditioned to within 2% of the optimum moisture content and then compacted to at least 95% of the modified Proctor value as determined by ASTM D 1557.

Paving asphalt should be PG 64-10. Asphalt-concrete materials should conform to Section 203-6 and construction should conform to Section 302 of the Greenbook.

6.7 Stormwater Infiltration

The site is underlain by predominantly silty and clayey soils between approximately 5 and 18 feet bgs. Based on our evaluation of the percolation test results and subsurface data obtained to date, near the proposed infiltration depths of 10 to 15 feet below ground surface, infiltration rates ranging from 0 to 0.5 inches per hour were encountered at the silty and clayey layer. However, an infiltration rate of 16.5 inches per hour was encountered at the fine to coarse grained sandy layer only present within the most northern part of site.

The infiltration rate of the soils at the locations tested are summarized in the table below.

Table 5 – Infiltration Results Summary

Boring ID	Test Depth (feet)	Soil Type	Infiltration Rate (inches/hour)
LB-1/P-1	5 to 10	SP	16.54
LB-3/P-2	5 to 10	ML	0.51
LB-10/P-3	5 to 10	CL	0.04

Because of the uncertainty of the subsurface condition within the site, the feasibility of stormwater infiltration within this area is not consistent. In addition, a silty and clayey layer was encountered above the groundwater level at approximately 36 feet bgs and may have low permeability. Therefore, Langan recommends additional percolation testing based on civil design requirements.

7. CONSTRUCTION CONSIDERATIONS

This section presents earthwork recommendations and construction considerations for site preparation and grading.

7.1 Site Preparation

Prior to the commencement of excavation and grading, a meeting should be held with the owner, excavation/grading contractor, civil engineer, and geotechnical engineer to discuss the work schedule and geotechnical aspects of the grading. All vegetation and deleterious materials should be disposed of off-site before beginning grading operations.

Any obstruction encountered during demolition and grading should be completely removed including existing utilities. If utility pipes are too deep to be removed economically, they should be filled with cement, sand grout or equivalent material that will prevent future collapse of the pipe.

Disturbance of the near-surface clays could result in soft, yielding subgrade, and soils that pump or otherwise yield under construction loading. The contractor should minimize the use of equipment, especially vibration inducing equipment, on top of the clayey soils. Areas observed to pump or yield under construction traffic should be removed and replaced with firm and unyielding compacted soil or stabilized with cement.

Temporary excavations should be performed in accordance with Cal/OSHA. Excavations should not be left open for prolonged periods. If excavations are limited by existing improvements or property lines, special grading techniques, such as slot cuttings or other acceptable design criteria may be required. Under such conditions, specific recommendations should be provided by the geotechnical consultant during review of final grading plan.

7.3 Engineered Fill and Compaction Criteria

On-site soils are generally considered suitable for reuse as engineered fill provided that the soils are absent of environmentally unsuitable materials, construction debris, or roots, etc. Engineered

fill (imported or reused) should be free of organic and other deleterious materials and have a maximum particle size no greater than 3 inches.

We do not anticipate the need to import fill; however, if import fill is needed, the geotechnical consultant should test the proposed fill prior to delivery to the site. Imported fill should be noncorrosive to concrete and ferrous metals, contain no more than 15% passing the No. 200 sieve by dry weight and have a plasticity index less than 7. Grain-size distributions, Atterberg limits, maximum dry density, and optimum water-content (ASTM D1557) determinations should be made on representative samples of the proposed fill material before being brought to the site.

Engineered fill should be placed in loose lifts no greater than 8 inches in thickness, moisture conditioned between 0% to 3% above of optimum moisture content and compacted to at least 95% relative compaction in accordance with ASTM D1557.

Any fill greater than 5 feet thick or with less than 10% fines (passing through the No. 200 sieve) by weight should be placed in loose lifts no greater than 8 inches thick, moisture conditioned to above optimum moisture content, and compacted to at least 95% of the laboratory maximum dry density for its entirety.

All engineered fill placement should be subject to controlled engineering observation by the geotechnical engineer or their representative. No fill should be placed on areas where free water is standing or on surfaces that the geotechnical consultant has not approved.

7.4 Site Drainage

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.

8.0 RECOMMENDED FUTURE STUDIES

Comments and preliminary recommendations provided herein are based on a review of publicly available documents and geotechnical information pertaining to the site and our subsurface investigation. At this time, we recommend performing the following supplemental studies:

- A design level geotechnical exploration and laboratory testing program will be required at the time of building design.

9.0 LIMITATIONS

The conclusions and recommendations provided in this report result from our interpretation of the geotechnical conditions existing at the Site inferred from a limited number of borings. Recommendations provided are contingent 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 shown on the logs represents 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 in their site selection process and is only applicable to the design of the specific project identified. The information in this report cannot be used or depended on by engineers or contractors 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 permitting or potentially contaminated soil and groundwater) are outside the scope of this study and are be addressed in a separate evaluation.

10. REFERENCES

American Concrete Institute (2019), Building Code Requirements for Structural Concrete (ACI 318-19) and Commentary, 2019.

American Society of Civil Engineers (2017), Minimum Design Loads for Buildings and Other Structures, ASCE/SEI 7-16.

California Building Standards Commission (2022), California Building Code, California Code of Regulations, Title 24.

California Department of Conservation (2010), Geologic Compilation of Quaternary Surficial Deposits in Southern California Orange County, dated July 2010.

California Department of Conservation and California Geologic Survey, (1999), Earthquake Zones of Required Investigation Seal Beach Quadrangle, released 25 March 1999, revised 17 January 2006.

California Department of Conservation, Division of Mines and Geology, (1998), Seismic Hazard Zone Report for the Seal Beach 7.5-Minute Quadrangle, Los Angeles and Orange Counties, California, dated 1998.

California Department of Conservation, Geologic Energy Management Division, CalGEM Well Finder, accessed 27 January 2025.

California Department of Water Resources, Flood Emergency Response Information Exchange (FERIX) Dam Breach Inundation Map web publisher, accessed on 27 January 2025.

California Geological Survey (2008), Guidelines for Evaluating and Mitigating Seismic Hazards in California, Special Publication 117A.

City of Huntington Beach (2017), General Plan, dated 2 October 2017.

Federal Emergency Management Agency (2019), National Flood Insurance Map Program, Flood Insurance Rate Map (FIRM) Map Number 06059C0241K, dated 21 March 2019.

Federal Emergency Management Agency (2019), National Flood Insurance Map Program, Flood Insurance Rate Map (FIRM) Map Number 06059C0242K, dated 21 March 2019.

Jennings, C.W., and Bryant, W.A. (2010), An Explanatory Text to Accompany the Fault Activity Map of California, California Department of Conservation & California Geological Survey, dated 2010.

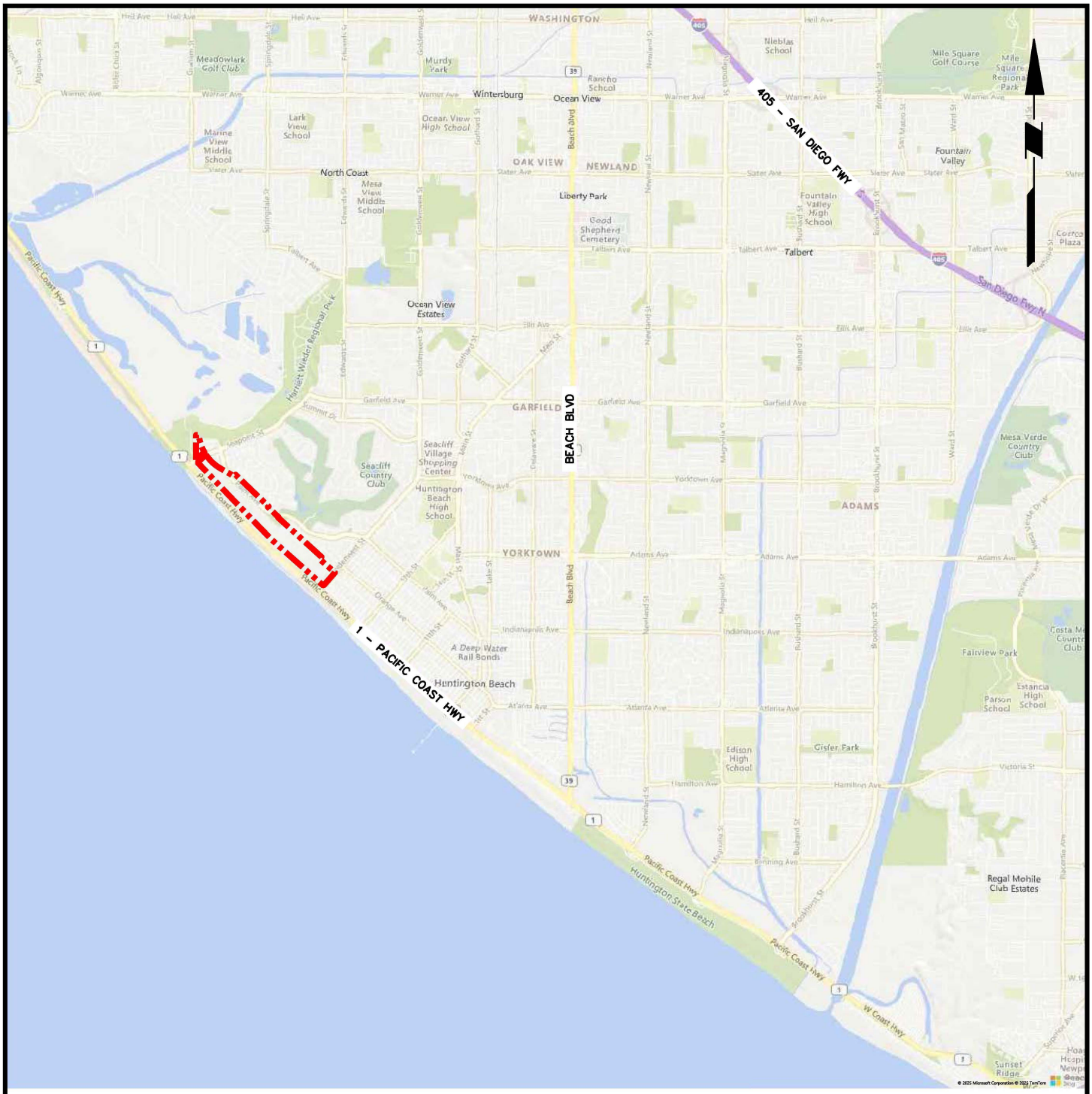
Jennings, C.W., and Bryant, W.A. (2010), Fault Activity Map of California, California Department of Conservation & California Geological Survey, map scale 1:750,000, dated 2010.

JZMK (2024) drawing titled "CRCDevelopment Concept Plan – Palm/Goldenwest Specific Plan".

Orange County Department of Public Works "Exhibit 7.III Technical Guidance Document (TGD) for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans (WQMPs)" dated 20 December 2021.

United States Geological Survey (USGS) (2017) ANSS Comprehensive Catalog (Comcat), http://earthquake.usgs.gov/earthquakes/search, accessed 15 January 2025.

FIGURES



LEGEND:

APPROXIMATE SITE LIMITS

5000 0 2500 5000

SCALE: 1 INCH = 5000 FEET

NOTES:

1. BACKGROUND REFERENCED FROM MICROSOFT BING MAPS ACCESSED THROUGH AUTOCAD ON 13 FEBRUARY 2025.
2. SITE LIMITS REFERENCED FROM PARCEL MAP P.M. 411-31, ASSESSOR'S MAP 023-181-53 AND 023-181-54, DATED MARCH 1969.

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Langan CA, Inc.
18575 Jamboree Road, Suite 150
Irvine, CA 92612

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Figure Title
SITE VICINITY MAP

Project No.	700152701
Date	FEBRUARY 2025
Scale	AS SHOWN
Drawn By	VR

Figure No. 1

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LEGEND:

APPROXIMATE SITE LIMITS

APPROXIMATE PROPOSED DEVELOPMENT LIMITS

600 0 300 600

SCALE: 1 INCH = 600 FEET

NOTES:

1. BACKGROUND REFERENCED FROM MICROSOFT BING MAPS ACCESSED THROUGH AUTOCAD ON 13 FEBRUARY 2025.
2. SITE LIMITS REFERENCED FROM PARCEL MAP P.M. 411-31, ASSESSOR'S MAPS 023-181-53 AND 023-181-54, DATED MARCH 1969.
3. PROPOSED DEVELOPMENT LIMITS REFERENCED FROM CONCEPT PLAN TITLED "CRC DEVELOPMENT CONCEPT" BY JZMK, DATED DECEMBER 2024.

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Irvine, CA 92612
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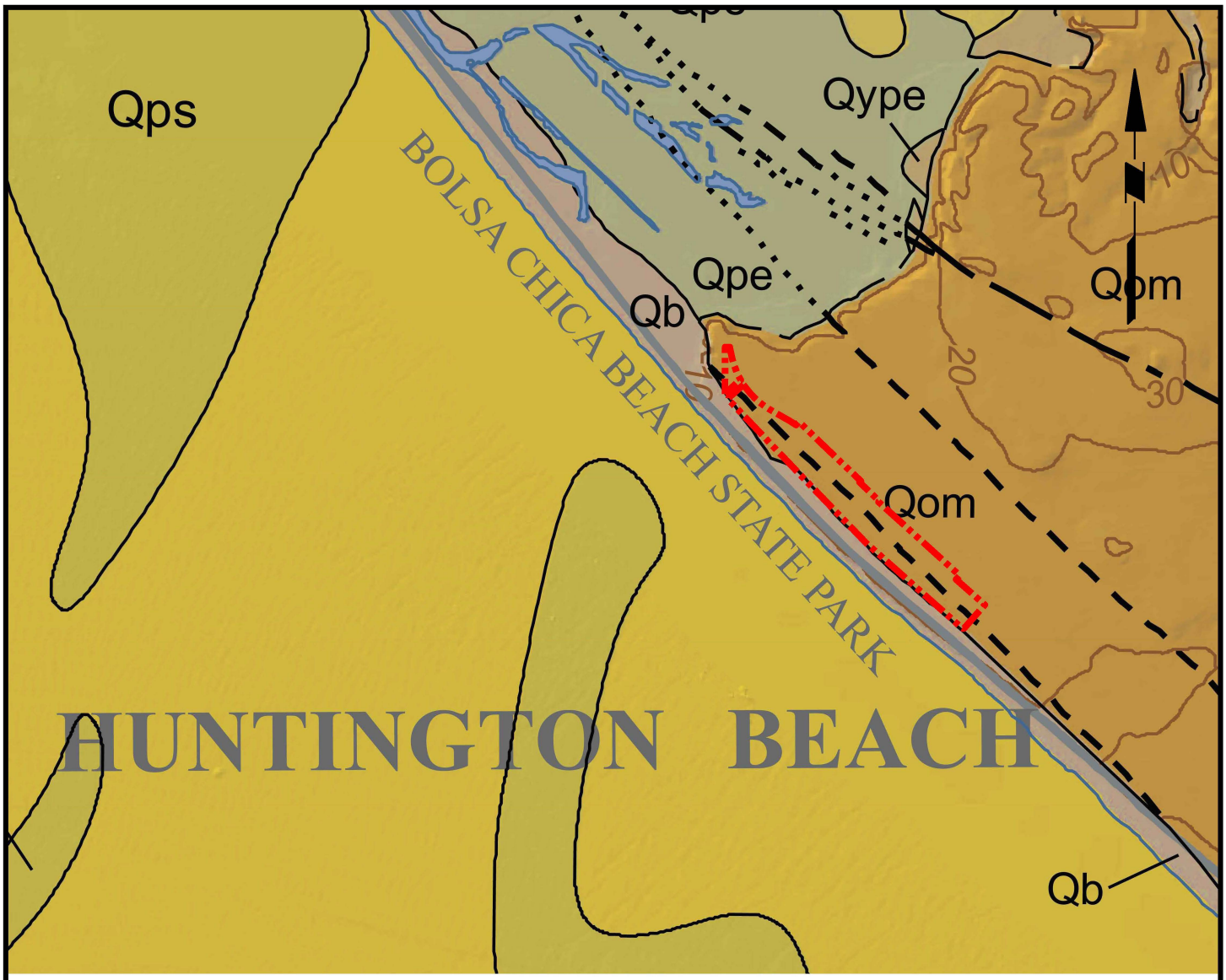
Figure Title
SITE PLAN

Project No. 700152701
Date FEBRUARY 2025
Scale AS SHOWN
Drawn By RF

Figure No. 2

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3000 1500 0 3000

SCALE IN FEET

LEGEND:

APPROXIMATE SITE LIMITS

Qom — Old shallow marine deposits on wave-cut surface

Qb — Beach deposits

Qps — Pleistocene sedimentary deposits, undivided

Qype — Young paralic estuarine deposits

Qpe — Paralic estuarine deposits

U / D — Fault - Solid where accurately located; long dash where approximately located; short dash where inferred; dotted where concealed; queried where continuation, identity, or existence is uncertain.

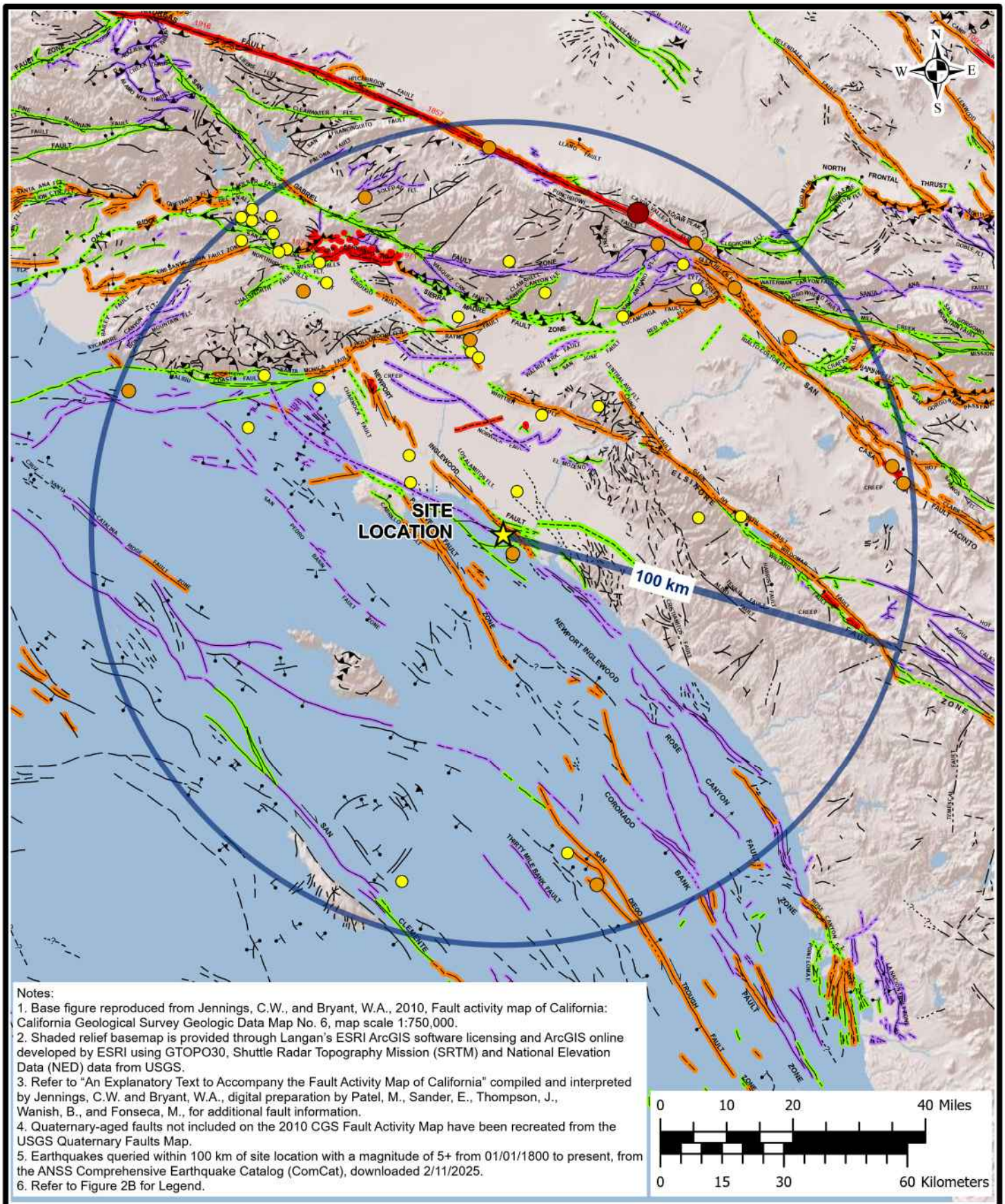
NOTES:

1. BACKGROUND REFERENCED FROM MAP TITLED "GEOLOGIC MAP OF THE LONG BEACH 30' x 60' QUADRANGLE, CALIFORNIA", BY GEORGE SAUCEDO, GARY GREENE, AND MICHAEL KENNEDY DATED 2016.
2. SITE LIMITS REFERENCED FROM PARCEL MAP P.M. 411-31, ASSESSOR'S MAP 023-181-53 AND 023-181-54, DATED MARCH 1969.

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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 "An Explanatory Text to Accompany the Fault Activity 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 fault information.
4. Quaternary-aged faults not included on the 2010 CGS Fault Activity Map have been recreated from the USGS Quaternary Faults Map.
5. Earthquakes queried within 100 km of site location with a magnitude of 5+ from 01/01/1800 to present, from the ANSS Comprehensive Earthquake Catalog (ComCat), downloaded 2/11/2025.
6. Refer to Figure 2B for Legend.

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Irvine, CA 92612
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Figure Title
MAP OF MAJOR FAULTS AND EARTHQUAKE EPICENTERS

Project No. 700152701
Date 2/11/2025
Drawn By TO
Checked By

Figure
4A

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LEGEND:

Site Location

Fault Age

- Historic
- Holocene
- Late Quaternary
- Early Quaternary
- Pre-Quaternary Fault
- 100 km Search Radius

Earthquake Epicenter

- Magnitude 5.0 to 5.9
- Magnitude 6.0 to 6.9
- Magnitude 7.0 to 7.4
- Magnitude 7.5 to 8.0

Fault Symbols

Bar and ball on downthrown side (relative or apparent).

Relative or apparent direction of lateral movement.

Direction of dip.

Low angle fault (barbs on upper plate). Fault surface generally dips less than 45° but locally may have been subsequently steepened.

491 Numbers refer to annotations listed in the appendices of the accompanying report.

Structural discontinuity (offshore) separating differing Neogene structural domains.

Brawley Seismic Zone.

Fault Classification

Fault along which historic (last 200 years) displacement has occurred and is associated with one or more of the following:
(a) a recorded earthquake with surface rupture. (Also included are some well-defined surface breaks caused by ground shaking during earthquakes, e.g. extensive ground breakage, not on the White Wolf fault, caused by the Arvin-Tehachapi earthquake of 1952). The date of the associated earthquake is indicated. Where repeated surface ruptures on the same fault have occurred, only the date of the latest movement may be indicated, especially if earlier reports are not well documented as to location of ground breaks.
(b) fault creep slippage - slow ground displacement usually without accompanying earthquakes.
(c) displaced survey lines.

1906 ▶ / 1906 ▷ A triangle to the right or left of the date indicates termination point of observed surface displacement. Solid red triangle indicates known location of rupture termination point. Open black triangle indicates uncertain or estimated location of rupture termination point.

▶1906◀ Date bracketed by triangles indicates local fault break.

1906 No triangle by date indicates an intermediate point along fault break.

CREEP Fault that exhibits fault creep slippage. Hachures indicate linear extent of fault creep. Annotation (creep with leader) indicates representative locations where fault creep has been observed and recorded.

1906 / 1906 ■ Square on fault indicates where fault creep slippage has occurred that has been triggered by an earthquake on some other fault. Date of causative earthquake indicated. Squares to right and left of date indicate terminal points between which triggered creep slippage has occurred (creep either continuous or intermittent between these end points).

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Figure Title: MAP OF MAJOR FAULTS AND EARTHQUAKE EPICENTERS

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Figure 4B

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LEGEND:

- APPROXIMATE SITE LIMITS
- Alquist-Priolo Zone Faults
- Newport Inglewood Fault Zone
- City Limits
- Major City Streets

2000 0 1000 2000

SCALE: 1 INCH = 2000 FEET

NOTES:

1. BACKGROUND REFERENCED FROM MAP TITLED "LOCAL FAULTS" BY THE CITY OF HUNTINGTON BEACH, ADOPTED FROM THE "CITY OF HUNTINGTON BEACH GENERAL PLAN", DATED 2 OCTOBER 2017.
2. SITE LIMITS REFERENCED FROM PARCEL MAP P.M. 411-31, ASSESSOR'S MAP 023-181-53 AND 023-181-54, DATED MARCH 1969.
3. PROPOSED DEVELOPMENT LIMITS REFERENCED FROM CONCEPT PLAN TITLED "CRC DEVELOPMENT CONCEPT" BY JZMK, DATED DECEMBER 2024.

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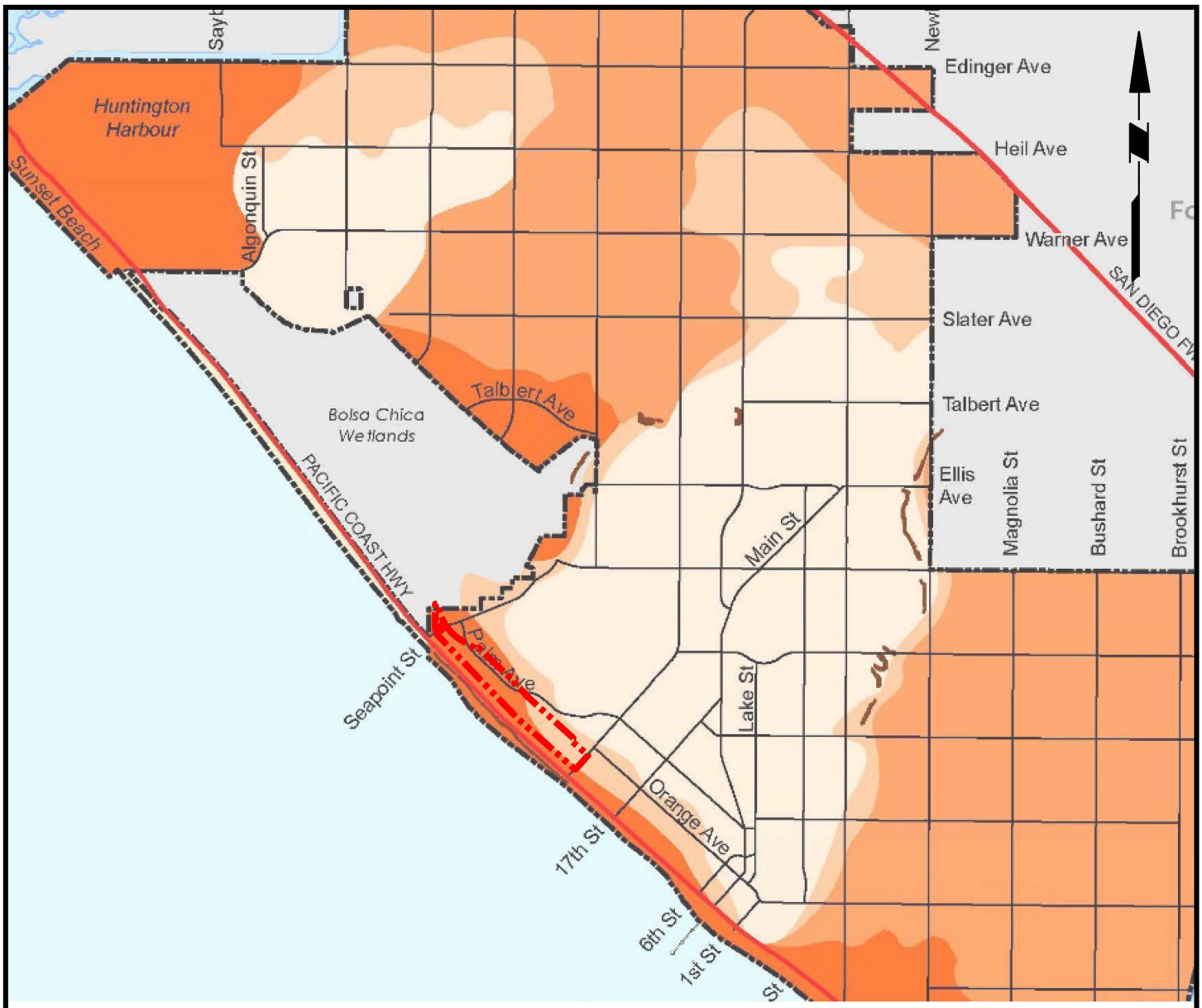
Figure Title
ALQUIST-PRIOLO EARTHQUAKE FAULT ZONES MAP

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Date FEBRUARY 2025
Scale AS SHOWN
Drawn By VR

Figure No. 5

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LEGEND:

APPROXIMATE SITE LIMITS

Earthquake Induced Landslide Zone

City Limits

Major City Streets

Liquefaction Potential

Low

High to Medium

High to Very High

Very High

2000 0 1000 2000

SCALE: 1 INCH = 2000 FEET

NOTES:

1. BACKGROUND REFERENCED FROM MAP TITLED "SEISMIC HAZARD ZONES (LIQUEFACTION AND LANDSLIDE)", BY THE CITY OF HUNTINGTON BEACH ADOPTED FROM THE "CITY OF HUNTINGTON BEACH GENERAL PLAN", DATED 2 OCTOBER 2017.
2. SITE LIMITS REFERENCED FROM PARCEL MAP P.M. 411-31, ASSESSOR'S MAP 023-181-53 AND 023-181-54, DATED MARCH 1969.

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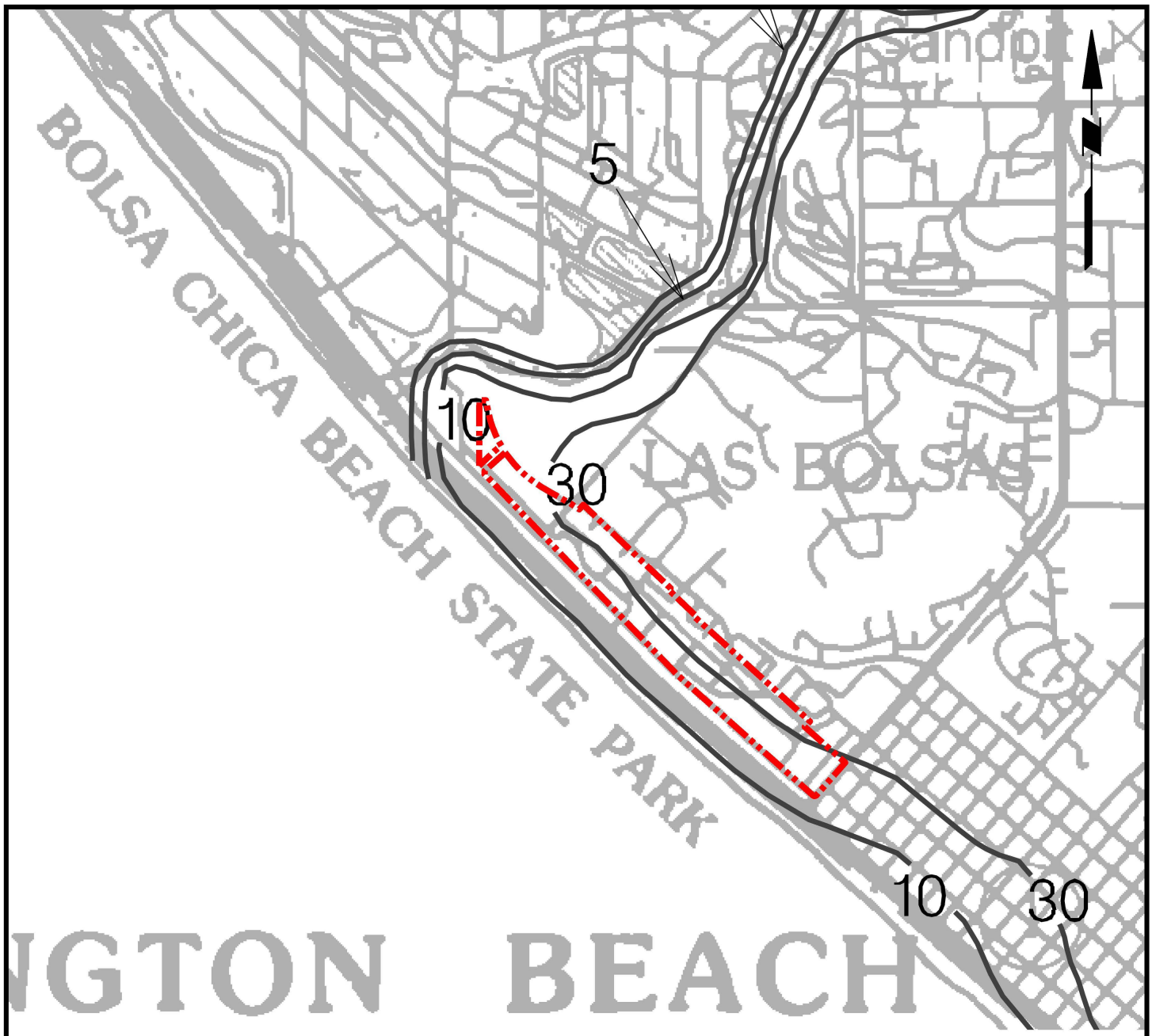
Figure Title
CITY OF HUNTINGTON BEACH SEISMIC HAZARDS MAP

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LEGEND:

APPROXIMATE SITE LIMITS

● Borehole Site

30 Depth to ground water in feet

2000 0 1000 2000

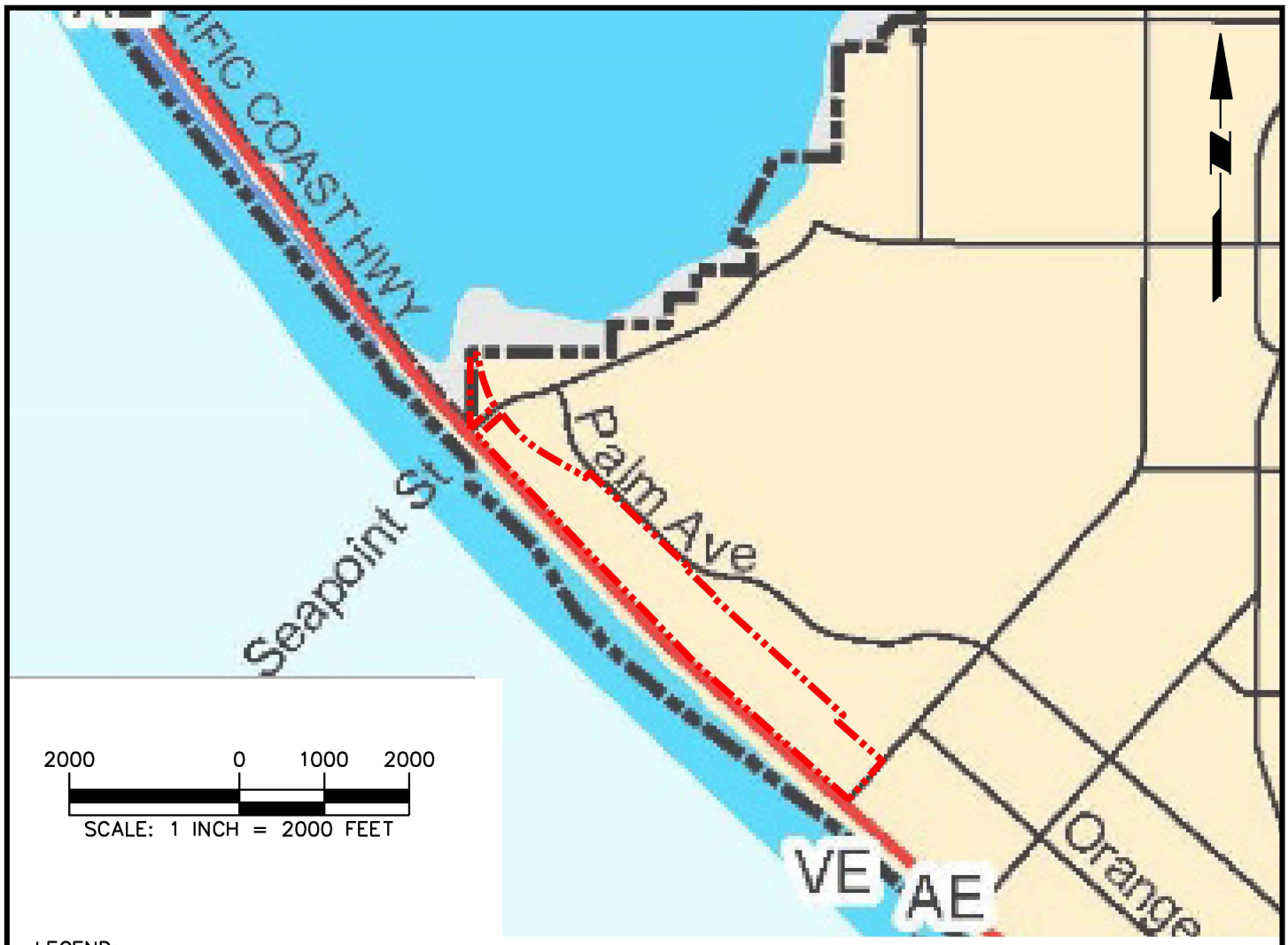
SCALE: 1 INCH = 2000 FEET

NOTES:

1. BACKGROUND REFERENCED FROM MAP TITLED "PLATE 1.2 HISTORICALLY HIGHEST GROUND WATER CONTOURS AND BOREHOLE LOG DATA LOCATIONS, SEAL BEACH QUADRANGLE" FROM REPORT TITLED, "SEISMIC HAZARD ZONE REPORT FOR THE SEAL BEACH 7.5-MINUTE QUADRANGLE, LOS ANGLES AND ORANGE COUNTIES, CALIFORNIA", BY THE CALIFORNIA DEPARTMENT OF CONSERVATION DIVISION OF MINES AND GEOLOGY, DATED 1998.
2. SITE LIMITS REFERENCED FROM PARCEL MAP P.M. 411-31, ASSESSOR'S MAP 023-181-53 AND 023-181-54, DATED MARCH 1969.

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LEGEND:

APPROXIMATE SITE LIMITS

Major City Streets

City Limits

Flood Zone Type

100 Year Flood Zone

500 Year Flood Zone

Outside Flood Zone

Annual Probability of Flooding of 1% or Greater (100-year Flood Event)	
A	Subject to 100-year flood. Base flood elevation undetermined.
AE or A1-A30	Subject to 100-year flood. Base flood elevation determined.
AH	Subject to 100-year shallow flooding (usually areas of ponding) with average depth of 1-3 feet. Base flood elevation determined.
AO	Subject to 100-year shallow flooding (usually sheet flow on sloping terrain) with average depth of 1-3 feet. Base flood elevation undetermined.
V	Subject to 100-year flood and additional velocity hazard (wave action). Base flood elevation undetermined.
VE or V1-V30	Subject to 100-year flood and additional velocity hazard (wave action). Base flood elevation determined.
Annual Probability of Flooding of 0.2% to 1% (500-year Flood Event)	
B or X500	Both B and X500 represent areas between the limits of the 100-year and 500-year flood; or certain areas subject to 100-year flood with average depths less than 1 foot or where the contributing drainage area is less than 1 square mile; or areas protected by levees from the 100-year flood.

NOTES:

1. BACKGROUND REFERENCED FROM MAP TITLED "FLOOD HAZARD AREAS" BY THE CITY OF HUNTINGTON BEACH, ADOPTED FROM THE "CITY OF HUNTINGTON BEACH GENERAL PLAN", DATED 2 OCTOBER 2017.
2. SITE LIMITS REFERENCED FROM PARCEL MAP P.M. 411-31, ASSESSOR'S MAP 023-181-53 AND 023-181-54, DATED MARCH 1969.

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Figure Title
CITY OF HUNTINGTON BEACH FLOOD ZONES MAP

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Scale AS SHOWN
Drawn By VR

Figure No. 8

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LEGEND:

APPROXIMATE SITE LIMITS

Yes, Tsunami Hazard Area

No, Outside Hazard Area

2000 0 1000 2000

SCALE: 1 INCH = 2000 FEET

NOTES:

1. BACKGROUND REFERENCED FROM THE DEPARTMENT OF CONSERVATION CALIFORNIA GEOLOGICAL SURVEY ARC GIS ONLINE DATABASE, ACCESSED ON 21 JANUARY 2025.

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18575 Jamboree Road, Suite 150
Irvine, CA 92612

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Figure Title
TSUNAMI ZONES MAP

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LEGEND:

APPROXIMATE SITE LIMITS

- Major City Streets
- City Limits
- Inland 2050 Contingent Flooding Zone
- Inland 2050 Tidal Flooding Zone
- Coastal 2050 Flooding Zone
- Inland Waterway Planning Areas
- Channels

3000 1500 0 3000

SCALE: 1" = 3000'

NOTES:

1. BACKGROUND REFERENCED FROM MAP TITLED "POTENTIAL SEA LEVEL RISE HAZARD AREAS (2050)" BY THE CITY OF HUNTINGTON BEACH, ADOPTED FROM THE "CITY OF HUNTINGTON BEACH GENERAL PLAN", DATED 2 OCTOBER 2017.
2. SITE LIMITS REFERENCED FROM PARCEL MAP P.M. 411-31, ASSESSOR'S MAP 023-181-53 AND 023-181-54, DATED MARCH 1969.

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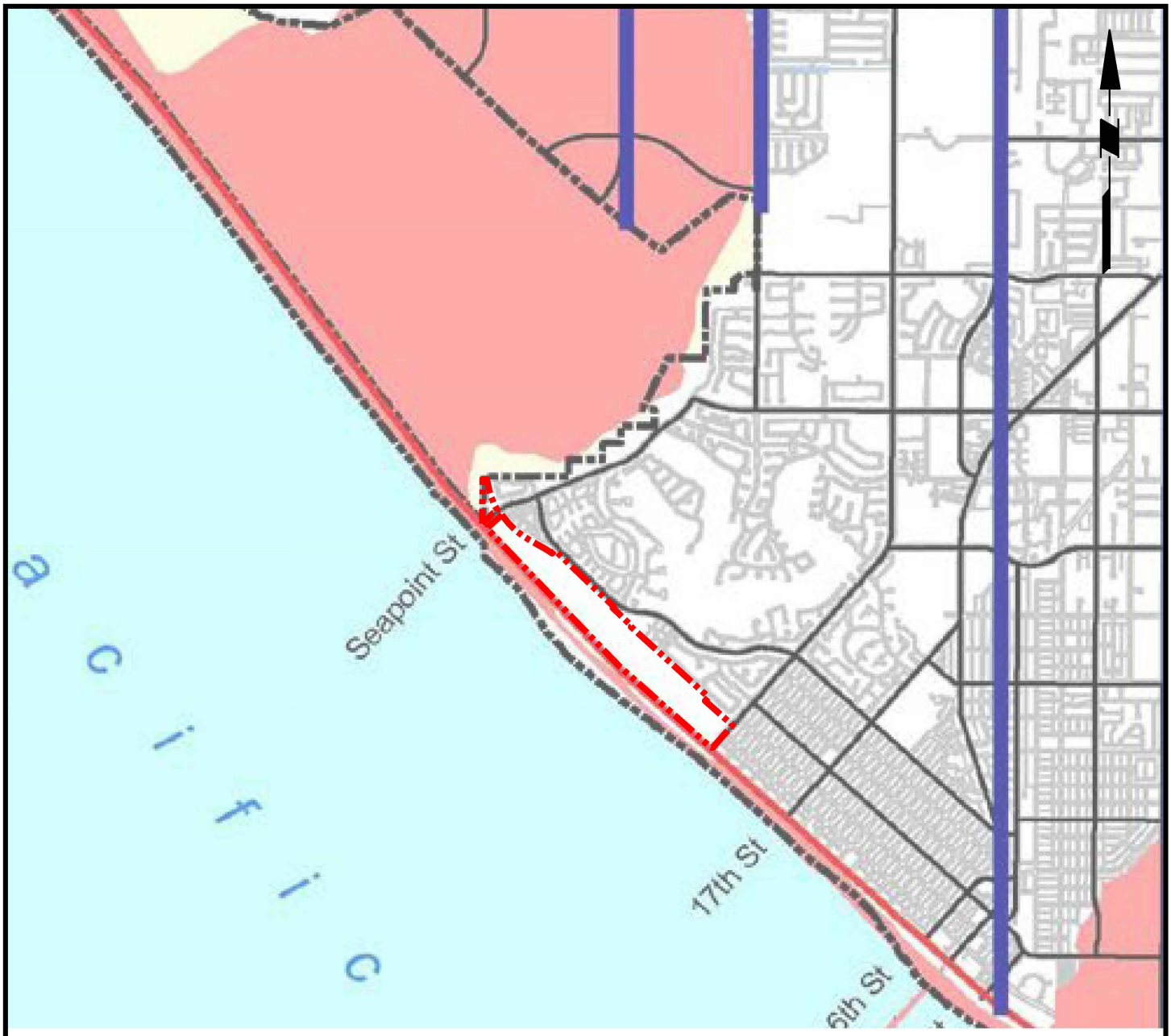
Figure Title
POTENTIAL SEA LEVEL RISE HAZARDS MAP

Project No. 700152701
Date FEBRUARY 2025
Scale AS SHOWN
Drawn By VR

Figure No. 10

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e: \\langan.com\data\IRV\data7\700152701\Project Data_Discipline\Geotechnical\CAD\Geotech Report Figures.dwg Date: 2/28/2025 Time: 15:54 User: rfanous Style Table: Langan.stb Layout: City Sea Level Rise



LEGEND:

APPROXIMATE SITE LIMITS

Evacuation Route

Tsunami Evacuation Area

3000 1500 0 3000

SCALE: 1" = 3000'

NOTES:

1. BACKGROUND REFERENCED FROM MAP TITLED "TSUNAMI EVACUATION MAP" BY THE CITY OF HUNTINGTON BEACH, ADOPTED FROM THE "CITY OF HUNTINGTON BEACH GENERAL PLAN", DATED 2 OCTOBER 2017.
2. SITE LIMITS REFERENCED FROM PARCEL MAP P.M. 411-31, ASSESSOR'S MAP 023-181-53 AND 023-181-54, DATED MARCH 1969.

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Figure Title
CITY OF HUNTINGTON BEACH TSUNAMI ZONES MAP

Project No.	700152701
Date	FEBRUARY 2025
Scale	AS SHOWN
Drawn By	VR

Figure No. 11

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LEGEND:

- APPROXIMATE SITE LIMITS
- Prado Reservoir Inundation
- City Limits
- Major City Streets

2000 0 1000 2000

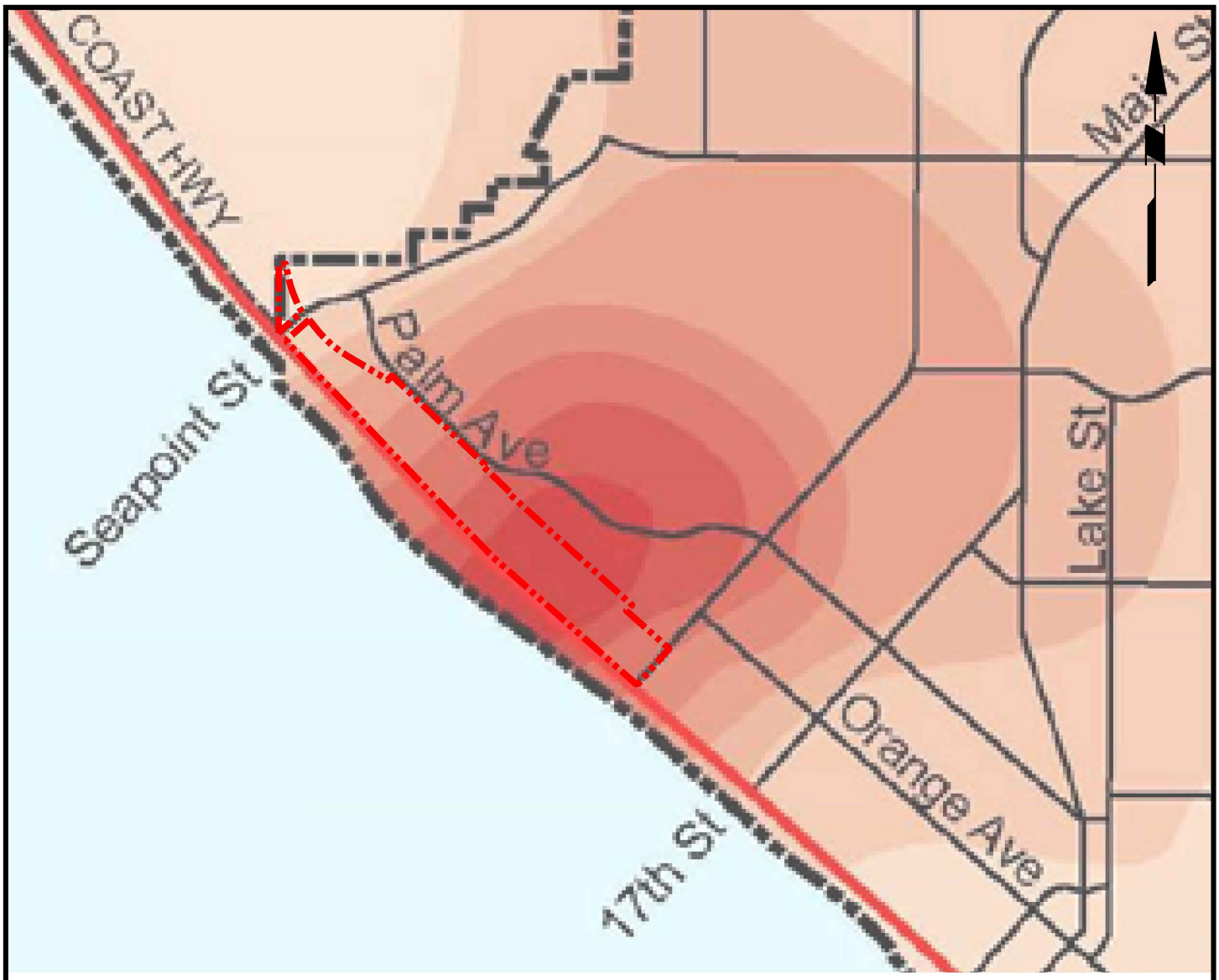
SCALE: 1 INCH = 2000 FEET

NOTES:

1. BACKGROUND REFERENCED FROM MAP TITLED "DAM FLOODING AREAS" BY THE CITY OF HUNTINGTON BEACH, ADOPTED FROM THE "CITY OF HUNTINGTON BEACH GENERAL PLAN", DATED 2 OCTOBER 2017.
2. SITE LIMITS REFERENCED FROM PARCEL MAP P.M. 411-31, ASSESSOR'S MAP 023-181-53 AND 023-181-54, DATED MARCH 1969.

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LEGEND:

APPROXIMATE SITE LIMITS

City Limits

Major City Streets

Subsidence (inches)

0 to -0.1	-0.5 to -0.6
-0.1 to -0.2	-0.6 to -0.7
-0.2 to -0.3	-0.7 to -0.8
-0.3 to -0.4	-0.8 +
-0.4 to -0.5	

2000 0 1000 2000

SCALE: 1 INCH = 2000 FEET

NOTES:

1. BACKGROUND REFERENCED FROM MAP TITLED "SUBSIDENCE" BY THE CITY OF HUNTINGTON BEACH, ADOPTED FROM THE "CITY OF HUNTINGTON BEACH GENERAL PLAN", DATED 2 OCTOBER 2017.
2. SITE LIMITS REFERENCED FROM PARCEL MAP P.M. 411-31, ASSESSOR'S MAP 023-181-53 AND 023-181-54, DATED MARCH 1969.

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Figure Title
SUBSIDENCE MAP

Project No. 700152701
Date FEBRUARY 2025
Scale AS SHOWN
Drawn By VR

Figure No. 13

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LEGEND:

- APPROXIMATE SITE LIMITS
- LB-9 — APPROXIMATE BORING LOCATION
- LB-10/P-3 — APPROXIMATE PERCOLATION TEST LOCATION
- C — C' — APPROXIMATE CROSS-SECTION ALIGNMENT
- APPROXIMATE PROPOSED DEVELOPMENT LIMITS

600 0 300 600

SCALE: 1 INCH = 600 FEET

NOTES:

1. BACKGROUND REFERENCED FROM MICROSOFT BING MAPS ACCESSED THROUGH AUTOCAD ON 13 FEBRUARY 2025.
2. SITE LIMITS REFERENCED FROM PARCEL MAP P.M. 411-31, ASSESSOR'S MAPS 023-181-53 AND 023-181-54, DATED MARCH 1969.
3. PROPOSED DEVELOPMENT LIMITS REFERENCED FROM CONCEPT PLAN TITLED "CRC DEVELOPMENT CONCEPT" BY JZMK DATED DECEMBER 2024.
4. BORINGS LB-1 THROUGH LB-10 WERE DRILLED ON 15 THROUGH 17 JANUARY 2025. PERCOLATION TESTS WERE PERFORMED IN BORINGS LB-1, LB-3, AND LB-10 ON 17 JANUARY 2025.

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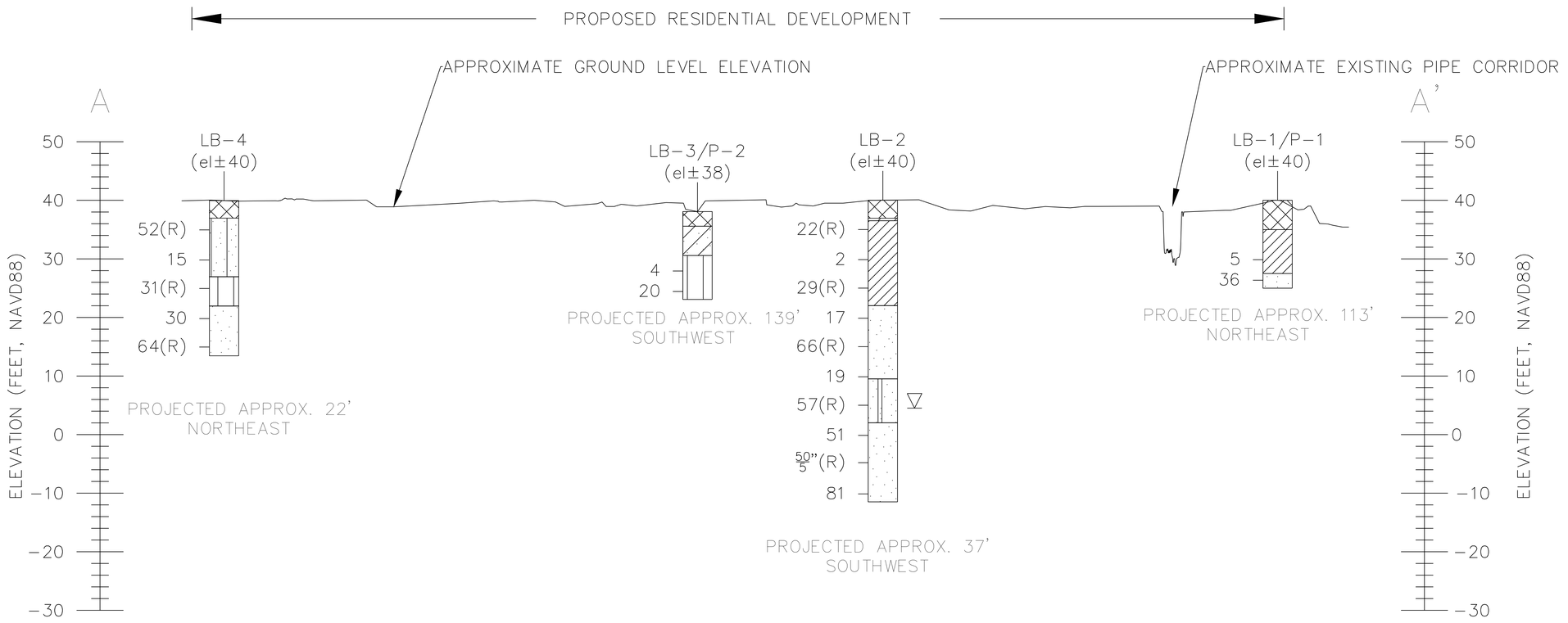
Figure Title: EXPLORATION LOCATION MAP

Project No. 700152701
Date FEBRUARY 2025
Scale AS SHOWN
Drawn By RF

Figure No. 14

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LEGEND:

LB−1	LB−1	BORING IDENTIFICATION
(el±####.#)	(el±####.#)	INFERRED GROUND SURFACE ELEVATION (FEET) AT TIME OF BORING
N(R)	N	STANDARD PENETRATION TEST BLOWCOUNT: 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)	STANDARD PENETRATION TEST BLOWCOUNT: NUMBER OF BLOWS OF 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
	▽	GROUNDWATER AT TIME OF DRILLING

KEY TO SYMBOLS:

SP (POORLY−GRADED SAND) · FILL · ASPHALT

SC (CLAYEY SAND) · CL (LOW−PLASTICITY CLAY)

SM (SILTY SAND) · ML (SILT)

10 0 5 10
VERTICAL SCALE: 1 INCH = 10 FEET

100 0 50 100
HORIZONTAL SCALE: 1 INCH = 100 FEET

NOTES:

1. THE FIGURE SHOWS GENERALIZED SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. VARIATIONS IN CONDITIONS SHOULD BE EXPECTED BETWEEN BORING LOCATIONS. FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED SEE BORING LOGS.
2. BORINGS WERE DRILLED BY ABC LIOVIN DRILLING INC BETWEEN 15 JANUARY AND 17 JANUARY 2025 UNDER THE FULL−TIME ENGINEERING OBSERVATION OF A LANGAN FIELD ENGINEER.
3. SEE FIGURE 14 FOR LOCATION OF CROSS−SECTION WITH RESPECT TO SITE PLAN.
4. APPROXIMATE EXISTING GROUND SURFACE ELEVATIONS WERE REFENCED FROM NOAA (2010).
5. APPROXIMATE PROPOSED DEVELOPMENT LIMITS REFERENCED FROM CONCEPT PLAN TITLED "TEST PLOT OPTION 1" DATED 10 DECEMBER 2024.

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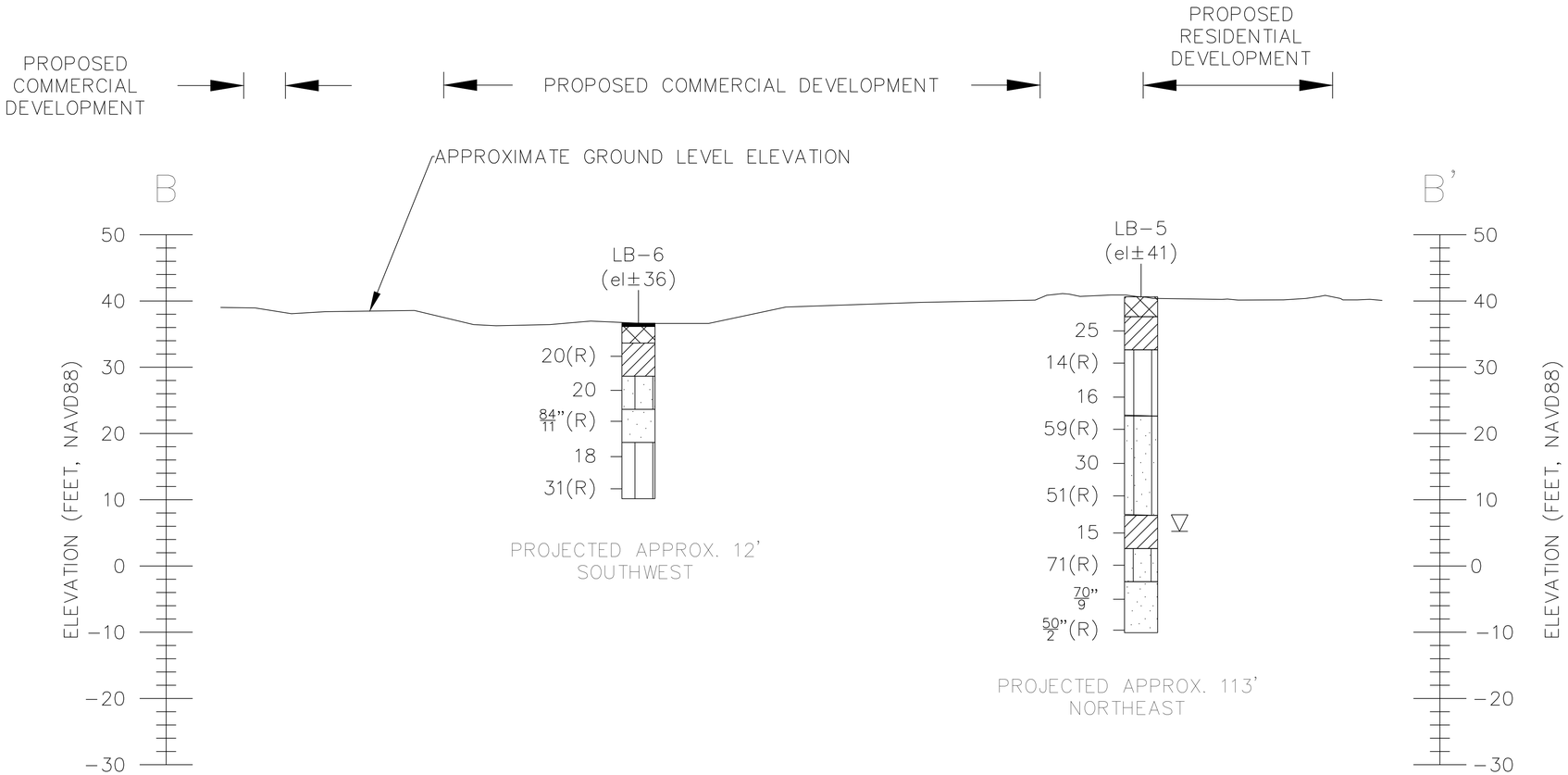
Project: 20101 GOLDENWEST STREET
HUNTINGTON BEACH
ORANGE COUNTY CALIFORNIA

Drawing Title: GENERALIZED SUBSURFACE CROSS-SECTION A-A'

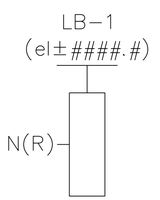
Project No. 700152701
Date FEBRUARY 2025
Scale AS SHOWN
Drawn By RF

Drawing No. 15A

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LEGEND:



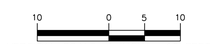
LB−1	BORING IDENTIFICATION
(el±####.#)	INFERRED GROUND SURFACE ELEVATION (FEET) AT TIME OF BORING
N	STANDARD PENETRATION TEST BLOWCOUNT: NUMBER OF BLOWS OF A 140−LB AUTOMATIC HAMMER FREE FALLING 30 INCHES TO DRIVE A 2−INCH−O.D. SPLIT SPOON SAMPLER 12 INCHES AFTER 6 INCHES OF INITIAL PENETRATION
N(R)	STANDARD PENETRATION TEST BLOWCOUNT: NUMBER OF BLOWS OF 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
▽	GROUNDWATER AT TIME OF DRILLING

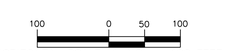
KEY TO SYMBOLS:

SP (POORLY−GRADED SAND) | FILL | ASPHALT

SC (CLAYEY SAND) | CL (LOW−PLASTICITY CLAY)

SM (SILTY SAND) | ML (SILT)





NOTES:

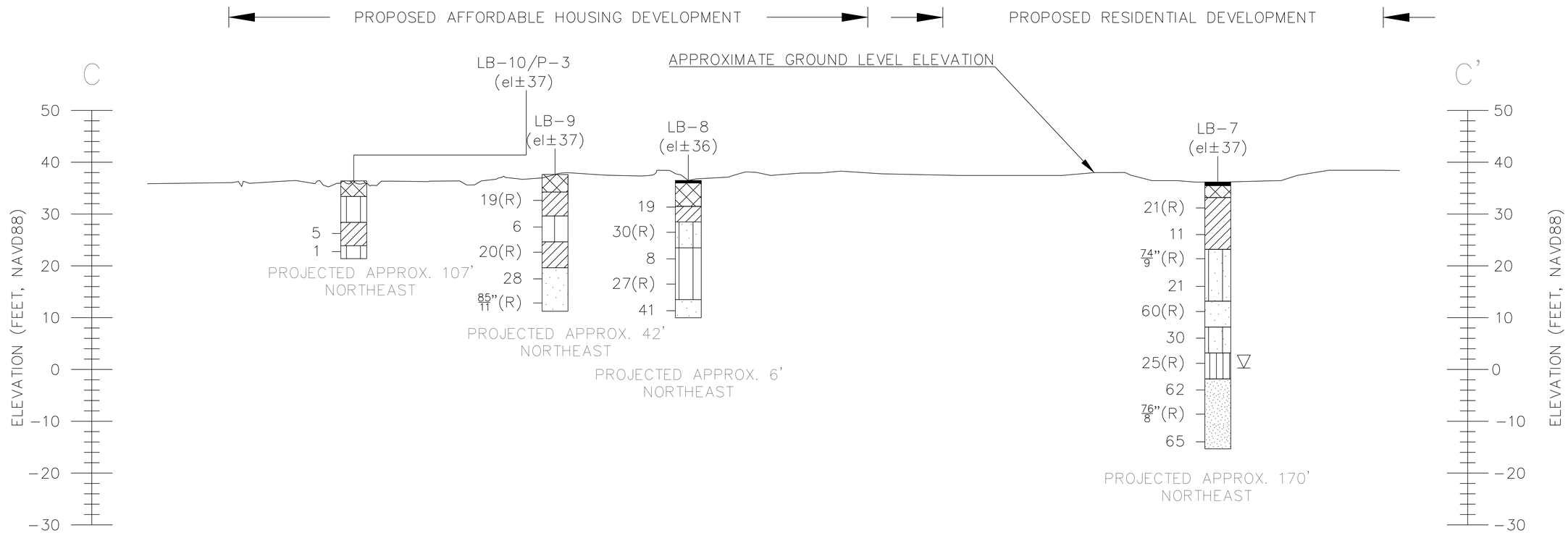
1. THE FIGURE SHOWS GENERALIZED SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. VARIATIONS IN CONDITIONS SHOULD BE EXPECTED BETWEEN BORING LOCATIONS. FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED SEE BORING LOGS.
2. BORINGS WERE DRILLED BY ABC LIOVIN DRILLING INC BETWEEN 15 JANUARY AND 17 JANUARY 2025 UNDER THE FULL−TIME ENGINEERING OBSERVATION OF A LANGAN FIELD ENGINEER.
3. SEE FIGURE 14 FOR LOCATION OF CROSS−SECTION WITH RESPECT TO SITE PLAN.
4. APPROXIMATE EXISTING GROUND SURFACE ELEVATIONS WERE REFENCED FROM NOAA (2010).
5. APPROXIMATE PROPOSED DEVELOPMENT LIMITS REFERENCED FROM CONCEPT PLAN TITLED "TEST PLOT OPTION 1" DATED 10 DECEMBER 2024.

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Langan CA, Inc.
18575 Jamboree Road, Suite 150
Irvine, CA 92612
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Project	20101 GOLDENWEST STREET HUNTINGTON BEACH ORANGE COUNTY CALIFORNIA
Drawing Title	GENERALIZED SUBSURFACE CROSS-SECTION B-B'
Project No.	700152701
Date	FEBRUARY 2025
Scale	AS SHOWN
Drawn By	RF
Drawing No.	15B

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LEGEND:

LB-1	LB-1	BORING IDENTIFICATION
(el±####.#)	(el±####.#)	INFERRED GROUND SURFACE ELEVATION (FEET) AT TIME OF BORING
N(R)	N	STANDARD PENETRATION TEST BLOWCOUNT: 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)	STANDARD PENETRATION TEST BLOWCOUNT: NUMBER OF BLOWS OF 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
	▽	GROUNDWATER AT TIME OF DRILLING

KEY TO SYMBOLS:

SP (POORLY-GRADED SAND) | FILL | ASPHALT

SC (CLAYEY SAND) | CL (LOW-PLASTICITY CLAY)

SM (SILTY SAND) | ML (SILT)

10 0 5 10
VERTICAL SCALE: 1 INCH = 10 FEET

100 0 50 100
HORIZONTAL SCALE: 1 INCH = 100 FEET

NOTES:

1. THE FIGURE SHOWS GENERALIZED SUBSURFACE CONDITIONS AT THE RESPECTIVE BORING LOCATIONS. VARIATIONS IN CONDITIONS SHOULD BE EXPECTED BETWEEN BORING LOCATIONS. FOR A DETAILED DESCRIPTION OF CONDITIONS ENCOUNTERED SEE BORING LOGS.
2. BORINGS WERE DRILLED BY ABC LIOVIN DRILLING INC BETWEEN 15 JANUARY AND 17 JANUARY 2025 UNDER THE FULL-TIME ENGINEERING OBSERVATION OF A LANGAN FIELD ENGINEER.
3. SEE FIGURE 14 FOR LOCATION OF CROSS-SECTION WITH RESPECT TO SITE PLAN.
4. APPROXIMATE EXISTING GROUND SURFACE ELEVATIONS WERE REFENCED FROM NOAA (2010).
5. APPROXIMATE PROPOSED DEVELOPMENT LIMITS REFERENCED FROM CONCEPT PLAN TITLED "TEST PLOT OPTION 1" DATED 10 DECEMBER 2024.

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Project	20101 GOLDENWEST STREET HUNTINGTON BEACH ORANGE COUNTY CALIFORNIA
Drawing Title	GENERALIZED SUBSURFACE CROSS-SECTION C-C'
Project No.	700152701
Date	FEBRUARY 2025
Scale	AS SHOWN
Drawn By	RF
Drawing No.	15C

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APPENDIX A
USGS ANSS Earthquake Catalog

TABLE A.1 - SUMMARY OF USGS 2014 CALIFORNIA SEISMIC SOURCES

Fault Name	Distance (km)	Distance (miles)
Newport-Inglewood alt 1	1.6	1.0
Newport-Inglewood alt 2	1.6	1.0
Compton	3.6	2.2
San Joaquin Hills	8.6	5.4
Anaheim	13.5	8.4
Newport-Inglewood (Offshore)	13.7	8.5
Palos Verdes	15.1	9.4
Elysian Park (Lower CFM)	21.0	13.0
Peralta Hills	22.6	14.1
Puente Hills (Coyote Hills)	22.8	14.1
Yorba Linda	23.9	14.9
Richfield	25.5	15.9
Oceanside alt2	26.3	16.3
Oceanside alt1	26.4	16.4
Puente Hills (Santa Fe Springs)	27.3	16.9
Puente Hills	28.4	17.7
Whittier alt 2	32.0	19.9
Whittier alt 1	32.0	19.9

Notes:
1. Sources are within a 32-kilometer (20-mile) search radius.

TABLE A.2 - USGS ANSS EARTHQUAKE CATALOG SEARCH RESULTS

Date 1	Latitude [1]	Longitude [1]	Approximate Magnitude [1]	Magnitude Type [1]	Approximate Distance from Site (km) [2]
3/29/2014	33.9325	-117.9158	5.1	mw	30
7/29/2008	33.9485	-117.7663	5.4	mw	39
4/26/1997	34.3690	-118.6700	5.1	mw	97
6/26/1995	34.3940	-118.6690	5.0	ml	100
3/20/1994	34.2310	-118.4750	5.2	ml	74
1/29/1994	34.3060	-118.5790	5.1	ml	87
1/19/1994	34.3780	-118.6190	5.1	ml	95
1/18/1994	34.3770	-118.6980	5.2	ml	100
1/17/1994	34.3260	-118.6980	5.6	ml	95
1/17/1994	34.3400	-118.6140	5.2	ml	92
1/17/1994	34.2750	-118.4930	5.9	ml	79
1/17/1994	34.2130	-118.5370	6.7	ml	76
6/28/1991	34.2700	-117.9930	5.8	ml	66
2/28/1990	34.1440	-117.6970	5.5	mw	60
12/3/1988	34.1510	-118.1300	5.0	mw	54
10/4/1987	34.0740	-118.0980	5.3	ml	45
10/1/1987	34.0610	-118.0790	5.9	ml	43
7/13/1986	32.9710	-117.8740	5.5	ml	79
1/1/1979	33.9165	-118.6872	5.2	mw	67
2/9/1971	34.4160	-118.3700	5.3	ml	88
2/9/1971	34.4160	-118.3700	5.8	ml	88
2/9/1971	34.4160	-118.3700	5.8	mw	88
2/9/1971	34.4160	-118.3700	6.6	mh	88
9/12/1970	34.2548	-117.5343	5.2	mh	79
12/26/1951	32.9162	-118.3052	5.8	mh	88
11/14/1941	33.7907	-118.2637	5.1	mw	26
5/31/1938	33.6993	-117.5112	5.2	ml	47
3/11/1933	33.8500	-118.2660	5.0	ml	30
3/11/1933	33.6238	-118.0012	5.3	ml	6
3/11/1933	33.7667	-117.9850	5.0	ml	11
3/11/1933	33.6308	-117.9995	6.4	mh	5
8/31/1930	34.0300	-118.6430	5.3	mh	69
8/4/1927	34.0000	-118.5000	5.3	mw	57
7/23/1923	34.0890	-117.2590	6.2	ms	84
6/6/1918	33.8000	-117.0000	5.0	uk	96
4/21/1918	33.7620	-116.9720	6.7	uk	98
5/15/1910	33.7000	-117.4000	5.3	mw	58
5/13/1910	33.7000	-117.4000	5.0	ml	58
4/11/1910	33.7000	-117.4000	5.0	ml	58
12/25/1899	33.8000	-117.0000	6.7	mw	96
7/22/1899	34.3000	-117.5000	6.4	ml	85
7/22/1899	34.2000	-117.4000	5.9	mw	82

Date 1	Latitude [1]	Longitude [1]	Approximate Magnitude [1]	Magnitude Type [1]	Approximate Distance from Site (km) [2]
7/30/1894	34.3000	-117.6000	6.2	ml	80
4/4/1893	34.3000	-118.6000	5.8	ml	87
6/14/1892	34.2000	-117.5000	5.5	ml	76
8/28/1889	34.2000	-117.9000	5.6	ml	59
12/16/1858	34.2000	-117.4000	6.0	ml	82
1/17/1857	34.5200	-118.0400	6.3	mw	94
7/11/1855	34.1000	-118.1000	6.0	ml	48
9/24/1827	34.0000	-119.0000	6.0	ml	97
12/8/1812	34.3700	-117.6500	7.5	mw	85
11/22/1800	32.9000	-117.8000	6.3	mw	89

Notes:

1. The listed Earthquake Catalog Search results were obtained from USGS ANSS website on 24 January 2025.

2. Earthquake Catalog search results include earthquake events within 100 km of the Site with magnitudes of 5.0 or greater since 1800.

APPENDIX B
LANGAN Boring Logs

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

Project: CRC Huntington Beach	Project No.: 700152701
Location: 20101 Goldenwest Street, Huntington Beach, CA	Elevation and Datum: Approx. el. 40.0 (NAVD 88)
Drilling Company: ABC Liovin Drilling Inc.	Date Started: 1/16/2025 / Date Finished: 1/17/2025
Drilling Equipment: Limited Access Rig	Completion Depth: 15.0 ft / Rock Depth: Not Encountered
Size and Type of Bit: 8-in O.D. Hollow Stem Auger	Number of Samples: Disturbed 2, Undisturbed 0, Core 0
Casing Diameter (in): N/A / Casing Depth (ft): N/A	Water Level (ft.): First ▽ N/A, Completion ▼ N/A, 24 HR. ▼ N/A
Casing Hammer: N/A / Weight (lbs): N/A / Drop (in): N/A	Drilling Foreman: Juan R. and Pedro G.
Sampler: 2-inch O.D. Split Spoon	Field Engineer: Rafic Fanous
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

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, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+40.0	Brown, clayey fine to coarse SAND, some fine to coarse gravel, (SC), moist. [FILL]	0						Hand augered to 5 feet.
	+35.0		5						
		Medium stiff, tannish-brown to brown, sandy CLAY, (CL), moist.	10	S-1	SS	18	2 1 4	• 5	PID = 3.1 ppm
	+27.5		12						
		Dense, orangish-brown, fine to coarse SAND, trace silt, (SP), moist.	13	S-2	SS	18	6 15 21	36 •	PID = 2.0 ppm
	+25.0	End of Boring at 15.0ft.	15						End of boring at 15 feet. No groundwater was encountered. Percolation test performed from 10 to 15 feet. Boring was backfilled with grout.

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

Project: CRC Huntington Beach	Project No.: 700152701
Location: 20101 Goldenwest Street, Huntington Beach, CA	Elevation and Datum: Approx. el. 40.0 (NAVD 88)
Drilling Company: ABC Liovin Drilling Inc.	Date Started: 1/17/2025 — Date Finished: 1/17/2025
Drilling Equipment: Limited Access Rig	Completion Depth: 51.5 ft — Rock Depth: Not Encountered
Size and Type of Bit: 8-in O.D. Hollow Stem Auger	Number of Samples: Disturbed 11 — Undisturbed 0 — Core 0
Casing Diameter (in): N/A — Casing Depth (ft): N/A	Water Level (ft.): First ▽ 35.5 — Completion ▼ N/A — 24 HR. ▼ N/A
Casing Hammer: N/A — Weight (lbs): N/A — Drop (in): N/A	Drilling Foreman: Juan R. and Pedro G.
Sampler: 2-inch O.D. Split Spoon & 3-inch O.D. California Modified	Field Engineer: Rafic Fanous
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+40.0	Light brown to tannish-brown, silty fine to medium SAND, some fine to coarse gravel, trace concrete fragments (SM), dry. [FILL]	0	B-1					Hand augered to 5 feet. Bag sample was collected from 0 to 5 feet.
	+37.0		1						
	+36.5	Dark brown to black, clayey fine to medium SAND, (SC), moist.	2						
			3						
		Black, CLAY, (CL), moist.	4						Odor.
		Very stiff, brown, CLAY, trace fine sand, (CL), moist.	5						PID = 0.1 ppm
			6	S-1	CR	18	4 12 10	22	
			7						
			8						
			9						
		Soft, light gray to brown, CLAY, some silt, (CL), moist.	10						PID = 9.5 ppm Odor.
			11	S-2	SS	18	2 1 1	2	
			12						
			13						
			14						
		Very stiff, mottled tannish-brown, sandy CLAY, some silt, trace fine gravel, (CL), moist.	15						PID = 0.4 ppm
			16	S-3	CR	18	9 12 17	29	
			17						
	+22.0		18						
			19						
		Medium dense, gray to orangish-brown, silty fine to coarse SAND, (SM), moist.	20						PID = 0.5 ppm
			21	S-4	SS	18	5 9 8	17	
			22						
	+17.0		23						
			24						

N-Value (Blows/ft) scale: 10 20 30 40

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Log of Boring **LB-2** Sheet 2 of 2

Project	Project No.
CRC Huntington Beach	700152701
Location	**Elevation and Datum**
20101 Goldenwest Street, Huntington Beach, CA	Approx. el. 40.0 (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, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+16.0	Dense, tannish-brown to orangish-brown, fine to coarse SAND, (SP), moist.	24–26	S-5	CR	18	11 29 37	66	PID = 0.6 ppm
	+9.5	Medium dense, orangish-brown, fine to coarse SAND, (SP), moist.	30	S-6A	SS	18	10 9 10	19	PID = 0.6 ppm
		Medium dense, grayish-brown, silty fine to medium SAND, (SM), moist.	31	S-6B					
		Dense, dark gray, silty fine to medium SAND, (SM), wet. ▽	35–36	S-7	CR	18	10 21 36	57	PID = 0.0 ppm Groundwater was encountered at 35.5 feet, Bentonite mix was added.
	+2.0		38						
		Very dense, dark gray, fine to coarse SAND, trace silt, (SP), wet.	40–41	S-8	SS	18	13 21 30	51	PID = 0.0 ppm
		Very dense, dark gray, fine to coarse SAND, (SP), wet.	45	S-9	CR	10	25 50/5"	50/5"	PID = 0.0 ppm
		Very dense, dark gray, fine to coarse SAND, trace coarse gravel, (SP), wet.	50–51	S-10	SS	16	18 31 50	81	PID = 0.0 ppm
	-11.5	End of Boring at 51.5ft.	52						End of boring at 51.5 feet. Groundwater was first encountered at 35.5 feet. Boring was backfilled with grout using the tremie method.

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Log of Boring **LB-3/P-2** Sheet 1 of 1

Project: CRC Huntington Beach	Project No.: 700152701
Location: 20101 Goldenwest Street, Huntington Beach, CA	Elevation and Datum: Approx. el. 38.0 (NAVD 88)
Drilling Company: ABC Liovin Drilling Inc.	Date Started: 1/16/2025 — Date Finished: 1/17/2025
Drilling Equipment: Limited Access Rig	Completion Depth: 15.0 ft — Rock Depth: Not Encountered
Size and Type of Bit: 8-in O.D. Hollow Stem Auger	Number of Samples: Disturbed 2, Undisturbed 0, Core 0
Casing Diameter (in): N/A — Casing Depth (ft): N/A	Water Level (ft.): First ▽ N/A, Completion ▼ N/A, 24 HR. ⧩ N/A
Casing Hammer: N/A — Weight (lbs): N/A — Drop (in): N/A	Drilling Foreman: Juan R. and Pedro G.
Sampler: 2-inch O.D. Split Spoon	Field Engineer: Rafic Fanous
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

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, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+38.0	Brown, silty SAND, trace clay, (SM), moist. [FILL]	0						Hand augered to 5 feet.
	+35.0	Brown, clayey fine to medium SAND, (SC), moist.	3						
	+30.5	Medium stiff, tannish-brown, sandy SILT, (ML), moist.	10	S-1	SS	18	WOH 1 3	• 4	PID = 0.7 ppm
	+23.0	Very stiff, tannish-brown, sandy SILT, some clay, (ML), moist.	14	S-2	SS	18	5 8 12	• 20	PID = 0.8 ppm
		End of Boring at 15.0ft.	15						End of boring at 15 feet. No groundwater was encountered. Percolation test performed from 10 to 15 feet. Boring was backfilled with grout.

Template: Log-BH; Strip: BH-GEO no line; Printed on 02/27/2025

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Log of Boring **LB-4** Sheet 1 of 2

Project: CRC Huntington Beach	Project No.: 700152701
Location: 20101 Goldenwest Street, Huntington Beach, CA	Elevation and Datum: Approx. el. 40.0 (NAVD 88)
Drilling Company: ABC Liovin Drilling Inc.	Date Started: 1/16/2025 / Date Finished: 1/16/2025
Drilling Equipment: Limited Access Rig	Completion Depth: 26.5 ft / Rock Depth: Not Encountered
Size and Type of Bit: 8-in O.D. Hollow Stem Auger	Number of Samples: Disturbed 6, Undisturbed 0, Core 0
Casing Diameter (in): N/A / Casing Depth (ft): N/A	Water Level (ft.): First ▽ N/A, Completion ▼ N/A, 24 HR. ▼ N/A
Casing Hammer: N/A / Weight (lbs): N/A / Drop (in): N/A	Drilling Foreman: Juan R. and Pedro G.
Sampler: 2-inch O.D. Split Spoon & 3-inch O.D. California Modified	Field Engineer: Rafic Fanous
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

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, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+40.0	Brown, silty fine to coarse SAND, some fine to coarse gravel, (SM), moist. [FILL]	0	B-1					Hand augered to 5 feet. Bag sample was collected from 0 to 5 feet.
	+37.0	Dense, brown, silty fine to medium SAND, (SM), moist.	5	S-1	CR	18	13 21 31	52	PID = 0.9 ppm
		Medium dense, brown, silty fine to medium SAND, (SM), moist.	10	S-2	SS	18	5 7 8	15	
	+27.0	Very stiff, tannish-brown, sandy SILT, trace clay, (ML), moist.	15	S-3	CR	18	6 11 20	31	PID = 0.0 ppm
	+22.0	Medium dense, light brown, fine to coarse SAND, trace silt, (SP), moist.	20	S-4	SS	8	16 13 17	30	PID = 0.0 ppm
			24						

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Log of Boring **LB-4** Sheet 2 of 2

Project	Project No.
CRC Huntington Beach	700152701
Location	**Elevation and Datum**
20101 Goldenwest Street, Huntington Beach, CA	Approx. el. 40.0 (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, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+16.0		24						
			25						PID = 0.0 ppm
		Dense, light brown to orangish-brown, fine to coarse SAND, (SP), moist.		S-5	CR	18	7 25 39	64	
	+13.5		26						End of boring at 26.5 feet. No groundwater was encountered. Boring was backfilled with grout.
		End of Boring at 26.5ft.	27						
			28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						
			46						
			47						
			48						
			49						
			50						
			51						
			52						
			53						
			54						

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Log of Boring **LB-5** Sheet 1 of 2

Project: CRC Huntington Beach	Project No.: 700152701
Location: 20101 Goldenwest Street, Huntington Beach, CA	Elevation and Datum: Approx. el. 41.0 (NAVD 88)
Drilling Company: ABC Liovin Drilling Inc.	Date Started: 1/15/2025 — Date Finished: 1/15/2025
Drilling Equipment: Limited Access Rig	Completion Depth: 50.7 ft — Rock Depth: Not Encountered
Size and Type of Bit: 8-in O.D. Hollow Stem Auger	Number of Samples: Disturbed 11 — Undisturbed 0 — Core 0
Casing Diameter (in): N/A — Casing Depth (ft): N/A	Water Level (ft.): First ▽ 36.3 — Completion ▼ 35.4 — 24 HR. ▼ N/A
Casing Hammer: N/A — Weight (lbs): N/A — Drop (in): N/A	Drilling Foreman: Juan R. and Pedro G.
Sampler: 2-inch O.D. Split Spoon & 3-inch O.D. California Modified	Field Engineer: Rafic Fanous
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+41.0	Dark brown, silty fine to medium SAND, trace clay, (SM), moist. [FILL]	0	B-1					Hand augered to 5 feet. Bag sample was collected from 0 to 5 feet.
	+38.0		3						
		Very stiff, dark brown, sandy CLAY, (CL), moist.	5	S-1	SS	18	6 11 14	25	PID = 0.2 ppm
	+33.0		8						
		Stiff, tannish-brown, sandy SILT, trace clay, (ML), moist.	10	S-2	CR	18	4 6 8	14	PID = 2.0 ppm
		Very stiff, tannish-brown, sandy SILT, trace clay, (ML), moist.	15	S-3	SS	18	6 6 10	16	PID = 0.5 ppm
	+23.0		18						
		Dense, light brown to orangish-brown, silty fine to medium SAND, (SM), moist.	20	S-4	CR	10	6 19 40	59	PID = 0.0 ppm
			24						

N-Value (Blows/ft) scale: 10 20 30 40

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Log of Boring **LB-5** Sheet 2 of 2

Project	Project No.
CRC Huntington Beach	700152701
Location	**Elevation and Datum**
20101 Goldenwest Street, Huntington Beach, CA	Approx. el. 41.0 (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, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+17.0		24						
		Medium dense, tannish-brown to orangish-brown, silty fine to medium SAND, (SM), moist.	25	S-5	SS	18	8 13 17	30	PID = 0.0 ppm
			26						
			27						
			28						
			29						
		Dense, orangish-brown to reddish-brown, silty fine to coarse SAND, (SM), moist.	30	S-6	CR	18	19 13 38	51	PID = 0.0 ppm
			31						
			32						
	+8.0		33						
		Stiff, grayish-brown, silty CLAY, trace fine sand, (CL), moist. ▼	34						
		▽	35	S-7	SS	18	3 6 9	15	PID = 0.0 ppm
			36						Groundwater was first encountered at 36.3 feet.
			37						
	+3.0		38						
		Dense, tannish-brown to orangish-brown, silty fine to coarse SAND, (SM), wet.	39						
			40	S-8	CR	18	17 30 41	71	PID = 0.0 ppm
			41						
	-2.0		42						
		Very dense, grayish-brown, fine to coarse SAND, trace fine gravel, (SP), wet.	43						
			44						
			45	S-9	SS	18	18 20 50/3"	50/3"	PID = 0.0 ppm
			46						
			47						
			48						
			49						
	-9.7	Very dense, grayish-brown, gravelly fine to coarse SAND, (SP), wet.	50	S-10	CR	8	10 50/2"	50/2"	PID = 0.0 ppm
		End of Boring at 50.7ft.	51						End of boring at 50.7 feet. Groundwater was first encountered at 36.3 feet and completion at 35.4 feet. Boring was backfilled with grout using the tremie method.
			52						
			53						
			54						

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Log of Boring **LB-6** Sheet 1 of 2

Project: CRC Huntington Beach	Project No.: 700152701
Location: 20101 Goldenwest Street, Huntington Beach, CA	Elevation and Datum: Approx. el. 36.0 (NAVD 88)
Drilling Company: ABC Liovin Drilling Inc.	Date Started: 1/17/2025 — Date Finished: 1/16/2025
Drilling Equipment: Limited Access Rig	Completion Depth: 26.5 ft — Rock Depth: Not Encountered
Size and Type of Bit: 8-in O.D. Hollow Stem Auger	Number of Samples: Disturbed 6 — Undisturbed 0 — Core 0
Casing Diameter (in): N/A — Casing Depth (ft): N/A	Water Level (ft.): First ▽ N/A — Completion ▼ N/A — 24 HR. ▼ N/A
Casing Hammer: N/A — Weight (lbs): N/A — Drop (in): N/A	Drilling Foreman: Juan R. and Pedro G.
Sampler: 2-inch O.D. Split Spoon & 3-inch O.D. California Modified	Field Engineer: Rafic Fanous
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+36.0							10 20 30 40	
	+35.5	6-inches of asphalt concrete.	0						Hand auger to 5 feet. Bag sample was collected from 0 to 5 feet.
		Grayish-brown, silty fine to medium SAND, some fine to coarse gravel, (SM), moist. [FILL]	1						
	+33.0		2	B-1					Odor
		Dark brown to black, CLAY, (CL), moist.	3						
			4						
		Stiff, dark gray, CLAY, trace fine gravel, (CL), moist.	5						PID = 1.2 ppm
			6	S-1	CR	18	4 12 8	• 20	
			7						
	+28.0		8						
		Medium dense, tannish-brown, silty fine to coarse SAND, (SM), moist.	9						
			10						PID = 0.2 ppm
			11	S-2	SS	18	5 13 7	• 20	
			12						
	+23.0		13						
		Very dense, light brown, fine to coarse SAND, (SP), moist.	14						
			15						PID = 1.7 ppm
			16	S-3	CR	18	13 34 50/5"	50/5" •	
	+18.0		17						
		Very stiff, mottled brown, sandy SILT, trace clay, (ML), moist.	18						
			19						
			20						PID = 2.2 ppm
			21	S-4	SS	18	4 11 7	• 18	
			22						
			23						
			24						

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Log of Boring **LB-6** Sheet 2 of 2

Project	Project No.
CRC Huntington Beach	700152701
Location	**Elevation and Datum**
20101 Goldenwest Street, Huntington Beach, CA	Approx. el. 36.0 (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, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+12.0		24						
		Very stiff, mottled brown, sandy SILT, trace clay, (ML), moist.	25	S-5	CR	18	5 10 21	31	PID = 0.0 ppm
	+9.5	End of Boring at 26.5ft.	26						End of boring at 26.5 feet. No groundwater was encountered. Boring was backfilled with grout and was surface patched with asphalt concrete.
			27						
			28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						
			46						
			47						
			48						
			49						
			50						
			51						
			52						
			53						
			54						

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Log of Boring **LB-7** Sheet 1 of 2

Project: CRC Huntington Beach		Project No.: 700152701	
Location: 20101 Goldenwest Street, Huntington Beach, CA		Elevation and Datum: Approx. el. 37.0 (NAVD 88)	
Drilling Company: ABC Liovin Drilling Inc.		Date Started: 1/15/2025	Date Finished: 1/15/2025
Drilling Equipment: Limited Access Rig		Completion Depth: 51.5 ft	Rock Depth: Not Encountered
Size and Type of Bit: 8-in O.D. Hollow Stem Auger		Number of Samples: Disturbed 10	Undisturbed 0 / Core 0
Casing Diameter (in): N/A	Casing Depth (ft): N/A	Water Level (ft.): First ▽ 35.9	Completion ▼ N/A / 24 HR. ▼ N/A
Casing Hammer: N/A	Weight (lbs): N/A / Drop (in): N/A	Drilling Foreman: Juan R. and Pedro G.	
Sampler: 2-inch O.D. Split Spoon & 3-inch O.D. California Modified		Field Engineer: Rafic Fanous	
Sampler Hammer: Automatic	Weight (lbs): 140 / Drop (in): 30		

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Data: Number	Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+37.0		0					10 20 30 40	
	+36.3	8-inches of asphalt concrete.	1						Hand augered to 5 feet.
		Dark brown to black, clayey fine to medium SAND, some fine to coarse gravel, (SC), moist. [FILL]	2						
	+34.0		3						
		Stiff, dark brown, sandy CLAY, (CL), moist.	4						
			5	S-1	CR	18	4 12 9	21	PID = 2.5 ppm
			6						
			7						
			8						
			9						
		Stiff, brown, sandy CLAY, (CL), moist.	10						PID = 35.3 ppm
			11	S-2	SS	18	3 6 5	11	
	+24.0		12						
		No Recovery.	13						
			14						
			15	S-3	CR	0	11 50/3" 24	50/3"	
			16						
			17						
			18						
			19						
		Medium dense, tannish-brown, silty fine to medium SAND, trace fine to coarse gravel, (SM), moist.	20						PID = 4.1 ppm
			21	S-4	SS	18	5 12 9	21	
			22						
	+14.0		23						
			24						

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Log of Boring **LB-7** Sheet 2 of 2

Project	Project No.
CRC Huntington Beach	700152701
Location	**Elevation and Datum**
20101 Goldenwest Street, Huntington Beach, CA	Approx. el. 37.0 (NAVD 88)

Material Symbol	Elev. (ft)	Sample Description	Depth Scale	Sample Number	Sample Type	Recov. (in)	Penetr-resist BL/6in	N-Value (Blows/ft)	Remarks (Drilling Fluid, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+13.0	Dense, orangish-brown, fine to coarse SAND, (SP), moist.	24–25						
			25–26	S-5	CR	18	15 32 28	60	PID = 4.2 ppm
			26–27						
			27–28						
	+9.0	Medium dense, tannish-brown, silty fine to medium SAND, (SM), moist.	28–29						
			29–30						
			30–31	S-6	SS	18	8 16 14	30	PID = 0.0 ppm
			31–32						
	+4.0	Stiff, tannish-brown, sandy SILT, trace clay, (ML), wet.	32–33						
			33–34						
			34–35						
			35–36	S-7	CR	18	6 15 10	25	PID = 0.0 ppm
			36–37						
			37–38						
	-1.0	Very dense, tannish-brown, fine to coarse SAND, trace silt, (SP), wet.	38–39						
			39–40						
			40–41	S-8	SS	18	10 34 28	62	PID = 0.8 ppm
			41–42						
			42–43						
			43–44						
			44–45						
		Very dense, tannish-brown, fine to medium SAND, trace silt, (SP), wet.	45–46	S-9	CR	16	7 50/2" 26	50/2"	PID = 0.0 ppm
			46–47						
			47–48						
			48–49						
			49–50						
		Very dense, tannish-brown, fine to medium SAND, trace silt, (SP), wet.	50–51	S-10	SS	18	5 41 24	65	PID = 0.0 ppm
	-14.5	End of Boring at 51.5ft.	51–52						End of boring at 51.5 feet. Groundwater was first encountered at 35.9 feet. Boring was backfilled with grout and was surface patched with asphalt concrete.
			52–53						
			53–54						

N-Value (Blows/ft) scale: 10 20 30 40

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Log of Boring **LB-8** Sheet 1 of 2

Project: CRC Huntington Beach	Project No.: 700152701
Location: 20101 Goldenwest Street, Huntington Beach, CA	Elevation and Datum: Approx. el. 36.0 (NAVD 88)
Drilling Company: ABC Liovin Drilling Inc.	Date Started: 1/15/2025 — Date Finished: 1/15/2025
Drilling Equipment: Limited Access Rig	Completion Depth: 26.5 ft — Rock Depth: Not Encountered
Size and Type of Bit: 8-in O.D. Hollow Stem Auger	Number of Samples: Disturbed 5 — Undisturbed 0 — Core 0
Casing Diameter (in): N/A — Casing Depth (ft): N/A	Water Level (ft.): First ▽ N/A — Completion ▼ N/A — 24 HR. ▼ N/A
Casing Hammer: N/A — Weight (lbs): N/A — Drop (in): N/A	Drilling Foreman: Juan R. and Pedro G.
Sampler: 2-inch O.D. Split Spoon & 3-inch O.D. California Modified	Field Engineer: Rafic Fanous
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

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, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+36.0		0						
	+35.5	6-inches of asphalt concrete.							Hand augered to 5 feet.
		Dark brown, clayey fine to coarse SAND, some fine to coarse gravel, (SC), moist. [FILL]	1 2 3 4						
	+31.0		5						PID = 0.4 ppm
		Very stiff, tannish-brown to greenish-brown, sandy CLAY, some silt, (CL), moist.	6 7 8 9	S-1	SS	18	5 7 12	• 19	
	+28.0								
		Medium dense, dark brown, silty fine to medium SAND, (SM), moist.	10 11 12 13 14	S-2	CR	18	7 12 18	30 •	PID = 1.3 ppm
	+23.0								
		Stiff, dark brown, sandy SILT, (ML), moist.	15 16 17 18 19	S-3	SS	7	3 3 5	• 8	PID = 1.2 ppm
		Very stiff, grayish-brown, sandy SILT, (ML), moist.	20 21 22	S-4	CR	18	3 9 18	27 •	PID = 0.2 ppm
	+13.0		23 24						

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Log of Boring **LB-8** Sheet 2 of 2

Project	Project No.
CRC Huntington Beach	700152701
Location	**Elevation and Datum**
20101 Goldenwest Street, Huntington Beach, CA	Approx. el. 36.0 (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, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+12.0		24						
			25						PID = 1.3 ppm
		Dense, tannish-brown to orangish-brown, fine to coarse SAND, (SP), moist.		S-5	SS	18	9 17 24	41 •	
	+9.5		26						End of boring at 26.5 feet. No groundwater was encountered. Boring was backfilled with grout and was surface patched with asphalt concrete.
		End of Boring at 26.5ft.	27						
			28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						
			46						
			47						
			48						
			49						
			50						
			51						
			52						
			53						
			54						

LANGAN

Log of Boring **LB-9** Sheet 1 of 2

Project: CRC Huntington Beach	Project No.: 700152701
Location: 20101 Goldenwest Street, Huntington Beach, CA	Elevation and Datum: Approx. el. 37.0 (NAVD 88)
Drilling Company: ABC Liovin Drilling Inc.	Date Started: 1/15/2025 — Date Finished: 1/15/2025
Drilling Equipment: Limited Access Rig	Completion Depth: 26.4 ft — Rock Depth: Not Encountered
Size and Type of Bit: 8-in O.D. Hollow Stem Auger	Number of Samples: Disturbed 6 — Undisturbed 0 — Core 0
Casing Diameter (in): N/A — Casing Depth (ft): N/A	Water Level (ft.): First ▽ N/A — Completion ▼ N/A — 24 HR. ▼ N/A
Casing Hammer: N/A — Weight (lbs): N/A — Drop (in): N/A	Drilling Foreman: Juan R. and Pedro G.
Sampler: 2-inch O.D. Split Spoon & 3-inch O.D. California Modified	Field Engineer: Rafic Fanous
Sampler Hammer: Automatic — Weight (lbs): 140 — Drop (in): 30	

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, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+37.0	Dark brown, clayey fine to medium SAND, (SC), moist. [FILL]	0	B-1					Hand augered to 5 feet. Bag sample was collected from 0 to 5 feet.
	+34.0	Stiff, brown, fine to medium sandy CLAY, (CL), moist.	5	S-1	CR	18	4 8 11	• 19	PID = 0.0 ppm
	+29.0	Brown, clayey fine to medium SAND, (SC), moist. Medium stiff, brown to black, fine to medium sandy SILT, (ML), moist.	10	S-2	SS	18	2 3 3	• 6	PID = 5.2 ppm
	+24.0	Stiff, light gray to gray, silty CLAY, trace fine sand, trace fine to coarse gravel, (CL), moist.	15	S-3	CR	16	4 8 12	• 20	PID = 4.0 ppm
	+19.0	Medium dense, grayish white to orangish brown, fine to coarse SAND, trace silt, (SP), moist.	20	S-4	SS	12	9 13 15	28 •	PID = 27.8 ppm

LANGAN

Log of Boring **LB-9** Sheet 2 of 2

Project	Project No.
CRC Huntington Beach	700152701
Location	**Elevation and Datum**
20101 Goldenwest Street, Huntington Beach, CA	Approx. el. 37.0 (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, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+13.0		24						
		Very dense, light gray to orangish brown, fine to coarse SAND, trace silt, (SP), moist.	25	S-5	CR	15	16 35 50/5"	50/5"	PID = 2.8 ppm
	+10.6	End of Boring at 26.4ft.	26						End of boring at 26.42 feet. No groundwater was encountered. Boring was backfilled with grout.
			27						
			28						
			29						
			30						
			31						
			32						
			33						
			34						
			35						
			36						
			37						
			38						
			39						
			40						
			41						
			42						
			43						
			44						
			45						
			46						
			47						
			48						
			49						
			50						
			51						
			52						
			53						
			54						

LANGAN

Log of Boring **LB-10/P-3** Sheet 1 of 1

Project: CRC Huntington Beach	Project No.: 700152701
Location: 20101 Goldenwest Street, Huntington Beach, CA	Elevation and Datum: Approx. el. 37.0 (NAVD 88)
Drilling Company: ABC Liovin Drilling Inc.	Date Started: 1/16/2025 / Date Finished: 1/17/2025
Drilling Equipment: Limited Access Rig	Completion Depth: 15.0 ft / Rock Depth: Not Encountered
Size and Type of Bit: 8-in O.D. Hollow Stem Auger	Number of Samples: Disturbed 2 / Undisturbed 0 / Core 0
Casing Diameter (in): N/A / Casing Depth (ft): N/A	Water Level (ft.): First ▽ N/A / Completion ▼ N/A / 24 HR. ▼ N/A
Casing Hammer: N/A / Weight (lbs): N/A / Drop (in): N/A	Drilling Foreman: Juan R. and Pedro G.
Sampler: 2-inch O.D. Split Spoon	Field Engineer: Rafic Fanous
Sampler Hammer: Automatic / Weight (lbs): 140 / Drop (in): 30	

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, Casing Depth, Fluid Loss, Drilling Resistance, etc.)
	+37.0	Brown, clayey fine to medium SAND, trace fine to coarse gravel, (SC), moist. [FILL]	0						Hand augered to 5 feet.
	+34.0	Dark brown, clayey SILT, some fine to medium sand, (ML), moist.	5						
	+29.0	Medium stiff, dark brown to black, sandy CLAY, (CL), moist.	10	S-1	SS	18	2 2 3	• 5	PID = 6.1 ppm Odor.
	+24.5	Very soft, black, clayey SILT, (ML), moist.	15	S-2	SS	18	WOH WOH 1	• 1	PID = 382.0 ppm Odor.
	+22.0	End of Boring at 15.0ft.	20						End of boring at 15 feet. No groundwater was encountered. Percolation test performed from 10 to 15 feet. Boring was backfilled with grout.

APPENDIX C
Percolation Test Results

PERCOLATION TEST DATA SHEET

LANGAN

Project:	CRC Huntington Beach Property				Project No.:	700152701	Date of Test:	1/17/2025	
Test Hole No.:	LB-1/P-1				Tested By:	RF			
Depth of Test Hole (ft):	15.0				USCS Soil Classification:		SP		
Casing Depth (ft):	5.0-ft slotted, 10 feet solid PVC Pipe, 2-inch Diameter				Test Hole Diameter (in):		8.0		
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)
Pre-Soak #1	1/16/2025	13:30 PM	13.30	13:33 PM	14.60	3	1.30	5.20	
Pre-Soak #2	1/16/2025	13:34 PM	11.00	13:44 PM	14.90	10	3.90	4.68	
1	1/17/2025	11:26 AM	11.10	11:31 AM	14.30	5	3.20	7.68	
2	1/17/2025	11:32 AM	11.00	11:37 AM	13.30	5	2.30	5.52	
3	1/17/2025	11:40 AM	11.00	11:45 AM	13.40	5	2.40	5.76	
4	1/17/2025	11:47 PM	11.00	11:52 PM	13.30	5	2.30	5.52	
5	1/17/2025	11:53 AM	11.00	12:03 PM	14.40	10	3.40	4.08	
6	1/17/2025	12:06 PM	11.00	12:16 PM	14.40	10	3.40	4.08	
7	1/17/2025	12:17 PM	11.00	12:27 PM	14.40	10	3.40	4.08	
8	1/17/2025	12:28 PM	11.00	12:38 PM	14.40	10	3.40	4.08	16.54

Comments:

1. Percolation test was performed in accordance with the North Orange County - Technical Guidance Document dated 20 December 2013.
2. Infiltration Rate was calculated using Porchet Method.
3. Per the procedures for deep percolation tests in sandy soils, a minimum of six measurements were taken within 10-minute intervals after sandy soil criteria was met.
4. Weather: Cloudy, 75°F
5. Measurements were collected from the Top of PVC Pipe

PERCOLATION TEST DATA SHEET

LANGAN

Project:	CRC Huntington Beach Property			Project No.:	700152701	Date of Test:	1/17/2025		
Test Hole No.:	LB-3/P-2			Tested By:	RF				
Depth of Test Hole (ft):	15.0			USCS Soil Classification:		ML			
Casing Depth (ft):	5.0-ft slotted, 10 feet solid PVC Pipe, 2-inch Diameter			Test Hole Diameter (in):		8.0			
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)
Pre-Soak #1	1/16/2025	11:00 AM	12.90	11:30 AM	13.30	30	0.40	0.16	
Pre-Soak #2	1/16/2025-1/17/2025	11:30 AM	13.30	8:30 AM	14.90	-	1.60	-	
1	1/17/2025	8:30 AM	10.90	9:00 AM	11.50	30	0.60	0.24	
2	1/17/2025	9:01 AM	11.00	9:31 AM	11.50	30	0.50	0.20	
3	1/17/2025	9:32 AM	11.00	10:02 AM	11.50	30	0.50	0.20	
4	1/17/2025	10:03 AM	11.00	10:33 AM	11.50	30	0.50	0.20	
5	1/17/2025	10:34 AM	11.00	11:04 AM	11.50	30	0.50	0.20	
6	1/17/2025	11:05 AM	11.00	11:35 AM	11.50	30	0.50	0.20	
7	1/17/2025	11:36 AM	11.00	12:06 PM	11.50	30	0.50	0.20	
8	1/17/2025	12:28 PM	11.00	12:58 PM	11.50	30	0.50	0.20	
9	1/17/2025	11:36 AM	11.00	12:06 PM	11.50	30	0.50	0.20	
10	1/17/2025	12:28 PM	11.00	12:58 PM	11.50	30	0.50	0.20	
11	1/17/2025	11:36 AM	11.00	12:06 PM	11.50	30	0.50	0.20	
12	1/17/2025	12:28 PM	11.00	12:58 PM	11.50	30	0.50	0.20	0.51

Comments:

1. Percolation test was performed in accordance with the North Orange County - Technical Guidance Document dated 20 December 2013.
2. Infiltration Rate was calculated using Porchet Method.
3. Per the procedures for deep percolation tests in non-sandy soils, a minimum of twelve measurements were taken within 30-minute intervals 24 hours after non-sandy soil criteria was met.
4. Weather: Cloudy, 75°F
5. Measurements were collected from the Top of PVC Pipe

PERCOLATION TEST DATA SHEET

LANGAN

Project:	CRC Huntington Beach Property				Project No.:	700152701	Date of Test:	1/17/2025	
Test Hole No.:	LB-10/P-3				Tested By:	RF			
Depth of Test Hole (ft):	15.0				USCS Soil Classification:		CL		
Casing Depth (ft):	5.0-ft slotted, 10 feet solid PVC Pipe, 2-inch Diameter				Test Hole Diameter (in):		8.0		
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)
Pre-Soak #1	1/16/2025	8:43 AM	10.40	9:49 AM	10.75	66	0.35	0.06	
Pre-Soak #2	1/16/2025-1/17/2025	9:49 AM	10.75	9:10 AM	13.20	-	2.45	-	
1	1/17/2025	9:11 AM	10.80	9:41 AM	10.85	30	0.05	0.02	
2	1/17/2025	9:42 AM	10.30	10:12 AM	10.35	30	0.05	0.02	
3	1/17/2025	10:16 AM	10.30	10:46 AM	10.35	30	0.05	0.02	
4	1/17/2025	10:47 AM	10.30	11:17 AM	10.35	30	0.05	0.02	
5	1/17/2025	11:18 AM	10.30	11:48 AM	10.35	30	0.05	0.02	
6	1/17/2025	11:49 AM	10.30	12:19 PM	10.35	30	0.05	0.02	
7	1/17/2025	12:20 PM	10.30	12:50 PM	10.35	30	0.05	0.02	
8	1/17/2025	12:51 PM	10.30	1:21 PM	10.35	30	0.05	0.02	
9	1/17/2025	1:22 PM	10.30	1:52 PM	10.35	30	0.05	0.02	
10	1/17/2025	1:53 PM	10.30	2:23 PM	10.35	30	0.05	0.02	
11	1/17/2025	2:24 PM	10.30	2:54 PM	10.35	30	0.05	0.02	
12	1/17/2025	2:55 PM	10.30	3:25 PM	10.35	30	0.05	0.02	0.04

Comments:

1. Percolation test was performed in accordance with the North Orange County - Technical Guidance Document dated 20 December 2013.
2. Infiltration Rate was calculated using Porchet Method.
3. Per the procedures for deep percolation tests in non-sandy soils, a minimum of twelve measurements were taken within 30-minute intervals 24 hours after non-sandy soil criteria was met.
4. Weather: Cloudy, 75°F
5. Measurements were collected from the Top of PVC Pipe

APPENDIX D
Laboratory Test Results

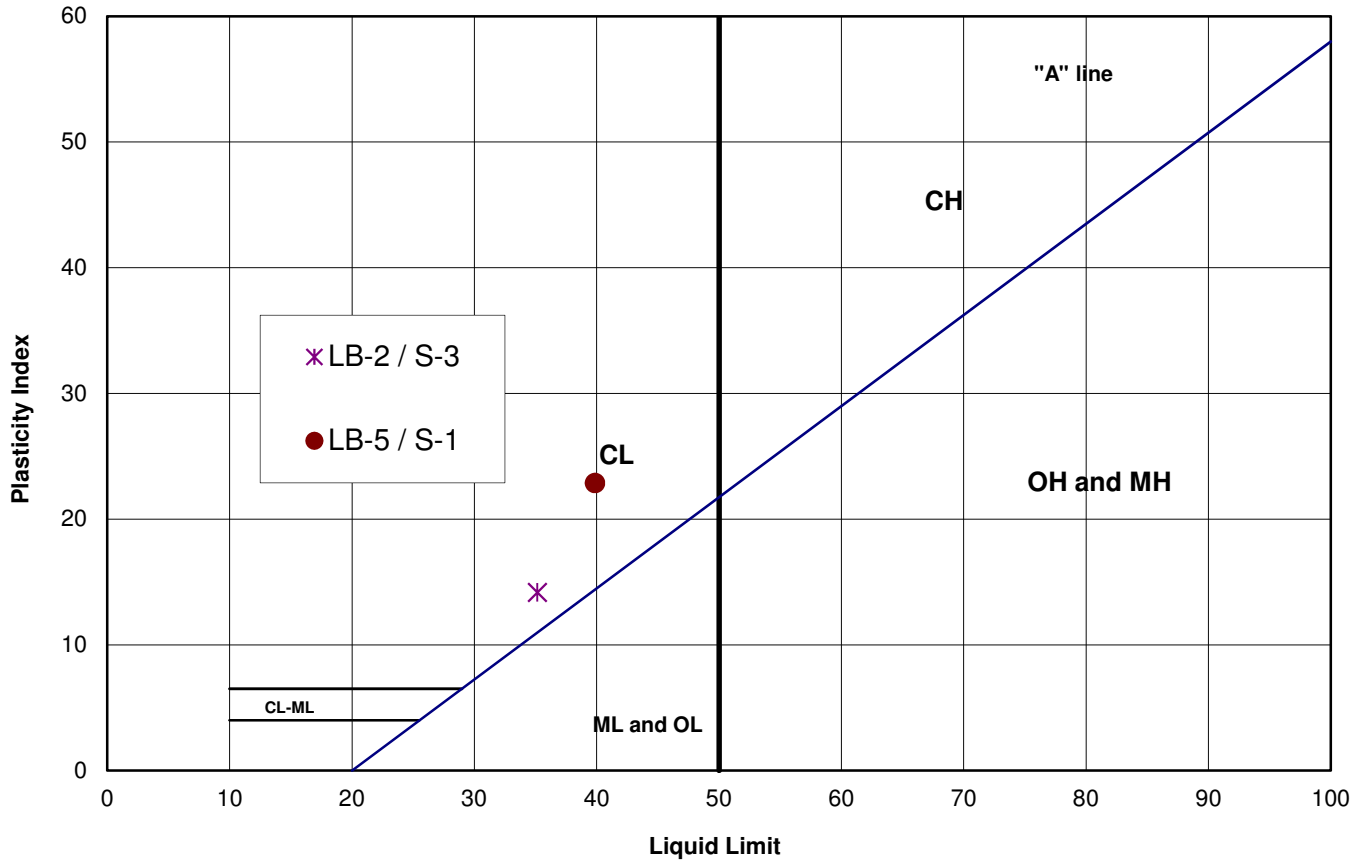
MOISTURE DENSITY TESTS

PROJECT Langan # 700152701 **JOB NO.** 2012-0057 **BY** LD **DATE** 02/09/25

Sample No.	LB-2 / S-3	LB-8 / S-2	LB-8 / S-4					
Depth (ft)	15.0	10.0	20.0					
Testing								
Soil Type	Brown, Sandy Clay	Brown, Silty Sand	Brown, Sandy Silt					
Wet+Tare	609.3	798.7	884.9					
Tare	3	4	5					
Wet Weight	301.4	155.9	62.6					
Dry Weight	255.6	141.0	57.4					
Wet density	136.3	133.4	114.4					
% Water	17.9	10.6	9.1					
Dry Density	115.6	120.7	104.9					
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
LB-2 / S-3	15'	35	21	14	CL	
LB-5 / S-1	5'	40	17	23	CL	

Job Name: Langan # 700152701 Date: 2/9/25

Job No.: 2012-0057

Geo-Logic ASSOCIATES

WASH #200 SIEVE - ASTM D 1140-92

Job Name	Langan # 700152701	Date	02/09/25
Job No.	2012-0057	By	LD

Sample	LB-3 / S-1	**Sample**	LB-8 / S-3	**Sample**	
Soil Type		Soil Type		Soil Type	
% water	10.4	% water	21.1	% water	
Wet weight	182.6	Wet weight	218	Wet weight	
Dry weight	165.4	Dry weight	180.0	Dry weight	
+ 200 sieve	64.9	+ 200 sieve	47.5	+ 200 sieve	
% Retained	39.2	% Retained	26.4	% Retained	
%Pass. #200	**61**	**%Pass. #200**	**74**	**%Pass. #200**	

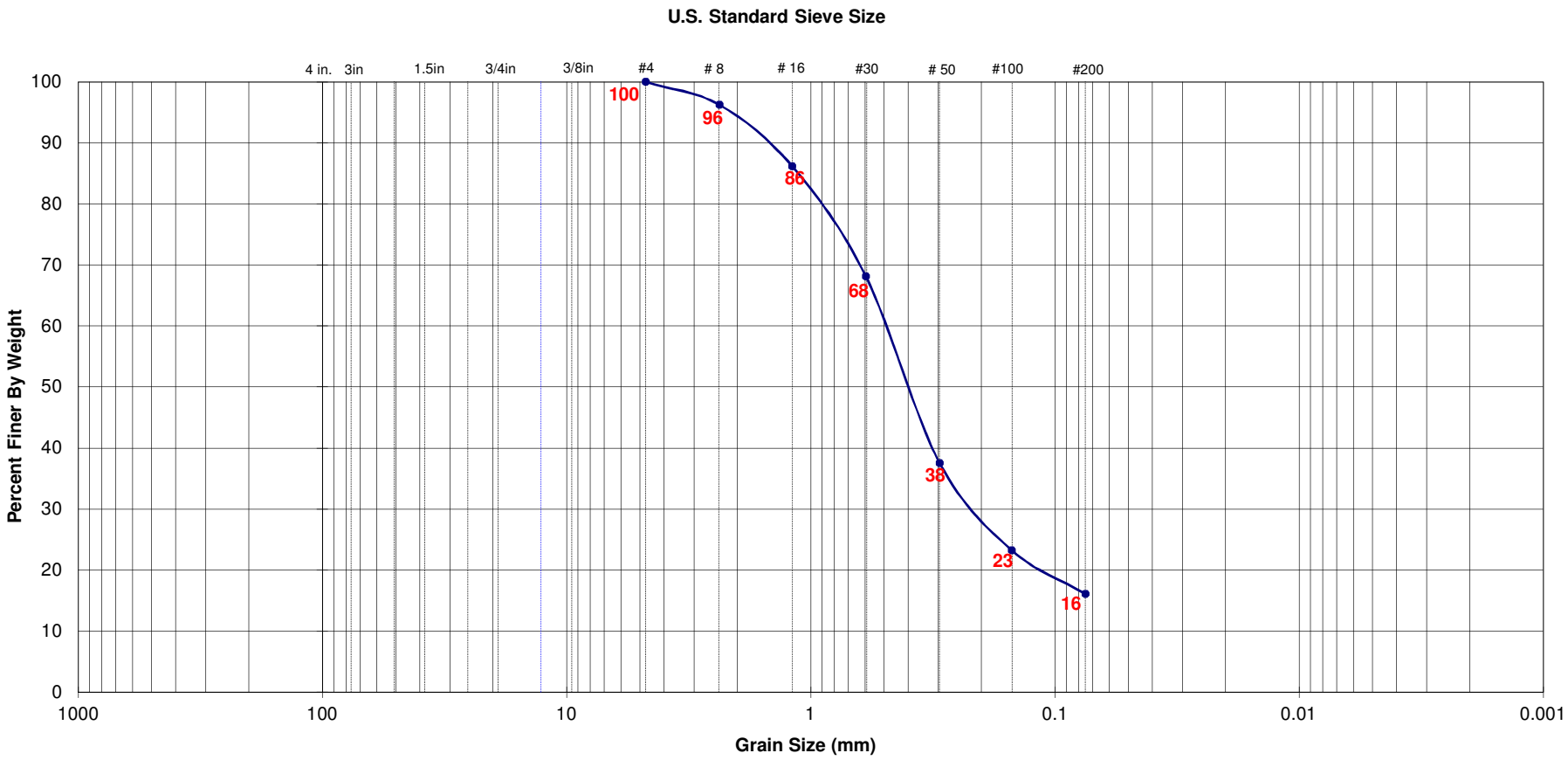
Sample		**Sample**		**Sample**	
Soil Type		Soil Type		Soil Type	
% water		% water		% water	
Wet weight		Wet weight		Wet weight	
Dry weight		Dry weight		Dry weight	
+ 200 sieve		+ 200 sieve		+ 200 sieve	
% Retained		% Retained		% Retained	
%Pass. #200		**%Pass. #200**		**%Pass. #200**	

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**	

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

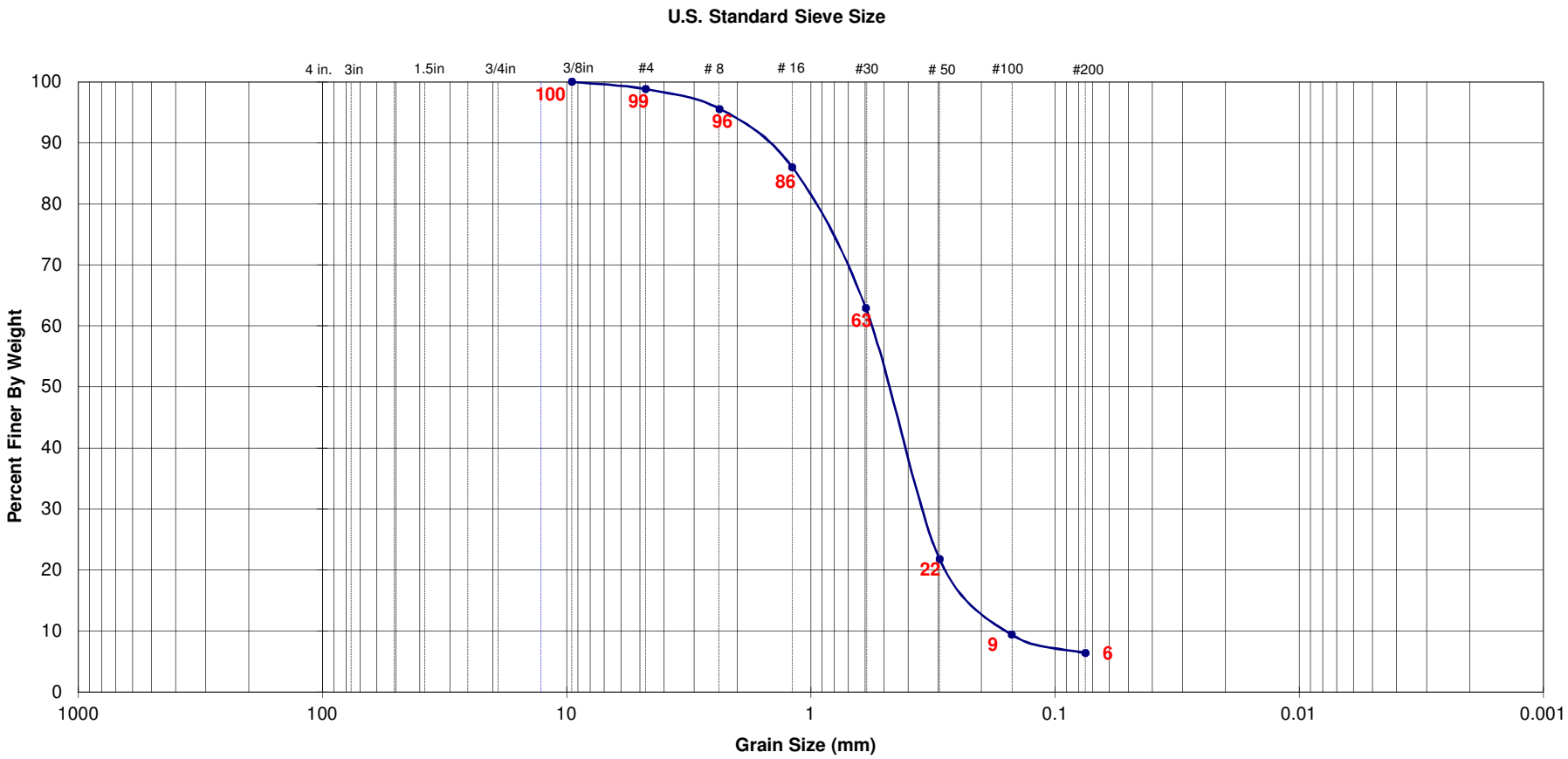
Date: 2/9/25



Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeabilty, k (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
LB-2 / S-4									SM	

Geo-Logic ASSOCIATES

Date: 2/9/25

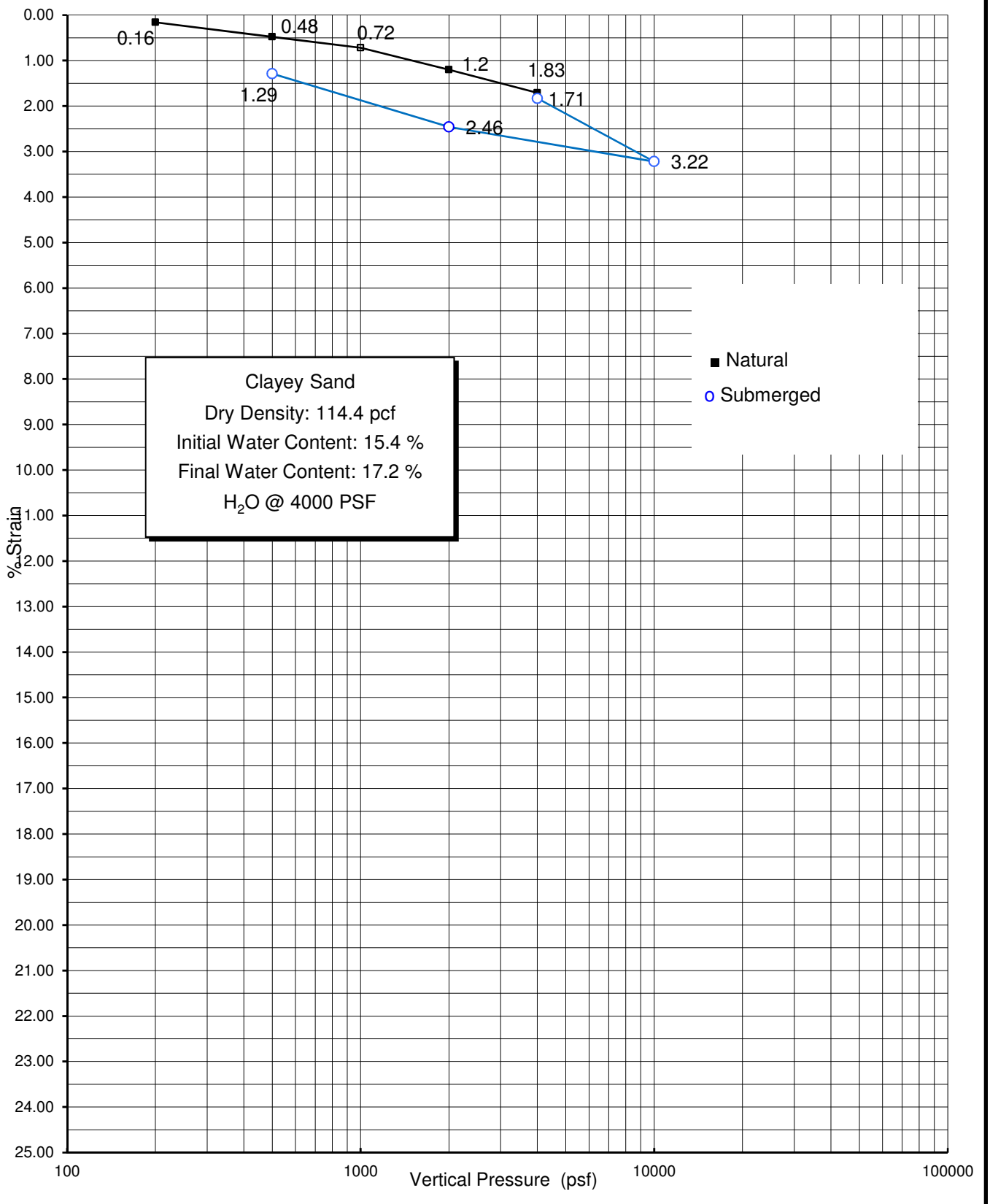


Boring / Sample No.	Initial Dry Density (pcf)	Initial Moist. (%)	Test Dry Density (pcf)	Test Moist. (%)	Permeabilty, k (cm/sec)	LL	PL	PI	Unified Soil Class.	Description
LB-7 / S-5									SP	

Geo-Logic Associates

CONSOLIDATION TEST - ASTM D2435

Boring / Sample No.	LB-2 / S-1	Depth:	5'	Date	01-28-25

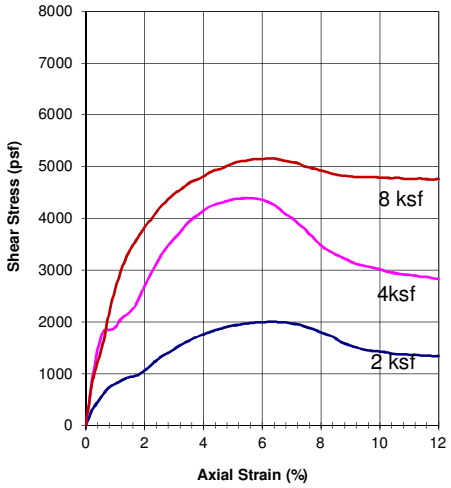


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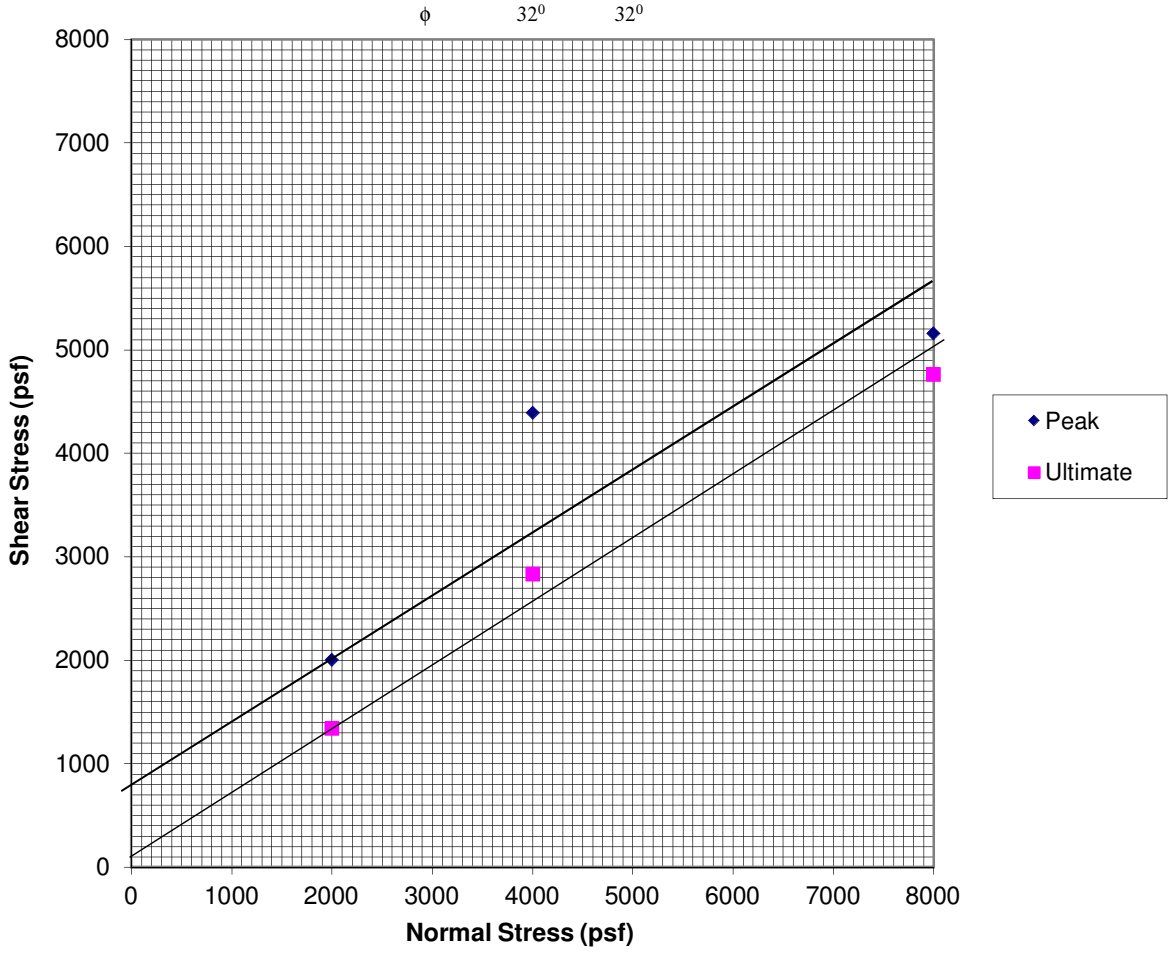
DIRECT SHEAR
ASTM D3080

PROJECT:	Langan # 700152701	Date:	2/9/2025
GLA JOB NO.:	2012-0057		
SAMPLE :	LB-4 / S-1		
SAMPLE TYPE:	Undisturbed & Saturated		
DESCRIPTION:	Sandy Clay		

Specimen No.	1	2	3
Normal Stress, psf	2000	4000	8000
Peak Stress, psf	2004	4392	5160
Displacement, % strain	6.2	5.44	6.24
Ultimate Stress, psf	1344	2832	4764
Displacement, % strain	12	12	12
Initial Dry Density, pcf	128.8	128.8	128.8
Initial Water Content,%	8.1	8.1	8.1
Final Water Content,%	13.4	13.4	13.4
Strain Rate, in/min.	0.0084	0.0084	0.0084



	Peak	Ultimate
C(psf)	800	100
ϕ	32^0	32^0

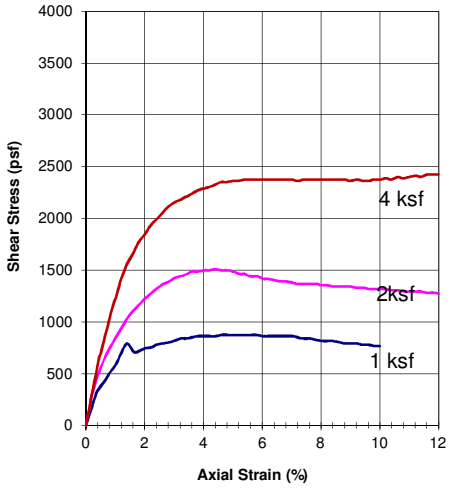


Geo-Logic ASSOCIATES

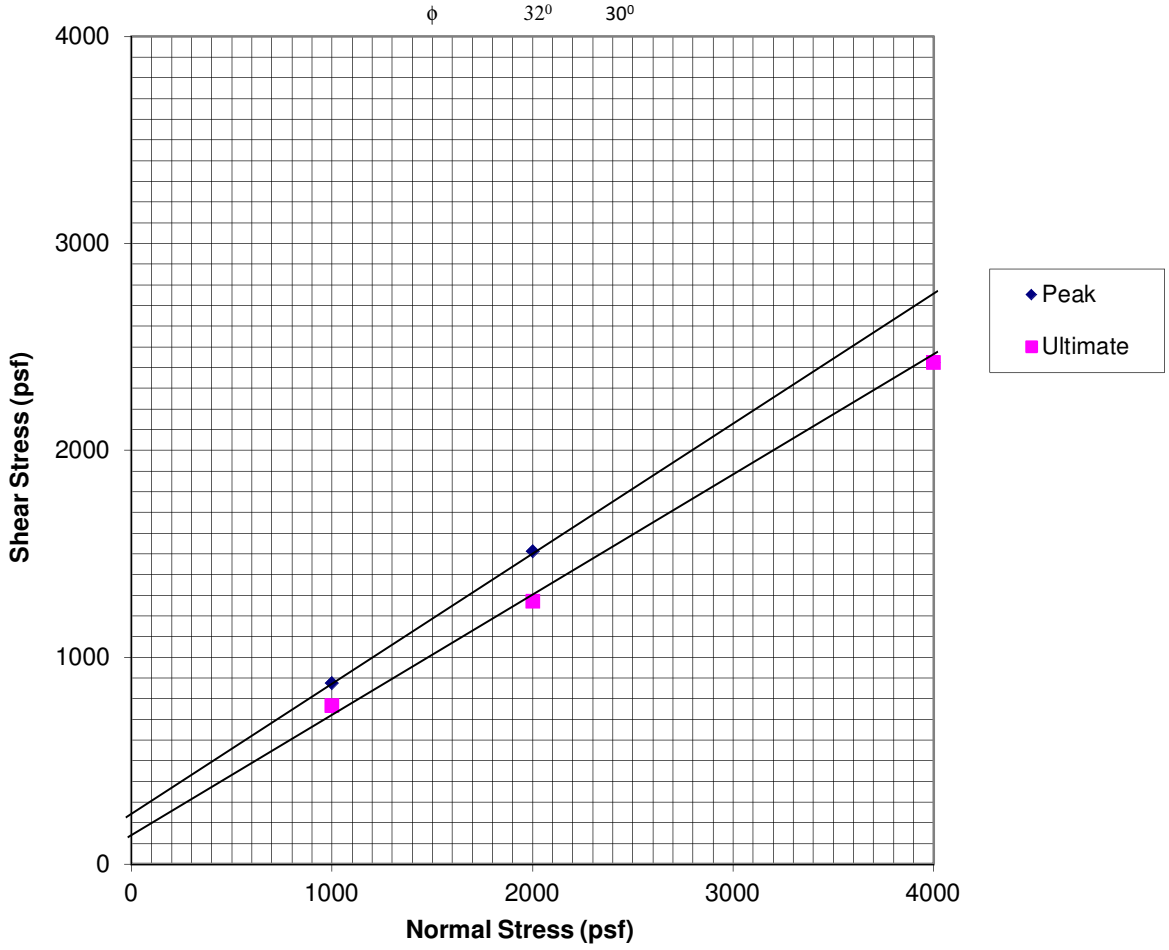
DIRECT SHEAR
ASTM D3080

PROJECT:	Langan # 700152701	Date:	2/9/2025
GLA JOB NO.:	2012-0057		
SAMPLE :	LB-9 / S-1		
SAMPLE TYPE:	Undisturbed & Saturated		
DESCRIPTION:	Silty Clay		

Specimen No.	1	2	3
Normal Stress, psf	1000	2000	4000
Peak Stress, psf	876	1512	2424
Displacement, % strain	4.6	4.4	11.6
Ultimate Stress, psf	768	1272	2424
Displacement, % strain	10	12	12
Initial Dry Density, pcf	110.9	110.9	110.9
Initial Water Content,%	14.6	14.6	14.6
Final Water Content,%	18.6	18.6	18.6
Strain Rate, in/min.	0.0084	0.0084	0.0084



	Peak	Ultimate
C(psf)	250	150
ϕ	32^0	30^0



Geo-Logic ASSOCIATES

EXPANSION INDEX - UBC 18-2 & ASTM D 4829-88

PROJECT Langan # 700154701 JOB NO. 2012-0057

Sample	LB-5 / B-1		By	LD	Sample			By	
Sta. No.					Sta. No.				
Soil Type	Brown, Silty Sand w. trace Clay				Soil Type				
Date	Time	Dial Reading	Wet+Tare	625.6	Date		Dial Reading	Wet+Tare	
2/5/2025	16:20	0.3884	Tare	219.4				Tare	
		H2O	Net Weight	406.2				Net Weight	
2/6/2025	10:00	0.3787	% Water	9.5				% Water	
			Dry Dens.	112.4				Dry Dens.	
			% Max					% Max	
			Wet+Tare	657				Wet+Tare	
			Tare	219.4				Tare	
			Net Weight	437.6				Net Weight	
INDEX	10	1.0%	% Water	18.0	**INDEX**			% Water	

Sample			By		Sample			By	
Sta. No.					Sta. No.				
Soil Type					Soil Type				
Date		Dial Reading	Wet+Tare		Date		Dial Reading	Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
			% Water					% Water	
			Dry Dens.					Dry Dens.	
			% Max					% Max	
			Wet+Tare					Wet+Tare	
			Tare					Tare	
			Net Weight					Net Weight	
INDEX			% Water		**INDEX**			% Water	

Geo-Logic ASSOCIATES

SAMPLE NO.:	LB2 & LB9																	
Depth:	0 - 5'																	
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)	1300																	
pH (CTM643)	7.7																	
CHEMICAL TESTS																		
Soluble Sulfate (CTM 417) (ppm)	687																	
Chloride Content (CTM 422) (ppm)	217																	
Wash #200 Sieve (ASTM-1140) %																		
Sand Equivalent (ASTM D2419)																		

Geo-Logic ASSOCIATES