

Appendix E Updated Geotechnical Investigation

Appendices

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**UPDATED GEOTECHNICAL
INVESTIGATION**

**PROPOSED MULTI-FAMILY
RESIDENTIAL DEVELOPMENT
NEWPORT CROSSINGS
5.6 ACRE AREA BOUNDED BY
DOVE STREET, SCOTT DRIVE,
CORINTHIAN WAY, AND
MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA**



GEOCON
WEST, INC.

GEOTECHNICAL
ENVIRONMENTAL
MATERIALS

PREPARED FOR

**STARBOARD MACARTHUR SQUARE, LP
C/O STARBOARD REALTY PARTNERS, LLC
NEWPORT BEACH, CALIFORNIA**

PROJECT NO. A9138-88-02

JULY 14, 2017



Project No. A9138-88-02

July 14, 2017

Starboard MacArthur Square, LP
c/o Starboard Realty Partners, LLC
1301 Dove Street, Suite 1080
Newport Beach, California 92660

Attention: Mr. Dan Vittone

Subject: UPDATED GEOTECHNICAL INVESTIGATION
PROPOSED MULTI-FAMILY RESIDENTIAL DEVELOPMENT
NEWPORT CROSSINGS
5.6 ACRE AREA BOUNDED BY DOVE STREET, SCOTT DRIVE,
CORINTHIAN WAY AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

Dear Mr. Vittone:

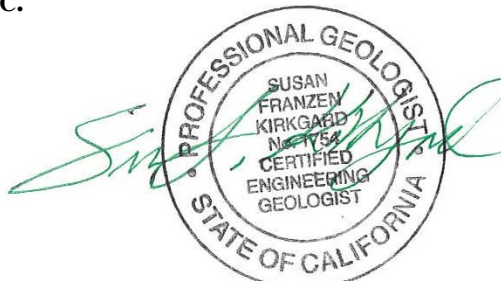
In accordance with your authorization of our proposal dated June 1, 2017, we have prepared this updated geotechnical investigation report for the proposed multi-family residential development to be located at the 5.6-acre area bounded by Dove Street, Scott Drive, Corinthian Way, and Martingale Way in Newport Beach, California. The accompanying report presents the findings of our study, and our conclusions and recommendations pertaining to the geotechnical aspects of proposed design and construction. Based on the results of our investigation, it is our opinion that the site can be developed as proposed provided the recommendations in this report are followed and implemented during design and construction. If you have any questions regarding this report, or if we may be of further service, please contact the undersigned.

Very truly yours,

GEOCON WEST, INC.



Petrina Zen
PE 87489



Susan Kirkgard
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(EMAIL) Addressee

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LIMITATIONS AND UNIFORMITY OF CONDITIONS

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UPDATED GEOTECHNICAL INVESTIGATION

1. PURPOSE AND SCOPE

This report presents the results of an updated geotechnical investigation for the proposed multi-family residential development located at the 5.6-acre site bounded by Dove Street, Scott Drive, Corinthian Way, and Martingale Way in Newport Beach, California (Vicinity Map, Figure 1). The purpose of this investigation was to evaluate the subsurface soil and geologic conditions underlying the property and, based on conditions encountered, to provide conclusions and recommendations pertaining to the geotechnical aspects of proposed design and construction.

The scope of this investigation included a site reconnaissance, field exploration, laboratory testing, engineering analysis, and the preparation of this report. The site was initially explored on May 15, 2014, by drilling four 8-inch diameter borings utilizing a truck-mounted hollow-stem auger drilling machine and advancing two cone penetrometer tests (CPTs). The borings were drilled to depths between 10½ and 30½ feet below the existing ground surface. The CPTs were advanced to depths of 50½ feet below existing ground surface. Additional site exploration was performed on June 19, 2017, by excavating two 8-inch diameter borings to depths of 35½ feet utilizing a truck-mounted hollow-stem auger drilling machine. The approximate locations of the exploratory borings and CPTs are depicted on the Site Plan (Figure 2). A detailed discussion of the field investigation, including boring logs and CPT logs, is presented in Appendix A.

Laboratory tests were performed on selected soil samples obtained during the investigation to determine pertinent physical and chemical soil properties. Appendix B presents a summary of the laboratory test results.

The recommendations presented herein are based on analysis of the data obtained during the investigation and our experience with similar soil and geologic conditions. References reviewed to prepare this report are provided in the *List of References* section.

If project details vary significantly from those described herein, Geocon should be contacted to determine the necessity for review and possible revision of this report.

2. SITE CONDITIONS & PROJECT DESCRIPTION

The subject property is an approximately 5.6 acre parcel located in Newport Beach, California (see Vicinity Map, Figure 1). The property is bounded by Corinthian Way to the north, by Martingale Way to the east, by Scott Drive and Dove Street to the west, and by a multi-story commercial structure and paved parking to the south. The property is currently occupied by on-grade single-story commercial structures and paved parking. The site slopes gently to the west with approximately 3 feet of vertical relief and no pronounced highs or lows. Surface water drainage at the site appears to be by sheet flow along the ground surface to area drains and the city streets. Vegetation on site consists of bushes, plants, grass, and trees located in isolated planter areas.

Information concerning the proposed project was furnished by the client. It is our understanding that the proposed development consists of a 350-unit, four- to five-story type III structure wrapped around a six-story parking structure. The development will also include 7,500 square feet of ground floor retail, and all structures will be constructed at or near present site grade. The proposed site development is depicted on the Site Plan (see Figure 2).

Due to the preliminary nature of the design at this time, wall and column loads were not made available. It is estimated that column loads for the proposed residential structures will be up to 500 kips and wall loads will be up to 5 kips per linear foot. It is anticipated that the column loads for the proposed parking structure will be up to 600 kips, and the wall loads will be up to 8 kips per linear foot.

Once the design phase proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Geocon should be contacted to determine the necessity for review and possible revision of this report.

3. GEOLOGIC SETTING

The subject site is situated within the south-central portion of the Orange County Coastal Plain, a relatively flat-lying alluviated surface with an average slope of less than 20 feet per mile. The lowland surface is bounded by hills and mountains on the north and east and by the Pacific Ocean to the south and southwest (Department of Water Resources, 1967). Prominent structural features within the Orange County Coastal Plain include the central lowland plain, the northwest trending line of low hills and mesas near the coast underlain by the Newport-Inglewood Fault Zone (Newport Mesa, Huntington Beach Mesa, Bolsa Chica Mesa, and Landing Hill), and the San Joaquin Hills to the southeast (Department of Water Resources, 1967).

4. SOIL AND GEOLOGIC CONDITIONS

Based on our field investigation and published geologic maps, the site is underlain by artificial fill over Pleistocene age marine terrace deposits that are estimated to be approximately 100 feet thick (Sprotte et al., 1980). These marine terrace deposits are composed mainly of silt, with some sand and clay (Sprotte et al., 1980; California Division of Mines and Geology, 1981). Detailed stratigraphic profiles are provided on the boring logs in Appendix A.

4.1 Artificial Fill

Artificial fill was encountered to a maximum depth of 4 feet below existing ground surface. The artificial fill generally consists of olive brown to dark reddish brown clayey sand, silty sand, sandy clay and sandy silt. The artificial fill is characterized as slightly moist and medium dense or firm, with varying amounts of trace fine gravel. Deeper fill may exist between excavations and in other portions of the site that were not directly explored.

4.2 Marine Terrace Deposits

The artificial fill is underlain by Pleistocene age marine terrace deposits which generally consist of yellowish brown to olive brown silty sand to sandy silt, silt and clay. The terrace deposits are predominantly slightly moist to moist and firm to stiff or loose to medium dense.

5. GROUNDWATER

Review of the Seismic Hazard Zone Report for the Tustin Quadrangle (California Division of Mines and Geology [CDMG], 2001) indicates the historically highest groundwater level in the area is approximately 10 feet beneath the ground surface. Groundwater information presented in this document is generated from data collected in the early 1900's to the late 1990s. Based on current groundwater basin management practices, it is unlikely that groundwater levels will ever exceed the historic high levels.

Groundwater was encountered in boring B1 and B5 drilled on May 5, 2014, and June 19, 2017, at depths of 30 and 34 feet below the existing ground surface, respectively. Considering the depth to groundwater encountered in our borings and depth of the proposed structures, groundwater is not expected to be encountered during construction. However, it is not uncommon for groundwater levels to vary seasonally or for groundwater seepage conditions to develop where none previously existed, especially in impermeable fine-grained soils which are heavily irrigated or after seasonal rainfall. In addition, recent requirements for stormwater infiltration could result in shallower seepage conditions in the immediate site vicinity. Proper surface drainage of irrigation and precipitation will be critical for future performance of the project. Recommendations for drainage are provided in the *Surface Drainage* section of this report (see Section 7.20).

6. GEOLOGIC HAZARDS

6.1 Surface Fault Rupture

The numerous faults in Southern California include active, potentially active, and inactive faults. The criteria for these major groups are based on criteria developed by the California Geological Survey (CGS, formerly known as CDMG) for the Alquist-Priolo Earthquake Fault Zone Program (Bryant and Hart, 2007). By definition, an active fault is one that has had surface displacement within Holocene time (about the last 11,000 years). A potentially active fault has demonstrated surface displacement during Quaternary time (approximately the last 1.6 million years), but has had no known Holocene movement. Faults that have not moved in the last 1.6 million years are considered inactive.

The site is not within a state-designated Alquist-Priolo Earthquake Fault Zone (Bryant and Hart, 2007) for surface fault rupture hazards. No active or potentially active faults with the potential for surface fault rupture are known to pass directly beneath the site. Therefore, the potential for surface rupture due to faulting occurring beneath the site during the design life of the proposed development is considered low. However, the site is located in the seismically active Southern California region, and could be subjected to moderate to strong ground shaking in the event of an earthquake on one of the

many active Southern California faults. The faults in the vicinity of the site are shown in Figure 3, Regional Fault Map.

The closest surface trace of an active fault to the site is the Newport-Inglewood Fault Zone located approximately 6.5 miles to the south-southwest (Ziony and Jones, 1989). Other nearby active faults are the Palos Verdes Fault Zone (offshore segment), the Whittier Fault, and the Elsinore Fault located approximately 16 miles southwest, 16½ miles north-northeast, and 17 miles northeast of the site, respectively (Ziony and Jones, 1989). The active San Andreas Fault Zone is located approximately 46 miles northeast of the site (Ziony and Jones, 1989).

The closest potentially active fault to the site is the Pelican Hill Fault located approximately 2.3 miles to the south-southwest (Ziony and Jones, 1989). Other nearby potentially active faults are the El Modeno Fault, Peralta Hills Fault, and the Los Alamitos Fault located approximately 11 miles north, 11 miles north-northeast, and 14½ miles northwest, respectively (Ziony and Jones, 1989).

The site is located within the vertical projection of the San Joaquin Hills Blind Thrust. The San Joaquin Hills Blind Thrust is a deep thrust fault underlying the San Joaquin Hills at the southern portion of the Orange County coastal plain. The San Joaquin Hills Blind Thrust extends to within 2 kilometers of the surface east of the San Joaquin Hills, dips between 20° and 30° to the west underneath the San Joaquin Hills, and extends to the base of the seismogenic crust (approximately 17 kilometers deep) along the coast (Grant et. al., 1999). Deformation related to an earthquake event originating along this blind thrust fault is limited to compressional folding at depth and do not present a potential surface fault rupture hazard. However, these active features are capable of generating future earthquakes.

6.2 Seismicity

As with all of Southern California, the site has experienced historic earthquakes from various regional faults. The seismicity of the region surrounding the site was formulated based on research of an electronic database of earthquake data. The epicenters of recorded earthquakes with magnitudes equal to or greater than 5.0 in the site vicinity are depicted on Figure 4, Regional Seismicity Map. A partial list of moderate to major magnitude earthquakes that have occurred in the Southern California area within the last 100 years is included in the following table.

LIST OF HISTORIC EARTHQUAKES

Earthquake (Oldest to Youngest)	Date of Earthquake	Magnitude	Distance to Epicenter (Miles)	Direction to Epicenter
San Jacinto-Hemet area	April 21, 1918	6.8	50	E
Near Redlands	July 23, 1923	6.3	42	ENE
Long Beach	March 10, 1933	6.4	7	SSW
Tehachapi	July 21, 1952	7.5	113	NW
San Fernando	February 9, 1971	6.6	60	NW
Whittier Narrows	October 1, 1987	5.9	30	NNW
Sierra Madre	June 28, 1991	5.8	42	N
Landers	June 28, 1992	7.3	90	NE
Big Bear	June 28, 1992	6.4	70	NE
Northridge	January 17, 1994	6.7	54	NW

The site could be subjected to strong ground shaking in the event of an earthquake. However, this hazard is common in Southern California and the effects of ground shaking can be mitigated if the proposed structures are designed and constructed in conformance with current building codes and engineering practices.

6.3 Seismic Design Criteria

The following table summarizes site-specific design criteria obtained from the 2016 California Building Code (CBC; Based on the 2015 International Building Code [IBC] and ASCE 7-10), Chapter 16 Structural Design, Section 1613 Earthquake Loads. The data was calculated using the computer program *U.S. Seismic Design Maps*, provided by the USGS. The short spectral response uses a period of 0.2 second. We evaluated the Site Class based on the discussion in Section 1613.3.2 of the 2016 CBC and Table 20.3-1 of ASCE 7-10. The values presented below are for the risk-targeted maximum considered earthquake (MCE_R).

2016 CBC SEISMIC DESIGN PARAMETERS

Parameter	Value	2016 CBC Reference
Site Class	D	Section 1613.3.2
MCE _R Ground Motion Spectral Response Acceleration – Class B (short), S _S	1.582g	Figure 1613.3.1(1)
MCE _R Ground Motion Spectral Response Acceleration – Class B (1 sec), S ₁	0.580g	Figure 1613.3.1(2)
Site Coefficient, F _A	1.0	Table 1613.3.3(1)
Site Coefficient, F _V	1.5	Table 1613.3.3(2)
Site Class Modified MCE _R Spectral Response Acceleration (short), S _{MS}	1.582g	Section 1613.3.3 (Eqn 16-37)
Site Class Modified MCE _R Spectral Response Acceleration – (1 sec), S _{M1}	0.870g	Section 1613.3.3 (Eqn 16-38)
5% Damped Design Spectral Response Acceleration (short), S _{DS}	1.055g	Section 1613.3.4 (Eqn 16-39)
5% Damped Design Spectral Response Acceleration (1 sec), S _{D1}	0.580g	Section 1613.3.4 (Eqn 16-40)

The table below presents the mapped maximum considered geometric mean (MCE_G) seismic design parameters for projects located in Seismic Design Categories of D through F in accordance with ASCE 7-10.

ASCE 7-10 PEAK GROUND ACCELERATION

Parameter	Value	ASCE 7-10 Reference
Mapped MCE _G Peak Ground Acceleration, PGA	0.617g	Figure 22-7
Site Coefficient, F _{PGA}	1.0	Table 11.8-1
Site Class Modified MCE _G Peak Ground Acceleration, PGAM	0.617g	Section 11.8.3 (Eqn 11.8-1)

The Maximum Considered Earthquake Ground Motion (MCE) is the level of ground motion that has a 2 percent chance of exceedance in 50 years, with a statistical return period of 2,475 years. According to the 2016 California Building Code and ASCE 7-10, the MCE is to be utilized for the evaluation of liquefaction, lateral spreading, seismic settlements, and it is our understanding that the intent of the Building code is to maintain “Life Safety” during a MCE event. The Design Earthquake Ground Motion (DE) is the level of ground motion that has a 10 percent chance of exceedance in 50 years, with a statistical return period of 475 years.

Deaggregation of the MCE peak ground acceleration was performed using the USGS online BETA Unified Hazard Tool, 2008 Conterminous U.S. Dynamic edition. The result of the deaggregation analysis indicates that the predominant earthquake contributing to the MCE peak ground acceleration is characterized as a 6.71 magnitude event occurring at a hypocentral distance of 8.89 kilometers from the site.

Deaggregation was also performed for the Design Earthquake (DE) peak ground acceleration, and the result of the analysis indicates that the predominant earthquake contributing to the DE peak ground acceleration is characterized as a 6.65 magnitude occurring at a hypocentral distance of 19.78 kilometers from the site.

Conformance to the criteria in the above tables for seismic design does not constitute any kind of guarantee or assurance that significant structural damage or ground failure will not occur if a large earthquake occurs. The primary goal of seismic design is to protect life, not to avoid all damage, since such design may be economically prohibitive.

6.4 Liquefaction Potential

Liquefaction is a phenomenon in which loose, saturated, relatively cohesionless soil deposits lose shear strength during strong ground motions. Primary factors controlling liquefaction include intensity and duration of ground motion, gradation characteristics of the subsurface soils, in-situ stress conditions, and the depth to groundwater. Liquefaction is typified by a loss of shear strength in the liquefied layers due to rapid increases in pore water pressure generated by earthquake accelerations.

The current standard of practice, as outlined in the “Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California” and “Special Publication 117A, Guidelines for Evaluating and Mitigating Seismic Hazards in California” requires liquefaction analysis to a depth of 50 feet below the lowest portion of the proposed structure. Liquefaction typically occurs in areas where the soils below the water table are composed of poorly consolidated, fine to medium-grained, primarily sandy soil. In addition to the requisite soil conditions, the ground acceleration and duration of the earthquake must also be of a sufficient level to induce liquefaction.

The State of California Seismic Hazard Zone Map for the Tustin Quadrangle (CDMG, 2001) indicates that the site is not located in an area designated as “liquefiable”. The Orange County General Plan (2004) and the Newport Beach General Plan (2006) also indicate that site is not located within an area identified as having a potential for liquefaction. As stated previously, the soils encountered during exploration are generally composed of well consolidated Pleistocene age fine-grained soils. Based on these considerations, it is our opinion that the potential for liquefaction and associated ground deformations beneath the site is very low.

6.5 Slope Stability

The topography at the site is relatively level and the site is not located within an area identified as having a potential for slope instability (CDMG, 2001; City of Newport Beach, 2006). There are no known landslides near the site, nor is the site in the path of any known or potential landslides. Therefore, the potential for slope stability hazards to adversely affect the proposed development is considered low.

6.6 Earthquake-Induced Flooding

Earthquake-induced flooding is inundation caused by failure of dams or other water-retaining structures due to earthquakes. The Orange County Safety Element (2004) indicates that the site is located within the Prado Dam inundation area. However, this reservoir, as well as others in California, are continually monitored by various governmental agencies (such as the State of California Division of Safety of Dams and the U.S. Army Corps of Engineers) to guard against the threat of dam failure. Current design, construction practices, and ongoing programs of review, modification, or total reconstruction of existing dams are intended to ensure that all dams are capable of withstanding the maximum considered earthquake (MCE) for the site. Therefore, the potential for inundation at the site as a result of an earthquake-induced dam failure is considered low.

6.7 Tsunamis, Seiches, and Flooding

The site is located approximately 5 miles from the Pacific Ocean. According to the City of Newport Beach General Plan (2006), the site is not within a tsunami inundation hazard zone. Therefore, tsunamis are not anticipated to adversely impact the site.

Seiches are large waves generated in enclosed bodies of water in response to ground shaking. No major water-retaining structures are located immediately up gradient from the project site. Flooding from a seismically-induced seiche is considered unlikely.

The site is within an area of minimal flooding (Zone X) as defined by the Federal Emergency Management Agency (FEMA, 2009, City of Newport Beach, 2006).

6.8 Oil Fields & Methane Potential

Based on a review of the California Division of Oil, Gas and Geothermal Resources (DOGGR) Well Finder Website (DOGGR, 2017), the site is not located within the limits of an oilfield and oil or gas wells are not located in the immediate site vicinity. However, due to the voluntary nature of record reporting by the oil well drilling companies, wells may be improperly located or not shown on the location map and undocumented wells could be encountered during construction. Any wells encountered during construction will need to be properly abandoned in accordance with the current requirements of the DOGGR.

As previously indicated, the site is not located within an oilfield. Therefore, the potential for methane at the site is considered very low. Should it be determined that a methane study is required for the proposed development it is recommended that a qualified methane consultant be retained to perform the study and provide mitigation measures as necessary.

6.9 Subsidence

Subsidence occurs when a large portion of land is displaced vertically, usually due to the withdrawal of groundwater, oil, or natural gas. Soils that are particularly subject to subsidence include those with high silt or clay content. The site is not located within an area of known ground subsidence (Orange County, 2004). No large-scale extraction of groundwater, gas, oil, or geothermal energy is occurring or planned at the site or in the general site vicinity. There appears to be little or no potential for ground subsidence due to withdrawal of fluids or gases at the site.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 General

- 7.1.1 It is our opinion that neither soil nor geologic conditions were encountered during the investigation that would preclude construction of the proposed project provided the recommendations presented herein are followed and implemented during design and construction.
- 7.1.2 Up to 4 feet of existing artificial fill was encountered during site exploration. The existing fill encountered is believed to be the result of past grading and construction activities at the site. Deeper fill may exist between borings and in other areas of the site that were not directly explored. Future demolition of the existing structures and improvements which occupy the site will likely disturb the upper few feet of existing site soils. It is our opinion that the existing fill, in its present condition, is not suitable for direct support of proposed foundations or slabs. The existing fill and site soils are suitable for re-use as engineered fill provided the recommendations in the *Grading* section of this report are followed (see Section 7.4).
- 7.1.3 Based on these considerations, it is recommended that the upper five feet of existing earth materials within the building footprint areas be excavated and properly compacted for foundation and slab support. Deeper excavations should be conducted as necessary to completely remove all artificial fill and any soft, unsuitable alluvium at the direction of the Geotechnical Engineer (a representative of Geocon). Proposed building foundations should be underlain by a minimum of 3 feet of newly placed engineered fill. The excavation should extend laterally a minimum distance of 3 feet beyond the building footprint area or a distance equal to the depth of fill below the foundation, whichever is greater. Recommendations for earthwork are provided in the *Grading* section of this report (see Section 7.4).
- 7.1.4 Subsequent to the recommended grading, the proposed structures may be supported on conventional foundation systems deriving support in newly placed engineered fill. Recommendations for the design of a conventional foundation system are provided in Section 7.6.
- 7.1.5 Where miscellaneous subterranean improvements are planned (Elevator Pits and Swimming Pools), the structures may be supported on a conventional or mat foundation system deriving support in the undisturbed alluvial soils generally found at or below a depth of 4 feet below the ground surface. If necessary, these miscellaneous improvements may derive support in a combination of newly placed engineered fill and competent alluvial soils. It is the intent of the Geotechnical Engineer to allow miscellaneous subterranean structures to derive support in both engineered fill and alluvial soils if project conditions warrant such an occurrence. Recommendations for swimming pool and elevator pit design are provided in Sections 7.15 and 7.16 of this report, respectively.

- 7.1.6 All excavations must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon). Prior to placing any fill, the excavation bottom must be proof-rolled with heavy equipment in the presence of the Geotechnical Engineer (a representative of Geocon West, Inc.).
- 7.1.7 It is anticipated that stable excavations for the recommended grading associated with the proposed structures can be achieved with sloping measures. However, if excavations in close proximity to an adjacent property line and/or structure are required, special excavation measures may be necessary in order to maintain lateral support of offsite improvements. Excavation recommendations are provided in the *Temporary Excavations* section of this report (Section 7.18).
- 7.1.8 Foundations for small outlying structures, such as block walls up to 6 feet high, planter walls or trash enclosures, which will not be tied to the proposed structure, may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill. Where excavation and compaction cannot be performed, such as adjacent to property lines, foundations may bear in the undisturbed alluvial soils generally found at or below a depth of 2 feet. If the soils exposed in the excavation bottom are soft, compaction of the soft soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative.
- 7.1.9 Where new paving is to be placed, it is recommended that all existing fill and soft alluvial soils be excavated and properly recompacted for paving support. The client should be aware that removal and recompaction of all existing fill and soft alluvial soils in the area of new paving is not required, however, paving constructed over existing uncertified fill or unsuitable soils may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper 12 inches of soil should be scarified and properly compacted for paving support. Paving recommendations are provided in the *Preliminary Pavement Recommendations* section of this report (see Section 7.12).
- 7.1.10 Based on the results of the percolation testing performed at the site, a stormwater infiltration system is not considered feasible for this project. A discussion of the test results is provided in the *Stormwater Infiltration* section of this report (see Section 7.19).
- 7.1.11 Once the design and foundation loading configuration for the proposed structures proceeds to a more finalized plan, the recommendations within this report should be reviewed and revised, if necessary. Based on the final foundation loading configurations, the potential for settlement should be re-evaluated by this office.

- 7.1.12 Any changes in the design, location or elevation of improvements, as outlined in this report, should be reviewed by this office. Geocon should be contacted to determine the necessity for review and possible revision of this report.

7.2 Soil and Excavation Characteristics

- 7.2.1 The in-situ soils can be excavated with moderate effort using conventional excavation equipment. Minor caving should be anticipated in vertical excavations, especially where granular soils are encountered.
- 7.2.2 It is the responsibility of the contractor to ensure that all excavations and trenches are properly sloped, shored and maintained in accordance with applicable OSHA rules and regulations to maintain safety and maintain the stability of adjacent existing improvements.
- 7.2.3 All onsite excavations must be conducted in such a manner that potential surcharges from existing structures, construction equipment, and vehicle loads are resisted. The surcharge area may be defined by a 1:1 projection down and away from the bottom of an existing foundation or vehicle load. Penetrations below this 1:1 projection will require special excavation measures such as sloping and possibly shoring. Excavation recommendations are provided in the *Temporary Excavations* section of this report (see Section 7.18).
- 7.2.4 The upper 5 feet of soils encountered during the investigation are considered to have a “low” to “moderate” (EI = 44 & 51) expansive potential and are classified as “expansive” based on the 2016 California Building Code (CBC) Section 1803.5.3. Recommendations presented herein assume that the building foundations and slabs will derive support in these materials.

7.3 Minimum Resistivity, pH and Water-Soluble Sulfate

- 7.3.1 Potential of Hydrogen (pH) and resistivity testing, as well as chloride content testing, were performed on representative samples of on-site soil to generally evaluate the corrosion potential to surface utilities. The tests were performed in accordance with California Test Method Nos. 643 and 422 and indicate that the soils are considered “moderately corrosive” to “corrosive” with respect to corrosion of buried ferrous metals on site. The results are presented in Appendix B (Figure B13) and should be considered for design of underground structures.
- 7.3.2 Laboratory tests were performed on representative samples of the on-site soil to measure the percentage of water-soluble sulfate content. Results from the laboratory water-soluble sulfate tests are presented in Appendix B (Figure B13) and indicate that the on-site soil possess a “negligible” sulfate exposure to concrete structures as defined by 2016 CBC Section 1904 and ACI 318-11 Section 4.2 and 4.3.

7.3.3 Geocon West, Inc. does not practice in the field of corrosion engineering and mitigation. If corrosion sensitive improvements are planned, it is recommended that a corrosion engineer be retained to evaluate corrosion test results and incorporate the necessary precautions to avoid premature corrosion of buried metal pipes and concrete structures in direct contact with the soils.

7.4 Grading

7.4.1 Earthwork should be observed, and compacted fill tested by representatives of Geocon West, Inc. The existing fill encountered during exploration is suitable for re-use as an engineered fill, provided any encountered oversized material (greater than 6 inches) and any encountered deleterious debris are removed.

7.4.2 A preconstruction conference should be held at the site prior to the beginning of grading operations with the owner, contractor, civil engineer, and geotechnical engineer in attendance. Special soil handling requirements can be discussed at that time.

7.4.3 Grading should commence with the removal of all existing vegetation and existing improvements from the area to be graded. Deleterious debris such as wood and root structures should be exported from the site and should not be mixed with the fill soils. Asphalt and concrete should not be mixed with the fill soils unless approved in writing by the Geotechnical Engineer. All existing underground improvements planned for removal should be completely excavated and the resulting depressions properly backfilled in accordance with the procedures described herein. Once a clean excavation bottom has been established it must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.).

7.4.4 As a minimum, it is recommended that the upper 5 feet of existing site soils within the proposed building footprint areas be excavated and properly compacted for foundation and slab support. Deeper excavation should be conducted as necessary to completely remove all existing artificial fill or soft soil at the direction of the Geotechnical Engineer (a representative of Geocon). Proposed building foundations should be underlain by a minimum of 3 feet of newly placed engineered fill. It is recommended that the grading contractor verify the depth of all building foundations prior to commencement of site grading activities in order to correctly determine the required grading overexcavations for foundations. The excavation should extend laterally a minimum distance of three feet beyond the building footprint area, or for a distance equal to the depth of fill below the foundations, whichever is greater. The limits of existing fill and/or soft soil removal will be verified by the Geocon representative during site grading activities.

- 7.4.5 All excavations must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon), prior to placing fill. Prior to placing any fill, the excavation bottom must be proof-rolled with heavy equipment in the presence of the Geotechnical Engineer (a representative of Geocon West, Inc.). If determined to be excessively soft, additional removals or stabilization of the excavation bottom may be required in order to provide a firm working surface upon which engineered fill can be placed and heavy equipment can operate. If required, recommendations for stabilization measures can be provided under separate cover.
- 7.4.6 All fill and backfill soils should be placed in horizontal loose layers approximately 6 to 8 inches thick, moisture conditioned to 2 percent above optimum moisture content, and properly compacted to a minimum 90 percent of the maximum dry density in accordance with ASTM D 1557 (latest edition).
- 7.4.7. Where new paving is to be placed, it is recommended that all existing fill and soft alluvium be excavated and properly compacted for paving support. As a minimum, the upper 12 inches of soil should be scarified, moisture conditioned to 2 percent above optimum moisture content, and compacted to at least 92 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Paving recommendations are provided in *Preliminary Pavement Recommendations* section of this report (see Section 7.12).
- 7.4.8 Foundations for small outlying structures, such as block walls up to 6 feet high, planter walls or trash enclosures, which will not be tied to the proposed structure, may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and proper compaction cannot be performed or is undesirable, foundations may derive support directly in the undisturbed alluvial soils generally found at or below a depth of 2 feet below the existing ground surface, and should be deepened as necessary to maintain a minimum 12 inch embedment into undisturbed alluvium. If the alluvial soils exposed in the excavation bottom are loose or disturbed, compaction of the soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved by a Geocon representative.
- 7.4.9 All imported fill shall be observed, tested, and approved by Geocon West, Inc. prior to bringing soil to the site. Rocks larger than 6 inches in diameter shall not be used in the fill. Import soils used as structural fill should have an expansion index less than 40 and corrosivity properties that are equally or less detrimental to that of the existing onsite soils (see Figure B13). Import soils placed in the building area should be placed uniformly across the building pad or in a manner that is approved by the Geotechnical Engineer (a representative of Geocon).

- 7.4.10 Utility trenches should be properly backfilled in accordance with the requirements of the Green Book (latest edition). The pipe should be bedded with clean sands (Sand Equivalent greater than 30) to a depth of at least one foot over the pipe, and the bedding material must be inspected and approved in writing by the Geotechnical Engineer (a representative of Geocon). The use of gravel is not acceptable unless used in conjunction with filter fabric to prevent the gravel from having direct contact with soil. The remainder of the trench backfill may be derived from onsite soil or approved import soil, compacted as necessary, until the required compaction is obtained. The use of minimum 2-sack slurry as backfill is also acceptable. Prior to placing any bedding materials or pipes, the excavation bottom must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon).
- 7.4.11 All trench and foundation excavation bottoms must be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon), prior to placing bedding materials, fill, steel, gravel or concrete.

7.5 Shrinkage

- 7.5.1 Shrinkage results when a volume of material removed at one density is compacted to a higher density. A shrinkage factor of between 5 and 10 percent should be anticipated when excavating and compacting the upper 5 feet of existing earth materials on site to an average relative compaction of 92 percent.
- 7.4.2 If import soils will be utilized in the building pads, the soils must be placed uniformly and at equal thickness at the direction of the Geotechnical Engineer (a representative of Geocon West, Inc.). Soils can be borrowed from non-building pad areas and later replaced with imported soils.

7.6 Conventional Foundation Design

- 7.6.1 Subsequent to the recommended grading, a conventional shallow spread foundation system may be utilized for support of the proposed structures provided foundations derive support in newly placed engineered fill. Proposed building foundations should be underlain by a minimum of 3 feet of newly placed engineered fill.
- 7.6.2 Since the proposed parking structure is heavier and is anticipated to settle more than the residential structures, it is recommended that the parking structure be constructed prior to the adjacent residential structures in order to allow the majority of the static settlement to occur. This will help to minimize differential settlements between the two structures if they are to be joined. The utilization of a lesser bearing value, or utilizing engineered fill below the foundations, would further reduce the anticipated settlements and could be evaluated further once the design becomes more finalized.

- 7.6.3 Continuous footings deriving support in the recommended bearing materials may be designed for an allowable bearing capacity of 2,500 pounds per square foot, and should be a minimum of 12 inches in width, 24 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing materials.
- 7.6.4 Isolated spread foundations deriving support in the recommended bearing materials may be designed for an allowable bearing capacity of 2,700 psf, and should be a minimum of 24 inches in width, 24 inches in depth below the lowest adjacent grade, and 12 inches into the recommended bearing materials.
- 7.6.5 The soil bearing pressure above may be increased by 100 psf and 400 psf for each additional foot of foundation width and depth, respectively, up to a maximum allowable soil bearing value of 4,500 psf.
- 7.6.6 The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.
- 7.6.7 Continuous footings should be reinforced with a minimum of four No. 4 steel reinforcing bars, two placed near the top of the footing and two near the bottom. Reinforcement for spread footings should be designed by the project structural engineer.
- 7.6.8 If depth increases are utilized for the exterior wall footings, this office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary. Additional grading should be conducted as-needed in order to maintain the required 3-foot thick blanket of engineered fill below proposed foundations.
- 7.6.9 The above foundation dimensions and minimum reinforcement recommendations are based on soil conditions and building code requirements only, and are not intended to be used in lieu of those required for structural purposes.
- 7.6.10 Due to the expansion potential of the site soils, the moisture content in the slab and foundation subgrade should be maintained subsequent to grading and as necessary until concrete placement.
- 7.6.11 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete to verify that the exposed soil conditions are consistent with those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.
- 7.6.12 This office should be provided a copy of the final construction plans so that the excavation recommendations presented herein could be properly reviewed and revised if necessary.

7.7 Foundation Settlement

- 7.7.1 The maximum expected total settlement for a structure supported on a conventional foundation system designed with the maximum allowable bearing value of 4,500 psf and deriving support in the recommended bearing materials is estimated to be approximately 1½ inch and occur below the heaviest loaded structural element. A majority of the settlement of the foundation system is expected to occur on initial application of loading; however, minor additional settlements are expected within the first 12 months. Differential settlement is expected to be less than ¾ inch over a distance of 20 feet.
- 7.7.2 If side by side construction is planned for the residential structures and parking structure, it is recommended that the parking structure be constructed prior to the adjacent residential structures in order to allow the majority of the static settlement to occur in the parking structure. This will help to minimize differential settlements between the two structures. The utilization of a lesser bearing value, or increasing the thickness of engineered fill below the foundations, would further reduce the anticipated settlements and could be evaluated further once the design becomes more finalized.
- 7.7.3 It is recommended that either a seismic separation or flexible connection be utilized where the apartment structures and parking structure may be attached. The design of the connection is at the discretion of the project structural engineer.
- 7.7.4 It is recommended that flexible utility connections be utilized for all rigid utilities to minimize or prevent damage to utilities from minor differential movements.
- 7.7.5 Once the design and foundation loading configurations for the proposed structures proceeds to a more finalized plan, the estimated settlements presented in this report should be reviewed and revised, if necessary. If the final foundation loading configurations are different than the assumed loading conditions the potential for settlement should be reevaluated by this office.

7.8 Mat Foundation Design – Swimming Pool

- 7.8.1 A reinforced concrete mat foundation may be utilized for support of proposed swimming pools. The mat foundation for the pool may derive support in the undisturbed alluvial soils generally found at or below a depth of 4 feet below the ground surface. If necessary, these miscellaneous improvements may derive support in a combination of newly placed engineered fill and competent alluvial soils. It is the intent of the Geotechnical Engineer to allow miscellaneous subterranean structures to derive support in both engineered fill and alluvial soils if project conditions warrant such an occurrence.
- 7.8.2 It is anticipated that the proposed mat foundation will impart an average pressure of less than 1,500 psf. The recommended maximum allowable bearing value is 1,500 psf. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

- 7.8.3 It is recommended that a modulus of subgrade reaction of 150 pounds per cubic inch be utilized for the design of the mat foundation bearing on marine deposits. The modulus should be reduced in accordance with the following equation when used with larger foundations:

$$K_R = K \left[\frac{B + 1}{2B} \right]^2$$

Where: K_R = reduced subgrade modulus
 K = unit subgrade modulus
 B = foundation width in feet

- 7.8.4 The thickness of and reinforcement for the mat foundation should be designed by the project structural engineer.
- 7.8.5 Based on the soil overburden load that will be removed during excavation of the swimming pool, anticipated settlements are expected to be very small. We estimate the total settlements for a mat foundation to be less than ½ inch, with differential settlements on the order of ¼ inch over a horizontal distance of 40 feet.
- 7.8.6 Foundation excavations should be observed by Geocon, prior to the placement of reinforcing steel and concrete to verify that the exposed soil conditions are consistent with those anticipated. If unanticipated soil conditions are encountered, foundation modifications may be required.

7.9 Miscellaneous Foundations

- 7.9.1 Foundations for small outlying structures, such as block walls, planter walls or trash enclosures, which will not be tied to the proposed structures, may be supported on conventional foundations bearing on a minimum of 12 inches of newly placed engineered fill which extends laterally at least 12 inches beyond the foundation area. Where excavation and compaction cannot be performed, such as adjacent to property lines, foundations may derive support in the undisturbed alluvium generally found at or below a depth of 2 feet, and should be deepened as necessary to maintain a 12 inch embedment in to the recommended bearing materials.
- 7.9.2 If the soils exposed in the excavation bottom are soft, compaction of the soft soils will be required prior to placing steel or concrete. Compaction of the foundation excavation bottom is typically accomplished with a compaction wheel or mechanical whacker and must be observed and approved in writing by a Geocon representative. Miscellaneous foundations may be designed for a bearing value of 1,500 pounds per square foot, and should be a minimum of 12 inches in width, 24 inches in depth below the lowest adjacent grade and 12 inches into the recommended bearing material. The allowable bearing pressure may be increased by up to one-third for transient loads due to wind or seismic forces.

- 7.9.3 Foundation excavations should be observed and approved in writing by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to the placement of reinforcing steel and concrete to verify that the excavations and exposed soil conditions are consistent with those anticipated.

7.10 Lateral Design

- 7.10.1 Resistance to lateral loading may be provided by friction acting at the base of foundations and by passive earth pressure. An allowable coefficient of friction of 0.30 may be used with the dead load forces in the newly placed engineered fill and competent, undisturbed alluvium.
- 7.10.2 Passive earth pressure for the sides of foundations and slabs poured against the newly placed engineered fill and competent undisturbed alluvium may be computed as an equivalent fluid having a density of 200 pcf with a maximum earth pressure of 2,000 pcf. When combining passive and friction for lateral resistance, the passive component should be reduced by one-third.

7.11 Concrete Slabs-on-Grade

- 7.11.1 Exterior concrete slabs-on-grade at the ground surface subject to vehicle loading should be designed in accordance with the recommendations in the *Preliminary Pavement Recommendations* section of this report (Section 7.12).
- 7.11.2 Subsequent to the recommended grading, the concrete slab-on-grade for the structures, not subject to vehicle loading, should be a minimum of 4-inches thick and minimum slab reinforcement should consist of No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions. Steel reinforcing should be positioned vertically near the slab midpoint.
- 7.11.3 Slabs-on-grade at the ground surface that may receive moisture-sensitive floor coverings or may be used to store moisture-sensitive materials should be underlain by a vapor retarder placed directly beneath the slab. The vapor retarder and acceptable permeance should be specified by the project architect or developer based on the type of floor covering that will be installed. The vapor retarder design should be consistent with the guidelines presented in Section 9.3 of the American Concrete Institute's (ACI) Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials (ACI 302.2R-06) and should be installed in general conformance with ASTM E 1643 (latest edition) and the manufacturer's recommendations. A minimum thickness of 15 mils extruded polyolefin plastic is recommended; vapor retarders which contain recycled content or woven materials are not recommended. The vapor retarder should have a permeance of less than 0.01 perms demonstrated by testing before and after mandatory conditioning. The vapor retarder should be installed in direct contact with the concrete slab with proper perimeter seal. If the California Green Building Code requirements apply to this project, the vapor

retarder should be underlain by 4 inches of clean aggregate. It is important that the vapor retarder be puncture resistant since it will be in direct contact with angular gravel. As an alternative to the clean aggregate suggested in the Green Building Code, it is our opinion that the concrete slab-on-grade may be underlain by a vapor retarder over 4 inches of clean sand (sand equivalent greater than 30), since the sand will serve a capillary break and will minimize the potential for punctures and damage to the vapor barrier.

- 7.11.4 For seismic design purposes, a coefficient of friction of 0.30 may be utilized between concrete slabs and subgrade soils without a moisture barrier, and 0.15 for slabs underlain by a moisture barrier.
- 7.11.5 Exterior slabs, not subject to traffic loads, should be at least 4 inches thick and reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions, positioned near the slab midpoint. Prior to construction of slabs, the upper 12 inches of subgrade should be moistened to 2 percent above optimum moisture content and properly compacted to at least 92 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).
- 7.11.6 Crack control joints should be spaced at intervals not greater than 10 feet and should be constructed using saw-cuts or other methods as soon as practical following concrete placement. Crack control joints should extend a minimum depth of one-fourth the slab thickness. Construction joints should be designed by the project structural engineer.
- 7.11.7 Due to the expansive potential of the anticipated subgrade soils, the moisture content of the slab subgrade should be maintained and sprinkled as necessary to maintain a moist condition as would be expected in any concrete placement. In addition, consideration should be given to doweling slabs into adjacent curbs and foundations to minimize movements and offsets which could lead to a potential tripping hazard.
- 7.11.8 The recommendations of this report are intended to reduce the potential for cracking of slabs due to settlement. However, even with the incorporation of the recommendations presented herein, foundations, stucco walls, and slabs-on-grade may exhibit some cracking due to minor soil movement and/or concrete shrinkage. The occurrence of concrete shrinkage cracks is independent of the supporting soil characteristics. Their occurrence may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement and curing, and by the placement of crack control joints at periodic intervals, in particular, where re-entrant slab corners occur.

7.12 Preliminary Pavement Recommendations

- 7.12.1 Where new paving is to be placed, it is recommended that all existing fill and soft or unsuitable alluvial soils be excavated and properly compacted for paving support. The client should be aware that excavation and compaction of all soft or unsuitable soils in the area of new paving is not required, however, paving constructed over existing unsuitable soils may experience increased settlement and/or cracking, and may therefore have a shorter design life and increased maintenance costs. As a minimum, the upper twelve inches of paving subgrade should be scarified, moisture conditioned to 2 percent above optimum moisture content, and properly compacted to at least 92 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).
- 7.12.2 The following pavement sections are based on an assumed R-Value of 20. Once site grading activities are complete, it is recommended that laboratory testing confirm the properties of the soils serving as paving subgrade prior to placing pavement.
- 7.12.3 The Traffic Indices listed below are estimates. Geocon does not practice in the field of traffic engineering. The actual Traffic Index for each area should be determined by the project civil engineer. If pavement sections for Traffic Indices other than those listed below are required, Geocon should be contacted to provide additional recommendations. Pavement thicknesses were determined following procedures outlined in the *California Highway Design Manual* (Caltrans). It is anticipated that the majority of traffic will consist of automobile and large truck traffic.

PRELIMINARY PAVEMENT DESIGN SECTIONS

Location	Estimated Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base (inches)
Automobile Traffic & Driveway	4.0	3.0	4.0
Trash Truck & Fire Lanes	7.0	4.0	12.0

- 7.12.4 Asphalt concrete should conform to Section 203-6 of the “*Standard Specifications for Public Works Construction*” (Green Book). Class 2 aggregate base materials should conform to Section 26-1.02A of the “*Standard Specifications of the State of California, Department of Transportation*” (Caltrans). The use of Crushed Miscellaneous Base in place of Class 2 aggregate base is acceptable. Crushed Miscellaneous Base should conform to Section 200-2.4 of the “*Standard Specifications for Public Works Construction*” (Green Book).

- 7.12.5 Unless specifically designed and evaluated by the project structural engineer, where exterior concrete paving will be utilized for support of vehicles, it is recommended that the concrete be a minimum of 6 inches of concrete reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions. Concrete paving supporting vehicular traffic should be underlain by a minimum of 4 inches of aggregate base and a properly compacted subgrade. The paving subgrade material should be moisture conditioned to 2 percent above optimum moisture content and compacted to at least 92 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition). Base material should be compacted to at least 95 percent relative compaction, as determined by ASTM Test Method D 1557 (latest edition).
- 7.12.6 The performance of pavements is highly dependent upon providing positive surface drainage away from the edge of pavements. Ponding of water on or adjacent to the pavement will likely result in saturation of the subgrade materials and subsequent cracking, subsidence and pavement distress. If planters are planned adjacent to paving, it is recommended that the perimeter curb be extended at least 12 inches below the bottom of the aggregate base to minimize the introduction of water beneath the paving.

7.13 Retaining Walls

- 7.13.1 The recommendations presented below are generally applicable to the design of rigid concrete or masonry retaining walls having a maximum height of 5 feet. In the event that walls higher than 5 feet are planned, Geocon should be contacted for additional recommendations.
- 7.13.2 Retaining wall foundations may be designed in accordance with the recommendations provided in the *Foundation Design* sections of this report (see Section 7.6).
- 7.13.3 Retaining walls with a level backfill surface that are not restrained at the top should be designed utilizing a triangular distribution of pressure (active pressure) of 30 pcf.
- 7.13.4 Restrained walls are those that are not allowed to rotate more than $0.001H$ (where H equals the height of the retaining portion of the wall in feet) at the top of the wall. Where walls are restrained from movement at the top, walls may be designed utilizing a triangular distribution of pressure (at-rest pressure) of 50 pcf.
- 7.13.5 The wall pressures provided above assume that the retaining wall will be properly drained preventing the buildup of hydrostatic pressure. If retaining wall drainage is not implemented, the equivalent fluid pressure to be used in design of undrained walls is 90 pcf. The value includes hydrostatic pressures plus buoyant lateral earth pressures.

- 7.13.6 The wall pressures provided above assume that the proposed retaining walls will support relatively undisturbed alluvial soils or engineered fill derived from onsite soils. If import soil will be used to backfill proposed retaining walls, revised earth pressures may be required to account for the geotechnical properties of the import soil used as engineered fill. This should be evaluated once the use of import soil is established. All imported fill shall be observed, tested, and approved by Geocon West, Inc. prior to bringing soil to the site.
- 7.13.7 Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent structures and should be designed for each condition as the project progresses. Once the design becomes more finalized, an addendum letter can be prepared revising recommendations and addressing specific surcharge conditions throughout the project, if necessary.

7.14 Retaining Wall Drainage

- 7.14.1 Retaining walls should be provided with a drainage system extended at least two-thirds the height of the wall. At the base of the drain system, a subdrain covered with a minimum of 12 inches of gravel should be installed, and a compacted fill blanket or other seal placed at the surface (see Figure 5). The clean bottom and subdrain pipe, behind a retaining wall, should be observed by the Geotechnical Engineer (a representative of Geocon), prior to placement of gravel or compacting backfill.
- 7.14.2 As an alternative, a plastic drainage composite such as Miradrain or equivalent may be installed in continuous, 4-foot wide columns along the entire back face of the wall, at 8 feet on center. The top of these drainage composite columns should terminate approximately 18 inches below the ground surface, where either hardscape or a minimum of 18 inches of relatively cohesive material should be placed as a cap (see Figure 6). These vertical columns of drainage material would then be connected at the bottom of the wall to a collection panel or a 1-cubic-foot rock pocket drained by a 4-inch subdrain pipe.
- 7.14.3 Subdrainage pipes at the base of the retaining wall drainage system should outlet to an acceptable location via controlled drainage structures. Drainage should not be allowed to flow uncontrolled over descending slopes.
- 7.14.4 Moisture affecting below grade walls is one of the most common post-construction complaints. Poorly applied or omitted waterproofing can lead to efflorescence or standing water. Particular care should be taken in the design and installation of waterproofing to avoid moisture problems, or actual water seepage into the structure through any normal shrinkage cracks which may develop in the concrete walls, floor slab, foundations and/or construction joints. The design and inspection of the waterproofing is not the responsibility of the geotechnical engineer. A waterproofing consultant should be retained in order to recommend a product or method, which would provide protection to subterranean walls, floor slabs and foundations.

7.15 Swimming Pool

- 7.15.1 The proposed swimming pool should be designed as free-standing structures deriving support in newly placed engineered fill and/or the competent alluvial soils generally found at or below a depth of 4 feet.
- 7.15.2 Swimming pool foundations and walls may be designed in accordance with the *Mat Foundation Design* and *Retaining Wall Design* sections of this report (see Sections 7.8 and 7.13). The proposed pool should be constructed utilizing an expansive soils design, and a hydrostatic relief valve should be considered as part of the swimming pool design unless a gravity drain system can be placed beneath the pool shell.
- 7.15.3 If a spa is proposed it should be constructed independent of the swimming pool and must not be cantilevered from the swimming pool shell.

7.16 Elevator Pit Design

- 7.16.1 The elevator pit slab and retaining wall should be designed by the project structural engineer. As a minimum the slab-on-grade for the elevator pit bottom should be at least 4 inches thick and reinforced with No. 3 steel reinforcing bars placed 18 inches on center in both horizontal directions, positioned near the slab midpoint. Elevator pit walls may be designed in accordance with the recommendations in the *Foundation Design and Retaining Wall Design* section of this report (see Sections 7.6 and 7.13).
- 7.16.2 Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent foundations and should be designed for each condition as the project progresses.
- 7.16.3 If retaining wall drainage is to be provided, the drainage system should be designed in accordance with the *Retaining Wall Drainage* section of this report (see Section 7.14).
- 7.16.4 It is suggested that the exterior walls and slab be waterproofed to prevent excessive moisture inside of the elevator pit. Waterproofing design and installation is not the responsibility of the geotechnical engineer.

7.17 Elevator Piston

- 7.17.1 If a plunger-type elevator piston is installed for this project, a deep drilled excavation will be required. It is important to verify that the drilled excavation is not situated immediately adjacent to a foundation, or the drilled excavation could compromise the existing foundation support, especially if the drilling is performed subsequent to the foundation construction.

- 7.17.2 Casing may be required if caving is experienced in the drilled excavation. The contractor should be prepared to use casing and should have it readily available at the commencement of drilling activities. The contractor should also be prepared to mitigate buoyant forces during installation of the piston casing. Continuous observation of the drilling and installation of the elevator piston by the Geotechnical Engineer (a representative of Geocon West, Inc.) is required.
- 7.17.3 The annular space between the piston casing and drilled excavation wall should be filled with a minimum of 1½-sack slurry pumped from the bottom up. As an alternative, pea gravel may be utilized. The use of soil to backfill the annular space is not acceptable.

7.18 Temporary Excavations

- 7.18.1 Excavations on the order of 5 feet in height may be required during grading operations. The excavations are expected to expose artificial fill and alluvial soils, which are suitable for vertical excavations up to 5 feet in height where loose soils or caving sands are not present, and where not surcharged by adjacent traffic or structures.
- 7.18.2 Vertical excavations greater than five feet will require sloping and/or shoring measures in order to provide a stable excavation. Where sufficient space is available, temporary unsurcharged embankments up to 12 feet high could be sloped back at a uniform 1:1 slope gradient or flatter. A uniform slope does not have a vertical portion.
- 7.18.3 If excavations in close proximity to an adjacent property line and/or structure are required, special excavation measures such as slot-cutting or shoring may be necessary in order to maintain lateral support of offsite improvements. Recommendations for alternative temporary excavation measures can be provided under separate cover, if needed.
- 7.18.4 Where sloped embankments are utilized, the top of the slope should be barricaded to prevent vehicles and storage loads at the top of the slope within a horizontal distance equal to the height of the slope. If the temporary construction embankments are to be maintained during the rainy season, berms are suggested along the tops of the slopes where necessary to prevent runoff water from entering the excavation and eroding the slope faces. Geocon personnel should inspect the soils exposed in the cut slopes during excavation so that modifications of the slopes can be made if variations in the soil conditions occur. All excavations should be stabilized within 30 days of initial excavation.

7.19 Stormwater Infiltration

- 7.21.1 During the May 15, 2014 site exploration, boring B2 was utilized to perform percolation testing. The boring was advanced to a depth of 10 feet below the existing ground surface. Slotted casing was placed in the boring, and the annular space between the casing and excavation were filled with filter pack. The boring was then filled with water to pre-saturate the soils to a depth of approximately 3 feet below ground surface.
- 7.21.2 On May 16, 2014, upon returning to the site after the 24 hour pre-soak period, water was still present in the boring. The water depth was measured as 5 feet below the ground surface. Geocon remained onsite for an additional hour, and no further dissipation of the water was observed. Based on these considerations, these soils are considered impermeable and are not conducive for infiltration of stormwater. It is recommended that stormwater be retained, filtered, and discharged in accordance with the requirements of the local governing agency.

7.20 Surface Drainage

- 7.22.1 Proper surface drainage is critical to the future performance of the project. Uncontrolled infiltration of irrigation excess and storm runoff into the soils can adversely affect the performance of the planned improvements. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change in the original designed engineering properties. Proper drainage should be maintained at all times.
- 7.22.2 All site drainage should be collected and controlled in non-erosive drainage devices. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundation or retaining wall. The site should be graded and maintained such that surface drainage is directed away from structures in accordance with 2016 CBC 1804.4 or other applicable standards. In addition, drainage should not be allowed to flow uncontrolled over any descending slope. Discharge from downspouts, roof drains and scuppers are not recommended onto unprotected soils within 5 feet of the building perimeter. Planters which are located adjacent to foundations should be sealed to prevent moisture intrusion into the soils providing foundation support. Landscape irrigation is not recommended within five feet of the building perimeter footings except when enclosed in protected planters.
- 7.22.3 Positive site drainage should be provided away from structures, pavement, and the tops of slopes to swales or other controlled drainage structures. The building pad and pavement areas should be fine graded such that water is not allowed to pond.
- 7.22.4 Landscaping planters immediately adjacent to paved areas are not recommended due to the potential for surface or irrigation water to infiltrate the pavement's subgrade and base course. Either a subdrain, which collects excess irrigation water and transmits it to drainage structures, or an impervious above-grade planter boxes should be used. In addition, where landscaping is planned adjacent to the pavement, it is recommended that consideration be

given to providing a cutoff wall along the edge of the pavement that extends at least 12 inches below the base material.

7.21 Plan Review

- 7.23.1 Grading and foundation plans should be reviewed by the Geotechnical Engineer (a representative of Geocon West, Inc.), prior to finalization to verify that the plans have been prepared in substantial conformance with the recommendations of this report and to provide additional analyses or recommendations.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations of this report pertain only to the site investigated and are based upon the assumption that the soil conditions do not deviate from those disclosed in the investigation. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geocon West, Inc. should be notified so that supplemental recommendations can be given. The evaluation or identification of the potential presence of hazardous or corrosive materials was not part of the scope of services provided by Geocon West, Inc.
2. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to ensure that the information and recommendations contained herein are brought to the attention of the architect and engineer for the project and incorporated into the plans, and the necessary steps are taken to see that the contractor and subcontractors carry out such recommendations in the field.
3. The findings of this report are valid as of the date of this report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and should not be relied upon after a period of three years.
4. The firm that performed the geotechnical investigation for the project should be retained to provide testing and observation services during construction to provide continuity of geotechnical interpretation and to check that the recommendations presented for geotechnical aspects of site development are incorporated during site grading, construction of improvements, and excavation of foundations. If another geotechnical firm is selected to perform the testing and observation services during construction operations, that firm should prepare a letter indicating their intent to assume the responsibilities of project geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for their records. In addition, that firm should provide revised recommendations concerning the geotechnical aspects of the proposed development, or a written acknowledgement of their concurrence with the recommendations presented in our report. They should also perform additional analyses deemed necessary to assume the role of Geotechnical Engineer of Record.

LIST OF REFERENCES

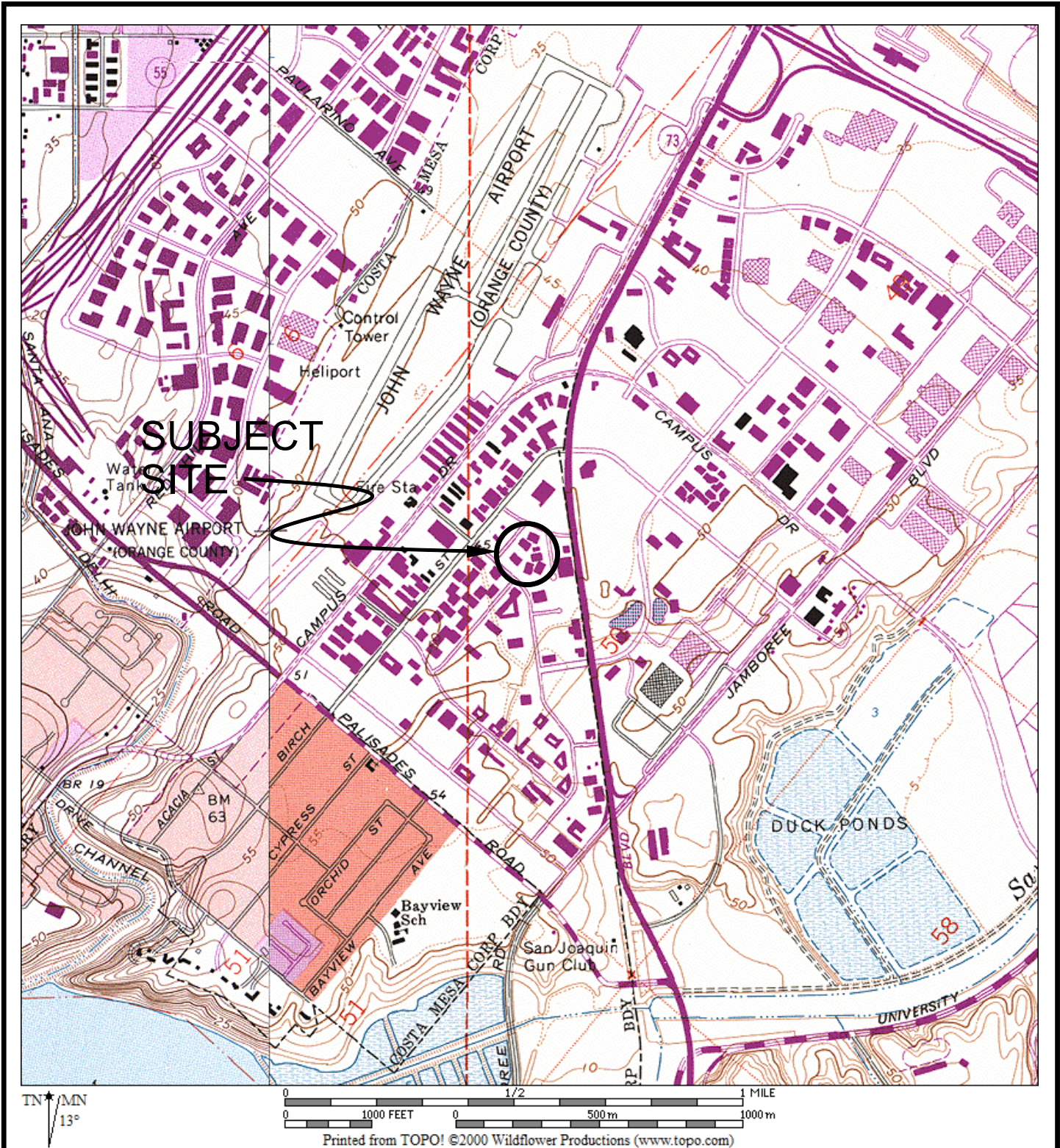
- Anderson, J. G., 1984, *Synthesis of Seismicity and Geologic Data in California*, U.S. Geological Survey Open File Report 84-424.
- Applied Technology Council, 1978, *Tentative Provisions for Development of Seismic Regulations for Buildings*, ATC Publication ATC 3-06, NBS Special Publication 510, NSF Publication 78-8.
- Blake, T. F., 2000, *EQFAULT, A Computer Program for the Deterministic Prediction of Peak Horizontal Acceleration from Digitized California Faults*, Version 2.20.
- Blake, T. F., 2000, *EQSEARCH, A Computer Program for the Estimation of Peak Horizontal Acceleration from California Historical Earthquake Catalogs*, Version 2.20.
- Blake, T. F., 2000, *FRISKSP, A Computer Program for the Probabilistic Estimation of Uniform-Hazard Spectra Using 3-D Faults as Earthquake Sources*.
- Boore, D. M., Joyner, W. B., and Fumal, T. E., 1997, *Equations for Estimating Horizontal Response Spectra and Peak Acceleration from Western North American Earthquakes, A Summary of Recent Work*, Seismological Research Letters, Vol. 68, No. 1, pp. 128-153.
- Bryant, W. A. and Hart, E. W., 2007, *Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zone Maps*, California Division of Mines and Geology Special Publication 42, interim revision.
- Bryant, W. A., 1988, *Recently Active Traces of the Newport-Inglewood Fault Zone, Los Angeles and Orange Counties, California*, California Division of Mines and Geology Open File Report 88-14.
- Bryant, W. A., 1986, *Newport-Inglewood Fault Zone Across Southwest Newport Mesa, Orange County, California*, California Division of Mines and Geology Fault Evaluation Report FER 172.
- California Department of Water Resources, 1967, *Progress Report on Groundwater Geology of the Coastal Plain of Orange County*.
- California Division of Mines and Geology, 1997 (Revised 2001), *Seismic Hazard Evaluation of the Tustin 7.5-Minute Quadrangle, Orange County, California*, Open File Report 97-20.
- California Division of Mines and Geology, 2001, *State of California, Seismic Hazard Zones, Tustin Quadrangle, Official Map Released: January 17, 2001*.
- California Division of Mines and Geology, 1981, *Geologic Map of Orange County, California, Showing Mines and Mineral Deposits*, Bulletin 204, Plate 1, Scale: 1:48000.
- California Division of Oil, Gas and Geothermal Resources, 2004; *Regional Wildcat Map, Orange County*, Map Number W1-6.
- California Geological Survey, 2008, *Guidelines for Evaluating and Mitigating Seismic Hazards in California*, Special Publication 117A.
- Chang, S.W., et al., 1994, *Ground Motions and Local Site Effects*, University of California at Berkeley Earthquake Engineering Research Center, Report No. UCB/EERC-94/08, p.28.

LIST OF REFERENCES (continued)

- Bryant, W. A. and Hart, E. W., 2007, *Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zone Maps*, California Division of Mines and Geology Special Publication 42, interim revision.
- California Department of Water Resources, 2017, *Groundwater Level Data by Township, Range, and Section*, Web Site Address: http://www.water.ca.gov/waterdatalibrary/groundwater/hydrographs/index_trs.cfm.
- California Division of Mines and Geology, 1999; *State of California Seismic Hazard Zones, Tustin Quadrangle*, Official Map, Released: January 17, 2001.
- California Division of Mines and Geology, 1998, *Seismic Hazard Evaluation of the Tustin 7.5-Minute Quadrangle, Orange County, California*, Open File Report 97-20.
- California Division of Oil, Gas and Geothermal Resources, 2017. Division of Oil, Gas, and Geothermal Resources Well Finder, <http://maps.conservation.ca.gov/doggr/index.html#close>. Accessed July, 12, 2017.
- California Division of Oil, Gas and Geothermal Resources (DOGGR), 2006, *Regional Wildcat Map, Los Angeles and Orange Counties*, Map W1-6.
- California Geological Survey, 2017, CGS Information Warehouse, Regulatory Map Portal, <http://maps.conservation.ca.gov/cgs/informationwarehouse/index.html?map=regulatorymaps>.
- FEMA, 2009, *Flood Insurance Rate Map, Orange County, California and Incorporated Areas, Panel 286 of 539, Map Number 06059C0286J*; Online Flood Hazard Maps, <http://www.esri.com/hazards/index.html>.
- Grant, L. B., Ballenger, L. J., and Runnerstrom, E. E., 2002, *Coastal Uplift of the San Joaquin Hills, Southern Los Angeles Basin, California, by a Large Earthquake Since A. D. 1635*, Bulletin of the Seismological Society of America, Vol. 92, No. 2, pp. 590-599.
- Grant, L. B., Mueller, K. J., Gath, E. M., and Munro, R., 2000, *Late Quaternary Uplift and Earthquake Potential of the San Joaquin Hills, Southern Los Angeles Basin, California*, Geology, Vol. 28, No. 4, p. 384.
- Grant, L. B., et. al., 1999, *Late Quaternary Uplift and Earthquake potential of the San Joaquin Hills, Southern Los Angeles Basin, California*. Geology; Vol. 27; No. 11; pg. 1013-1034
- Hauksson, E., 1987, *Seismotectonics of the Newport-Inglewood Fault Zone in the Los Angeles Basin, Southern California*, Bulletin of the Seismological Society of America, Vol. 77, pp. 539-561.
- Ishihara, K., 1985, *Stability of Natural Deposits During Earthquakes*, Proceedings of the Eleventh International Conference on Soil Mechanics and Foundation Engineering, A. A. Balkema Publishers, Rotterdam, Netherlands, vol. 1, pp. 321-376.
- Jennings, C. W. and Bryant, W. A., 2010, *Fault Activity Map of California*, California Geological Survey Geologic Data Map No. 6.

LIST OF REFERENCES (continued)

- Martin, G. R., and Lew, M., 1999, Co-chairs and Editors of the Implementation Committee, *Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction Hazards in California*, Organized through the Southern California Earthquake Center, University of Southern California.
- Mendenhall, W. C., 1905, *Development of Underground Waters in the Western Coastal Plain Region, Southern California*, U. S. Geological Survey Water Supply Paper 139.
- Orange County General Plan, 2004, *Safety Element*, Advance Planning Program, Environmental Management Agency.
- Robertson, P. K., 2009, *Performance Based Earthquake Design Using the CPT*, Keynote Lecture, International Conference on Performance-based Design in Earthquake Geotechnical Engineering – from case history to practice, IS-Tokyo, June 2009.
- Sadigh, K., Chang, C.Y., Egan, J. A., Makdisi, F., and Youngs, R. R., 1997, *Attenuation Relationships for Shallow Crustal Earthquakes Based on California Strong Motion Data*, Seismological Research Letters, Vol. 68, No. 1.
- Newport Beach, City of, 2006, *Safety Element of the General Plan*, Figures S1 through S3.
- Sprotte, E. C., Fuller, D. R., Greenwood, R. B., Mumm, H. A. Real, C. R., and Sherburne, R. W., 1980, *Classification and Mapping of Quaternary Sedimentary Deposits for Purposed of Seismic Zonation, South Coastal Los Angeles Basin, Orange County, California*, California Division of Mines and Geology Open File Report 80-19.
- Topozada, T. R., Bennett, J. H., Borchardt, G. A., Saul, R., and Davis, J .F., 1988, *Planning Scenario for a Major Earthquake on the Newport–Inglewood Fault Zone*, California Division of Mines and Geology *Special Publication 99*.
- U.S. Geological Survey, 1972, *Tustin 7.5-Minute Topographic Map*.
- Wesnousky, S. G., 1986, *Earthquakes, Quaternary Faults and Seismic Hazard in California*, Journal of Geophysical Research, Vol. 91, No. B12, pp. 12,587–12,631.
- Zhang, G., Robertson, P. K., Brachman, R., 2002, *Estimating Liquefaction Induced Ground Settlements from the CPT*, Canadian Geotechnical Journal, 39: pp 1168-1180.
- Ziony, J. I., and Jones, L. M., 1989, *Map Showing Late Quaternary Faults and 1978–1984 Seismicity of the Los Angeles Region, California*, U.S. Geological Survey Miscellaneous Field Studies Map MF-1964.



REFERENCE: U.S.G.S. TOPOGRAPHIC MAPS, 7.5 MINUTE SERIES, NEWPORT BEACH AND TUSTIN, CA QUADRANGLES

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VICINITY MAP
MAC ARTHUR SQUARE
 5.6 ACRE AREA BOUNDED BY DOVE STREET,
 SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
 NEWPORT BEACH, CALIFORNIA

JULY 2017	PROJECT NO. A9138-88-02	FIG. 1
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LEGEND

-  B6 Approximate Location of Boring
-  CPT-2 Approximate Location of CPT
-  Approximate Limits of Proposed Development
-  Approximate Location of Existing Structures

LEGEND:

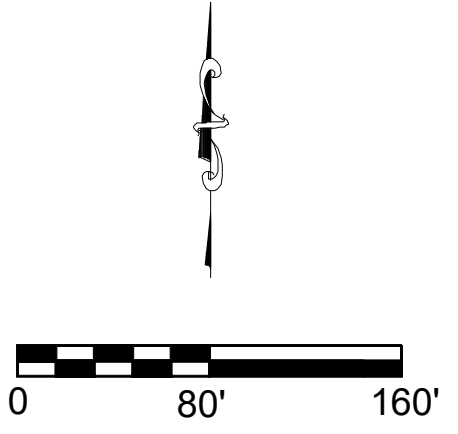
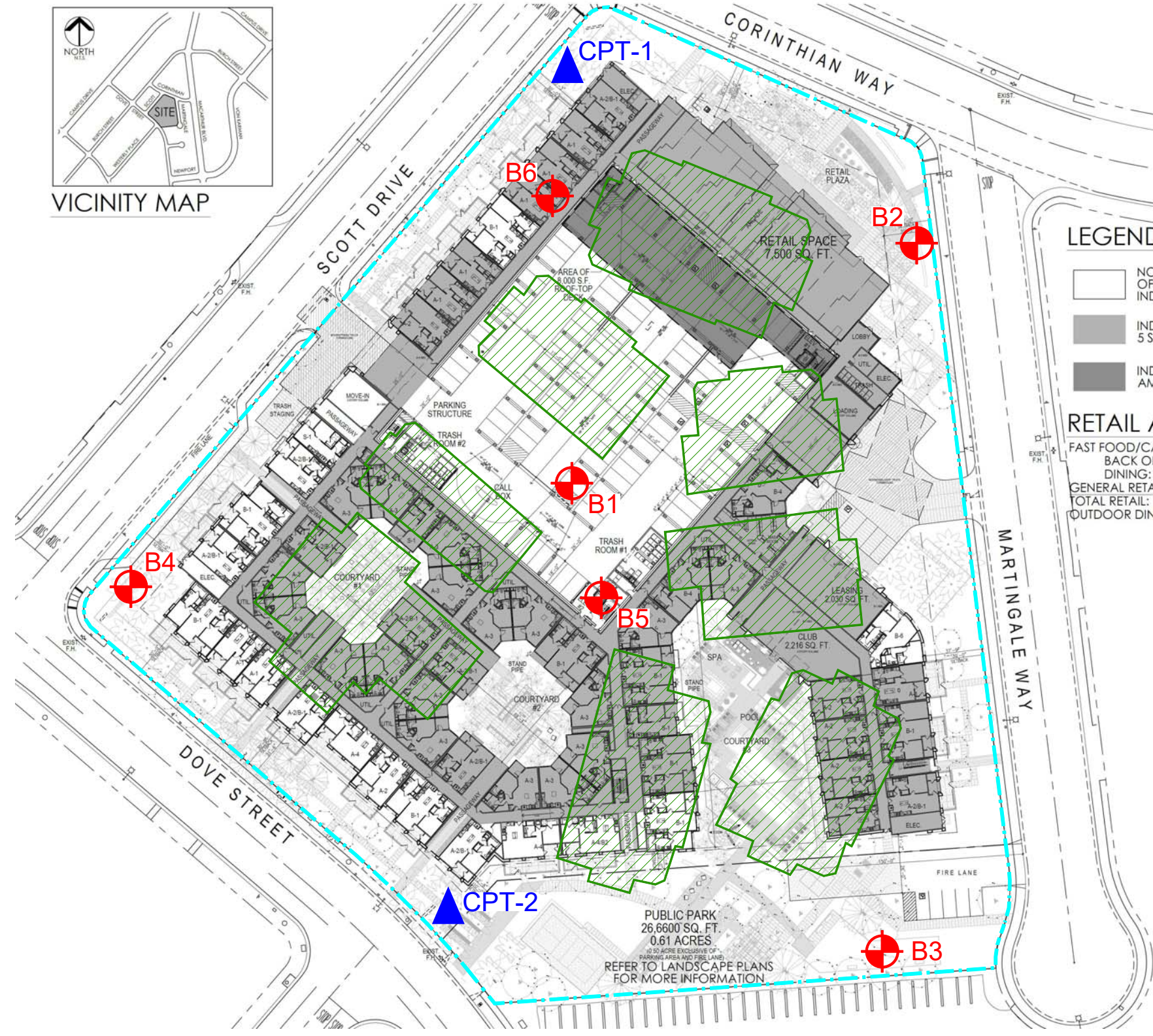
-  NON-SHADED PORTIONS OF RESIDENTIAL BUILDING INDICATES 4 STORIES
-  INDICATES AREA OF 5 STORIES
-  INDICATES AREA OF AMENITY DECK


RETAIL ASSUMPTIONS:

FAST FOOD/CASUAL	
BACK OF HOUSE:	1000 S.F.
DINING:	1000 S.F.
GENERAL RETAIL:	5500 S.F.
TOTAL RETAIL:	7500 S.F.
OUTDOOR DINING:	1000 S.F.

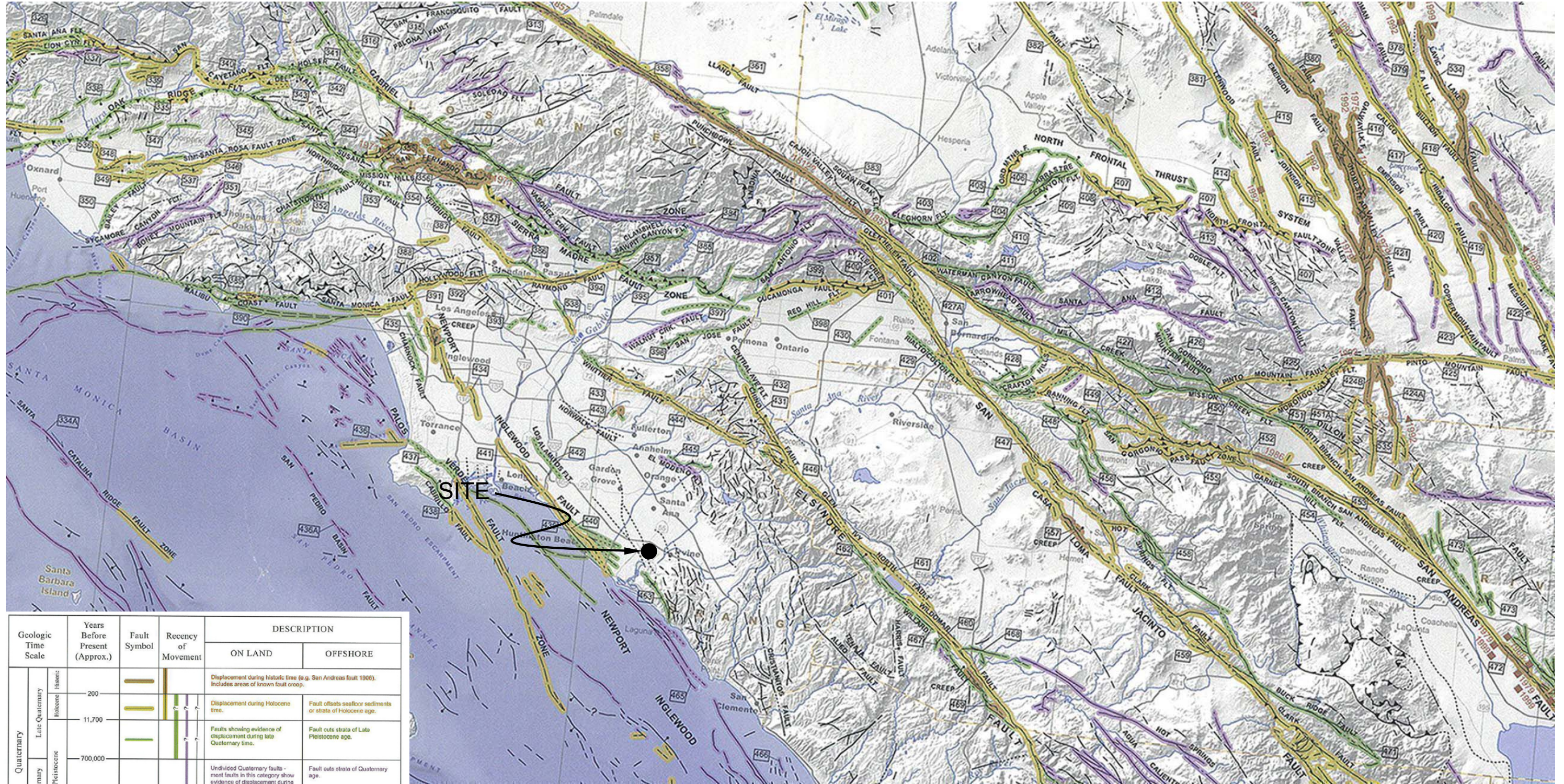


VICINITY MAP



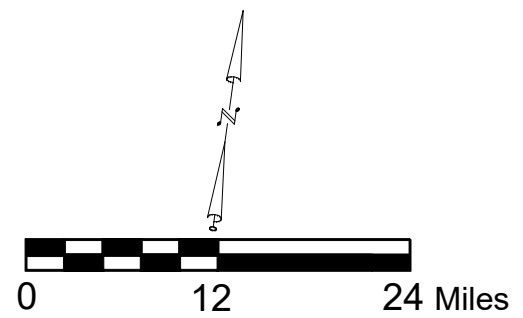
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SITE PLAN		
MAC ARTHUR SQUARE 5.6 ACRE AREA BOUNDED BY DOVE STREET, SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY NEWPORT BEACH, CALIFORNIA		
JULY 2017	PROJECT NO. A9138-88-02	FIG. 2

Reference: Jennings, C.W. and Bryant, W. A., 2010, Fault Activity Map of California, California Geological Survey Geologic Data Map No. 6.



Geologic Time Scale	Years Before Present (Approx.)	Fault Symbol	Reency of Movement	DESCRIPTION	
				ON LAND	OFFSHORE
Quaternary	Late Quaternary Holocene 200 - 11,700			Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	Fault offsets seafloor sediments or strata of Holocene age.
				Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
	Early Quaternary Pleistocene 700,000 - 1,600,000			Undiscovered Quaternary faults - most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Plio-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary 4.5 billion (Age of Earth)					Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.

* Quaternary now recognized as extending to 2.6 Ma (Walker and Geissman, 2009). Quaternary faults in this map were established using the previous 1.6 Ma criterion.



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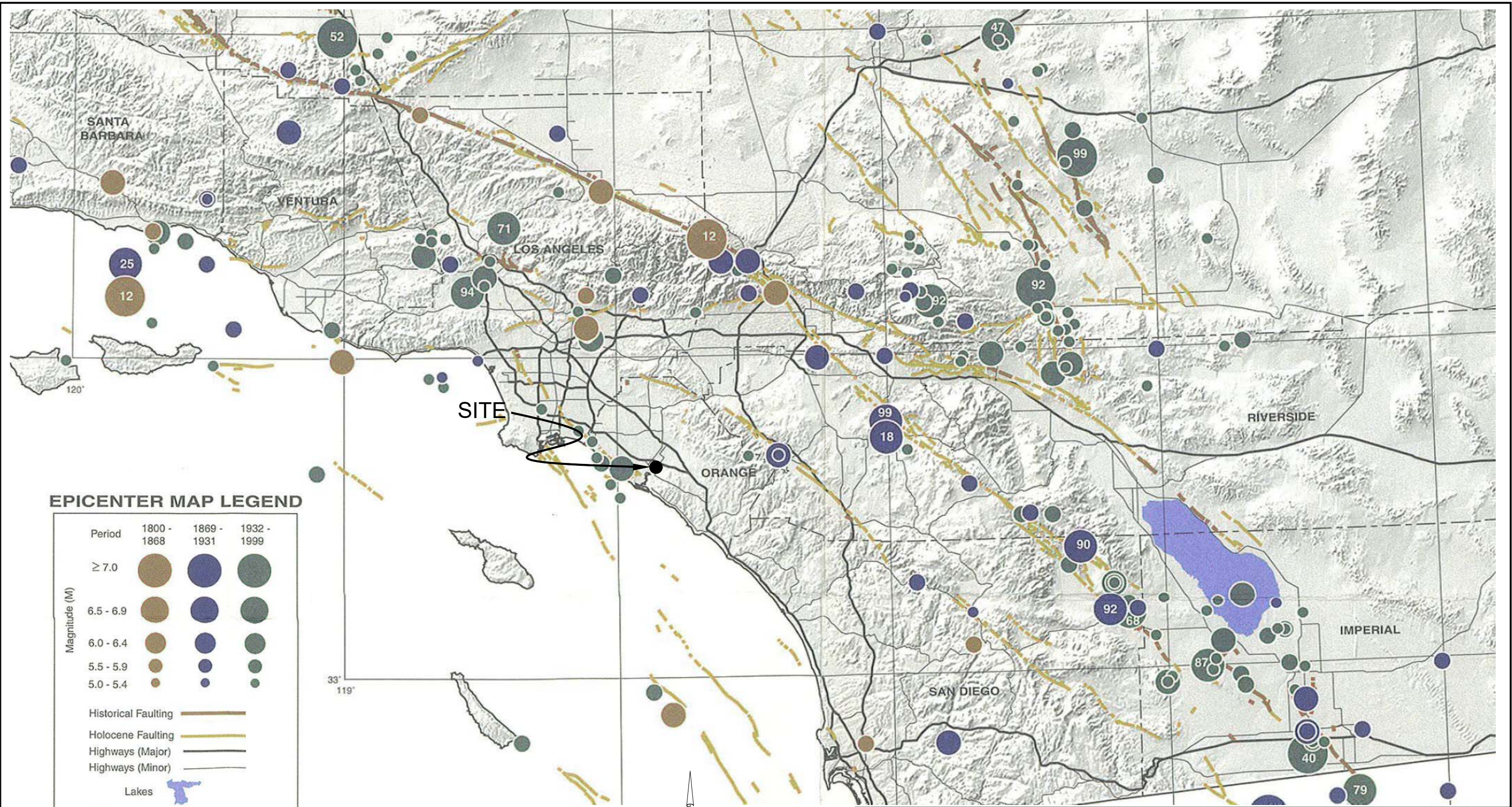
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REGIONAL FAULT MAP

MAC ARTHUR SQUARE
5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

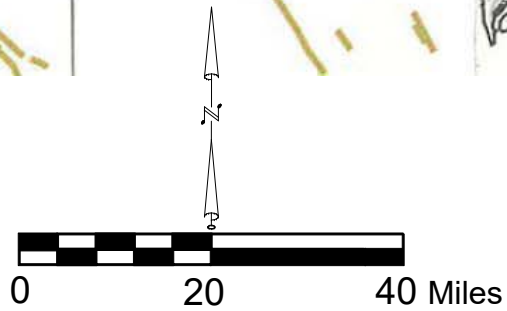
JULY 2017 PROJECT NO. A9138-88-02 FIG. 3



EPICENTER MAP LEGEND

Period	1800 - 1868	1869 - 1931	1932 - 1999
Magnitude (M) ≥ 7.0			
6.5 - 6.9			
6.0 - 6.4			
5.5 - 5.9			
5.0 - 5.4			
Historical Faulting			
Holocene Faulting			
Highways (Major)			
Highways (Minor)			
Lakes			
	Last two digits of M ≥ 6.5 earthquake year		

Reference: Topozada, T., Branum, D., Petersen, M., Hallstrom, C., Cramer, C., and Reichle, M., 2000, Epicenters and Areas Damaged by M \geq 5 California Earthquakes, 1800 - 1999, California Geological Survey, Map Sheet 49.



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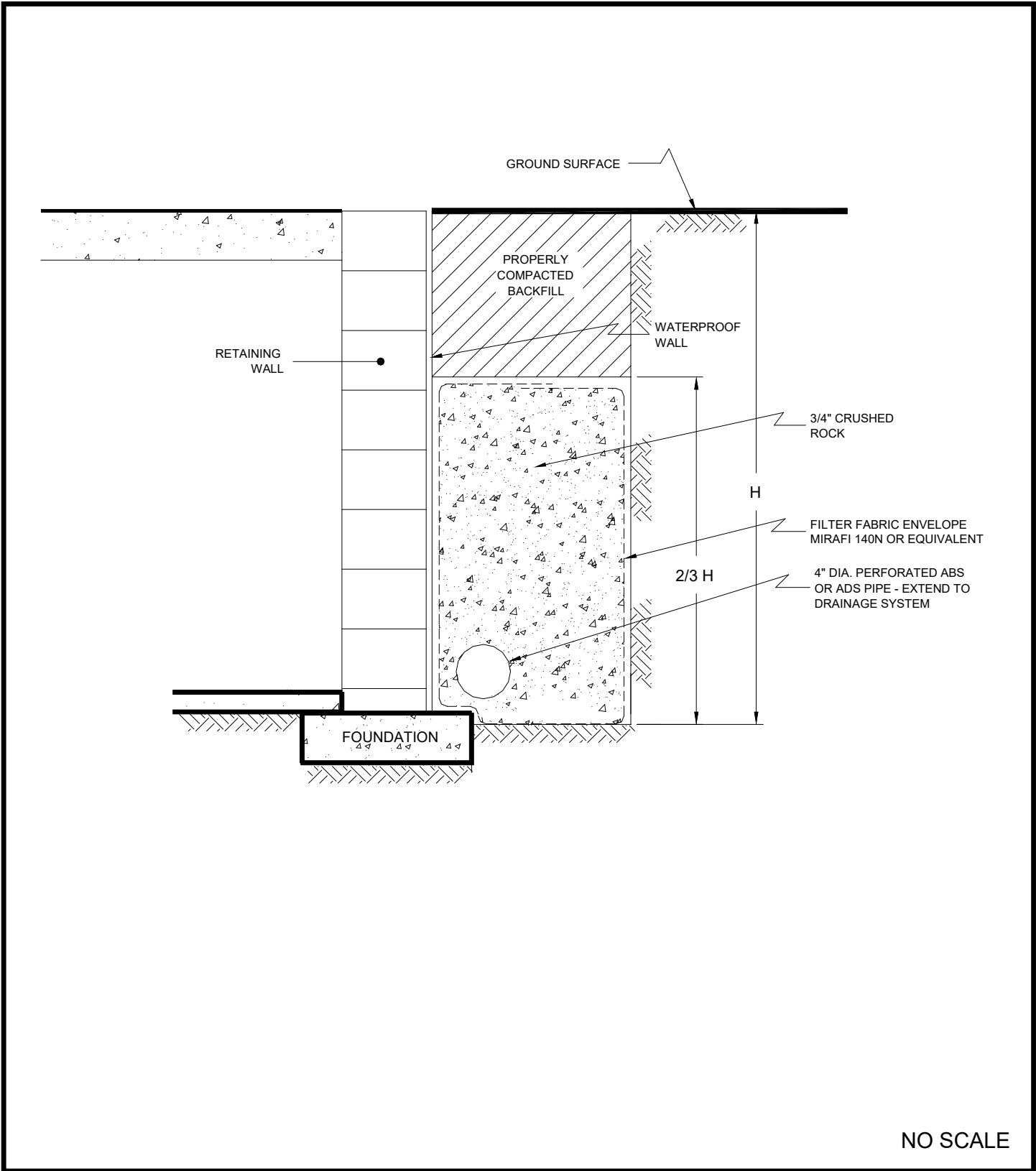
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REGIONAL SEISMICITY MAP

MAC ARTHUR SQUARE
5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JULY 2017 PROJECT NO. A9138-88-02 FIG. 4



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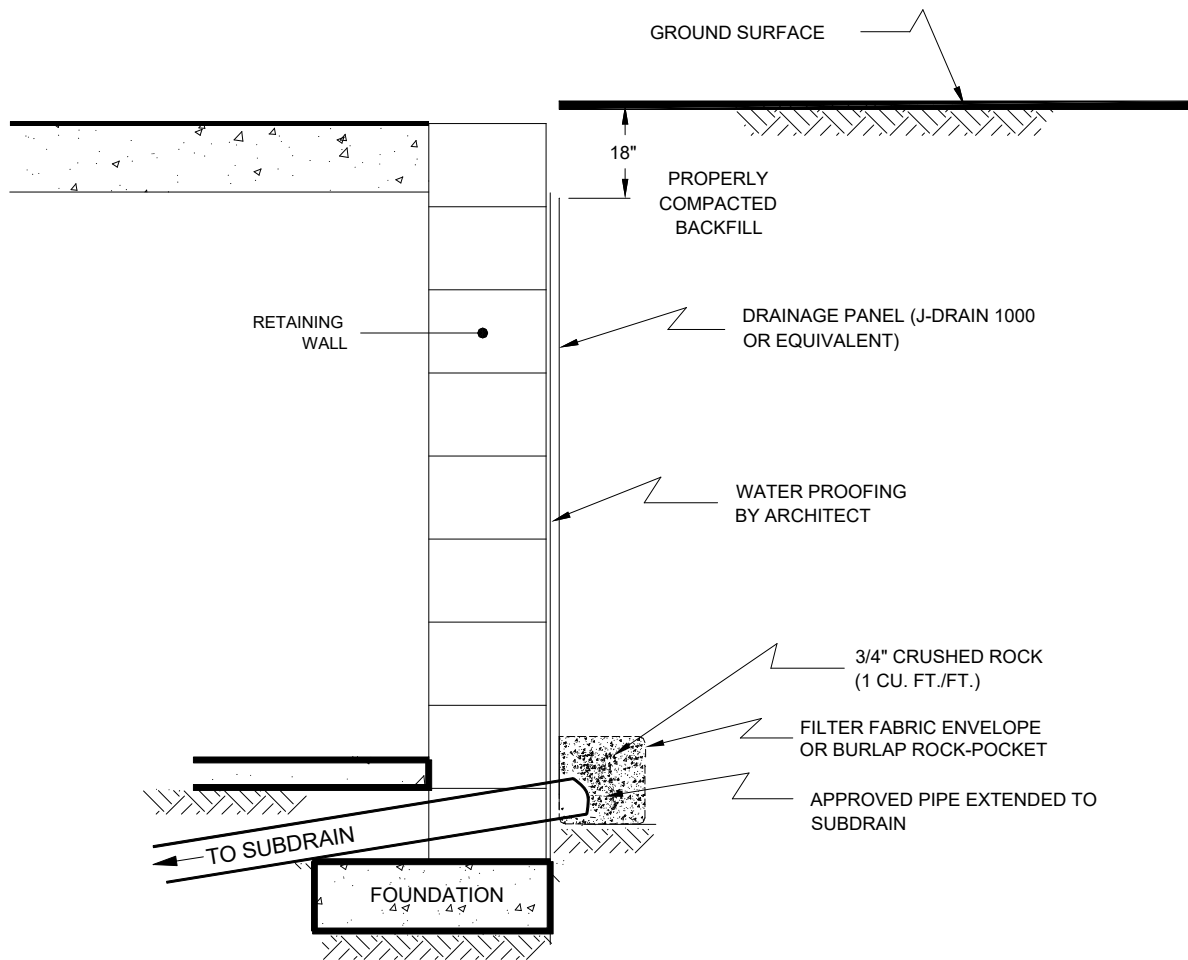
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RETAINING WALL DRAIN DETAIL

MAC ARTHUR SQUARE
5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JULY 2017	PROJECT NO. A9138-88-02	FIG. 5
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NO SCALE

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RETAINING WALL DRAIN DETAIL

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JULY 2017

PROJECT NO. A9138-88-02

FIG. 6

APPENDIX



A

APPENDIX A

FIELD INVESTIGATION







The site was initially explored on May 15, 2014, by drilling four 8-inch diameter borings utilizing a truck-mounted hollow-stem auger drilling machine and advancing two cone penetrometer tests (CPTs). The borings were drilled to depths between 10½ and 30½ feet below the existing ground surface. The CPTs were advanced to depths of 50½ feet below existing ground surface. Additional site exploration was performed on June 19, 2017 by excavating two 8-inch diameter borings to depths of 35½ feet utilizing a truck-mounted hollow-stem auger drilling machine. Representative and relatively undisturbed samples were obtained by driving a 3 inch, O. D., California Modified Sampler into the “undisturbed” soil mass with blows from a 140-pound auto-hammer falling 30 inches. The California Modified Sampler was equipped with 1-inch high by 2³/₈-inch diameter brass sampler rings to facilitate soil removal and testing. Bulk samples were also obtained. The approximate locations of the exploratory borings and CPTS are depicted on the Site Plan (see Figure 2).

The soil conditions encountered in the boring were visually examined, classified and logged in general accordance with the Unified Soil Classification System (USCS). The logs of the borings are presented on Figures A1 through A6, and the CPT soundings are presented as Figures A7 and A8. The logs depict the soil and geologic conditions encountered and the depth at which samples were obtained.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 1		PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) --	DATE COMPLETED <u>5/15/14</u>			
					EQUIPMENT <u>HOLLOW STEM AUGER</u> BY: <u>PZ</u>				
MATERIAL DESCRIPTION									
0					ASPHALT: 3" BASE: 4"				
2	B1@2'				Silty Sand/Sandy Silt, medium dense to stiff, slightly moist, reddish brown, fine- to medium-grained, trace fine gravel, some clay.		35	125.3	6.5
4					MARINE TERRACE DEPOSITS				
6	B1@5'			ML	Sandy Silt, stiff, slightly moist, yellowish brown, fine- to medium-grained, some clay.		27	121.7	8.4
8	B1@7'				- loose, increase in medium-grained with some coarse-grained, decrease in silt content		11	103.7	2.4
10	B1@10'				Silt with Sand, stiff, slightly moist, yellowish brown, very fine- to fine-grained.		24	115.1	8.9
12	B1@12'			ML			25	115.7	9.4
14					- slightly porous				
16	B1@15'						35	115.2	11.2
18	B1@18'				Clay with Sand, stiff, slightly moist, olive brown with oxidation mottles, very fine- to fine-grained, some silt, trace fine gravel, moderate plasticity.		25	111.3	10.5
20	B1@20'			CL			39	111.4	12.2
22	B1@22'						27	107.2	13.7
24					- increase in silt content				
26	B1@25'				Sandy Silt, stiff, moist, olive brown with oxidation mottles, very fine- to fine-grained.		23	108.0	13.6
28	B1@27'			ML	- increase in sand content		33	111.6	14.2
				SP-SM	Sand with Silt, poorly graded, medium dense, wet, olive brown to yellowish				

Figure A1,
Log of Boring 1, Page 1 of 2

A9138-88-02 BORING LOGS.GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 1 ELEV. (MSL.) -- DATE COMPLETED <u>5/15/14</u> EQUIPMENT <u>HOLLOW STEM AUGER</u> BY: <u>PZ</u>	PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
30	B1 @ 30'				MATERIAL DESCRIPTION brown, fine- to medium-grained. Total depth of boring: 30.5 feet Fill to 4 feet. Groundwater encountered at 30 feet. Backfilled with soil cuttings and tamped. Asphalt patched. *Penetration resistance for 140 pound hammer falling 30 inches by auto hammer.	27	104.2	11.8

**Figure A1,
Log of Boring 1, Page 2 of 2**

A9138-88-02 BORING LOGS.GPJ

SAMPLE SYMBOLS <input type="checkbox"/> ... SAMPLING UNSUCCESSFUL <input checked="" type="checkbox"/> ... DISTURBED OR BAG SAMPLE	<input type="checkbox"/> ... STANDARD PENETRATION TEST <input checked="" type="checkbox"/> ... CHUNK SAMPLE	<input checked="" type="checkbox"/> ... DRIVE SAMPLE (UNDISTURBED) <input checked="" type="checkbox"/> ... WATER TABLE OR SEEPAGE
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NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 2		PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) --	DATE COMPLETED <u>5/15/14</u>			
					EQUIPMENT <u>HOLLOW STEM AUGER</u> BY: <u>PZ</u>				
MATERIAL DESCRIPTION									
0	BULK 0-5'					ASPHALT: 4" BASE: 3"			
2	B2@2'				ML	ARTIFICIAL FILL Clayey Sand/Sandy Clay, firm, slightly moist, dark brown, fine-grained, moderate plasticity.	27	119.9	5.9
4	B2@4'					MARINE TERRACE DEPOSITS Sandy Silt, firm, slight moist, reddish brown, fine-grained with trace coarse-grained, slighty porous, trace clay. - increase in silt content, stiff - yellowish brown, very fine- to fine-grained, trace clay	23	120.8	7.2
6	B2@6'						19	124.0	8.9
8	B2@8'				SM	Silty Sand, loose, slightly moist, yellowish brown, fine- to medium-grained with trace coarse-grained. - decrease in silt content	12	102.0	3.3
10	B2@10'						17	103.0	2.2
Total depth of boring: 10.5 feet. Fill to 1.5 feet. Fabric material encountered within asphalt. No groundwater encountered. Percolation testing performed. Backfilled with soil cuttings and tamped. Asphalt patched. *Penetration resistance for 140 pound hammer falling 30 inches by auto hammer.									

Figure A2,
Log of Boring 2, Page 1 of 1

A9138-88-02 BORING LOGS.GPJ







SAMPLE SYMBOLS		... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
		... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 3			PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) --	DATE COMPLETED <u>5/15/14</u>	EQUIPMENT <u>HOLLOW STEM AUGER</u> BY: <u>PZ</u>			
MATERIAL DESCRIPTION										
0					ASPHALT: 4" BASE: 6"					
					ARTIFICIAL FILL					
2				ML	Clayey Sand, firm, slightly moist, olive brown, fine- to medium-grained.					
					MARINE TERRACE DEPOSITS					
4				SM	Sandy Silt, firm, slightly moist, yellowish brown, fine-grained.					
					- decrease in silt content					
6	B3@5'			SM	Silty Sand, loose, slightly moist, yellowish brown, very fine- to fine-grained.			10	100.5	2.7
8					Silt with Sand, firm, slightly moist, olive brown, very fine- to fine-grained.					
					- increase in sand content, stiff					
10	B3@10' BULK			ML	Silt with Sand, firm, slightly moist, olive brown, very fine- to fine-grained.			29	114.5	6.0
	10-15'				- decrease in sand content					
12	B3@12'				- slightly porous, trace clay, oxidation mottles			26	111.2	12.8
14					- trace fine gravel, stiff					
16	B3@15'				- trace fine gravel, stiff			32	106.6	15.4
18	B3@18'				Clay with Sand, firm, slightly moist, olive brown, very fine- to fine-grained, some silt, moderate plasticity.			19	115.4	9.3
20	B3@20'				- trace fine gravel			22	108.8	13.9
					- decrease in sand content					
22	B3@22'			CL	Clay with Sand, firm, slightly moist, olive brown, very fine- to fine-grained, some silt, moderate plasticity.			25	100.9	16.3
24					- moderate to high plasticity					
26	B3@25'				- moderate to high plasticity			21	103.7	15.0
28	B3@27'				- increase in silt content, firm			16	107.8	15.4

Figure A3,
Log of Boring 3, Page 1 of 2

A9138-88-02 BORING LOGS.GPJ

SAMPLE SYMBOLS					
	... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 3		PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	
					ELEV. (MSL.) --	DATE COMPLETED <u>5/15/14</u>				
					EQUIPMENT <u>HOLLOW STEM AUGER</u> BY: <u>PZ</u>					
					MATERIAL DESCRIPTION					
30	B3@30'				Total depth of boring: 30.5 feet. Fill to 1.5 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Asphalt patched. *Penetration resistance for 140 pound hammer falling 30 inches by auto hammer.		20	103.6	16.3	

**Figure A3,
Log of Boring 3, Page 2 of 2**

A9138-88-02 BORING LOGS.GPJ

SAMPLE SYMBOLS	<input type="checkbox"/> ... SAMPLING UNSUCCESSFUL	<input type="checkbox"/> ... STANDARD PENETRATION TEST	<input checked="" type="checkbox"/> ... DRIVE SAMPLE (UNDISTURBED)
	<input checked="" type="checkbox"/> ... DISTURBED OR BAG SAMPLE	<input checked="" type="checkbox"/> ... CHUNK SAMPLE	<input checked="" type="checkbox"/> ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 4		PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) --	DATE COMPLETED <u>5/15/14</u>			
					EQUIPMENT <u>HOLLOW STEM AUGER</u> BY: <u>PZ</u>				
MATERIAL DESCRIPTION									
0	BULK 0-5'					ASPHALT:3" BASE: 4"			
2	B4@2'			CL		ARTIFICIAL FILL Clayey Sand, medium dense, slightly moist, dark brown, fine- to medium-grained with trace coarse-grained, trace fine gravel.	19	120.8	11.1
4	B4@4'					MARINE TERRACE DEPOSITS Sandy Clay, firm, slightly moist, yellowish brown, fine-grained.	18	112.3	10.6
6	B4@6'			SM		- increase in sand content Silty Sand, loose, slightly moist, yellowish brown, fine-grained.	8	103.1	4.1
8	B4@8'					- increase in silt content Sandy Silt, firm, slightly moist, olive brown, very fine- to fine-grained.	18	107.4	11.1
10	B4@10'					Silt with Sand, firm, slightly moist, yellowish brown, very fine- to fine-grained.	14	104.4	11.6
12	B4@12'			ML		- some clay	19	112.4	11.9
14	B4@15'						17	105.2	16.9
18	B4@18'			CL		Clay with Sand, firm, slightly moist, olive brown, very fine- to fine-grained, moderate plasticity.	16	101.5	22.3
20	B4@20'						20	107.6	20.1
					Total depth of boring: 20.5 feet. Fill to 1 foot. No groundwater encountered. Backfilled with soil cuttings and tamped. Asphalt patched. *Penetration resistance for 140 pound hammer falling 30 inches by auto hammer.				

Figure A4,
Log of Boring 4, Page 1 of 1

A9138-88-02 BORING LOGS.GPJ

SAMPLE SYMBOLS		... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
		... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.




DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 5		PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) --	DATE COMPLETED <u>6/19/17</u>			
					EQUIPMENT <u>HOLLOW STEM AUGER</u> BY: <u>PZ</u>				
MATERIAL DESCRIPTION									
0	BULK 0-5'				ASPHALT: 4.5" BASE: 4" ARTIFICIAL FILL Sandy Clay, firm, slightly moist, brown, fine-grained, trace fine gravel.				
2	B5@2.5'			CL	MARINE TERRACE DEPOSITS Sandy Clay, stiff, slightly moist, reddish brown, fine-grained, trace medium-grained.		28	123.2	11.9
4	B5@5'				- hard, yellowish brown		52	121.4	12.2
6	B5@7'			SM	Silty Sand, medium dense, slightly moist, yellowish brown, fine- to medium-grained.		30	106.0	5.9
8	B5@10'				Clay, stiff, slightly moist, light brown.				
10	B5@12'				- some fine-grained sand, hard, yellowish brown		54	109.2	20.6
12	B5@15'				- no sand, stiff, grayish brown, heavy oxidation staining		32	109.8	18.1
14	B5@20'			CL					
16	B5@25'				- firm, yellowish brown		21	102.4	22.5
18									
20									
22									
24									
26									
28									

Figure A5,
Log of Boring 5, Page 1 of 2

A9138-88-02 BORING LOGS.GPJ







SAMPLE SYMBOLS		... SAMPLING UNSUCCESSFUL		... STANDARD PENETRATION TEST		... DRIVE SAMPLE (UNDISTURBED)
		... DISTURBED OR BAG SAMPLE		... CHUNK SAMPLE		... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 5			PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) --	DATE COMPLETED <u>6/19/17</u>	EQUIPMENT <u>HOLLOW STEM AUGER</u> BY: <u>PZ</u>			
MATERIAL DESCRIPTION										
30	B5@30'			CL	- stiff, gray, some oxidation staining		26	90.8	32.9	
32										
34				SP	Sand, poorly graded, dense, moist to wet, grayish brown, fine-grained.					
	B5@35'						59	104.2	22.9	
					Total depth of boring: 35.5 feet Fill to 1.5 feet. Groundwater encountered at 34 feet. Backfilled with soil cuttings and tamped. Asphalt patched. *Penetration resistance for 140 pound hammer falling 30 inches by auto hammer.					

**Figure A5,
Log of Boring 5, Page 2 of 2**

A9138-88-02 BORING LOGS.GPJ







SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 6		PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)
					ELEV. (MSL.) --	DATE COMPLETED <u>6/19/17</u>			
					EQUIPMENT <u>HOLLOW STEM AUGER</u> BY: <u>PZ</u>				
MATERIAL DESCRIPTION									
0					ASPHALT: 4" BASE: 3"				
2					ARTIFICIAL FILL Sandy Clay, firm, slightly moist, brown to dark brown, fine-grained.				
4				ML	MARINE TERRACE DEPOSITS Sandy Silt, hard, slightly moist, reddish brown, fine-grained.				
6	B5@5'			CL	Sandy Clay, hard, slightly moist, brown, fine-grained, trace medium-grained.		43	128.8	10.5
8	B5@7'			CL			57	125.0	11.7
10	B5@10'			SM	Silty Sand, loose, slightly moist, yellowish brown, fine- to medium-grained.		11	104.7	3.3
12	B5@12'				- fine-grained		17	104.3	8.6
14	B5@15'				- dense, increase in silt content		61	117.5	11.1
20	B5@20'			CL	Clay, stiff, slightly moist, grayish brown, some oxidation staining.		25	104.0	23.5
26	B5@25'				- trace coarse gravel (1.5")		30	110.5	21.7

Figure A6,
Log of Boring 6, Page 1 of 2

A9138-88-02 BORING LOGS.GPJ

SAMPLE SYMBOLS	 ... SAMPLING UNSUCCESSFUL	 ... STANDARD PENETRATION TEST	 ... DRIVE SAMPLE (UNDISTURBED)
	 ... DISTURBED OR BAG SAMPLE	 ... CHUNK SAMPLE	 ... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.

DEPTH IN FEET	SAMPLE NO.	LITHOLOGY	GROUNDWATER	SOIL CLASS (USCS)	BORING 6		PENETRATION RESISTANCE (BLOWS/FT*)	DRY DENSITY (P.C.F.)	MOISTURE CONTENT (%)	
					ELEV. (MSL.) --	DATE COMPLETED <u>6/19/17</u>				
					EQUIPMENT <u>HOLLOW STEM AUGER</u> BY: <u>PZ</u>					
					MATERIAL DESCRIPTION					
30	B5@30'			SM	Silty Sand, medium dense, slightly moist, grayish brown, fine-grained, some oxidation staining.		48	102.4	23.4	
32										
34										
	B5@35'				- dense		62	103.0	23.1	
					Total depth of boring: 35.5 feet Fill to 3 feet. No groundwater encountered. Backfilled with soil cuttings and tamped. Asphalt patched. *Penetration resistance for 140 pound hammer falling 30 inches by auto hammer.					

**Figure A6,
Log of Boring 6, Page 2 of 2**

A9138-88-02 BORING LOGS.GPJ

SAMPLE SYMBOLS	... SAMPLING UNSUCCESSFUL	... STANDARD PENETRATION TEST	... DRIVE SAMPLE (UNDISTURBED)
	... DISTURBED OR BAG SAMPLE	... CHUNK SAMPLE	... WATER TABLE OR SEEPAGE

NOTE: THE LOG OF SUBSURFACE CONDITIONS SHOWN HEREON APPLIES ONLY AT THE SPECIFIC BORING OR TRENCH LOCATION AND AT THE DATE INDICATED. IT IS NOT WARRANTED TO BE REPRESENTATIVE OF SUBSURFACE CONDITIONS AT OTHER LOCATIONS AND TIMES.



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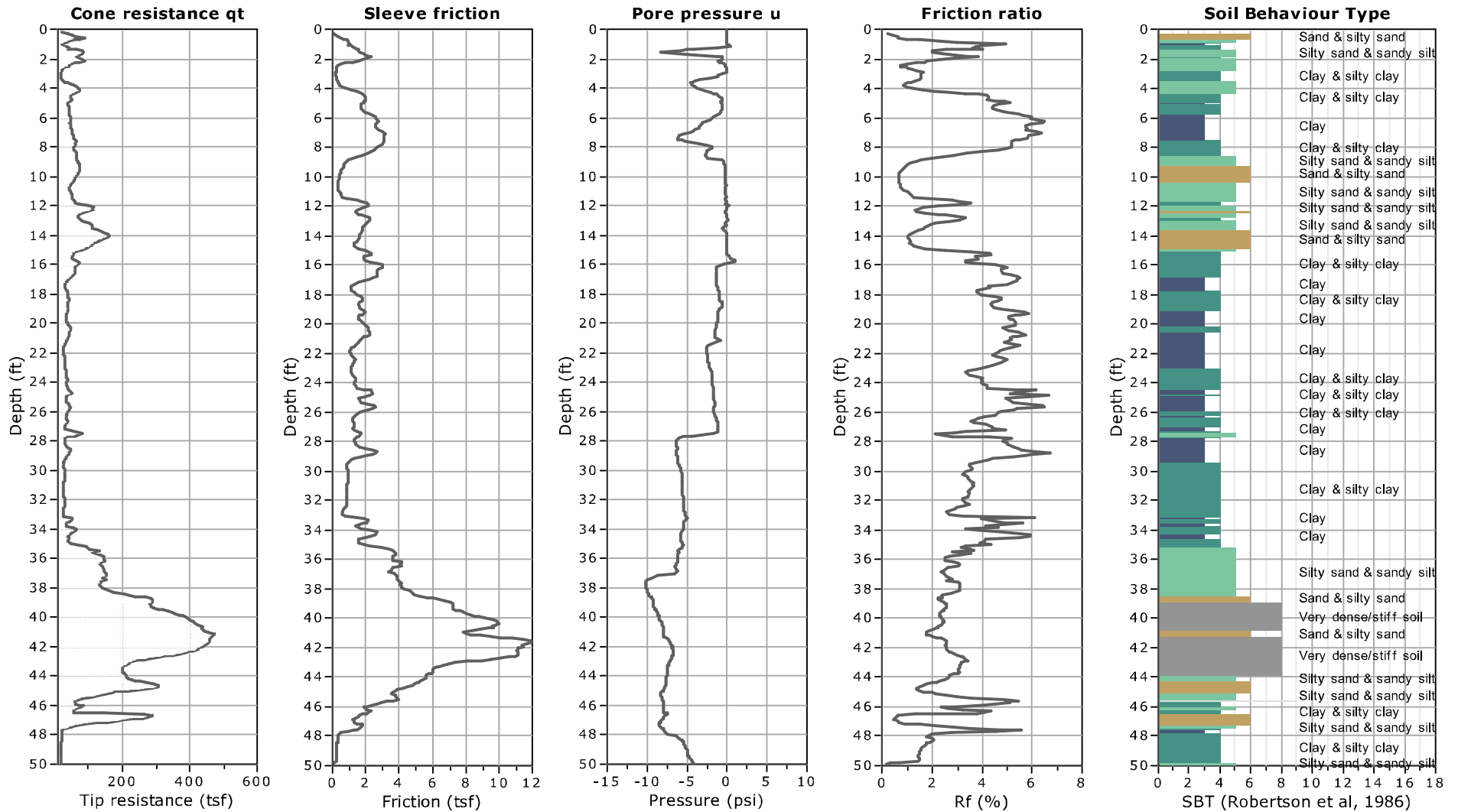
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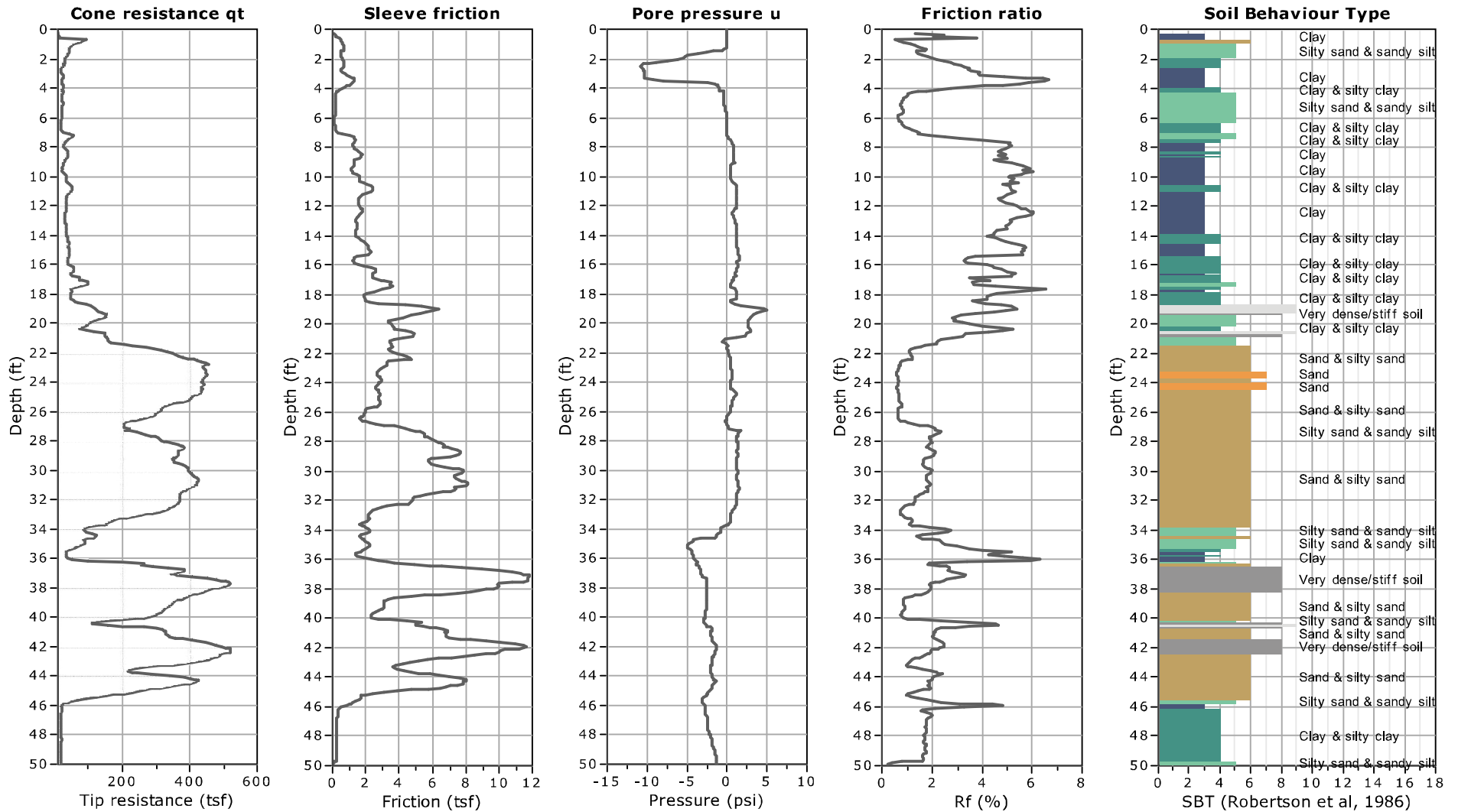
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CPT: CPT-1

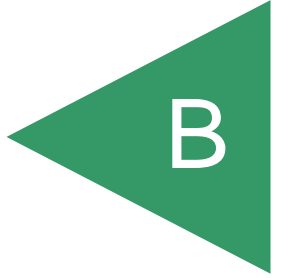
Total depth: 50.10 ft, Date: 5/16/2014

Cone Type: Vertek





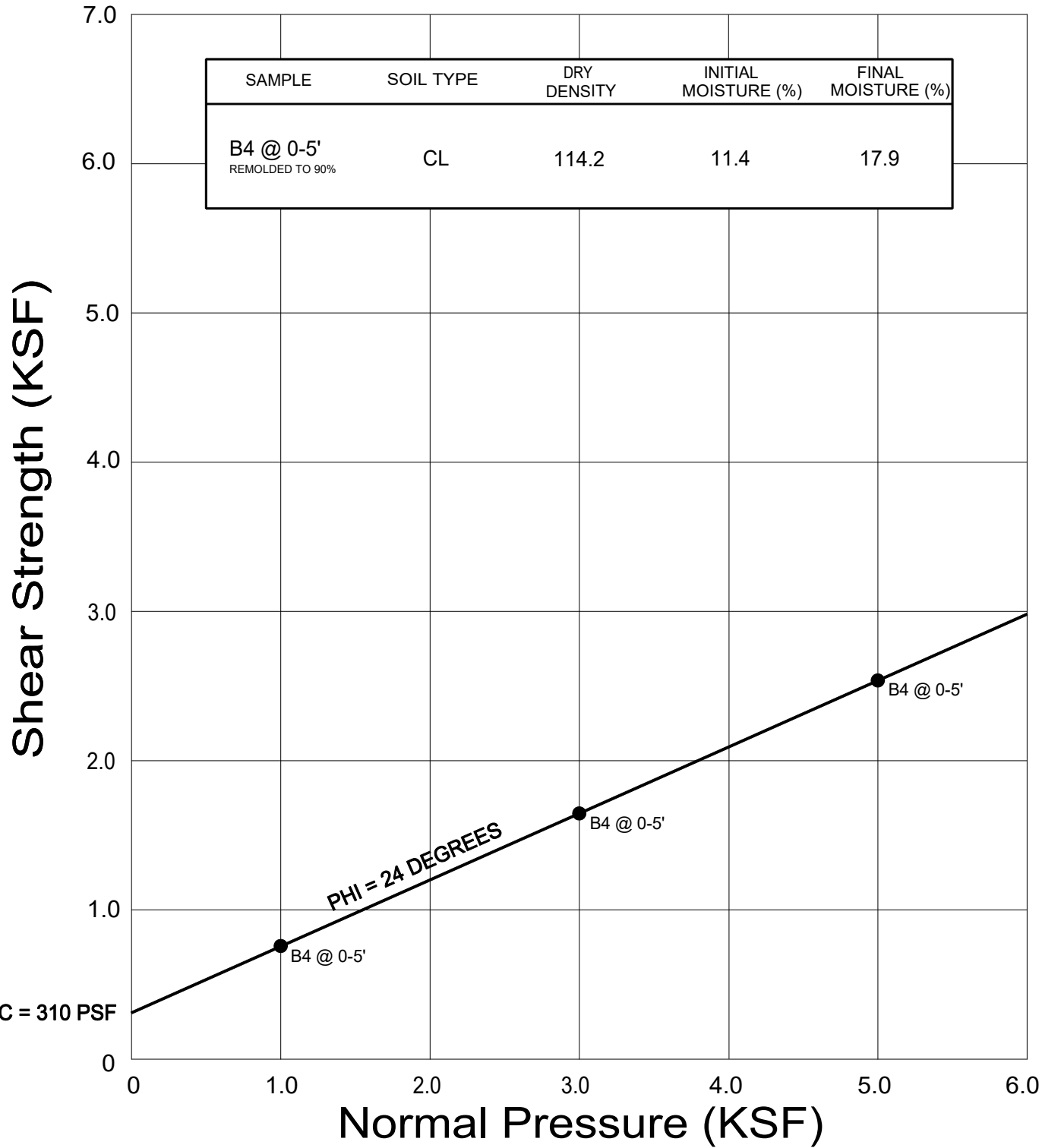
APPENDIX



APPENDIX B

LABORATORY TESTING

Laboratory tests were performed in accordance with generally accepted test methods of the “American Society for Testing and Materials (ASTM)”, or other suggested procedures. Selected samples were tested for direct shear strength, consolidation and expansion characteristics, moisture density relationships, corrosivity, plasticity indices, in-place dry density and moisture content. The results of the laboratory tests are summarized in Figures B1 through B13. The in-place dry density and moisture content of the samples tested are presented in the boring logs, Appendix A.



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DIRECT SHEAR TEST RESULTS

MAC ARTHUR SQUARE
5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

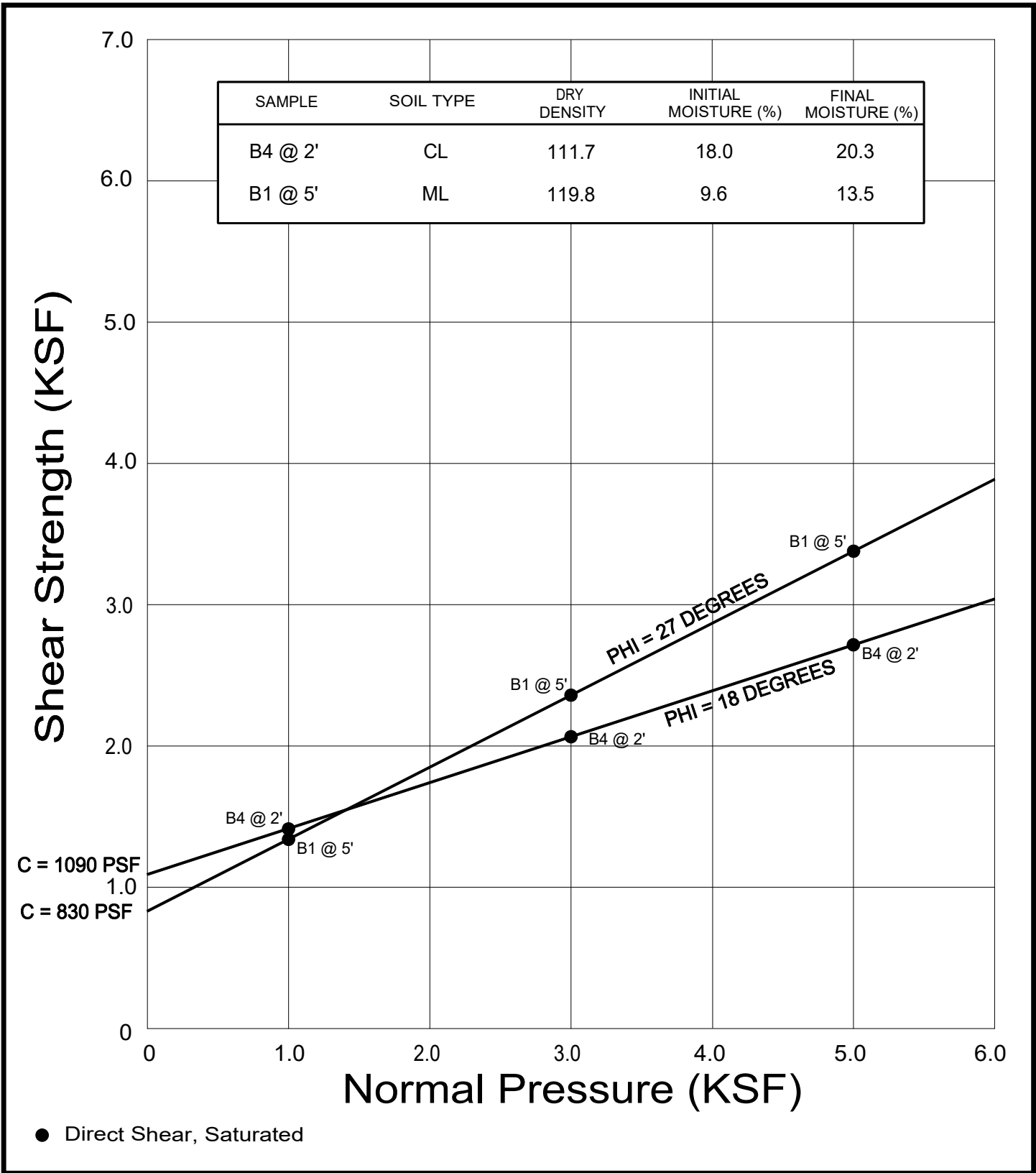
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FIG. B1



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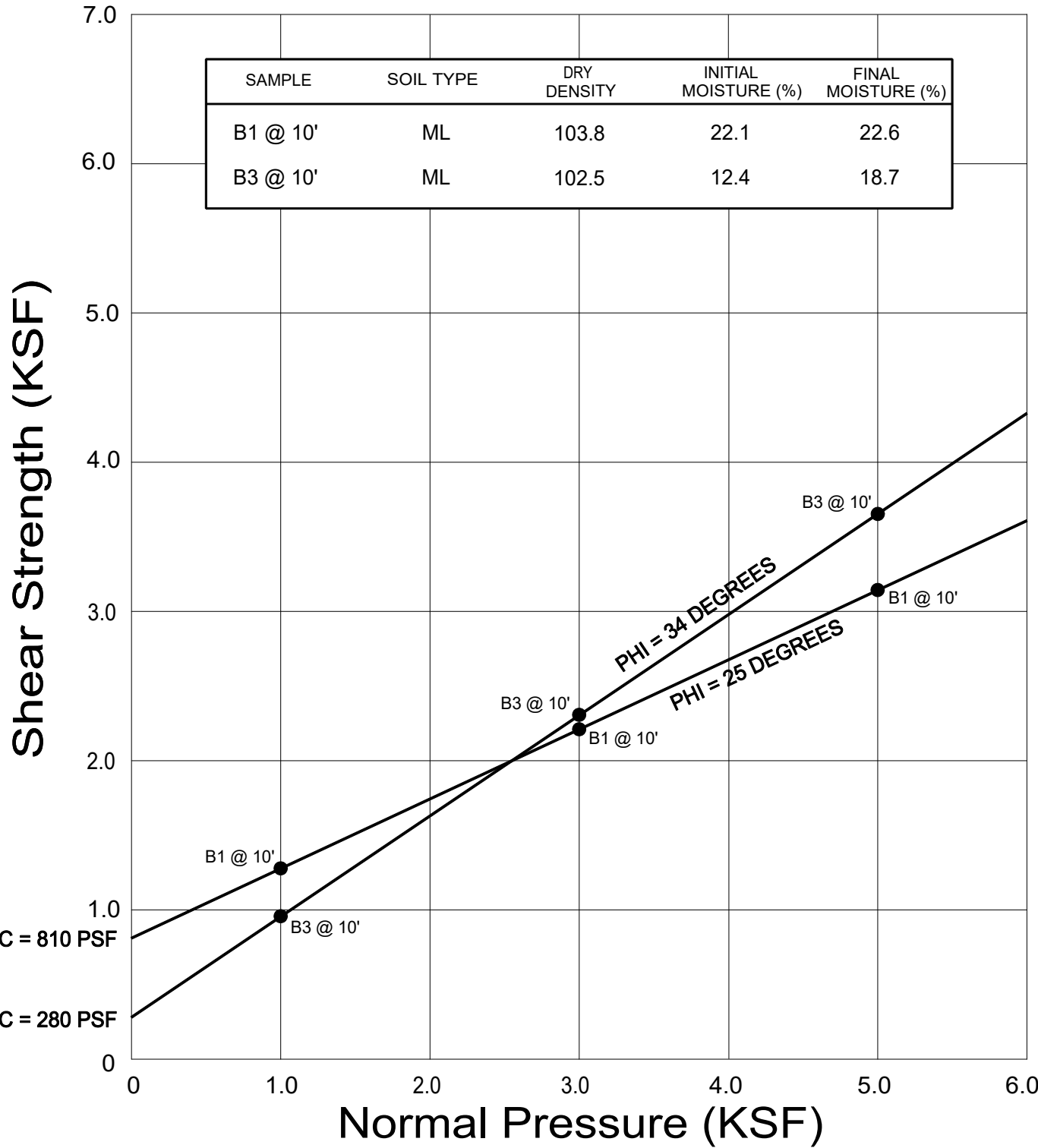
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DIRECT SHEAR TEST RESULTS

MAC ARTHUR SQUARE
5.6 ACRE AREA BOUNDED BY DOVE STREET,
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● Direct Shear, Saturated

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DIRECT SHEAR TEST RESULTS

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5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

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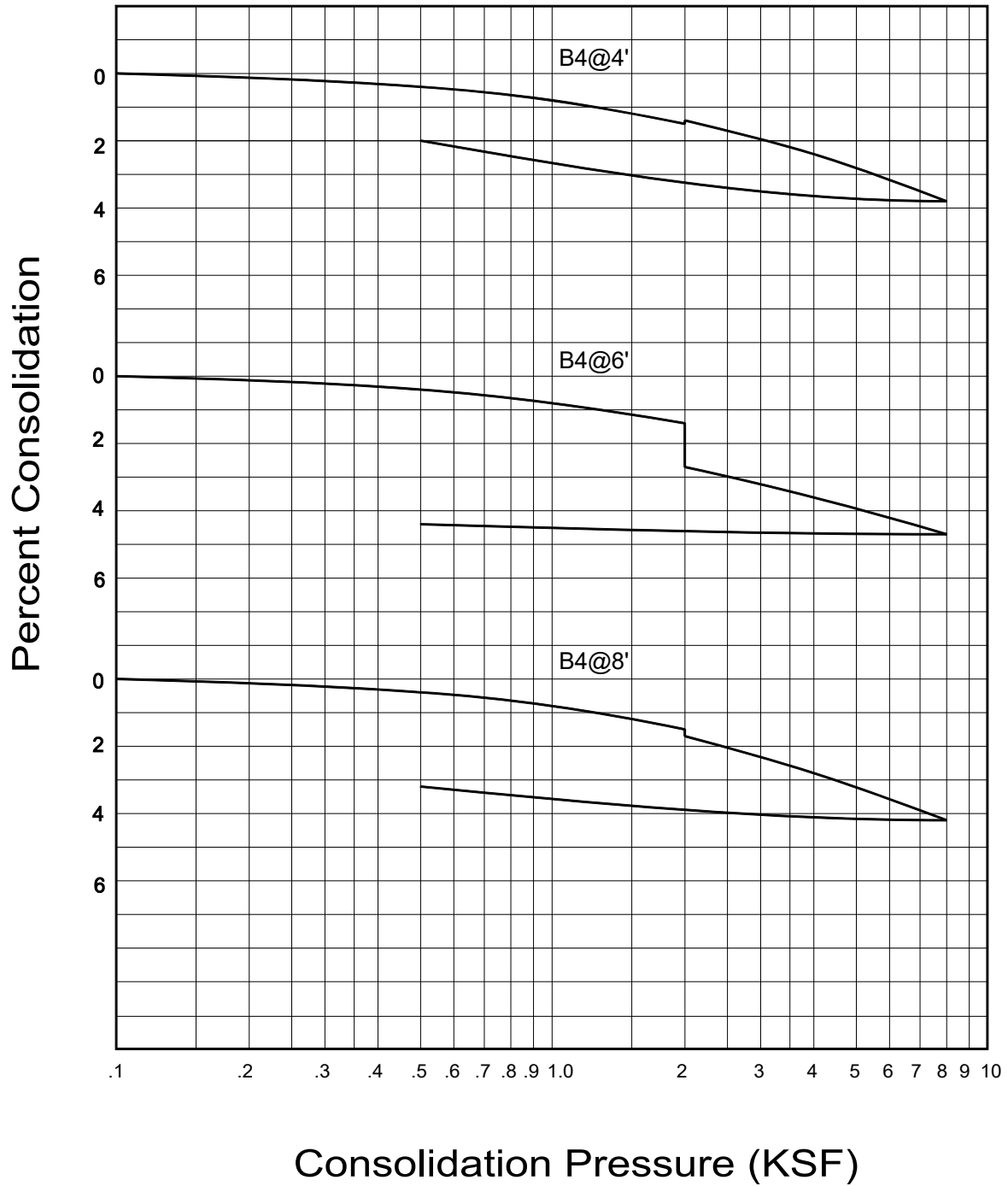
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FIG. B3

WATER ADDED AT 2 KSF



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CONSOLIDATION TEST RESULTS

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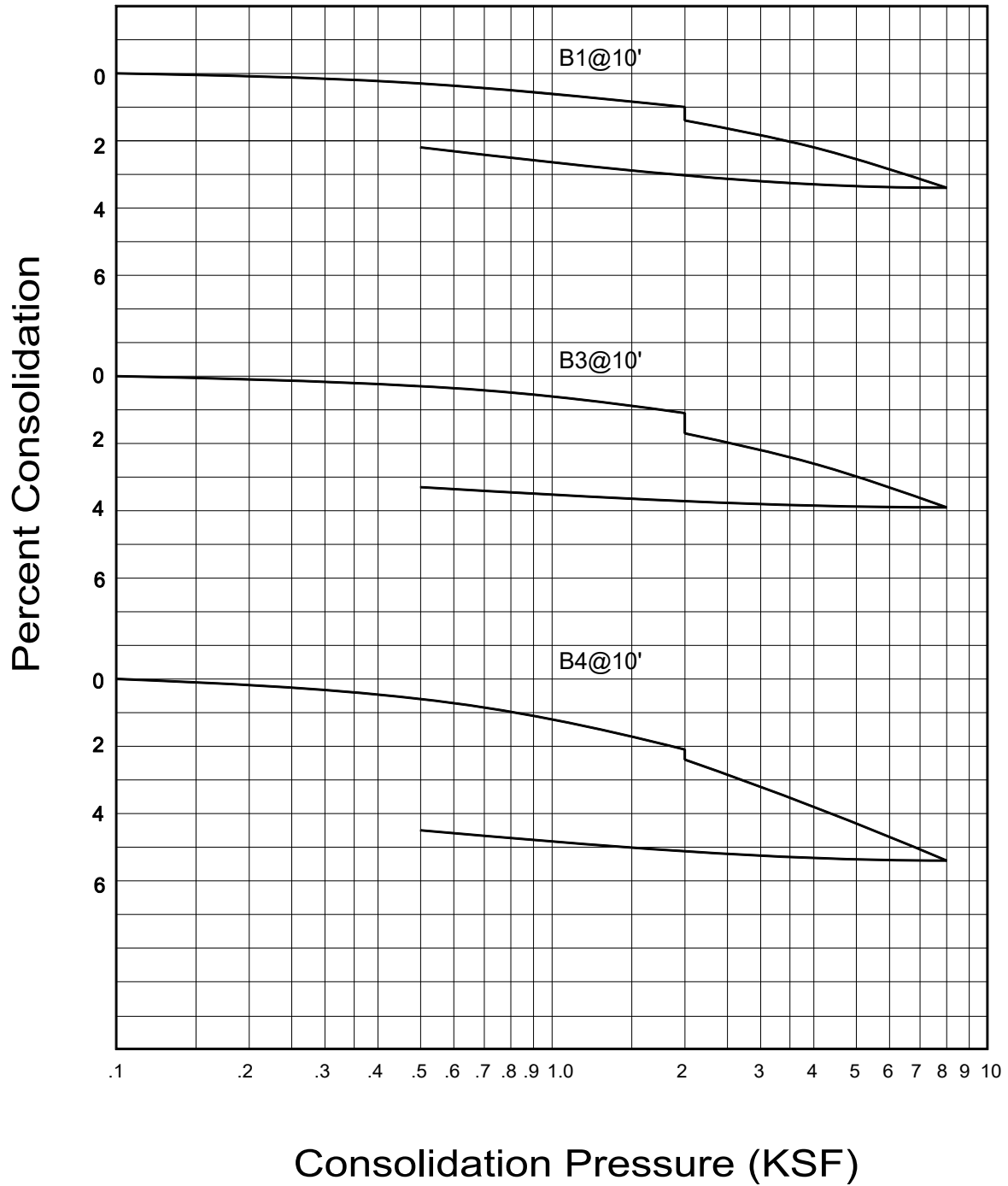
5.6 ACRE AREA BOUNDED BY DOVE STREET,
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FIG. B4

WATER ADDED AT 2 KSF



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CONSOLIDATION TEST RESULTS

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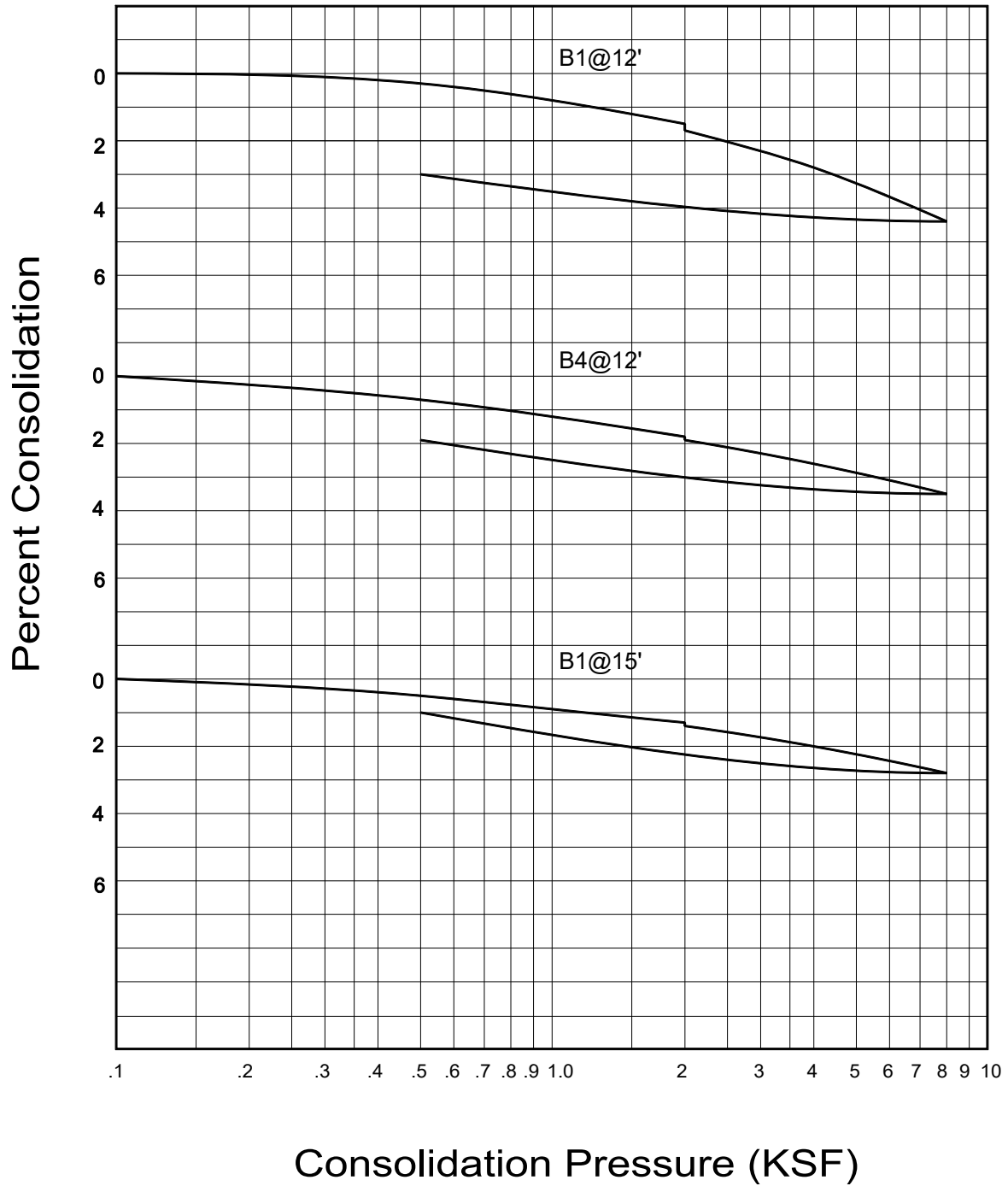
5.6 ACRE AREA BOUNDED BY DOVE STREET,
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FIG. B5

WATER ADDED AT 2 KSF



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CONSOLIDATION TEST RESULTS

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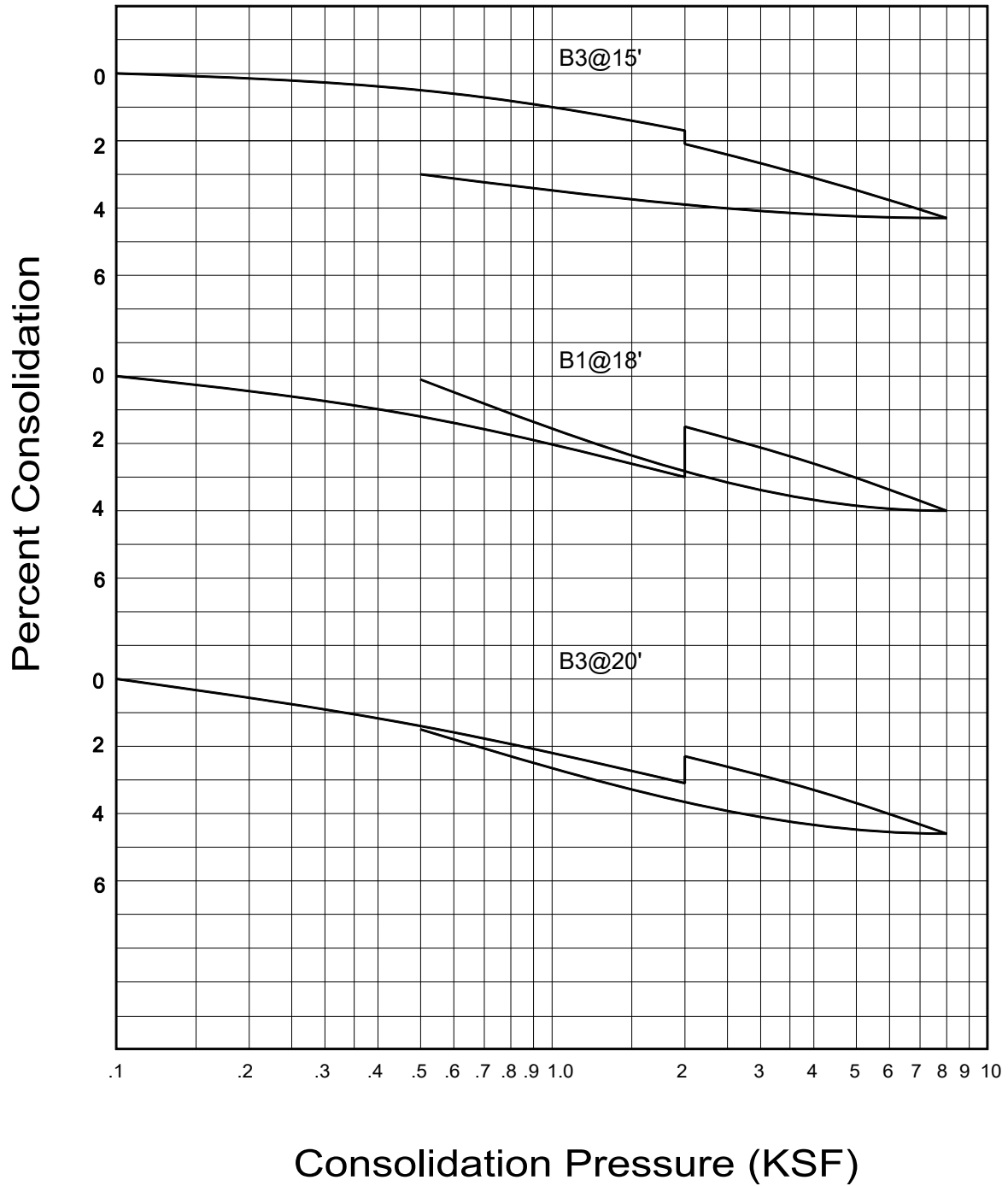
5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

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FIG. B6

WATER ADDED AT 2 KSF



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CONSOLIDATION TEST RESULTS

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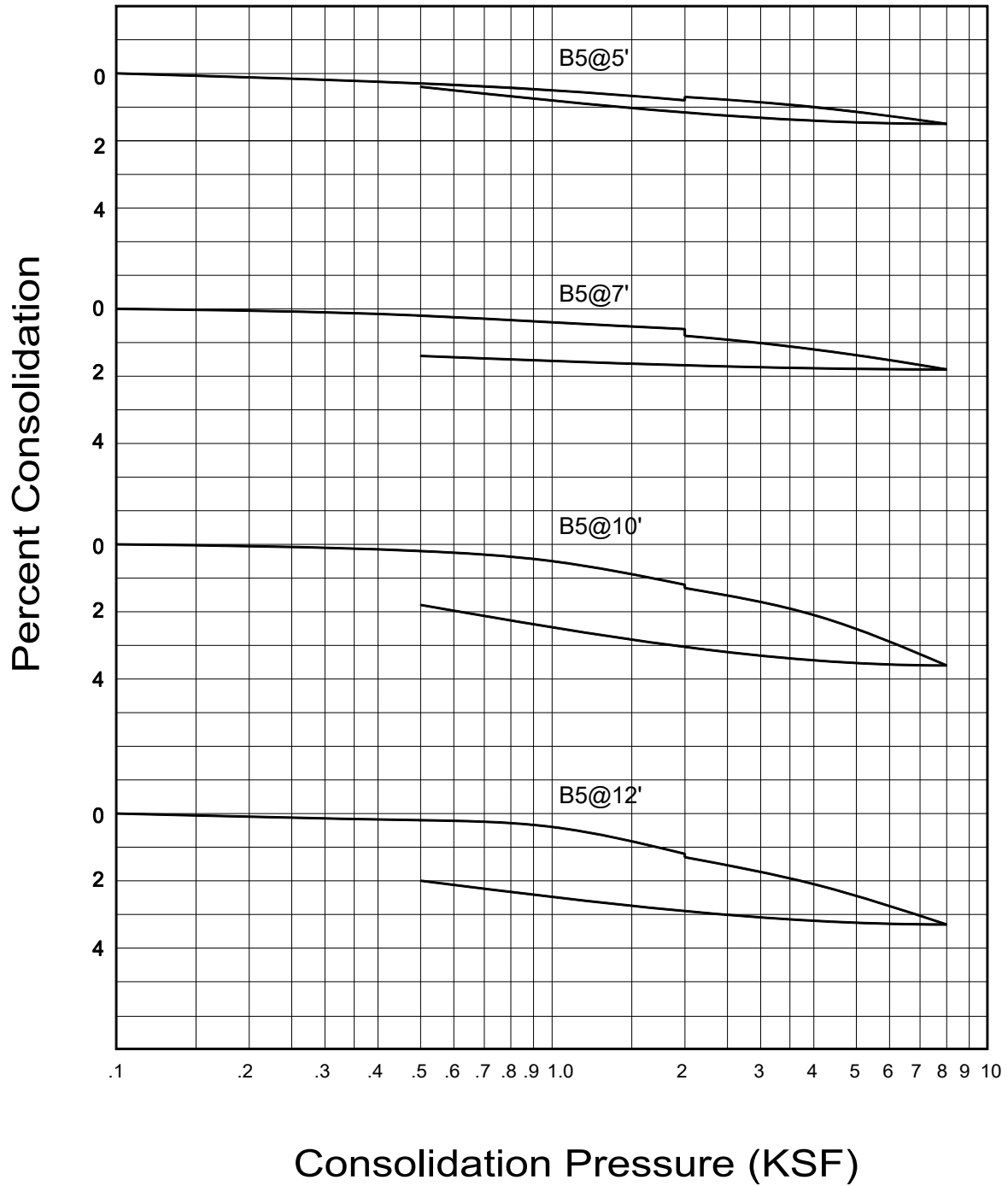
5.6 ACRE AREA BOUNDED BY DOVE STREET,
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FIG. B7

WATER ADDED AT 2 KSF



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CONSOLIDATION TEST RESULTS

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5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

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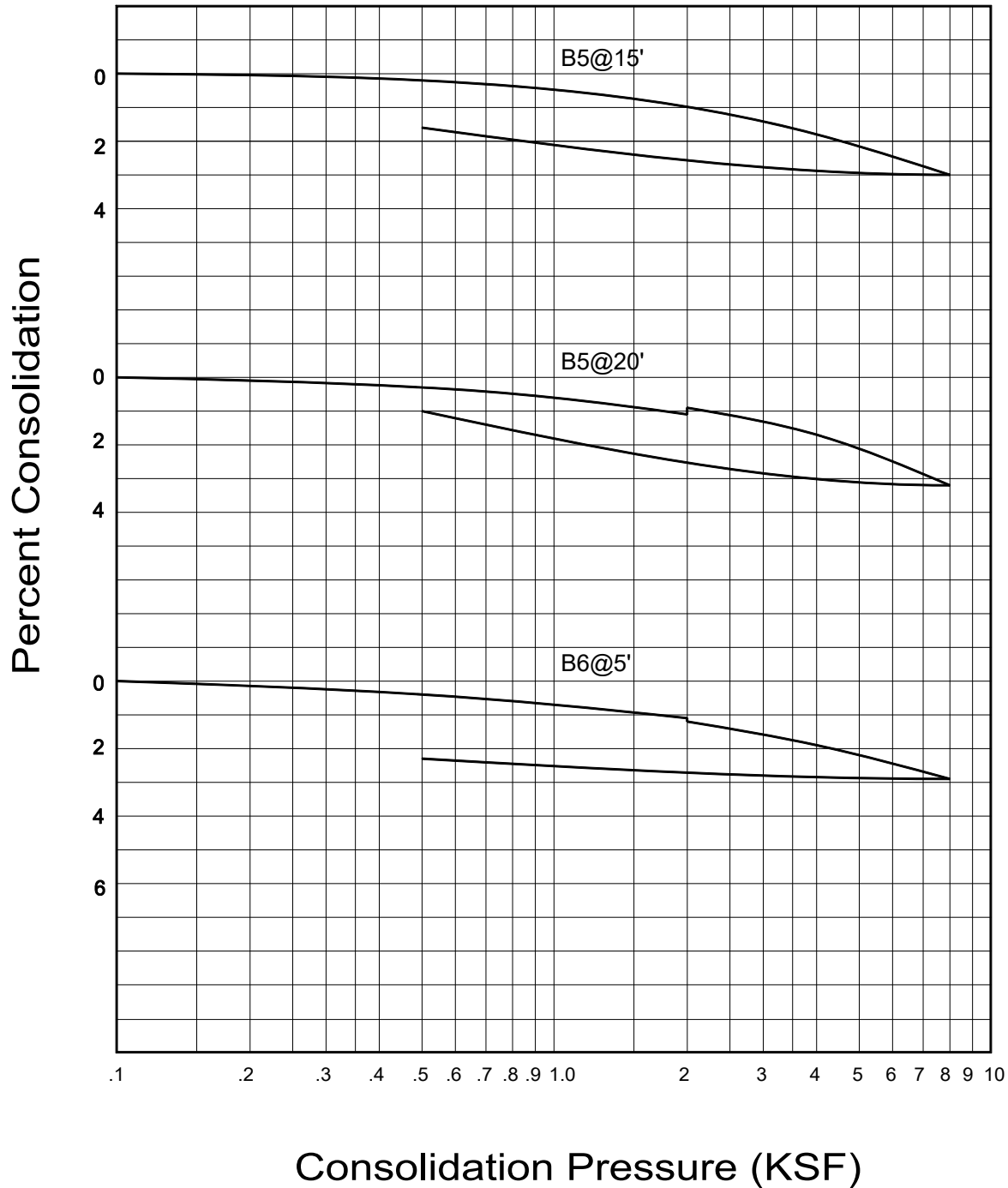
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FIG. B8

WATER ADDED AT 2 KSF



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CONSOLIDATION TEST RESULTS

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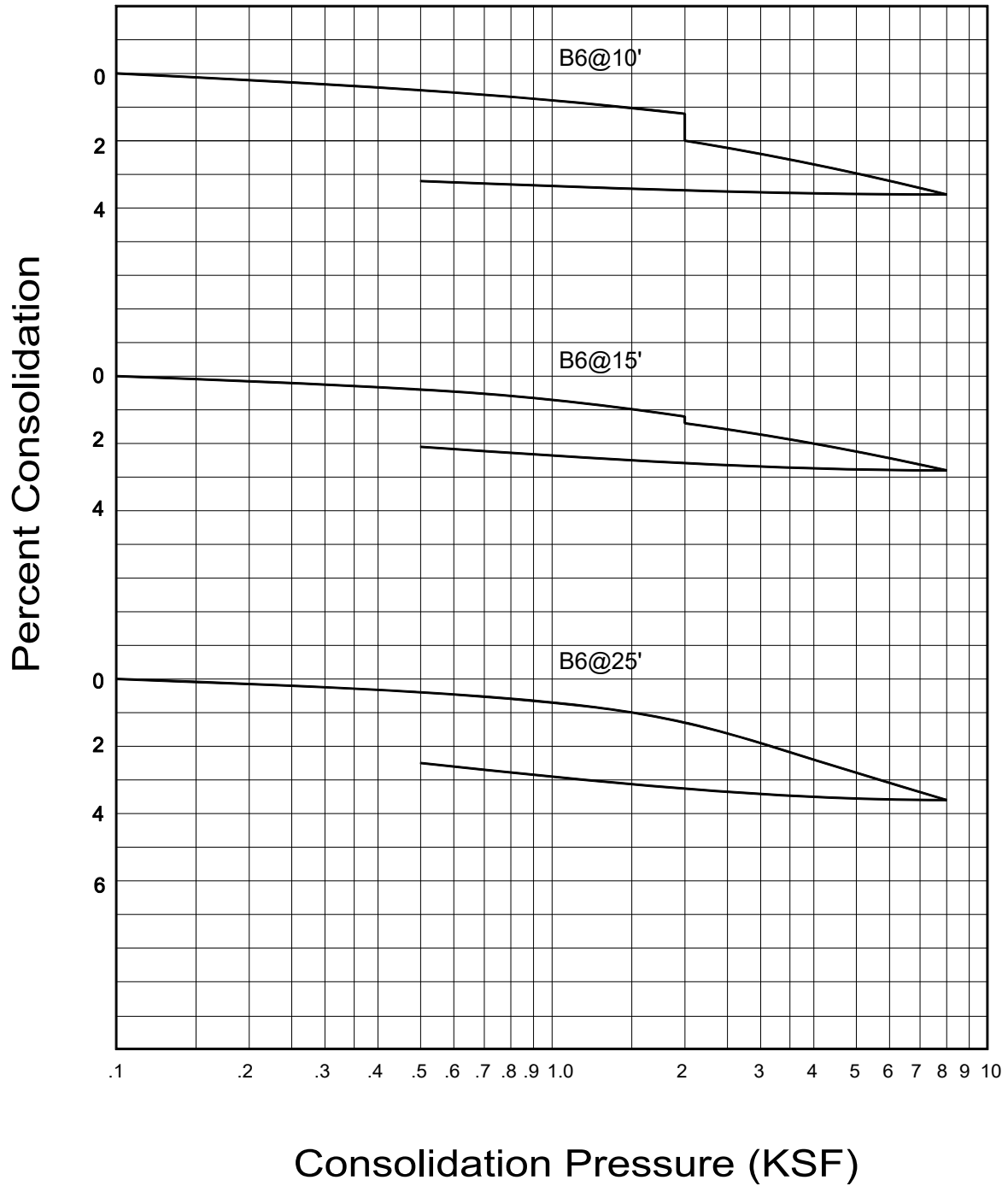
5.6 ACRE AREA BOUNDED BY DOVE STREET,
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FIG. B9

WATER ADDED AT 2 KSF



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CONSOLIDATION TEST RESULTS

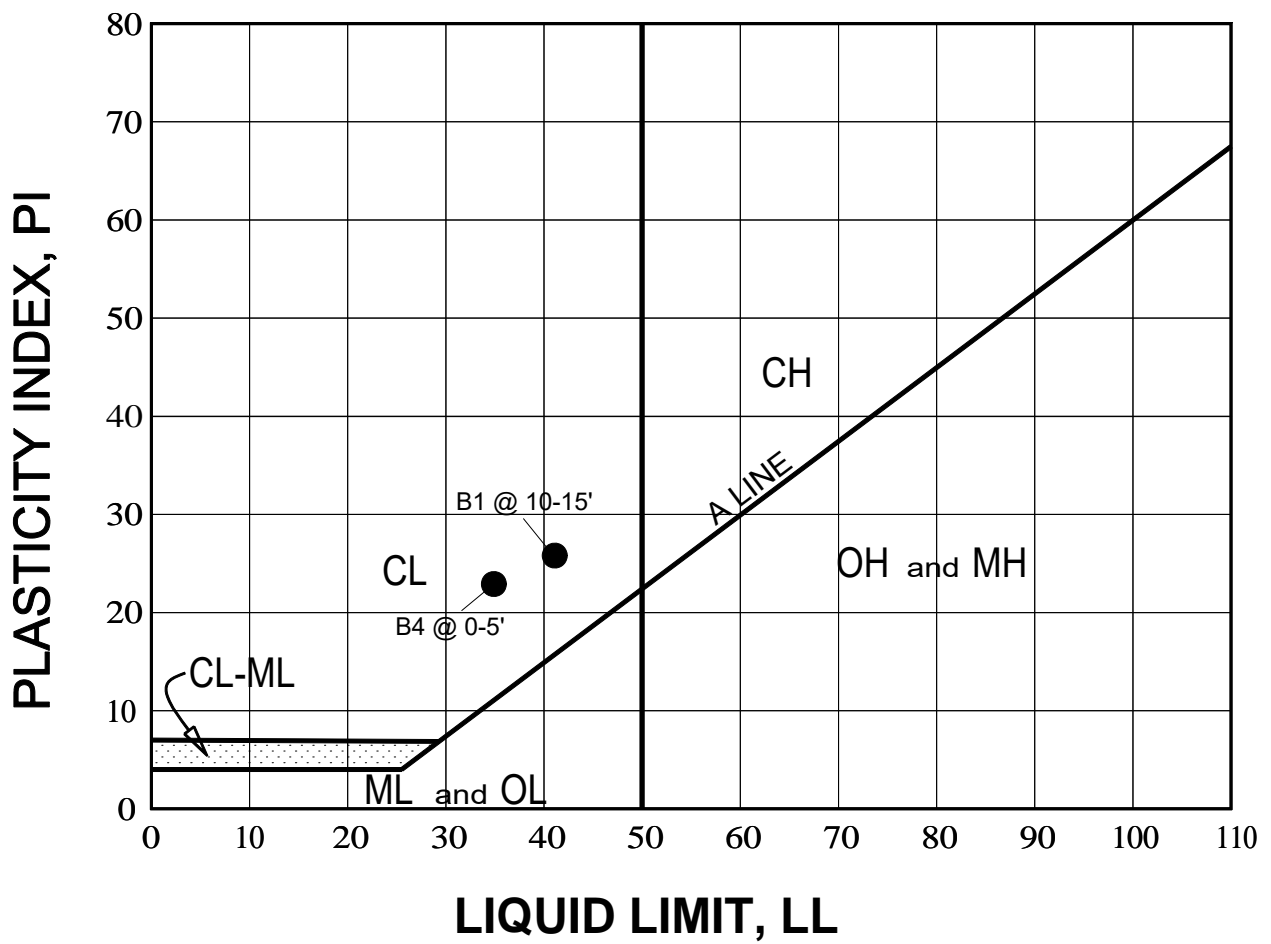
MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
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FIG. B8



BORING NUMBER	DEPTH (FEET)	LL	PL	PI	SOIL BEHAVIOR
B4	0 - 5	34.9	11.9	22.9	CL
B1	10 - 15	41.1	15.3	25.8	CL

*N/P indicates Non-Plastic

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ATTERBERG LIMITS

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

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PROJECT NO. A9138-88-02

FIG. B11

**SUMMARY OF LABORATORY EXPANSION INDEX TEST RESULTS
ASTM D 4829-11**

Sample No.	Moisture Content (%)		Dry Density (pcf)	Expansion Index	*UBC Classification	**CBC Classification
	Before	After				
B4 @ 0-5'	9.9	20.7	108.9	51	Moderate	Expansive
B5 @ 0-5'	8.7	19.7	112.8	44	Low	Expansive

* Reference: 1997 Uniform Building Code, Table 18-I-B.

** Reference: 2016 California Building Code, Section 1803.5.3

**SUMMARY OF LABORATORY MAXIMUM DENSITY AND
AND OPTIMUM MOISTURE CONTENT TEST RESULTS
ASTM D 1557-12**

Sample No.	Soil Description	Maximum Dry Density (pcf)	Optimum Moisture (%)
B4 @ 0-5'	Brown Sandy Clay	128.0	10.5
B5 @ 0-5'	Brown Sandy Clay	127.1	9.3

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LABORATORY TEST RESULTS

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

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FIG. B12

**SUMMARY OF LABORATORY POTENTIAL OF
HYDROGEN (pH) AND RESISTIVITY TEST RESULTS
CALIFORNIA TEST NO. 643**

Sample No.	pH	Resistivity (ohm centimeters)
B4 @ 0-5'	7.32	2200 (Moderately Corrosive)
B1 & B3 MIX @ 10-15'	7.51	710 (Severely Corrosive)
B5 @ 0-5'	8.90	1712 (Corrosive)

**SUMMARY OF LABORATORY CHLORIDE CONTENT TEST RESULTS
EPA NO. 325.3**

Sample No.	Chloride Ion Content (%)
B4 @ 0-5'	0.003
B1 & B3 MIX @ 10-15'	0.016
B5 @ 0-5'	0.012

**SUMMARY OF LABORATORY WATER SOLUBLE SULFATE TEST RESULTS
CALIFORNIA TEST NO. 417**

Sample No.	Water Soluble Sulfate (% SO ₄)	Sulfate Exposure*
B4 @ 0-5'	0.012	Negligible
B1 & B3 MIX @ 10-15'	0.089	Negligible
B5 @ 0-5'	0.002	Negligible

* Reference: 2016 California Building Code, Section 1904.3 and ACI 318-11 Section 4.3.

GEOCON
WEST, INC.



ENVIRONMENTAL GEOTECHNICAL MATERIALS
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CHECKED BY: JTA

CORROSIVITY TEST RESULTS

MAC ARTHUR SQUARE

5.6 ACRE AREA BOUNDED BY DOVE STREET,
SCOTT DRIVE, CORINTHIAN WAY, AND MARTINGALE WAY
NEWPORT BEACH, CALIFORNIA

JULY 2017

PROJECT NO. A9138-88-02

FIG. B13