Appendix D

Geotechnical Investigation

GEOTECHNICAL EXPLORATION
PROPOSED RETAIL DEVELOPMENT
2501 AND 2539 EAST GARVEY AVENUE NORTH
CITY OF WEST COVINA, CALIFORNIA

Prepared For:

BRENTON DEVELOPMENT CORPORATION
1932 East Garvey Avenue South
West Covina, California 91791

Project No. 12680.001

April 3, 2020

Leighton Consulting, Inc.
A LEIGHTON GROUP COMPANY

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Brenton Development Corporation
1932 East Garvey Avenue South
West Covina, California 91791

Attention: Mr. Jeff Tuck

Subject: Geotechnical Exploration, Proposed Retail Development, 2501 and 2539 East Garvey Avenue North, City of West Covina, California

In accordance with your request and authorization, Leighton Consulting, Inc. (Leighton) has conducted geotechnical exploration of the approximately 3.7-acre site of a proposed retail development located at 2501 and 2539 East Garvey Avenue North in the City of West Covina, California. The site is located north of East Garvey Avenue, just west of Citrus Street. The purpose of this study has been to evaluate the geotechnical conditions at the site with respect to the proposed development and to provide geotechnical recommendations for design and construction.

Based on this study, construction of the proposed retail development is feasible from a geotechnical standpoint. The most significant geotechnical issues at the site are those related to the potential for strong seismic shaking and the presence of potentially compressible soils. Good planning and design of the project can limit the impact of these constraints. This report presents our findings, conclusions, and geotechnical recommendations for the project.

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We appreciate the opportunity to work with you on the development of this project. If you have any questions regarding this report, please call us at your convenience.

Respectfully submitted,

LEIGHTON CONSULTING, INC.

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1.0 INTRODUCTION

1.1 Site Location and Description

The proposed retail development is an approximately 3.7-acre site located at 2501 and 2539 East Garvey Avenue North (Garvey), in the City of West Covina, California. Former car dealerships occupy both properties. The property at 2539 Garvey includes two buildings serving as showroom/offices and a repair shop surrounded by asphalt-paved driveways and lots. The property at 2501 Garvey is occupied by a single-story commercial building and parking area.

The area is relatively flat and drains gently towards the south.

1.2 Proposed Development

Based on the concept sketch provided, the proposed development includes construction of a major retail space (about 34,850 square feet), a building to house smaller shops (6,750 square feet total), and a pad (4,300 square feet) separate from the main strip of stores. Utility, drainage, hardscape landscape and parking improvements are also planned.

Although grading plans for the project are not yet available, we expect shallow cuts and fills to achieve design grade (generally on the order of 5 feet or less).

1.3 Purpose of Investigation

The purpose of this study has been to evaluate the geotechnical conditions with respect to the proposed development and to provide geotechnical recommendations for design and construction of the development.

Our geotechnical exploration included hollow-stem auger soil borings, laboratory testing, infiltration testing, and geotechnical analysis to evaluate existing geotechnical conditions and to develop the conclusions and recommendations contained in this report.

1.4 Scope of Investigation

The scope of our study has included the following tasks:

- Background Review: We reviewed available, relevant geologic maps and reports and aerial photographs available from our in-house library or available online or provided by you.

- Utility Coordination: We contacted Underground Services Alert (USA) prior to excavating borings so that utility companies could mark utilities onsite.

- Field Exploration: A total of 13 exploratory soil borings (LB-1 through LB-11, LB-1B and LB-3B) were logged and sampled onsite to evaluate subsurface conditions. The borings were drilled to depths ranging from 11 to 51.5 feet below the existing ground surface (bgs). Relatively undisturbed soil samples were obtained at selected intervals within the borings using a California Ring Sampler. Standard Penetration Tests (SPT) were also conducted at selected depths and samples from SPT were obtained. Representative bulk soil samples were also collected at shallow depths from the borings. Logs of the geotechnical borings and infiltration testing are presented in Appendix B.

- Infiltration Testing: Well permeameter tests were conducted within two of our borings borings (LB-1B and LB-3B) located in the southern portion of the site to estimate infiltration characteristics of subsurface soils at the depths and locations tested. Well permeameter tests were conducted based on the USBR-7300-89 method and in general accordance with Los Angeles County guidelines. Tests were conducted at depths of approximately 9 to 9.5 feet bgs to estimate the infiltration rate.

  Excavations were backfilled with soil cuttings and asphalt patched at surface. Logs of the geotechnical borings are presented in Appendix B. Approximate boring locations are shown on the accompanying Boring Location Map, Figure 2.

- Geotechnical Laboratory Testing: Geotechnical laboratory tests were conducted on selected relatively undisturbed and bulk soil samples obtained during our field investigation. This laboratory testing program was designed to evaluate engineering characteristics of site soils. Laboratory tests conducted during this investigation include:

  - In situ moisture content and dry density
  - Maximum dry density and optimum moisture content
  - Water-soluble sulfate concentration in the soil
  - Resistivity, chloride content and pH
  - Sieve analysis for grain-size distribution
  - Swell-Collapse
  - Expansion index

  A description of test procedures and results are presented in Appendix C, *Laboratory Test Results*.

- Engineering Analysis: Data obtained from our background review, along with data from our field exploration and geotechnical laboratory testing was evaluated and analyzed to develop geotechnical conclusions and provide preliminary recommendations presented in this report.

- Report Preparation: Results of our geotechnical exploration have been summarized in this report, presenting our findings, conclusions and preliminary geotechnical recommendations for design and construction of the proposed development.

2.0 FINDINGS

2.1 Regional Geologic Conditions

The site is located in the northeastern portion of the Los Angeles Basin within the Peninsular Ranges geomorphic province of California. The Peninsular Ranges are characterized by elongate structural blocks bounded by northwest to west-northwest trending fault zones. Several of these faults terminate at or merge with the east-west trending thrust faults at the southern edge of the Traverse Ranges geomorphic province to the north of the site. Several faults that have been mapped in the region are active or potentially active and are believed to accommodate stresses associated with the interaction of the Earth's crust between the two geomorphic provinces. The site is underlain by younger alluvial soil deposits eroded from the mountains surrounding the basin and deposited in the site vicinity (Dibblee and Ehrenspeck, 1999).

2.2 Subsurface Soil Conditions

Based upon our review of pertinent geotechnical literature and our subsurface exploration, the site is underlain by undocumented artificial fill and alluvial soil deposits.

The undocumented artificial fill encountered generally consisted of very loose to medium dense, slightly moist silty sand and firm sandy silt. The alluvial soil encountered generally consisted of medium dense to dense, slightly moist, silty sand with gravel, to silt,with occasional layers of sand, sandy silt, and sandy clay. The soil profile was highly variable across the site, being more sandy in some areas, and more silty and clayey in other areas. The moisture content of near surface soil generally ranged from 5 to 15 percent. More detailed descriptions of the subsurface soil are presented on the boring logs (Appendix B).

2.2.1 Compressible and Collapsible Soil

Soil compressibility refers to a soil's potential for settlement when subjected to increased loads as from a fill surcharge. Based on this study, undocumented artificial fill and the upper portion of native soils are considered slightly to moderately compressible. Partial removal of near surface alluvium is recommended later in this report to reduce the potential for adverse total and differential settlement of the proposed improvements.

Collapse potential refers to the potential settlement of a soil under existing stresses upon being wetted. Based on this study, the onsite soils are anticipated to have a negligible collapse potential when inundated with water.

2.2.2 Expansive Soils

Expansive soils contain significant amounts of clay particles that swell considerably when wetted and shrink when dried. Foundations constructed on these soils are subjected to large uplifting forces caused by the swelling. Without proper measures taken, heaving and cracking of building foundations and slabs-on-grade could result.

A near surface soil sample was tested for expansion potential. The test result yielded an Expansion Index of 9. Hever, many ares of the site contained sandy silt soils near the surface. Based on this testing and our observations, the near-surface soil is expected to have a low to very low to low expansion potential.

2.2.3 Sulfate Content

Water-soluble sulfates in soil can react adversely with concrete. However, concrete in contact with soil containing sulfate concentrations of less than 0.1 percent by weight is considered to have negligible sulfate exposure based on American Concrete Institute (ACI) provisions, adopted by the 2016 CBC (CBC, 2016, Chapter 19, and ACI, 2014).

Near-surface soil samples were tested during this investigation for soluble sulfate content. The results of these tests indicate sulfate contents of less than 0.10 percent by weight, indicating negligible sulfate exposure.

2.2.4 Resistivity, Chloride and pH

Soil corrosivity to ferrous metals can be estimated by the soil's electrical resistivity, chloride content and pH. In general, soil having a minimum resistivity less than 1,000 ohm-cm is considered very severely corrosive.

Soil with a chloride content of 500 parts-per-million (ppm) or more is considered corrosive to ferrous metals.

As a screening for potentially corrosive soil, representative soil samples were tested during this investigation to determine minimum resistivity, chloride content, and pH. The tests indicated a minimum resistivity of 2,994 ohm-cm, chloride content of 180 ppm, and pH of 6.56. Based on these results, the onsite soil is considered moderately corrosive to ferrous metals.

2.3 Groundwater

Groundwater was not encountered in any of our borings drilled to a maximum depth of 51.5 feet bgs during our investigation.

The historically highest groundwater level indicated by the California Geological Survey (2006) is almost 100 feet bgs.

A well located approximately 1.8 miles northeast of the site maintained by the Main San Gabriel Basin Watermaster indicated the highest groundwater level of approximately 307 feet bgs from measurements taken from August 2011 through July 2019.

2.4 Faulting and Seismicity

In general, the primary seismic hazards for sites in the region include surface rupture along active faults and strong ground shaking. The potential for fault rupture and seismic shaking are discussed below.

2.4.1 Surface Faulting

No State of California or San Bernardino County established Earthquake Fault Zones have been mapped on or near the site. No active faults have been mapped in the near site vicinity in references we reviewed. The closest mapped active faults are the San Jose located about 2.5 miles south/southeast, the Sierra Madre located about 4 miles north, and the Elsinore located about 9 miles to the southwest. Based on our understanding of the current geologic framework, the potential for future surface rupture of active faults onsite is considered very low.

2.4.2 Seismic Design Parameters

The principal seismic hazard to the site is ground shaking resulting from an earthquake occurring along any of several major active and potentially active faults in southern California. The intensity of ground shaking at a given location depends primarily upon the earthquake magnitude, the distance from the seismic source, and the site response characteristics. The site should be expected to experience strong ground shaking after the proposed project is developed resulting from an earthquake occurring along one or more of the major active faults. Accordingly, the project should be designed in accordance with all applicable current codes and standards utilizing the appropriate seismic design parameters to reduce seismic risk as defined by California Geological Survey (CGS) Chapter 2 of Special Publication 117a (CGS, 2008). Through compliance with these regulatory requirements and the utilization of appropriate seismic design parameters selected by the design professionals, potential effects relating to seismic shaking can be reduced.

The following parameters should be considered for design under the 2019 CBC:

2019 CBC Seismic Design Parameters

2019 CBC Parameters (CBC or ASCE 7-16 reference)	Value 2019 CBC
Site Latitude and Longitude: 34.0731, -117.8916	
Site Class Definition (1613A.2.2, ASCE 7-16 Ch 20)	D
Mapped Spectral Response Acceleration at 0.2s Period (1613A.2.1), S_s	1.665 g
Mapped Spectral Response Acceleration at 1s Period (1613A.2.1), S_1	0.610 g
Short Period Site Coefficient at 0.2s Period (T1613A.2.3(1)), F_a	*1.0*
Long Period Site Coefficient at 1s Period (T1613A.2.3(2)), F_v	*1.7**
Adjusted Spectral Response Acceleration at 0.2s Period (1613A.2.3), S_{MS}	1.665 g
Adjusted Spectral Response Acceleration at 1s Period (1613A.2.3), S_{M1}	1.037* g
Design Spectral Response Acceleration at 0.2s Period (1613A.2.4), S_{DS}	1.110 g
Design Spectral Response Acceleration at 1s Period (1613A.2.4), S_{D1}	0.691 g
Mapped MCE_G peak ground acceleration (11.8.3.2, Fig 22-9 to 13), *PGA*	0.705
Site Coefficient for Mapped MCE_G *PGA* (11.8.3.2), F_{PGA}	1.1
Peak Ground Acceleration (1803A.5.12; 11.8.3.2), PGA_M	0.776 g

* Per Table 11.4-2 of Supplement 1 of ASCE 7-16, this value of Fv may only be used to calculate Ts [that note is not included in Table 1613A.2.3(2)]; note that SD1 and SM1 are functions of Fv. In addition, per Exception 2 of 11.4.8 of ASCE 7-16, special equations for Cs are required. This is in lieu of a site-specific ground motion hazard analysis per ASCE 7-16 Chapter 21.2.

** Site Class D, and all of the resulting parameters in this table, may only be used for structures with a fundamental period of vibration of 0.5 s or less on sites with potentially liquefiable soils, and for structures without seismic isolation or seismic damping systems.

Based on the 2019 CBC Table 1613A.2.3(2) footnote c., Fv should be determined in accordance with Section 11.4.8 of ASCE 7-16, since the mapped spectral response acceleration at 1 second is greater than 0.2g for Site Class D; in accordance with Section 11.4.8 of ASCE 7-16, a site-specific seismic analysis is required. However, the values provided in the table above may be utilized if design is performed in accordance with Exception (2) in Section 11.4.8 of ASCE 7-16, with special requirements for the seismic response coefficient (Cs), and Fv is only used for calculation of Ts. This exception does not apply for structures with seismic isolation or seismic damping systems. The project structural engineer should review the seismic parameters. A site-specific seismic ground motion analysis can be performed upon request.

Hazard deaggregation was estimated using the USGS Interactive Deaggregations utility. The results of this analysis indicate that the predominant modal earthquake has a magnitude of approximately 6.7 (M_W) at a distance on the order of 6 kilometers for the Maximum Considered Earthquake (2% probability of exceedance in 50 years).

2.5 Secondary Seismic Hazards

In general, secondary seismic hazards for sites in the region could include soil liquefaction, earthquake-induced settlement, lateral displacement, landsliding, and earthquake-induced flooding. The potential for secondary seismic hazards at the site is discussed below.

2.5.1 Liquefaction Potential

Liquefaction is the loss of soil strength or stiffness due to a buildup of pore-water pressure during severe ground shaking. Liquefaction is associated primarily with loose (low density), saturated, fine-to-medium grained, cohesionless soils. As the shaking action of an earthquake progresses, the soil grains are rearranged and the soil densifies within a short period of time. Rapid densification of the soil results in a buildup of pore-water pressure. When the pore-water pressure approaches the total overburden pressure, the soil reduces greatly in strength and temporarily behaves similarly to a fluid. Effects of liquefaction can include sand boils, settlement, and bearing capacity failures below structural foundations.

The California Geological Survey has mapped the site as having no liquefaction potential (California Geological Survey (CGS), 1999). Groundwater is currently and has historically been deep.

Based on the absence of shallow groundwater, the subsurface soils are not considered susceptible to liquefaction.

2.5.2 Seismically Induced Settlement

Seismically induced settlement consists of dry dynamic settlement (above groundwater) and liquefaction-induced settlement (below groundwater). During a strong seismic event, seismically induced settlement can occur within loose to moderately dense sandy soil due to reduction in volume during and shortly after an earthquake event. Settlement caused by ground shaking is often nonuniformly distributed, which can result in differential settlement.

We have performed analyses to estimate the potential for seismically induced settlement using the method of Tokimatsu and Seed, and based on Martin and Lew (1999), considering the maximum considered earthquake (MCE) peak ground acceleration (PGA_M). The results of our analyses that the onsite soils are susceptible to up to 2.5 inches of seismic settlement based on the overexcavation recommendations presented later in this report. Differential settlement due to seismic loading is estimated to be 1¼ inches over a horizontal distance of 40 feet.

2.6 Infiltration Testing

Two well permeameter tests (LB-1B, and LB-3B) were conducted in the south/southwestern portion of the site based on our discussions with the project civil engineer. Well permeameter tests were performed within soils typically described as sand with gravel and fines, silty clayey sand, and sand with silt at depths of about 15 feet.

Well permeameter tests are useful for field measurements of soil infiltration rates, and are suited for testing when the design depth of the basin or chamber is deeper than current existing grades. It should be noted that this is a clean-water, small-scale test, and that correction factors need to be applied. The test consists of excavating a boring to the depth of the test (or deeper if it is partially backfilled with soil and a bentonite plug with a thin soil covering is placed just below the design test elevation). A layer of clean sand is placed in the boring bottom to support temporary perforated well casing pipe and a float valve. In addition, gravel is poured around the outside of the well casing within the test zone to prevent the boring from caving/collapsing or eroding when water is added. The float valve, lowered into the boring inside the casing, adds water to the boring as water infiltrates into the soil, while maintaining a relatively constant water head in the boring. The incremental infiltration rate as measured during intervals of the test is defined as the incremental flow rate of water infiltrated, divided by the surface area of the infiltration interface. The test was conducted based on the USBR 7300-89 test method.

Raw infiltration rates at the well permeameter locations ranged from 0.0 to 0.6 inch per hour. See Section 3.7 for infiltration recommendations, including infiltration rates.

3.0 CONCLUSIONS AND RECOMMENDATIONS

Based on this study, construction of the proposed development is feasible from a geotechnical standpoint. No severe geologic or soils related issues were identified that would preclude development of the site for the proposed improvements. The most significant geotechnical issues at the site are those related to the potential for strong seismic shaking, and potentially compressible soils. Additionally, infiltration tests performed yielded low infiltration rates at the depths tested. Good planning and design of the project can limit the impact of these constraints. Remedial recommendations for these and other geotechnical issues are provided in the following sections.

Although not identified during this investigation, abandoned septic tanks, seepage pits, or other buried structures, trash pits, or items related to past site uses may be present. If such items are encountered during grading, they would require further evaluation and special consideration.

3.1 General Earthwork and Grading

All grading should be performed in accordance with the General Earthwork and Grading Specifications presented in Appendix E, unless specifically revised or amended below or by future recommendations based on final development plans.

3.1.1 Site Preparation

Prior to construction, the site should be cleared of debris, which should be disposed of offsite. Any underground obstructions should be removed. Resulting cavities should be properly backfilled and compacted. Efforts should be made to locate existing utility lines. Those lines should be removed or rerouted if they interfere with the proposed construction, and the resulting cavities should be properly backfilled and compacted.

3.1.2 Overexcavation and Recompaction

To reduce the potential for adverse total and differential settlement of the proposed structures, the underlying subgrade soil should be prepared in such a manner that a uniform response to the applied loads is achieved.

For the proposed structures, we recommend that the onsite soils be overexcavated to a minimum depth of 7 feet below the existing ground surface or 4 feet below the bottom of the proposed footings, whichever is deeper. In addition, all undocumented artificial fill should be removed. We encountered undocumented artificial fill at depths ranging from approximately 5 to 7.5 feet bgs. Deeper overexcavation may be recommended, depending on building loads. Where possible, the removal bottom should extend horizontally a minimum of 5 feet from the outside edges of the footings (including columns connected to the buildings), or a distance equal to the depth of overexcavation below the footings, whichever is farther. During overexcavation, the soil conditions should be observed by Leighton to further evaluate these recommendations based on actual field conditions encountered. A firm removal bottom should be established across the building footprint to provide uniform foundation support for the proposed structure. Leighton should observe and test the removal bottom prior to placing fill. Deeper overexcavation and recompaction may be recommended locally until a firm removal bottom is achieved.

Areas outside of the proposed structures planned for new asphalt or concrete pavement (such as drive aisles, parking areas or fire lanes), flatwork (such as sidewalks), site walls and low retaining walls (taller walls should be overexcavated per the recommendations for buildings), areas to receive fill, and other improvements, should be overexcavated to a minimum depth of 24 inches below existing grade or 12 inches below proposed subgrade (including the footing subgrade for walls), whichever is deeper.

After completion of the overexcavation, and prior to fill placement, the exposed surfaces should be scarified to a minimum depth of 6 inches, moisture conditioned to or slightly above optimum moisture content, and recompacted to a minimum 90 percent relative compaction, relative to the ASTM D1557 laboratory maximum density.

3.1.3 Fill Placement and Compaction

Onsite soil to be used for compacted structural fill should also be free of organic material debris and oversized material (greater than 8 inches in largest dimension). Any soil to be placed as fill, whether onsite or imported material, should be reviewed and possibly tested by Leighton.

Fill placement during wet weather may be problematic with onsite soils that are finer-grained, possibly requiring drying back or mixing with drier soils.

All fill soil should be placed in thin, loose lifts, moisture conditioned, as necessary to near optimum moisture content, and compacted to a minimum 90 percent relative compaction. Relative compaction should be determined in accordance with ASTM Test Method D1557. Aggregate base for pavement should be compacted to a minimum of 95 percent relative compaction.

3.1.4 Import Fill Soil

Import soil to be placed as fill should be geotechnically accepted by Leighton. Preferably at least 3 working days prior to proposed import to the site, the contractor should provide Leighton pertinent information of the proposed import soil, such as location of the soil, whether stockpiled or native in place, and pertinent geotechnical reports if available. We recommend that a Leighton representative visit the proposed import site to observe the soil conditions and obtain representative soil samples. Potential issues may include soil that is more expansive than onsite soil, soil that is too wet, soil that is too rocky or too dissimilar to onsite soils, oversize material, organics, debris, etc.

3.1.5 Shrinkage and Subsidence

The change in volume of excavated and recompacted soil varies according to soil type and location. This volume change is represented as a percentage increase (bulking) or decrease (shrinkage) in volume of fill after removal and recompaction. This value does not factor in removal of debris or other materials. Subsidence occurs as in-place soil (e.g., natural ground) is moisture-conditioned and densified to receive fill, such as in processing an overexcavation bottom. Subsidence is in addition to shrinkage due to recompaction of fill soil. Field and laboratory data used in our calculations included laboratory-measured maximum dry densities for soil types encountered at the subject site, the measured in-place densities of soils encountered and our experience. We preliminarily estimate the following earth volume changes will occur during grading:

Table 1 - Shrinkage and Subsidence Estimates

Shrinkage	Approximately 17% +/- 4%
Subsidence (overexcavation bottom processing)	Approximately 0.15 foot

The level of fill compaction, variations in the dry density of the existing soils and other factors influence the amount of volume change. Some adjustments to earthwork volume should be anticipated during grading of the site.

3.1.6 Rippability and Oversized Material

Oversized material (rock or rock fragments greater than 8 inches in dimension) was not observed during our investigation. Oversized material should not be placed as fill within structural fill areas.

3.2 Shallow Foundation Recommendations

The proposed buildings can be supported on shallow foundations. Maximum column loading and wall loading is not available at the time of this report. We have assumed that the proposed structures will be lightly loaded. Structural loading information should be provided to us when available for review.

Overexcavation and recompaction of the footing subgrade should be performed as detailed in Section 3.1. The following recommendations are based on the onsite soil conditions and soils with a very low to low expansion potential.

3.2.1 Minimum Embedment and Width

Based on our preliminary investigation, footings should have a minimum embedment per code requirements, with a minimum width of 24 and 12 inches for isolated and continuous footings, respectively.

3.2.2 Allowable Bearing

An allowable bearing pressure of 2,000 pounds per square foot (psf) may be used, based on an assumed embedment depth of 18 inches and minimum width described above. This allowable bearing value may be increased by 250 psf per foot increase in depth or width to a maximum allowable bearing pressure of 4,000 psf. If higher bearing pressures are required, this should be reviewed on a case-by-case basis and may include additional overexcavation and/or soil reinforcement. These allowable bearing pressures are for total dead load and sustained live loads. Footing reinforcement should be designed by the structural engineer.

3.2.3 Lateral Load Resistance

Soil resistance available to withstand lateral loads on a shallow foundation is a function of the frictional resistance along the base of the footing and the passive resistance that may develop as the face of the structure tends to move into the soil. The frictional resistance between the base of the foundation and the subgrade soil may be computed using a coefficient of friction of 0.35. The passive resistance may be computed using an allowable equivalent fluid pressure of 240 pounds per cubic foot (pcf), assuming there is constant contact between the footing and undisturbed soil. The coefficient of friction and passive resistance may be combined without further reduction.

3.2.4 Increase in Bearing and Friction - Short Duration Loads

The allowable bearing pressure and coefficient of friction values may be increased by one-third when considering loads of short duration, such as those imposed by wind and seismic forces.

3.2.5 Settlement Estimates

The recommended allowable bearing pressure is generally based on a total allowable, post-construction static settlement of 1 inch. Differential settlement due to static loading is estimated at ½ inch over a horizontal distance of 30 feet. Since settlement is a function of footing sustained load, size and contact bearing pressure, differential settlement can be expected between adjacent columns or walls where a large differential loading condition exists.

The total seismic settlement is estimated to be up to 2.5 inches based on the overexcavation recommendations presented in section 3.1. Differential seismic settlement is estimated at 1¼ inches over a horizontal distance of 40 feet. Adding this to the estimated static settlement results in an angular distortion of approximately 0.004L. This is within the differential settlement thresholds listed on Table 12.13-3 of ASCE 7-16 for structures within Risk Categories I through III, except for multistory masonry or concrete structures of Risk Category III. ASCE 7-16 C12.13.9.2 indicates that “the differential settlement limits specified in Table 12.13-3 are intended to provide collapse resistance for Risk Category II and III structures”; therefore, considerable structural damage may occur before the threshold is reached.

3.3 Recommendations for Slabs-On-Grade

Concrete slabs-on-grade should be designed by the structural engineer in accordance with the current CBC for soil with a low or very low expansion potential. Where conventional light floor loading conditions exist, the following minimum recommendations should be used. More stringent requirements may be required by local agencies, the structural engineer, the architect, or the CBC. Laboratory testing should be conducted at finish grade to evaluate the expansion index of near-surface subgrade soils. In addition, slabs-on-grade should have the following minimum recommended components:

- Subgrade Moisture Conditioning: The subgrade soil should be moisture conditioned to at least 2 percentage points above optimum moisture content to a minimum depth of 12 inches prior to placing the moisture vapor retarder, steel or concrete.

- Moisture Retarder: A minimum of 10-mil moisture retarder should be placed below slabs where moisture-sensitive floor coverings or equipment is planned. The structural engineer should specify pertinent concrete design parameters and moisture migration prevention measures, such as whether a capillary break should be placed under the vapor retarder and whether or not a sand blotter layer should be placed over the vapor retarder. However, ACI does not recommend placing sand under the slab and above the vapor barrier, but rather recommends specific concrete properties and curing procedures to mitigate cracking/curling during curing, such as wet curing of the slab to reduce the potential of rapid top hydration. The moisture barrier may be placed directly on subgrade provided gravel or other protruding objects that could puncture the moisture retarder are removed from the subgrade prior to placement. A heavier vapor retarder (such as 15 mil Stego Wrap) placed directly on prepared subgrade may also be used. Moisture retarders can reduce, but not eliminate moisture vapor rise from the underlying soils up through the slab. Moisture retarders should be designed and constructed in accordance with applicable American Concrete Institute, Portland Cement Association, Post-Tensioning Institute, ASTM International, and California Building Code requirements and guidelines.

- Concrete Thickness: Slabs-on-grade should be at least 4 inches thick (this is referring to the actual minimum thickness, not the nominal thickness). Reinforcing steel should be designed by the structural engineer, but as a minimum (for conventionally reinforced, 4-inch-thick slabs) should be No. 4 rebar placed at 18 inches on center, each direction, mid-depth in the slab. Crack control joints should be provided at a maximum spacing of 15 feet on center.

Minor cracking of the concrete as it cures, due to drying and shrinkage, is normal and should be expected. However, cracking is often aggravated by a high water/cement ratio, high concrete temperature at the time of placement, small nominal aggregate size, and rapid moisture loss due to hot, dry, and/or windy weather conditions during placement and curing. Cracking due to temperature and moisture fluctuations can also be expected. Low slump concrete can reduce the potential for shrinkage cracking. Additionally, our experience indicates that reinforcement in slabs and foundations can generally reduce the potential for concrete cracking. The structural engineer should consider these components in slab design and specifications.

Moisture retarders can reduce, but not eliminate moisture vapor rise from the underlying soils up through the slab. Floor covering manufacturers should be consulted for specific recommendations.

Leighton does not practice in the field of moisture vapor transmission evaluation, since this is not specifically a geotechnical issue. Therefore, we recommend that a qualified person, such as the flooring subcontractor and/or structural engineer, be consulted with to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. That person should provide recommendations for mitigation of potential adverse impact of moisture vapor transmission on various components of the structures as deemed appropriate.

3.4 Seismic Design Parameters

Seismic parameters presented in this report should be considered during project design. In order to reduce the effects of ground shaking produced by regional seismic events, seismic design should be performed in accordance with the current CBC. The CBC seismic design parameters listed in Table 1 of Section 2.4 of this report should be considered for the seismic analysis of the subject site.

3.5 Retaining Walls

We recommend that retaining walls be backfilled with very low expansive soil and constructed with a backdrain in accordance with the recommendations provided on Figure 3 (rear of text). Using expansive soil as retaining wall backfill will result in higher lateral earth pressures exerted on the wall. Based on these recommendations, the following parameters may be used for the design of conventional retaining walls:

Table 2 - Retaining Wall Lateral Earth Parameters

Static Equivalent Fluid Weight (pcf)	
Condition	Level Backfill
Active	35 pcf
At-Rest	65 pcf
Passive	240 pcf (allowable) (Maximum of 3,500 psf)

The above values do not contain an appreciable factor of safety unless noted, so the structural engineer should apply the applicable factors of safety and/or load factors during design, as specified by the California Building Code.

Cantilever walls that are designed to yield at least 0.001H, where H is equal to the wall height, may be designed using the active condition. Rigid walls and walls braced at the top should be designed using the at-rest condition.

Passive pressure is used to compute soil resistance to lateral structural movement. In addition, for sliding resistance, a frictional resistance coefficient of 0.35 may be used at the concrete and soil interface. The lateral passive resistance should be taken into account only if it is ensured that the soil providing passive resistance, embedded against the foundation elements, will remain intact with time.

In addition to the above lateral forces due to retained earth, surcharge due to improvements, such as an adjacent structure or traffic loading, should be considered in the design of the retaining wall. Loads applied within a 1:1 projection from the surcharging structure on the stem of the wall should be considered in the design.

We recommend that the wall designs for walls taller than 6 feet be checked seismically by adding an additive seismic equivalent fluid pressure (EFP) of 35 pcf, which is added to the active EFP.

A soil unit weight of 120 pcf may be assumed for calculating the actual weight of the soil over the wall footing.

3.6 Pavement Design

Flexible Pavements: Based the design procedures outlined in the current Caltrans Highway Design Manual, and using an assumed design R-value of 50, flexible pavement sections may consist of the following for the Traffic Index indicated. Final pavement design should be based on the Traffic Index determined by the project civil engineer and R-value testing provided near the end of grading.

Table 3 - Asphalt Pavement Section Thickness

Traffic Index	Asphaltic Concrete (AC) Thickness (inches)	Class 2 Aggregate Base Thickness (inches)
5 or less	3.0	4.0
6	3.5	4.0
7	4.0	4.5
8	5.0	5.0

If the pavement is to be constructed prior to construction of the structures, we recommend that the full depth of the pavement section be placed in order to support heavy construction traffic.

***Rigid Pavements*:** For onsite Portland Cement Concrete (PCC) pavement in truck drive aisles and truck parking areas, we recommend a minimum of 7-inch-thick concrete with dowels at construction joints, placed on compacted fill subgrade, with the upper 8 inches compacted to a minimum of 95 percent relative compaction. In areas with car traffic only, we recommend a minimum of 5-inch-thick concrete, placed on compacted fill subgrade with the upper 8 inches compacted to a minimum of 95 percent relative compaction.

The PCC pavement sections should be provided with crack-control joints spaced no more than 15 feet or 10 feet on center each way for 7-inch-thick and 5-inch-thick PCC, respectively. If sawcuts are used, they should have a minimum depth of ¼ of the slab thickness and made within 24 hours of concrete placement.

***Other Pavement Recommendations*:** Irrigation adjacent to pavements without a deep curb or other cutoff to separate landscaping from the paving may result in premature pavement failure.

All pavement construction should be performed in accordance with the Standard Specifications for Public Works Construction or Caltrans Specifications. Field observations and periodic testing, as needed during placement of the base course materials, should be undertaken to ensure that the requirements of the standard specifications are fulfilled.

Prior to placement of aggregate base, the subgrade soil should be processed to a minimum depth of 6 inches, moisture-conditioned, as necessary, and recompacted to a minimum of 95 percent relative compaction. Aggregate base should be moisture conditioned, as necessary, and compacted to a minimum of 95 percent relative compaction.

3.7 Infiltration Recommendations

Infiltration tests performed at depths of about 15 feet yielded raw infiltration rates ranging from about 0.0 and 0.6 inches per hour. Considering these results, infiltration into the onsite soils will be marginal at best. Infiltration systems may not be suitbale in portions of the site. If infiltration systems are to be considered, additional specific testing at the location and depth will be warrented. It appears that dry wells may be a feasible option.

Additional Review and Evaluation:

Infiltration rates are anticipated to vary significantly based on the location and depth. Infiltration concepts should be discussed with Leighton as infiltration plans are being developed. Leighton should review all infiltration plans, including specific locations and depths of proposed facilities. Further testing may be needed based on the design of infiltration facilities, particularly considering their type, depth and location.

3.8 Temporary Excavations

All temporary excavations, including utility trenches, retaining wall excavations and other excavations should be performed in accordance with project plans, specifications and all OSHA requirements.

No surcharge loads should be permitted within a horizontal distance equal to the height of cut or 5 feet, whichever is greater from the top of the slope, unless the cut is shored appropriately. Excavations that extend below an imaginary plane inclined at 45 degrees below the edge of any adjacent existing site foundation should be properly shored to maintain support of the adjacent structures.

Cantilever shoring should be designed based on an active equivalent fluid pressure of 35 pcf. If excavations are braced at the top and at specific design intervals, the active pressure may then be approximated by a rectangular soil pressure distribution with the pressure per foot of width equal to 25H, where H is equal to the depth of the excavation being shored.

During construction, the soil conditions should be regularly evaluated to verify that conditions are as anticipated. The contractor should be responsible for providing the "competent person" required by OSHA, standards to evaluate soil conditions. Close coordination between the competent person and the geotechnical engineer should be maintained to facilitate construction while providing safe excavations.

3.9 Trench Backfill

Utility-type trenches onsite can be backfilled with the onsite material, provided it is free of debris, significant organic material and oversized material. Prior to backfilling the trench, pipes should be bedded and shaded in a granular material that has a sand equivalent of 40 or greater; the material should be highly permeable and freely draining. The sand should extend 12 inches above the top of the pipe. The bedding/shading sand should be densified in-place by mechanical means, or by jetting if the trench walls are granular in accordance with Greenbook specifications. The native backfill should be placed in loose layers, moisture conditioned, as necessary, and mechanically compacted using a minimum standard of 90 percent relative compaction. The thickness of layers should be based on the compaction equipment used in accordance with the Standard Specifications for Public Works Construction (Greenbook).

3.10 Surface Drainage

Inadequate control of runoff water and/or poorly controlled irrigation can cause the onsite soils to expand and/or shrink, producing heaving and/or settlement of foundations, flatwork, walls, and other improvements. Maintaining adequate surface drainage, proper disposal of runoff water, and control of irrigation should help reduce the potential for future soil moisture problems.

Positive surface drainage should be designed to be directed away from foundations and toward approved drainage devices, such as gutters, paved drainage swales, or watertight area drains and collector pipes.

Surface drainage should be provided to prevent ponding of water adjacent to the structures. In general, the area around the buildings should slope away from the building. We recommend that unpaved landscaped areas adjacent to the buildings be avoided. Roof runoff should be carried to suitable drainage outlets by watertight drain pipes or over paved areas.

3.11 Sulfate Attack and Corrosion Protection

Based on the results of laboratory testing, concrete structures in contact with the onsite soil will have negligible exposure (Exposure Class S0) to water-soluble sulfates in the soil. Based on Table 19.3.2.1 of ACI 318-14, for this Exposure Class S0, there are no mix-design restrictions for sulfate exposure other than $f'c$

(28-day compressive strength) of at least 2,500 pounds per square inch (psi) for structural concrete. Note that this is based solely on tested site soils.

Concrete should be designed in accordance with ACI 318-14, Section 19.3 (ACI, 2014), adopted by the 2016 CBC (Section 1904.2).

The onsite soil is considered to be moderately corrosive to ferrous metals. Corrosion information presented in this report should be provided to your underground utility subcontractors.

3.12 Additional Geotechnical Services

The preliminary geotechnical recommendations presented in this report are based on subsurface conditions as interpreted from limited subsurface explorations and limited laboratory testing. Our supplemental geotechnical recommendations provided in this report are based on information available at the time the report was prepared and may change as plans are developed. Additional geotechnical investigation and analysis may be required based on final improvement plans. Leighton should review the site and grading plans when available and comment further on the geotechnical aspects of the project. Geotechnical observation and testing should be conducted during excavation and all phases of grading operations. Our conclusions and preliminary recommendations should be reviewed and verified by Leighton during construction and revised accordingly if geotechnical conditions encountered vary from our preliminary findings and interpretations.

Geotechnical observation and testing should be provided:

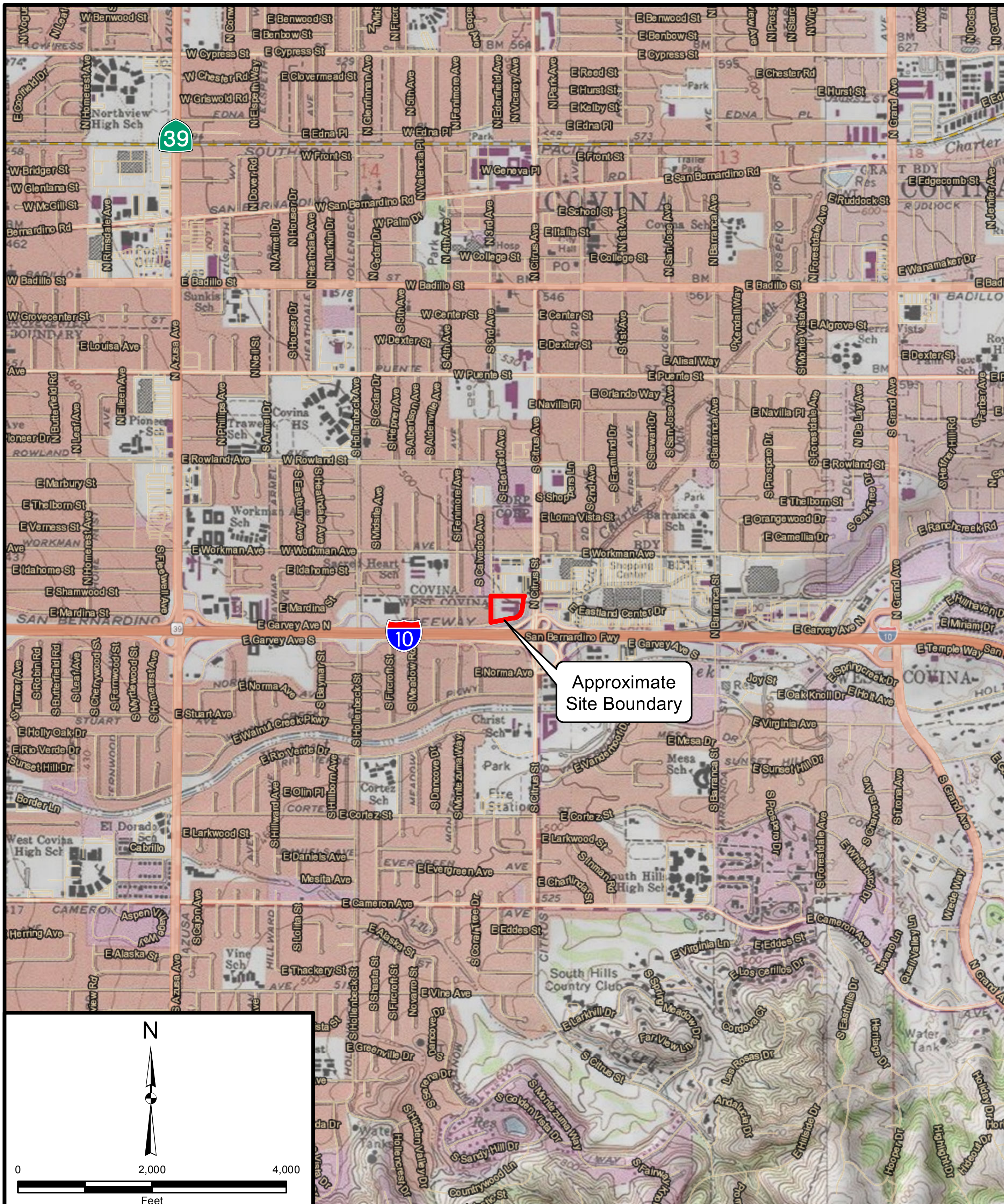
- After completion of site clearing.
- During overexcavation of compressible soil.
- During compaction of all fill materials.
- After excavation of all footings and prior to placement of concrete.
- During utility trench backfilling and compaction.
- During pavement subgrade and base preparation.
- When any unusual conditions are encountered.

4.0 LIMITATIONS

This report was based in part on data obtained from a limited number of observations, site visits, soil excavations, samples, and tests. Such information is, by necessity, incomplete. The nature of many sites is such that differing soil or geologic conditions can be present within small distances and under varying climatic conditions. Changes in subsurface conditions can and do occur over time. Therefore, our findings, conclusions, and recommendations presented in this report are based on the assumption that Leighton Consulting, Inc. will provide geotechnical observation and testing during construction.

This report was prepared for the sole use of Brenton Development Corporation for application to the design of the proposed retail development in accordance with generally accepted geotechnical engineering practices at this time in California.

See the GBA insert on the following page for important information about this geotechnical engineering report.



Project: 12680.001	Geol: SGO
Scale: 1 " = 2,000 '	Date: April 2020

Base Map: ESRI ArcGIS Online 2020
Thematic Information: Leighton
Author: Leighton Geomatics (mmurphy)

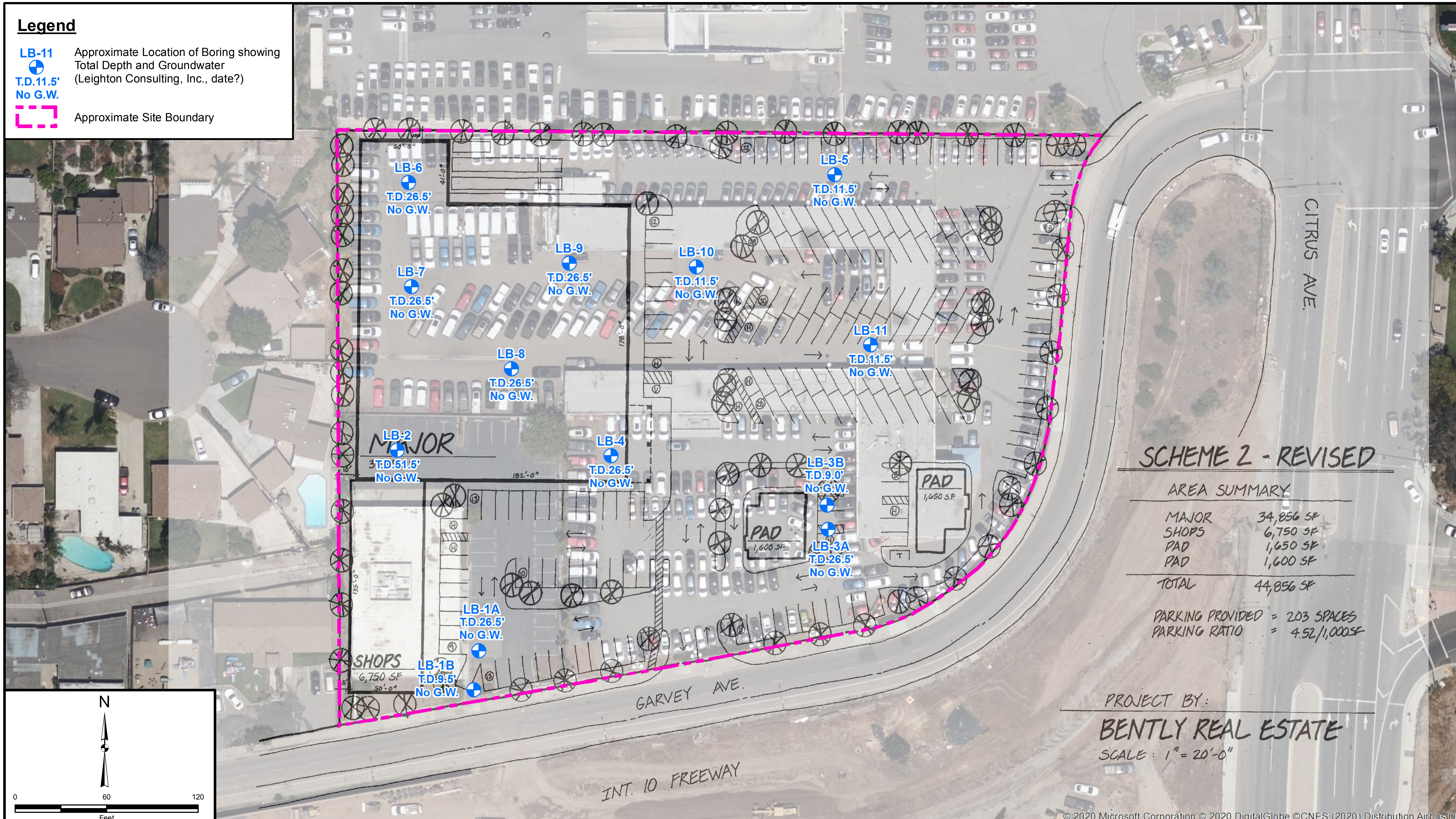
SITE LOCATION MAP

Proposed Retail Development
2501 and 2539 East Garvey Avenue N
City of West Covina, California

Figure 1

Leighton

Map Saved as P:\Drafting\12680\001\Maps\12680-001_F01_SLM_2020-03-13.mxd on 3/13/2020 9:33:57 AM



Project: 12680.001 | Eng/Geol: SGO
Scale: 1 " = 60 ' | Date: April 2020

Base Map: Bing Maps, 2016 2020

Author: (mmurphy)

BORING LOCATION MAP

Proposed Retail Development
2501 and 2539 East Garvey Avenue N
City of West Covina, California

Figure 2

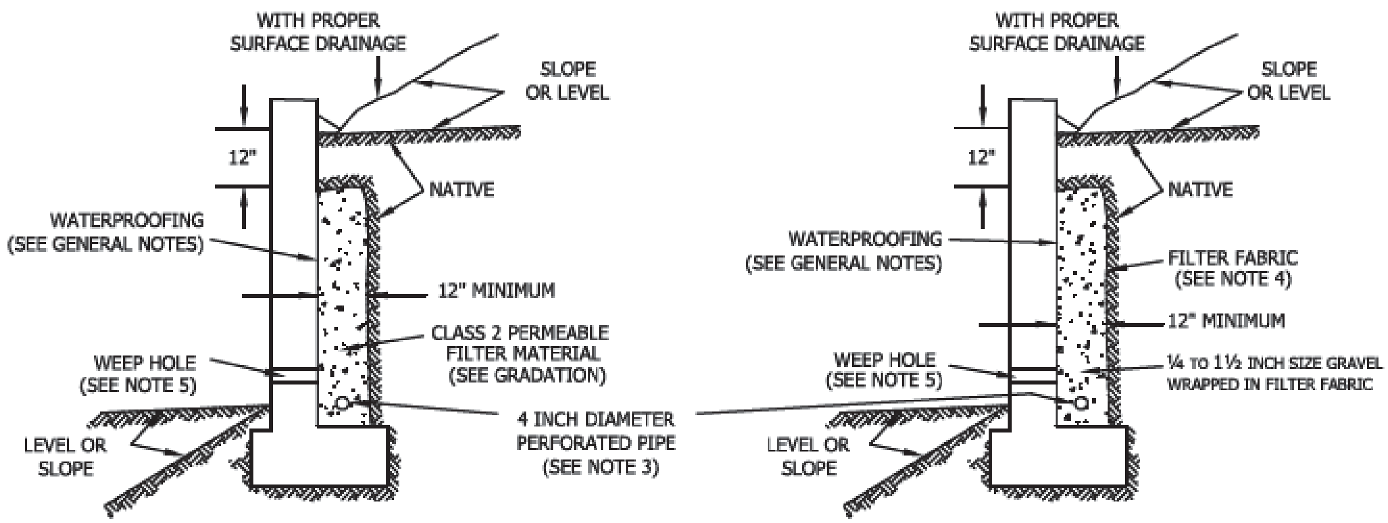
Leighton

Map Saved as P:\Drafting\12680\001\Maps\12680-001_F02_BLM_2020-03-13.mxd on 3/13/2020 9:29:49 AM

SUBDRAIN OPTIONS AND BACKFILL WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

OPTION 1: PIPE SURROUNDED WITH CLASS 2 PERMEABLE MATERIAL

OPTION 2: GRAVEL WRAPPED IN FILTER FABRIC



Class 2 Filter Permeable Material Gradation
Per Caltrans Specifications

Sieve Size	Percent Passing
1"	100
3/4"	90-100
3/8"	40-100
No. 4	25-40
No. 8	18-33
No. 30	5-15
No. 50	0-7
No. 200	0-3

GENERAL NOTES:

* Waterproofing should be provided where moisture nuisance problem through the wall is undesirable.
* Water proofing of the walls is not under purview of the geotechnical engineer
* All drains should have a gradient of 1 percent minimum

*Outlet portion of the subdrain should have a 4-inch diameter solid pipe discharged into a suitable disposal area designed by the project engineer. The subdrain pipe should be accessible for maintenance (rodding)

*Other subdrain backfill options are subject to the review by the geotechnical engineer and modification of design parameters.

Notes:

1) Sand should have a sand equivalent of 30 or greater and may be densified by water jetting.
2) 1 Cu. ft. per ft. of 1/4- to 1 1/2-inch size gravel wrapped in filter fabric
3) Pipe type should be ASTM D1527 Acrylonitrile Butadiene Styrene (ABS) SDR35 or ASTM D1785 Polyvinyl Chloride plastic (PVC), Schedule 40, Armco A2000 PVC, or approved equivalent. Pipe should be installed with perforations down. Perforations should be 3/8 inch in diameter placed at the ends of a 120-degree arc in two rows at 3-inch on center (staggered)
4) Filter fabric should be Mirafi 140NC or approved equivalent.
5) Weephole should be 3-inch minimum diameter and provided at 10-foot maximum intervals. If exposure is permitted, weepholes should be located 12 inches above finished grade. If exposure is not permitted such as for a wall adjacent to a sidewalk/curb, a pipe under the sidewalk to be discharged through the curb face or equivalent should be provided. For a basement-type wall, a proper subdrain outlet system should be provided.
6) Retaining wall plans should be reviewed and approved by the geotechnical engineer.
7) Walls over six feet in height are subject to a special review by the geotechnical engineer and modifications to the above requirements.

RETAINING WALL BACKFILL AND SUBDRAIN DETAIL FOR WALLS 6 FEET OR LESS IN HEIGHT

WHEN NATIVE MATERIAL HAS EXPANSION INDEX OF ≤50

Leighton

Figure 3

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APPENDIX A

REFERENCES

Leighton

APPENDIX A

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APPENDIX B

GEOTECHNICAL LOGS

GEOTECHNICAL BORING LOG LB-10

Project No.	12680.001	**Date Drilled**	2-26-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	485'
Location	see Figure 2	**Sampled By**	ECB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
485	0			B1					Surface: 4" Asphalt over 2" Base **Undocumented Artificial Fill (Afu)**	
				R1	3 6 17	116	15	ML	@2.5' SANDY SILT (ML), stiff, dark brown, very moist, 80% fines (field estimate), fine sand	
480	5			R2	13 22 30	120	14	SM	**Alluvium (Qal)** @5.0' SILTY SAND with gravel (SM), dense, dark brown, dry, 40-50% fines (field estimate), fine sand, 15% subangular gravel up to 1/4" to 1/2" in dimension (field estimate), clotted	
						115	16		@7.5', Spoils: SILTY SAND	
475	10			R3	9 14 20			SM	@10.0' SILTY SAND (SM), medium dense, brown, moist, 60% fines (field estimate), fine sand	
									Total Depth: 11.5 feet **No groundwater encountered** **Backfilled to ground surface with soil cuttings and ashpalt patched on 2/26/2020**	
470	15									
465	20									
460	25									
455	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG LB-11

Project No.	12680.001	**Date Drilled**	2-26-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	487'
Location	see Figure 2	**Sampled By**	ECB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
	0			B1					Surface: 4" Asphalt over 2" Base **Undocumented Artificial Fill (Afu)**	
485				R1	5 6 7	115	14	ML	@2.5' SANDY SILT (ML), firm, dark brown, moist, 80% fines (field estimate), fine sand, 5% subangular gravel up to 1/4" in dimension (field estimate), pipe debris in cuttings	
	5			R2	9 20 27	118	15	CL	**Alluvium (Qal)** @5.0' SANDY CLAY (CL), very stiff, dark brown, slightly moist, 70% fines (field estimate), fine sand, <5% subrounded gravel up to 1/4" in dimension (field estimate), clotted	
480				R3	14 20 21	119	14	SM	@7.5' SILTY SAND (SM), medium dense, dark brown, slightly moist, 60% fines (field estimate), fine sand, clotted	
	10			R4	12 17 21	115	16	ML	@10.0' SANDY SILT (ML), very stiff, brown, moist, 90% fines (field estimate), fine sand	
475										
	15								**Total Depth: 11.5 feet** **No groundwater encountered** **Backfilled to ground surface with soil cuttings and ashpalt patched on 2/26/2020**	
470										
	20									
465										
	25									
460										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
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- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-1A

Project No.	12680.001	**Date Drilled**	2-25-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	483'
Location	see Figure 2	**Sampled By**	ECB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
	0			B1					Surface: 3.5" Asphalt over 3.5" Base **Undocumented Artificial Fill (Afu)**	
480				R1	5 6 5	116	12	SM	@2.5' SILTY SAND (SM), loose, dark brown, slightly moist, 20% fines (field estimate), very fine sand	
	5			R2	8 10 12	126	11	SC	**Alluvium (Qal)** @5.0' CLAYEY SAND (SC), medium dense, dark brown, moist, 15-20% fines (field estimate), fine sand, <5% 0.25-1.0" subrounded gravel up to 1/4" to 1" in dimension (field estimate)	
475				R3	4 6 6	116	10	SM	@7.5' SILTY SAND (SM), loose, dark brown, moist, 25% fines (field estimate), fine sand, 10% subangular gravel up to 1/4" to 1/2" in dimension (field estimate)	
	10			R4	3 3 3	111	8	SP-SM	@10.0' SAND with gravel (SP), very loose, brown, moist, 10% fines (field estimate), fine to medium sand, 20-30% subrounded gravel up to 1/4" to 2" in dimension (field estimate)	
470										
	15			R5	5 6 8	104	11	SP	@15.0' SAND (SP), loose, brown, moist, <5% fines (field estimate), fine to medium sand, <5% subangular gravel up to 1/4" in dimension (field estimate)	
465										
	20			R6	9 11 15	116	7	ML	@20.0' SANDY SILT (ML), stiff, dark brown, moist, 90% fines (field estimate), very fine sand	
460										
	25			S1	3 5 8			CL	@25.0' CLAY with sand (CL), firm, dark brown, moist, low to medium plasticity, 90% fines (field estimate), very fine sand	
455									**Total Depth: 26.5 feet** **No groundwater encountered** **Backfilled to ground surface with soil cuttings and ashpalt patched on 2/25/2020**	
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

* * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * *

GEOTECHNICAL BORING LOG LB-1B

Project No.	12680.001	**Date Drilled**	2-25-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	483'
Location	see Figure 2	**Sampled By**	ECB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0								PERCOLATION TESTING BORING	
480										
	5								Spoils: Primarily SILTY SAND, some gravel up to 2" in dimension	
475										
	10			R1	9 15 16	120	11	SM	@10.0' SILTY SAND with gravel (SM), medium dense, dark brown, moist, 15% fines (field estimate), fine sand, 15-20% subangular (fractured from auger) gravel up to 1/2" in dimension (field estimate)	
470										
	15								**Total Depth: 11.5 feet, caved in to 9.5 feet** **No groundwater encountered** **Bottom tamped down, 6" of gravel at bottom, installed pipe with 2.5 bags of gravel around base** **Backfilled to ground surface with soil cuttings and ashpalt patched on 2/28/2020**	
465										
	20									
460										
	25									
455										
	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** This log is a part of a report by Leighton and should not be used as a stand-alone document. ***

GEOTECHNICAL BORING LOG LB-2

Project No.	12680.001	**Date Drilled**	2-25-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	485'
Location	see Figure 2	**Sampled By**	ECB

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
485	0			B1					Surface: 3' Asphalt over 2" Base **Undocumented Artificial Fill (Afu)**	
				R1	8 5 6	118	6	SM	@2.5' SILTY SAND (SM), loose, dark brown, slightly moist, 20-25% fines (field estimate), very fine sand, 10% subangular gravel up to 1/2" to 1" in dimension (field estimate)	
480	5			R2	7 12 13	113	8	SM	**Alluvium (Qal)** @5.0' SILTY SAND with gravel (SM), medium dense, dark brown, slightly moist, 30-40% fines (field estimate), very fine sand, 15% subrounded gravel up to 1/4" to 1" in dimension (field estimate)	
				R3	8 10 12	112	5	SP	@7.5' SAND with gravel (SP), medium dense, brown, slightly moist, <5% fines (field estimate), fine to coarse subrounded sand, 30% subangular gravel up to 1/4" to 1" in dimension (field estimate)	
475	10			R4	10 12 15	114	13	SM	@10.0' SILTY SAND (SM), medium dense, brown, moist, 30% fines (field estimate), <5% subangular gravel up to 1/4" in dimension (field estimate)	
470	15			R5	9 11 10	103	5	SP	@15.0' SAND with gravel (SP), medium dense, brown, slightly moist, <5% fines (field estimate), fine to coarse subangular sand, 30% subangular gravel up to 1/4" to 3/4" in dimension (field estimate), some rootlets	
465	20			R6	12 16 28	109	7	SM	@20.0' SILTY SAND (SM), medium dense, dark brown, slightly moist, 40% fines (field estimate), very fine sand, 5% subrounded gravel up to 1/2" in dimension (field estimate), some rootlets	
460	25			S1	11 15 15			SM	@25.0' SILTY SAND (SM), medium dense, dark brown, dry, 50% fines (field estimate), very fine sand, <5% subrounded gravel up to 1/4" in dimension (field estimate), clotted	
455	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-2

Project No.	12680.001	**Date Drilled**	2-25-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	485'
Location	see Figure 2	**Sampled By**	ECB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
455	30			R7	10 16 21	122	9	SM	@30.0' SILTY SAND (SM), medium dense, dark brown, slightly moist, 25% fines (field estimate), fine sand, 2% subrounded gravel up to 1/4" in dimension (field estimate), clotted	
450	35			S2	6 9 11			ML	@35.0' SILT (ML), stiff, dark brown, dry, 90% fines (field estimate), 10% fine sand, clotted	
445	40			R8	50/6"	108	5	SP	@40.0' SAND with gravel (SP), very dense, light brown, dry, <5% fines (field estimate), fine to coarse subrounded sand, 30% subrounded gravel up to 1/4" to 1" in dimension (field estimate)	
440	45			S3	13 14 16			SM	@45.0' SILTY SAND (SM), medium dense, light brown, slightly moist, 15% fines (field estimate), very fine to fine sand	
435	50			R9	14 30 39	101	4	SM	@50.0' SILTY SAND (SM), dense, light brown, slightly moist, 15% fines (field estimate), very fine to fine sand	
									Total Depth: 51.5 feet **No groundwater encountered** **Backfilled to ground surface with soil cuttings and ashpalt patched on 2/25/2020**	
430	55									
425	60									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-3A

Project No.	12680.001	**Date Drilled**	2-25-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	485'
Location	see Figure 2	**Sampled By**	ECB

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	Soil Description	Type of Tests
485	0			B1					Surface: 3" Asphalt over 2" Base **Undocumented Artificial Fill (Afu)**	
				R1	3 3 10	120	15	ML	@2.5' SANDY SILT (ML), firm, dark brown, wet, 85% fines (field estimate), very fine sand	
480	5			R2	11 18 25	116	17	CL	**Alluvium (Qal)** @5.0' SANDY CLAY (CL), very stiff, dark brown, dry, low to medium plasticity, 80% fines (field estimate), very fine sand, clotted	
				R3	8 20 26	120	15	SC	@7.5' CLAYEY SAND (SC), medium dense, dark brown, slightly moist, low plasticity, 30-40% fines (field estimate), fine sand, 3% subangular gravel up to 1/4" in dimension (field estimate)	
475	10			R4	15 29 50/5"	123	2	SP	@10.0' SAND with gravel (SP), very dense, light brown, dry, <5% fines (field estimate), fine to coarse subangular sand, 40-50% subangular (fractured from auger) gravel up to 1/4" to 2" in dimension (field estimate) upper 6": SILTY SAND, moist, 30% fines (field estimate)	
470	15			R5	13 18 23	70	17	CL-ML	@15.0' CLAYEY SILT (CL-ML), very stiff, dark brown, slightly moist, low plasticity, 95% fines (field estimate), <5% fractured (from auger) gravel up to 1/2" to 1" in dimension (field estimate), 4.0" cobble in opening of sampler	
465	20			R6	8 10 15	106	17	ML	@20.0' SANDY SILT (ML), very stiff, orange brown, moist, 60-70% fines (field estimate), very fine sand	
460	25			S1	6 7 12			ML	@25.0' SILT (ML), stiff, brown, slightly moist, 100% fines (field estimate), clotted	
									Total Depth: 26.5 feet **No groundwater encountered** **Backfilled to ground surface with soil cuttings and ashpalt patched on 2/25/2020**	
455	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-3B

Project No.	12680.001	**Date Drilled**	2-25-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	485'
Location	see Figure 2	**Sampled By**	ECB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
485	0								PERCOLATION TESTING BORING	
480	5								Spoils: Primarily SILTY SAND, some gravel up to 1" in dimension	
475	10			R1	13 19 21	128	7	SM	@10.0' SILTY SAND with gravel (SM), medium dense, brown, moist, 20-30% fines (field estimate), fine to medium sand, 10% angular (fractured from auger) gravel up to 1" to 2" in dimension (field estimate)	
470	15								**Total Depth: 11.5 feet, caved in to 9.0 feet** **No groundwater encountered** **Bottom tamped down, 2" of gravel at bottom, installed pipe with 2.0 bags of gravel around base** **Backfilled to ground surface with soil cuttings and ashpalt patched on 2/28/2020**	
465	20									
460	25									
455	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-4

Project No.	12680.001	**Date Drilled**	2-25-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	485'
Location	see Figure 2	**Sampled By**	ECB

SOIL DESCRIPTION

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
485	0			B1					Surface: 6" Asphalt over 1" Base **Undocumented Artificial Fill (Afu)**	
				R1	15 11 11	110	6	SM	@2.5' SILTY SAND (SM), medium dense, brown, slightly moist, 20% fines (field estimate), very fine to fine sand	
480	5			R2	15 16 14	114	7	SM	**Alluvium (Qal)** @5.0' SILTY SAND (SM), medium dense, dark brown, dry, 50% fines (field estimate), fine sand, 5% subrounded gravel up to 1/4" to 1/2" in dimension (field estimate), clotted	
				R3	10 14 16	109	6	SM	@7.5' same material as 5.0'	
475	10			R4	19 20 20	113	5	SP-SM	@10.0' SAND (SP), medium dense, light brown, dry, 10% fines (field estimate), <5% 0.25" subangular gravel up to 1/4" in dimension (field estimate), clotted	
470	15			R5	14 17 23	109	8	SM	@15.0' SILTY SAND (SM), medium dense, brown, slightly moist, 30% fines (field estimate), fine sand, clotted	
465	20			R6	12 19 23	116	12	SM	@20.0' SILTY SAND (SM), medium dense, brown, dry, 30% fines (field estimate), fine sand	
460	25			S1	7 9 11			ML	@25.0' SILT (ML), stiff, light brown, dry, 100% fines (field estimate), clotted	
									Total Depth: 26.5 feet **No groundwater encountered** **Backfilled to ground surface with soil cuttings and ashpalt patched on 2/25/2020**	
455	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-5

Project No.	12680.001	**Date Drilled**	2-26-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	487'
Location	see Figure 2	**Sampled By**	ECB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0			B1					Surface: 6" Asphalt over 1" Base **Undocumented Artificial Fill (Afu)**	
485				R1	6 8 8	117	9	SM	@2.5' SILTY SAND with gravel (SM), loose, dark brown, moist, 20-30% fines (field estimate), fine sand, 10% subangular gravel up to 1/4" to 1" in dimension (field estimate)	
	5			R2	7 9 11	115	4	SP	**Alluvium (Qal)** @5.0' SAND with gravel (SP), medium dense, light brown, moist, 2-5% fines (field estimate), fine to coarse subangular sand, 30-40% subrounded gravel up to 1/4" to 1" in dimension (field estimate)	
480				R3	12 12 14	110	13	SM	@7.5' SILTY SAND (SM), medium dense, dark brown, very moist, 40-50% fines (field estimate), fine to medium sand top 3": SAND with gravel, light brown, 40% gravel up to 1/4" to 2" in dimension (field estimate)	
	10			R4	7 19 29	118	15	SC	@10.0' CLAYEY SAND (SC), medium dense, dark brown, moist, 30-40% fines (field estimate), very fine sand	
475										
	15								**Total Depth: 11.5 feet** **No groundwater encountered** **Backfilled to ground surface with soil cuttings and ashpalt patched on 2/26/2020**	
470										
	20									
465										
	25									
460										
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
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- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-6

Project No.	12680.001	**Date Drilled**	2-26-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	486'
Location	see Figure 2	**Sampled By**	ECB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
	0			B1					Surface: 4" Asphalt over 7" Base **Undocumented Artificial Fill (Afu)**	
485				R1	3 3 3	111	10	SM	@2.5' SILTY SAND with gravel (SM), very loose, dark brown, moist, 30-40% fines (field estimate), fine to medium sand, 15% subrounded gravel up to 1/4" to 1" in dimension (field estimate)	
480	5			R2	5 5 7	115	8	SP-SM	@5.0' SAND with gravel (SP-SM), loose, brown, moist, 10% fines (field estimate), fine to coarse subangular sand, 30% subangular (fractured from auger drill) gravel up to 1/4" to 2" in dimension (field estimate)	
				R3	5 14 30	113	6	SP-SM	**Alluvium (Qal)** @7.5' SAND with gravel (SP-SM), medium dense, brown, moist, 10% fines (field estimate), fine to coarse subangular sand, 40% subangular gravel up to 1/4" to 2" in dimension (field estimate)	
475	10			R4	23 40 35	117	4	SP	@10.0' SAND with gravel (SP), dense, brown, moist, 5% fines (field estimate), fine to coarse subangular sand, 40% subrounded to subangular gravel up to 1/4" to 3" in dimension (field estimate)	
470	15			R5	24 27 39	114	7	SP	@15.0' SAND with gravel (SP), dense, brown, very moist, 5% fines (field estimate), fine to coarse subrounded to subangular sand, 25% gravel up to 1" in dimension (field estimate)	
465	20			R6	8 13 17	115	14	ML	@20.0' SANDY SILT (ML), very stiff, dark brown, very moist, 80% fines (field estimate), very fine sand	
460	25			S1	5 6 8			ML	@25.0' SILT (ML), stiff, dark brown, moist, 100% fines (field estimate)	
	30								**Total Depth: 26.5 feet** **No groundwater encountered** **Backfilled to ground surface with soil cuttings and ashpalt patched on 2/26/2020**	

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

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GEOTECHNICAL BORING LOG LB-7

Project No.	12680.001	**Date Drilled**	2-26-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	485'
Location	see Figure 2	**Sampled By**	ECB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
485	0			B1					Surface: 6" Asphalt over 1" Base **Undocumented Artificial Fill (Afu)**	
				R1	3 3 3	118	6	SM	@2.5' SILTY SAND with gravel (SM), very loose, dark brown, moist, 30-40% fines (field estimate), fine sand, 15-20% subrounded to subangular gravel up to 1/4" to 1" in dimension (field estimate)	
480	5			R2	4 4 4	108	5	SP	@5.0' SAND with gravel (SP), loose, brown, moist, 5% fines (field estimate), fine to coarse subrounded sand, 15-20% subrounded (some fractured by auger) gravel and cobbles up to 1/4" to 4" in dimension (field estimate)	
				R3	6 8 12	113	15	ML	**Alluvium (Qal)** @7.5' SANDY SILT (ML), stiff, brown, very moist, 70% fines (field estimate), very fine sand, <5% subangular gravel up to 1/4" in dimension (field estimate)	
475	10			R4	10 17 21	118	15	ML	@10.0' SANDY SILT (ML), very stiff, brown, moist, 60% fines (field estimate), very fine sand	
470	15			R5	9 10 12	113	9	SM	@15.0' SILTY SAND (SM), medium dense, dark brown, very moist, 30-40% fines (field estimate), very fine to fine sand	
465	20			R6	10 10 19	117	9	ML	@20.0' SANDY SILT (ML), very stiff, dark brown, moist, 80% fines (field estimate), fine sand upper 6": SILTY SAND, brown, moist, 40% fines (field estimate), fine sand	
460	25			S1	8 11 11			CL	@25.0' SANDY CLAY (CL), stiff, brown, slightly moist, low plasticity, 80% fines (feild estimate), very fine sand	
									Total Depth: 26.5 feet **No groundwater encountered** **Backfilled to ground surface with soil cuttings and ashpalt patched on 2/26/2020**	
455	30									

This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-8

Project No.	12680.001	**Date Drilled**	2-26-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	484'
Location	see Figure 2	**Sampled By**	ECB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION *This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.*	Type of Tests
	0			B1					Surface: 4" Asphalt over 3" Base **Undocumented Artificial Fill (Afu)**	
				R1	6 8 12	109	9	SM	@2.5' SILTY SAND (SM), medium dense, dark brown, moist, 30% fines (field estimate), fine sand, <5% subrounded gravel up to 1/4" in dimension (field estimate)	
480										
	5			R2	15 16 17	111	7	SM	**Alluvium (Qal)** @5.0' SILTY SAND with gravel (SM), medium dense, brown, slightly moist, 20% fines (field estimate), fine to medium sand, 20% subangular gravel up to 1/4" to 1/2" in dimension (field estimate), clotted	
				R3	16 27 42	122	13	SM	@7.5' SILTY SAND (SM), dense, brown, slightly moist, 20-30% fines (field estimate), fine sand, 5% subrounded gravel up to 1/4" in dimension (field estimate), clotted	
475										
	10			R4	16 27 37	123	11	ML	@10.0' SANDY SILT (ML), hard, orange dark brown, moist, 60-70% fines (field estimate), fine sand	
470										
	15			R5	8 10 15	104	14	ML	@15.0' SILT (ML), stiff, light brown, slightly moist, 100% fines (field estimate), clotted	
465										
	20			R6	8 15 16	111	16	ML	@20.0' SILT (ML), very stiff, brown, slightly moist, 90% fines (field estimate), fine sand	
460										
	25			S1	8 12 12			ML	@25.0' SILT (ML), stiff, brown, slightly moist, 90% fines (field estimate), fine sand	
									Total Depth: 26.5 feet **No groundwater encountered** **Backfilled to ground surface with soil cuttings and ashpalt patched on 2/26/2020**	
455										
	30									

SAMPLE TYPES:
- **B** BULK SAMPLE
- **C** CORE SAMPLE
- **G** GRAB SAMPLE
- **R** RING SAMPLE
- **S** SPLIT SPOON SAMPLE
- **T** TUBE SAMPLE

TYPE OF TESTS:
- **-200** % FINES PASSING
- **AL** ATTERBERG LIMITS
- **CN** CONSOLIDATION
- **CO** COLLAPSE
- **CR** CORROSION
- **CU** UNDRAINED TRIAXIAL
- **DS** DIRECT SHEAR
- **EI** EXPANSION INDEX
- **H** HYDROMETER
- **MD** MAXIMUM DENSITY
- **PP** POCKET PENETROMETER
- **RV** R VALUE
- **SA** SIEVE ANALYSIS
- **SE** SAND EQUIVALENT
- **SG** SPECIFIC GRAVITY
- **UC** UNCONFINED COMPRESSIVE STRENGTH

GEOTECHNICAL BORING LOG LB-9

Project No.	12680.001	**Date Drilled**	2-26-20
Project	Brenton- West Covina Retail Center	**Logged By**	ECB
Drilling Co.	2R Drilling	**Hole Diameter**	8"
Drilling Method	Hollow Stem Auger - 140lb - Autohammer - 30" Drop	**Ground Elevation**	486'
Location	see Figure 2	**Sampled By**	ECB

Elevation Feet	Depth Feet	Graphic Log (N S)	Attitudes	Sample No.	Blows Per 6 Inches	Dry Density pcf	Moisture Content, %	Soil Class. (U.S.C.S.)	SOIL DESCRIPTION	Type of Tests
									This Soil Description applies only to a location of the exploration at the time of sampling. Subsurface conditions may differ at other locations and may change with time. The description is a simplification of the actual conditions encountered. Transitions between soil types may be gradual.	
485	0								Surface: 3" Asphalt over 2" Base **Undocumented Artificial Fill (Afu)**	
				R1	4 4 6	118	10	ML	@2.5' SANDY SILT (ML), loose, dark brown, very moist, 70% fines (field estimate), fine sand, 10% subangular gravel up to 1/4" to 2" in dimension (field estimate)	
480	5			R2	9 15 21	123	5	SC	**Alluvium (Qal)** @5.0' CLAYEY SAND with gravel (SC), medium dense, brown, moist, 25% fines (field estimate), fine to coarse subrounded sand, 30% subrounded gravel up to 1/4" to 3" in dimension (field estimate)	
				R3	9 15 24	122	14	ML	@7.5' SANDY SILT (ML), very stiff, dark brown, slightly moist, 70% fines (field estimate), fine sand, <5% subrounded gravel up to 1/4" in dimension (field estimate)	
475	10			R4	10 19 28	115	16	SM	@10.0' SILTY SAND (SM), medium dense, brown, moist, 60% fines (field estimate), fine sand	
470	15			R5	11 11 11	112	10	SM	@15.0' SILTY SAND (SM), medium dense, brown, moist, 40-50% fines (field estimate), fine sand	
465	20			R6	9 13 20	117	13	ML	@20.0' SANDY SILT (ML), very stiff, brown, moist, 80% fines (field estimate), fine sand, clotted	
460	25			S1	5 6 8			ML	@25.0' SILT (ML), stiff, brown, slightly moist, 100% fines (field estimate), clotted	
									Total Depth: 26.5 feet **No groundwater encountered** **Backfilled to ground surface with soil cuttings and ashpalt patched on 2/26/2020**	
	30									

SAMPLE TYPES:
- B BULK SAMPLE
- C CORE SAMPLE
- G GRAB SAMPLE
- R RING SAMPLE
- S SPLIT SPOON SAMPLE
- T TUBE SAMPLE

TYPE OF TESTS:
- -200 % FINES PASSING
- AL ATTERBERG LIMITS
- CN CONSOLIDATION
- CO COLLAPSE
- CR CORROSION
- CU UNDRAINED TRIAXIAL
- DS DIRECT SHEAR
- EI EXPANSION INDEX
- H HYDROMETER
- MD MAXIMUM DENSITY
- PP POCKET PENETROMETER
- RV R VALUE
- SA SIEVE ANALYSIS
- SE SAND EQUIVALENT
- SG SPECIFIC GRAVITY
- UC UNCONFINED COMPRESSIVE STRENGTH

*** * * This log is a part of a report by Leighton and should not be used as a stand-alone document. * * ***

Results of Falling Head Infiltration Test

Leighton

Project: Vernola Apartments

Exploration #/Location:	*B-1B*
Depth Boring drilled to (ft):	11.5
Tested by:	JDO
USCS Soil Type in test zone:	SM
Weather (start to finish):	
Liquid Used/pH:	
Measured boring diameter:	9 in.
Approx Depth to GW below GS:	ft
Well Prep:	6" gravel below pipe

4.5 in. Well Radius

Initial estimated Depth to Water Surface (in.):	11
Average depth of water in well, "h" (in.):	103
approx. h/r:	22.9
Tu (Fig. 8) (ft):	-0.9
Tu>3h?:	No, Cannot use Condition I Equation, must re-evaluate, shal
Cross-sectional area for vol calcs (in.^2):	63.6

	ft	in.	Total (in.)
Depth to Bot of well (or top of soil over Bentonite)	9. ft	6. in.	114
Pilot Tube stickup (+ is above ground)		-2. in.	-2
Depth to top of sand outside of casing from top of pilot tube			

Field Data / **Calculations**

Date	Time	Depth to WL in Boring (measured from top of pilot tube) ft	Depth to WL in Boring (measured from top of pilot tube) in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	Vol Change (in.^3) from Δh	Vol Change (in.^3) Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date 1/1/2019	Start time:																		
-																			
2/27/20	10:11		0				608291	2.0	112.0										
2/27/20	10:22		0.75			11	608302	2.8	111.3	-0.75	112	0	48	48	4	260	0.9	0.01	**0.07**
2/27/20	10:32		1.5			10	608312	3.5	110.5	-0.75	111	0	48	48	5	286	0.9	0.01	**0.08**
2/27/20	10:42		2.5			10	608322	4.5	109.5	-1	110	0	64	64	6	382	0.921	0.01	**0.11**
2/27/20	10:52		3.25			10	608332	5.3	108.8	-0.75	109	0	48	48	5	286	0.9	0.01	**0.08**
2/27/20	11:02		4			10	608342	6.0	108.0	-0.75	108	0	48	48	5	286	0.9	0.01	**0.08**
2/27/20	11:15		5			13	608355	7.0	107.0	-1	108	0	64	64	5	293	0.9	0.01	**0.09**
2/27/20	11:30		6			15	608370	8.0	106.0	-1	107	0	64	64	4	254	0.9	0.01	**0.08**
2/27/20	11:40		6.5			10	608380	8.5	105.5	-0.5	106	0	32	32	3	191	0.9	0.01	**0.06**
2/27/20	11:50		7			10	608390	9.0	105.0	-0.5	105	0	32	32	3	191	0.9	0.01	**0.06**
2/27/20	12:06		8			16	608406	10.0	104.0	-1	105	0	64	64	4	238	0.9	0.01	**0.07**
2/27/20	12:26		9			20	608426	11.0	103.0	-1	104	0	64	64	3	191	0.9	0.01	**0.06**
2/27/20	12:36		9.25			10	608436	11.3	102.8	-0.25	103	0	16	16	2	95	0.9	0.00	**0.03**
2/27/20	12:45		9.75			9	608445	11.8	102.3	-0.5	103	0	32	32	4	212	0.9	0.01	**0.07**
2/27/20	13:10		11			25	608470	13.0	101.0	-1.25	102	0	79	79	3	191	0.9	0.01	**0.06**

Results of Falling Head Infiltration Test

Leighton

Project: Vernola Apartments

Exploration #/Location: *B-3B*

Depth Boring drilled to (ft): 11.5

Tested by: JDO

USCS Soil Type in test zone: SM

Weather (start to finish):

Liquid Used/pH:

Measured boring diameter: 8 in. 4 in. Well Radius

Approx Depth to GW below GS: ft

Well Prep: 2" gravel below pipe

Initial estimated Depth to Water Surface (in.): 11

Average depth of water in well, "h" (in.): 97

approx. h/r: 24.2

Tu (Fig. 8) (ft): -0.9

Tu>3h?: No, Cannot use Condition I Equation, must re-evaluate, shallo

Cross-sectional area for vol calcs (in.^2): 50.2

	ft	in.	Total (in.)
Depth to Bot of well (or top of soil over Bentonite)	9. ft		108
Pilot Tube stickup (+ is above ground)		-2.5 in.	-2.5
Depth to top of sand outside of casing from top of pilot tube			

Field Data / **Calculations**

Date	Time	Depth to WL in Boring (measured from top of pilot tube) ft	Depth to WL in Boring (measured from top of pilot tube) in.	Water Temp (deg F)	Comments	Δt (min)	Total Elapsed Time (min.)	Depth to WL in well (in.)	h, Height of Water in Well (in.)	Δh (in.)	Avg. h	Vol Change (in.^3) from supply	Vol Change (in.^3) from Δh	Vol Change (in.^3) Total	Flow (in^3/ min)	q, Flow (in^3/ hr)	V (Fig 9)	K20, Coef. Of Perme-ability at 20 deg C (in./hr)	Infiltration Rate [flow/surf area] (in./hr) (FS=1)
Start Date 1/1/2019	Start time:																		
-																			
2/27/20	9:54		0				608274	2.5	105.5										
2/27/20	10:02		6			8	608282	8.5	99.5	-6	103	0	301	301	38	2261	0.9	0.10	**0.79**
2/27/20	10:15		6			13	608295	8.5	99.5	0	100	0	0	0	0	0	0.9	0.00	**0.00**
2/27/20	10:25		6			10	608305	8.5	99.5	0	100	0	0	0	0	0	0.921	0.00	**0.00**
2/27/20	10:35		6			10	608315	8.5	99.5	0	100	0	0	0	0	0	0.9	0.00	**0.00**
2/27/20	10:45		6			10	608325	8.5	99.5	0	100	0	0	0	0	0	0.9	0.00	**0.00**
2/27/20	11:40		7			55	608380	9.5	98.5	-1	99	0	50	50	1	55	0.9	0.00	**0.02**
2/27/20	12:00		7.5			20	608400	10.0	98.0	-0.5	98	0	25	25	1	75	0.9	0.00	**0.03**
2/27/20	12:15		8			15	608415	10.5	97.5	-0.5	98	0	25	25	2	100	0.9	0.00	**0.04**
2/27/20	12:30		8			15	608430	10.5	97.5	0	98	0	0	0	0	0	0.9	0.00	**0.00**
2/27/20	12:46		9			16	608446	11.5	96.5	-1	97	0	50	50	3	188	0.9	0.01	**0.07**
2/27/20	13:12		9.25			26	608472	11.8	96.3	-0.25	96	0	13	13	0	29	0.9	0.00	**0.01**

APPENDIX C

LABORATORY TEST RESULTS

Leighton

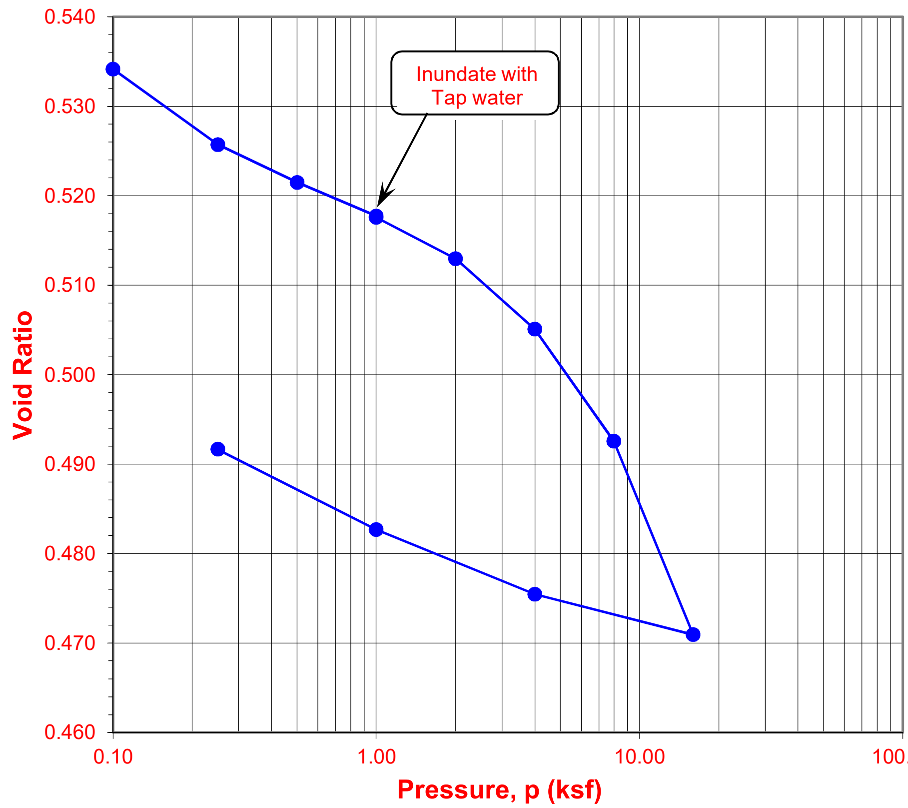
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Leighton

Project Name:	Brenton/West Covina	Tested By: G. Bathala	Date: 03/14/20
Project No.:	12680.001	Checked By: A. Santos	Date: 03/26/20
Boring No.:	LB-7	Depth (ft.): 7.5	
Sample No.:	R3	Sample Type: Ring	
Soil Identification:	Yellowish brown sandy silty clay s(CL-ML)		

Sample Diameter (in.):	2.415
Sample Thickness (in.):	1.000
Weight of Sample + ring (g):	199.00
Weight of Ring (g):	45.96
Height after consol. (in.):	0.9721
Before Test	
Wt. of Wet Sample+Cont. (g):	266.70
Wt. of Dry Sample+Cont. (g):	239.50
Weight of Container (g):	63.30
Initial Moisture Content (%)	15.4
Initial Dry Density (pcf)	110.3
Initial Saturation (%):	78
Initial Vertical Reading (in.)	0.1241
After Test	
Wt. of Wet Sample+Cont. (g):	270.42
Wt. of Dry Sample+Cont. (g):	248.28
Weight of Container (g):	68.91
Final Moisture Content (%)	16.60
Final Dry Density (pcf):	114.1
Final Saturation (%):	93
Final Vertical Reading (in.)	0.1538
Specific Gravity (assumed):	2.71
Water Density (pcf):	62.43

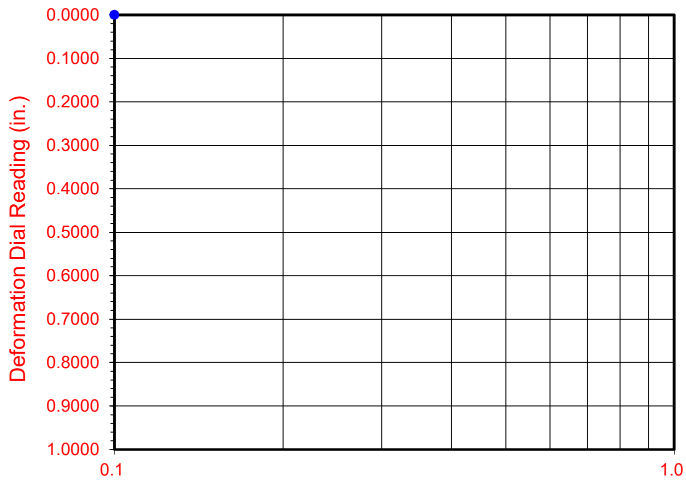


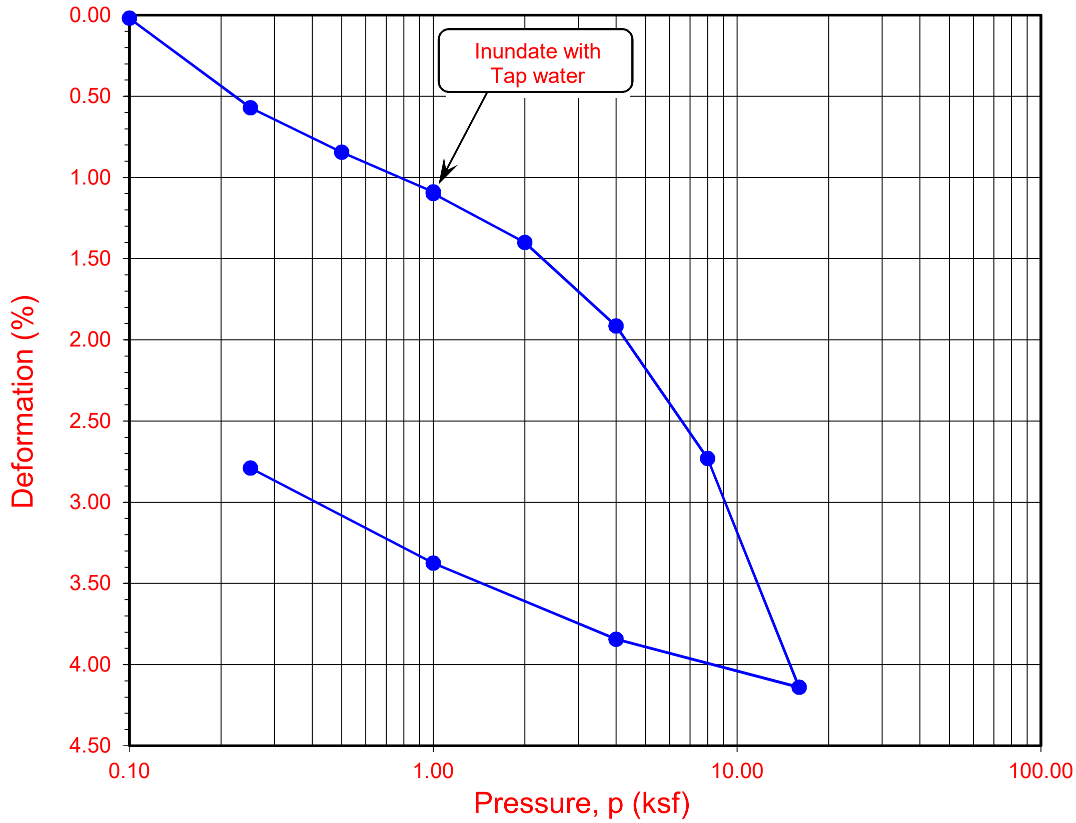
Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deforma-tion (%)
0.10	0.1243	0.9998	0.00	0.02	0.534	0.02
0.25	0.1301	0.9940	0.03	0.60	0.526	0.57
0.50	0.1334	0.9908	0.08	0.92	0.521	0.84
1.00	0.1365	0.9876	0.15	1.24	0.518	1.09
1.00	0.1366	0.9875	0.15	1.25	0.518	1.10
2.00	0.1402	0.9839	0.21	1.61	0.513	1.40
4.00	0.1463	0.9779	0.30	2.22	0.505	1.92
8.00	0.1554	0.9687	0.40	3.13	0.493	2.73
16.00	0.1708	0.9533	0.53	4.67	0.471	4.14
4.00	0.1665	0.9577	0.39	4.24	0.475	3.85
1.00	0.1607	0.9635	0.28	3.66	0.483	3.38
0.25	0.1538	0.9703	0.18	2.97	0.492	2.79

Time Readings

Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)

Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
LB-7	**R3**	**7.5**	**15.4**	**16.6**	**110.3**	**114.1**	**0.534**	**0.492**	**78**	**93**

Soil Identification: Yellowish brown sandy silty clay s(CL-ML)

Leighton

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 12680.001

Brenton/West Covina

03-20

TESTS for SULFATE CONTENT
CHLORIDE CONTENT and pH of SOILS

Project Name:	Brenton/West Covina	Tested By :	O. Figueroa	Date:	03/23/20
Project No. :	12680.001	Checked By:	A. Santos	Date:	03/26/20

Boring No.	LB-8			
Sample No.	B1			
Sample Depth (ft)	0-5			
Soil Identification:	Dark brown SC-SM			
Wet Weight of Soil + Container (g)	118.98			
Dry Weight of Soil + Container (g)	118.88			
Weight of Container (g)	39.53			
Moisture Content (%)	0.13			
Weight of Soaked Soil (g)	100.25			

SULFATE CONTENT, DOT California Test 417, Part II

Beaker No.	201			
Crucible No.	4			
Furnace Temperature (°C)	860			
Time In / Time Out	9:15/10:00			
Duration of Combustion (min)	45			
Wt. of Crucible + Residue (g)	21.0689			
Wt. of Crucible (g)	21.0659			
Wt. of Residue (g) (A)	0.0030			
PPM of Sulfate (A) x 41150	123.45			
PPM of Sulfate, Dry Weight Basis	**124**			

CHLORIDE CONTENT, DOT California Test 422

ml of Extract For Titration (B)	30			
ml of AgNO3 Soln. Used in Titration (C)	2.0			
PPM of Chloride (C -0.2) * 100 * 30 / B	180			
PPM of Chloride, Dry Wt. Basis	**180**			

pH TEST, DOT California Test 643

pH Value	**6.56**			
Temperature °C	20.3			

SOIL RESISTIVITY TEST
DOT CA TEST 643

Project Name:	Brenton/West Covina	Tested By :	S. Seiler	Date:	03/23/20
Project No. :	12680.001	Checked By:	A. Santos	Date:	03/26/20
Boring No.:	LB-8	Depth (ft.) :	0-5		
Sample No. :	B1				

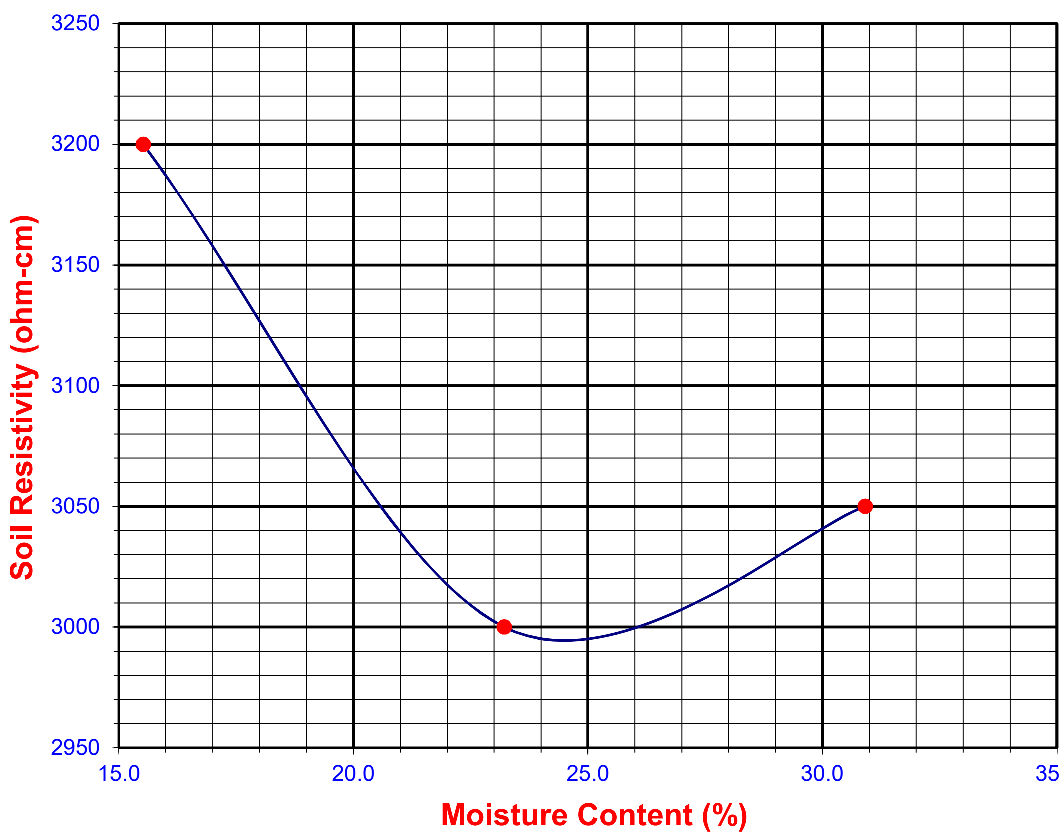
Soil Identification:* Dark brown SC-SM

*California Test 643 requires soil specimens to consist only of portions of samples passing through the No. 8 US Standard Sieve before resistivity testing. Therefore, this test method may not be representative for coarser materials.

Specimen No.	Water Added (ml) (Wa)	Adjusted Moisture Content (MC)	Resistance Reading (ohm)	Soil Resistivity (ohm-cm)
1	20	15.52	3200	3200
2	30	23.21	3000	3000
3	40	30.91	3050	3050
4				
5				

Moisture Content (%) (MCi)	0.13
Wet Wt. of Soil + Cont. (g)	118.98
Dry Wt. of Soil + Cont. (g)	118.88
Wt. of Container (g)	39.53
Container No.	
Initial Soil Wt. (g) (Wt)	130.10
Box Constant	1.000
MC =(((1+Mci/100)x(Wa/Wt+1))-1)x100	

Min. Resistivity (ohm-cm)	Moisture Content (%)	Sulfate Content (ppm)	Chloride Content (ppm)	Soil pH: pH	Soil pH: Temp. (°C)
DOT CA Test 643		DOT CA Test 417 Part II	DOT CA Test 422	DOT CA Test 643	
2994	**24.5**	**124**	**180**	**6.56**	**20.3**



Leighton

EXPANSION INDEX of SOILS

ASTM D 4829

Project Name:	Brenton/West Covina	Tested By:	O. Figueroa	Date:	03/25/20
Project No.:	12680.001	Checked By:	A. Santos	Date:	03/26/20
Boring No.:	LB-8	Depth (ft.):	0-5		
Sample No.:	B1				
Soil Identification:	Dark brown silty clayey sand (SC-SM)				

Dry Wt. of Soil + Cont.	(g)	1000.00
Wt. of Container No.	(g)	0.00
Dry Wt. of Soil	(g)	1000.00
Weight Soil Retained on #4 Sieve		0.00
Percent Passing # 4		100.00

MOLDED SPECIMEN		Before Test	After Test
Specimen Diameter	(in.)	4.01	4.01
Specimen Height	(in.)	1.0000	1.0080
Wt. Comp. Soil + Mold	(g)	621.40	456.50
Wt. of Mold	(g)	187.90	0.00
Specific Gravity (Assumed)		2.70	2.70
Container No.		O	O
Wet Wt. of Soil + Cont.	(g)	867.60	644.40
Dry Wt. of Soil + Cont.	(g)	810.80	593.04
Wt. of Container	(g)	0.00	187.90
Moisture Content	(%)	7.01	12.68
Wet Density	(pcf)	130.8	136.6
Dry Density	(pcf)	122.2	121.2
Void Ratio		0.380	0.391
Total Porosity		0.275	0.281
Pore Volume	(cc)	56.9	58.6
Degree of Saturation (%) [S_{meas}]		**49.8**	87.6

SPECIMEN INUNDATION in distilled water for the period of 24 h or expansion rate < 0.0002 in./h

Date	Time	Pressure (psi)	Elapsed Time (min.)	Dial Readings (in.)
03/25/20	14:30	1.0	0	0.6750
03/25/20	14:40	1.0	10	0.6745
Add Distilled Water to the Specimen				
03/25/20	15:00	1.0	20	0.6810
03/26/20	7:00	1.0	980	0.6830
03/26/20	9:05	1.0	1105	0.6830

Expansion Index (EI_{meas}) = ((Final Rdg - Initial Rdg) / Initial Thick.) x 1000	**9**

MODIFIED PROCTOR COMPACTION TEST
ASTM D 1557

Leighton

Project Name:	Brenton/West Covina	Tested By:	A. Lopez	Date:	03/23/20
Project No.:	12680.001	Input By:	A. Santos	Date:	03/25/20
Boring No.:	LB-8	Depth (ft.):	0-5		
Sample No.:	B1				
Soil Identification:	Dark brown silty clayey sand (SC-SM)				

Note: Corrected dry density calculation assumes specific gravity of 2.70 and moisture content of 1.0% for oversize particles

Preparation Method:	X	Moist	Scalp Fraction (%)		Rammer Weight (lb.) =	10.0
		Dry	#3/4		Height of Drop (in.) =	18.0
Compaction Method	X	Mechanical Ram	#3/8			
		Manual Ram	#4	9.7	Mold Volume (ft³)	0.03330

TEST NO.	1	2	3	4	5	6
Wt. Compacted Soil + Mold (g)	3813	3988	4040	3918		
Weight of Mold (g)	1868	1868	1868	1868		
Net Weight of Soil (g)	1945	2120	2172	2050		
Wet Weight of Soil + Cont. (g)	486.7	433.2	504.1	502.1		
Dry Weight of Soil + Cont. (g)	468.6	408.4	464.2	452.3		
Weight of Container (g)	39.4	40.1	39.3	39.1		
Moisture Content (%)	4.22	6.73	9.39	12.05		
Wet Density (pcf)	128.8	140.4	143.8	135.7		
Dry Density (pcf)	123.6	131.5	131.5	121.1		

Maximum Dry Density (pcf)	132.7	**Optimum Moisture Content (%)**	8.1
Corrected Dry Density (pcf)	135.5	**Corrected Moisture Content (%)**	7.4

- [X] **Procedure A**
Soil Passing No. 4 (4.75 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
May be used if +#4 is 20% or less

- [ ] **Procedure B**
Soil Passing 3/8 in. (9.5 mm) Sieve
Mold : 4 in. (101.6 mm) diameter
Layers : 5 (Five)
Blows per layer : 25 (twenty-five)
Use if +#4 is >20% and +3/8 in. is 20% or less

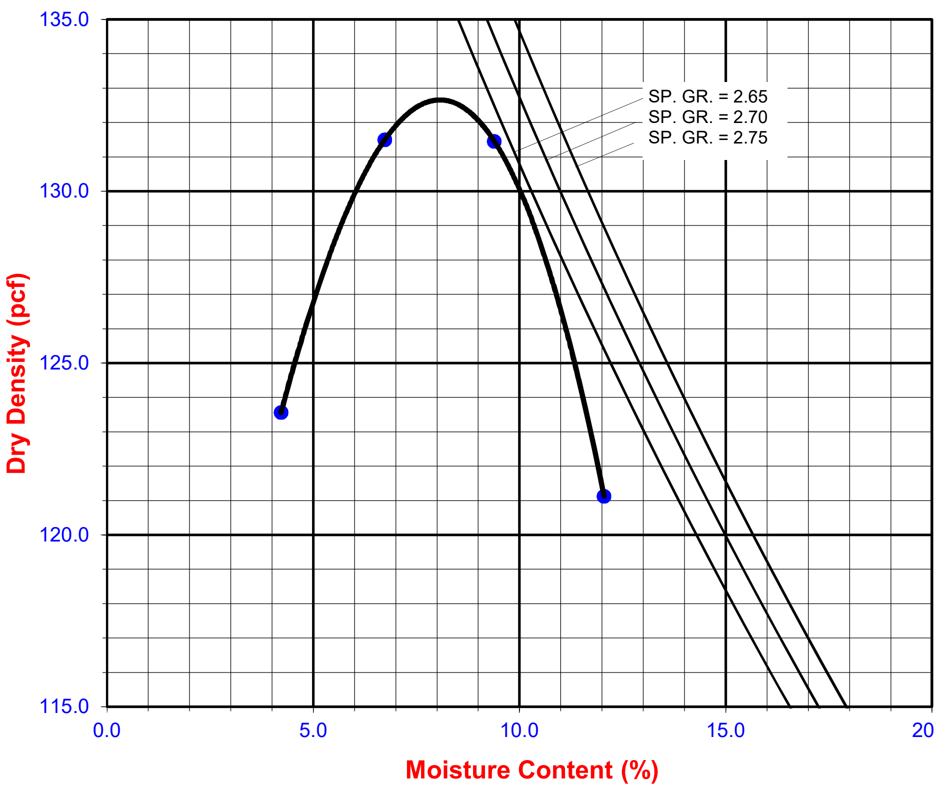
- [ ] **Procedure C**
Soil Passing 3/4 in. (19.0 mm) Sieve
Mold : 6 in. (152.4 mm) diameter
Layers : 5 (Five)
Blows per layer : 56 (fifty-six)
Use if +3/8 in. is >20% and +¾ in. is <30%

Particle-Size Distribution:

GR:SA:FI

Atterberg Limits:

LL,PL,PI



Boring No.	LB-8							
Sample No.	B1							
Depth (ft.)	0-5							
Sample Type	Bulk							
Soil Identification	Dark brown silty clayey sand (SC-SM)							
No Moisture Correction; ASTM D 1140 modified to include splitting the sample on the #4 sieve								
Total Sample Dry Weight Determination								
Dry Weight of Soil + Container (g)	1723.50							
Weight of Container (g)	218.70							
Dry Weight of Soil (g)	1504.80							
Sample Dry Weight Determination, Retained on Sieve #4								
Dry Weight of Sample + Cont. (g)	251.40							
Weight of Container (g)	88.00							
Weight of Dry Sample (g)	163.40							
Sample Dry Weight Determination, Passing Sieve #4								
Dry Weight of Sample + Cont. (g)	526.00							
Weight of Container (g)	106.90							
Weight of Dry Sample (g)	419.10							
After Wash								
Method (A or B)	A							
Dry Weight of Sample + Cont. (g)	348.20							
Weight of Container (g)	106.90							
Weight of Dry Sample (g)	241.30							
% Passing No. 4 Sieve	89.1							
% Retained No. 4 Sieve	10.9							
% Passing No. 200 Sieve	**37.8**							

Leighton

PERCENT PASSING
No. 200 SIEVE
ASTM D 1140

Project Name:	Brenton/West Covina		
Project No.:	12680.001		
Client Name:			
Tested By:	O.Figueroa	Date:	03/25/20

ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS
ASTM D 4546

Leighton

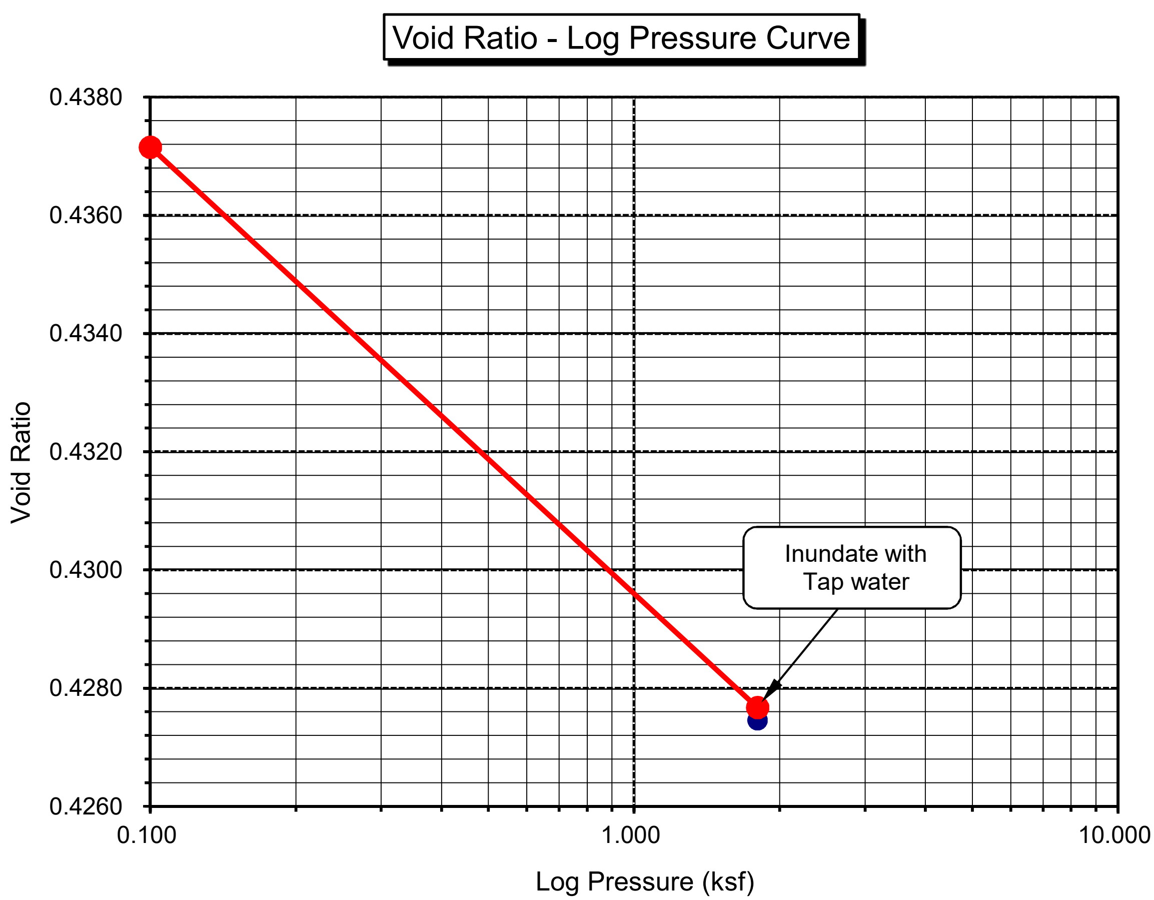
Project Name:	Brenton/West Covina	Tested By:	G. Bathala	Date:	03/23/20
Project No.:	12680.001	Checked By:	A. Santos	Date:	03/26/20
Boring No.:	LB-9	Sample Type:	Ring		
Sample No.:	R5	Depth (ft.)	15.0		
Sample Description:	Brown silty clay with sand (CL-ML)s				

Initial Dry Density (pcf):	117.3
Initial Moisture (%):	10.45
Initial Length (in.):	1.0000
Initial Dial Reading:	0.3059
Diameter(in):	2.415

Final Dry Density (pcf):	118.1
Final Moisture (%) :	17.0
Initial Void Ratio:	0.4372
Specific Gravity(assumed):	2.70
Initial Saturation (%)	64.5

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.100	0.3059	1.0000	0.00	0.00	0.4372	0.00
1.800	0.2965	0.9906	0.28	-0.94	0.4277	-0.66
H2O	0.2963	0.9904	0.28	-0.96	0.4275	-0.68

Percent Swell (+) / Settlement (-) After Inundation = -0.02



APPENDIX D

SUMMARY OF SEISMIC HAZARD ANALYSIS

OSHPD

Latitude, Longitude: 34.073109, -117.891574

Date	3/30/2020, 8:08:06 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.665	MCE_R ground motion. (for 0.2 second period)
S_1	0.61	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.665	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.11	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.705	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.775	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	1.665	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.817	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.175	Factored deterministic acceleration value. (0.2 second)
S1RT	0.61	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.672	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.676	Factored deterministic acceleration value. (1.0 second)
PGAd	0.871	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.917	Mapped value of the risk coefficient at short periods
C_{R1}	0.907	Mapped value of the risk coefficient at a period of 1 s

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APPENDIX E

GENERAL EARTHWORK AND GRADING SPECIFICATIONS

LEIGHTON CONSULTING, INC.

GENERAL EARTHWORK AND GRADING SPECIFICATIONS FOR ROUGH GRADING

Table of Contents

1.0 General

1.1 Intent: These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 The Geotechnical Consultant of Record: Prior to commencement of work, the owner shall employ the Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultants shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required. Subsurface areas to be geotechnically observed, mapped, elevations recorded, and/or tested include natural ground after it has been cleared for receiving fill but before fill is placed, bottoms of all "remedial removal" areas, all key bottoms, and benches made on sloping ground to receive fill.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to determine the attained level of compaction. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor: The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The

Contractor shall be solely responsible for performing the grading in accordance with the plans and specifications.

The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of "spreads" of work and the estimated quantities of daily earthwork contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate observations and tests can be planned and accomplished. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing: Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). No fill lift shall contain more than 5 percent of organic matter. Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed.

2.2 Processing: Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be overexcavated as specified in the following section. Scarification shall continue until soils are broken down and free of large clay lumps or clods and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Overexcavation: In addition to removals and overexcavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be overexcavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching: Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise overexcavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas: All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General: Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize: Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import: If importing of fill material is required for grading, proposed import material shall meet the requirements of Section 3.1. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers: Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning: Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557-91).

4.3 Compaction of Fill: After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557-91). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes: In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557-91.

4.5 Compaction Testing: Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing: Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations: The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than 5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 Safety: The Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

7.2 Bedding and Backfill: All bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of maximum from 1 foot above the top of the conduit to the surface.

The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

7.3 Lift Thickness: Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

7.4 Observation and Testing: The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.