BYER GEOTECHNICAL, INC.

Appendix C-1

October 14, 2022
BG 23334

DLS Builders
1975 North Batavia Street
Orange, California 92865

Attention: Mr. Scott Schalliol

Subject

Transmittal of Geotechnical Engineering Exploration Update
Proposed Two-Story At-Grade Residential Development
Golden Oaks Senior Living Facility
Assessor's Parcel No. 8174-041-028
Portion of Lot 126, Tract 12444
6018 Norwalk Boulevard
Whittier, Los Angeles County, California

Dear Mr. Schalliol:

Byer Geotechnical has completed our update report dated October 14, 2022, for the currently-proposed project on the subject site. The reviewing agency for this document is the City of Whittier, Building and Safety Division. Copies of the report have been distributed as follows.

(4) Addressee (E-mail and Mail)
(1) Pickard Architects, Attention: David Pickard (E-mail)

It is our understanding that you or your representative will file the report with the City of Whittier. Questions concerning the report should be directed to the undersigned. Byer Geotechnical appreciates the opportunity to offer our consultation and advice on this project.

Very truly yours,
BYER GEOTECHNICAL, INC.

Raffi S. Babayan
Senior Project Engineer

BYER GEOTECHNICAL, INC.

October 14, 2022
BG 23334

DLS Builders
1975 North Batavia Street
Orange, California 92865

Attention: Mr. Scott Schalliol

Subject

Geotechnical Engineering Exploration Update
Proposed Two-Story At-Grade Residential Development
Golden Oaks Senior Living Facility
Assessor's Parcel No. 8174-041-028
Portion of Lot 126, Tract 12444
6018 Norwalk Boulevard
Whittier, Los Angeles County, California

Reference: Report by Byer Geotechnical, Inc.:

Geotechnical Engineering Exploration, Proposed Two-Story, At-Grade Mixed-Use Development, Assessor's Parcel No. 8174-041-028, Portion of Lot 126, Tract 12444, 6018 Norwalk Boulevard, Whittier, Los Angeles County, California, dated February 25, 2021.

Dear Mr. Schalliol:

As requested by Mr. David Pickard, project architect, Byer Geotechnical, Inc., is providing our geotechnical engineering exploration update with respect to construction of the proposed project on the subject site. The current Site Plan, Sheet A-1.0, prepared by Pickard Architects, dated July 29, 2022, was considered during the preparation of this update report. We understand that the above-referenced report was submitted to the City of Whittier, Building and Safety Division.

The scope of the original project has not significantly changed from that described in the above-referenced report. The project still consists of the construction of three, two-story at-grade residential buildings, which are planned to occupy the majority of the site, as shown on the enclosed Site Plan. The ground floor of the proposed two buildings adjacent to the public alley will consist of garage space. No retail space is planned onsite.

The conclusions and recommendations included in the above-referenced report remain valid and applicable to the currently proposed project.

Byer Geotechnical appreciates the opportunity to continue to provide our service on this project. Any questions concerning the data or interpretation of this report should be directed to the undersigned.

Respectfully submitted,
BYER GEOTECHNICAL, INC.

REGISTERED PROFESSIONAL ENGINEER
RAFFI S. BABAYAN
No. 72168
Exp. June 30, 2024
CIVIL
STATE OF CALIFORNIA

Raffi S. Babayan
P. E. 72168

RSB:cj
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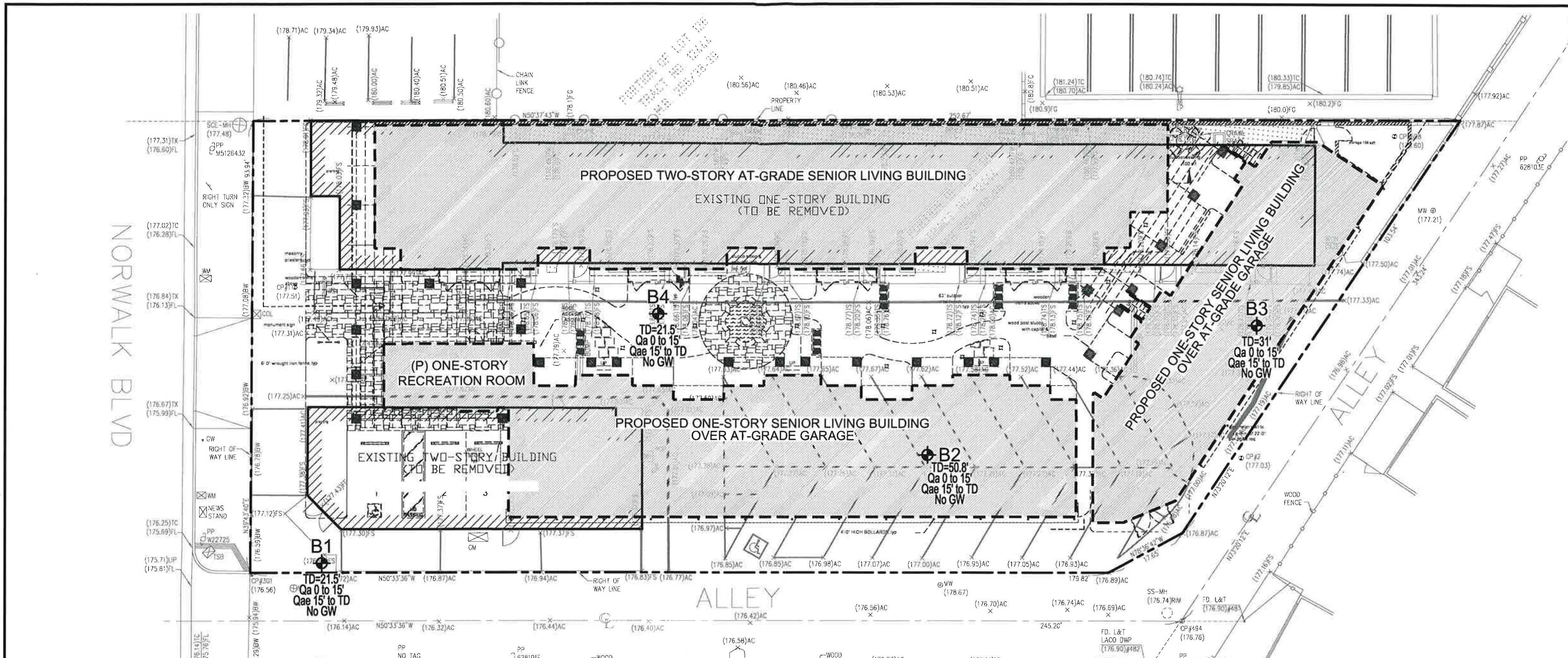
Enc.: Site Plan

xc: (4) Addressee (E-mail and Mail)
(1) Pickard Architects, Attention: David Pickard (E-mail)



LEGEND

B4	LOCATION AND NUMBER OF HOLLOW-STEM AUGER BORING
TD=21.5'	TOTAL DEPTH (FEET)
Qa 0 to 15'	DEPTH OF ALLUVIUM (FEET)
Qae 15' to TD	DEPTH OF OLDER ALLUVIUM (FEET)
No GW	NO GROUNDWATER ENCOUNTERED

GRAPHIC SCALE

20 15 10 5 0 10 20 40

(IN FEET)
1 inch = 20 ft.

OCTOBER 14, 2022

REFERENCE: TOPOGRAPHIC SURVEY PREPARED BY THE CITY OF WHITTIER DEPARTMENT OF PUBLIC WORKS, DATED UNKNOWN AND PROPOSE SITE PLAN PROVIDED BY PICKARD ARCHITECTS, DATED 07/29/2022.

BYER GEOTECHNICAL INC.
1461 E. CHEVY CHASE DR., SUITE 200
GLENDALE, CA 91206
818.549.9959 TEL
818.543.3747 FAX

SITE PLAN

BG: 23334 DLS BUILDERS

CONSULTANT: RSB

DRAWN BY: AS

SCALE: 1" = 20'

BYER GEOTECHNICAL, INC.

February 25, 2021
BG 23334

DLS Builders
1975 North Batavia Street
Orange, California 92865

Attention: Mr. Scott Schalliol

Subject

Transmittal of Geotechnical Engineering Exploration
Proposed Two-Story, At-Grade Mixed-Use Development
Assessor's Parcel No. 8174-041-028
Portion of Lot 126, Tract 12444
6018 Norwalk Boulevard
Whittier, Los Angeles County, California

Dear Mr. Schalliol:

Byer Geotechnical has completed our report dated February 25, 2021, which describes the geotechnical engineering conditions with respect to the proposed project. The reviewing agency for this document is the City of Whittier, Building and Safety Division. Copies of the report have been distributed as follows:

(5) Addressee (E-mail and Mail)
(1) Pickard Architects, Attention: David Pickard (E-mail)
(1) CRF Engineering, Inc., Attention: Cesar Ramirez (E-mail)

It is our understanding that you or your representative will file the report with the City of Whittier. Please review the report carefully prior to submittal to the governmental agency. Questions concerning the report should be directed to the undersigned. Byer Geotechnical appreciates the opportunity to offer our consultation and advice on this project.

Very truly yours,
BYER GEOTECHNICAL, INC.

Raffi S. Babayan
Senior Project Engineer

BYER GEOTECHNICAL, INC.

GEOTECHNICAL ENGINEERING EXPLORATION

PROPOSED TWO-STORY, AT-GRADE MIXED-USE DEVELOPMENT

ASSESSOR'S PARCEL NO. 8174-041-028

PORTION OF LOT 126, TRACT 12444

6018 NORWALK BOULEVARD

WHITTIER, LOS ANGELES COUNTY, CALIFORNIA

FOR DLS BUILDERS

BYER GEOTECHNICAL, INC., PROJECT NUMBER BG 23334

FEBRUARY 25, 2021

1461 East Chevy Chase Drive, Suite 200 • Glendale, California 91206 • tel 818.549.9959 • fax 818.543.3747 • www.byergeo.com

GEOTECHNICAL ENGINEERING EXPLORATION
PROPOSED TWO-STORY, AT-GRADE MIXED-USE DEVELOPMENT
ASSESSOR'S PARCEL NO. 8174-041-028
PORTION OF LOT 126, TRACT 12444
6018 NORWALK BOULEVARD
WHITTIER, LOS ANGELES COUNTY, CALIFORNIA
FOR DLS BUILDERS
BYER GEOTECHNICAL, INC., PROJECT NUMBER BG 23334
FEBRUARY 25, 2021

INTRODUCTION

This report has been prepared per our signed Agreement and summarizes findings of Byer Geotechnical, Inc., geotechnical engineering exploration performed on the subject site. The purpose of this study is to evaluate the nature, distribution, engineering properties, and geologic hazards of the earth materials underlying the site with respect to construction of the proposed project. This report is intended to assist in the design and completion of the proposed project and to reduce geotechnical risks that may affect the project. The professional opinions and advice presented in this report are based upon commonly accepted exploration standards and are subject to the AGREEMENT with TERMS AND CONDITIONS, and the GENERAL CONDITIONS AND NOTICE section of this report. No warranty is expressed or implied by the issuing of this report.

PROPOSED PROJECT

The scope of the proposed project was determined from consultation with Mr. David Pickard of Pickard Architects, and the preliminary plans prepared by Pickard Architects, dated September 11, 2020. Final plans have not been prepared and await the conclusions and recommendations of this report. The project consists of the construction of three, two-story, at-grade mixed-use and residential buildings, which are planned to occupy the majority of the site, as shown on the enclosed Site Plan. The front portion of the building facing Norwalk Boulevard will consist of retail spaces. The ground floor of the proposed buildings adjacent to the public alley will consist of garage space. Access to the garages will be provided via the south-bounding public alley.

EXPLORATION

The scope of the field exploration was determined from our initial site visit and consultation with Mr. David Pickard. The preliminary plans prepared by Pickard Architects, dated September 11, 2020, were a guide to our work on this project. Exploration was conducted using techniques normally applied to this type of project in this setting. This report is limited to the area of the exploration and the proposed project as shown on the enclosed Site Plan. The scope of this exploration did not include an assessment of general site environmental conditions for the presence of contaminants in the earth materials and groundwater. Conditions affecting portions of the property outside the area explored are beyond the scope of this report.

Exploration was conducted on February 3, 2021, with the aid of a hollow-stem-auger drill rig. It included drilling four borings to approximate depths of 21.5 to 50.8 feet below existing grade. Samples of the earth materials were obtained and delivered to our soils engineering laboratory for testing and analysis. The boring tailings were visually logged by the project soils engineer. Following drilling and sampling, the borings were backfilled, mechanically tamped, and patched with asphalt.

Office tasks included laboratory testing of selected soil samples, review of published maps and photos for the area, review of our files, review of agency files, preparation of the Site Plan, engineering analysis, and preparation of this report. Earth materials exposed in the borings are described on the enclosed Log of Borings. Appendix I contains a discussion of the laboratory testing procedures and results. Appendix II contains the results of liquefaction analysis. The proposed project and the locations of the borings are shown on the enclosed Site Plan.

SITE DESCRIPTION

The subject property consists of an irregularly-shaped, partially-graded, relatively-level parcel that is located just southwest of the Puente Hills, in the city of Whittier, Los Angeles County, California (33.9892° N Latitude, 118.0641° W Longitude). As depicted on the enclosed Aerial Vicinity Map, the property is bounded by Norwalk Boulevard on the northwest, a gas station and a one-story commercial establishment on the northeast, and a public alley on the southeast and southwest. The property is located approximately one-third of a mile east of the San Gabriel River (605) Freeway and 150 feet southwest of Whittier Boulevard. A one-story apartment building, with a retail store at the front, currently occupies the northeast portion of the site. A two-story mixed-use building occupies the western portion of the site. An asphalt-paved parking lot occupies the remaining portions of the site. The surrounding area has been developed generally with single-family residences, as well as commercial establishments along Whittier Boulevard.

Past grading on the site has consisted of minor grading to create a level pad for the existing buildings and parking lot. Minor amounts of fill may have been placed within the footprints of the existing buildings. The site is devoid from vegetation. Surface drainage is by sheetflow runoff down the contours of the land to the south-southwest.

GROUNDWATER

Groundwater was not encountered in the borings to a maximum depth of 50.8 feet below existing grade. In *Seismic Hazard Zone Report 037,* the California Geological Survey (CGS) has estimated the historically-highest groundwater level at the site was on the order of 20 feet below ground surface (CGS, 1998), as shown on the enclosed Historic-High Groundwater Map.

Seasonal fluctuations in groundwater levels occur due to variations in climate, irrigation, development, and other factors not evident at the time of the exploration. Groundwater levels may also differ across the site. Groundwater can saturate earth materials causing subsidence or instability of slopes.

EARTH MATERIALS

Fill (Afu)

Fill was not encountered during the subsurface exploration. Fill may be present locally within the footprints of the existing buildings and is expected to be minor. Any fill will be removed during future grading for the proposed buildings.

Alluvium (Qa)

Natural alluvium underlies the subject site and was encountered in the borings. The alluvium is on the order of 15 feet thick across the site and consists of clay that is yellowish-brown to dark brown, moist to very moist, and medium stiff to hard, with varying amounts of fine- to medium-grained sand.

Older Alluvium (Qae)

Older alluvium deposits underlie the alluvium layer and were encountered in the borings. The older alluvium consists of layers of clayey sand, silty sand, sandy silt, sand, and gravelly sand that are generally yellowish-brown and light olive-brown, slightly moist to moist, stiff to very stiff, and medium dense to very dense, with varying amounts of fine- to coarse-grained gravel.

GEOTECHNICAL CHARACTERISTICS

In-Situ Percolation Testing

In-situ percolation testing was conducted in Boring 3, which was drilled to a depth of 31 feet below existing grade. The purpose of this test was to determine the infiltration rate and evaluate the infiltration characteristics of the earth materials underlying the subject site. The test was performed in accordance with the Administrative Manual of the County of Los Angeles, Department of Public Works, Section GS200.2, dated June 30, 2017. Following drilling and sampling, a PVC pipe was inserted into the boring, covered with a filter sock, and surrounded with the onsite excavated soil. The upper 5 feet of the pipe was solid and the lower 25 feet was screened to allow water infiltration below 5 feet. The boring was then presoaked utilizing water from the drill rig and was allowed to set for at least 30 minutes. Following presoaking, a falling-head percolation test was conducted. The test consisted of ceasing the flow of water into the boring and measuring the drop of the water surface (head) at 10-minute intervals. The test was repeated seven times.

The results of the infiltration rate calculations are shown on the enclosed Calculation Sheet #1. Based on the results of *in-situ* percolation testing, the design infiltration rate for the earth materials between the depths of 5 and 30 feet is estimated to be 1.81 inches-per-hour (1.3×10^{-3} centimeters-per-second). The calculations incorporate a reduction factor of 4 based on the guidelines of the Administrative Manual.

Hydroconsolidation

The potential for hydroconsolidation of the natural alluvium and older alluvium is considered to be very low.

GENERAL SEISMIC CONSIDERATIONS

Regional Faulting

The subject property is located in an active seismic region. Moderate to strong earthquakes can occur on numerous local faults. The United States Geological Survey, California Geological Survey (CGS), private consultants, and universities have been studying earthquakes in southern California for several decades. Early studies were directed toward earthquake prediction and estimation of the effects of strong ground shaking. Studies indicate that earthquake prediction is not practical and not sufficiently accurate to benefit the general public. Governmental agencies now require earthquake-resistant structures. The purpose of the code seismic-design parameters is to prevent collapse during strong ground shaking. Cosmetic damage should be expected.

Southern California faults are classified as "active" or "potentially active." Faults from past geologic periods of mountain building that do not display evidence of recent offset are considered "potentially active." Faults that have historically produced earthquakes or show evidence of movement within the past 11,000 years are known as "active faults." No known active faults cross the subject property, and the property is not located within a currently-designated Alquist-Priolo Earthquake Fault Zone (CGS, 2000). Therefore, the potential for surface rupture onsite is considered very low.

The known regional local active and potentially-active faults that could produce the most significant ground shaking on the site include the Elsinore - Whittier Section Fault. Forty-three faults were found within a 100-kilometer-radius search area from the site using EZ-FRISK V8.06 computer program. The results of seismic-source analysis are listed in Appendix II. The closest mapped "active" fault is the Elsinore - Whittier Section Fault, a Type A fault that is located 1.6 kilometers (one mile) east-southeast of the site. The Elsinore - Whittier Section Fault is capable of producing a maximum moment magnitude of 7.9 and an average slip rate of 2.5 ± 1.0 millimeters per year (Cao et al., 2003). The San Andreas Fault, also a Type A fault, is located 53.9 kilometers (33.5 miles) northeast of the site. General locations of regional active faults with respect to the subject site are shown on the enclosed Regional Fault Map (Appendix II).

Seismic Design Coefficients

The following table lists the applicable seismic coefficients for the project based on the California Building Code:

SEISMIC COEFFICIENTS (2019 California Building Code - Based on ASCE Standard 7-16)		
Latitude = 33.9892° N Longitude = 118.0641° W	Short Period (0.2s)	One-Second Period
Earth Materials and Site Class from Table 20.3.3, ASCE Standard 7-16	Alluvium / Older Alluvium - D	
Mapped Spectral Accelerations from Figures 22-1 and 22-2 and USGS	S_s = 1.872 (g)	S_1 = 0.668 (g)
Site Coefficients from Tables 11.4-1 and 11.4-2 and USGS	F_A = 1.0	F_V = 1.7 (g)
Maximum Considered Spectral Response Accelerations from Equations 11.4-1 and 11.4-2	S_{MS} = 1.872 (g)	S_{M1} = 1.136 (g)
Design Spectral Response Accelerations from Equations 11.4-3 and 11.4-4	S_{DS} = 1.248 (g)	S_{D1} = 0.757 (g)
Maximum Considered Earthquake Geometric Mean (MCE_G) Peak Ground Acceleration, adjusted for Site Class effects	PGA_M = 0.891 (g)	

Reference: American Society for Civil Engineers, **ASCE 7 Hazard Tool,** https://asce7hazardtool.online/

The mapped spectral response acceleration parameter for the site for a 1-second period (S_1) is less than 0.75g. The design spectral response acceleration parameters for the site for a 1-second period (S_{D1}) is greater than 0.20g, and/or the short period (S_{DS}) is greater than 0.50g. Therefore, the project is considered to be in Seismic Design Category D.

The principal seismic hazard to the proposed project is strong ground shaking from earthquakes produced by local faults. Modern buildings are designed to resist ground shaking through the use of shear panels, moment frames, and reinforcement. Additional precautions may be taken, including strapping water heaters and securing furniture to walls and floors. It is likely that the subject property will be shaken by future earthquakes produced in southern California.

Seismic Hazard Deaggregation Analysis

A probabilistic seismic hazard deaggregation analysis was performed for the subject site. Seismic parameters were determined using currently-available earthquake and fault information, utilizing data from the United States Geological Survey (USGS) Earthquake Hazards Program (USGS, 2021). An averaging of four Next Generation Attenuation relations (Abrahamson-et. al. (2014) NGA West 2 USGS 2014, Boore-et. al. (2014) NGA West 2 USGS 2014, Campbell-Bozorgnia (2014) NGA West 2 USGS 2014, and Chiou-Youngs (2014) NGA West 2 USGS 2014) was incorporated in the analysis. An average shear-wave velocity (Vs30) of 259 meters-per-second (Site Class D) was used in the analysis. Results of the probabilistic seismic hazard deaggregation analysis are shown in the following table:

Probabilistic Seismic Hazard Deaggregation Analysis		
Latitude = 33.9892° N Longitude = 118.0641° W	Percent Probability of Exceedance in 50 Years	
Shear-Wave Velocity = 259 Meters-per-Second	10%	2%
Return Period	475 Years	2,475 Years
Peak Ground Acceleration (PGA)	0.47g	0.83g
Magnitude of the Predominant Earthquake (Mw)*	6.3	6.3
Distance to the Seismic Source (Km)*	5.9	4.6

* Modal Values (Largest r-m Bin)

Reference: U.S. Geological Survey, 2020, Unified Hazard Tool, http://earthquake.usgs.gov/hazards/interactive.

Results of the analysis are graphically presented in the enclosed Seismic Hazard Deaggregation Charts 1 and 2 (Appendix II).

Site-Specific Ground Motion Analysis

Site-specific ground motion analysis was performed in accordance with Chapter 21 of the American Society of Civil Engineers (ASCE) Standard 7-16. The probabilistic and deterministic seismic response spectra, based on a geometric mean horizontal component of spectral response at five-percent damping, are enclosed. The analysis is also based on a probability of exceedance of two percent in 50 years (2,475-return period). A computerized program, EZ-FRISK V8.06, was used to generate the seismic response spectra. An averaging of four Next Generation Attenuation relations (Abrahamson-et. al. (2014) NGA West 2 USGS 2014, Boore-et. al. (2014) NGA West 2 USGS 2014, Campbell-Bozorgnia (2014) NGA West 2 USGS 2014, and Chiou-Youngs (2014) NGA West 2 USGS 2014) was incorporated in both the probabilistic and deterministic analyses to estimate ground motions at the subject site. The deterministic response spectrum was generated using the 84th percentile of the maximum rotated component of spectral response at five-percent damping. A shear-wave velocity (Vs30) of 259 meters-per-second (Site Class D) was used in the analysis.

The design response spectrum was generated by multiplying the lesser of the deterministic and probabilistic response spectra by two-thirds, according to Sections 21.2.3 and 21.3 of ASCE Standard 7-16. The deterministic lower-limit response spectrum was determined according to Section 21.2.2 of the ASCE Standard 7-16. Spectral response accelerations for selected periods are shown in the following table:

Spectral Response Accelerations (g)*									
Seismic Response Spectra	Fundamental Period (seconds)								
	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Probabilistic MCE_R	1.6843	1.9590	2.0183	1.9486	1.7738	1.6571	1.5363	1.4150	1.3227
Probabilistic (ASCE 7-16)	1.4976	1.4976	1.4976	1.4976	1.4976	1.4976	1.3917	1.2370	1.1133
Deterministic MCE_R (84th Percentile)	1.8579	2.2196	2.3932	2.4029	2.2980	2.2209	2.1250	2.0145	1.9240
Deterministic Lower Limit on MCE_R Response Spectrum	1.8000	1.8000	1.8000	1.8000	1.8000	1.8000	1.8000	1.6667	1.5000
Site Specific MCE_R	1.6843	1.9590	2.0183	1.9486	1.7738	1.6571	1.5363	1.4150	1.3227
80% Design Response Spectrum	1.1981	1.1981	1.1981	1.1981	1.1981	1.1981	1.1134	0.9896	0.8906
Site-Specific Design Response Spectrum	**1.1981**	**1.3060**	**1.3455**	**1.2991**	**1.1981**	**1.1981**	**1.1134**	**0.9896**	**0.8906**

* Reference: *American Society of Civil Engineers (ASCE), Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Standard 7-16, 2016.*

The data included in the table above are plotted and presented in the enclosed Site-Specific Seismic Response Spectra figure. Detailed calculations for fundamental periods up to eight seconds are also included in the "Site-Specific Ground Motion Analysis" table (Appendix II).

As shown on the enclosed Site-Specific Seismic Response Spectra figure, the site-specific design response spectrum is equal or greater than or equal to 80 percent of the probabilistic response spectrum. According to Section 21.3 of ASCE Standard 7-16, the design response spectrum shall not be less than 80 percent of the probabilistic response spectrum.

Based on Section 21.4 of the ASCE Standard 7-16, the design earthquake spectral response acceleration parameters at short period, $S_{DS,}$ and at one-second period, S_{D1}, derived from the site-specific ground motion analysis, are shown in the following table:

SITE-SPECIFIC SPECTRAL RESPONSE ACCELERATION PARAMETERS (Based on ASCE Standard 7-16 - Chapter 21)		
Latitude = 33.9892° N Longitude = 118.0641° W	Short Period (0.2s)	One-Second Period
Maximum Considered Spectral Response Accelerations Chapter 21 - Section 21.4	S_{MS} = 1.817 (g)	S_{M1} = 1.337 (g)
Design Spectral Response Accelerations Chapter 21 - Section 21.4	S_{DS} = 1.211 (g)	S_{D1} = 0.891 (g)

Liquefaction

The CGS has mapped the site within an area where historic occurrence of liquefaction or geological, geotechnical, and groundwater conditions indicate a potential for permanent ground displacement such that mitigation as defined in Public Resources Code Section 2693 (c) would be required, as shown on the enclosed Seismic Hazard Zones Map.

Liquefaction is a process that occurs when saturated sediments are subjected to repeated strain reversals during an earthquake. The strain reversals cause increased pore water pressure such that the internal pore pressure approaches the overburden stress and the shear strength approaches zero. Liquefied soils may be subject to flow or excessive strain, which may induce settlement. Liquefaction occurs in soils below the groundwater table. Soils commonly subject to liquefaction include loose to medium-dense sand and silty sand. Predominantly fine-grained soils, such as silts and clay, are less susceptible to liquefaction. Generally, medium dense to dense sand-like soils with fines content (percent passing the No. 200 sieve) greater than 35 percent are not considered susceptible to liquefaction. In addition, cohesive soils with Plasticity Index (PI) values between 12 and 18 and a saturated moisture content less than 80 percent of the Liquid Limit (LL) are not considered susceptible to liquefaction (CGS, 2008, and Bray and Sancio, 2006). Cohesive soils with

PI greater than 18 may be susceptible to liquefaction, if considered sensitive (CGS, 2008). Soil sensitivity is the ratio of the undisturbed shear strength of a cohesive soil to the remolded shear strength at the same water content (Bowles, 1996). Based on the study conducted by Bray and Sancio on soils affected by the 1999 earthquakes in Taiwan and Turkey, soils with a PI greater than 18 tested at low confining effective stresses are not considered susceptible to liquefaction (Bray and Sancio, 2006).

Soils data collected in Boring B2 was utilized to quantify the liquefaction potential of the site. The following input parameters were incorporated in the liquefaction analysis:

Liquefaction Analysis Input Parameters	
Peak Ground Acceleration (g)	0.891 (PGA_M)
Probability of Exceedance in 50 Years	2%
Return Period	2,475 Years
Earthquake Magnitude (Mw)	6.3
Factor of Safety	1.3

For a conservative analysis, it was assumed that groundwater rose to the historic-high groundwater level of 20 feet below the ground surface (see "Groundwater" section of this report).

Laboratory testing consisting of sieve analysis by wash method (ASTM D 1140-14) was performed on representative samples of the earth materials collected in Boring B2. The purpose of these tests was to determine the fines content (percent passing the No. 200 sieve) and incorporate the results in the liquefaction analysis. The results are shown on the Laboratory Testing program in Appendix I, as well as on the enclosed liquefaction calculations (Appendix II).

A liquefaction potential analysis based upon SPT data from Boring B2 is presented in Appendix II on the plates entitled "Liquefaction Susceptibility Analysis: SPT Method." The column labeled "Factor of Safety" lists the calculated safety factor of each 2½-foot-thick layer of soil encountered in the upper 30 feet, and each 5-foot-thick layer of soil encountered below the depth of 30 feet in the boring. In addition, a borehole diameter correction factor (C_B) of 1.15 was incorporated in the analysis to account for the stress relief, since the tip of the auger was raised a few inches from the bottom of the hole prior to driving the sampler. The stresses and safety factors for liquefaction were calculated using the methodology of Youd et al. (2001) and Special Publication 117A (CGS, 2008). Soils with a factor of safety less than 1.3 were considered susceptible to liquefaction.

Quantitative evaluation and screening analysis was performed to determine the depths and limits of potentially-liquefiable soil layers encountered in Boring B2 below the historic-high groundwater level. The results are summarized in the following table:

Results of Quantitative Evaluation and Screening Analysis											
Boring No.	Layer Depth (feet)	Liquid Limit LL (%)	Plastic Limit PL (%)	Plasticity Index PI (%)	Fines Content (%)	Soil Type & Unit	*In-Situ* Moisture Content (%)	Saturated Moisture Content w_c (%)	$(N_1)_{60cs}$ Clean Sand	Screening Criteria	Result
B2	22.5	-	-	-	30.2	Sand (SM)	-	-	43.3	CRR > CSR	Non-Liquefiable
B2	25.0	-	-	-	69.4	Silt (ML)	-	-	31.4	CRR > CSR	Non-Liquefiable
B2	40.0	-	-	-	63.0	Silt (ML)	-	-	53.1	CRR > CSR	Non-Liquefiable

The results of liquefaction analysis indicate that the earth materials underlying the subject site are not considered susceptible to liquefaction.

Seiches and Tsunamis

Seiches are large waves generated in enclosed bodies of water, such as lakes and reservoirs, in response to ground shaking. Tsunamis are waves generated in large bodies of water by fault displacement or major ground movement. The site is not located near any reservoir. In addition, the site is at an average elevation of 177 feet above mean sea level and is located approximately 21.5 miles from the Pacific Ocean. Therefore, the risk to the project from seiches or tsunamis is considered nil.

CONCLUSIONS AND RECOMMENDATIONS

General Findings

The conclusions and recommendations of this exploration are based upon review of the preliminary plans, review of published maps, four borings, research of available records, laboratory testing, engineering analysis, and years of experience performing similar studies on similar sites. It is the finding of Byer Geotechnical, Inc., that development of the proposed project is feasible from a geotechnical engineering standpoint, provided the advice and recommendations contained in this report are included in the plans and are implemented during construction.

The recommended bearing material for the proposed buildings is future compacted fill. Conventional foundations may be used. Soils to be exposed at finished grade are expected to exhibit a low expansion potential.

Geotechnical issues affecting the project include temporary excavations during grading adjacent to the northeast property line to prepare a compacted-fill pad for the proposed mixed-use building. These excavations will remove support from the adjacent properties to the northeast. Therefore, ABC slot cuts will be required.

SITE PREPARATION - REMOVALS

Surficial materials consisting of existing fill and disturbed alluvium, resulting from the demolition and removal of the existing buildings, may be expected blanketing the site. Remedial grading is recommended to improve site conditions. The areas of the proposed buildings should be removed to three feet below the bottom of the footings and replaced as certified compacted fill. The following general grading specifications may be used in preparation of the grading plan and job specifications. Byer Geotechnical would appreciate the opportunity of reviewing the plans to ensure that these recommendations are included. The grading contractor should be provided with a copy of this report.

A. The area to receive compacted fill should be prepared by removing all vegetation, demolition debris, existing fill, and alluvium. The exposed excavated area should be observed by the soils engineer/geologist prior to placing compacted fill. Removal depths can be found in the "Site Preparation - Removals" section above. The exposed grade should be scarified to a depth of six inches, moistened to optimum moisture content, and recompacted to 90 percent of the maximum dry density.

B. The proposed building sites shall be excavated to a minimum depth of three feet below the bottom of all footings. The excavation shall extend beyond the edge of the exterior footing a minimum of three feet or to the depth of fill below the footing. The excavation should not extend beyond the northeast property line. The excavated areas shall be observed by the soils engineer/geologist prior to placing compacted fill.

C. Fill, consisting of soil approved by the soils engineer, shall be placed in horizontal lifts, moistened as required, and compacted in six-inch layers with suitable compaction equipment. The excavated onsite materials are considered satisfactory for reuse in the controlled fills. Any imported fill shall be observed by the soils engineer prior to use in fill areas. Rocks larger than six inches in diameter shall not be used in the fill.

D. The moisture content of the fill should be near the optimum moisture content. When the moisture content of the fill is too wet or dry of optimum, the fill shall be moisture conditioned and mixed until the proper moisture is attained.

E. The fill shall be compacted to at least 90 percent of the maximum laboratory dry density for the material used. The maximum dry density shall be determined by ASTM D 1557-12 or equivalent.

F. Field observation and testing shall be performed by the soils engineer during grading to assist the contractor in obtaining the required degree of compaction and the proper moisture content. Where compaction is less than required, additional compactive effort shall be made with adjustment of the moisture content, as necessary, until 90 percent relative compaction is obtained. A minimum of one compaction test is required for each 500 cubic yards or two vertical feet of fill placed.

FOUNDATION DESIGN

Spread Footings

Continuous and/or pad footings may be used to support the proposed two-story, at-grade buildings, provided they are founded in future compacted fill. Continuous footings should be a minimum of

12 inches in width. Pad footings should be a minimum of 24-inches square. The following chart contains the recommended design parameters.

Bearing Material	Minimum Embedment Depth of Footing (Inches)	Vertical Bearing (psf)	Coefficient of Friction	Passive Earth Pressure (pcf)	Maximum Earth Pressure (psf)
Future Compacted Fill	24	2,000	0.3	250	4,000

Increases in the bearing value are allowable at a rate of 400 pounds-per-square-foot for each additional foot of footing width or depth to a maximum of 4,000 pounds-per-square-foot. For bearing calculations, the weight of the concrete in the footing may be neglected.

The bearing value shown above is for the total of dead and frequently applied live loads and may be increased by one-third for short duration loading, which includes the effects of wind or seismic forces. When combining passive and friction for lateral resistance, the passive component should be reduced by one-third.

Footings adjacent to retaining walls should be deepened below a 1:1 plane from the bottom of the lower retaining wall, or the footings should be designed as grade beams to bridge from the wall to the l:l plane.

All continuous footings should be reinforced with a minimum of four #4 steel bars: two placed near the top and two near the bottom of the footings. Footings should be cleaned of all loose soil, moistened, free of shrinkage cracks, and approved by the geotechnical engineer prior to placing forms, steel, or concrete.

Foundation Settlement

Settlement of the foundation system is expected to occur on initial application of loading. A total settlement of one-fourth to one-half of an inch may be anticipated. Differential settlement should not exceed one-fourth of an inch within a horizontal distance of 30 feet.

TEMPORARY EXCAVATIONS

Temporary excavations will be required during grading to prepare compacted-fill pads for the proposed buildings. The excavations are expected to be up to about five feet in height and will expose alluvium with a possible minor fill blanket above. Vertical excavations up to five feet in height are considered temporarily stable (see Calculation Sheet#2). Where vertical excavations exceed five feet in height, the upper portion should be trimmed to 1:1 (45 degrees).

Vertical excavations adjacent to the northeast property line will require the use of slot cutting (ABC method). The slot cutting method uses the earth as a buttress and allows the excavation to proceed in phases. The initial excavation is made at a slope of 1:1. Alternate slots of eight feet in width may be worked (see Calculation Sheet#3). The remaining earth buttresses should be sixteen feet in width. The removal and recompaction should be completed in the "A" slots before the "B" earth buttresses are excavated. The "C" earth buttresses may be excavated upon completion of the removal and recompaction in the "B" areas.

The geologist should be present during grading to see temporary slopes. All excavations should be stabilized within 30 days of initial excavation. Water should not be allowed to pond on top of the excavations nor to flow toward them. No vehicular surcharge should be allowed within three feet of the top of the cut.

FLOOR SLABS

Floor slabs should be cast over approved compacted fill and reinforced with a minimum of #4 bars on 16-inch centers, each way. Slabs that will be provided with a floor covering should be protected by a polyethylene plastic vapor barrier. The barrier should be sandwiched between the layers of sand, about two inches each, to prevent punctures and aid in the concrete cure. A low-slump concrete may be used to minimize possible curling of the slab. The concrete should be allowed to cure properly before placing vinyl or other moisture-sensitive floor covering.

It should be noted that cracking of concrete slabs is common. The cracking occurs because concrete shrinks as it cures. Control joints, which are commonly used in exterior decking to control such cracking, are normally not used in interior slabs. The reinforcement recommended above is intended to reduce cracking and its proper placement is critical to the performance of the slab. The minor shrinkage cracks, which often form in interior slabs, generally do not present a problem when carpeting, linoleum, or wood floor coverings are used. The slab cracks can, however, lead to surface cracks in brittle floor coverings such as ceramic tile.

EXTERIOR CONCRETE DECKS

Decking should be cast over approved compacted fill and reinforced with a minimum of #3 bars placed 18 inches on center, each way. Decking that caps a retaining wall should be provided with a flexible joint to allow for the normal one to two percent deflection of the retaining wall. Decking that does not cap a retaining wall should not be tied to the wall. The space between the wall and the deck will require periodic caulking to prevent moisture intrusion into the retaining wall backfill. The subgrade should be moistened prior to placing concrete.

PAVING

Prior to placing paving in the proposed parking area, any existing fill and disturbed alluvium (minimum 12 inches) should be removed and replaced as certified compacted fill. The exposed grade should be scarified, moistened as required to obtain optimum moisture content, and recompacted to 90 percent of the maximum dry density, as determined by ASTM D 1557-12. Trench backfill below paving should be compacted to 90 percent of the maximum dry density. Irrigation water should be prevented from migrating under paving.

A representative bulk sample of the near-surface soils was obtained from Boring 4 for laboratory testing to determine the Expansion Index (see Appendix I). The results indicate an Expansion Index (EI) value of 36 (low). Based on a correlation with the EI values, a preliminary R-value of 35 is considered appropriate for design of flexible pavement at the subject site. Based on the Caltrans Design Procedures (Cal Test 301), flexible pavement sections may consist of the following for the Traffic Indices (TI) indicated.

Type of Vehicle (TI)	Asphalt Concrete (AC) Pavement Thickness (Inches)	Class II Aggregate Base Thickness (Inches)
Passenger Vehicles (5)	3.0	4.5
Moderate Trucks (6)	3.5	6.0

For rigid concrete pavement, four inches of concrete over six inches of aggregate base can be used. Concrete should be reinforced for heavy load application.

The Class II aggregate base and top one foot of subgrade should be compacted to a minimum of 95 percent of maximum dry density. Crushed aggregate base should meet the requirements of "Greenbook" (Standard Specification for Public Works Construction) Section 200-2.2.

UTILITY-TRENCH BACKFILL

Utility trenches on the subject site may be backfilled with the onsite soil, provided it is free of debris and oversize material. Prior to backfilling the trench, pipes should be bedded and shaded in a granular material that has a sand equivalent (SE) of 30 or greater. The sand should extend 12 inches above the top of the pipe. The bedding/shading sand should be densified in-place by water jetting. Soil backfill above the bedding sand should be placed in thin, loose layers, moistened as required, and compacted to at least 90 percent of the maximum dry density. The thickness of layers should be based on the type of equipment used for compaction in accordance with the recent edition of Standard Specifications for Public Works Construction (Greenbook).

CEMENT TYPE AND CORROSION PROTECTION

A representative sample of the near-surface soil was obtained from Boring 4 for laboratory testing. Corrosion test results are included in Appendix I. The results indicate that concrete structures in contact with the soils onsite will have negligible exposure to water-soluble sulfates in the soil. According to Tables 19.3.1.1 and 19.3.2.1 of Section 19.3 of the ACI 318-14 Code, Type II cement may be used for concrete construction.

The results of the laboratory testing also indicate that the near-surface soil onsite is considered severely corrosive to ferrous metals. Special mitigation measures for corrosion protection of steel and other metallic elements in contact with the soil may be required. The corrosion information presented in Appendix I of this report should be provided to the underground utility subcontractor.

DRAINAGE

Control of site drainage is important for the performance of the proposed project. Roof gutters are recommended. Pad and roof drainage should be collected and transferred to the street or approved location in non-erosive drainage devices. Drainage should not be allowed to pond on the pad or against any foundation. Planters located within retaining wall backfill should be sealed to prevent moisture intrusion into the backfill. Drainage control devices require periodic cleaning, testing, and maintenance to remain effective.

Storm Water Infiltration System

Based on the results of the *in-situ* percolation testing conducted onsite, the design infiltration rate for the alluvium and older alluvium between the depths of 5 and 30 feet is estimated to be 1.81 inches-per-hour (1.3×10^{-3} centimeters-per-second), which is reasonable for the type of soil encountered in the borings.

The following recommendations shall be incorporated into the design and construction of drywell infiltration system.

- The infiltration system should be deepened into the natural older alluvium to allow for water infiltration into the granular soil layers below the depth of 15 feet.
- The upper five to ten feet of the drywell shaft should be sealed with concrete rings to avoid any lateral water infiltration into future fill. The shaft below the concrete rings should be backfilled with a minimum of 3/4-inch crushed rock.
- A geotextile fabric liner should be placed throughout the height of the shaft to separate between the permeable gravel fill and the surrounding soil.
- The distance between the edge of the infiltration system and any adjacent property line or public right-of-way should be at least 5 feet.
- The distance between the edge of the infiltration system and any adjacent structural foundations should be a minimum of 10 feet.
- The infiltration system shall be designed to overflow to the street in case the capacity is exceeded.
- If the infiltration system is to be planned in the parking area, vehicular surcharge should be considered in the design and construction of the system.

- The exposed excavated area should be observed by the soils engineer to verify natural alluvium is exposed prior to construction of the infiltration system.

Byer Geotechnical should be provided with the design plans to verify the location of the infiltration system and to provide additional recommendations, if necessary, depending on the type of the infiltration system to be installed.

Irrigation

Control of irrigation water is a necessary part of site maintenance. Soggy ground and perched water may result if irrigation water is excessively applied. Irrigation systems should be adjusted to provide the minimum water needed. Adjustments should be made for changes in climate and rainfall.

PLAN REVIEW

Formal plans ready for submittal to the building department should be reviewed by Byer Geotechnical. Any change in scope of the project may require additional work.

SITE OBSERVATIONS DURING CONSTRUCTION

The building department requires that the geotechnical engineer provide site observations during grading and construction. Foundation excavations should be observed and approved by the geotechnical engineer prior to placing steel, forms, or concrete. The engineer should observe bottoms for fill, compaction of fill, temporary and slot cut excavations, and subdrains. All fill that is placed should be approved by the geotechnical engineer and the building department prior to use for support of structural footings and floor slabs.

Please advise Byer Geotechnical, Inc., at least 24 hours prior to any required site visit. The building department stamped plans, the permits, and the geotechnical reports should be at the job site and available to our representative. The project consultant will perform the observation and post a notice at the job site with the findings. This notice should be given to the agency inspector.

FINAL REPORTS

The geotechnical engineer will prepare interim and final compaction reports upon request.

CONSTRUCTION SITE MAINTENANCE

It is the responsibility of the contractor to maintain a safe construction site. The area should be fenced and warning signs posted. All excavations must be covered and secured. Soil generated by foundation excavations should be either removed from the site or placed as compacted fill. Soil should not be spilled over any descending slope. Workers should not be allowed to enter any unshored trench excavations over five feet deep. Water shall not be allowed to saturate open footing trenches.

GENERAL CONDITIONS AND NOTICE

This report and the exploration are subject to the following conditions. Please read this section carefully; it limits our liability.

In the event of any changes in the design or location of any structure, as outlined in this report, the conclusions and recommendations contained herein may not be considered valid unless the changes are reviewed by Byer Geotechnical, Inc., and the conclusions and recommendations are modified or reaffirmed after such review.

The subsurface conditions, excavation characteristics, and geologic structure described herein have been projected from test excavations on the site and may not reflect any variations that occur between these test excavations or that may result from changes in subsurface conditions.

Fluctuations in the level of groundwater may occur due to variations in rainfall, temperature, irrigation, and other factors not evident at the time of the measurements reported herein. Fluctuations also may occur across the site. High groundwater levels can be extremely hazardous. Saturation of earth materials can cause subsidence or slippage of the site.

If conditions encountered during construction appear to differ from those disclosed herein, notify us immediately so we may consider the need for modifications. Compliance with the design concepts, specifications, and recommendations requires the review of the engineering geologist and geotechnical engineer during the course of construction.

THE EXPLORATION WAS PERFORMED ONLY ON A PORTION OF THE SITE, AND CANNOT BE CONSIDERED AS INDICATIVE OF THE PORTIONS OF THE SITE NOT EXPLORED.

This report, issued and made for the sole use and benefit of the client, is not transferable. Any liability in connection herewith shall not exceed the Phase I fee for the exploration and report or a negotiated fee per the Agreement. No warranty is expressed, implied, or intended in connection with the exploration performed or by the furnishing of this report.

THIS REPORT WAS PREPARED ON THE BASIS OF THE PRELIMINARY DEVELOPMENT PLAN FURNISHED. FINAL PLANS SHOULD BE REVIEWED BY THIS OFFICE AS ADDITIONAL GEOTECHNICAL WORK MAY BE REQUIRED.

Byer Geotechnical appreciates the opportunity to provide our service on this project. Any questions concerning the data or interpretation of this report should be directed to the undersigned.

Respectfully submitted,
BYER GEOTECHNICAL, INC.

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Enc: List of References (2 Pages)
Appendix I - Laboratory Testing and Log of Borings
- Laboratory Testing (2 Pages)
- Shear Test Diagrams (2 Pages)
- Consolidation Curves (7 Pages)
- Log of Borings 1 - 4 (7 Pages)

Appendix II - Calculations and Figures
- Seismic Sources (2 Pages)
- Seismic Hazard Deaggregation Charts (2 Pages)
- Site-Specific Ground Motion Analysis (2 Pages)
- Liquefaction Susceptibility Analysis: SPT Method (2 Pages)
- *In-Situ* Percolation Test Calculation Sheet #1
- Temporary Excavation Height Calculation Sheet #2
- Slot Cut Calculation Sheet #3
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- Regional Topographic Map
- Historic Topographic Map
- Regional Geologic Maps #1 and #2 (2 Pages)
- Regional Fault Map
- Seismic Hazard Zones Map
- Historic-High Groundwater Map
- Site Plan

xc: (5) Addressee (E-mail and Mail)
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(1) CRF Engineering, Inc., Attention: Cesar Ramirez (E-mail)

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Software

EZ-FRISK 8.06, Fugro Consultants, Inc.

APPENDIX I

Laboratory Testing and Log of Borings

LABORATORY TESTING

Undisturbed and bulk samples of the alluvium and older alluvium were obtained from the borings and transported to the laboratory for testing and analysis. The samples were obtained by driving a ring-lined, barrel sampler conforming to ASTM D 3550-01 with successive drops of the sampler. Experience has shown that sampling causes some disturbance of the sample. However, the test results remain within a reasonable range. The samples were retained in brass rings of 2.50 inches outside diameter and 1.00 inch in height. The samples were stored in close fitting, waterproof containers for transportation to the laboratory.

Moisture-Density

The dry density of the samples was determined using the procedures outlined in ASTM D 2937-10. The moisture content of the samples was determined using the procedures outlined in ASTM D 2216-10. The results are shown on the enclosed Log of Borings.

Maximum Density

The maximum dry density and optimum moisture content of the future compacted fill were determined using the procedures outlined in ASTM D 1557-12, a five-layer standard. Remolded samples were prepared at 90 percent of the maximum dry density. The remolded samples were tested for shear strength.

Boring	Depth (Feet)	Earth Material	USCS + Color Soil Type	Maximum Density (pcf)	Optimum Moisture %	Expansion Index
4	0 - 5	Alluvium	Brown Sandy Clay	119.0	14.0	36 - Low

Expansion Test

To find the expansiveness of the soil, a swell test was performed using the procedures outlined in ASTM D 4829-11. Based upon the testing, the near-surface soil is expected to exhibit a low expansion potential.

Shear Tests

Shear tests were performed on samples of the alluvium and future compacted fill using the procedures outlined in ASTM D 3080-11 and a strain controlled, direct-shear machine manufactured by Soil Test, Inc. The rate of deformation was 0.025 inch per minute. The samples were tested in an artificially saturated condition. Following the shear test, the moisture content of the samples was determined to verify saturation. The results are plotted on the enclosed Shear Test Diagrams.

LABORATORY TESTING (Continued)

Consolidation

Consolidation tests were performed on *in situ* samples of the alluvium, older alluvium, and future compacted fill using the procedures outlined in ASTM D 2435-11. Results are graphed on the enclosed Consolidation Curves.

Fines Content

Sieve analysis (wash method) was performed on representative samples of the alluvium and older alluvium obtained from the borings using the procedures outlined in ASTM D 1140-14. The tests were performed to assist in the classification of the soil and to determine the fines content (percent passing #200 sieve). The results are shown on the enclosed Log of Borings and are summarized in the following table:

Results of Sieve Analysis (Wash Method) Laboratory Tests							
Boring No.	Depth (feet)	Fines Content (%)	Soil Type	Boring No.	Depth (feet)	Fines Content (%)	Soil Type
B2	22.5	30.2	Silty Sand (SM)	B3	2.5	70.3	Sandy Clay (CL)
B2	25.0	69.4	Sandy Silt (ML)	B3	5.0	87.6	Clay (CL)
B1	40.0	63.0	Sandy Silt (ML)	B3	15.0	47.7	Clayey Sand (SC)

Corrosion

A representative bulk sample of the near-surface soil was transported to Environmental Geotechnology Laboratory for chemical testing. The testing was performed in accordance with Caltrans Standards 643 (pH), 422 (Chloride Content), 417 (Sulfate Content), and 532 (Resistivity). The results of the testing are reported in the following table:

CHEMICAL TEST RESULTS TABLE

Sample	Depth (Feet)	pH	Chloride (PPM)	Sulfate (%)	Resistivity (Ohm-cm)
B4	0 - 5	7.53	175	0.025	830

The chloride and sulfate contents of the soil are negligible and not a factor in corrosion. The pH is near neutral and not a factor. The resistivity indicates that the soil is considered severely corrosive to ferrous metals.

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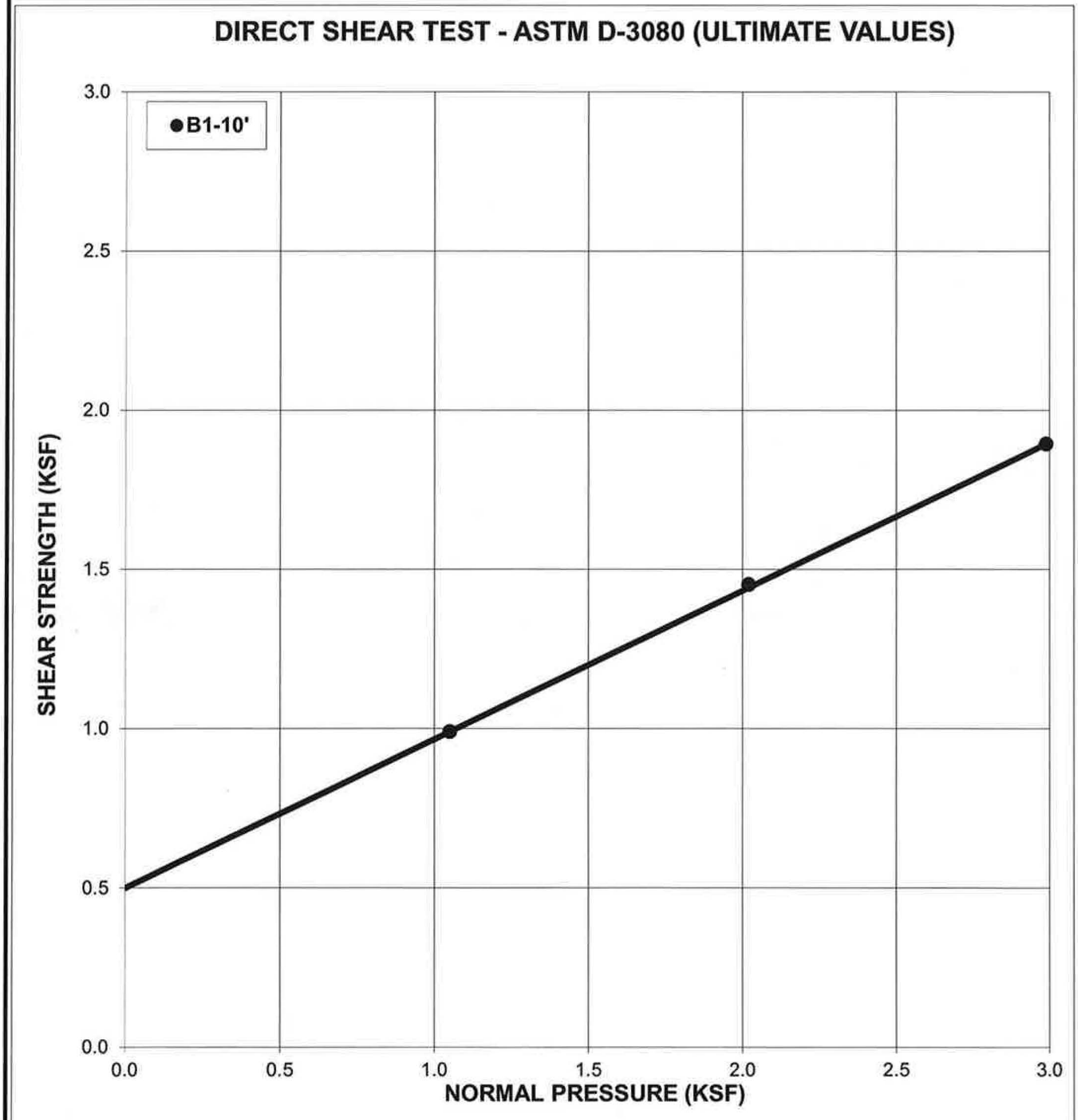
SHEAR TEST DIAGRAM #1

BG: 23334 ENGINEER: RSB
CLIENT: DLS Builders

EARTH MATERIAL: Alluvium

Phi Angle =	**25.0**	**degrees**	**Moisture Content**	**18.9%**
Cohesion =	**500**	**psf**	**Dry Density (pcf)**	**110.2**
			Saturation	**100%**



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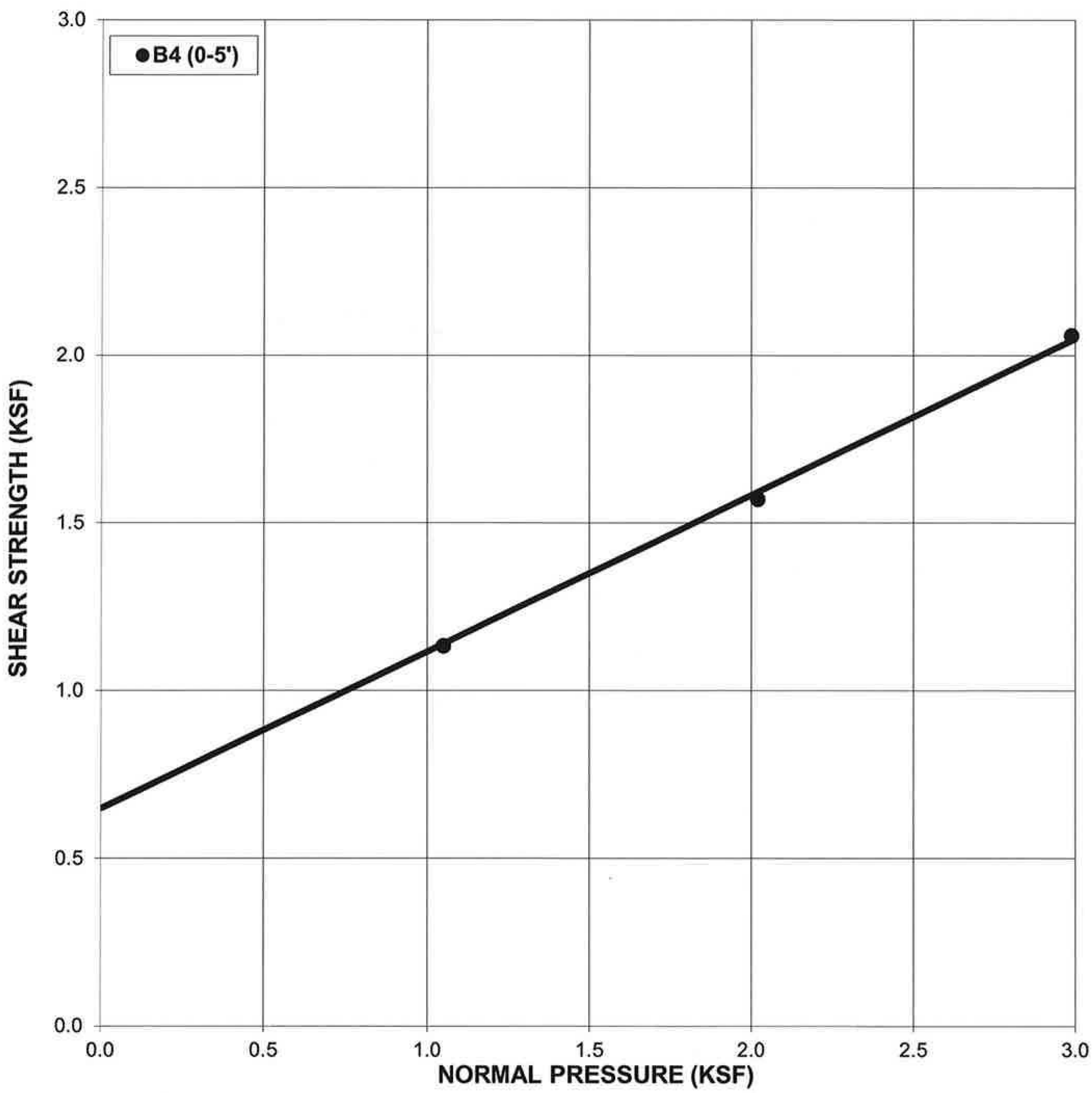
SHEAR TEST DIAGRAM #2

BG: 23334 ENGINEER: RSB
CLIENT: DLS Builders

EARTH MATERIAL: **Future Compacted Fill (Remolded at 90%)**

Phi Angle =	**25.0**	**degrees**	**Moisture Content**	**20.5%**
Cohesion =	**650**	**psf**	**Dry Density (pcf)**	**107.1**
			Saturation	**98%**

DIRECT SHEAR TEST - ASTM D-3080 (ULTIMATE VALUES)



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CONSOLIDATION CURVE #1

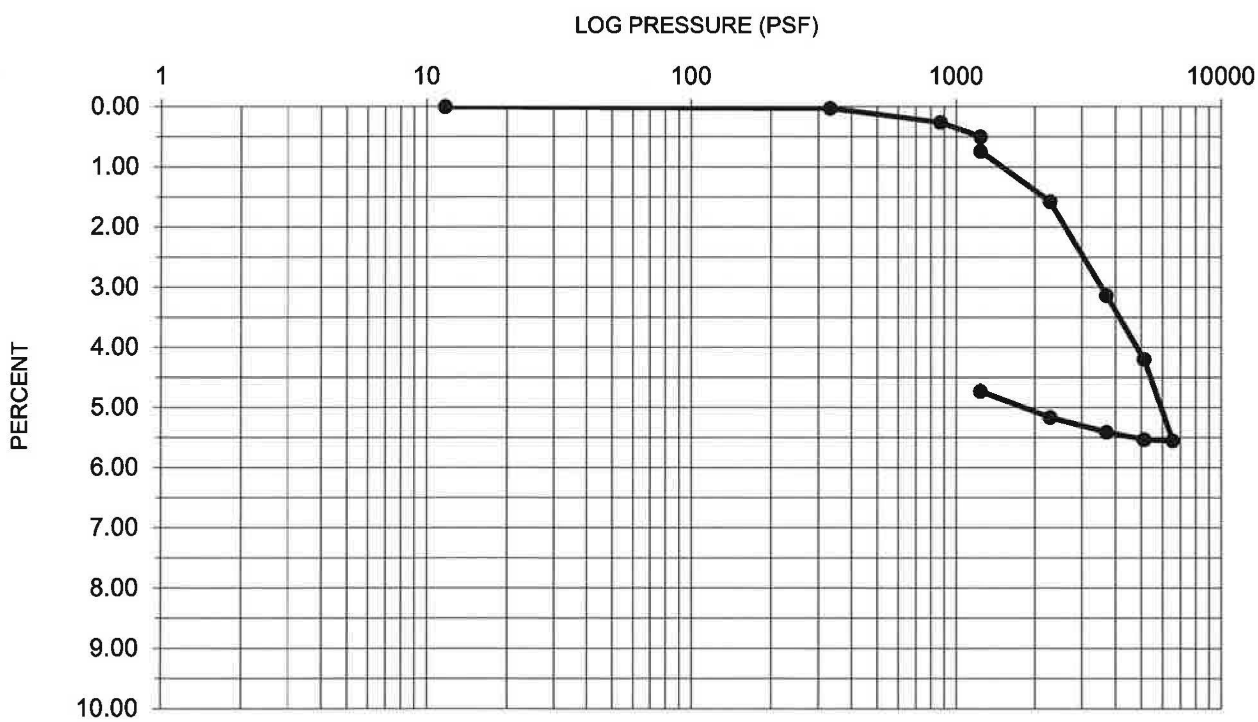
BG: **23334** ENGINEER: **RSB**

CLIENT: **DLS Builders**

Earth Material:	Alluvium
Sample Location:	B1-5'
Dry Weight (pcf):	101.8
Initial Moisture:	22.1%
Initial Saturation:	93.8%
Water Added at (psf)	1237

Specific Gravity:	2.65
Initial Void Ratio:	0.62
Compression Index (Cc):	0.206
Recompression Index (Cr):	0.026

CONSOLIDATION DIAGRAM (ASTM D 2435-11)



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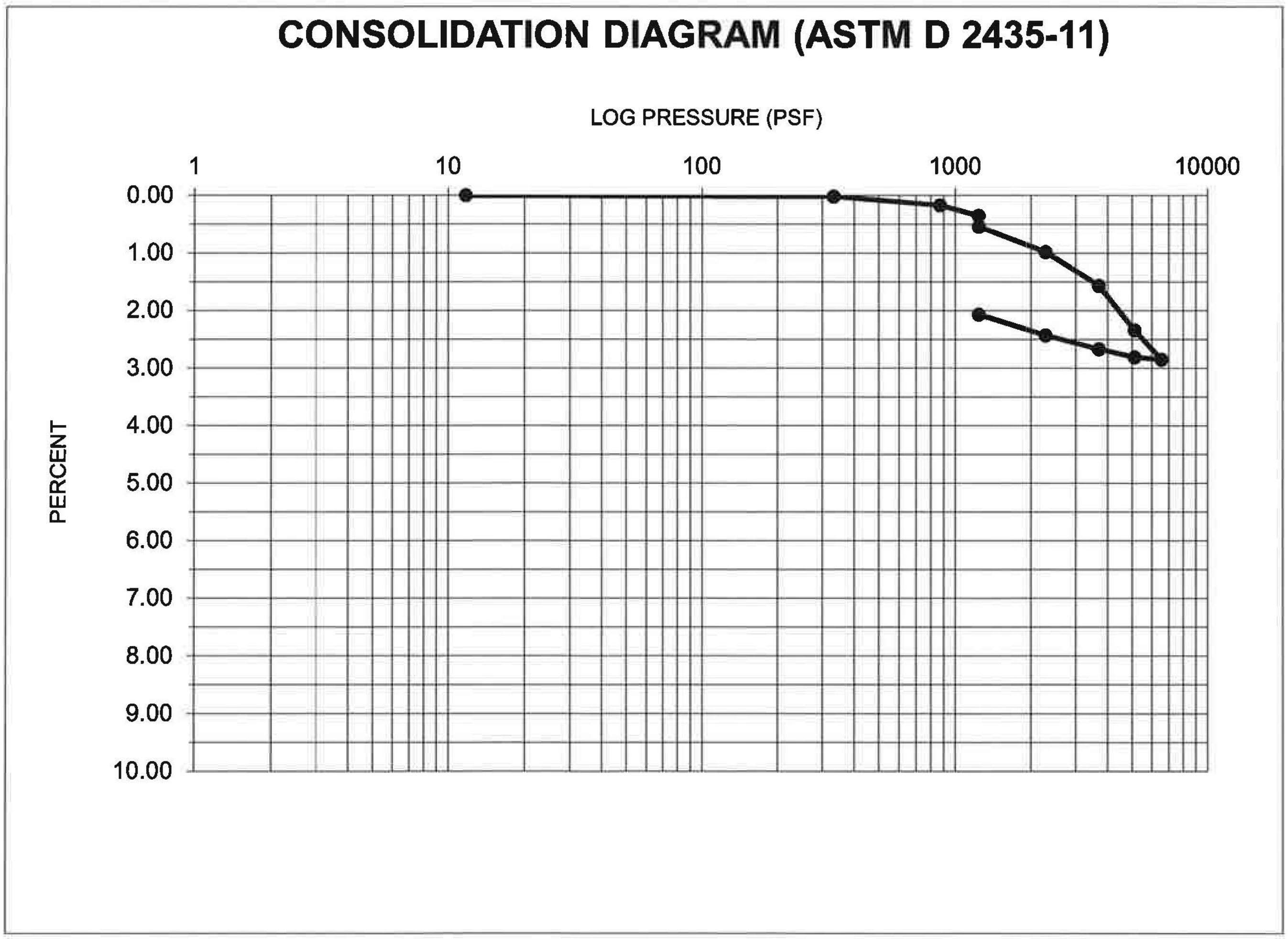
CONSOLIDATION CURVE #2

BG: **23334** ENGINEER: **RSB**

CLIENT: **DLS Builders**

Earth Material:	Alluvium
Sample Location:	B3-10'
Dry Weight (pcf):	112.3
Initial Moisture:	17.8%
Initial Saturation:	99.8%
Water Added at (psf)	1237

Specific Gravity:	2.65
Initial Void Ratio:	0.47
Compression Index (Cc):	0.080
Recompression Index (Cr):	0.020



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CONSOLIDATION CURVE #3

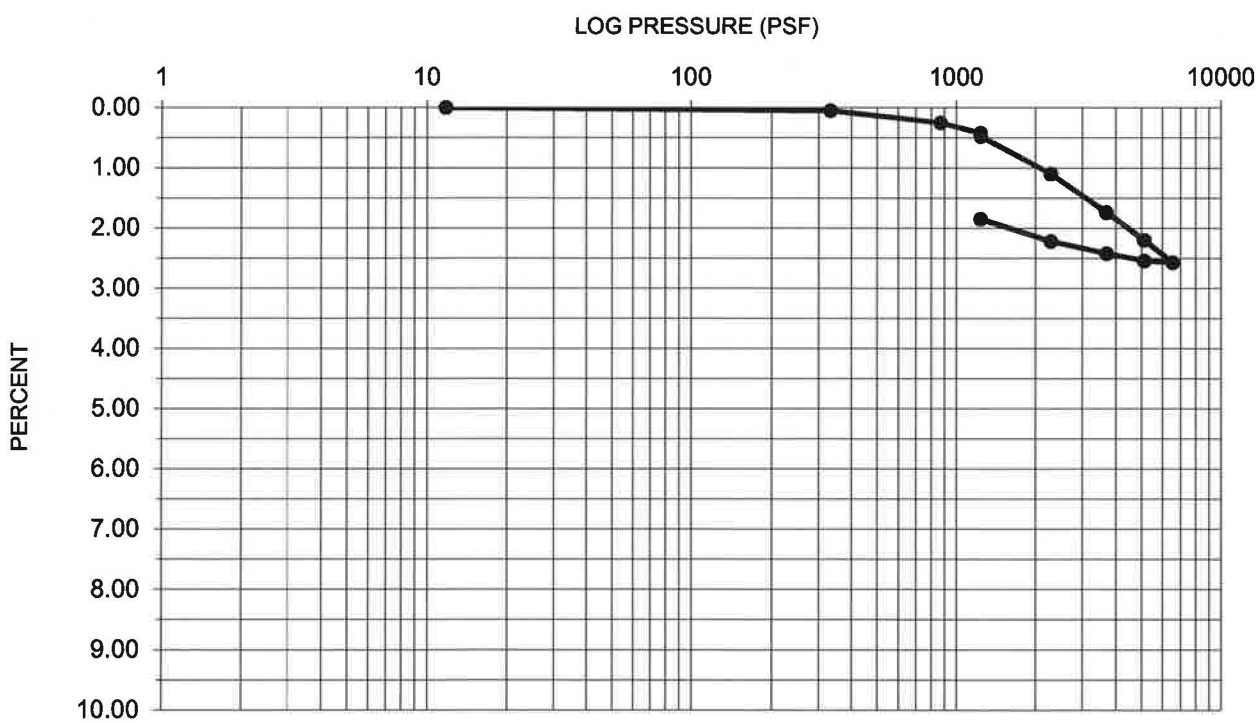
BG: 23334 ENGINEER: RSB

CLIENT: DLS Builders

Earth Material:	Older Alluvium
Sample Location:	B1-15'
Dry Weight (pcf):	122.9
Initial Moisture:	12.1%
Initial Saturation:	92.9%
Water Added at (psf)	1237

Specific Gravity:	2.65
Initial Void Ratio:	0.35
Compression Index (Cc):	0.047
Recompression Index (Cr):	0.019

CONSOLIDATION DIAGRAM (ASTM D 2435-11)



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CONSOLIDATION CURVE #4

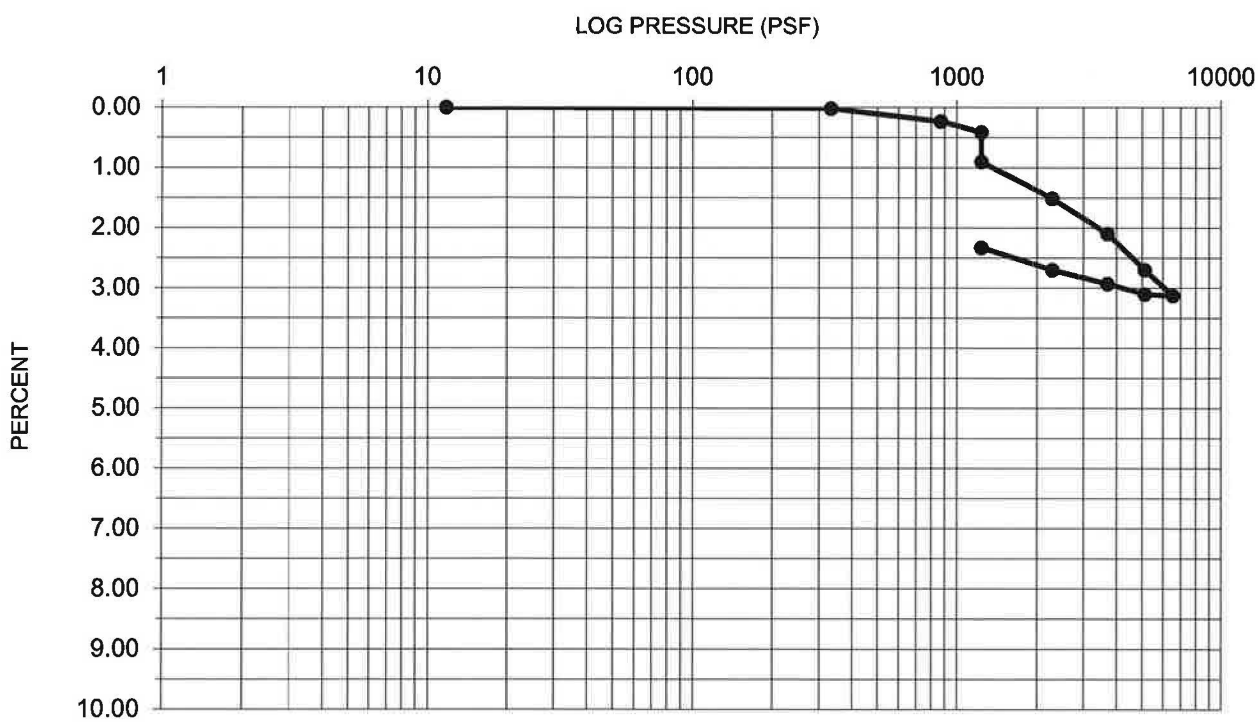
BG: **23334** ENGINEER: **RSB**

CLIENT: **DLS Builders**

Earth Material:	Older Alluvium
Sample Location:	B1-20'
Dry Weight (pcf):	116.2
Initial Moisture:	5.4%
Initial Saturation:	33.8%
Water Added at (psf)	1237

Specific Gravity:	2.65
Initial Void Ratio:	0.42
Compression Index (Cc):	0.060
Recompression Index (Cr):	0.020

CONSOLIDATION DIAGRAM (ASTM D 2435-11)



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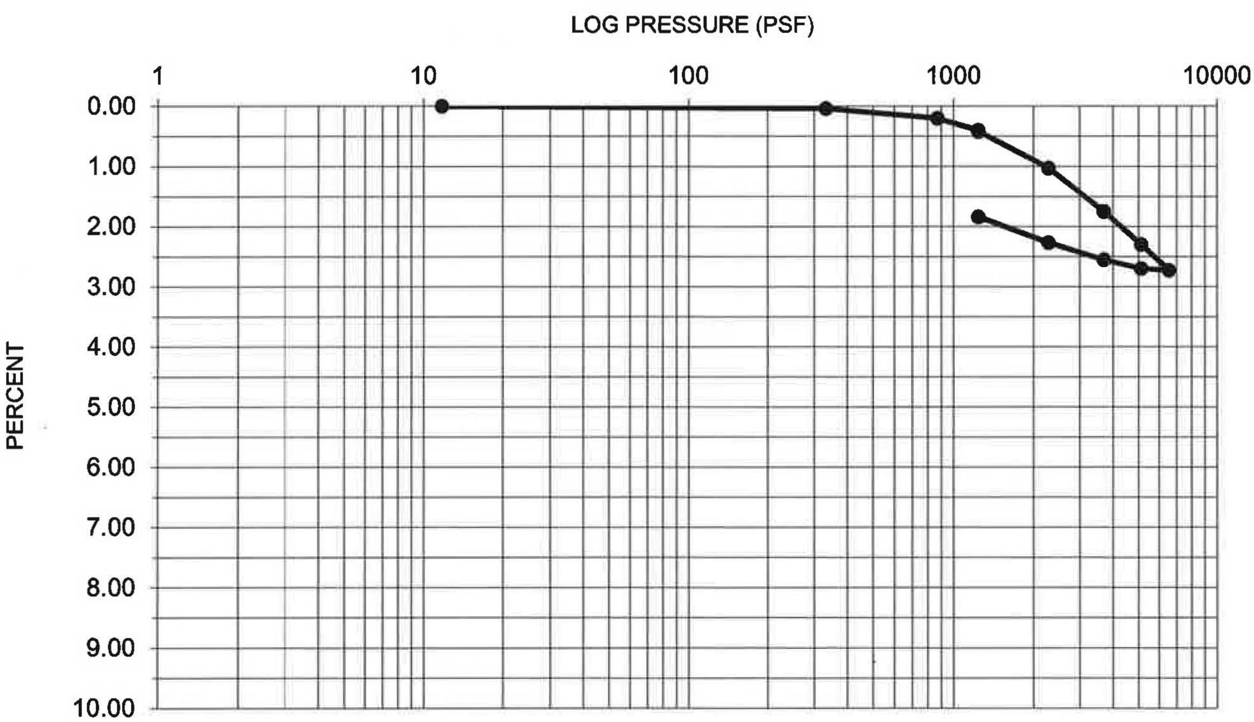
CONSOLIDATION CURVE #5

BG: **23334** ENGINEER: **RSB**

CLIENT: **DLS Builders**

Earth Material:	Older Alluvium		
Sample Location:	B3-25'	Specific Gravity:	2.65
Dry Weight (pcf):	108.6	Initial Void Ratio:	0.52
Initial Moisture:	2.8%	Compression Index (Cc):	0.061
Initial Saturation:	14.2%	Recompression Index (Cr):	0.025
Water Added at (psf)	1237		

CONSOLIDATION DIAGRAM (ASTM D 2435-11)



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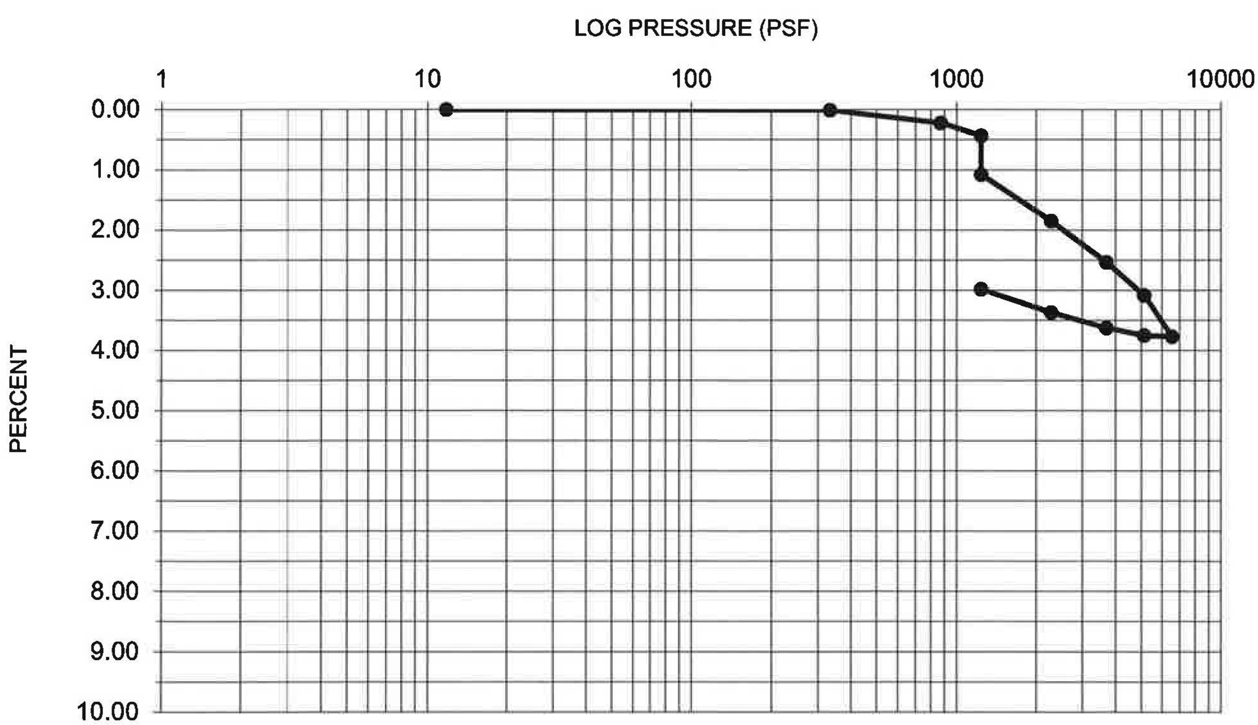
CONSOLIDATION CURVE #6

BG: 23334 ENGINEER: RSB

CLIENT: DLS Builders

Earth Material:	Older Alluvium		
Sample Location:	B3-30'	Specific Gravity:	2.65
Dry Weight (pcf):	102.2	Initial Void Ratio:	0.62
Initial Moisture:	2.7%	Compression Index (Cc):	0.105
Initial Saturation:	11.6%	Recompression Index (Cr):	0.024
Water Added at (psf)	1237		

CONSOLIDATION DIAGRAM (ASTM D 2435-11)



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CONSOLIDATION CURVE #7

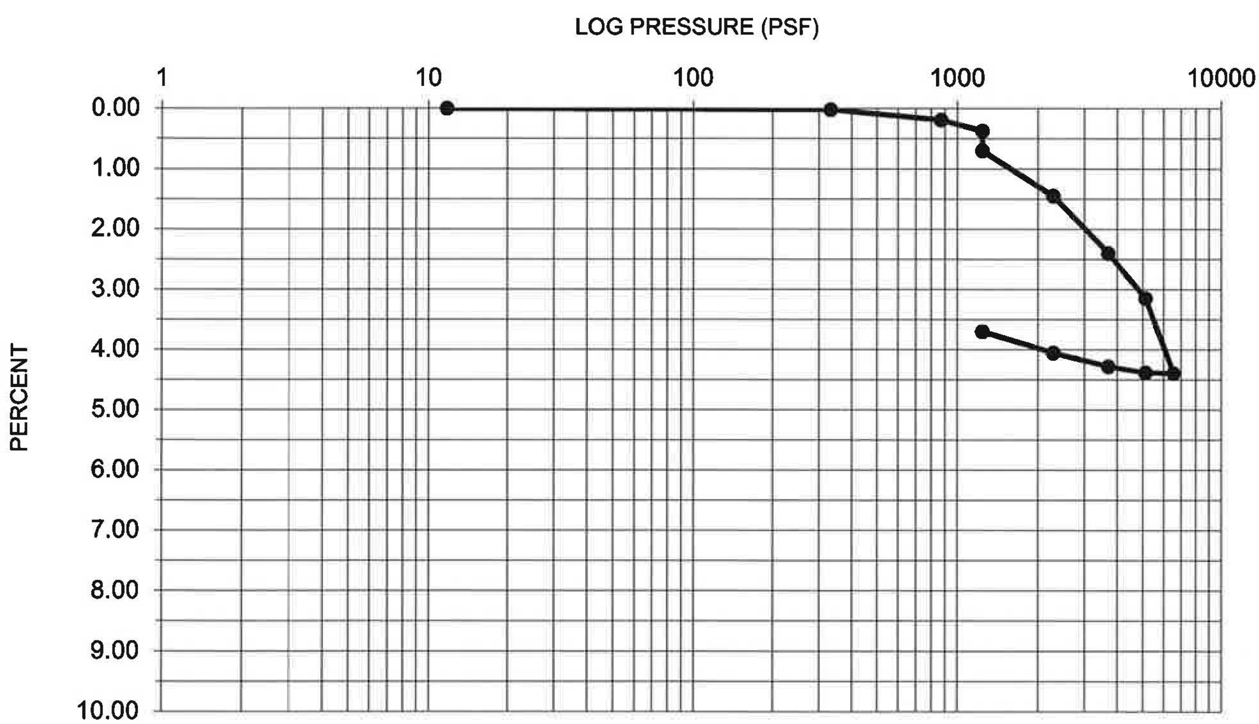
BG: **23334** ENGINEER: **RSB**

CLIENT: **DLS Builders**

Earth Material:	Future Compacted Fill
Sample Location:	B4 (0-5')
Dry Weight (pcf):	107.1
Initial Moisture:	14.0%
Initial Saturation:	63.9%
Water Added at (psf)	1237

Specific Gravity:	2.75
Initial Void Ratio:	0.60
Compression Index (Cc):	0.186
Recompression Index (Cr):	0.021

CONSOLIDATION DIAGRAM (ASTM D 2435-11)



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LOG OF BORING B1

BG No. 23334

CLIENT DLS Builders **REPORT DATE** 2/25/21 **DRILL DATE** 2/3/21

PROJECT LOCATION 6018 Norwalk Blvd., Whittier, CA **LOGGED BY** RSB

CONTRACTOR 2R Drilling **DRILLING METHOD** Hollow-Stem Auger **HOLE SIZE** 8-inch diameter

DRIVE WEIGHT 140-Pound Automatic Hammer **HAMMER DROP** 30 Inches **ELEV. TOP OF HOLE** 177 ft

ELEVATION (ft)	DEPTH (ft)	EARTH MATERIAL DESCRIPTION	GRAPHIC SYMBOL	USCS UNIT	SAMPLE TYPE & NUMBER	BLOW COUNT (Per 6 Inches)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SATURATION (%)	TYPE OF TEST
	0	Surface: 4 inches asphalt, no base.								
175		(CL) **ALLUVIUM (Qa):** 0.35' - 2.5': Sandy CLAY, brown, moist to very moist, fine sand.		CL						
		(CL) 2.5': Sandy CLAY, brown, moist to very moist, medium stiff, fine sand.		CL	S1	1 3 3	23.4			
	5	(CL) 5': Sandy CLAY, dark brown, moist to very moist, medium stiff to stiff, fine sand.		CL	R1	4 6 7	22.1	101.8	93.8	Consolidation
170		(CL) 7.5': CLAY, yellowish-brown, moist, very stiff, some fine sand, moderately tough.		CL	S2	6 10 12	17.5			
	10	(CL) 10': CLAY, yellowish-brown, moist, very stiff to hard, some fine to medium sand, moderately tough, trace caliche stringer.		CL	R2	7 20 26	18.9	110.2	100	Direct Shear
165										
	15	(SC) **OLDER ALLUVIUM (Qae):** 15': Clayey SAND, yellowish-brown, moist, medium dense, fine to medium sand.		SC	R3	7 14 15	12.1	122.9	92.9	Consolidation
160										
	20	(SP) 20': SAND, light yellowish-brown, moist, dense to very dense, fine to medium sand, trace coarse sand.		SP	R4	13 30 44	5.4	116.1	33.8	Consolidation

End at 21.5 Feet; No Groundwater; No Fill.

Standard Penetration Test

Ring Sample

BYER GEOTECHNICAL, INC.

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LOG OF BORING B2

BG No. 23334

CLIENT DLS Builders REPORT DATE 2/25/21 DRILL DATE 2/3/21

PROJECT LOCATION 6018 Norwalk Blvd., Whittier, CA LOGGED BY RSB

CONTRACTOR 2R Drilling DRILLING METHOD Hollow-Stem Auger HOLE SIZE 8-inch diameter

DRIVE WEIGHT 140-Pound Automatic Hammer HAMMER DROP 30 Inches ELEV. TOP OF HOLE 177 ft

ELEVATION (ft)	DEPTH (ft)	EARTH MATERIAL DESCRIPTION	GRAPHIC SYMBOL	USCS UNIT	SAMPLE TYPE & NUMBER	BLOW COUNT (Per 6 Inches)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SATURATION (%)	TYPE OF TEST
	0	Surface: 6 inches asphalt over 5 inches base.								
175		(CL) **ALLUVIUM (Qa):** 0.9' - 2.5': Sandy CLAY, brown, moist, fine sand.		CL						
		(CL) 2.5': CLAY, brown, moist, stiff, some fine sand, trace caliche stringers.		CL	S1	3 4 5	19.2			
	5	(CL) 5': CLAY, brown, moist, stiff, some fine sand, trace caliche stringers.		CL	S2	3 3 5	20			
170		(CL) 7.5': CLAY, yellowish-brown, moist, stiff, some fine sand, moderately tough, trace caliche stringers.		CL	S3	3 3 7	18.1			
	10	(CL) 10': CLAY, yellowish-brown, moist, stiff, some fine sand, moderately tough, trace caliche stringers.		CL	S4	5 7 7	15.9			
165		(CL) 12.5': CLAY, yellowish-brown, moist, very stiff, some fine sand, moderately tough.		CL	S5	8 9 13	17.4			
	15	(SC) **OLDER ALLUVIUM (Qae):** 15': Clayey SAND, yellowish-brown, moist, medium dense, fine sand, some medium sand.		SC	S6	5 7 11	13.4			
160		(SC) 17.5': Clayey SAND, yellowish-brown, moist, medium dense, fine to medium sand.		SC	S7	5 6 11	8.5			
	20	(SP) 20': SAND, light yellowish-brown, slightly moist, dense, fine to medium sand, trace coarse sand, trace fine gravel to 3/4" subangular to subrounded.		SP	S8	10 17 23	5.2			
155		(SM) 22.5': Silty SAND, light olive-brown, slightly moist to moist, medium dense, fine to medium sand, 30.2% fines.		SM	S9	10 9 14	8			Sieve Wash (-#200)
	25									

Standard Penetration Test

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LOG OF BORING B2

BG No. 23334

CLIENT DLS Builders REPORT DATE 2/25/21 DRILL DATE 2/3/21
PROJECT LOCATION 6018 Norwalk Blvd., Whittier, CA LOGGED BY RSB
CONTRACTOR 2R Drilling DRILLING METHOD Hollow-Stem Auger HOLE SIZE 8-inch diameter
DRIVE WEIGHT 140-Pound Automatic Hammer HAMMER DROP 30 Inches ELEV. TOP OF HOLE 177 ft

ELEVATION (ft)	DEPTH (ft)	EARTH MATERIAL DESCRIPTION	GRAPHIC SYMBOL	USCS UNIT	SAMPLE TYPE & NUMBER	BLOW COUNT (Per 6 Inches)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SATURATION (%)	TYPE OF TEST
	25	(ML) 25': Sandy SILT, light olive-brown, moist, stiff to very stiff, fine sand, 69.4% fines.		ML	S10	4 5 11	19.8			Sieve Wash (-#200)
150										
		(SP) 27.5': SAND, light olive-brown, slightly moist, dense, fine to medium sand, trace coarse sand, trace fine to coarse gravel to 1" subangular to subrounded, trace fines.		SP	S11	11 13 25	7.2			
	30	(SP) 30': SAND, light olive-brown, slightly moist, very dense, fine to medium sand.		SP	S12	10 24 28	5			
145										
	35	(SP) 35': SAND, light olive-brown, slightly moist, dense, fine sand, some medium sand, some silt pockets.		SP	S13	9 13 26	16.3			
140										
	40	(ML) 40': Sandy SILT, light olive-brown, slightly moist to moist, hard, fine sand, trace medium sand, 63% fines.		ML	S14	8 10 25	20.3			Sieve Wash (-#200)
135										
	45	(SP) 45': Gravelly SAND, light olive-brown, slightly moist, dense, fine sand, some medium sand, fine to coarse gravel to 1.5" subangular to subrounded, some silt pockets.		SP	S15	9 11 27	16.3			
130										
	50									

Standard Penetration Test

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LOG OF BORING B2

BG No. 23334

CLIENT DLS Builders **REPORT DATE** 2/25/21 **DRILL DATE** 2/3/21

PROJECT LOCATION 6018 Norwalk Blvd., Whittier, CA **LOGGED BY** RSB

CONTRACTOR 2R Drilling **DRILLING METHOD** Hollow-Stem Auger **HOLE SIZE** 8-inch diameter

DRIVE WEIGHT 140-Pound Automatic Hammer **HAMMER DROP** 30 Inches **ELEV. TOP OF HOLE** 177 ft

ELEVATION (ft)	DEPTH (ft)	EARTH MATERIAL DESCRIPTION	GRAPHIC SYMBOL	USCS UNIT	SAMPLE TYPE & NUMBER	BLOW COUNT (Per 6 Inches)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SATURATION (%)	TYPE OF TEST
	50	(SP) 50': Gravelly SAND, light olive-brown, slightly moist, very dense, fine to medium sand, trace coarse sand, fine to coarse gravel to 1.5" subangular to subrounded.		SP	S16	31 50/3"	2.3			

End at 50.8 Feet; No Groundwater; No Fill.

BORING LOG BYER BY RSB - GINT STD US BYER.GDT - 2/25/21 10:59 - P:\23000 - 23999\23334 DLS BUILDERS_WHITTIER\23334 BORING LOGS.GPJ

Standard Penetration Test

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LOG OF BORING B3

BG No. 23334

CLIENT DLS Builders REPORT DATE 2/25/21 DRILL DATE 2/3/21

PROJECT LOCATION 6018 Norwalk Blvd., Whittier, CA LOGGED BY RSB

CONTRACTOR 2R Drilling DRILLING METHOD Hollow-Stem Auger HOLE SIZE 8-inch diameter

DRIVE WEIGHT 140-Pound Automatic Hammer HAMMER DROP 30 Inches ELEV. TOP OF HOLE 178 ft

ELEVATION (ft)	DEPTH (ft)	EARTH MATERIAL DESCRIPTION	GRAPHIC SYMBOL	USCS UNIT	SAMPLE TYPE & NUMBER	BLOW COUNT (Per 6 Inches)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SATURATION (%)	TYPE OF TEST
	0	Surface: 5 inches asphalt over 6" base.								
		(CL) **ALLUVIUM (Qa):** 0.9' - 2.5': Sandy CLAY, brown, moist, fine sand.		CL						
175		(CL) 2.5': Sandy CLAY, brown, moist, medium stiff, fine sand, 70.3% fines.		CL	R1	4 4 6	17.5	103.9	78.5	Sieve Wash (-#200)
	5	(CL) 5': CLAY, brown, moist, very stiff, some fine sand, moderately tough, 87.6% fines.		CL	R2	6 13 16	18.6	103.4	82.2	Sieve Wash (-#200)
170										
	10	(CL) 10': CLAY, brown, moist, very stiff, some fine sand, moderately tough, 84.5% fines.		CL	R3	8 18 28	17.8	112.3	99.8	Consolidation, Sieve Wash (-#200)
165										
	15	(SC) **OLDER ALLUVIUM (Qae):** 15': Clayey SAND, yellowish-brown, moist, medium dense, fine sand, some medium sand, 47.7% fines.		SC	R4	10 19 22	12.7	117.8	83.4	Sieve Wash (-#200)
160										
	20	(SP) 20': SAND, light yellowish-brown, slightly moist, dense, fine to medium sand, trace coarse sand, trace fine gravel to 1/2" subangular.		SP	R5	20 31 42	4.8	106.9	23.3	
155										
	25									

■ Ring Sample

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LOG OF BORING B3

BG No. 23334

CLIENT DLS Builders **REPORT DATE** 2/25/21 **DRILL DATE** 2/3/21

PROJECT LOCATION 6018 Norwalk Blvd., Whittier, CA **LOGGED BY** RSB

CONTRACTOR 2R Drilling **DRILLING METHOD** Hollow-Stem Auger **HOLE SIZE** 8-inch diameter

DRIVE WEIGHT 140-Pound Automatic Hammer **HAMMER DROP** 30 Inches **ELEV. TOP OF HOLE** 178 ft

ELEVATION (ft)	DEPTH (ft)	EARTH MATERIAL DESCRIPTION	GRAPHIC SYMBOL	USCS UNIT	SAMPLE TYPE & NUMBER	BLOW COUNT (Per 6 Inches)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SATURATION (%)	TYPE OF TEST
	25	(SP) 25': SAND, light olive-brown, slightly moist, very dense, fine to medium sand, some coarse sand.		SP	R6	26 50/3"	2.8	108.7	14.2	Consolidation
150										
	30	(SP) 30': SAND, light olive-brown, slightly moist, very dense, fine sand, some medium to coarse sand, trace fine gravel to 1/2" subangular.		SP	R7	35 50	2.7	102.2	11.6	Consolidation

End at 31 Feet; No Groundwater; No Fill.

Ring Sample

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LOG OF BORING B4

BG No. 23334

CLIENT DLS Builders REPORT DATE 2/25/21 DRILL DATE 2/3/21
PROJECT LOCATION 6018 Norwalk Blvd., Whittier, CA LOGGED BY RSB
CONTRACTOR 2R Drilling DRILLING METHOD Hollow-Stem Auger HOLE SIZE 8-inch diameter
DRIVE WEIGHT 140-Pound Automatic Hammer HAMMER DROP 30 Inches ELEV. TOP OF HOLE 178 ft

ELEVATION (ft)	DEPTH (ft)	EARTH MATERIAL DESCRIPTION	GRAPHIC SYMBOL	USCS UNIT	SAMPLE TYPE & NUMBER	BLOW COUNT (Per 6 Inches)	MOISTURE CONTENT (%)	DRY UNIT WT. (pcf)	SATURATION (%)	TYPE OF TEST
	0	Surface: 7 inches asphalt over 7" base.								
		(CL) **ALLUVIUM (Qa):** 0.9' - 2.5': Sandy CLAY, brown, moist to very moist, fine sand.		CL						Max, EI, Remolded Shear, Remolded Consolidation, Corrosion Suite
175		(CL) 2.5': CLAY, brown, moist, medium stiff, some fine sand.		CL	Bag1 R1	5 6 6	14.1	103.8	63	
	5	(CL) 5': CLAY, brown, moist, stiff, some fine sand.		CL	R2	4 6 9	19	101.3	79.6	
170										
	10	(CL) 10': CLAY, yellowish-brown, moist, hard, trace fine sand, tough, trace caliche stringers.		CL	R3	14 29 46	15.5	117.2	100	
165										
	15	(SC) **OLDER ALLUVIUM (Qae):** 15': Clayey SAND, yellowish-brown, moist, dense, fine to medium sand.		SC	R4	13 22 28	11.9	117.1	76.5	
160										
	20	(SP) 20': SAND, light yellowish-brown, slightly moist, dense to very dense, fine to medium sand, trace coarse sand, trace fine to coarse gravel to 1" subangular to subrounded.		SP	R5	15 34 43	3.7	117.6	24.1	

End at 21.5 Feet; No Groundwater; No Fill.

Bulk Sample Ring Sample

APPENDIX II

Calculations and Figures

SEISMIC SOURCES
EZ-FRISK V8.06

DETERMINISTIC CALCULATION
OF PEAK GROUND ACCELERATION BASED ON DIGITIZED FAULT DATA

BG: 23334 ANALYSIS DATE: 2/22/2021
CLIENT: DLS Builders ENGINEER: RSB
PROJECT DESCRIPTION: Proposed 2-Styory, At-Grade Mixed-Use Building

SITE COORDINATES: LATITUDE: 33.9892
LONGITUDE: -118.0641

SEARCH RADIUS: 100 km

ATTENUATION RELATIONS: Abrahamson-et al (2014) NGA West 2 USGS 2014
Boore-et al (2014) NGA West 2 USGS 2014
Campbell-Bozorgnia (2014) NGA West 2 USGS 2014
Chiou-Youngs (2014) NGA West 2 USGS 2014

SEISMIC SOURCE SUMMARY
DETERMINISTIC SITE PARAMETERS

FAULT NAME	APPROXIMATE DISTANCE		MAXIMUM EATHQUAKE MAGNITUDE	PEAK GROUND ACCELERATION
	(km)	(mi)	(Mw)	(g)
Elsinore	1.6	1.0	7.9	0.846
Puente Hills (Santa Fe Springs)	6.1	3.8	6.7	0.874
Puente Hills (LA)	6.5	4.0	7.0	0.684
Puente Hills	6.9	4.3	7.1	0.881
Puente Hills (Coyote Hills)	8.3	5.2	6.9	0.736
Elysian Park (Upper)	9.9	6.1	6.7	0.519
Raymond	15.6	9.7	6.8	0.383
Verdugo	17.8	11.1	6.9	0.361
San Jose	17.9	11.1	6.7	0.340
Sierra Madre	20.5	12.7	7.2	0.366
Sierra Madre Connected	20.5	12.7	7.3	0.380
Newport-Inglewood	20.8	13.0	7.5	0.393
Hollywood	21.1	13.1	6.7	0.295
Clamshell-Sawpit	21.8	13.6	6.7	0.287
Santa Monica	24.3	15.1	7.4	0.359
Chino	24.3	15.1	6.8	0.271
Palos Verdes	32.1	20.0	7.3	0.273

FAULT NAME	APPROXIMATE DISTANCE		MAXIMUM EATHQUAKE MAGNITUDE	PEAK GROUND ACCELERATION
	(km)	(mi)	(Mw)	(g)
Palos Verdes Connected	32.1	20.0	7.7	0.324
Cucamonga	34.4	21.4	6.7	0.196
San Joaquin Hills	34.9	21.7	7.1	0.247
Imp Extensional Gridded, Char, Normal	24.5	15.2	7.0	0.276
Imp Extensional Gridded, Char, Strike Slip	24.5	15.2	7.0	0.324
Imp Extensional Gridded, GR, Normal	24.6	15.3	7.0	0.275
Imp Extensional Gridded, GR, Strike Slip	24.6	15.3	7.0	0.323
Sierra Madre (San Fernando)	38.5	24.0	6.7	0.176
San Gabriel	41.6	25.9	7.3	0.225
Malibu Coast	42.7	26.5	7.0	0.189
Northridge	45.0	28.0	6.9	0.213
Anacapa-Dume	45.1	28.0	7.2	0.208
Southern San Andreas	53.9	33.5	8.2	0.294
Santa Susana, alt 1	54.4	33.8	6.9	0.144
San Jacinto	57.1	35.5	7.9	0.239
Holser, alt 1	63.6	39.5	6.8	0.119
Cleghorn	65.8	40.9	6.8	0.110
Simi-Santa Rosa	67.9	42.2	6.9	0.115
Oak Ridge Connected	72.2	44.9	7.4	0.156
Oak Ridge (Onshore)	74.0	46.0	7.2	0.136
Coronado Bank	80.1	49.8	7.4	0.133
San Cayetano	81.2	50.4	7.2	0.118
North Frontal (West)	81.7	50.8	7.2	0.117
San Gorgornio Shear Gridded	54.1	33.7	7.6	0.236
Santa Ynez (East)	98.4	61.2	7.2	0.091
Santa Ynez Connected	98.8	61.4	7.4	0.105

43 Faults found within a 100 km Search Radius.

Closest Fault to the Site: Elsinore Distance = 1.62 km (1.01mi)

Largest Peak Ground Acceleration: 0.881 g

The San Andreas Fault is Located Aproximately 53.9 km (33.5 mi) from the Site.

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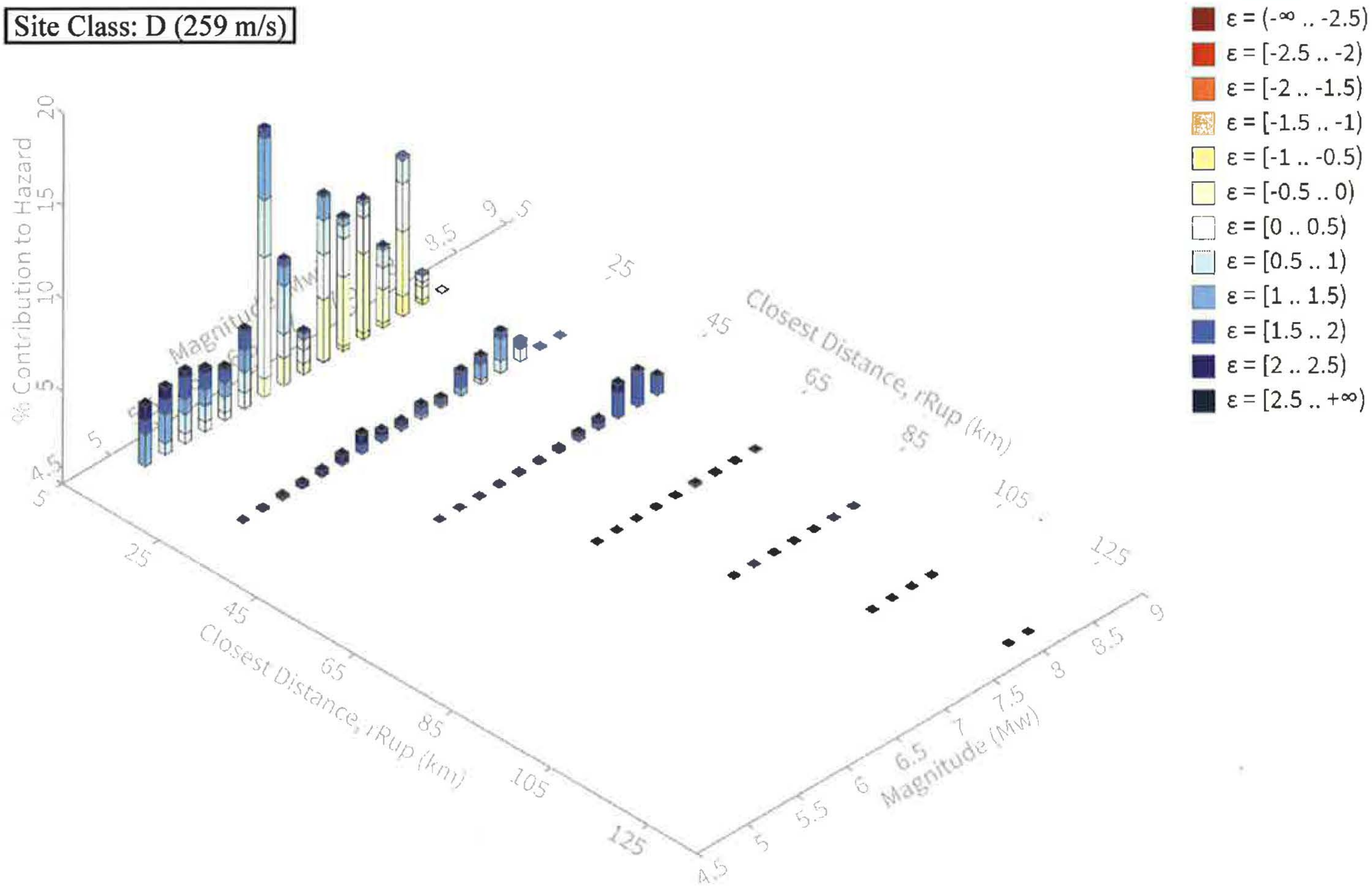
SEISMIC HAZARD DEAGGREGATION CHART #1
(Probability of Exceedance: 10% in 50 years)

BG: 23334 CLIENT: DLS BUILDERS

ENGINEER: RSB

REFERENCE: USGS, 2020, Earthquake Hazards Program, Beta - Unified Hazard Tool, Seismic Hazard Deaggregation, Conterminous U.S. 2014 (update) (v4.2.0) Edition, https://earthquake.usgs.gov/hazards/interactive/index.php.

Site Class: D (259 m/s)



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 475 yrs
Exceedance rate: 0.0021052632 yr^{-1}
PGA ground motion: 0.47444833 g

Recovered targets

Return period: 504.5778 yrs
Exceedance rate: 0.0019818549 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.18 %

Mode (largest m-r bin)

m: 6.28
r: 5.92 km
εo: 0.54 σ
Contribution: 14.42 %

Mode (largest m-r-εo bin)

m: 6.26
r: 2.61 km
εo: 0.16 σ
Contribution: 6.56 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

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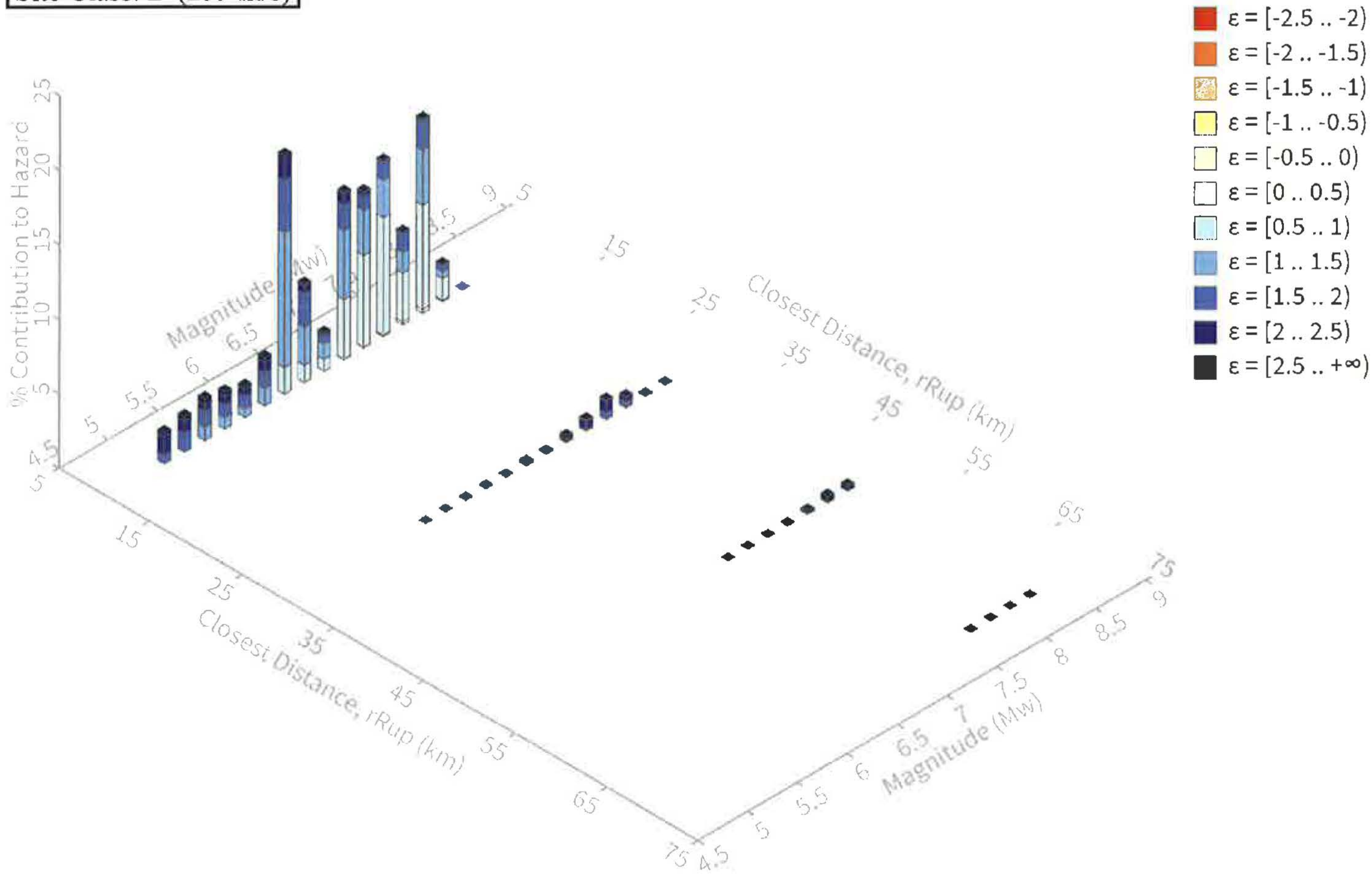
SEISMIC HAZARD DEAGGREGATION CHART #2
(Probability of Exceedance: 2% in 50 years)

BG: 23334 CLIENT: DLS BUILDERS

ENGINEER: RSB

REFERENCE: USGS, 2020, Earthquake Hazards Program, Beta - Unified Hazard Tool, Seismic Hazard Deaggregation, Conterminous U.S. 2014 (update) (v4.2.0) Edition, https://earthquake.usgs.gov/hazards/interactive/index.php.

Site Class: D (259 m/s)



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
PGA ground motion: 0.83360742 g

Recovered targets

Return period: 2881.6396 yrs
Exceedance rate: 0.00034702465 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.04 %

Mode (largest m-r bin)

m: 6.27
r: 4.56 km
ε_0: 1.39 σ
Contribution: 16.03 %

Mode (largest m-r-ε_0 bin)

m: 6.25
r: 2.56 km
ε_0: 1.15 σ
Contribution: 9.06 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Site-Specific Ground Motion Analysis (Based on ASCE 7-16 Standard)

BG: 23334 Client: DLS Builders Analysis Date: 2/22/21
Project Description: Proposed 2-Story, At-Grade Mixed-Use Building Engineer: RSB

								80% of Sections. 11.4.3 & 11.4.4 of ASCE 7-16	**RESULTS** Design Values ASCE 7-16 (§ 21.4)
Ss (0.2s) =	1.872	Latitude:	33.9892			Periods (seconds):			
S1 (1s) =	0.668	Longitude:	-118.0641			T_o =	0.149		
Fa =	1.20	Site Class:	D			T_s =	0.743		
Fv =	2.50					T_L =	8		
SMs =	2.246		Fig. 22-18A	S_{MS}=	1.817	>		1.797	1.817
SM1 =	1.670	C_{RS}:	0.897	S_{M1}=	1.337	>		1.336	1.337
SDs =	1.498		Fig. 22-19A	S_{DS}=	1.211	>		1.198	1.211
SD1 =	1.113	C_{R1}:	0.898	S_{D1}=	0.891	=		0.891	0.891

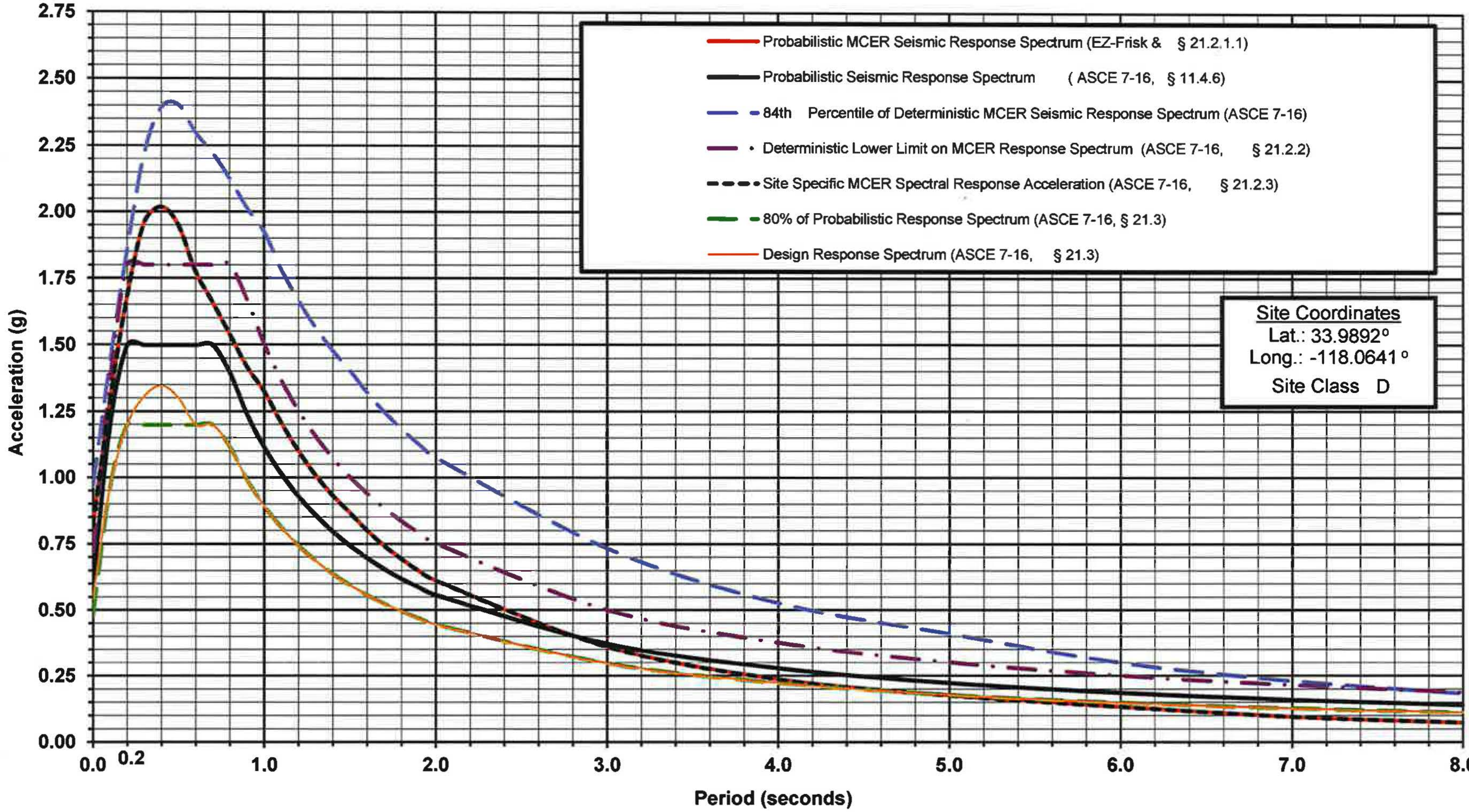
Fundamental Period	Risk Coefficient C_R (Method 1, § 21.2.1.1, ASCE 7-16)	Scaling Factor (ASCE 7-16, §21.2)	Probabilistic MCE_R Seismic Response Spectrum (EZ-Frisk & § 21.2.1.1)	Probabilistic Seismic Response Spectrum (ASCE 7-16, § 11.4.6)	84th Percentile of Deterministic MCE_R Seismic Response Spectrum (ASCE 7-16)	Deterministic Lower Limit on MCE_R Response Spectrum (ASCE 7-16, § 21.2.2)	Site Specific MCE_R Spectral Response Acceleration (ASCE 7-16, § 21.2.3)	80% of Probabilistic Response Spectrum (ASCE 7-16, § 21.3)	Design Response Spectrum (ASCE 7-16, § 21.3)
T (sec)			Sa (g)	Sa (g)	Sa (g)	Sa (g)	Sa (g)	Sa (g)	Sa (g)
0.0	0.897	1.100	0.8198	0.5990	0.9686	0.7200	0.8198	0.4792	0.5465
0.1	0.897	1.100	1.2965	1.2021	1.4377	1.3680	1.2965	0.9617	0.9617
0.2	0.897	1.100	1.6843	1.4976	1.8579	1.8000	1.6843	1.1981	1.1981
0.3	0.897	1.125	1.9590	1.4976	2.2196	1.8000	1.9590	1.1981	1.3060
0.4	0.897	1.150	2.0183	1.4976	2.3932	1.8000	2.0183	1.1981	1.3455
0.5	0.897	1.175	1.9486	1.4976	2.4029	1.8000	1.9486	1.1981	1.2991
0.6	0.898	1.200	1.7738	1.4976	2.2980	1.8000	1.7738	1.1981	1.1981
0.7	0.898	1.225	1.6571	1.4976	2.2209	1.8000	1.6571	1.1981	1.1981
0.8	0.898	1.250	1.5363	1.3917	2.1250	1.8000	1.5363	1.1134	1.1134
0.9	0.898	1.275	1.4150	1.2370	2.0145	1.6667	1.4150	0.9896	0.9896
1.0	0.898	1.300	1.3227	1.1133	1.9240	1.5000	1.3227	0.8906	0.8906
1.1	0.898	1.305	1.2047	1.0121	1.7813	1.3636	1.2047	0.8097	0.8097
1.2	0.898	1.310	1.0986	0.9278	1.6637	1.2500	1.0986	0.7422	0.7422
1.3	0.898	1.315	1.0069	0.8564	1.5622	1.1538	1.0069	0.6851	0.6851
1.4	0.898	1.320	0.9304	0.7952	1.4758	1.0714	0.9304	0.6362	0.6362
1.5	0.898	1.325	0.8648	0.7422	1.4005	1.0000	0.8648	0.5938	0.5938
1.6	0.898	1.330	0.7984	0.6958	1.3179	0.9375	0.7984	0.5566	0.5566
1.7	0.898	1.335	0.7416	0.6549	1.2458	0.8824	0.7416	0.5239	0.5239
1.8	0.898	1.340	0.6918	0.6185	1.1819	0.8333	0.6918	0.4948	0.4948
1.9	0.898	1.345	0.6482	0.5860	1.1250	0.7895	0.6482	0.4688	0.4688
2.0	0.898	1.350	0.6108	0.5567	1.0739	0.7500	0.6108	0.4454	0.4454
3.0	0.898	1.400	0.3599	0.3711	0.7322	0.5000	0.3599	0.2969	0.2969
4.0	0.898	1.450	0.2363	0.2783	0.5265	0.3750	0.2363	0.2226	0.2226
5.0	0.898	1.500	0.1756	0.2227	0.4095	0.3000	0.1756	0.1782	0.1782
6.0	0.898	1.500	0.1324	0.1856	0.2991	0.2500	0.1324	0.1485	0.1485
7.0	0.898	1.500	0.0949	0.1590	0.2303	0.2143	0.0949	0.1272	0.1272
8.0	0.898	1.500	0.0731	0.1392	0.1833	0.1875	0.0731	0.1114	0.1114

* The Probabilistic and Deterministic Seismic Response Spectra are Based on the Geometric Mean Horizontal Component of Spectral Response at 5-Percent Damping. These Spectra are Multiplied by the Scaling Factors Shown Above.

References: *- American Society of Civil Engineers (ASCE), 2016, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Standard ASCE/SEI 7-16, Chapter 21.*

- American Society of Civil Engineers (ASCE), 2018, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, Standard ASCE/SEI 7-16,Supplement 1, effective December 12, 2018.

SEISMIC RESPONSE SPECTRA



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SITE-SPECIFIC SEISMIC RESPONSE SPECTRA

Proposed 2-Story, At-Grade Mixed-Use Building

BG: 23334 Client: DLS Builders

Engineer: RSB Analysis Date: February 22, 2021

Liquefaction Susceptibility Analysis: SPT Method (2475-Yr Return) (Input Data)

Project No.: 23334 Client: DLS Builders

Project Description.: Proposed 2-Story, At-Grade Mixed-Use Building

Engineer: RSB Date: February 22, 2021

Boring No.	Top Elevation (ft)	Total Depth (ft)	Existing GW Depth (ft)	Design GW Depth (ft)	Recommended Fill Depth (ft)
B2	177	50	100	20	0

Peak Ground Acceleration:	0.891
Earthquake Magnitude:	6.3
Probability of Exceedance in 50 Years:	2%
Borehole Diamter (inches):	8
Delivered Energy Ratio, ERm (%):	75
Energy Ratio Correction Factor, $C_{E:}$	1.25
Borehole Diameter Correction Factor, $C_{B:}$	1.15
Rod Length Correction Factor, $C_{R:}$	1
Sampler Correction with or without Liners, $C_{S:}$	1.2
Minimum Factor of Safety, FS_{liq}:	1.3

References: - *Youd, T. L., et. al. (2001), Liquefaction Resistane of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils, ASCE, Journal of Geotechnical and Geoenvironmental Engineering, Vol. 127, No. 10, October 2001.*

- Tokimatsu and Seed (1987), Evaluation of Settlements in Sands due to Earthquake Shaking, American Society for Civil Engineers, Journal of Geotechnical Engineering, Vol. 113, No. 8, August, 1987.

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

- County of Los Angeles, Department of Public Works (2009), Liquefaction/Lateral Spreading, Administrative Manual, Publication No. GS 045-0, May 28, 2009.

Liquefaction Susceptibility Analysis: SPT Method
(2475-Yr Return)

Project No.: 23334 Client: DLS Builders Date: 2/22/21
Project Description.: Proposed 2-Story, At-Grade Mixed-Use Building Engineer: RSB

Energy Ratio Correction Factor, C_E = 1.25
Borehole Diameter Correction Factor, C_B = 1.15
Sampler Correction with or without Liners, C_S = 1.2 (No Liners)

Boring No.	SPT Depth (ft)	Elev. (ft)	Approximate Layer Depth (ft)	Approx. Layer Thick. (ft)	Soil Type (USCS)	Screening Analysis & Behavior (Based on Laboratory Testing, Existing Conditions, Soil Characteristics, and Project Configuration)	Fines Content FC (%)	Plasticity Index PI (%)	Liquid Limit LL (%)	Saturated Moisture Content w_c (%)	w_c / LL	Unit Weight Y_t (pcf)	SPT Blow Count Nm (blows/ft)	C_R	N_{60}	σ_{vc} (psf)	σ'_{vc} (psf) (Current) (GW)	σ'_v (psf) (Hist.) (GW)	C_N (Youd) (2001)	$(N_1)_{60}$	α	β	$(N_1)_{60cs}$ for Clean Sand	Stress Red. Coef. r_d	CSR	MSF	$CRR_{7.5}$	CRR Adjusted with MSF	Factor of Safety FS_{liq} (Liquefiable/ Non Liquefiable) (Min FS = 1.3)		Post-Liquefaction Reconsolidation Settlement Vol. Strain ε_v	Seismic Settle. (in)	Cum. Settle. (in)
B2	2.5	174.5	0 to 3.8	3.8	CL	Above Hist. GW						120	9	0.75	11.6	300.0	300.0	300.0	1.70	19.8	0.00	1.00	19.8	0.994	0.576	1.56	0.213	Non Liq	N/A	**Non Liq**	0.0000	0.00	0.00
B2	5	172.0	3.8 to 6.3	2.5	CL	Above Hist. GW						120	8	0.80	11.0	600.0	600.0	600.0	1.70	18.8	0.00	1.00	18.8	0.988	0.572	1.56	0.201	Non Liq	N/A	**Non Liq**	0.0000	0.00	0.00
B2	7.5	169.5	6.3 to 8.8	2.5	CL	Above Hist. GW						120	10	0.80	13.8	900.0	900.0	900.0	1.53	21.2	0.00	1.00	21.2	0.983	0.569	1.56	0.230	Non Liq	N/A	**Non Liq**	0.0000	0.00	0.00
B2	10	167.0	8.8 to 11.3	2.5	CL	Above Hist. GW						120	14	0.85	20.5	1200.0	1200.0	1200.0	1.33	27.3	0.00	1.00	27.3	0.977	0.566	1.56	0.346	Non Liq	N/A	**Non Liq**	0.0000	0.00	0.00
B2	12.5	164.5	11.3 to 13.8	2.5	CL	Above Hist. GW						120	22	0.85	32.3	1500.0	1500.0	1500.0	1.19	38.3	0.00	1.00	38.3	0.971	0.562	1.56	(N1)60cs >= 30	N/A	N/A	**Non Liq**	0.0000	0.00	0.00
B2	15	162.0	13.8 to 16.3	2.5	SC	Above Hist. GW						120	18	0.95	29.5	1800.0	1800.0	1800.0	1.08	32.0	0.00	1.00	32.0	0.965	0.559	1.56	(N1)60cs >= 30	N/A	N/A	**Non Liq**	0.0000	0.00	0.00
B2	17.5	159.5	16.3 to 18.8	2.5	SC	Above Hist. GW						120	17	0.95	27.9	2100.0	2100.0	2100.0	1.00	28.0	0.00	1.00	28.0	0.959	0.555	1.56	0.368	Non Liq	N/A	**Non Liq**	0.0000	0.00	0.00
B2	20	157.0	18.8 to 21.3	2.5	SP							120	40	0.95	65.6	2400.0	2400.0	2400.0	0.94	61.6	0.00	1.00	61.6	0.953	0.552	1.56	(N1)60cs >= 30	N/A	N/A	**Non Liq**	0.0000	0.00	0.00
B2	22.5	154.5	21.3 to 23.8	2.5	SM		30.2					120	23	0.95	37.7	2700.0	2700.0	2544.0	0.89	33.4	4.72	1.16	43.3	0.948	0.583	1.56	(N1)60cs >= 30	N/A	N/A	**Non Liq**	0.0000	0.00	0.00
B2	25	152.0	23.8 to 26.3	2.5	ML		69.4					120	16	0.95	26.2	3000.0	3000.0	2688.0	0.84	22.0	5.00	1.20	31.4	0.942	0.609	1.56	(N1)60cs >= 30	N/A	N/A	**Non Liq**	0.0000	0.00	0.00
B2	27.5	149.5	26.3 to 28.8	2.5	SP							120	38	0.95	62.3	3300.0	3300.0	2832.0	0.80	49.9	0.00	1.00	49.9	0.936	0.632	1.56	(N1)60cs >= 30	N/A	N/A	**Non Liq**	0.0000	0.00	0.00
B2	30	147.0	28.8 to 32.5	3.7	SP							120	52	1.00	89.7	3600.0	3600.0	2976.0	0.77	68.8	0.00	1.00	68.8	0.93	0.652	1.56	(N1)60cs >= 30	N/A	N/A	**Non Liq**	0.0000	0.00	0.00
B2	35	142.0	32.5 to 37.5	5.0	SP							120	39	1.00	67.3	4200.0	4200.0	3264.0	0.71	47.8	0.00	1.00	47.8	0.889	0.663	1.56	(N1)60cs >= 30	N/A	N/A	**Non Liq**	0.0000	0.00	0.00
B2	40	137.0	37.5 to 42.5	5.0	ML		63.0					120	35	1.00	60.4	4800.0	4800.0	3552.0	0.66	40.1	5.00	1.20	53.1	0.848	0.664	1.56	(N1)60cs >= 30	N/A	N/A	**Non Liq**	0.0000	0.00	0.00
B2	45	132.0	42.5 to 47.5	5.0	SP							120	38	1.00	65.6	5400.0	5400.0	3840.0	0.63	41.0	0.00	1.00	41.0	0.808	0.658	1.56	(N1)60cs >= 30	N/A	N/A	**Non Liq**	0.0000	0.00	0.00
B2	50	127.0	47.5 to 51.5	4.0	SP							120	50	1.00	86.3	6000.0	6000.0	4128.0	0.59	51.2	0.00	1.00	51.2	0.767	0.646	1.56	(N1)60cs >= 30	N/A	N/A	**Non Liq**	0.0000	0.00	0.00

In-Situ Percolation Test Results - Boring Test Procedure

Calculation Sheet #: 1

BG No.:	23334	**Date Excavated:**	2/3/2021
Client:	DLS Builders	**Date Tested:**	2/3/2021
Project Name:	Proposed Two-Story At-Grade Mixed-Use Building	**Tested by:**	RSB

Input Data:

Boring No.	Date of Presoak	Time of Presoak	Top of Perforation Depth (ft)	Perc Hole Depth (ft)	Approx. Hole Diam. (in)	Pipe ID (in)
B3*	2/3/21	1:57 PM	5	31	8	2

Soil Distribution

0 - 15 ft: CLAY (CL)
15 - 20 ft: Clayey SAND (SC)
20 - 30 ft: SAND (SP)

Falling Head Percolation Test Data and Results:

Test Number	Initial Time of Reading	Final Time of Reading	Elapsed Time (min.)	Initial Water Depth d_1, (ft)	Surface Area (sq-ft)	Final Water Depth (ft)	Water Level Drop Δd, (ft)	Initial Vol. of Water (cu-ft)	Final Vol. of Water (cu-ft)	Vol. of Water Discharge (cu-ft)	Infiltration Rate (in./hr.)
1	15:28:00	15:38:00	10	27.5	57.9	7.5	20.0	9.6	2.6	7.0	8.67
2	15:40:00	15:50:00	10	28.2	59.4	9.0	19.2	9.8	3.1	6.7	8.12
3	15:51:00	16:01:00	10	28.0	59.0	9.1	18.9	9.8	3.2	6.6	8.05
4	16:02:00	16:12:00	10	28.0	59.0	9.6	18.4	9.8	3.4	6.4	7.84
5	16:13:00	16:23:00	10	28.0	59.0	10.0	18.0	9.8	3.5	6.3	7.67
6	16:24:00	16:34:00	10	28.0	59.0	11.0	17.0	9.8	3.8	5.9	7.24
7	16:35:00	16:45:00	10	28.0	59.0	11.0	17.0	9.8	3.8	5.9	7.24
Reduction Factor (Administrative Manual) =											**4**
Calculated Design Raw Infiltration Rate (in/hr) =											**1.81**

*** See Site Plan for boring location.**

Reference: County of Los Angeles, 2017, Administrative Manual, Guidelines for Geotechnical Investigation and Reporting, Low Impact Development Stormwater Infiltration, Department of Public Works, GS200.2, dated June 30, 2017.

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TEMPORARY EXCAVATION HEIGHT

BG: **23334** ENGINEER: **RSB**
CLIENT: **DLS Builders**

CALCULATION SHEET # **2**

CALCULATE THE HEIGHT TO WHICH TEMPORARY EXCAVATIONS ARE STABLE (NEGATIVE THRUST). THE EXCAVATION HEIGHT AND BACKSLOPE AND SURCHARGE CONDITIONS ARE LISTED BELOW. ASSUME THE EARTH MATERIAL IS SATURATED WITH NO EXCESS HYDROSTATIC PRESSURE.

CALCULATION PARAMETERS

EARTH MATERIAL:	Alluvium	WALL HEIGHT:	5 feet
SHEAR DIAGRAM:	1	BACKSLOPE ANGLE:	0 degrees
COHESION:	500 psf	SURCHARGE:	0 pounds
PHI ANGLE:	25 degrees	SURCHARGE TYPE:	p Point
DENSITY:	125 pcf	INITIAL FAILURE ANGLE:	20 degrees
SAFETY FACTOR:	1.25	FINAL FAILURE ANGLE:	70 degrees
WALL FRICTION:	0 degrees	INITIAL TENSION CRACK:	1 feet
CD (C/FS):	400.0 psf	FINAL TENSION CRACK:	10 feet
PHID = ATAN(TAN(PHI)/FS) =	20.5 degrees		

CALCULATED RESULTS

CRITICAL FAILURE ANGLE	40 degrees
AREA OF TRIAL FAILURE WEDGE	4.6 square feet
TOTAL EXTERNAL SURCHARGE	0.0 pounds
WEIGHT OF TRIAL FAILURE WEDGE	572.6 pounds
NUMBER OF TRIAL WEDGES ANALYZED	510 trials
LENGTH OF FAILURE PLANE	1.3 feet
DEPTH OF TENSION CRACK	4.2 feet
HORIZONTAL DISTANCE TO UPSLOPE TENSION CRACK	1.0 feet
CALCULATED HORIZONTAL THRUST	**-315.9 pounds**
CALCULATED EQUIVALENT FLUID PRESSURE	**-25.3 pcf**
MAXIMUM HEIGHT OF TEMPORARY EXCAVATION	**5.0 feet**

CONCLUSIONS:

THE CALCULATION INDICATES THAT THE TEMPORARY VERTICAL EXCAVATIONS UP TO FIVE FEET HIGH WITH LEVEL BACKSLOPE HAVE A NEGATIVE THRUST AND ARE TEMPORARILY STABLE.

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SLOT CUT ANALYSIS

BG: **23334** ENGINEER: **RSB**
CLIENT: **DLS Builders**

CALCULATION SHEET # **3**

CALCULATE THE FACTOR OF SAFETY OF SLOT CUT EXCAVATIONS. ASSUME COHESIVE AND FRICTIONAL RESISTANCE ALONG THE SIDES OF SLOTS AS WELL AS THE FAILURE SURFACE. THE HORIZONTAL PRESSURE ON THE SIDES OF THE SLOTS IS THE AT-REST PRESSURE (1-SIN(phi)).

CALCULATION PARAMETERS

EARTH MATERIAL:	Alluvium	EXCAVATION HEIGHT:	5 feet
SHEAR DIAGRAM:	1	BACKSLOPE ANGLE:	0 degrees
COHESION:	500 psf	SURCHARGE:	0 pounds
PHI ANGLE:	25 degrees	SURCHARGE TYPE:	u Uniform
DENSITY:	125 pcf	INITIAL FAILURE ANGLE:	20 degrees
SLOT BOUNDARY CONDITIONS		FINAL FAILURE ANGLE:	70 degrees
SLOT CUT WIDTH:	8 feet	INITIAL TENSION CRACK:	1 feet
COHESION:	500 psf	FINAL TENSION CRACK:	10 feet
PHI ANGLE:	25 degrees		

CALCULATED RESULTS

CRITICAL FAILURE ANGLE	53 degrees
HORIZONTAL DISTANCE TO UPSLOPE TENSION CRACK	1.0 feet
DEPTH OF TENSION CRACK	3.7 feet
TOTAL EXTERNAL SURCHARGE	0.0 pounds
VOLUME OF FAILURE WEDGE	34.7 ft^3
WEIGHT OF FAILURE WEDGE	4336.5 pounds
LENGTH OF FAILURE PLANE	1.7 feet
SURFACE AREA OF FAILURE PLANE	13 ft^2
SURFACE AREA OF SIDES OF SLOTS	4.3 ft^2
NUMBER OF TRIAL WEDGES ANALYZED	53592 trials
TOTAL RESISTING FORCE ALONG WEDGE BASE (FrB)	1888.2 pounds
TOTAL RESISTING FORCE ALONG WEDGE SIDES (FrS)	1294.3 pounds
RESULTANT HORIZONTAL COMPONENT OF FORCE	**-91.9 pounds**
CALCULATED FACTOR OF SAFETY	**3.52**

CONCLUSIONS:

THE CALCULATION INDICATES THAT SLOTS CUTS UP TO 8 FEET WIDE AND 5 FEET HIGH IN ALLUVIUM HAVE A SAFETY FACTOR GREATER THAN 1.25 AND ARE TEMPORARILY STABLE.

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AERIAL VICINITY MAP

BG: 23334	DLS BUILDERS		
CONSULTANT : RSB		SCALE:	1" = 100'
DRAWN BY : AS			

REFERENCE: LOS ANGELES COUNTY DEPARTMENT OF REGIONAL PLANNING, GIS-NET, 2013, http://gis.planning.lacounty.gov/GIS-NET_Public/Viewer.html

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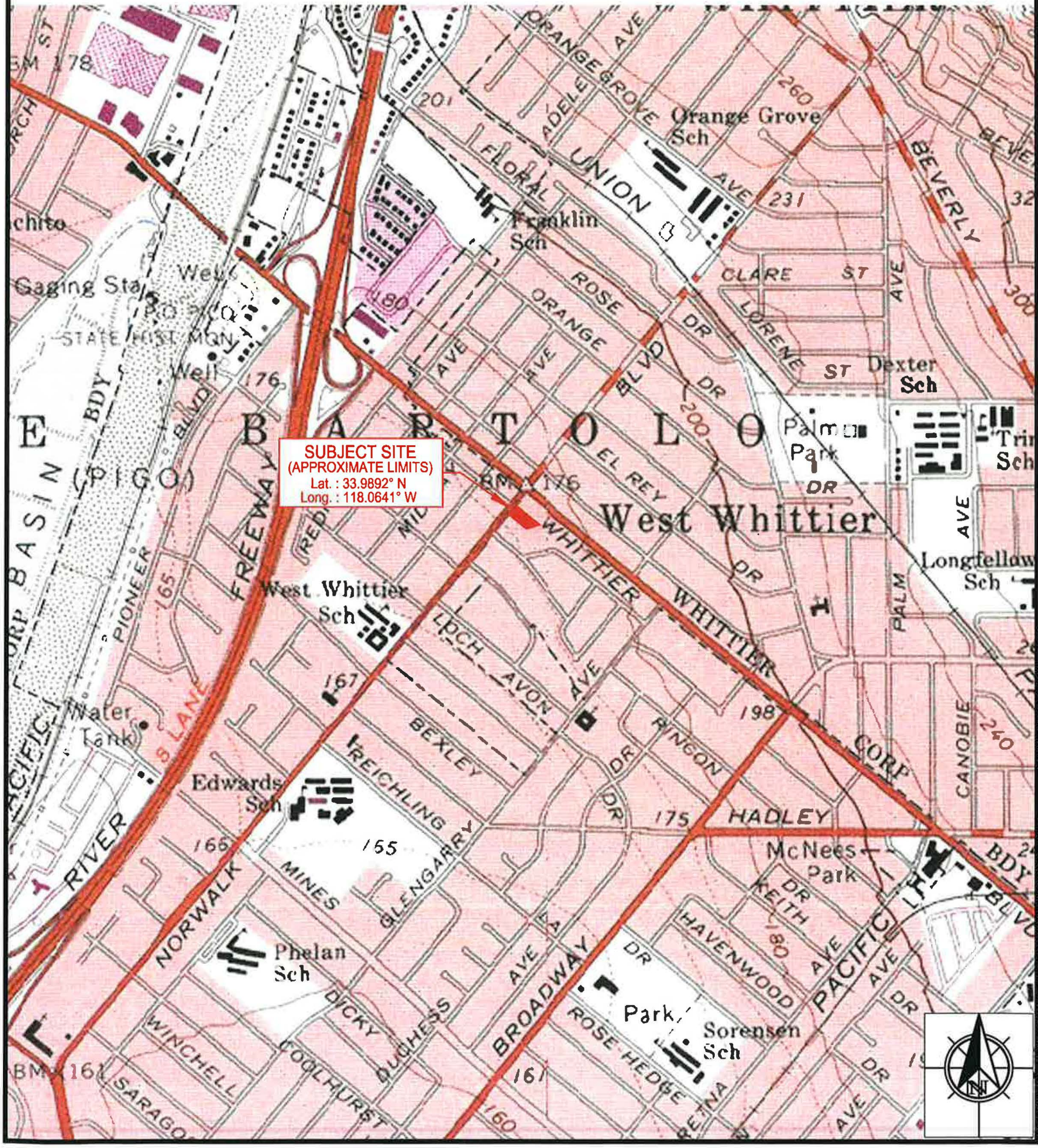
REGIONAL TOPOGRAPHIC MAP

BG: 23334 DLS BUILDERS

CONSULTANT : RSB
DRAWN BY : AS
SCALE: 1" = 1000'

REFERENCE: USGS TOPOGRAPHIC MAP, WHITTIER 7.5-MINUTE SERIES QUADRANGLE, LOS ANGELES COUNTY, CALIFORNIA, PHOTO REVISED 1981 CREATED 1965.



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HISTORIC TOPOGRAPHIC MAP

BG: 23334	DLS BUILDERS
CONSULTANT : RSB	SCALE: 1" = 1000'
DRAWN BY : AS	

REFERENCE: USGS TOPOGRAPHIC MAP, WHITTIER 6-MINUTE SERIES QUADRANGLE, LOS ANGELES COUNTY, CALIFORNIA CREATED 1926.

PLOT DATE/TIME: 2/23/2021 - 2:11pm
CAD FILE: S:\LandProjects\23334 DLS Builders_Whittier\HISTORIC TOPOGRAPHIC MAP.dwg

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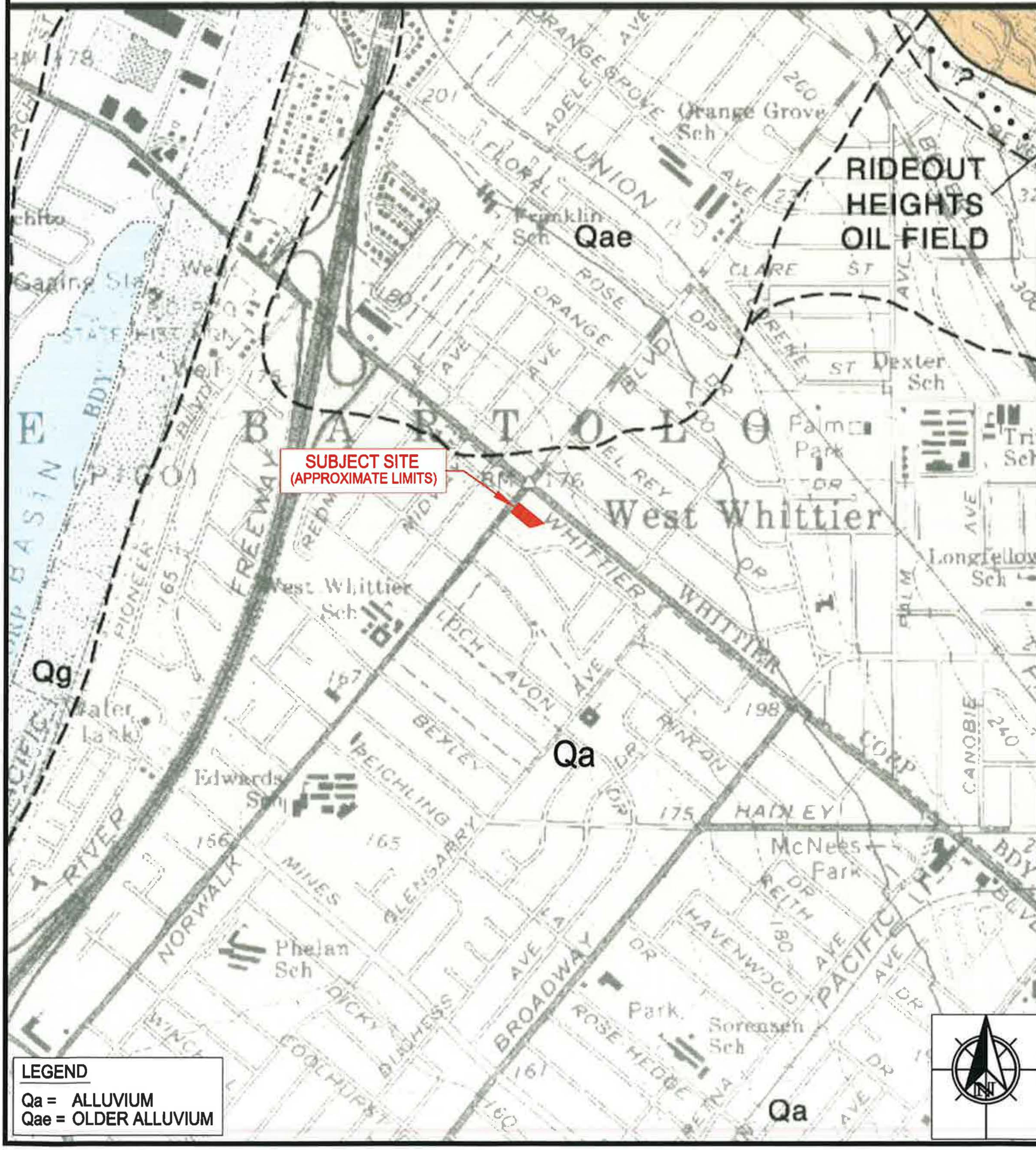
REGIONAL GEOLOGIC MAP #1

BG: 23334	DLS BUILDERS
CONSULTANT : RSB	SCALE: 1" = 1000'
DRAWN BY : AS	

REFERENCE: DIBBLEE, T.W. (2001), GEOLOGIC MAP OF THE WHITTIER AND LA HABRA QUADRANGLES (WESTERN PUENTE HILLS) LOS ANGELES AND ORANGE COUNTIES, CALIFORNIA, MAP DF-74



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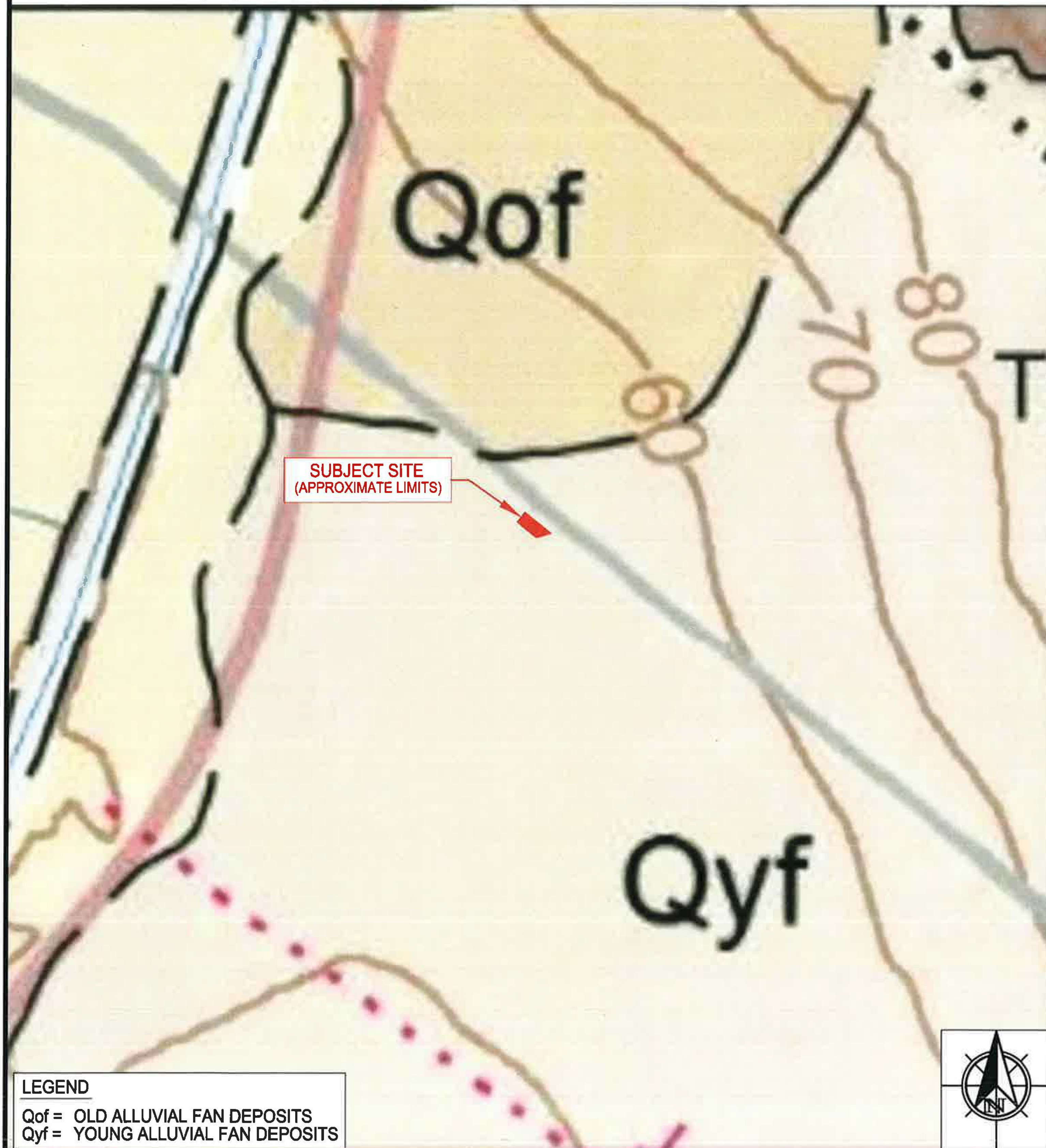
1461 E. CHEVY CHASE DR., SUITE 200
GLENDALE, CA 91206
818.549.9959 TEL
818.543.3747 FAX

REGIONAL GEOLOGIC MAP #2

BG: 23334	DLS BUILDERS
CONSULTANT : RSB	SCALE: 1" = 1000'
DRAWN BY : AS	

REFERENCE: GEOLOGIC MAP OF THE LONG BEACH 30' X 60' QUADRANGLE, CALIFORNIA (VER. 2.0), DATED 2016 BY SAUCEDO, G.J., GREENE, H.G., KENNEDY, M.P., AND BEZORE, S.P.



LEGEND
Qof = OLD ALLUVIAL FAN DEPOSITS
Qyf = YOUNG ALLUVIAL FAN DEPOSITS

CAD FILE: S:\LandProjects\23334 DLS Builders_Whittier\REGIONAL GEOLOGIC MAP #2.dwg PLOT DATE/TIME: 2/23/2021 - 2:12pm

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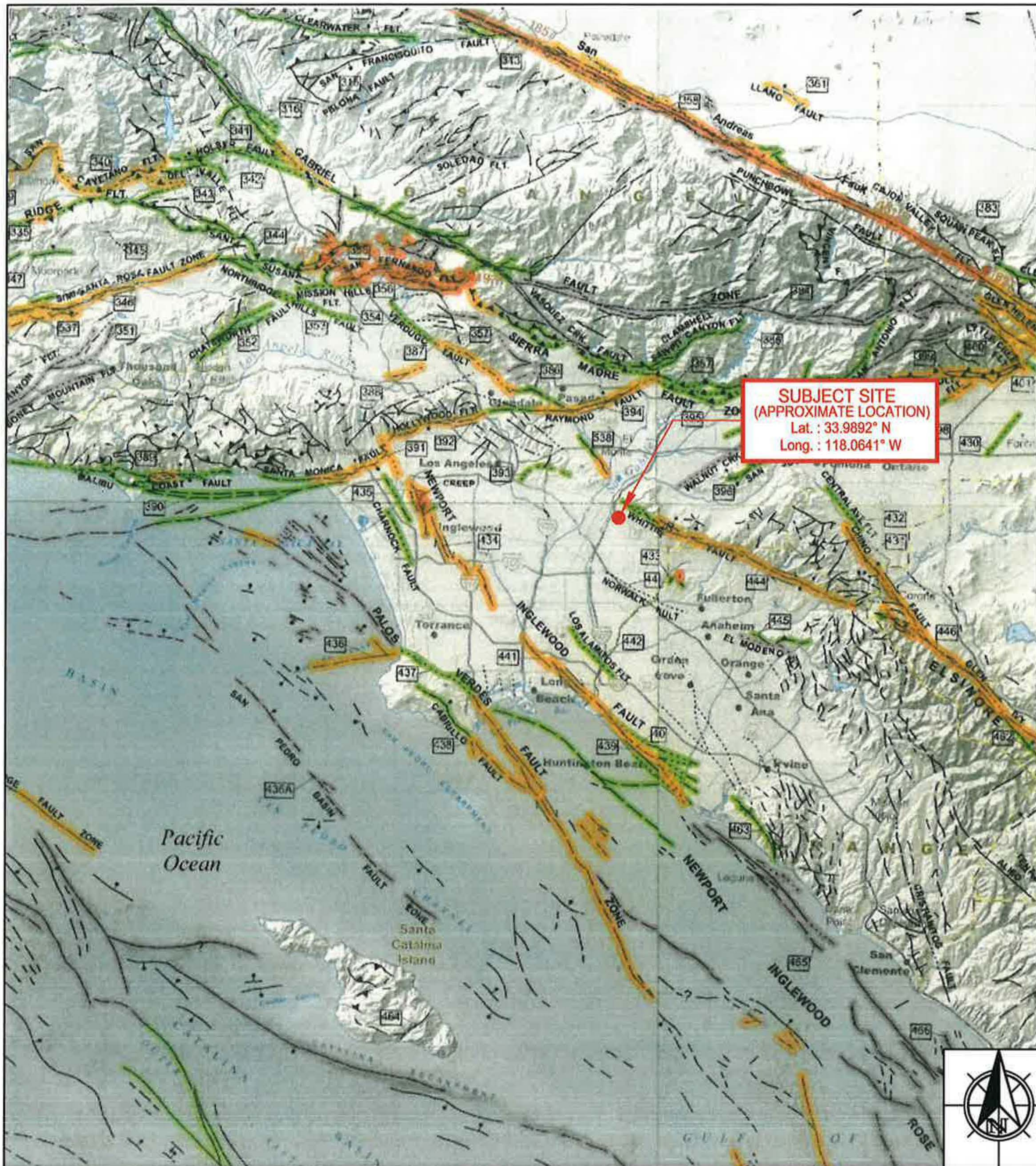
REGIONAL FAULT MAP

BG: 23334	DLS BUILDERS	
CONSULTANT : RSB	SCALE:	1" = 12 MILES
DRAWN BY : AS		

REFERENCE: JENNINGS, C.W., AND BRYANT, W.A.,2010, FAULT ACTIVITY MAP OF CALIFORNIA GEOLOGICAL SURVEY, 150th ANNIVERSARY, MAP No 6.



PLOT DATE/TIME: 2/25/2021 - 11:21am

CAD FILE: S:\LandProjects\23334 DLS Builders_Whittier\REGIONAL FAULT MAP.dwg

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SEISMIC HAZARD ZONES MAP

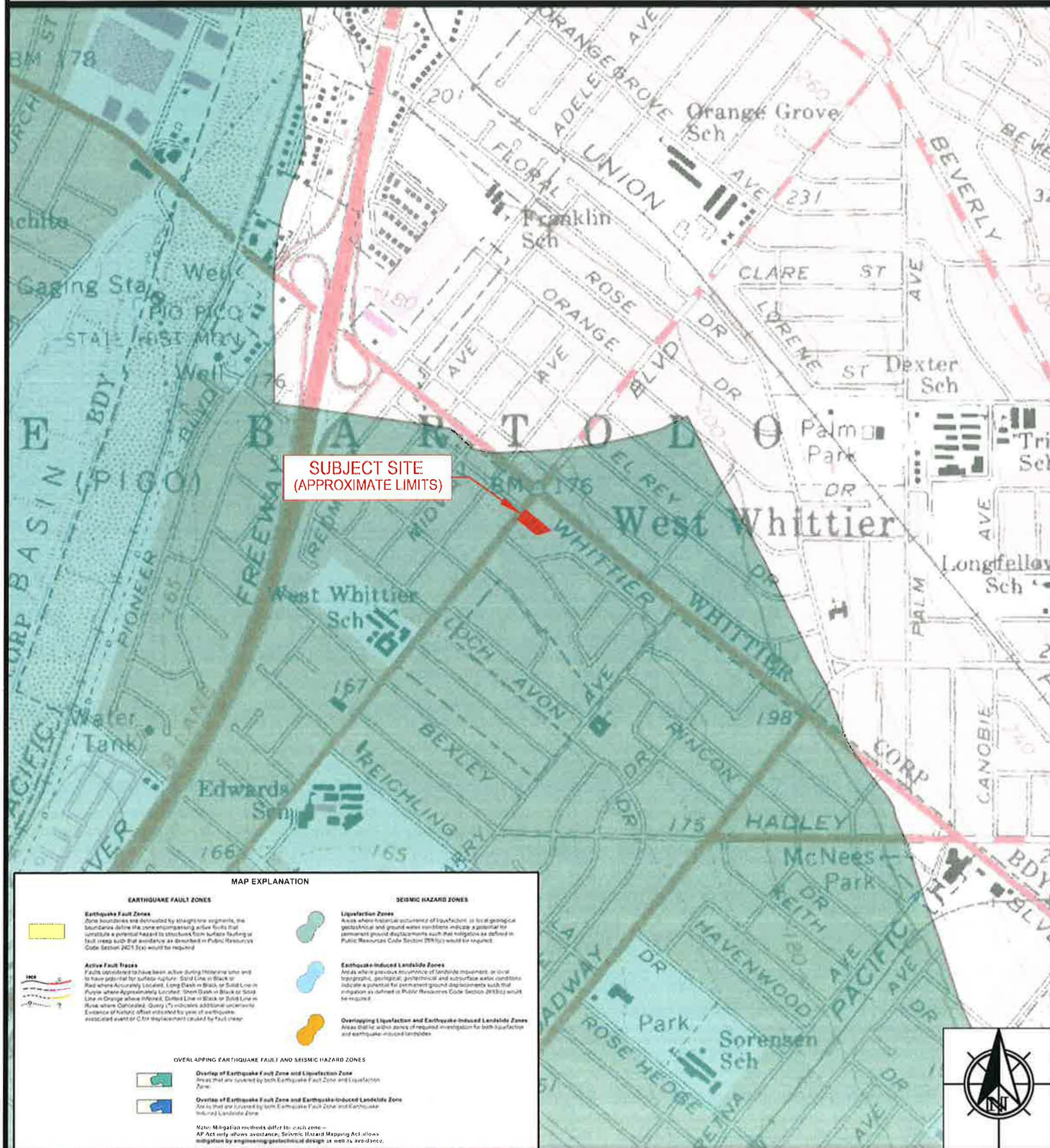
BG: 23334 DLS BUILDERS

CONSULTANT : RSB

DRAWN BY : AS

SCALE: 1" = 1000'

REFERENCE: EARTHQUAKE ZONES OF REQUIRED INVESTIGATION WHITTIER QUADRANGLE; SEISMIC HAZARD ZONES, DATED MARCH 25, 1999.



PLOT DATE/TIME: 2/23/2021 - 2:12pm

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HISTORIC-HIGH GROUNDWATER MAP

BG: 23334	DLS BUILDERS
CONSULTANT : RSB	SCALE: 1" = 4000'
DRAWN BY : AS	

REFERENCE: CGS, 1998, Seismic Hazard Zone Report for the Whittier 7.5-Minute Quadrangle, Los Angeles County, California, Seismic Hazard Zone Report 037.

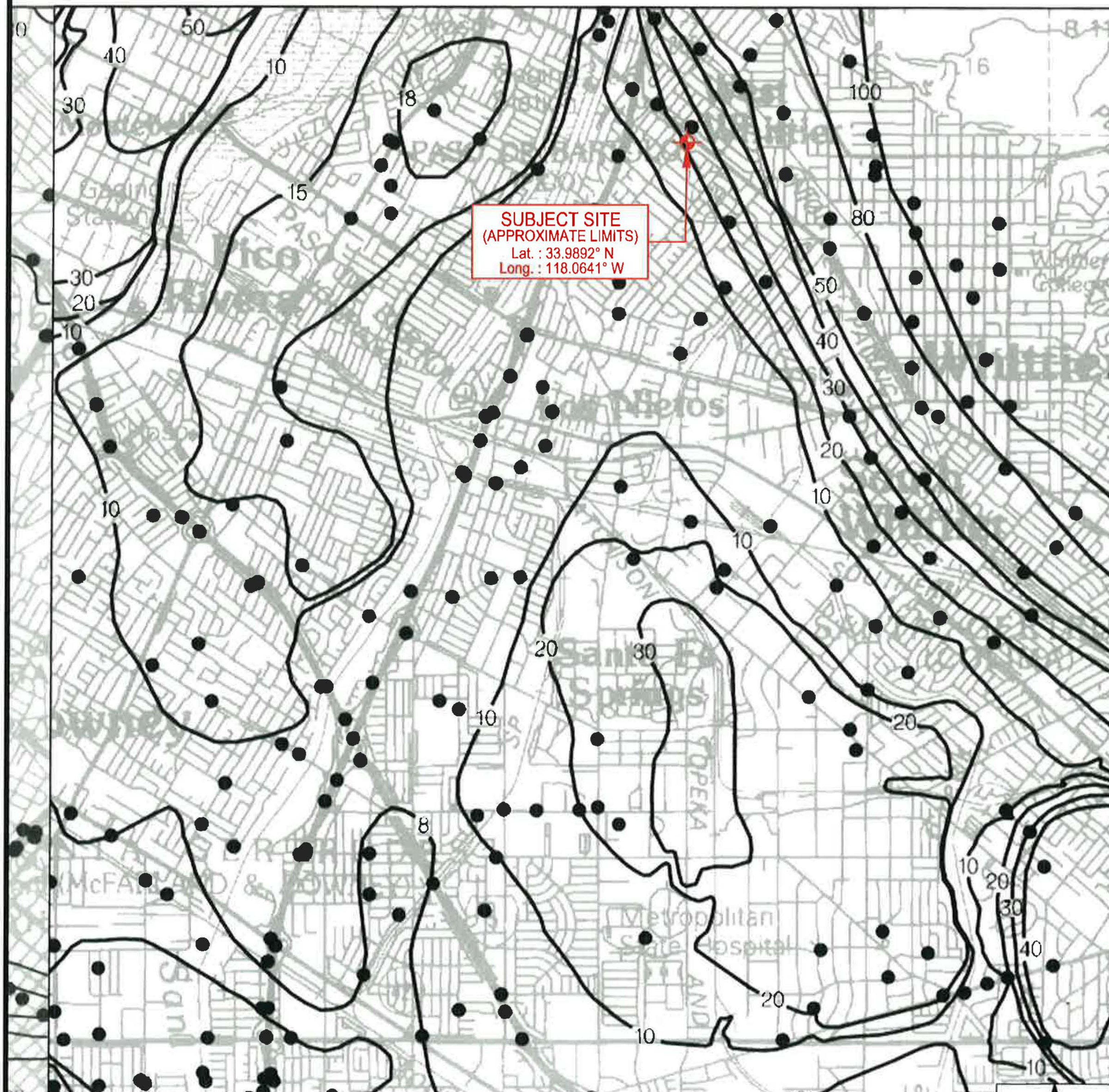
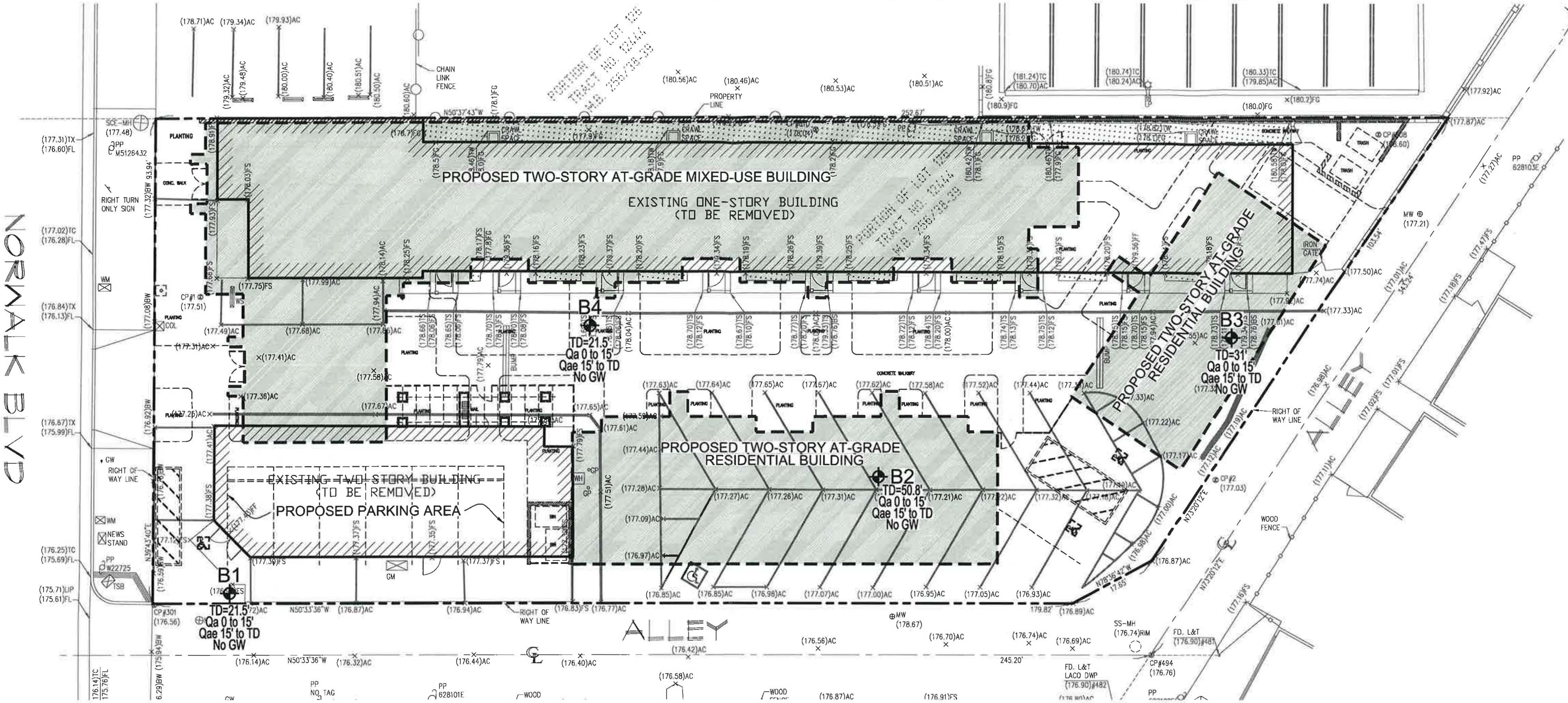


Plate 1.2 Historically Highest Ground Water Contours and Borehole Log Data Locations, Hollywood Quadrangle.

● Borehole Site

30 Depth to ground water in feet



LEGEND

B4	LOCATION AND NUMBER OF HOLLOW-STEM AUGER BORING
TD=21.5'	TOTAL DEPTH (FEET)
Qa 0 to 15'	DEPTH OF ALLUVIUM (FEET)
Qae 15' to TD	DEPTH OF OLDER ALLUVIUM (FEET)
No GW	NO GROUNDWATER ENCOUNTERED

GRAPHIC SCALE

20 15 10 5 0 10 20 40

(IN FEET)
1 inch = 20 ft.

FEBRUARY 25, 2021

REFERENCE: TOPOGRAPHIC SURVEY PREPARED BY THE CITY OF WHITTIER DEPARTMENT OF PUBLIC WORKS, DATED UNKNOWN AND PROPOSE SITE PLAN PROVIDED BY PICKARD ARCHITECTS, DATED 09/11/2020.

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SITE PLAN

BG: 23334 DLS BUILDERS

CONSULTANT: RSB

DRAWN BY: AS

SCALE: 1" = 20'

PLOT DATE/TIME: 2/25/2021 - 2:40pm

United States Department of Agriculture

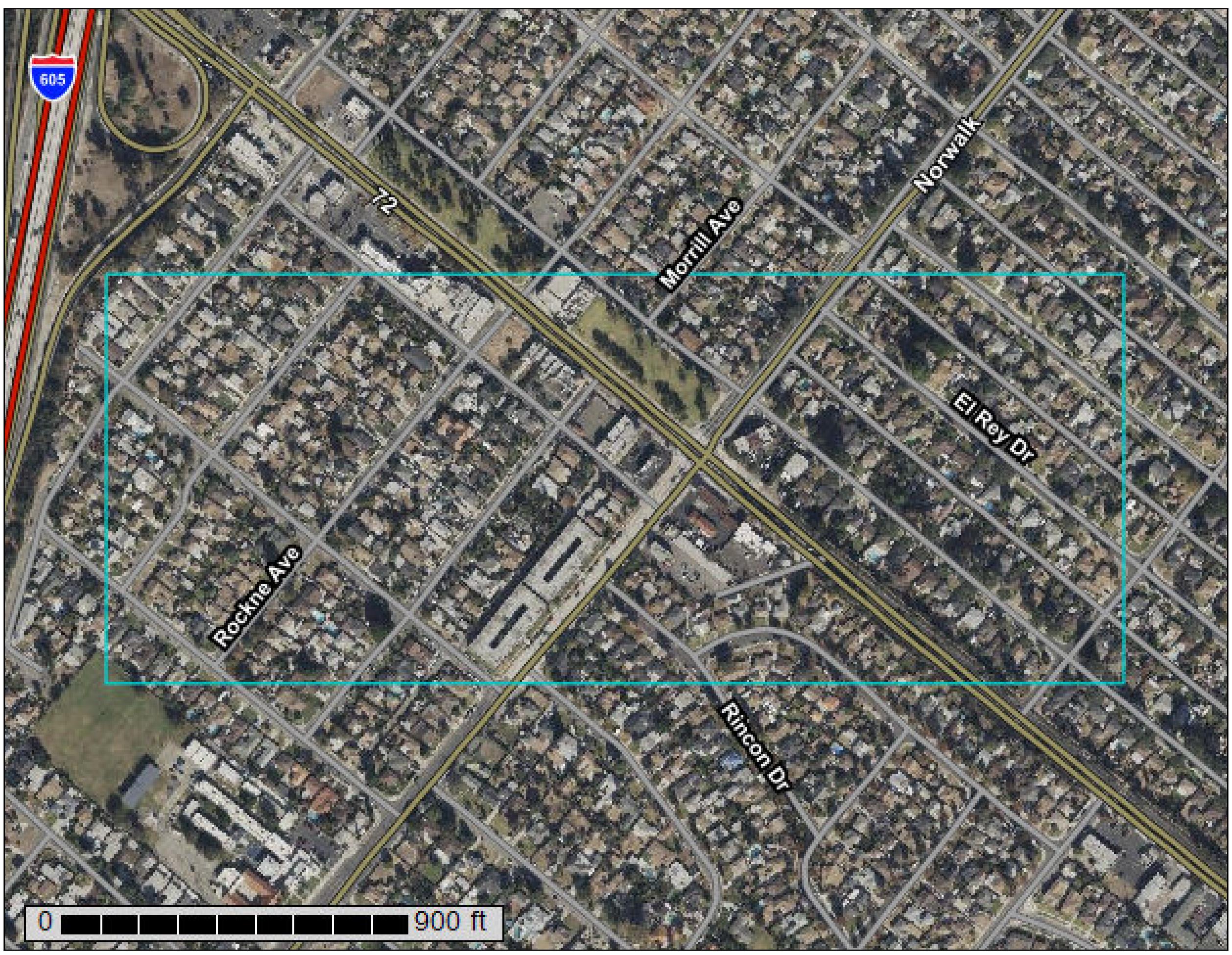
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Los Angeles County, California, Southeastern Part

6018 Norwalk, Whittier



January 4, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:4,410 if printed on A landscape (11" x 8.5") sheet.

Meters: 0, 50, 100, 200, 300

Feet: 0, 200, 400, 800, 1200

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Los Angeles County, California, Southeastern Part
Survey Area Data: Version 8, Sep 13, 2021

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Nov 21, 2020—Dec 2, 2020

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND	MAP INFORMATION
	imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1005	Urban land-Biscailuz-Hueneme, drained complex, 0 to 2 percent slopes	4.7	7.4%
1136	Urban land-Sorrento-Arbolado complex, 2 to 9 percent slopes	18.8	29.4%
1137	Urban land-Ballona-Typic Xerorthents, fine substratum complex, 0 to 5 percent slopes	36.3	56.8%
1138	Urban land-Azuvina-Montebello complex, 0 to 5 percent slopes	4.1	6.4%
Totals for Area of Interest		**63.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Los Angeles County, California, Southeastern Part

1005—Urban land-Biscailuz-Hueneme, drained complex, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2nbzh
Elevation: 0 to 190 feet
Mean annual precipitation: 11 to 16 inches
Mean annual air temperature: 63 to 66 degrees F
Frost-free period: 350 to 365 days
Farmland classification: Prime farmland if irrigated and drained

Map Unit Composition

Urban land: 50 percent
Biscailuz and similar soils: 20 percent
Hueneme, drained, and similar soils: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Alluvial fans

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Frequency of flooding: RareNone

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Description of Biscailuz

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Discontinuous human-transported material over mixed alluvium derived from granite and/or sedimentary rock

Typical profile

^A - 0 to 3 inches: loam
^Cu1 - 3 to 12 inches: loam
2Bk1 - 12 to 24 inches: loam
2Bk2 - 24 to 31 inches: loam
2C2 - 31 to 43 inches: loamy fine sand
3Ab3 - 43 to 79 inches: silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 4.0
Available water supply, 0 to 60 inches: Moderate (about 8.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Description of Hueneme, Drained

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Discontinuous human-transported material over mixed alluvium derived from granite and/or sedimentary rock

Typical profile

^A - 0 to 4 inches: fine sandy loam
C1 - 4 to 22 inches: fine sandy loam
C2 - 22 to 41 inches: fine sandy loam
C3 - 41 to 61 inches: silt loam
C4 - 61 to 75 inches: fine sandy loam
C5 - 75 to 79 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: RareNone
Frequency of ponding: None
Calcium carbonate, maximum content: 3 percent
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water supply, 0 to 60 inches: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Minor Components

Bolsa, drained

Percent of map unit: 8 percent
Landform: Alluvial fans
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Pico

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Xerorthents

Percent of map unit: 2 percent
Landform: Alluvial fans
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

1136—Urban land-Sorrento-Arbolado complex, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2pt40
Elevation: 160 to 1,390 feet
Mean annual precipitation: 14 to 19 inches
Mean annual air temperature: 64 to 67 degrees F
Frost-free period: 355 to 365 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Urban land: 40 percent
Sorrento and similar soils: 20 percent
Arbolado and similar soils: 20 percent

Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Fan aprons

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Description of Sorrento

Setting

Landform: Fan aprons
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Discontinuous human-transported material over young alluvium derived from sedimentary rock

Typical profile

^Au1 - 0 to 3 inches: clay loam
^Au2 - 3 to 17 inches: loam
2Btk1 - 17 to 30 inches: clay loam
2Btk2 - 30 to 39 inches: clay loam
2BC1 - 39 to 71 inches: clay loam
2BC2 - 71 to 79 inches: loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Description of Arbolado

Setting

Landform: Fan aprons
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Human-transported material consisting mostly of alluvium derived from sedimentary rock

Typical profile

^A1 - 0 to 2 inches: clay loam
^A2 - 2 to 16 inches: clay loam
^C1 - 16 to 30 inches: clay loam
^C2 - 30 to 35 inches: clay loam
^C3 - 35 to 43 inches: clay
^C4 - 43 to 59 inches: clay

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 3 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 9.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Minor Components

Ballona

Percent of map unit: 10 percent
Landform: Fan aprons
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Grommet, graded surface

Percent of map unit: 5 percent
Landform: Fan aprons
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope

Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Azuvina

Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

1137—Urban land-Ballona-Typic Xerorthents, fine substratum complex, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2pt41
Elevation: 10 to 630 feet
Mean annual precipitation: 13 to 19 inches
Mean annual air temperature: 62 to 66 degrees F
Frost-free period: 355 to 365 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Urban land: 45 percent
Typic xerorthents, fine substratum, and similar soils: 20 percent
Ballona and similar soils: 20 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Alluvial fans

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Description of Ballona

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Discontinuous human-transported material over young alluvium derived from sedimentary rock

Typical profile

^A - 0 to 6 inches: loam
^A2 - 6 to 18 inches: loam
2A3 - 18 to 31 inches: clay loam
2Bk1 - 31 to 47 inches: clay
2Bk2 - 47 to 79 inches: clay

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Description of Typic Xerorthents, Fine Substratum

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Human-transported material over young alluvium derived from sedimentary rock

Typical profile

^Au - 0 to 13 inches: loam
^Cu - 13 to 47 inches: clay loam
2C1 - 47 to 57 inches: clay
2C2 - 57 to 79 inches: clay loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches

Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 7.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: C
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Minor Components

Arbolado

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Cropley, coarse fill surface

Percent of map unit: 5 percent
Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Azuvina

Percent of map unit: 3 percent
Landform: Fan remnants
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

San emigdio

Percent of map unit: 2 percent
Landform: Alluvial fans
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

1138—Urban land-Azuvina-Montebello complex, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: 2pt42
Elevation: 70 to 1,420 feet
Mean annual precipitation: 14 to 23 inches
Mean annual air temperature: 64 to 66 degrees F
Frost-free period: 355 to 365 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

Urban land: 45 percent
Azuvina and similar soils: 25 percent
Montebello and similar soils: 20 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Landform: Fan remnants

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Description of Azuvina

Setting

Landform: Fan remnants
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Discontinuous human-transported material over old alluvium derived from granite

Typical profile

^A1 - 0 to 5 inches: loam
^A2 - 5 to 14 inches: loam
2Bt1 - 14 to 24 inches: clay loam
2Bt2 - 24 to 43 inches: sandy clay loam

2BCt1 - 43 to 57 inches: loam
2BCt2 - 57 to 79 inches: fine sandy loam

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum: 8.0
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Description of Montebello

Setting
Landform: Fan remnants
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Human-transported material over alluvium derived from granite

Typical profile
^A - 0 to 4 inches: silt loam
^C - 4 to 34 inches: clay loam
2Bt1 - 34 to 53 inches: loam
2Bt2 - 53 to 79 inches: loam

Properties and qualities
Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum: 5.0
Available water supply, 0 to 60 inches: High (about 10.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C
Ecological site: R019XG911CA - Loamy Fan
Hydric soil rating: No

Minor Components

Pachic argixerolls, fine

Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Palmview

Percent of map unit: 5 percent
Landform: Fan remnants
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

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