Appendix C

Geotechnical Report

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Celebrating 50 YEARS OF SERVICE 1971-2021

September 22, 2021
File Number 22144

Alexandria Real Estate Equities, Inc.
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Pasadena, California 91101

Attention: Tony Wei

Received
04/05/2022

Subject: Geotechnical Engineering Investigation
Proposed Industrial Park Complex
1100 Rancho Conejo Boulevard, Thousand Oaks, California

Ladies and Gentlemen:

This letter transmits the Geotechnical Engineering Investigation for the subject property prepared by Geotechnologies, Inc. This report provides geotechnical recommendations for the development of the site, including earthwork, seismic design, retaining walls, excavations, shoring and foundation design. Engineering for the proposed project should not begin until approval of the geotechnical investigation is granted by the local building official. Significant changes in the geotechnical recommendations may result due to the building department review process.

The validity of the recommendations presented herein is dependent upon review of the geotechnical aspects of the project during construction by this firm. The subsurface conditions described herein have been projected from limited subsurface exploration and laboratory testing. The exploration and testing presented in this report should in no way be construed to reflect any variations which may occur between the exploration locations or which may result from changes in subsurface conditions.

Should you have any questions please contact this office.

Respectfully submitted,
GEOTECHNOLOGIES, INC.

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TABLE OF CONTENTS

SECTION **PAGE**

TABLE OF CONTENTS

SECTION **PAGE**

TABLE OF CONTENTS

SECTION **PAGE**

GEOTECHNICAL ENGINEERING INVESTIGATION
PROPOSED INDUSTRIAL PARK COMPLEX
1100 RANCHO CONEJO BOULEVARD
THOUSAND OAKS, CALIFORNIA

INTRODUCTION

This report presents the results of the geotechnical engineering investigation performed on the subject property. The purpose of this investigation was to identify the distribution and engineering properties of the earth materials underlying the site, and to provide geotechnical recommendations for the design of the proposed development.

This investigation included thirty-three exploratory borings, performance of geophysical survey, collection of representative samples, laboratory testing, engineering analysis, review of published geologic data, review of available geotechnical engineering information and the preparation of this report. The exploratory excavation locations are shown on the enclosed Plot Plan. The results of the exploration and the laboratory testing are presented in the Appendix of this report.

PROPOSED DEVELOPMENT

Information concerning the proposed development was furnished by the client. Preliminary architectural plans were provided by the client and the design team. The site is proposed to be developed with an industrial park complex. The proposed complex will include five, 2-story office, research, and laboratory buildings (Building A through E), a one-story Fitness Amenity building, a 4 to 5-story parking structure, and a sports field. All structures are proposed to be built at- or near existing site grades, except for Building A and E, which will be constructed over a partial to one subterranean level. Rough finish floor elevations for the B1 Level of Building A and E is anticipated to be 682.0 feet above Mean Sea Level Elevation (MSL), and a rough finish floor elevation of 695.0 feet above MSL for Buildings B, C, and D. Due to the sloping nature of the site, the proposed parking structure will be constructed over 2 to 3 partial subterranean levels. Column loads are estimated to be between 300 and 600 kips. Wall loads are estimated to be between 4 and 6 kips per lineal foot. Grading will consist of removal and recompaction of existing unsuitable soils, in the area of the at-grade structures. In addition, excavations on the order of 5 to 25 feet may be required for the recommended grading, proposed retaining walls, subterranean levels and foundation elements.

Any changes in the design of the project or location of any structure, as outlined in this report, should be reviewed by this office. The recommendations contained in this report should not be considered valid until reviewed and modified or reaffirmed, in writing, subsequent to such review.

SITE CONDITIONS

The property is located at 1100 Rancho Conejo Boulevard in the City of Thousand Oaks, California. The site is bounded by multiple one-story commercial structures to the north, by multiple single family residences to the east, by Ventu Park Road to the south, and by Rancho Conejo Boulevard to the west. The site is shown relative to nearby topographic features on the enclosed Vicinity Map.

At the time of exploration, the site was occupied by three 2-story office buildings with associated at-grade parking lots. The eastern portion of the site is undeveloped and is used by a landscape maintenance crew for miscellaneous storage. Based on review of the topographic survey provided by JRN Civil Engineers, dated June 4, 2021, an approximate high elevation of 712.48 feet above MSL is recorded near the center of the site and an approximate low elevation of 663.6 feet above MSL is recorded near the northern corner of the site. This corresponds to an approximate elevation difference of 48.88 feet across the site. The enclosed Survey Plan provides site elevations.

Drainage occurs by sheetflow along existing topographic contours towards the adjacent city streets and local area drains. Vegetation on the site contained within landscaped areas consisting of grasses, bushes, and mature trees. Vegetation within the undeveloped area at the east end of the site consists of patches of grass and trees. The surrounding developments predominantly consist of 1 to 2-story residential and commercial structures.

LOCAL GEOLOGY

The subject property is in the Transverse Ranges Geomorphic Province consisting of roughly east-west trending Santa Monica, San Gabriel, and San Bernardino mountains. The convergent deformational features of the Transverse Ranges are a result of north-south shortening because of plate tectonics. This has resulted in local folding and uplift of the mountains along with the propagation of thrust faults (including blind thrusts). The ranges are separated by narrow to moderately broad valleys such as the San Fernando, Oxnard, and Santa Clarita valleys. The intervening valleys have been filled with sediments derived from the bordering mountains.

The geomorphic province is bounded by the Santa Ynez reverse fault scarp to the north, and the Sierra Madre and San Jacinto faults zones to the south. To the west, the Transverse Range plunges under the Pacific Ocean at Point Arguello and extends as far east as the eastern portion of the Little San Bernardino Mountains. The geomorphic province is approximately 50 miles-wide at the western end, approximately 55 miles-wide at the eastern end, and approximately 30 miles-wide in the middle part of the San Bernadino Mountains. (Bailey and Jahns, 1954).

GEOTECHNICAL EXPLORATION

FIELD EXPLORATION

The site was explored between May 17, and August 25, 2021, by excavating 33 exploratory borings. The exploratory excavations varied in depth from 5 to 50 feet. The exploration was performed with the aid of a truck-mounted drilling machine using 8-inch diameter hollowstem augers. The exploration locations are shown on the Plot Plan and Survey Plan, and the geologic materials encountered are logged on Plates A-1 through A-33.

The location of exploratory excavations was determined hardscape features shown on the attached Survey Plan. Elevations of the exploratory borings were determined from a topographic survey provided by the client, date June 4, 2021. The location and elevation of the exploratory excavations should be considered accurate only to the degree implied by the method used.

Geologic Materials

The site is underlain by fill materials, older alluvium, and bedrock of the Lower Topanga Formation and Conejo Volcanics. The enclosed geologic maps (Yerkes and Campbell, 1997) and (Dibblee, 1990), illustrates the geologic materials expected at the site and its vicinity.

Existing Fill

Existing fill materials were encountered in all exploratory borings, to depths ranging between 3 and 37.5 feet below the existing site grade. The observed fill consists of sandy to clayey silts, silty clays, and silty sands, which are yellowish brown to dark brown and gray to dark gray in color, moist to very moist, stiff to very stiff, medium dense to very dense, and fine grained, with variable amounts of rock fragments, gravel and asphalt.

Majority of the existing fill materials in the building pad areas consist of engineered fill placed for the creation of the existing building pads and parking lots. A discussion of the compacted fill materials is provided in the “Research” section below. No records were found for the fill materials located in the northeastern portion of the site (rear of the property). Therefore, these fill materials along the northeast portion of the site shall be considered to be uncertified fill.

Older Alluvium

The fill is in turn underlain by older alluvial deposits. The Older Alluvium consists of sandy to clayey silts, silty clays, silty sands, cobbley to gravelly sands, and sands, which are yellowish to dark brown, grayish brown, and gray to dark gray in color, moist to very moist, stiff to very stiff, dense to very dense, and fine to coarse grained, with variable amounts of caliche, pebbles, rock fragments, gravel and cobbles. The older alluvial deposits ranged in thickness from 0 to greater than 30 feet.

Bedrock - Lower Topanga Formation

Bedrock of the Lower Topanga Formation was encounter in Borings B5, B10, B11, B12 and B23 at depths ranging between 17 and 40 feet below the ground surface. The bedrock consists of Sandstone, which is yellowish brown to dark brown in color, moist, and moderately hard to hard.

Bedrock - Conejo Volcanics

Bedrock of the Conejo Volcanics was encountered in Borings B6, B7, B8, B9, B16, B17, B18, B29, B30 and B31 at depths ranging between 3 and 25 feet below the ground surface. The bedrock consists of Basalt and volcanic rock, which is yellowish to dark brown, grayish brown, and gray to dark gray in color, moist, and moderately hard to very hard. Boring B29 displayed some weathering of the bedrock within the upper 2½ feet. Drilling refusal was encountered within the volcanic bedrock, at depths between 5 and 8 feet below the existing ground surface, in B8, B16, B17, and B18. More detailed descriptions of the earth materials encountered may be obtained from individual logs of the subsurface excavations.

Groundwater

Groundwater was not encountered during exploration within the deepest boring, conducted in Boring B14 to a depth of 50 feet below the existing grade, which corresponds to an elevation of 627.4 feet above MSL.

The historically highest groundwater level was established by review of the historically high groundwater contour map (Plate 1.2), of the California Geological Survey Seismic Hazard Zone Report for the Newbury Park 7.5-Minute Quadrangle (SHZR 055). Review of this plate indicates that the closest historically highest groundwater level is 0.4 miles to the south of the site, and is on the order of 10 feet below grade. A copy of the map is enclosed for reference. However, due to the significant variation of the ground surface topography, subsurface condition and the geologic units in the vicinity of the Project Site, it is the opinion of this firm that the historically highest groundwater level is not a good representation of the groundwater level for the area.

Fluctuations in the level of groundwater may occur due to variations in rainfall, temperature, and other factors not evident at the time of the measurements reported herein. Fluctuations also may occur across the site. High groundwater levels can result in changed conditions.

Caving

Caving could not be directly observed during exploration due to the type of excavation equipment utilized. Based on the experience of this firm, large diameter excavations, excavations that encounter granular, cohesionless soils and excavations below the groundwater table will most likely experience caving.

Research

Available geotechnical reports for the subject site were provided by the Records Management Division at the City of Thousand Oaks Public Works Department. The first document reviewed was "As-Built Grading Plan and Site Improvement Plan", 1100 Rancho Conejo Boulevard, Thousand Oaks, California, by Gorian & Associates, dated March 1975. This plan is based on recommendations of the supportive Soils Engineering and Engineering Geology Reports, by Gorian & Associates, dated April 6, 1972 and May 28, 1973. These reports were unable to be located by the City of Thousands, Records Management Division. However, the provided plan specifies the controlled and inspected grading done at the site under Grading Permit No. 5577. This plan also specifies an area of uncompacted fill located near the east facing slope near the southeast property line. The Grading Plan was subsequently checked and approved by Ventura County on September 13, 1973. The cut fill lines provided in the plan are shown on the attached Plot Plan and Survey plan.

Also provided was a Geotechnical Site Update Report, Proposed Parking Lot Addition, by Geotechnical Associates, Inc, dated May 5, 1996. This report is provides geotechnical site update for the proposed parking lot addition adjacent to Buildings 36 and 37 at 1100 Rancho Conejo Boulevard, Thousand Oaks, California. The report is based on the previous report provided by Gorian & Associates (1973) and a grading plan prepared by Crosby Mead Benton and Associates. Based on the previous rough grading of the site (Gorian, 1973), the area of the proposed improvements consisted of cuts of up to approximately 12 feet and fills of up to approximately 20 feet to obtain finish grades. Recommendations are provided for the proposed improvements. Subsequently, two compaction reports were prepared by Geotechnical Associates, Inc., dated November 26, 1996 and January 23, 1997. These reports provided field compaction tests for cuts and fills up to approximately 22 feet, fill slope extension along the north property line to a maximum height of 25 feet, and utility trench backfills. The fill soils met the minimum requirements specified. The area of the approved fill soils is within the parking lots areas at the north and northeast of the upper developed portion of the site. Copies of the grading reports and As-Built Grading Plans are enclosed at the end of this report for reference.

SEISMIC EVALUATION

REGIONAL GEOLOGIC SETTING

The subject property is located in the Transverse Ranges Geomorphic Province. The Transverse Ranges are characterized by roughly east-west trending mountains and the northern and southern boundaries are formed by reverse fault scarps. The convergent deformational features of the

Transverse Ranges are a result of north-south shortening due to plate tectonics. This has resulted in local folding and uplift of the mountains along with the propagation of thrust faults (including blind thrusts). The intervening valleys have been filled with sediments derived from the bordering mountains.

REGIONAL FAULTING

Based on criteria established by the California Division of Mines and Geology (CDMG) now called California Geologic Survey (CGS), Faults may be categorized as Holocene-active, Pre-Holocene faults, and Age-undetermined faults. Holocene-active faults are those which show evidence of surface displacement within the last 11,700 years. Pre-Holocene faults are those that have not moved in the past 11,700 years. Age-undetermined faults are faults where the recency of fault movement has not been determined.

Buried thrust faults are faults without a surface expression but are a significant source of seismic activity. They are typically broadly defined based on the analysis of seismic wave recordings of hundreds of small and large earthquakes in the southern California area. Due to the buried nature of these thrust faults, their existence is usually not known until they produce an earthquake. The risk for surface rupture potential of these buried thrust faults is inferred to be low (Leighton, 1990). However, the seismic risk of these buried structures in terms of recurrence and maximum potential magnitude is not well established. Therefore, the potential for surface rupture on these surface-verging splays at magnitudes higher than 6.0 cannot be precluded.

SEISMIC HAZARDS AND DESIGN CONSIDERATIONS

The primary geologic hazard at the site is moderate to strong ground motion (acceleration) caused by an earthquake on any of the local or regional faults. The potential for other earthquake-induced hazards was also evaluated including surface rupture, liquefaction, dynamic settlement, inundation and landsliding.

Surface Rupture

In 1972, the Alquist-Priolo Special Studies Zones Act (now known as the Alquist-Priolo Earthquake Fault Zoning Act) was passed into law. As revised in 2018, The Act defines "Holocene-active" Faults utilizing the same aging criteria as that used by California Geological Survey (CGS). However, established state policy has been to zone only those faults which have direct evidence of movement within the last 11,700 years. It is this recency of fault movement that the CGS considers as a characteristic for faults that have a relatively high potential for ground rupture in the future.

CGS policy is to delineate a boundary from 200 to 500 feet wide on each side of the Holocene-Active fault trace based on the location precision, the complexity, or the regional significance of the fault. If a site lies within an Earthquake Fault Zone, a geologic fault rupture investigation must be performed that demonstrates that the proposed building site is not threatened by surface displacement from the fault before development permits may be issued.

Ground rupture is defined as surface displacement which occurs along the surface trace of the causative fault during an earthquake. Based on research of available literature, no known Holocene-active or Pre-Holocene faults underlie the subject site. In addition, the subject site is not located within an Alquist-Priolo Earthquake Fault Zone. Based on these considerations, the potential for surface ground rupture at the subject site is considered low.

Liquefaction

Liquefaction is a phenomenon in which saturated silty to cohesionless soils below the groundwater table are subject to a temporary loss of strength due to the buildup of excess pore pressure during cyclic loading conditions such as those induced by an earthquake. Liquefaction-related effects include loss of bearing strength, amplified ground oscillations, lateral spreading, and flow failures.

The Seismic Hazards Maps of the State of California (CDMG, 2002), does not classify the site as part of the potentially "Liquefiable" area. This determination is based on groundwater depth records, soil type and distance to a fault capable of producing a substantial earthquake.

The subject site is underlain by Older Alluvium and Bedrock of the Lower Topanga Formation and Conejo Volcanics. By nature, bedrock in not considered to be liquefiable. Due to the dense nature of the underlying Older Alluvium, and the hard consistency of the bedrock, it is the opinion of this firm that the potential for liquefaction occurring at the site is considered to be remote.

Dynamic Dry Settlement

Seismically-induced settlement or compaction of dry or moist, cohesionless soils can be an effect related to earthquake ground motion. Such settlements are typically most damaging when the settlements are differential in nature across the length of structures.

Some seismically-induced settlement of the proposed structures should be expected as a result of strong ground-shaking, however, due to the uniform nature of the underlying geologic materials, excessive differential settlements are not expected to occur. The bedrock is not considered susceptible to dynamic dry settlement as well.

Tsunamis, Seiches and Flooding

Tsunamis are large ocean waves generated by sudden water displacement caused by a submarine earthquake, landslide, or volcanic eruption. In the opinion of this firm, the site is high enough and far enough away from the ocean to be susceptible to tsunami inundation hazard.

Seiches are oscillations generated in enclosed bodies of water which can be caused by ground shaking associated with an earthquake. No major water-retaining structures are located immediately up gradient from the project site. Therefore, the risk of flooding from a seismically-induced seiche is considered to be remote. Review of the Ventura County Hazards Appendix indicates seiche is not expected to be a hazard to the site.

A copy of the Flood Insurance Rate Map (FIRM) for the project site is obtained from the FEMA Flood Map Service Center website (https://msc/fema.gov/portal/search) and is provided in the Appendix of this report. Based on review of the FIRM map, the site is located within Zone X (Area of Minimal Flood Hazard).

Landsliding

Review of the Ventura County Hazards Appendix indicates the subject site does not lie within an area of potential earthquake induced landslide hazard area. Therefore, the probability of seismically-induced landslides occurring on the site is considered to be low.

CONCLUSIONS AND RECOMMENDATIONS

Based upon the exploration, laboratory testing, and research, it is the finding of Geotechnologies, Inc. that construction of the proposed project is considered feasible from a geotechnical engineering standpoint provided the advice and recommendations presented herein are followed and implemented during construction.

Between 3 and 37.5 feet of existing fill materials was encountered in the exploratory borings. The fill is underlain by Older Alluvium and bedrock of the Lower Topanga Formation and Conejo Volcanics. Groundwater was not encountered during exploration conducted to a maximum depth of 50 feet below the ground surface.

Majority of the existing fill materials in the proposed building pad areas (Buildings A through E) consist of engineered fill previously placed as part of the mass grading for the creation of the existing building pads and parking lots. However, no records were found for the fill materials located in the northeastern portion of the site (rear of property). Therefore, these fill materials along the northeast portion of the site shall be considered to be uncertified fill.

Based on review of available grading documents for the Project Site, obtained from the City of Thousand Oaks, the proposed Buildings A through E are located across cut/fill transition lines. Preliminarily, it is anticipated that the proposed Building A and Building E will be constructed over a partial to 1 level subterranean level with a finished floor elevation of 682 for the B1 Level.

It is recommended that the existing fill materials and the upper native soils be removed and recompacted to a depth of 3 feet below the bottom of the proposed foundations to create engineered fill pads for the support of the proposed foundations and floor slabs. Subsequent to the recommended removal, the bottom of excavations are anticipated to exposed previously placed engineered fill and/or native soils. The exposed bottoms shall be verified and tested by a representative of this firm prior to placement of compacted fill. Additional removal and recompaction may be required if localized loose soils are encountered during grading. The proposed structures may be constructed on conventional foundations bearing in the newly placed compacted fill pad.

It is recommended that ground improvement techniques be implemented for structures located in the northeastern portion of the subject site. The ground improvements shall be installed below the proposed foundation systems and slabs-on-grade, to densify the uncertified fill materials, and to mitigate the potential settlement within the areas of deep fill for support of the proposed parking structure and Fitness Amenity building.

These ground improvements are designed and installed by design-build foundation contractors, specializing and experienced with these mitigation methods. The design of the ground improvement mitigation method will be an iterative process between the ground improvement specialty contractor, the geotechnical engineer, and the structural engineer. The specialty contractor shall provide material requirements, preliminary spacing, and other design information.

Subsequent to the installation of the ground improvements, it is recommended that the existing fill materials and bedrock be removed and recompacted to a depth of 3 feet below the bottom of the foundations to create an engineered fill pad for support of the proposed parking structure and Fitness Amenity building. Conventional foundations bearing in newly placed controlled fill are recommended for foundation support.

It is anticipated that excavations on the order of 5 to 25 feet in depth for the recommended grading, proposed retaining walls, and subterranean elements for Building A and E and the parking structure. Excavations for the proposed retaining walls and subterranean elements may require the installation of temporary shoring to provide a stable working area due to the proposed depth, nature of the onsite soils, and the proximity of adjacent structures. Shoring recommendations are provided in the "Temporary Excavations" section of this report.

Foundations for small outlying structures, such as property line walls and trash enclosures, which will not be tied-in to the proposed structures may be supported on conventional foundations bearing in properly compacted fill or deepened to bear in native soils. Miscellaneous rigid site structures located in the northeastern portion of the site, such as retaining walls, shall also be supported on ground improvements.

The validity of the conclusions and design recommendations presented herein is dependent upon review of the geotechnical aspects of the proposed construction of this firm. The subsurface conditions described herein have been projected from excavations on the site as indicated and should in no way be construed to reflect any variations which may occur between these excavations or which may result from changes in subsurface conditions. Any changes in the design, as outlined in this report, should be reviewed by this office. The recommendations contained herein should not be considered valid until reviewed and modified or reaffirmed subsequent to such review.

SEISMIC DESIGN CONSIDERATIONS

Shearwave Velocity Measurements

Geophysical measurements were performed at the site by GeoPentech. According to the geophysical study, the average shearwave velocity (V_{S30}) was calculated for each location from the ground surface to a depth of 100 feet. The V_{S30} values varied widely across the site depending on the depth to the very hard volcanic bedrock, with NEHRP site classes ranging from Site Class D ("Stiff Soil) to Site Class B ("Rock"). The results for each survey location are summarized in the table below. The location of proposed structures can be found on the attached Plot Plan.

CALCULATED SITE V_{S30}			
Survey Line	**V_{S30} (ft/sec)**	**NEHRP Site Class**	**Representative Planned Building/Structure**
SW/SR21-1	1,028	D	Parking Structure
SW/SR21-2	3,784	B	Sports Field
SW/SR21-3	4,039	B	Building D
SW/SR21-4	1,450	C	
SW/SR21-5	3,399	B	Building C
SW/SR21-6	3,284	B	
SW/SR21-7	1,583	C	Building B
SW/SR21-8	1,126	D	Building E
SW/SR21-9	1,094	D	Building A

California Building Code Seismic Parameters

Buildings A, E, Parking and Fitness Amenity Structures – CBC Seismic Parameters

Based on information derived from the subsurface investigation, the Site Classification for Buildings A, E, Parking and Fitness Amenity Structures is classified as Site Class D, which corresponds to a "Stiff Soil" Profile, according to Table 20.3-1 of ASCE 7-16. This information and the site coordinates were input into the OSHPD seismic utility program in order to calculate ground motion parameters for the site.

CALIFORNIA BUILDING CODE SEISMIC PARAMETERS FOR BUILDINGS A, E, PARKING AND FITNESS AMENITY STRUCTURES	
California Building Code	2019
ASCE Design Standard	7-16
Risk Category	II
Site Class	D
Mapped Spectral Acceleration at Short Periods (S_S)	1.487g
Site Coefficient (F_a)	1.0
Maximum Considered Earthquake Spectral Response for Short Periods (S_{MS})	1.487g
Five-Percent Damped Design Spectral Response Acceleration at Short Periods (S_{DS})	0.991g
Mapped Spectral Acceleration at One-Second Period (S_1)	0.540g
Site Coefficient (F_v)	1.7*
Maximum Considered Earthquake Spectral Response for One-Second Period (S_{M1})	0.918g*
Five-Percent Damped Design Spectral Response Acceleration for One-Second Period (S_{D1})	0.612g*

* *According to ASCE 7-16, a Long Period Site Coefficient (F_v) of 1.7 may be utilized provided that the value of the Seismic Response Coefficient (C_s) is determined by Equation 12.8-2 for values of $T \leq 1.5T_s$ and taken as equal to 1.5 times the value computed in accordance with either Equation 12.8-3 for $T_L \geq T > 1.5T_s$ or equation 12.8-4 for $T > T_L$. Alternatively, a site-specific ground motion hazard analysis may be performed in accordance with ASCE 7-16 Section 21.1 and/or a ground motion hazard analysis in accordance with ASCE 7-16 Section 21.2 to determine ground motions for any structure.*

Building B & Sports Field – CBC Seismic Parameters

The Site Classification for Building B and miscellaneous structures associated with the Sports Field is classified as Site Class C, which corresponds to a "Very Dense Soil and Soft Rock" Profile, according to Table 20.3-1 of ASCE 7-16. This information and the site coordinates were input into the OSHPD seismic utility program in order to calculate ground motion parameters for the site.

CALIFORNIA BUILDING CODE SEISMIC PARAMETERS FOR BUILINDG B AND SPORTS FIELD	
California Building Code	2019
ASCE Design Standard	7-16
Risk Category	II
Site Class	C
Mapped Spectral Acceleration at Short Periods (S_S)	1.485g
Site Coefficient (F_a)	1.2
Maximum Considered Earthquake Spectral Response for Short Periods (S_{MS})	1.782g
Five-Percent Damped Design Spectral Response Acceleration at Short Periods (S_{DS})	1.188g
Mapped Spectral Acceleration at One-Second Period (S_1)	0.539g
Site Coefficient (F_v)	1.461
Maximum Considered Earthquake Spectral Response for One-Second Period (S_{M1})	0.787g
Five-Percent Damped Design Spectral Response Acceleration for One-Second Period (S_{D1})	0.525g

Buildings C & D – CBC Seismic Parameters

The Site Classification for Buildings C and D is classified as Site Class B, which corresponds to a "Rock" Profile, according to Table 20.3-1 of ASCE 7-16. This information and the site coordinates were input into the OSHPD seismic utility program in order to calculate ground motion parameters for the site.

CALIFORNIA BUILDING CODE SEISMIC PARAMETERS FOR BUILDINGS C AND D	
California Building Code	2019
ASCE Design Standard	7-16
Risk Category	II
Site Class	B
Mapped Spectral Acceleration at Short Periods (S_S)	1.488g
Site Coefficient (F_a)	0.9
Maximum Considered Earthquake Spectral Response for Short Periods (S_{MS})	1.339g
Five-Percent Damped Design Spectral Response Acceleration at Short Periods (S_{DS})	0.893g
Mapped Spectral Acceleration at One-Second Period (S_1)	0.540g
Site Coefficient (F_v)	0.8
Maximum Considered Earthquake Spectral Response for One-Second Period (S_{M1})	0.432g
Five-Percent Damped Design Spectral Response Acceleration for One-Second Period (S_{D1})	0.288g

FILL SOILS

The maximum depth of fill encountered on the site was 37.5 feet located within the lower northeast portion of the site. Majority of the existing fill materials in the proposed building pad areas (Buildings A through E) consist of engineered fill previously placed as part of the mass grading for the creation of the existing building pads and parking lots. However, no records were found for the fill materials located in the northeastern portion of the site (rear of property). Therefore, these fill materials along the northeast portion of the site shall be considered to be uncertified fill. Any fill generated during demolition should be removed and recompacted as controlled fill prior to foundation excavation.

EXPANSIVE SOILS

The onsite geologic materials within the upper 5 feet of the ground surface are in the low to moderate expansion range. The Expansion Index was found to range between 20 and 86 for bulk samples remolded to 90 percent of the laboratory maximum density. The onsite geologic materials within the range of 10 to 35 feet below grade was found to be in the moderate to high expansion range. The Expansion Index was found to be 64 and 114 for bulk sampled remolded to 90 percent of the laboratory maximum density. Recommended reinforcing is provided in the "Foundation Design" and "Slabs On Grade" sections of this report.

SOIL CORROSION POTENTIAL

The results of soil corrosion potential testing performed by HDR Engineering, Inc. indicate that the electrical resistivities of the soil were in the mildly corrosive and corrosive categories with as-received moisture, and in the corrosive category when saturated. Soil pH values varied from 7.1 to 7.4, indicated nearly neutral to mildly alkaline condition and do not particularly increase soil corrosivity. The soluble salt content was low. The nitrate concentration was high enough to be aggressive to copper in sample B8, however the nitrate concentration was low in the other samples. Ammonium was not detected.

In summary, the soil is classified as corrosive to ferrous metals and aggressive to copper. Sulfate exposure is considered to be negligible, and therefore, there are no restrictions on the type of cement to be utilized for concrete in contact with the underlying soils. Detailed results, discussion of results and recommended mitigating measures are provided within the report by HDR Engineering, Inc. presented herein.

GROUND IMPROVEMENT

Up to 37.5 feet of existing fill was encountered in the exploratory borings. No records were found for the fill materials located in the northeastern portion of the site (rear of property). Therefore, these fill materials along the northeast portion of the site shall be considered to be uncertified fill. It is recommended that ground improvement techniques be implemented for structures located in the northeastern portion of the subject site. The ground improvements shall be installed below the proposed foundation systems and slabs-on-grade, to densify the uncertified fill materials, and to mitigate the potential settlement within the areas of deep fill for support of the proposed parking structure and Fitness Amenity building.

A qualified ground improvement contractor should be retained to aid in the selection and implementation of an appropriate ground improvement method. At this time, it is anticipated the most feasible ground improvement technique would consist of the installation of rammed aggregate piers or vibrated stone columns.

Geotechnologies, Inc. must be consulted during the ground improvement method selection, design, and installation process. In addition, it may be necessary for the local building official to review and approve the proposed design. This office shall review and approve any ground improvement plans prior to implementation.

It will be necessary during construction to demonstrate through subsurface exploration, testing, and analysis that the applied ground improvement successfully achieved the recommended level of mitigation. It is recommended the construction schedule incorporate this requirement. Exploration, testing, and analysis of the improved subgrade soils will take several weeks to complete, and it may be necessary for the local building official to review and approve the analysis prior to foundation construction. In order to minimize delays to construction, it is suggested the exploration and testing be completed as soon as possible following the completion of ground improvements.

GRADING GUIDELINES

The following guidelines may be used in preparation of the grading plan and job specification for any areas where fill or recompaction may be required, such as the building subgrade area, or driveway and sidewalk areas.

Site Preparation

- A thorough search should be made for possible underground utilities and/or structures. Any existing or abandoned utilities or structures located within the footprint of the proposed grading should be removed or relocated as appropriate.
- All vegetation, existing fill, and soft or disturbed geologic materials should be removed from the areas to receive controlled fill. All existing fill materials and any disturbed geologic materials resulting from grading operations shall be completely removed and properly recompacted prior to foundation excavation.
- Any vegetation or associated root system located within the footprint of the proposed structures should be removed during grading.
- Subsequent to the indicated removals, the exposed grade shall be scarified to a depth of six inches, moistened to optimum moisture content, and recompacted in excess of the minimum required comparative density.
- The excavated areas shall be observed by the geotechnical engineer prior to placing compacted fill.

Recommended Building Pads

It is recommended that the existing fill materials and the upper native soils be removed and recompacted to a depth of 3 feet below the bottom of the proposed foundations to create engineered fill pads for the support of the proposed foundations and floor slabs. Subsequent to the recommended removal, the bottom of excavations are anticipated to exposed previously placed engineered fill and/or native soils. The exposed bottoms shall be verified and tested by a representative of this firm prior to placement of compacted fill. Additional removal and recompaction may be required if localized loose soils are encountered during grading.

In addition, the excavation shall extend at least three feet beyond the edge of foundations or for a distance equal to the depth of fill below the foundations, whichever is greater. It is very important that the positions of the proposed structures are accurately located so that the limits of the graded area are accurate and the grading operation proceeds efficiently.

Fill Slopes

Compacted fill slopes should not be steeper than a 2:1 (h:v) slope gradient. Sidehill fills should have a keyway placed at the toe of the proposed fill slope. This key should be cut a minimum of 3 feet into the approved native soils and/or bedrock. The base of the key shall be sloped back into the hill. Where slopes are steeper than 5:1 (h:v), horizontal benches shall be cut into bedrock in order to provide both lateral and vertical stability.

Sidehill fills shall have backdrains installed at the compacted fill/bedrock contact to prevent future poor water pressure buildup. Backdrains shall consist of four-inch perforated pipes; placed with perforations down. The pipe should be encased with at least one foot (1') of gravel. The minimum cover on the pipe should be one foot (1'). The gravel should consist of three-quarter inch (¾") to one inch (1") crushed rock.

The first drain shall be placed no higher than three feet above the front cut of the key excavation. Additional backdrains shall be placed at intervals roughly equivalent to 15 feet of vertical rise in elevation or where considered necessary by the representative of this firm.

Each drain shall be placed into a trench excavated along the back of a horizontal bench at the fill/bedrock contact. The trench bottom shall slope downward to each exit drain with a minimum gradient of two percent. The exit pipe shall consist of a four-inch diameter non-perforated pipe. This pipe need not be encased in gravel. It shall exit at a minimum gradient of two percent to the finish face of the fill slope. A cutoff wall consisting of concrete or soil cement shall be placed at the junction of the perforated pipe and the exit drains to stop seepage and force the water being removed into the perforated pipe.

Materials excavated uphill from where fills are to be placed, shall not be cast over the slope into the fill area. Materials shall be channeled down a ramp to the area to receive compacted fill and then spread in horizontal layers. As compacted fills are placed, this ramp will be trimmed out to expose the dense, tight materials approved by the soils engineer. The minimum vertical height of bench in approved materials shall be three feet. This will maintain the proper benching, as fill is placed up the slope. The ramp will be shifted periodically during the grading operations to allow for complete removal of the loose fill materials and for the proper benching.

A minimum compaction of 90 percent out to the finish face of fill slopes will be required. Compaction on slopes may be achieved by over building the slope and cutting back to the compacted core or by direct compaction of the slope face with suitable equipment. Direct compaction on the slope faces shall be accomplished by back-rolling the slopes in three foot to four foot increments of elevation gain.

Compaction

All fill should be mechanically compacted in layers not more than 8 inches thick. The materials placed should be moisture conditions to within 3 percent of the optimum moisture content of the particular material placed. Materials larger than 6 inches in maximum dimension shall not be used in the fill. All fill shall be compacted to at least 90 percent of the maximum laboratory density for the materials used. The maximum density shall be determined by the laboratory operated by Geotechnologies, Inc. in general accordance with the most recent revision of ASTM D 1557.

Field observation and testing shall be performed by a representative of the geotechnical 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 a minimum of 90 percent compaction is obtained.

Acceptable Materials

The excavated onsite materials are considered satisfactory for reuse in the controlled fills as long as any debris and/or organic matter is removed. Any imported materials shall be observed and tested by the representative of the geotechnical engineer prior to use in fill areas. Imported materials should contain sufficient fines so as to be relatively impermeable and result in a stable subgrade when compacted. Any required import materials should consist of geologic materials with an expansion index of less than 90. The water-soluble sulfate content of the import materials should be less than 0.1% percentage by weight.

Imported materials should be free from chemical or organic substances which could affect the proposed development. A competent professional should be retained in order to test imported materials and address environmental issues and organic substances which might affect the proposed development.

Utility Trench Backfill

Utility trenches should be backfilled with controlled fill. The utility should be bedded with clean sands at least one foot over the crown. The remainder of the backfill may be onsite soil compacted to 90 percent of the laboratory maximum density. Utility trench backfill should be tested by representatives of this firm in general accordance with the most recent revision of ASTM D 1557.

Wet Soils

At the time of exploration, the soils which will be exposed during grading were locally above optimum moisture content. It is anticipated that the excavated material to be placed as compacted fill, and the materials exposed at the bottom of excavated plane may require drying and aeration prior to recompaction.

Pumping (yielding or vertical deflection) of the high-moisture content soils at the bottom of the excavation may occur during operation of heavy equipment. Where pumping is encountered, angular minimum ¾-inch gravel and/or crushed concrete should be placed and worked into the subgrade. The exact thickness of the gravel would be a trial and error procedure, and would be determined in the field. It would likely be on the order of 1 to 2 feet thick.

The gravel will help to densify the subgrade as well as function as a stabilization material upon which heavy equipment may operate. It is not recommended that rubber tire construction equipment attempt to operate directly on the pumping subgrade soils prior to placing the gravel. Direct operation of rubber tire equipment on the soft subgrade soils will likely result in excessive disturbance to the soils, which in turn will result in a delay to the construction schedule since those disturbed soils would then have to be removed and properly recompacted. Extreme care should be utilized to place gravel as the subgrade becomes exposed.

Bulking and Shrinkage

Shrinkage results when a volume of soil removed at one density is compacted to a higher density. A shrinkage factor between 5 and 15 percent should be anticipated when excavating and recompacting the existing fill and underlying native geologic materials on the site to an average comparative compaction of 92 percent.

Weather Related Grading Considerations

When rain is forecast all fill that has been spread and awaits compaction shall be properly compacted prior to stopping work for the day or prior to stopping due to inclement weather. These fills, once compacted, shall have the surface sloped to drain to an area where water can be removed.

Temporary drainage devices should be installed to collect and transfer excess water to the street in non-erosive drainage devices. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundation or retaining wall. Drainage should not be allowed to flow uncontrolled over any descending slope.

Work may start again, after a period of rainfall, once the site has been reviewed by a representative of this office. Any soils saturated by the rain shall be removed and aerated so that the moisture content will fall within three percent of the optimum moisture content.

Surface materials previously compacted before the rain shall be scarified, brought to the proper moisture content and recompacted prior to placing additional fill, if considered necessary by a representative of this firm.

Geotechnical Observations and Testing During Grading

Geotechnical observations and testing during grading are considered to be a continuation of the geotechnical investigation. It is critical that the geotechnical aspects of the project be reviewed by representatives of Geotechnologies, Inc. during the construction process. Compliance with the design concepts, specifications or recommendations during construction requires review by this firm during the course of construction. Any fill which is placed should be observed, tested, and verified if used for engineered purposes. Please advise this office at least twenty-four hours prior to any required site visit.

Proper compaction is necessary to reduce settlement of overlying improvements. Some settlement of compacted fill should be anticipated. Any utilities supported therein should be designed to accept differential settlement. Differential settlement should also be considered at the points of entry to the structure.

FOUNDATION DESIGN

Following completion of the recommended removal and recompaction, and the installation of ground improvement and verification that the recommended level of mitigation has been achieved, where necessary, all proposed structures may be supported on conventional foundations bearing in the newly placed compacted fill pad. The bearing capacity provided herein should be reviewed, reconfirmed, and revised (if necessary) following exploration, testing, and analysis of the improved subgrade soils.

Conventional

Continuous foundations may be designed for a bearing capacity of 3,000 pounds per square foot, and should be a minimum of 12 inches in width, 24 inches in depth below the lowest adjacent grade and 24 inches into the recommended bearing material.

Column foundations may be designed for a bearing capacity of 3,500 pounds per square foot, and should be a minimum of 24 inches in width, 24 inches in depth below the lowest adjacent grade and 24 inches into the recommended bearing material.

The bearing capacity increase for each additional foot of width is 125 pounds per square foot. The bearing capacity increase for each additional foot of depth is 500 pounds per square foot. The maximum recommended bearing capacity is 6,000 pounds per square foot.

The bearing capacities indicated above are 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.

All continuous foundations should be reinforced with a minimum of four #4 steel bars. Two should be placed near the top of the foundation, and two should be placed near the bottom.

Miscellaneous Foundations

Conventional foundations for structures such as privacy walls or trash enclosures which will not be rigidly connected to the proposed structures may bear in proper compacted fill or native soils. Continuous footings may be designed for a bearing capacity of 1,500 pounds per square foot, and should be a minimum of 12 inches in width, 18 inches in depth below the lowest adjacent grade and 18 inches into the recommended bearing material. No bearing capacity increases are recommended.

Since the recommended bearing capacity is a net value, the weight of concrete in the foundations may be taken as 50 pounds per cubic foot and the weight of the soil backfill may be neglected when determining the downward load on the foundations.

Lateral Design

Resistance to lateral loading may be provided by friction acting at the base of foundations and by passive earth pressure. An allowable coefficient of friction of 0.3 may be used with the dead load forces.

Passive geologic pressure for the sides of foundations poured against undisturbed or recompacted soil may be computed as an equivalent fluid having a density of 250 pounds per cubic foot with a maximum earth pressure of 3,000 pounds per square foot. The passive and friction components may be combined for lateral resistance without reduction. A one-third increase in the passive value may be used for short duration loading such as wind or seismic forces.

Foundation Settlement

Settlement of the foundation system is expected to occur on initial application of loading. The maximum settlement is not expected to exceed 1 inch and occur below the heaviest loaded columns. Differential settlement is not expected to exceed ½ inch.

Modulus of Subgrade Reaction

Mat foundations may be required for supported of shearwalls and/or combined footings. Where necessary, a unit modulus of subgrade reaction of 250 pounds per cubic inch may be utilized for design of mat foundations. This value is a unit value for use with a one-foot square footing. The modulus should be reduced in accordance with the following equation when used with the larger footings:

$$K = K_1*[(B+1)/(2*B)]^2$$

Where:
K = Reduced Subgrade Modulus
K_1 = Unit Subgrade Modulus
B = Foundation Width (feet)

Foundation Observations

It is critical that all foundation excavations are observed by a representative of this firm to verify penetration into the recommended bearing materials. The observation should be performed prior to the placement of reinforcement. Foundations should be deepened to extend into satisfactory geologic materials, if necessary. Foundation excavations should be cleaned of all loose soils prior to placing steel and concrete. Any required foundation backfill should be mechanically compacted, flooding is not permitted.

RETAINING WALL DESIGN

Retaining walls on the order of 5 to 25 feet in height may be required as part of the proposed development. Retaining walls may be designed as indicated below, depending on whether the walls will be restrained or cantilevered. Retaining wall foundations may be designed in accordance with the provisions of the "Foundation Design" section of this report.

Additional pressure should be added to the retaining wall design for a surcharge condition due to adjacent structures or vehicular traffic. Information regarding the depth, configuration and loading of adjacent foundation will be required in order to determine the additional surcharge loading.

For traffic surcharge, the upper 10 feet of any retaining wall adjacent to streets, driveways or parking areas should be designed to resist a uniform lateral pressure of 100 pounds per square foot, acting as a result of an assumed 300 pounds per square foot traffic surcharge. If the traffic is more than 10 feet from the retaining walls, the traffic surcharge may be neglected.

Cantilever Retaining Walls

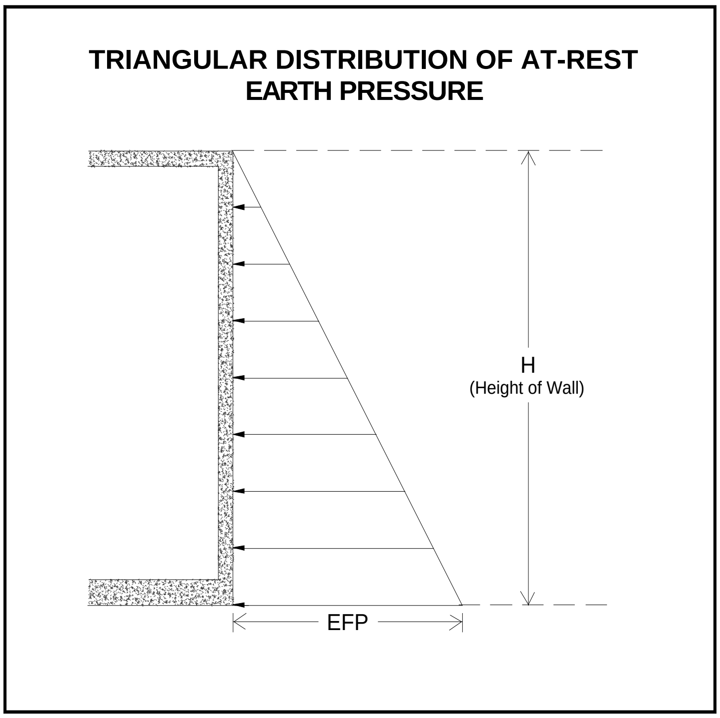
Retaining walls supporting a level backslope may be designed utilizing a triangular distribution of pressure. Cantilever retaining walls may be designed utilizing the following table:

HEIGHT OF WALL (feet)	EQUIVALENT FLUID PRESSURE (pounds per cubic foot)
Up to 25	42

This lateral earth pressure assumes that a permanent drainage system will be installed so that external water pressure will not be developed against the walls. Additional active pressure should be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent structures.

Restrained Drained Retaining Walls

Restrained retaining walls may be designed to resist a triangular pressure distribution of at-rest earth pressure as indicated in the diagram below. For the purpose of designing restrained retaining walls up to 25 feet in height, the at-rest pressure would be 72 pounds per cubic foot. Additional earth pressure should be added for a surcharge condition due to sloping ground, vehicular traffic or adjacent structures.



In addition to the recommended earth pressure, the upper ten feet of the retaining wall adjacent to streets, driveways or parking areas should be designed to resist a uniform lateral pressure of 100 pounds per square foot, acting as a result of an assumed 300 pounds per square foot surcharge behind the walls due to normal street traffic. If the traffic is kept back at least ten feet from the retaining walls, the traffic surcharge may be neglected.

The lateral earth pressures recommended above for retaining walls assume that a permanent drainage system will be installed so that external water pressure will not be developed against the walls. Also, where necessary, the retaining walls should be designed to accommodate any surcharge pressures that may be imposed by adjacent traffic and existing structures.

Dynamic (Seismic) Earth Pressure

Retaining walls exceeding 6 feet in height shall be designed to resist the additional earth pressure caused by seismic ground shaking. A triangular pressure distribution should be utilized for the additional seismic loads, with an equivalent fluid pressure of 20 pounds per cubic foot. When using the load combination equations from the building code, the seismic earth pressure should be combined with the lateral active earth pressure for analyses of restrained basement walls under seismic loading condition. The dynamic earth pressure may be omitted where the retaining wall are less than 6 feet in height.

Retaining Wall Drainage

All retaining walls shall be provided with a subdrain system in order to minimize the potential for future hydrostatic pressure buildup behind the proposed retaining walls. Subdrains may consist of 4-inch diameter perforated pipes, places with perforated facing down. The pipe shall be encased in at least one foot of gravel around the pipe. The gravel shall be wrapped in filter fabric. The gravel may consist of three-quarter inch to one-inch crushed rock.

As an alternative, the use of gravel pockets and weepholes is an acceptable drainage method. Weepholes shall be a minimum of 2 inches in diameter, placed at 8 feet on center along the base of the wall. Gravel pockets shall be a minimum of 1 cubic foot in dimension, and may consist of three-quarter inch to once inch crushed rock, wrapped in filter fabric.

Certain types of subdrain pipe are not acceptable to the various municipal agencies, it is recommended that prior to purchasing subdrainage pipe, the type and brand is cleared with the proper municipal agencies. Subdrainage pipes should outlet to an acceptable location.

Where retaining walls are to be constructed adjacent to property lines there is usually not enough space for emplacement of a standard pipe and gravel drainage system. Under these circumstances, the use of a flat drainage product is acceptable. Some municipalities do not allow the use of flat-drainage products. The use of such a product should be researched with the building official.

Where shoring will not allow the installation of a standard subdrainage system outside the wall rock pockets may be utilized. The rock pockets should drain through the wall. The pockets should be a minimum of 12 inches in length, width and depth. The pocket should be filled with gravel. The rock pockets should be no more than 8 feet on center. A collector is placed within the gravel which directs collected waters through the wall to a sump or standard pipe and gravel system constructed under the slab. This method should be approved by the retaining wall designer prior to implementation.

Sump Pump Design

The purpose of the recommended retaining wall backdrainage system is to relieve hydrostatic pressure. Groundwater was not encountered during exploration to a depth of 50 feet which corresponds to an elevation of 627.4 feet above MSL. Therefore, the only water which could affect the proposed retaining walls would be irrigation waters and precipitation. Additionally, the proposed site grading is such that all drainage is directed to the street and the structure has been designed with adequate non-erosive drainage devices.

Based on these considerations the retaining wall backdrainage system is not expected to experience an appreciable flow of water, and in particular, no groundwater will affect it. However, for the purposes of design, a flow of 5 gallons per minute may be assumed.

Waterproofing

Moisture effecting retaining walls is one of the most common post construction complaints. Poorly applied or omitted waterproofing can lead to efflorescence or standing water inside the building. Efflorescence is a process in which a powdery substance is produced on the surface of the concrete by the evaporation of water. The white powder usually consists of soluble salts such as gypsum, calcite, or common salt. Efflorescence is common to retaining walls and does not affect their strength or integrity.

Waterproofing is recommended for retaining walls. Waterproofing design and inspection of its installation is not the responsibility of the geotechnical engineer. A qualified waterproofing consultant should be retained in order to recommend a product or method which would provide protection to below grade walls.

Retaining Wall Backfill

Any required backfill should be mechanically compacted in layers not more than 8 inches thick, to at least 90 percent of the maximum density in general accordance with the most recent revision of ASTM D 1557 method of compaction. Flooding should not be permitted. Compaction within 5 feet, measured horizontally, behind a retaining structure should be achieved by use of light weight, hand operated compaction equipment.

Proper compaction of the backfill will be necessary to reduce settlement of overlying walks and paving. Some settlement of required backfill should be anticipated, and any utilities supported therein should be designed to accept differential settlement, particularly at the points of entry to the structure.

TEMPORARY EXCAVATIONS

Excavations on the order of 5 to 25 feet in vertical height will be required for the recommended grading, and excavation for the proposed subterranean levels. The excavations are expected to expose fill, older alluvium and bedrock, which are suitable for vertical excavations up to 5 feet where not surcharged by adjacent traffic or structures. Excavations which will be surcharged by adjacent traffic or structures should be shored.

Where sufficient space is available, temporary unsurcharged embankments exposing fill and/or native soils may be sloped back at a uniform 1:1 (h:v) slope gradient in its entirety to a maximum height of 25 feet. Where the volcanic bedrock is exposed, temporary unsurcharged excavation may be sloped back at a uniform ½:1 (h:v) slope gradient in its entirety to a maximum height of 25 feet. A uniform sloped excavation is sloped from bottom to top and does not have a vertical component. Sloped excavations with vertical cuts at the toe of the slope are not recommended.

Where sloped embankments are utilized, the tops of the slopes should be barricaded to prevent vehicles and storage loads near the top of slope within a horizontal distance equal to the depth of the excavation. If the temporary construction embankments are to be maintained during the rainy season, berms are strongly recommended along the tops of the slopes to prevent runoff water from entering the excavation and eroding the slope faces. The soils exposed in the cut slopes should be inspected during excavation by personnel from this office so that modifications of the slopes can be made if variations in the soil condition occur.

It is critical that the soils exposed in the cut slopes are observed by a representative of this office during excavation so that modifications of the slopes can be made if variations in the earth material conditions occur. All excavations should be stabilized within 30 days of initial excavation. Water should not be allowed to pond on top of the excavation nor to flow towards it.

Excavation Observations

It is critical that the soils exposed in the cut slopes are observed by a representative of Geotechnologies, Inc. during excavation so that modifications of the slopes can be made if variations in the geologic material conditions occur. Many building officials require that temporary excavations should be made during the continuous observations of the geotechnical engineer. All excavations should be stabilized within 30 days of initial excavation.

SHORING DESIGN

The following information on the design and installation of the shoring is as complete as possible at this time. It is suggested that Geotechnologies, Inc. review the final shoring plans and specifications prior to bidding or negotiating with a shoring contractor.

The recommended method of shoring would consist of steel soldier piles, placed in drilled holes and backfilled with concrete. The soldier piles may be designed as cantilevers or laterally braced utilizing drilled tied-back anchors or raker braces.

Soldier Piles – Drilled and Poured

Drilled cast-in-place soldier piles should be placed no closer than two diameters on center. The minimum diameter of the piles is 18 inches. Structural concrete should be used for the soldier piles below the excavation; lean-mix concrete may be employed above that level. As an alternative, lean-mix concrete may be used throughout the pile where the reinforcing consists of a wideflange section. The slurry must be of sufficient strength to impart the lateral bearing pressure developed by the wideflange section to the geologic materials. For design purposes, an allowable passive value for the geologic materials below the bottom plane of excavation, may be assumed to be 600 pounds per square foot per foot. To develop the full lateral value, provisions should be implemented to assure firm contact between the soldier piles and the undisturbed geologic materials.

The frictional resistance between the soldier piles and retained geologic material may be used to resist the vertical component of the anchor load. The coefficient of friction may be taken as 0.30 based on uniform contact between the steel beam and lean-mix concrete and retained earth. The portion of soldier piles below the plane of excavation may also be employed to resist the downward loads. The downward capacity may be determined using a frictional resistance of 350 pounds per square foot. The minimum depth of embedment for shoring piles is 5 feet below the bottom of the footing excavation or 7 feet below the bottom of excavated plane whichever is deeper.

Casing may be required should caving be experienced in the granular (saturated) geologic materials. If casing is used, extreme care should be employed so that the pile is not pulled apart as the casing is withdrawn. At no time should the distance between the surface of the concrete and the bottom of the casing be less than 5 feet.

Lagging

Soldier piles and anchors should be designed for the full anticipated pressures. Due to arching in the geologic materials, the pressure on the lagging will be less. It is recommended that the lagging should be designed for the full design pressure but may be limited to a maximum of 400 pounds per square foot. It is recommended that a representative of this firm observe the installation of lagging to insure uniform support of the excavated embankment.

Tied-Back Anchors

Tied-back anchors may be used to resist lateral loads. Friction anchors are recommended. For design purposes, it may be assumed that the active wedge adjacent to the shoring is defined by a plane drawn 35 degrees with the vertical through the bottom plane of the excavation. Friction anchors should extend a minimum of 20 feet beyond the potentially active wedge.

Drilled friction anchors may be designed for a skin friction of 350 pounds per square foot. Only the frictional resistance developed beyond the active wedge would be effective in resisting lateral loads. Where belled anchors are utilized, the capacity of belled anchors may be designed by applying the skin friction over the surface area of the bonded anchor shaft. The diameter of the bell may be utilized as the diameter of the bonded anchor shaft when determining the surface area. This implies that in order for the belled anchor to fail, the entire parallel soil column must also fail.

Depending on the techniques utilized, and the experience of the contractor performing the installation, it is anticipated that a skin friction of 2,500 pounds per square foot could be utilized for post-grouted anchors. Only the frictional resistance developed beyond the active wedge would be effective in resisting lateral loads.

Anchors should be placed at least 6 feet on center to be considered isolated. It is recommended that at least 3 of the initial anchors have their capacities tested to 200 percent of their design capacities for a 24-hour period to verify their design capacity.

The total deflection during this test should not exceed 12 inches. The anchor deflection should not exceed 0.75 inches during the 24 hour period, measured after the 200 percent load has been applied. All anchors should be tested to at least 150 percent of design load. The total deflection during this test should not exceed 12 inches.

The rate of creep under the 150 percent test load should not exceed 0.1 inch over a 15-minute period in order for the anchor to be approved for the design loading. After a satisfactory test, each anchor should be locked-off at the design load. This should be verified by rechecking the load in the anchor. The load should be within 10 percent of the design load. Where satisfactory tests are not attained, the anchor diameter and/or length should be increased or additional anchors installed until satisfactory test results are obtained. The installation and testing of the anchors should be observed by the geotechnical engineer. Minor caving during drilling of the anchors should be anticipated.

Anchor Installation

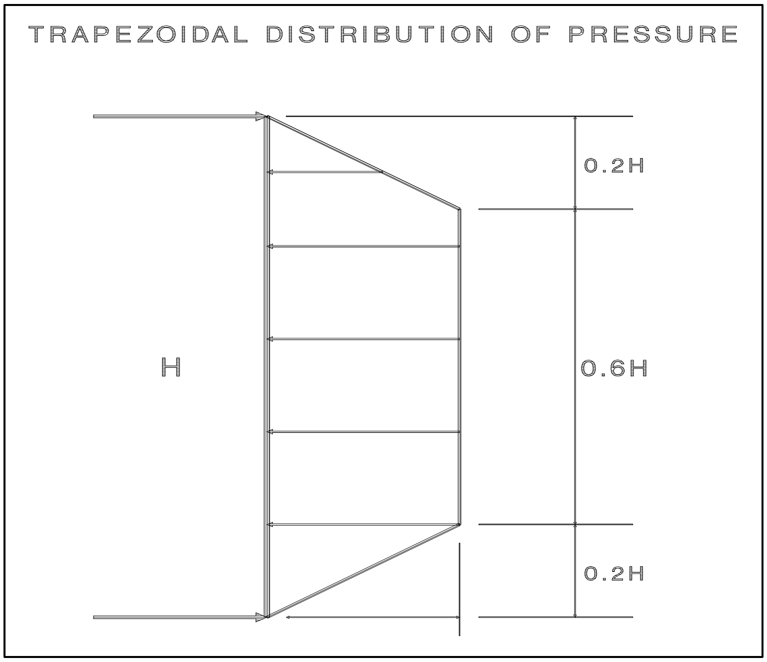
Tied-back anchors may be installed between 20 and 40 degrees below the horizontal. Caving of the anchor shafts, particularly within sand deposits, should be anticipated and the following provisions should be implemented in order to minimize such caving. The anchor shafts should be filled with concrete by pumping from the tip out, and the concrete should extend from the tip of the anchor to the active wedge. In order to minimize the chances of caving, it is recommended that the portion of the anchor shaft within the active wedge be backfilled with sand before testing the anchor. This portion of the shaft should be filled tightly and flush with the face of the excavation. The sand backfill should be placed by pumping; the sand may contain a small amount of cement to facilitate pumping.

Lateral Pressures

Cantilevered shoring supporting a level backslope may be designed utilizing a triangular distribution of pressure as indicated in the following table:

HEIGHT OF SHORING "H" (feet)	EQUIVALENT FLUID PRESSURE (pounds per cubic foot)
Up to 25	32

A trapezoidal distribution of lateral earth pressure would be appropriate where shoring is to be restrained at the top by bracing or tie backs, with the trapezoidal distribution as shown in the diagram below.



Restrained shoring supporting a level backslope may be designed utilizing a trapezoidal distribution of pressure as indicated in the following table:

HEIGHT OF SHORING "H" (feet)	DESIGN SHORING FOR (Where H is the height of the wall)
Up to 25	20H

Where a combination of sloped embankment and shoring is utilized, the pressure will be greater and must be determined for each combination. Additional active pressure should be applied where the shoring will be surcharged by adjacent traffic or structures. Where a combination of sloped embankment and shoring is utilized, the pressure will be greater and must be determined for each combination.

Deflection

It is difficult to accurately predict the amount of deflection of a shored embankment. It should be realized that some deflection will occur. It is estimated that the deflection could be on the order of one inch at the top of the shored embankment. If greater deflection occurs during construction, additional bracing may be necessary to minimize settlement of adjacent buildings and utilities in adjacent street and alleys. If desired to reduce the deflection, a greater active pressure could be used in the shoring design. Where internal bracing is used, the rakers should be tightly wedged to minimize deflection. The proper installation of the raker braces and the wedging will be critical to the performance of the shoring.

Limiting shoring deflection to ½ inch at the top of the shored embankment where a structure is within a 1:1 plane projected up from the base of the excavation. A maximum deflection of 1-inch has been allowed provided there are no structures within a 1:1 plane drawn upward from the base of the excavation.

Monitoring

Because of the depth of the excavation, some means of monitoring the performance of the shoring system is suggested. The monitoring should consist of periodic surveying of the lateral and vertical locations of the tops of all soldier piles and the lateral movement along the entire lengths of selected soldier piles. Also, some means of periodically checking the load on selected anchors will be necessary, where applicable.

Shoring Observations

It is critical that the installation of shoring is observed by a representative of Geotechnologies, Inc. Many building officials require that shoring installation should be performed during continuous observation of a representative of the geotechnical engineer. The observations insure that the recommendations of the geotechnical report are implemented and so that modifications of the recommendations can be made if variations in the geologic material or groundwater conditions warrant. The observations will allow for a report to be prepared on the installation of shoring for the use of the local building official, where necessary.

Raker Brace Foundations

An allowable bearing pressure of 4,000 pounds per square foot may be used for the design a raker foundations. This bearing pressure is based on a raker foundation a minimum of 4 feet in width and length as well as 4 feet in depth. The base of the raker foundations should be horizontal. Care should be employed in the positioning of raker foundations so that they do not interfere with the foundations for the proposed structure.

SLABS ON GRADE

Concrete Slabs-on Grade

Concrete floor slabs should be a minimum of 4 inches in thickness, and should be reinforced with a minimum of #4 bars on 16-inches center each way. Slabs-on-grade should be cast over undisturbed natural geologic materials or properly controlled fill materials. Any geologic materials loosened or over-excavated should be wasted from the site or properly compacted to 90 percent of the maximum dry density.

Outdoor concrete flatwork should be a minimum of 4 inches in thickness, and should be reinforced with a minimum of #3 bars on 18-inches center each way. Outdoor concrete flatwork should be cast over undisturbed natural geologic materials or properly controlled fill materials. Any geologic materials loosened or over-excavated should be wasted from the site or properly compacted to 90 percent of the maximum dry density.

Design of Slabs That Receive Moisture-Sensitive Floor Coverings

Geotechnologies, Inc. does not practice in the field of moisture vapor transmission evaluation and mitigation. Therefore, where necessary, it is recommended that a qualified consultant should be engaged to evaluate the general and specific moisture vapor transmission paths and any impact on the proposed construction. The qualified consultant should provide recommendations for mitigation of potential adverse impacts of moisture vapor on various components of the structure.

Where any dampness would be objectionable or where the slab will be cast below the historic high groundwater level, it is recommended that floor slabs should be waterproofed. A qualified waterproofing consultant should be engaged in order to recommend a product and/or method which would provide protection from unwanted moisture.

Based on ACI 302.2R-30, Chapter 7, for projects which do not have vapor sensitive coverings or humidity-controlled areas, a vapor retarder/barrier is not necessary. Where a vapor retarder/barrier is considered necessary, the design of the slab and the installation of the vapor retarder/barrier should comply with the most recent revisions of ASTM E 1643 and ASTM E 1745. The vapor retarder/barrier should comply with ASTM E 1745 Class A requirements. The necessity of a vapor retarder/barrier is not a geotechnical issue and should be confirmed by qualified members of the design team.

Based on ACI 302.2R-30, Chapter 7, for projects with vapor sensitive coverings, a vapor retarder/ barrier should be provided. Figure 7.1 shows that the slab should be poured on the vapor retarder/barrier. The ACI guide notes in 5.2.3.2 that the decision to locate the vapor retarder/barrier in direct contact with the slab's underside had long been debated. Experience has shown, however, that the greatest level of protection for floor coverings, coating, or building environments is provided when the vapor retarder/barrier is placed in direct contact with the slab.

The necessity of a vapor retarder as well as the use of dry granular material, as discussed above is not a geotechnical issue and should be confirmed by qualified members of the design team. Where a vapor retarder/barrier is used, it should be placed on a level and compact subgrade. Precautions should be taken to protect the vapor retarder/barrier from damage during installation of reinforcing, utilities and concrete. The use of stakes driven thought the vapor retarder/barrier should be avoided. Repair any damaged areas of the vapor retarder/barrier prior to concrete placement.

Concrete Crack Control

The recommendations presented in this report are intended to reduce the potential for cracking of concrete slabs-on-grade due to settlement. However even where these recommendations have been implemented, foundations, stucco walls and concrete slabs-on-grade may display some cracking due to minor soil movement and/or concrete shrinkage. The occurrence of concrete cracking may be reduced and/or controlled by limiting the slump of the concrete used, proper concrete placement and curing, and by placement of crack control joints at reasonable intervals, in particular, where re-entrant slab corners occur.

For standard control of concrete cracking, a maximum crack control joint spacing of 12 feet should not be exceeded. Lesser spacings would provide greater crack control. Joints at curves and angle points are recommended. The crack control joints should be installed as soon as practical following concrete placement. Crack control joints should extend a minimum depth of one-fourth the slab thickness. Construction joints should be designed by a structural engineer.

Complete removal of the existing fill soils beneath outdoor flatwork such as walkways or patio areas, is not required, however, due to the rigid nature of concrete, some cracking, a shorter design life and increased maintenance costs should be anticipated. In order to provide uniform support beneath the flatwork it is recommended that a minimum of 12 inches of the exposed subgrade beneath the flatwork be scarified and recompacted to 90 percent relative compaction.

PAVEMENTS

Prior to placing paving, the existing grade should be scarified to a depth of 12 inches, moistened as required to obtain optimum moisture content, and recompacted to 90 percent of the maximum density as determined by the most recent revision of ASTM D 1557. The design team should be aware that removal of all existing fill in the area of new paving is not required, however, pavement constructed in this manner will most likely have a shorter design life and increased maintenance costs. The following pavement sections are recommended:

Service	Asphalt Pavement Thickness Inches	Base Course Inches
Passenger Cars	4	6
Moderate Truck	5	9

Concrete paving may also be used on the project. For passenger cars and moderate truck traffic, concrete paving should be 6 inches of concrete over 4 inches of compacted base. For standard crack control maximum expansion joint spacing of 12 feet should not be exceeded. Lesser spacings would provide greater crack control. Joints at curves and angle points are recommended. Concrete paving should be reinforced with a minimum of #3 steel bars on 18-inch centers each way.

Aggregate base should be compacted to a minimum of 95 percent of the most recent revision of ASTM D 1557 laboratory maximum dry density. Base materials should consist of Crushed Aggregate Base which conform with Section 200-2.2 of the most recent edition of “Standard Specifications for Public Works Construction”, (Green Book).

SITE DRAINAGE

Proper surface drainage is critical to the future performance of the project. Saturation of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Proper site drainage should be maintained at all times.

All site drainage, with the exception of any required to disposed of onsite by stormwater regulations, should be collected and transferred to the street in non-erosive drainage devices. The proposed structure should be provided with roof drainage. Discharge from downspouts, roof drains and scuppers should not be permitted on unprotected soils within five feet of the building perimeter. Drainage should not be allowed to pond anywhere on the site, and especially not against any foundation or retaining wall. Drainage should not be allowed to flow uncontrolled over any descending slope. Planters which are located within a distance equal to the depth of a retaining wall should be sealed to prevent moisture adversely affecting the wall. Planters which are located within five feet of a foundation should be sealed to prevent moisture affecting the earth materials supporting the foundation.

STORMWATER DISPOSAL

Introduction

Regulatory agencies have been requiring the disposal of a certain amount of stormwater generated on a site by infiltration into the site soils. Increasing the moisture content of a soil can cause it to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. This means that any overlying structure, including buildings, pavements and concrete flatwork, could sustain damage due to saturation of the subgrade soils. Structures serviced by subterranean levels could be adversely impacted by stormwater disposal by increasing the design fluid pressures on retaining walls and causing leaks in the walls. Proper site drainage is critical to the performance of any structure in the built environment.

Percolation Testing

In accordance with Appendix C of the County of Venture Technical Guidance Manual for Stormwater Quality Control Measures (VCTGM, 2011, Updated 2018), percolation tests shall be performed for greater depths per the falling-head borehole infiltration test. A total of 4 borings were utilized for percolation testing. Borings B2 and B25 were drilled to depths of 30 feet and 40 feet, respectively, and were located Rancho Conejo Boulevard. The bottom 10 feet of each boring was backfilled with soil spoils before installation of the testing materials.

The bottom 10 feet of Boring B2 and the bottom 20 feet of Boring B25 were fitted with 4-inch diameter slotted casing, and packed with pea gravel. The remainder of the borehole was cased with a solid pipe and bentonite.

The boreholes were presoaked for a period of 24 hours prior to performing the field percolation tests. After presoaking, the boreholes were refilled with water, and the rate of drop in the water level was measured. The percolation test readings were recorded a minimum of 8 times or until a stabilized rate of drop was obtained, whichever occurred first. The results are recorded on the enclosed tables to illustrate the stabilized percolation rate. The lowest percolation rate obtained from each of the borehole's is summarized in the table below.

Boring Number	Depth of Borehole / Percolation Zone (feet)	Lowest Percolation Rate (P) (inches/hour)
B2	30 / 10-20	1368
B25	40 / 10-30	36

Following the VCTGM, the measured percolation rate must be corrected based on the site suitability assessment and design related considerations. A table summarizing the concerns related to each consideration for both borings is presented below. A factor value of 3 is assigned for all "High Concerns"; a factor value of 2 is assigned for all "Medium Concerns"; a factor value of 1 is assigned to all "Low Concerns". Each of the considerations is assigned a weighted value of 0.25 to determine the Suitability Assessment Safety Factor, S_A, and the Design Safety Factor, S_B.

Boring Number	Suitability Assessment Related Considerations	Concern	Factor Value (FV)
B2	Assessment Method	Medium	2
	Ventura Hydrology Manual Soil Number	High	3
	Site Soil Variability	Low	1
	Depth to Groundwater or Impervious Layer	Low	1
	Suitability Assessment Safety Factor, S_A	**0.25*∑(FV)**	**1.75**
B25	Assessment Method	Medium	2
	Ventura Hydrology Manual Soil Number	High	3
	Site Soil Variability	Low	1
	Depth to Groundwater or Impervious Layer	Low	1
	Suitability Assessment Safety Factor, S_A	**0.25*∑(FV)**	**1.75**

Boring Number	Design Related Considerations	Concern	Factor Value (FV)
B2	Tributary Area Size	Medium	2
	Levels of Pretreatment or Expected Influent Sediment Loads	High	3
	Redundancy of Treatment	Medium	2
	Compaction During Construction	Medium	2
	Design Safety Factor, S_B	**0.25*∑(FV)**	**2.25**
B25	Tributary Area Size	Medium	2
	Levels of Pretreatment or Expected Influent Sediment Loads	High	3
	Redundancy of Treatment	Medium	2
	Compaction During Construction	Medium	2
	Design Safety Factor, S_B	**0.25*∑(FV)**	**2.25**

The combined safety factor is obtained by multiplying the two safety factors together. The combined safety factor and adjusted percolation rate for each boring to be utilized in the design and sizing of the infiltration facilities is summarized in the table below.

Boring Number	Combined Safety Factor (SF =S_A*S_B)	Adjusted Percolation Rate (P_A = P/SF) (inches/hour)
B2	1.75 * 2.25 = 3.938	1368/3.938 = **347.38**
B25	1.75 * 2.25 = 3.938	36/3.938 = **9.14**

<u>The Proposed System</u>

Based on information provided by the design team, it is anticipated that the stormwater infiltration system will be installed near the front of the site along Rancho Conejo Boulevard. It is the opinion of this office that a “dry well” type system is possible on this site; however, this office should review the plan once it achieves more definition.

The proposed stormwater infiltration system shall only percolate into the underlying native soils, and will be designed to infiltrate at a minimum of 10 feet below the lowest level of the closest proposed structure. Stormwater infiltration is not allowed within 10 feet (vertically) from the groundwater level, bedrock, or low permeability soil layer. However, since no groundwater was encountered during exploration conducted to a depth of 50 feet below existing site grades. Therefore, it is recommended that the bottom of the proposed infiltration system should not exceed 30 feet below the existing site grade.

Additionally, the proposed infiltration system must be setback a minimum of 50 feet from slopes steeper than 15%. Also, a minimum setback of 100 feet may be provided between the infiltration system and potable wells, non-potable wells, drain fields, and springs.

The proposed infiltration systems should be provided with overflow protection. Once the device is full of water, additional water flowing to the device should be diverted to another acceptable disposal area, or disposed offsite in an acceptable manner.

The natural alluvial soil encountered below a depth of 10 feet beneath the proposed lowest level consists primarily of granular soils, and should allow stormwater to percolate in a generally vertical manner. Therefore, there is not potential for creating a perched water condition. The onsite granular soils are low to moderate expansion potential, and are not susceptible to significant hydroconsolidation. In addition, due to the dense nature of the underlying soils, stormwater infiltration should not cause any damage or settlement to any building.

Due to the dense consistency of the underlying natural alluvial soils and bedrock, liquefaction potential for the site was remote. It is the opinion of this firm that any proposed infiltration of stormwater will not materially impact the liquefaction potential of the site.

It is recommended that the design team, including the structural engineer, waterproofing consultant, plumbing engineer, environmental engineer and landscape architect be consulted in regard to the design and construction of filtration systems.

Recommendations

The design and construction of stormwater infiltration facilities is not the responsibility of the geotechnical engineer. However, based on the experience of this firm, it is recommended that several aspects of the use of such facilities should be considered by the design and construction team:

- All infiltration devices should be provided with overflow protection. Once the device is full of water, additional water flowing to the device should be diverted to another acceptable disposal area, or disposed offsite in an acceptable manner.
- All connections associated with stormwater infiltration devices should be sealed and water-tight. Water leaking into the subgrade soils can lead to loss of strength, piping, erosion, settlement and/or expansion of the effected earth materials.
- Excavations proposed for the installation of stormwater facilities should comply with the “Temporary Excavations” sections of this (the referenced) reports well as CalOSHA Regulations where applicable.

DESIGN REVIEW

Engineering of the proposed project should not begin until approval of the geotechnical report by the Building Official is obtained in writing. Significant changes in the geotechnical recommendations may result during the building department review process.

It is recommended that the geotechnical aspects of the project be reviewed by this firm during the design process. This review provides assistance to the design team by providing specific recommendations for particular cases, as well as review of the proposed construction to evaluate whether the intent of the recommendations presented herein are satisfied.

CONSTRUCTION MONITORING

Geotechnical observations and testing during construction are considered to be a continuation of the geotechnical investigation. It is critical that this firm review the geotechnical aspects of the project during the construction process. Compliance with the design concepts, specifications or recommendations during construction requires review by this firm during the course of construction. All foundations should be observed by a representative of this firm prior to placing concrete or steel. Any fill which is placed should be observed, tested, and verified if used for engineered purposes. Please advise Geotechnologies, Inc. at least twenty-four hours prior to any required site visit.

If conditions encountered during construction appear to differ from those disclosed herein, notify Geotechnologies, Inc. immediately so the need for modifications may be considered in a timely manner.

It is the responsibility of the contractor to ensure that all excavations and trenches are properly sloped or shored. All temporary excavations should be cut and maintained in accordance with applicable OSHA rules and regulations.

EXCAVATION CHARACTERISTICS

The exploration performed for this investigation is limited to the geotechnical excavations described. Direct exploration of the entire site would not be economically feasible. The owner, design team and contractor must understand that differing excavation and drilling conditions may be encountered based on boulders, gravel, oversize materials, groundwater and many other conditions. Fill materials, especially when they were placed without benefit of modern grading codes, regularly contain materials which could impede efficient grading and drilling. Southern California sedimentary bedrock is known to contain variable layers which reflect differences in depositional environment. Such layers may include abundant gravel, cobbles and boulders. Similarly bedrock can contain concretions. Concretions are typically lenticular and follow the bedding. They are formed by mineral deposits. Concretions can be very hard. Excavation and drilling in these areas may require full size equipment and coring capability. The contractor should be familiar with the site and the geologic materials in the vicinity.

CLOSURE AND LIMITATIONS

The purpose of this report is to aid in the design and completion of the described project. Implementation of the advice presented in this report is intended to reduce certain risks associated with construction projects. The professional opinions and geotechnical advice contained in this report are sought because of special skill in engineering and geology and were prepared in accordance with generally accepted geotechnical engineering practice. Geotechnologies, Inc. has a duty to exercise the ordinary skill and competence of members of the engineering profession. Those who hire Geotechnologies, Inc. are not justified in expecting infallibility, but can expect reasonable professional care and competence.

The recommendations of this report pertain only to the site investigated and are based upon the assumption that the geologic conditions do not deviate from those disclosed in the investigation. If any variations are encountered during construction, or if the proposed construction will differ from that anticipated herein, Geotechnologies, Inc. should be notified so that supplemental recommendations can be prepared.

This report is issued with the understanding that it is the responsibility of the owner, or the owner's representatives, to ensure that the information and recommendations contained herein are brought to the attention of the project architect and engineer and are incorporated into the plans. The owner is also responsible to see that the contractor and subcontractors carry out the geotechnical recommendations during construction.

The findings of this report are valid as of the date of this report. However, changes in the conditions of a property can occur with the passage of time, whether they are due to natural processes or the works of man on this or adjacent properties. In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside control of this firm. Therefore, this report is subject to review and should not be relied upon after a period of three years.

Geotechnical observations and testing during construction is considered to be a continuation of the geotechnical investigation. It is, therefore, most prudent to employ the consultant performing the initial investigative work to provide observation and testing services during construction. This practice enables the project to flow smoothly from the planning stages through to completion.

Should another geotechnical firm be selected to provide the testing and observation services during construction, that firm should prepare a letter indicating their assumption of the responsibilities of geotechnical engineer of record. A copy of the letter should be provided to the regulatory agency for review. The letter should acknowledge the concurrence of the new geotechnical engineer with the recommendations presented in this report.

EXCLUSIONS

Geotechnologies, Inc. does not practice in the fields of methane gas, radon gas, environmental engineering, waterproofing, dewatering organic substances or the presence of corrosive soils or wetlands which could affect the proposed development including mold and toxic mold. Nothing in this report is intended to address these issues and/or their potential effect on the proposed development. A competent professional consultant should be retained in order to address environmental issues, waterproofing, organic substances and wetlands which might effect the proposed development.

GEOTECHNICAL TESTING

Classification and Sampling

The soil is continuously logged by a representative of this firm and classified by visual examination in accordance with the Unified Soil Classification system. The field classification is verified in the laboratory, also in accordance with the Unified Soil Classification System. Laboratory classification may include visual examination, Atterberg Limit Tests and grain size distribution. The final classification is shown on the excavation logs.

Samples of the geologic materials encountered in the exploratory excavations were collected and transported to the laboratory. Undisturbed samples of soil are obtained at frequent intervals. Unless noted on the excavation logs as an SPT sample, samples acquired while utilizing a hollow-stem auger drill rig are obtained by driving a thin-walled, California Modified Sampler with successive 30-inch drops of a 140-pound hammer. The soil is retained in brass rings of 2.50 inches outside diameter and 1.00 inch in height. The central portion of the samples are stored in close fitting, waterproof containers for transportation to the laboratory. Samples noted on the excavation logs as SPT samples are obtained in general accordance with the most recent revision of ASTM D 1586. Samples are retained for 30 days after the date of the geotechnical report.

Moisture and Density Relationships

The field moisture content and dry unit weight are determined for each of the undisturbed soil samples, and the moisture content is determined for SPT samples in general accordance with the most recent revision of ASTM D 4959 or ASTM D 4643. This information is useful in providing a gross picture of the soil consistency between exploration locations and any local variations. The dry unit weight is determined in pounds per cubic foot and shown on the "Excavation Logs", A-Plates. The field moisture content is determined as a percentage of the dry unit weight.

Direct Shear Testing

Shear tests are performed in general accordance with the most recent revision of ASTM D 3080 with a strain controlled, direct shear machine manufactured by Soil Test, Inc. or a Direct Shear Apparatus manufactured by GeoMatic, Inc. The rate of deformation is approximately 0.025 inches per minute. Each sample is sheared under varying confining pressures in order to determine the Mohr-Coulomb shear strength parameters of the cohesion intercept and the angle of internal friction. Samples are generally tested in an artificially saturated condition. Depending upon the sample location and future site conditions, samples may be tested at field moisture content. The results are plotted on the "Shear Test Diagram," B-Plates.

The most recent revision of ASTM 3080 limits the particle size to 10 percent of the diameter of the direct shear test specimen. The sheared sample is inspected by the laboratory technician running the test. The inspection is performed by splitting the sample along the sheared plane and observing the soils exposed on both sides. Where oversize particles are observed in the shear plane, the results are discarded and the test run again with a fresh sample.

Consolidation Testing

Settlement predictions of the soil's behavior under load are made on the basis of the consolidation tests in general accordance with the most recent revision of ASTM D 2435. The consolidation apparatus is designed to receive a single one-inch high ring. Loads are applied in several increments in a geometric progression, and the resulting deformations are recorded at selected time intervals. Porous stones are placed in contact with the top and bottom of each specimen to permit addition and release of pore fluid. Samples are generally tested at increased moisture content to determine the effects of water on the bearing soil. The normal pressure at which the water is added is noted on the drawing. Results are plotted on the "Consolidation Test," C-Plates.

Expansion Index Testing

The expansion tests performed on the remolded samples are in accordance with the Expansion Index testing procedures, as described in the most recent revision of ASTM D 4829. The soil sample is compacted into a metal ring at a saturation degree of 50 percent. The ring sample is then placed in a consolidometer, under a vertical confining pressure of 1 lbf/square inch and inundated with distilled water. The deformation of the specimen is recorded for a period of 24 hour or until the rate of deformation becomes less than 0.0002 inches/hour, whichever occurs first. The expansion index, EI, is determined by dividing the difference between final and initial height of the ring sample by the initial height, and multiplied by 1,000.

Laboratory Compaction Characteristics

The maximum dry unit weight and optimum moisture content of a soil are determined in general accordance with the most recent revision of ASTM D 1557. A soil at a selected moisture content is placed in five layers into a mold of given dimensions, with each layer compacted by 25 blows of a 10 pound hammer dropped from a distance of 18 inches subjecting the soil to a total compactive effort of about 56,000 pounds per cubic foot. The resulting dry unit weight is determined. The procedure is repeated for a sufficient number of moisture contents to establish a relationship between the dry unit weight and the water content of the soil. The data when plotted represent a curvilinear relationship known as the compaction curve. The values of optimum moisture content and modified maximum dry unit weight are determined from the compaction curve.

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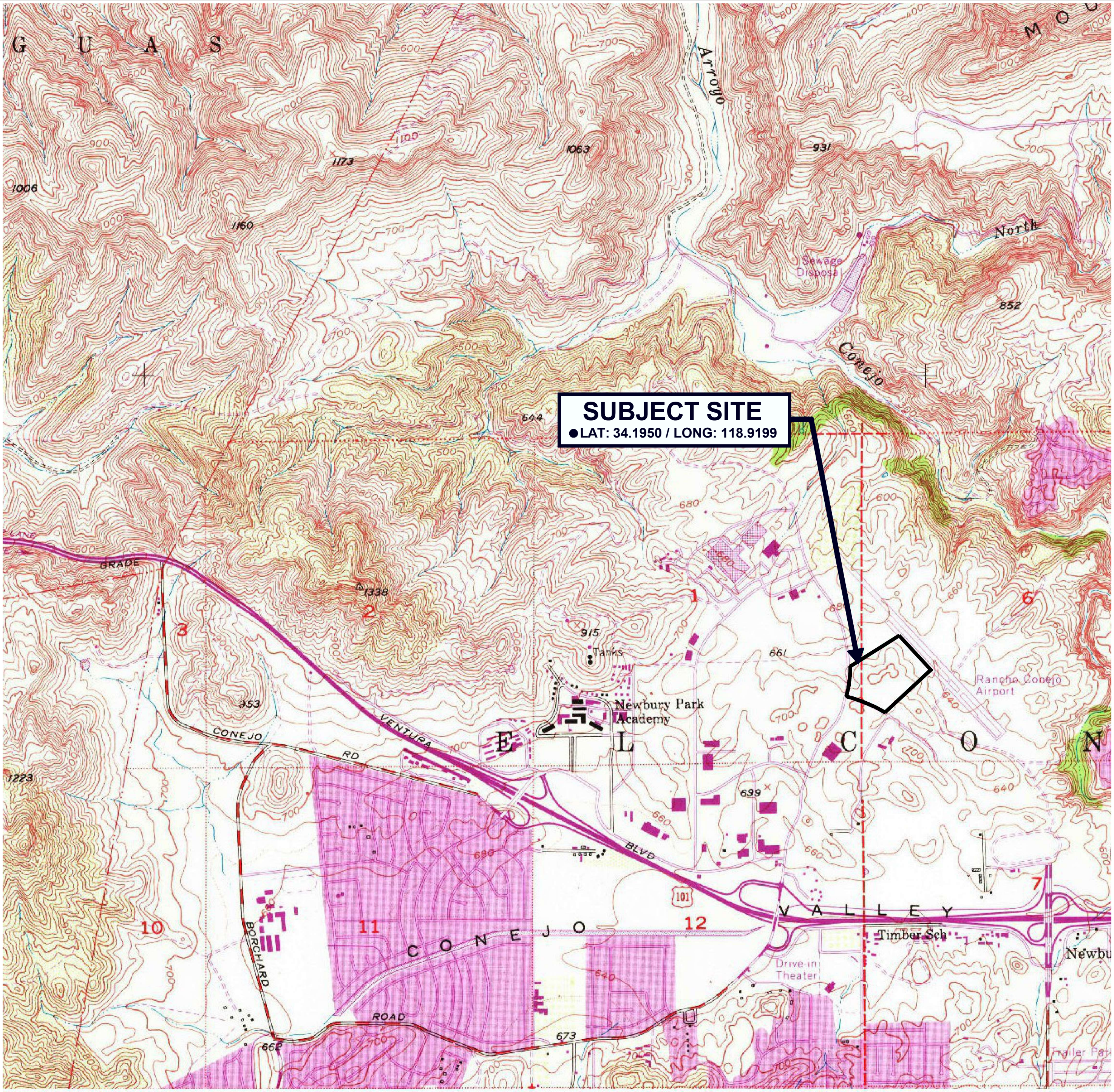

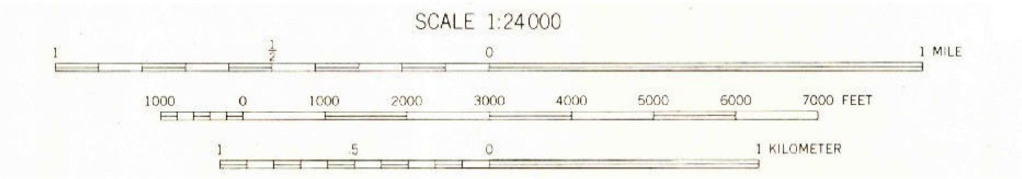

REFERENCE: U.S.G.S. TOPOGRAPHIC MAPS, 7.5 MINUTE SERIES, NEWBURY PARK, CA QUADRANGLE

VICINITY MAP

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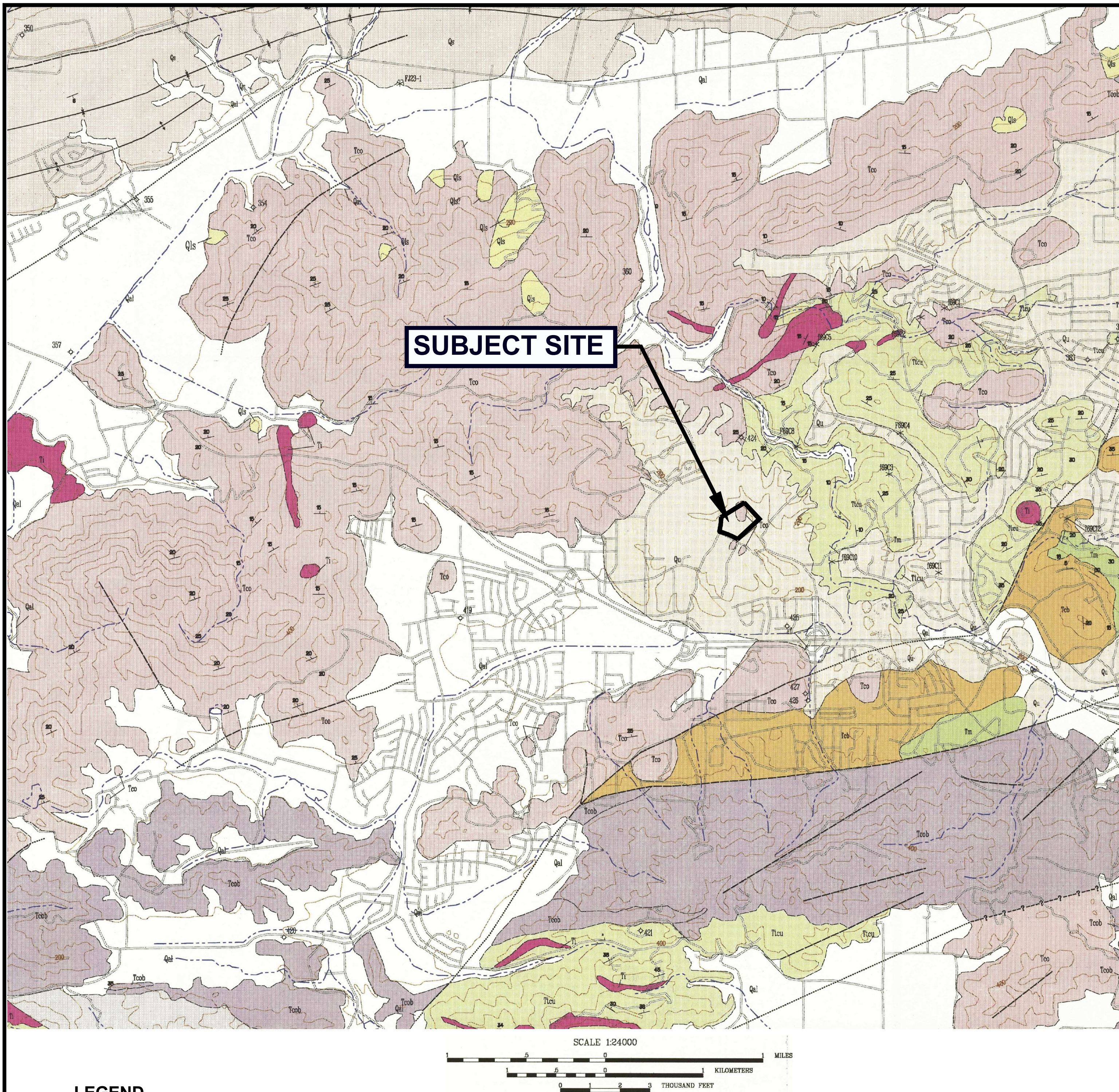
ALEXANDRIA REAL ESTATE EQUITIES, INC.
1100 RANCO CONEJO BLVD., THOUSAND OAKS

FILE NO. 22144



LEGEND

Qal: Alluvium - alluvial gravel, sand and clay
Qu: Undifferentiated Surficial Deposits -alluvium and colluvium, some wind-deposited silt and fine sand
Tco: Conejo Volcanics - andesitic to basaltic flows, volcanic breccia and agglomerate
Tm: Modelo Formation - siliceous or diatomaceous shale or siltstone, minor fine-grained sandstone
Tcob: Volcanic Breccia - chiefly basaltic
Ttcu: Topanga Canyon Formation - fine to medium-grained sandstone, minor interbedded siltstone and shale
Tcb: Calabasas Formation - sandstone and siltstone, massive to poorly bedded, scattered calcareous concretions
Ti: Intrusive Rocks - chiefly basalt or diabase

Folds - arrow on axial trace of fold indicates direction of plunge
Fault - dashed where indefinite or inferred, dotted where concealed, queried where existence is doubtful

REFERENCE: YERKES, R.F. AND CAMPBELL, R.H., (1997) PRELIMINARY GEOLOGIC MAP OF THE NEWBURY PARK QUADRANGLE (97-428)

LOCAL GEOLOGIC MAP - YERKES AND CAMPBELL

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ALEXANDRIA REAL ESTATE EQUITIES, INC.
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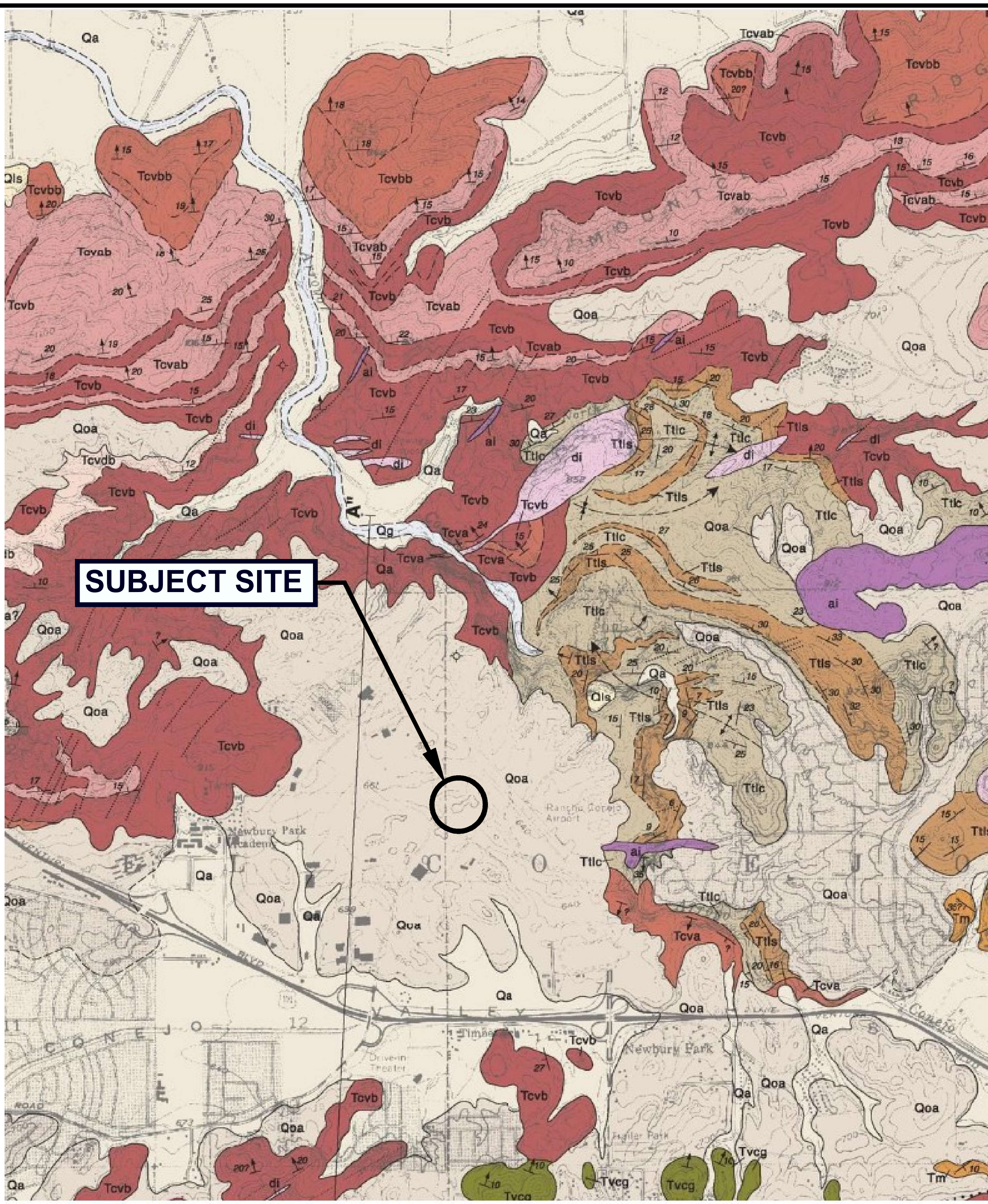

LEGEND

Qa: Surficial Sediments - alluvial gravel, sand and clay
Qls: Surficial Sediments -Landslide Debris
Qoa: Older Surficial Sediments - older dissected alluvial gravel
Tm: Monterey Formation - white weathering, thin bedded, platy, locally brittle siliceous shale to soft, punky shale
Tlvc: Detrital Sediments of Lindero Canyon - basal epiclastic (reworked) conglomerate of detritus derived from Conejo Volcanics
Ttuc: Upper Topanga Formation - clay shale and siltstone, gray thin-bedded, soft, crumbly, weakly resistant to erosion
Tvcg: Detrital Sediments of Lindero Canyon - gray to brown, cobble-boulders, marine
Ttls: Lower Topanga Formations - Sandstone and interbedded shale
Tcvb: Conejo Volcanics - Extrusive Rocks - basaltic rocks
Folds - arrow on axial trace of fold indicates direction of plunge
Fault - dashed where indefinite or inferred, dotted where concealed, queried where existence is doubtful

REFERENCE: DIBBLEE, T.W., (1990) GEOLOGIC MAP OF THE CAMIRILLO AND NEWBURY PARK QUADRANGLE (#DF-28)

LOCAL GEOLOGIC MAP - DIBBLEE

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Consulting Geotechnical Engineers

ALEXANDRIA REAL ESTATE EQUITIES, INC.
1100 RANCHO CONEJO BLVD., THOUSAND OAKS

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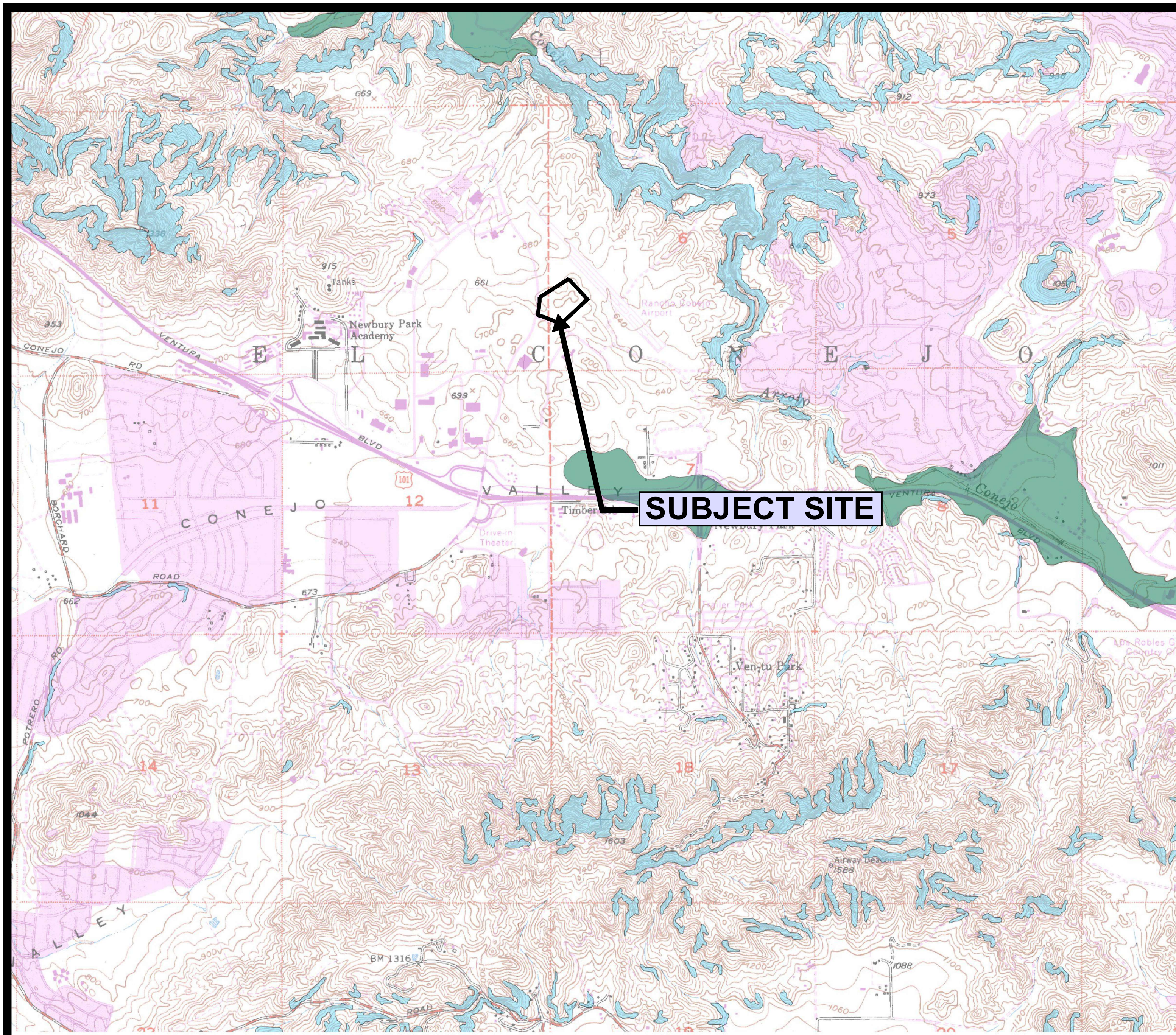

Scale 1: 24000

1 | 0.5 | 0 | 1 | 2 Miles

1,000 | 500 | 0 | 1,000 | 2,000 | 3,000 | 4,000 | 5,000 | 6,000 | 7,000 | 8,000 | 9,000 | 10,000 Feet

1 | 0.5 | 0 | 1 | 2 Kilometers

1000 | 500 | 0 | 1000 | 2000 Meters

Contour Interval 20 Feet

N

LIQUEFACTION AREA

REFERENCE: **SEISMIC HAZARD ZONES, NEWBURY PARK QUADRANGLE OFFICIAL MAP (CDMG, 2002)**

SEISMIC HAZARD ZONE MAP

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Consulting Geotechnical Engineers

ALEXANDREA REAL ESTATE EQUITIES, INC.
1100 RANCHO CONEJO BLVD.,THOUSAND OAKS

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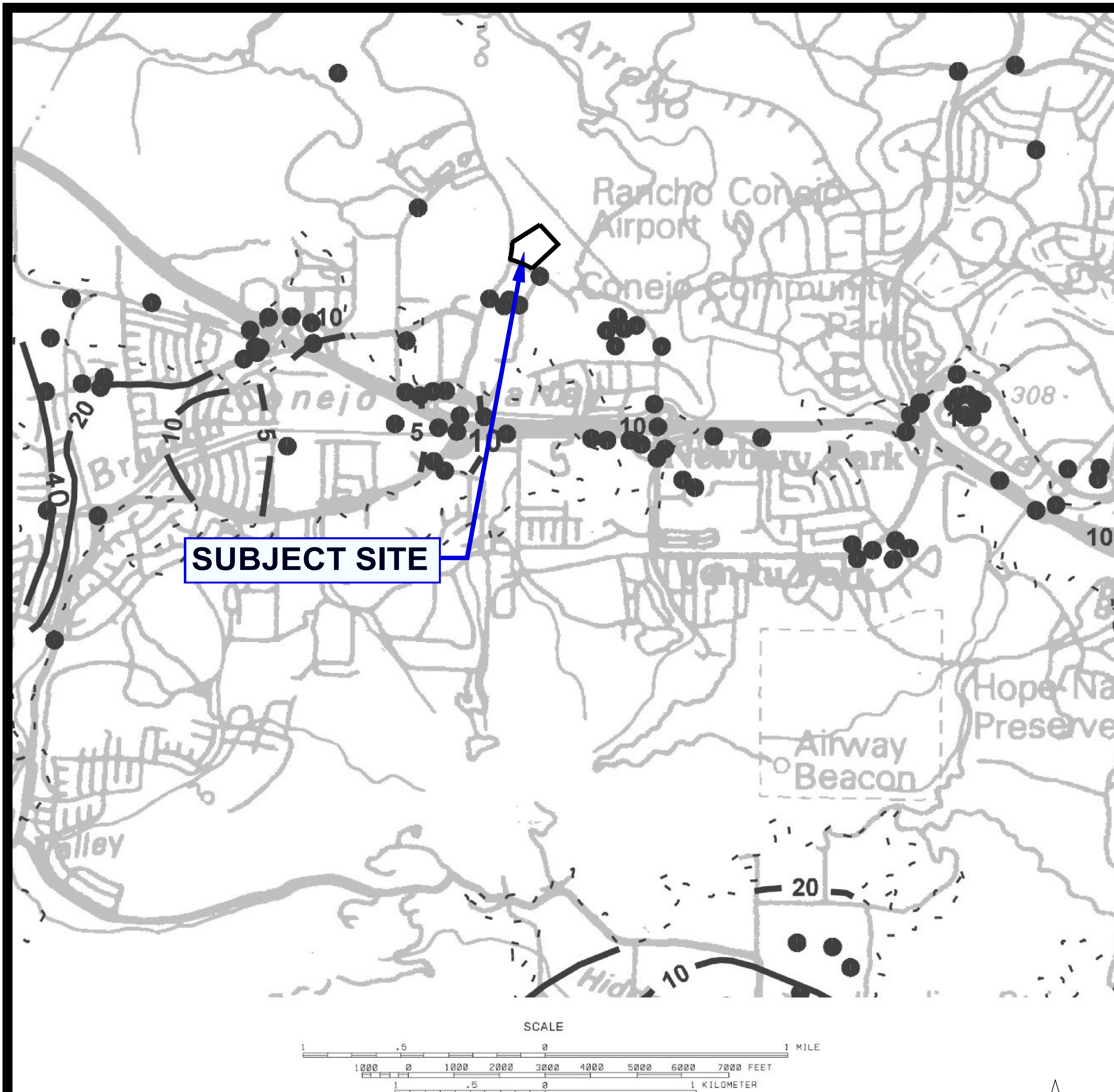

20 Depth to groundwater in feet

REFERENCE: CDMG, SEISMIC HAZARD ZONE REPORT, 055
NEWBURY PARK 7.5 - MINUTE QUADRANGLE, VENTURA COUNTY, CALIFORNIA (2002, REVISED 2006)

HISTORICALLY HIGHEST GROUNDWATER LEVELS

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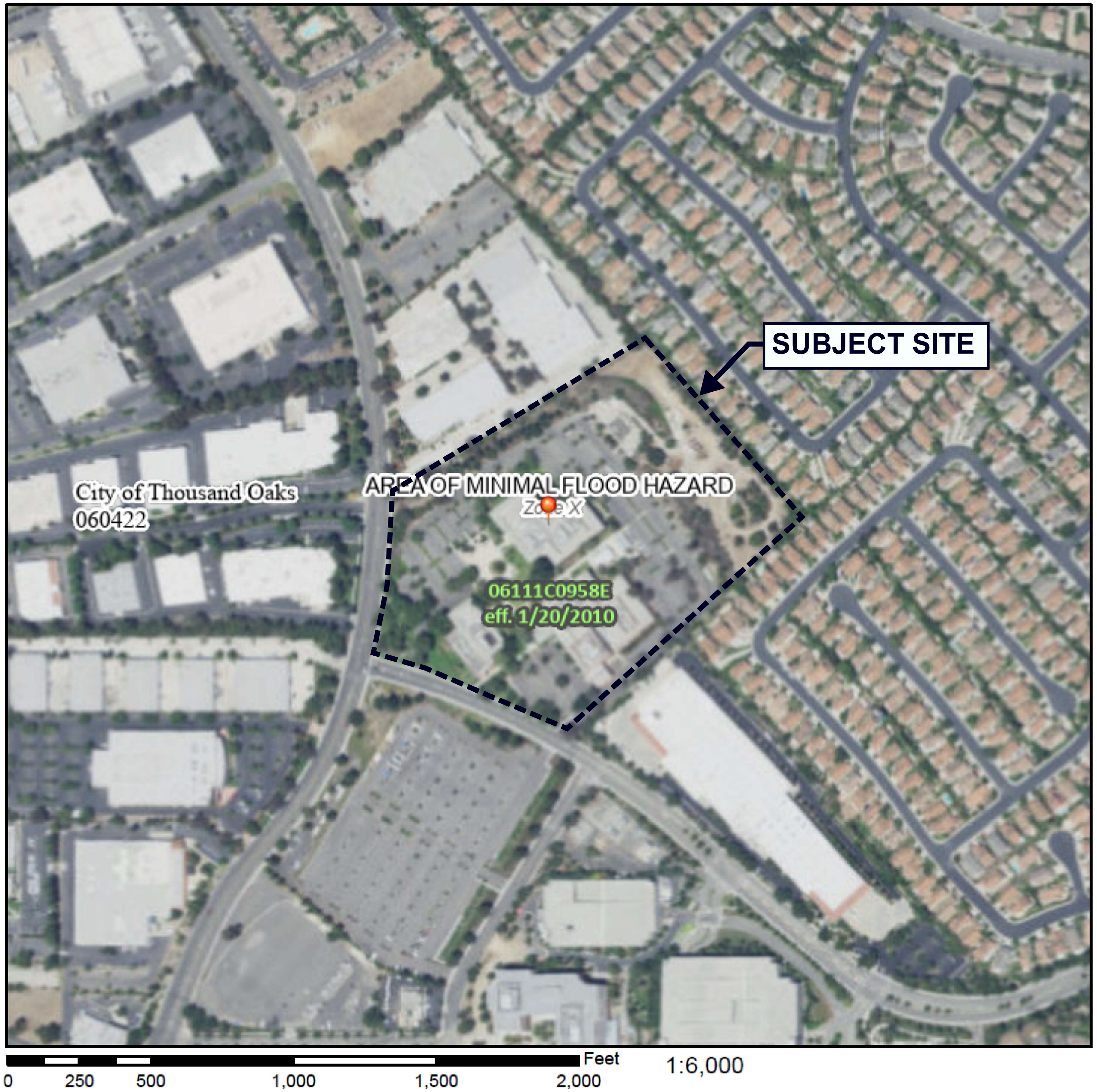
FILE NO. 22144



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/7/2021 at 2:30 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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FLOOD INSURANCE RATE MAP

Geotechnologies, Inc.
Consulting Geotechnical Engineers

ALEXANDRIA REAL ESTATE EQUITIES, INC.
1100 RANCHO CONEJO BLVD., THOUSAND OAKS

FILE No. 22144

SCALE IN FEET

0 150 300

LEGEND

B33 TD=20 FT Fill=3 FT No Bdrx Refusal @ 10 FT — LOCATION & NUMBER OF BORING
TD: Total Depth, Fill Depth,
Bdrx: Bedrock Encounter Depth, Refusal: Depth of Refusal.

CUT/FILL DAYLIGHT LINE
(Hale, Haaland & Assoc. Inc., Grading Plan, March 1975)

AREA OF UNCOMPACTED FILL
(Gorian Grading Plan, March 26, 1975)

UNCERTIFIED FILL
(This Investigation, May 2021)

REFERENCE: PRELIMINARY ARCHITECTURAL PLANS PROVIDED BY GENSLER
DATED: May 3, 2021

PLOT PLAN

Geotechnologies, Inc.
Consulting Geotechnical Engineers

ALEXANDRIA REAL ESTATE EQUITIES, INC.
1100 RANCHO CONEJO BLVD., THOUSAND OAKS

Drawn by: YD | File No. 22144

Date: September 2021

N
S
E
W
NE
NW
SE
SW

SCALE IN FEET

0 150 300

LEGEND

B33 — TD=20 FT, Fill=3 FT, No Bdrx, Refusal @ 10 FT

LOCATION & NUMBER OF BORING
TD: Total Depth, Fill Depth,
Bdrx: Bedrock Encounter Depth, Refusal: Depth of Refusal.

CUT/FILL DAYLIGHT LINE
(Hale, Haaland & Assoc. Inc., Grading Plan, March 1975)

AREA OF UNCOMPACTED FILL
(Gorian Grading Plan, March 26, 1975)

UNCERTIFIED FILL
(This Investigation, May 2021)

REFERENCE: TOPOGRAPHIC SURVEY PLAN PROVIDED BY JRN CIVIL ENGINEERS
DATED: June 4, 2021

SURVEY PLAN

Geotechnologies, Inc.
Consulting Geotechnical Engineers

ALEXANDRIA REAL ESTATE EQUITIES, INC.
1100 RANCHO CONEJO BLVD., THOUSAND OAKS

Drawn by: YD	File No. 22144
Date: September 2021	

BORING LOG NUMBER 1

Alexandria Real Estate Equities, Inc. **Date: 05/17/21** **Elevation: 690.2'***
File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**
dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for Driveway
				0 --		5.5-inch Asphalt over 3.5-inch Base
				-		
				1 --		FILL: Sandy Silt, dark brown, moist, stiff
				-		
				2 --		
2.5	71	18.2	110.1	-		
				3 --		
				-	ML	OLDER ALLUVIUM: Sandy to Clayey Silt, dark brown,
				4 --		very moist, stiff, minor caliche
				-		
5	80	22.4	102.9	5 --		
				-	SM/ML	Silty Sand to Sandy Silt, dark brown, moist, very dense,
				6 --		fine grained, stiff
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	38	18.2	110.7	10 --		
	50/5"			-		very dense, very stiff
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	42	19.1	107.4	15 --		
	50/3"			-		very stiff
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-	ML	Sandy Silt, dark brown, moist, stiff
20	38	25.3	101.5	20 --		
	50/5"			-		Total Depth: 20 feet
				21 --		No Water
				-		Fill to 3 feet
				22 --		
				-		NOTE: The stratification lines represent the approximate
				23 --		boundary between earth types; the transition may be gradual.
				-		
				24 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				25 --		Modified California Sampler used unless otherwise noted
				-		

BORING LOG NUMBER 2

Alexandria Real Estate Equities, Inc. **Date: 05/17/21** **Elevation: 671.0'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt Driveway
				0 --		5-inch Asphalt over 7-inch Base
				1 --		FILL: Silty Sand, gray, moist, medium dense, fine grained
2.5	85	22.6	99.4	2 --		
				3 --	ML	OLDER ALLUVIUM: Sandy Silt, yellowish brown, moist, very stiff, minor caliche
5	34 50/5"	23.0	92.5	5 --		Sandy Silt, yellowish brown, moist, very stiff
				6 -- 7 -- 8 -- 9 --		
10	100/9"	14.7	98.5	10 --	SM/ML	Silty Sand to Sandy Silt, yellowish brown, moist, very dense, fine grained, very stiff
				11 -- 12 -- 13 -- 14 --		
15	100/8"	9.6	103.3	15 --	SM	Silty Sand, dark and yellowish brown, moist, very dense, fine grained, minor pebbles
				16 -- 17 -- 18 -- 19 --		
20	100/9"	6.9	102.2	20 --	SP	Sand with pebbles, dark brown, moist, very dense, fine to medium grained
				21 -- 22 -- 23 -- 24 --		
25	46 50/5"	25.4	99.1	25 --	ML	Sandy Silt, dark brown, moist, very stiff

BORING LOG NUMBER 2

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				-		
				26 --		
				-		
				27 --		
				-		
				28 --		
				-		
				29 --	SM/ML	Silty Sand to Sandy Silt, dark brown, moist, very dense,
				-		fine grained, very stiff
30	100/9"	22.6	103.4	30 --		
				-		Total Depth: 30 feet
				31 --		No Water
				-		Fill to 3 feet
				32 --		
				-		NOTE: The stratification lines represent the approximate
				33 --		boundary between earth types; the transition may be gradual.
				-		
				34 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				35 --		Modified California Sampler used unless otherwise noted
				-		
				36 --		
				-		
				37 --		
				-		
				38 --		
				-		
				39 --		
				-		
				40 --		
				-		
				41 --		
				-		
				42 --		
				-		
				43 --		
				-		
				44 --		
				-		
				45 --		
				-		
				46 --		
				-		
				47 --		
				-		
				48 --		
				-		
				49 --		
				-		
				50 --		
				-		

BORING LOG NUMBER 3

Alexandria Real Estate Equities, Inc. **Date: 05/17/21** **Elevation: 690.1'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		3.5-inch Asphalt over 4.5-inch Base
				-		
				1 --		FILL: Silty Sand, gray, moist, medium dense, fine grained
				-		
				2 --		
2.5	100/8"	10.4	106.0	-		
				3 --		
				-	SM	OLDER ALLUVIUM: Silty Sand, yellowish brown, moist,
				4 --		very dense
				-		
5	100/9"	20.8	108.0	5 --		
				-	SM/ML	Silty Sand to Sandy Silt, yellowish brown, moist, very dense,
				6 --		fine grained, very stiff
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	100/9"	6.9	113.8	10 --		
				-	SM/SP	Silty Sand to Sand, dark and yellowish brown, very moist,
				11 --		very dense, fine to coarse grained, minor pebbles
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	72	26.1	100.1	15 --		
				-	ML	Sandy to Clayey Silt, dark brown, very moist, very stiff,
				16 --		minor caliche
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-	MC/CL	Clayey Silt to Silty Clay, dark brown, moist, very stiff
20	84	25.5	97.2	20 --		
				-		Total Depth: 20 feet
				21 --		No Water
				-		Fill to 3 feet
				22 --		
				-		NOTE: The stratification lines represent the approximate
				23 --		boundary between earth types; the transition may be gradual.
				-		
				24 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				25 --		Modified California Sampler used unless otherwise noted
				-		

BORING LOG NUMBER 4

Alexandria Real Estate Equities, Inc. **Date: 05/17/21** **Elevation: 687.0'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for Driveway
				0 --		5-inch Asphalt over 13-inch Base
				-		
				1 --		
				-		
				2 --		FILL: Silty Sand, gray, moist, medium dense, fine grained
				-		
				3 --		
3.5	77	21.8	99.6	-		
				4 --		Sandy Silt, gray, moist, stiff
				-		
5	81	13.6	105.5	5 --		
				-		
				6 --		
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	52	21.7	102.2	10 --		
				-	ML	OLDER ALLUVIUM: Sandy to Clayey Silt, yellow and grayish
				11 --		brown, moist, stiff
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	72	No Recovery		15 --		
				-		
				16 --		
				-		
				17 --		
17.5	86	24.3	100.6	-		
				18 --		Sandy Silt, yellowish brown, moist, very stiff
				-		
				19 --		
				-		
20	100/9"	23.3	102.4	20 --		
				-		Total Depth: 20 feet
				21 --		No Water
				-		Fill to 10 feet
				22 --		
				-		NOTE: The stratification lines represent the approximate
				23 --		boundary between earth types; the transition may be gradual.
				-		
				24 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				25 --		Modified California Sampler used unless otherwise noted
				-		

BORING LOG NUMBER 5

Alexandria Real Estate Equities, Inc. **Date: 05/17/21** **Elevation: 689.5'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy

***Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21**

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for driveway
				0 --		4-inch Asphalt over 6-inch Base
				-		
				1 --		
				-		FILL: Sandy Silt, gray, moist, stiff
				2 --		
				-		
				3 --		
				-		
				4 --		
				-		
5	40	9.1	108.4	5 --		
	50/3"			-		Silty Sand with rock fragments, dark and yellowish brown,
				6 --		moist, dense, fine grained
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	36	22.9	99.6	10 --		
				-		Sandy Silt, gray, very moist, stiff
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	68	14.3	115.5	15 --		
				-		Sandy to Clayey Silt with rock fragments, gray to dark gray,
				16 --		moist, stiff
				-		
				17 --		
17.5	45	15.0	104.5	-		
	50/4"			18 --		
				-		Silty Sand to Sandy Silt with rock fragments, dark and
				19 --		yellowish brown, moist, very dense, fine grained, very stiff
				-		
20	59	13.9	119.3	20 --		
				-		Sandy Silt, gray, moist, stiff, minor rock fragments
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	52	22.0	95.5	25 --		
				-		Sandy to Clayey Silt, dark gray, moist, stiff

BORING LOG NUMBER 5

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				-		
				26 --		
				-		
				27 --		
				-		
				28 --		
				-		
				29 --		
				-		
30	30	18.6	111.0	30 --		
	50/5"			-	ML	OLDER ALLUVIUM: Sandy Silt, yellow and grayish brown,
				31 --		moist, very stiff
				-		
				32 --		
				-		
				33 --		
				-		
				34 --		
				-		
35	40	16.9	112.1	35 --		
	50/5"			-	ML	Sandy to Clayey Silt, dark and yellowish brown, moist,
				36 --		very stiff
				-		
				37 --		
				-		
				38 --		
				-		
				39 --		BEDROCK (LOWER TOPANGA FORMATION): Sandstone,
				-		yellowish brown, moist, medium, hard
40	100/8"	18.3	102.3	40 --		
				-		Total Depth: 40 feet
				41 --		No Water
				-		Fill to 30 feet
				42 --		
				-		NOTE: The stratification lines represent the approximate
				43 --		boundary between earth types; the transition may be gradual.
				-		
				44 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				45 --		Modified California Sampler used unless otherwise noted
				-		
				46 --		
				-		
				47 --		
				-		
				48 --		
				-		
				49 --		
				-		
				50 --		
				-		

BORING LOG NUMBER 6

Alexandria Real Estate Equities, Inc. **Date: 05/18/21** **Elevation: 692.0'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		4-inch Asphalt over 7-inch Base
				1 --		FILL: Silty Sand to Sandy Silt, dark brown, moist, medium dense, fine grained, stiff
5	75	15.1	89.5	5 --		Silty Sand, to Sandy Silt with rock fragments, dark brown, very moist, medium dense, fine grained, stiff
10	43	30.9	91.5	10 --		Sandy Silt to Silty Clay, gray to dark gray, moist, stiff
15	72	21.7	102.2	15 --		Sandy to Clayey Silt, dark gray, moist, stiff
20	57	19.6	109.5	20 --		
25	79	14.6	110.6	25 --		BEDROCK (CONEJO VOLCANICS) Pyroclastic rock, dark and grayish brown, moist, moderately hard

GEOTECHNOLOGIES, INC. **Plate A-6a**

BORING LOG NUMBER 6

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26		
				27		
				28		
				29		
30	42 50/5"	26.0	96.6	30		Pyroclastic rock, yellow and grayish brown, moist, moderately hard
				31		
				32		
				33		
				34		Very hard
35	100/2"	10.9	Disturbed	35		Total Depth: 35 feet No Water Fill to 25 feet NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual. Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted
				36		
				37		
				38		
				39		
				40		
				41		
				42		
				43		
				44		
				45		
				46		
				47		
				48		
				49		
				50		

BORING LOG NUMBER 7

Alexandria Real Estate Equities, Inc. **Date: 05/21/21** **Elevation: 689.7***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	feet	USCS Class.	Description Surface Conditions: Asphalt for Driveway
				0 --		6-inch Asphalt over 12-inch Base
				-		
				1 --		
				-		
				2 --		FILL: Silty Sand, dark brown, moist, medium dense,
2.5	40	12.4	112.4	-		fine grained, minor gravel
	50/4"			3 --		Silty Sand to Sandy Silt with rock fragments, gray to dark gray,
				-		stiff
				4 --		
				-		
5	100/9"	8.1	101.7	5 --		
				-		Silty Sand with rock fragments, dark and grayish brown, moist,
				6 --		very dense, fine grained
				-		
				7 --		
7.5	45	25.7	93.1	-		
				8 --		Sandy Silt to Silty Clay, dark brown and gray, moist, stiff
				-		
				9 --		
				-		
10	78	18.4	110.1	10 --		
				-		Clayey Silt to Silty Clay, gray to dark gray
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	100/5"	11.3	94.5	15 --		
				-		BEDROCK (CONEJO VOLCANICS) Basalt, yellowish brown,
				16 --		moist, hard
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	100/5"	5.9	113.5	20 --		
				-		Total Depth: 20 feet by refusal
				21 --		No Water
				-		Fill to 15 feet
				22 --		
				-		NOTE: The stratification lines represent the approximate
				23 --		boundary between earth types; the transition may be gradual.
				-		
				24 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				25 --		Modified California Sampler used unless otherwise noted
				-		

BORING LOG NUMBER 8

Alexandria Real Estate Equities, Inc. **Date: 05/20/21** **Elevation: 691.5'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand, yellowish brown, moist, medium dense, fine grained
				1 --		
				2 --		
				3 --		BEDROCK (CONEJO VOLCANICS) Basalt, dark and yellowish brown, moist, hard
				4 --		
5	100/2"	3.8	Disturbed	5 --		dark brown and gray, moist, very hard
				6 --		
				7 --		
7.5	50/2"	15.7	SPT	8 --		Total Depth: 7.5 feet by refusal No Water Fill to 3 feet
				9 --		
				10 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
				11 --		Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted
				12 --		
				13 --		SPT=Standard Penetration Test
				14 --		
				15 --		
				16 --		
				17 --		
				18 --		
				19 --		
				20 --		
				21 --		
				22 --		
				23 --		
				24 --		
				25 --		

BORING LOG NUMBER 9

Alexandria Real Estate Equities, Inc. **Date: 05/20/21** **Elevation: 674.5'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand, dark brown, moist, medium dense, fine grained
				-		
				1 --		
				-		
				2 --		
				-		
				3 --		
				-		
				4 --		
				-		
5	77	17.9	110.5	5 --		
				-		Silty Sand to Sandy Silt, dense, stiff
				6 --		
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	81	15.2	107.1	10 --		
				-		Silty Sand, dark and yellowish brown, moist, dense, fine grained
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	32 50/5"	6.1	106.1	15 --		
				-	SM	OLDER ALLUVIUM: Silty Sand with rock fragments, yellowish brown, moist, very dense, fine grained
				16 --		
				-		
				17 --		
				-		BEDROCK (CONEJO VOLCANICS) Basalt, dark and yellowish brown, moist moderately hard to hard
				18 --		
				-		
				19 --		
				-		
20	100/7"	12.3	92.1	20 --		
				-		
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	100/6"	No Recovery		25 --		
				-		

BORING LOG NUMBER 9

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				-		
26	50/5"	4.9	SPT	26 --		
				-		Total Depth: 26 feet
				27 --		No Water
				-		Fill to 15 feet
				28 --		
				-		NOTE: The stratification lines represent the approximate
				29 --		boundary between earth types; the transition may be gradual.
				-		
				30 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				31 --		Modified California Sampler used unless otherwise noted
				-		
				32 --		SPT=Standard Penetration Test
				-		
				33 --		
				-		
				34 --		
				-		
				35 --		
				-		
				36 --		
				-		
				37 --		
				-		
				38 --		
				-		
				39 --		
				-		
				40 --		
				-		
				41 --		
				-		
				42 --		
				-		
				43 --		
				-		
				44 --		
				-		
				45 --		
				-		
				46 --		
				-		
				47 --		
				-		
				48 --		
				-		
				49 --		
				-		
				50 --		
				-		

BORING LOG NUMBER 10

Alexandria Real Estate Equities, Inc. **Date: 05/18/21** **Elevation: 671.5'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand to Sandy Silt, dark and yellowish brown,
				-		moist, medium dense, fine grained, stiff
				1 --		
				-		
				2 --		
2.5	72	15.1	113.1	-		
				3 --		
				-		
				4 --		
				-		
5	78	15.7	112.2	5 --		
				-		
				6 --		
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	71	18.2	107.6	10 --		
				-		Clayey Silt to Silty Clay, dark brown, moist, stiff
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	76	20.1	105.4	15 --		
				-		Sandy Silt to Silty Clay, dark and yellowish brown, moist, stiff
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	82	18.9	112.9	20 --		
				-		very stiff
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	55	17.3	105.6	25 --		
				-		

BORING LOG NUMBER 10

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				-		
				26 --		
				-		
				27 --		
				-		
				28 --		
				-		
				29 --		
				-		
30	100/8"	13.9	87.6	30 --		
				-		BEDROCK (LOWER TOPANGA FORMATION): Sandstone,
				31 --		yellowish brown and dark brown, moist, hard
				-		
				32 --		
32.5	100/7"	20.5	106.8	-		
				33 --		
				-		
				34 --		
				-		
35				35 --		
				-		Total Depth: 35 feet
				36 --		No Water
				-		Fill to 30 feet
				37 --		
				-		NOTE: The stratification lines represent the approximate
				38 --		boundary between earth types; the transition may be gradual.
				-		
				39 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				40 --		Modified California Sampler used unless otherwise noted
				-		
				41 --		
				-		
				42 --		
				-		
				43 --		
				-		
				44 --		
				-		
				45 --		
				-		
				46 --		
				-		
				47 --		
				-		
				48 --		
				-		
				49 --		
				-		
				50 --		
				-		

BORING LOG NUMBER 11

Alexandria Real Estate Equities, Inc. **Date: 05/18/21** **Elevation: 667.5'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand to Sandy Silt, dark and yellowish brown, moist, medium dense, fine grained, stiff
				1 --		
				2 --		
2.5	66	15.5	105.2	-		
				3 --		Silty Sand to Sandy Silt, dark and yellowish brown, moist, medium dense, fine grained, stiff
				4 --		
5	42	15.3	SPT	5 --		
				6 --		
				7 --		
7.5	52	12.8	104.1	-		
				8 --		
				9 --		
10	22	19.2	SPT	10 --		
				11 --		
				12 --		
12.5	51	16.3	107.9	-		
				13 --		
				14 --		
15	18	14.3	SPT	15 --		
				16 --		
				17 --		
17.5	79	10.7	107.3	-		
				18 --		
				19 --		
20	40	29.0	SPT	20 --		
				21 --		
				22 --		
22.5	100/8"	12.4	100.9	-		
				23 --		BEDROCK (LOWER TOPANGA FORMATION): Sandstone, dark and yellowish brown, moist, hard
				24 --		
25	50/6"	13.7	SPT	25 --		
				-		

BORING LOG NUMBER 11

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				-		
				26 --		
				-		
				27 --		
27.5	100/7"	14.0	113.7	-		
				28 --		Sandstone, less weathered, dark brown, moist, hard
				-		
				29 --		
				-		
				30 --		
				-		
				31 --		
				-		
				32 --		
32.5	100/7"	11.9	109.0	-		
				33 --		
				-		
				34 --		
				-		
				35 --		
				-		Total Depth: 35 feet
				36 --		No Water
				-		Fill to 22.5 feet
				37 --		
				-		NOTE: The stratification lines represent the approximate
				38 --		boundary between earth types; the transition may be gradual.
				-		
				39 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				40 --		Modified California Sampler used unless otherwise noted
				-		
				41 --		SPT=Standard Penetration Test
				-		
				42 --		
				-		
				43 --		
				-		
				44 --		
				-		
				45 --		
				-		
				46 --		
				-		
				47 --		
				-		
				48 --		
				-		
				49 --		
				-		
				50 --		
				-		

BORING LOG NUMBER 12

Alexandria Real Estate Equities, Inc. **Date: 05/20/21** **Elevation: 683.5'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand to Sandy Silt, dark and yellowish brown, moist, medium dense, fine grained, stiff
				1 --		
				2 --		
				3 --		
				4 --		
5	45	15.7	103.3	5 --		dark brown
				6 --		
				7 --		
				8 --		
				9 --		
10	80	22.4	107.6	10 --		dark and yellowish brown
				11 --		
				12 --		
				13 --		
				14 --		
15	40 50/2"	13.2	113.0	15 --		dark gray and yellowish brown, very dense
				16 --		
				17 --		
17.5	100/7"	9.3	110.4	-		
				18 --		BEDROCK (LOWER TOPANGA FORMATION): Sandstone, dark and yellowish brown, moist, hard
				19 --		
20	100/6"	7.5	125.8	20 --		
				21 --		Total Depth: 20 feet No Water Fill to 17 feet
				22 --		
				23 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
				24 --		Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted
				25 --		

BORING LOG NUMBER 13

Alexandria Real Estate Equities, Inc. **Date: 05/18/21** **Elevation: 674.8'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand to Sandy Silt, yellowish brown, moist, medium dense, fine grained
				-		
				1 --		
				-		
				2 --		
2.5	79	20.9	101.4	-		
				3 --		
				-		
				4 --		
				-		
5	89	12.1	105.9	5 --		
				-		
				6 --		
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	81	15.0	112.8	10 --		
				-		
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	40 50/5"	17.5	107.8	15 --		
				-		
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	84	18.8	110.0	20 --		
				-		
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	66	19.3	105.8	25 --		— — — — — — — — — — — — — —
				-		Clayey Silt to Silty Clay, dark gray and gray, moist, stiff

BORING LOG NUMBER 13

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				-		
				26 --		
				-		
				27 --		
				-		
				28 --		
				-		
				29 --		
				-		
30	81	17.7	114.3	30 --		
				-		Sandy Silt to Silty Clay, dark brown and gray, moist, stiff
				31 --		
				-		
				32 --		
				-		
				33 --		
				-		
				34 --		
				-		
35	40	15.8	93.4	35 --		
	50/3"			-		Silty Sand to Sandy Silt with rock fragments, dark and yellowish brown, moist, very dense, fine grained, very stiff
				36 --		
				-		
				37 --		
37.5	100/7"	17.4	87.7	-		
				38 --	SM	OLDER ALLUVIUM: Silty Sand with rock fragments, dark and yellowish brown, moist, very dense, fine grained
				-		
				39 --		
				-		
40	100/7"	17.8	113.3	40 --		
				-		
				41 --		
				-		
				42 --		
				-		
				43 --		
				-		
				44 --		
				-		
45	100/8"	14.0	114.5	45 --		
				-		Total Depth: 45 feet
				46 --		No Water
				-		Fill to 37.5 feet
				47 --		
				-		NOTE: The stratification lines represent the approximate
				48 --		boundary between earth types; the transition may be gradual.
				-		
				49 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				50 --		Modified California Sampler used unless otherwise noted
				-		

BORING LOG NUMBER 14

Alexandria Real Estate Equities, Inc. **Date: 05/18/21** **Elevation: 677.4'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand, dark brown, moist
				-		
				1 --		
				-		
				2 --		
2.5	76	16.5	103.6	-		
				3 --		Silty Sand, yellowish brown, moist, dense, fine grained
				-		
				4 --		
				-		
5	24	13.9	SPT	5 --		
				-		Silty Sand to Sandy Silt, dark and yellowish brown,
				6 --		medium dense
				-		
				7 --		
7.5	87	14.7	112.5	-		
				8 --		dense, stiff
				-		
				9 --		
				-		
10	21	15.1	SPT	10 --		
				-		medium dense
				11 --		
				-		
				12 --		
12.5	81	8.7	114.9	-		
				13 --		
				-		
				14 --		
				-		
15	34	15.4	SPT	15 --		
				-		
				16 --		
				-		
				17 --		
17.5	92	15.7	99.7	-		
				18 --		Silty Sand to Sandy Silt, gray, moist, very dense, fine grained,
				-		stiff
				19 --		
				-		
20	53	18.0	SPT	20 --		
				-		
				21 --		
				-		
				22 --		
22.5	39	18.0	110.3	-		
	50/5"			23 --		dark brown and gray
				-		
				24 --		
				-		
25	41	28.4	SPT	25 --		
				-		Sandy Silt to Silty Clay, dark and grayish brown

BORING LOG NUMBER 14

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26		
				27		
27.5	84	20.4	106.5			
				28		dark brown and gray
				29		
30	27	20.7	SPT	30		Clayey Silt to Silty Clay, dark gray and brown, moist, stiff
				31		
				32		
32.5	72	16.5	109.8			
				33		Sandy Silt to Silty Clay, dark gray and brown mottling, moist, stiff
				34		
35	28	15.7	SPT	35		Sandy to Clayey Silt, dark brown and grayish brown
				36		
				37		
37.5	45 50/4"	15.9	106.2			
				38	ML	OLDER ALLUVIUM: Sandy to Clayey Silt with rock fragments, dark brown and yellowish brown, moist, very stiff
				39		
40	74	11.2	SPT	40		
				41		
				42		
42.5	46 50/4"	23.1	104.9			
				43	ML	Sandy Silt, dark brown, moist, stiff
				44		
45	80	19.6	SPT	45		
					SM/ML	Silty Sand to Sandy Silt, dark brown, moist, very dense, fine grained, very stiff
				46		
				47		
47.5	89	20.1	102.4			
				48		
				49		
					ML/CL	Sandy Silt to Silty Clay, dark brown, moist, stiff
50	27	24.9	SPT	50		
						Total Depth: 50 feet No Water Fill to 37.5

BORING LOG NUMBER 15

Alexandria Real Estate Equities, Inc. **Date: 05/19/21** **Elevation: 682.2'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy ***Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21**

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand to Sandy Silt, yellowish brown, moist,
				-		medium dense, fine grained, stiff
				1 --		
				-		
				2 --		
				-		
				3 --		
				-		
				4 --		
				-		
5	78	17.3	100.7	5 --		
				-		Silty Sand to Sandy Silt, yellowish brown, moist, very dense,
				6 --		fine grained, very stiff
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	85	17.8	104.0	10 --		
				-		Sandy to Clayey Silt, very stiff
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	100/9"	13.3	118.6	15 --		
				-		Silty Sand, dark and yellowish brown, moist, very dense,
				16 --		fine grained
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	39	15.1	109.5	20 --		
	50/5"			-		Sandy Silt, very stiff
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	39	17.1	110.3	25 --		
	50/5"			-		dark gray and yellowish brown

BORING LOG NUMBER 15

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26		
				27		
				28		
				29		
30	100/7"	13.7	116.6	30		
				31	SM	OLDER ALLUVIUM: Silty Sand, dark brown and yellowish brown, moist, very dense, fine grained
				32		
				33		
				34		
35	100/8"	19.4	105.3	35		
				36		
				37		
				38		
				39	ML	Sandy Silt with rock fragments, dark brown, moist, very stiff
40	100/6"	14.5	101.3	40		
				41		Total Depth: 40 feet No Water Fill to 30 feet
				42		
				43		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
				44		
				45		Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted
				46		
				47		
				48		
				49		
				50		

BORING LOG NUMBER 16

Alexandria Real Estate Equities, Inc. **Date: 05/21/21** **Elevation: 693.0'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		3-inch Asphalt over 6.5-inch Base
				-		
				1 --		FILL: Silty Sand, yellowish brown, moist, medium dense,
				-		fine grained
				2 --		
2.5	50/1"	No Recovery		-		
				3 --		
				-		BEDROCK (CONEDJO VOLCANICS) Basalt, yellowish
				4 --		brown, moist, very hard
				-		
5	50/2"	6.8	SPT	5 --		
				-		Total Depth: 5 feet by refusal
				6 --		No Water
				-		Fill to 3 feet
				7 --		
				-		NOTE: The stratification lines represent the approximate
				8 --		boundary between earth types; the transition may be gradual.
				-		
				9 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				10 --		Modified California Sampler used unless otherwise noted
				-		
				11 --		SPT=Standard Penetration Test
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
				15 --		
				-		
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
				20 --		
				-		
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
				25 --		
				-		

BORING LOG NUMBER 17

Alexandria Real Estate Equities, Inc. **Date: 05/21/21** **Elevation: 694.9'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		3.5-inch Asphalt over 8.5-inch Base
				-		
				1 --		
				-		FILL: Silty Sand, yellowish brown, moist, medium dense,
				2 --		fine grained
2.5	100/6"	6.4	96.9	-		
				3 --		
				-		BEDROCK (CONEJO VOLCANICS) Basalt, dark and
				4 --		yellowish gray, moist, hard
				-		very hard
5	50/2"	3.4	SPT	5 --		
				-		Total Depth: 5 feet by refusal
				6 --		No Water
				-		Fill to 3 feet
				7 --		
				-		NOTE: The stratification lines represent the approximate
				8 --		boundary between earth types; the transition may be gradual.
				-		
				9 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				10 --		Modified California Sampler used unless otherwise noted
				-		
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
				15 --		
				-		
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
				20 --		
				-		
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
				25 --		
				-		

BORING LOG NUMBER 18

Alexandria Real Estate Equities, Inc. **Date: 05/20/21** **Elevation: 696.7'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		4-inch Asphalt, 4-inch Base over 4-inch Asphalt, 5-inch Base
				-		
				1 --		
				-		
				2 --		FILL: Silty Sand, yellowish brown, moist, medium, fine grained
				-		
				3 --		
				-		BEDROCK (CONEJO VOLCANICS) Basalt, dark gray,
				4 --		moist, hard
				-		
5	100/7"	4.4	109.2	5 --		
				-		
				6 --		
				-		
7	50/2"	6.6	SPT	7 --		
				-		
				8 --		
				-		Total Depth: 8 feet by refusal
				9 --		No Water
				-		Fill to 3 feet
				10 --		
				-		NOTE: The stratification lines represent the approximate
				11 --		boundary between earth types; the transition may be gradual.
				-		
				12 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				13 --		Modified California Sampler used unless otherwise noted
				-		
				14 --		
				-		
				15 --		
				-		
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
				20 --		
				-		
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
				25 --		
				-		

BORING LOG NUMBER 19

Alexandria Real Estate Equities, Inc. **Date: 05/19/21** **Elevation: 696.5'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		3.5-inch Asphalt over 6.5-inch Base
				-		
				1 --		
				-		FILL: Silty Sand, dark brown, moist, medium dense, fine grained
				2 --		
2.5	26 50/5"	11.2	101.6	-		
				3 --		Silty Sand with rock fragments, yellowish brown, moist, very dense, fine grained
				-		
				4 --		
				-		
5	79	11.5	107.5	5 --		
				-		Silty Sand to Sandy Silt, dark and yellowish brown, dense, stiff
				6 --		
				-		
				7 --		
7.5	84	5.5	113.5	-		
				8 --		
				-		
				9 --		
				-		
10	42 50/3"	6.3	106.8	10 --		
				-	SP/SW	OLDER ALLUVIUM: Sand to Cobbly Sand, dark brown, moist, very dense, fine to coarse grained
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	88	10.9	113.2	15 --		
				-	SM/SP	Silty Sand to Sand, dark brown, moist, very dense, fine to medium grained, minor gravel
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	82	15.0	114.3	20 --		
				-	SM	Silty Sand, dark and yellowish brown, moist, very dense, fine grained
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	49	22.6	99.7	25 --		
				-	ML	Sandy Silt, yellow and grayish brown, moist, stiff, minor caliche

BORING LOG NUMBER 19

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				-		
				26 --		
				-		
				27 --		
				-		
				28 --		
				-		
				29 --		
				-	SM	Silty Sand, dark brown, moist, very dense, fine grained
30	40 50/4"	19.2	105.1	30 --		
				-		Total Depth: 30 feet
				31 --		No Water
				-		Fill to 10 feet
				32 --		
				-		
				33 --		
				-		
				34 --		
				-		
				35 --		
				-		
				36 --		
				-		
				37 --		
				-		
				38 --		
				-		
				39 --		
				-		
				40 --		
				-		
				41 --		
				-		
				42 --		
				-		
				43 --		
				-		
				44 --		
				-		
				45 --		
				-		
				46 --		
				-		
				47 --		
				-		
				48 --		
				-		
				49 --		
				-		
				50 --		
				-		

BORING LOG NUMBER 20

Alexandria Real Estate Equities, Inc. **Date: 05/20/21** **Elevation: 695.9'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		3-inch Asphalt over 8-inch Base
				-		
				1 --		
				-		FILL: Silty Sand, dark and yellowish brown, moist, medium
				2 --		dense, fine grained
				-		
				3 --		
				-	SM	OLDER ALLUVIUM: Silty Sand, yellowish brown, moist,
				4 --		medium dense to dense, fine grained
				-		
5	38	13.8	109.9	5 --		
	50/4"			-		very dense
				6 --		
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	45	7.7	115.2	10 --		
	50/5"			-	ML/SP	Sandy Silty to Sand with gravel, gray and dark brown, moist,
				11 --		very dense, fine to medium grained, very stiff
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	78	10.3	100.1	15 --		
				-	SP	Sand, dark brown, moist, very dense, fine to coarse grained
				16 --		with gravel
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-	SM	Silty Sand, dark and yellowish brown, moist, dense, fine grained
20	86	16.9	112.3	20 --		
				-		Total Depth: 20 feet
				21 --		No Water
				-		Fill to 3 feet
				22 --		
				-		NOTE: The stratification lines represent the approximate
				23 --		boundary between earth types; the transition may be gradual.
				-		
				24 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				25 --		Modified California Sampler used unless otherwise noted
				-		

BORING LOG NUMBER 21

Alexandria Real Estate Equities, Inc. **Date: 05/20/21** **Elevation: 695.7'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		4-inch Asphalt over 8-inch Base
				-		
				1 --		FILL: Silty and to Sandy Silty, dark and yellowish brown, moist, medium dense, fine grained, stiff
				-		
				2 --		
				-		
				3 --		
				-	SM	OLDER ALLUVIUM: Silty Sand, yellowish brown, moist, dense, fine grained
				4 --		
				-		
5	42 50/5"	20.2	108.1	5 --		
				-		dark and yellowish brown, very dense
				6 --		
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	100/8"	7.5	114.9	10 --		
				-	SP/SW	Sand to Gravelly Sand, dark brown, moist, very dense, fine to coarse grained
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	41 50/4"	11.7	108.4	15 --		
				-	SP	Sand, dark brown, moist, very dense, fine to medium grained, minor cobbles
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	68	20.1	82.4	20 --		
				-	SM/ML	Silty Sand to Sandy Silt with Clay, brown, very moist, medium dense, fine grained, stiff
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	100/9"	9.0	98.6	25 --		
				-	SP	Sand, dark brown, moist, very dense, fine to medium grained

BORING LOG NUMBER 21

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				-		
				26 --		
				-		
				27 --		
				-		
				28 --		
				-		
				29 --	SM	Silty Sand, dark and yellowish brown, moist, very dense,
				-		fine grained
30	34	18.3	110.3	30 --		
	50/5"			-		Total Depth: 30 feet
				31 --		No Water
				-		Fill to 3 feet
				32 --		
				-		
				33 --		NOTE: The stratification lines represent the approximate
				-		boundary between earth types; the transition may be gradual.
				34 --		
				-		Used 8-inch diameter Hollow-Stem Auger
				35 --		140-lb. Automatic Hammer, 30-inch drop
				-		Modified California Sampler used unless otherwise noted
				36 --		
				-		
				37 --		
				-		
				38 --		
				-		
				39 --		
				-		
				40 --		
				-		
				41 --		
				-		
				42 --		
				-		
				43 --		
				-		
				44 --		
				-		
				45 --		
				-		
				46 --		
				-		
				47 --		
				-		
				48 --		
				-		
				49 --		
				-		
				50 --		
				-		

BORING LOG NUMBER 22

Alexandria Real Estate Equities, Inc. **Date: 05/19/21** **Elevation: 694.3'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		3-inch Asphalt over 8-inch Base
				-		
				1 --		
				-		FILL: Silty Sand, dark row, moist, medium dense,
				2 --		fine grained
2.5	66	16.4	106.6	-		
				3 --		Clayey Silt to Silty Clay, dark gray and light yellow, moist,
				-		stiff
				4 --		
				-		
5	89	12.2	118.3	5 --		
				-	SM	OLDER ALLUVIUM: Silty Sand, yellowish brown, moist,
				6 --		very dense, fine grained
				-		
				7 --		
7.5	88	18.1	101.4	-		
				8 --	ML	Sandy Silt, dark and yellowish brown, moist, stiff
				-		
				9 --		
				-		
10	88	8.1	115.6	10 --		
				-		Silty Sand to Sandy Silt, dark brown, very dense, very stiff
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	45	18.9	105.6	15 --		
	50/3"			-	ML	Sandy to Clayey Silt, dark and yellowish brown, moist,
				16 --		very stiff
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	45	18.1	98.7	20 --		NOTE: The stratification lines represent the approximate
	50/5"			-		boundary between earth types; the transition may be gradual.
				21 --		
				-		Used 8-inch diameter Hollow-Stem Auger
				22 --		140-lb. Automatic Hammer, 30-inch drop
				-		Modified California Sampler used unless otherwise noted
				23 --		
				-		
				24 --		
				-	SP	Sand, dark brown, moist, very dense, fine to medium grained
25	45	9.8	108.9	25 --		
	50/4"			-		Total Depth: 25 feet Fill to 5 feet
						No Water

BORING LOG NUMBER 23

Alexandria Real Estate Equities, Inc. **Date: 05/19/21** **Elevation: 696.2'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		4-inch Asphalt over 10-inch Base
				1 --		
				2 --		FILL: Sandy Silt to Silty Sand, dark brown, moist, medium dense, fine grained, stiff
2.5	30	25.1	92.2	-		
				3 --		Silty Sand to Silty Clay, gray to dark gray, moist, medium dense, fine grained, stiff
				4 --		
5	51	27.7	97.0	5 --		
				6 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual. Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted
				7 --		
				8 --		
				9 --		
10	68	20.3	106.8	10 --		
				11 --		Silty Clay, dark gray, moist, stiff
				12 --		
				13 --	SM	OLDER ALLUVIUM: Silty Sand, dark brown, moist, medium dense, fine grained
				14 --		
15	83	14.6	110.7	15 --		
				16 --		very dense
				17 --		
				18 --		
				19 --		
20	100/8"	11.1	101.2	20 --		
				21 --		BEDROCK: (LOWER TOPANGA FORMATION): Sandstone, dark and yellowish brown, moist, hard
				22 --		
				23 --		
				24 --		
25	100/7"	9.6	116.7	25 --		
				-		Total Depth: 25 feet Fill to 12 feet No Water

BORING LOG NUMBER 24

Alexandria Real Estate Equities, Inc. **Date: 05/19/21** **Elevation: 694.2'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		2-inch Asphalt over 3-inch Base
				-		
				1 --		FILL: Silty Sand to Sandy Silt, dark and yellowish brown, moist, medium dense, fine grained, stiff
				-		
				2 --		
				-		
				3 --		
				-	SM	OLDER ALLUVIUM: Silty Sand, yellowish brown, moist, medium dense, fine grained
				4 --		
				-		
5	95	7.5	104.4	5 --		
				-	SP/SW	Sand to Gravelly Sand, dark brown, moist, dense, fine to coarse grained
				6 --		
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	32 50/5"	7.6	113.3	10 --		
				-		very dense
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	63	24.5	103.6	15 --		
				-	ML	Sandy to Clayey Silt, dark brown, moist, stiff
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	70	21.4	104.8	20 --		
				-	SM/ML	Silty Sand to Sandy Silt, dark and yellowish brown, moist, dense, fine grained, stiff
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	100/8"	10.7	109.4	25 --		
				-	SP/ML	Sand to Sandy Silt w/Clay, dark brown to grayish brown, moist very dense, fine to medium grained, minor pebbles, very stiff

BORING LOG NUMBER 24

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				-		
				26 --		
				-		
				27 --		
				-		
				28 --		
				-		
				29 --	ML	Sandy Silt with rock fragments, yellowish brown, moist,
				-		very stiff
30	100/8"	9.3	88.4	30 --		
				-		Total Depth: 30 feet
				31 --		No Water
				-		Fill to 3 feet
				32 --		
				-		NOTE: The stratification lines represent the approximate
				33 --		boundary between earth types; the transition may be gradual.
				-		
				34 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				35 --		Modified California Sampler used unless otherwise noted
				-		
				36 --		
				-		
				37 --		
				-		
				38 --		
				-		
				39 --		
				-		
				40 --		
				-		
				41 --		
				-		
				42 --		
				-		
				43 --		
				-		
				44 --		
				-		
				45 --		
				-		
				46 --		
				-		
				47 --		
				-		
				48 --		
				-		
				49 --		
				-		
				50 --		
				-		

BORING LOG NUMBER 25

Alexandria Real Estate Equities, Inc. **Date: 08/24/21** **Elevation: 690.0'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for driveway
				0 --		3-inch Asphalt over 2-inch Base
				-		
				1 --		FILL: Silty Sand, dark brown, moist, medium dense,
				-		fine grained
				2 --		
2.5	88	22.4	101.7	-		
				3 --		
				-	ML	OLDER ALLUVIUM: Sandy Silt, dark and yellowish brown,
				4 --		moist, very stiff
				-		
5	90	24.7	102.8	5 --		
				-		yellow and grayish brown
				6 --		
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	85	26.8	96.7	10 --		
				-		dark and grayish brown
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	45	23.7	103.7	15 --		
	50/5"			-		yellowish brown
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	100/10"	13.1	115.2	20 --		
				-	SM	Silty Sand, dark brown, moist, very dense, fine grained
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	100/10"	19.3	107.5	25 --		
				-		dark brown and gray

BORING LOG NUMBER 25

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				-		
				26 --		
				-		
				27 --		
				-		
				28 --		
				-		
				29 --		
				-		
30	100/9"	11.4	110.0	30 --		
				-		Silty Sand with pebbles, dark brown, moist, very dense,
				31 --		fine to coarse grained
				-		
				32 --		
				-		
				33 --		
				-		
				34 --		
				-		
35	82	27.3	96.6	35 --		
				-	ML	Sandy Silt, dark and grayish brown, moist, very stiff
				36 --		
				-		
				37 --		
				-		
				38 --		
				-		
				39 --		
				-		Clayey Silt, dark and grayish brown, moist, very stiff
40	88	28.0	96.9	40 --		
				-		Total Depth: 40 feet
				41 --		No Water
				-		Fill to 3 feet
				42 --		
				-		NOTE: The stratification lines represent the approximate
				43 --		boundary between earth types; the transition may be gradual.
				-		
				44 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				45 --		Modified California Sampler used unless otherwise noted
				-		
				46 --		
				-		
				47 --		
				-		
				48 --		
				-		
				49 --		
				-		
				50 --		
				-		

BORING LOG NUMBER 26

Alexandria Real Estate Equities, Inc. **Date: 08/23/21** **Elevation: 286.5'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for driveway
				0 --		3-inch Asphalt over 7-inch Base
				-		
				1 --		
				-		FILL: Sandy Silt, dark brown, moist, stiff
				2 --		
2.5	78	17.0	110.7	-		
				3 --		
				-	ML/CL	OLDER ALLUVIUM: Clayey Silt to Silty Clay, gray to dark
				4 --		gray, moist, stiff
				-		
5	35	13.4	109.7	5 --		
	50/5"			-	SM/ML	Silty Sand to Sandy Silt, yellowish brown, moist, very dense,
				6 --		fine grained, very stiff, minor caliche
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	32	14.8	108.1	10 --		
	50/5"			-		
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	100/10"	22.5	103.6	15 --		
				-		
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	100/9"	15.7	109.9	20 --		
				-		Total Depth: 20 feet
				21 --		No Water
				-		Fill to 3 feet
				22 --		
				-		NOTE: The stratification lines represent the approximate
				23 --		boundary between earth types; the transition may be gradual.
				-		
				24 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				25 --		Modified California Sampler used unless otherwise noted
				-		

BORING LOG NUMBER 27

Alexandria Real Estate Equities, Inc. **Date: 08/25/21** **Elevation: 695.0'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for driveway
				0 --		3-inch Asphalt, No Base
				-		
				1 --		FILL: Sandy Silt to Silty Clay, dark brown, moist, stiff
				-		
				2 --		
				-		
3	49	19.6	106.8	3 --		
				-	CL	OLDER ALLUVIUM: Silty Clay, dark brown, moist, stiff, minor caliche
				4 --		
				-		
5	49	20.2	109.0	5 --		
				-	ML	Sandy to Clayey Silt, dark brown, moist, stiff, minor caliche
				6 --		
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	69	18.6	109.3	10 --		
				-	SM/ML	Silty Sand to Sandy Silt, dark brown, moist, medium dense, fine grained, stiff
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	100/8"	13.5	113.1	15 --		
				-	SM	Silty Sand, dark and yellowish brown, moist, very dense, fine grained
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	80	26.1	98.4	20 --		
				-	ML	Sandy Silt, yellowish brown, moist, very stiff
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
25	36 50/5"	22.5	102.9	25 --		
				-		Sandy to Clayey Silt, moist

BORING LOG NUMBER 27

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26 --		
				27 --		
				28 --		
				29 --	SM	Silty Sand, dark and yellowish brown, moist, very dense, fine grained
30	39 50/5"	23.0	104.2	30 --		
				31 --		Total Depth: 30 feet No Water Fill to 3 feet
				32 --		
				33 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
				34 --		Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted
				35 --		
				36 --		
				37 --		
				38 --		
				39 --		
				40 --		
				41 --		
				42 --		
				43 --		
				44 --		
				45 --		
				46 --		
				47 --		
				48 --		
				49 --		
				50 --		

BORING LOG NUMBER 28

Alexandria Real Estate Equities, Inc. **Date: 08/24/21** **Elevation: 697.0'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy ***Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21**

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Lawn Area
				0 --		FILL: Silty Sand with rock fragments, dark brown, moist, medium dense, fine grained
				1 --		
				2 --		
				3 --		
				4 --		
5	72	12.0	117.6	5 --		
				6 --		Silty Sand to Sandy Silt with rock fragments, dark brown, moist, dense, fine grained
				7 --		
				8 --		
				9 --		
10	48	20.5	101.4	10 --		
				11 --		Clayey Silt to Silty Clay, dark brown and gray, moist, stiff
				12 --		
12.5	49	23.5	102.3	-		
				13 --		Sandy to Clayey Silt, dark and grayish brown, moist, stiff
				14 --		
15	67	23.5	99.7	15 --		
				16 --		dark gray to gray
				17 --		
17.5	42 50/2"	19.9	98.8	-		
				18 --		dark and grayish brown
				19 --		
20	35	21.9	100.5	20 --		
				21 --		
				22 --		
22.5	58	22.8	105.7	-		
				23 --	CL	OLDER ALLUVIUM: Silty Clay, dark gray, moist, stiff, minor caliche
				24 --		
25	78	19.9	109.8	25 --		
				-	ML/CL	Clayey Silt to Silty Clay, dark brown, moist, very stiff

BORING LOG NUMBER 28

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				26 --		
				27 --		
				28 --		
				29 --		
30	38 50/3"	20.7	107.5	30 --	SM/ML	Silty Sand to Sandy Silt, yellowish brown, moist, very dense, fine grained, very stiff
				31 --		
				32 --		
				33 --		
				34 --		
35	100/7"	10.8	117.9	35 --	SM/SP	Silty Sand to Sand, dark brown, moist, very dense, fine to medium grained, minor pebbles
				36 --		
				37 --		
				38 --		
				39 --		
40	100/10"	18.5	111.2	40 --		Total Depth: 40 feet No Water Fill to 22.5 feet NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual. Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted
				41 --		
				42 --		
				43 --		
				44 --		
				45 --		
				46 --		
				47 --		
				48 --		
				49 --		
				50 --		

BORING LOG NUMBER 29

Alexandria Real Estate Equities, Inc. **Date: 08/23/21** **Elevation: 691.5'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0		3-inch Asphalt over 6-inch Base
				1		FILL: Silty Sand, dark brown, moist, medium dense, fine grained, minor asphalt and rock fragments
				2		
				3		
				4		
5	100/10"	12.9	94.6	5		
				6		Sandy Silt to Silty Sand, gray, moist, very stiff with rock fragments, very dense, fine grained
				7		
7.5	82	10.2	79.5			Silty Sand to Sandy Silt, grayish brown, moist, medium dense to dense, fine grained, stiff
				8		
				9		
10	72	19.1	106.9	10		
				11		Sandy Silt to Silty Clay, gray to dark gray, moist, stiff, minor rock fragments
				12		
12.5	86	13.4	115.2			
				13		Clayey Silt to Silty Sand, gray to dark gray, moist, very stiff, minor rock fragments
				14		
15	74	19.9	98.4	15		
				16		Sandy Silt to Silty Sand, dark gray and gray, moist, dense, fine grained, stiff, minor rock fragments
				17		
17.5	30 50/4"	16.7	113.4			
				18		
				19		
20	100/10"	19.2	99.6	20		
				21		BEDROCK (CONEJO VOLANICS): Weathered bedrock, dark and yellowish brown, moist, moderately hard
				22		
22.5	100/9"	11.3	100.5			
				23		volcanic rock, yellowish brown, moist, hard
				24		
25	100/9"	8.2	93.8	25		
						volcanic rock, yellowish brown, hard

BORING LOG NUMBER 29

Alexandria Real Estate Equities, Inc.

File No. 22144

dy

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description
				-		
				26 --		
				-		
				27 --		
				-		
				28 --		
				-		
				29 --		
				-		
30	100/4"	15.6	76.7	30 --		
				-		Total Depth: 30 feet
				31 --		No Water
				-		Fill to 20 feet
				32 --		
				-		NOTE: The stratification lines represent the approximate
				33 --		boundary between earth types; the transition may be gradual.
				-		
				34 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				35 --		Modified California Sampler used unless otherwise noted
				-		
				36 --		
				-		
				37 --		
				-		
				38 --		
				-		
				39 --		
				-		
				40 --		
				-		
				41 --		
				-		
				42 --		
				-		
				43 --		
				-		
				44 --		
				-		
				45 --		
				-		
				46 --		
				-		
				47 --		
				-		
				48 --		
				-		
				49 --		
				-		
				50 --		
				-		

BORING LOG NUMBER 30

Alexandria Real Estate Equities, Inc. **Date: 08/24/21** **Elevation: 695.0'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		4-inch Asphalt over 8-inch Base
				-		
				1 --		
				-		FILL: Silty Sand, dark brown, moist, medium dense,
				2 --		fine grained
2.5	100/7"	5.5	96.7	-		
				3 --		
				-		BEDROCK (CONJEO VOLANICS) Volcanic rock, dark brown,
				4 --		moist, hard
				-		
5	100/6.5"	5.5	Disturbed	5 --		
				-		
				6 --		
				-		
				7 --		
7.5	100/2"	2.2	Disturbed	-		
				8 --		
				-		Total Depth: 8 feet
				9 --		No Water
				-		Fill to 3 feet
				10 --		
				-		NOTE: The stratification lines represent the approximate
				11 --		boundary between earth types; the transition may be gradual.
				-		
				12 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				13 --		Modified California Sampler used unless otherwise noted
				-		
				14 --		
				-		
				15 --		
				-		
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
				20 --		
				-		
				21 --		
				-		
				22 --		
				-		
				23 --		
				-		
				24 --		
				-		
				25 --		
				-		

BORING LOG NUMBER 31

Alexandria Real Estate Equities, Inc. **Date: 08/25/21** **Elevation: 698.0'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		3-inch Asphalt over 8-inch Base
				-		
				1 --		
				-		FILL: Silty Sand, dark and yellowish brown, moist, medium
				2 --		dense, fine grained, minor rock fragments
2.5	100/8"	8.1	104.8	-		
				3 --		
				-		
				4 --		
				-		
5	100/8"	9.5	95.6	5 --		
				-		BEDROCK (CONEJO VOLANICS): Volcanic rock, yellowish
				6 --		brown, moist, hard
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	100/7"	11.7	110.0	10 --		
				-		volcanic rock or basalt, yellowish brown, moist, hard
				11 --		
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	100/6"	7.9	90.6	15 --		
				-		volcanic rock, yellowish brown and dark brown, moist, hard
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		
20	100/5"	6.1	110.2	20 --		
				-		Total Depth: 20 feet
				21 --		No Water
				-		Fill to 3 feet
				22 --		
				-		NOTE: The stratification lines represent the approximate
				23 --		boundary between earth types; the transition may be gradual.
				-		
				24 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				25 --		Modified California Sampler used unless otherwise noted
				-		

BORING LOG NUMBER 32

Alexandria Real Estate Equities, Inc. **Date: 08/25/21** **Elevation: 696.5'***

File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy

*Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Asphalt for parking
				0 --		3-inch Asphalt over 4-inch Base
				1 --		FILL: Silty Sand, dark brown, moist, medium dense, fine grained
				2 --		
2.5	100/8"	8.8	109.1			
				3 --	SM	OLDER ALLUVIUM: Silty Sand, yellowish brown, moist, very dense, fine grained
				4 --		
5	100/8"	10.9	104.8	5 --	SM/SP	Silty Sand to Sand, dark and yellowish brown, moist, very dense, fine to medium grained
				6 --		
				7 --		
				8 --		
				9 --		
10	100/9"	6.5	108.7	10 --	SP	Sand with rock fragments, dark brown, moist, very dense, fine to medium grained
				11 --		
				12 --		
				13 --		
				14 --		
15	100/8"	14.9	95.8	15 --	SM	Silty Sand with rock fragments, dark brown, moist, very dense, fine grained
				16 --		
				17 --		
				18 --		
				19 --		
20	45 50/3"	12.2	89.6	20 --		Total Depth: 20 feetby refusal No Water Fill to 3 feet
				21 --		
				22 --		NOTE: The stratification lines represent the approximate boundary between earth types; the transition may be gradual.
				23 --		
				24 --		Used 8-inch diameter Hollow-Stem Auger 140-lb. Automatic Hammer, 30-inch drop Modified California Sampler used unless otherwise noted
				25 --		

BORING LOG NUMBER 33

Alexandria Real Estate Equities, Inc. **Date: 08/24/21** **Elevation: 669.0'***

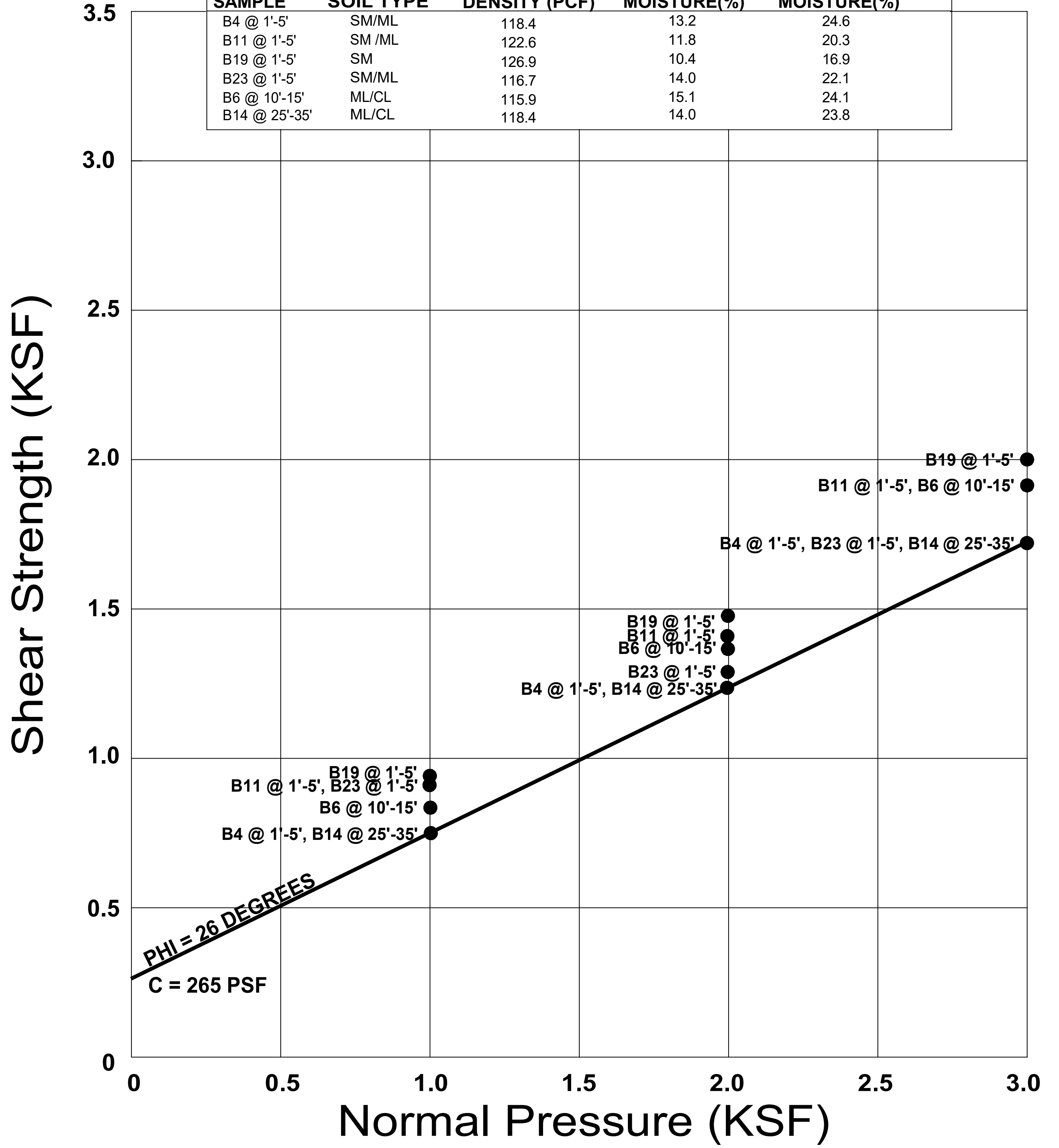
File No. 22144 **Method: 8-inch diameter Hollow Stem Auger**

dy *Based on topographic survey provided by JRN Civil Engineers, dated 6/4/21

Sample Depth ft.	Blows per ft.	Moisture content %	Dry Density p.c.f.	Depth in feet	USCS Class.	Description Surface Conditions: Bare Ground
				0 --		FILL: Silty Sand to Sand, dark and yellowish brown, moist,
				-		medium dense, fine grained
				1 --		
				-		
				2 --		
2.5	69	15.4	107.6	-		
				3 --		Silty Sand, dark brown, dense
				-		
				4 --		
				-		
5	82	12.8	117.8	5 --		
				-		Silty Sand to Sandy Silt, dark and yellowish brown, moist
				6 --		very dense, fine grained, very stiff
				-		
				7 --		
				-		
				8 --		
				-		
				9 --		
				-		
10	78	14.9	105.7	10 --		
				-		Silty Sand to Sandy Silt, dark and grayish brown, moist,
				11 --		very dense, fine grained, very stiff
				-		
				12 --		
				-		
				13 --		
				-		
				14 --		
				-		
15	61	34.4	86.6	15 --		
				-		Sandy Silt, dark and yellowish brown, moist, stiff
				16 --		
				-		
				17 --		
				-		
				18 --		
				-		
				19 --		
				-		Clayey Silt to Silty Clay, dark gray to gray, moist, stiff
20	52	24.2	91.6	20 --		
				-		Total Depth: 20 feet
				21 --		No Water
				-		Fill to 20 feet
				22 --		
				-		NOTE: The stratification lines represent the approximate
				23 --		boundary between earth types; the transition may be gradual.
				-		
				24 --		Used 8-inch diameter Hollow-Stem Auger
				-		140-lb. Automatic Hammer, 30-inch drop
				25 --		Modified California Sampler used unless otherwise noted
				-		

BULK SAMPLE REMOLDED TO 90 PERCENT OF THE MAXIMUM LABORATORY DENSITY

SAMPLE	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE(%)	FINAL MOISTURE(%)
B4 @ 1'-5'	SM/ML	118.4	13.2	24.6
B11 @ 1'-5'	SM /ML	122.6	11.8	20.3
B19 @ 1'-5'	SM	126.9	10.4	16.9
B23 @ 1'-5'	SM/ML	116.7	14.0	22.1
B6 @ 10'-15'	ML/CL	115.9	15.1	24.1
B14 @ 25'-35'	ML/CL	118.4	14.0	23.8



● Direct Shear, Saturated

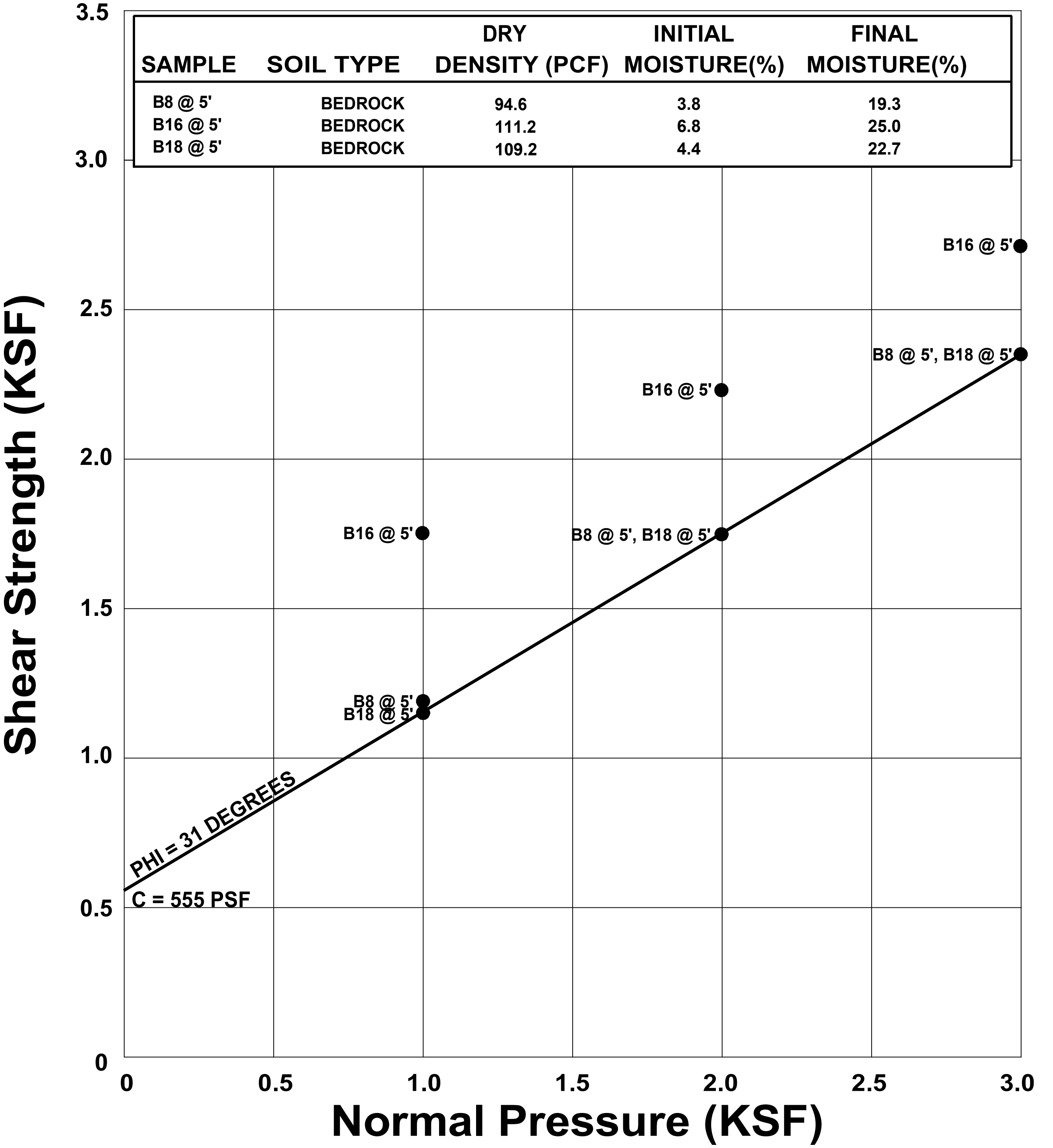
SHEAR TEST DIAGRAM

Geotechnologies, Inc.
Consulting Geotechnical Engineers

ALEXANDRIA REAL ESTATE EQUITIES, INC.
1100 RANCHO CONEJO BLVD., THOUSAND OAKS

FILE NO. 22144 | **PLATE: B-1**

BEDROCK



SAMPLE	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE(%)	FINAL MOISTURE(%)
B8 @ 5'	BEDROCK	94.6	3.8	19.3
B16 @ 5'	BEDROCK	111.2	6.8	25.0
B18 @ 5'	BEDROCK	109.2	4.4	22.7

● Direct Shear, Saturated

SHEAR TEST DIAGRAM

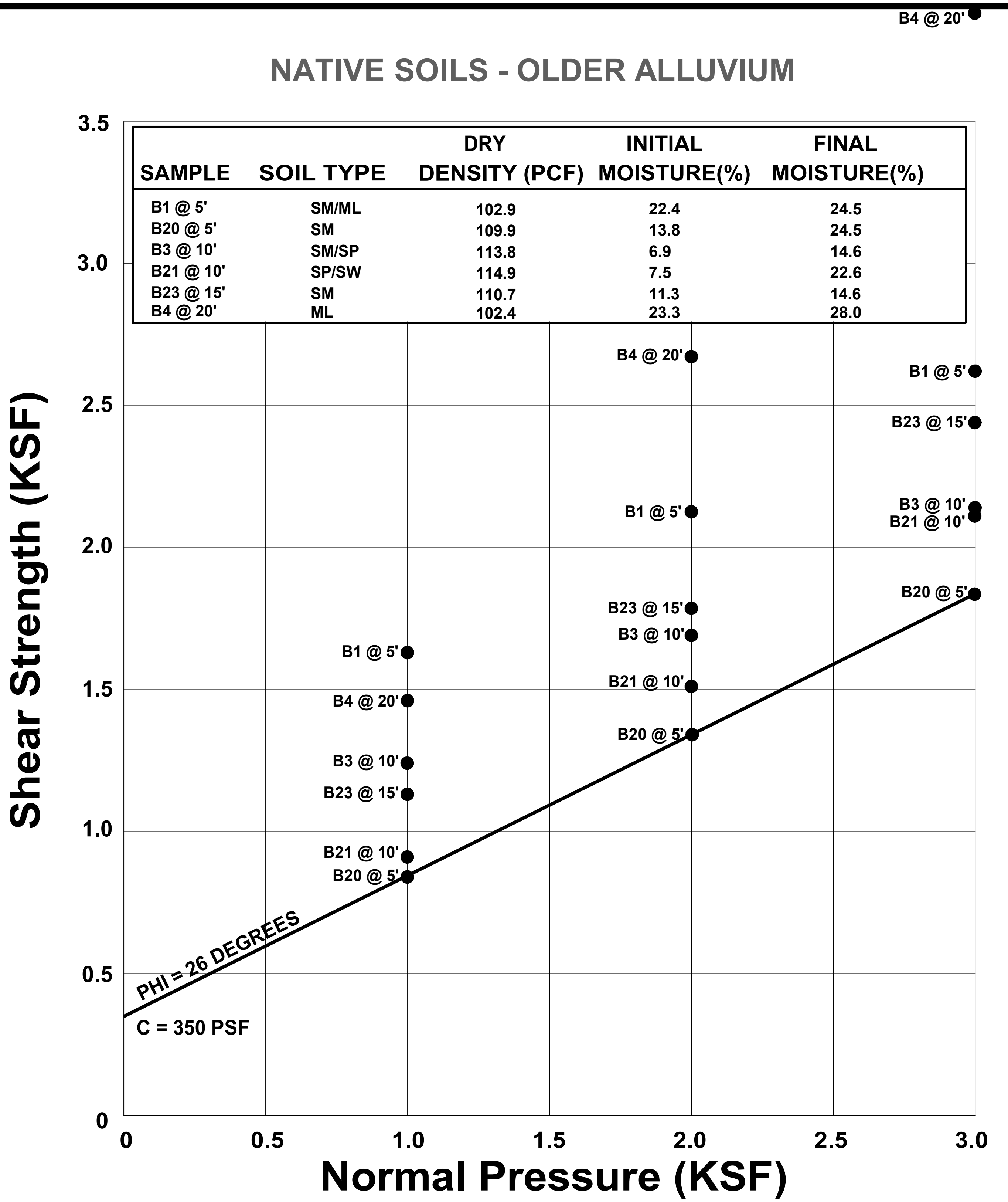
Geotechnologies, Inc.
Consulting Geotechnical Engineers

ALEXANDRIA REAL ESTATE EQUITIES, INC.
1100 RANCHO CONEJO BLVD., THOUSAND OAKS

FILE NO. 22144 | PLATE: B-2

NATIVE SOILS - OLDER ALLUVIUM

SAMPLE	SOIL TYPE	DRY DENSITY (PCF)	INITIAL MOISTURE(%)	FINAL MOISTURE(%)
B1 @ 5'	SM/ML	102.9	22.4	24.5
B20 @ 5'	SM	109.9	13.8	24.5
B3 @ 10'	SM/SP	113.8	6.9	14.6
B21 @ 10'	SP/SW	114.9	7.5	22.6
B23 @ 15'	SM	110.7	11.3	14.6
B4 @ 20'	ML	102.4	23.3	28.0



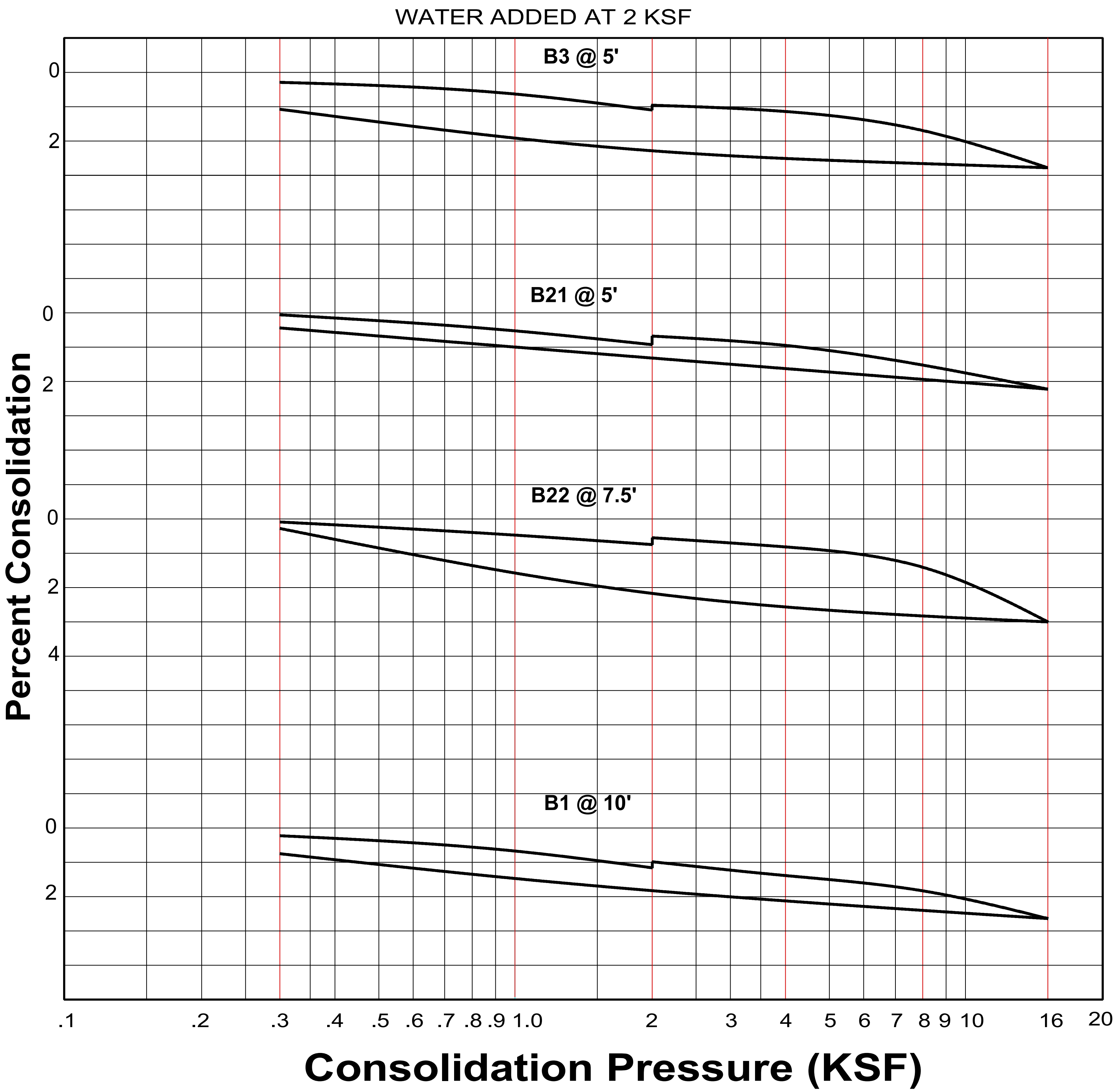
● Direct Shear, Saturated

SHEAR TEST DIAGRAM

Geotechnologies, Inc.
Consulting Geotechnical Engineers

ALEXANDRIA REAL ESTATE EQUITIES, INC.
1100 RANCHO CONEJO BLVD., THOUSAND OAKS

FILE NO. 22144 | PLATE: B-3

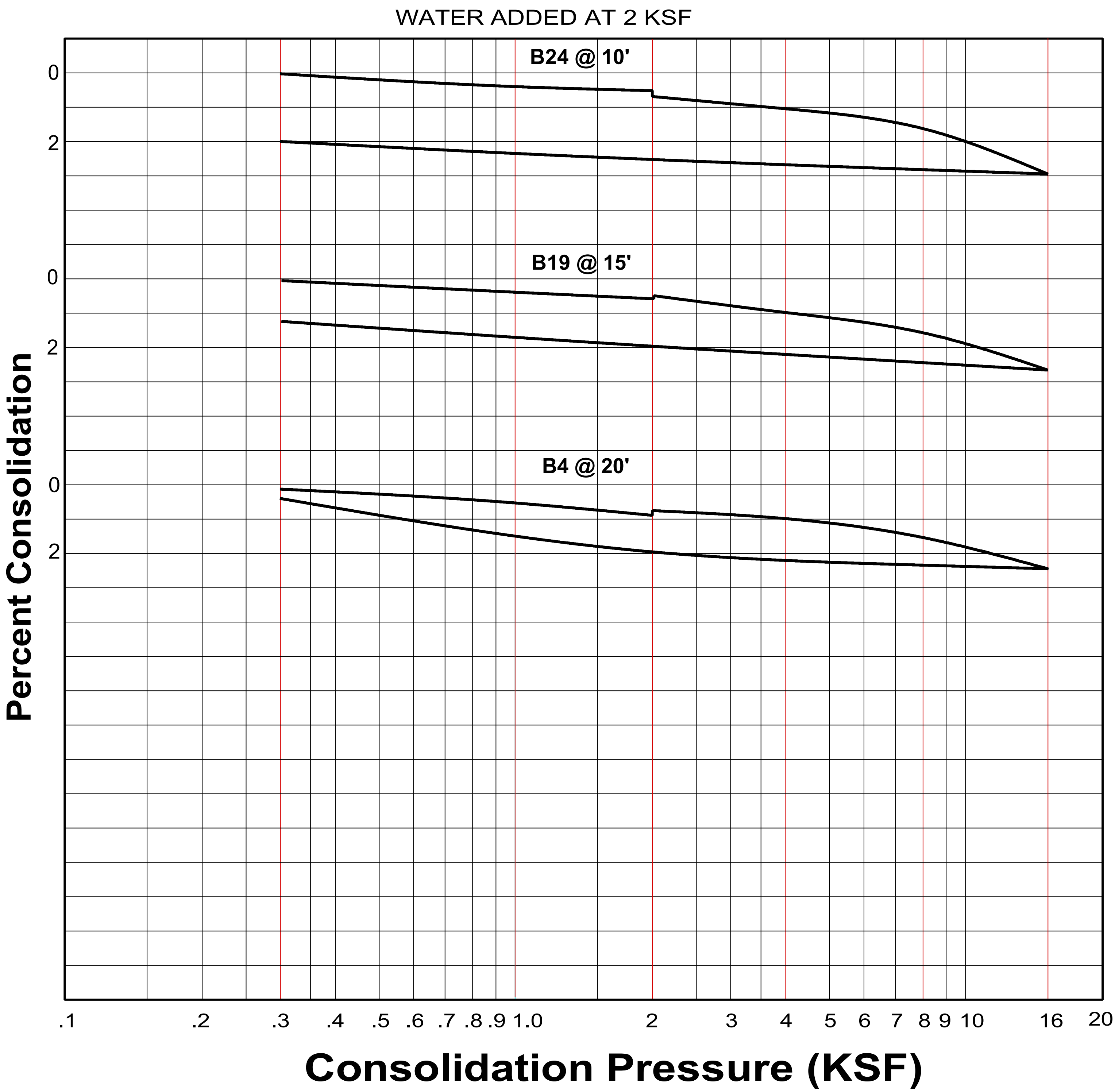


CONSOLIDATION TEST

Geotechnologies, Inc.
Consulting Geotechnical Engineers

ALEXANDRIA REAL ESTATE EQUITIES, INC.
1100 RANCHO CONEJO BLVD., THOUSAND OAKS

FILE NO. 22144 | **PLATE: C-1**



CONSOLIDATION TEST

Geotechnologies, Inc.
Consulting Geotechnical Engineers

ALEXANDRIA REAL ESTATE EQUITIES, INC.
1100 RANCHO CONEJO BLVD., THOUSAND OAKS

FILE NO. 22144 | **PLATE: C-2**

ASTM D-1557

SAMPLE	B4 @ 1'-5'	B11 @ 1'-5'	B19 @ 1'-5'	B23 @ 1'-5'	B6 @ 10'-15'	B14 @ 25'-35'
SOIL TYPE:	SM/ML	SM/ML	SM	SM/ML	ML/CL	ML/CL
MAXIMUM DENSITY pcf.	118.4	122.6	126.9	116.7	115.9	118.4
OPTIMUM MOISTURE %	13.2	11.8	10.4	14.0	15.1	14.0

ASTM D 4829-03

SAMPLE	B4 @ 1'-5'	B11 @ 1'-5'	B19 @ 1'-5'	B23 @ 1'-5'	B6 @ 10'-15'	B14 @ 25'-35'
SOIL TYPE:	SM/ML	SM/ML	SM	SM/ML	ML/CL	ML/CL
EXPANSION INDEX UBC STANDARD 18-2	86	62	20	70	64	114
EXPANSION CHARACTER	MODERATE	MODERATE	LOW	MODERATE	MODERATE	HIGH

SULFATE CONTENT

SAMPLE	B4 @ 1'-5'	B11 @ 1'-5'	B19 @ 1'-5'	B23 @ 1'-5'	B6 @ 10'-15'	B14 @ 25'-35'
SULFATE CONTENT: (percentage by weight)	< 0.1%	< 0.1 %	< 0.1 %	< 0.1 %	< 0.1 %	< 0.1 %

COMPACTION/EXPANSION/SULFATE DATA SHEET

Geotechnologies, Inc.
Consulting Geotechnical Engineers

ALEXANDRIA REAL ESTATE EQUITIES, INC.
1100 RANCHO CONEJO BLVD., THOUSAND OAKS

FILE NO. 22144 | PLATE: D

September 3, 2021
Project No. 21070A

Mr. Stan Tang
Geotechnologies, Inc.
439 Western Ave.
Glendale, CA 91201

SUBJECT: SURFACE WAVE AND SEISMIC REFRACTION GEOPHYSICAL SURVEY RESULTS 1100 RANCHO CONEJO BOULEVARD THOUSAND OAKS, CALIFORNIA

Dear Mr. Tang,

Per your request and in accordance with the provisions of our proposal, dated June 15, 2021, GeoPentech performed surface wave and seismic refraction geophysical measurements along nine survey lines (SW/SR21-1 through SW/SR21-9) at 1100 Rancho Conejo Blvd. in Thousand Oaks, California. The locations of the geophysical measurements are shown on Figure 1.

Project Understanding

We understand the proposed project includes construction of five new buildings, a parking structure, and a sports field. All buildings have been proposed to be constructed on grade with two to three stories above grade, and the parking structure is proposed to have five levels. The site is underlain with varying thicknesses of fill, older alluvium, and volcanic bedrock, with bedrock occurring very near to the surface in some locations in the northeast area of the site. We also understand that a surface-wave geophysical investigation was necessary to measure the shear-wave velocity profile at the site to evaluate the site V_{S30} and that seismic refraction measurements were needed to evaluate rippability and approximate depth of shallow bedrock. This letter summarizes the results of the surface wave and seismic refraction surveys and the evaluation of V_{S30} and rippability.

Surface Wave Geophysics Methods

Both active and passive surface wave surveys were performed at the site. The active surface wave surveys were performed using Multi-channel Analysis of Surface Waves (MASW) methods, and the passive surveys were performed using Refraction Microtremor (ReMi) methods. A detailed description of MASW is provided in Park et al. (1999)[1] and ReMi is provided in Louie (2001)[2].

[1] Park, C, Miller, R., and Xia, J. (1999). Multichannel analysis of surface waves: Geophysics, v. 64, no. 3, pp. 800-808.
[2] Louie, J.N. (2001). Faster, Better: Shear-wave Velocity to 100 Meters Depth from Refraction Microtremor Arrays: Bulletin of the Seismological Society of America, v. 91, no. 2, p. 347-364.

In general, the surface wave method records Rayleigh waves generated either with (1) an active source (e.g. sledgehammer) for the MASW method or (2) a passive (ambient) source (e.g. vehicular traffic) for the ReMi method. In a layered medium, Rayleigh surface waves of different frequencies (or wavelengths) propagate at different velocities, referred to as phase velocity. This phase velocity primarily depends on the material stiffness properties (e.g. S-wave velocity) over a depth approximately equal to one wavelength. Consequently, lower frequency, longer wavelength surface wave energy will provide samples to greater survey depths than higher frequency, shorter wavelength energy. Because surface waves of different frequencies (wavelengths) sample different depths, they travel at different velocities (dispersion) in a layered medium. Surface wave geophysical surveys measure the dispersive nature of the geologic medium and produce dispersion curves, which show the variation of Rayleigh wave phase velocity as a function of frequency (or wavelength). Due to the generally lower frequency nature of passive surface wave energy, passive surface wave techniques (i.e. ReMi) have the potential to supplement active surface wave data to achieve deeper investigation depths. For this reason, it is advantageous to perform both types of measurement along the same lines as was done for this project.

After the dispersion curve is generated, the dispersion curve picks are then iteratively fitted to a horizontally layered, laterally continuous, homogeneous-isotropic, S-wave velocity model that would account for the measured surface wave velocity dispersion. The results provide a representative average estimate of the one-dimensional S-wave velocity profile under the array.

Surface Wave Geophysics Procedures

The MASW and ReMi investigations were performed at the site on August 12, 2021. As shown on Figure 1, nine surface wave measurements were performed across the site. These measurements were collected using a Geometrics S12 seismograph with a linear array of twelve, 4.5-Hz geophones linearly spaced at 10- and 20-foot intervals for all surface wave lines (SW/SR21-1 through SW/SR21-9) except for SW/SR21-8, which had geophone spacings of 10 and 15 feet.

For the MASW measurements, the active seismic source consisted of a sledgehammer blow to a ground plate. The MASW measurements were collected along two separate arrays (110 and 220 feet long for all lines but SW/SR21-8, which were 110 and 165 feet long) for each line. Shots were performed at equal station intervals (either 10, 15, or 20 feet) starting at the end geophone to 3 to 5 station intervals (45 to 60 feet) beyond the end geophone. At each shot location, the sledgehammer was hit three times, and the resultant waveform was stacked. A 1,024-millisecond long record (0.5 millisecond sample interval) was recorded at each shot location. The recorded MASW data were subsequently processed using the program SurfSeis by Kansas Geological Survey. This program performs a wavefield transformation to convert the seismic data from time-distance space to frequency-phase velocity space. The highest amplitude energy in the frequency-phase velocity space was selected for the dispersion curve.

Because of the typical lower frequency nature of passive surface wave energy, ReMi measurements were performed to supplement the MASW measurements to deeper investigation depths. The ReMi measurements were collected along the same 220-foot-long 12-channel arrays as the 220-foot-long MASW measurements. For the ReMi measurements, a total of ten 32,768 millisecond long records (2 millisecond sample interval) were recorded along each survey line. The source of ambient surface wave energy was primarily nearby vehicular traffic. The recorded ReMi data were subsequently processed using the program SeisOpt ReMi by Optim Software. This program performs a slowness-frequency waveform transformation to the recorded surface wave records to separate Rayleigh waves from other seismic arrivals. The ReMi dispersion curves were picked at the lower bound envelope of the surface wave energy, which represents the slowest surface wave energy (highest slowness). In theory, the slowest identifiable surface wave energy represents the energy that is propagating parallel to the survey line. Energy propagating oblique to the line would be observed as higher velocity. Due to the large size of the site (with measurement locations relatively distant from roads) and the low volume of traffic immediately near the site, the ReMi measurements were generally weak. The ReMi signal was too low to be used for line SW/SR21-6.

For each line, the ReMi dispersion curve was combined with the dispersion curves generated from MASW for modeling. Overlapping portions of the ReMi and MASW dispersion curves were compared to evaluate the degree of fit of the dispersion picks. Additionally, as noted above, ReMi and MASW data complement each other by generally sampling different frequency ranges. After the data were combined, a best fit polynomial dispersion curve was calculated for modeling. The best fit dispersion curve was then iteratively fitted to a one-dimensional S-wave velocity model using the SurfSeis software. The results provide a one-dimensional vertical profile of S-wave velocity as a function of depth averaged beneath the area of the line.

Surface Wave Geophysics Results

The results of the combined MASW and ReMi surface wave measurements are shown in Figures 2 through 10 for lines SW/SR21-1 though SW/SR21-9, respectively. These figures present the MASW, ReMi, and best fit surface wave dispersion curves and the corresponding representative S-wave velocity models. As seen in these figures, the MASW and ReMi dispersion curves are generally in good agreement in the regions that overlap. The investigation depths modelled ranged from 110 feet to 325 feet, with deeper measurements occurring where shallow bedrock was present (concurrent with higher S-wave velocities).

Based on the shear wave velocity models shown in Figures 2 through 10, the V_{s30} was calculated for each survey location based on the procedures outlined in the National Earthquake Hazards Reduction Program (NEHRP) and UBC. The V_{s30} was calculated from the following equation from these references:

$$v_s = \frac{\sum_{i=1}^{n} di}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where:

i = distinct different soil and/or rock layer between 1 and n
v_{si} = shear wave velocity in feet per second of layer i
d_i = thickness of any layer within the 100-foot interval
$\sum_{i=1}^{n} d_i$ = 100 feet

Based on this procedure, the V_{S30} was calculated for each location from the ground surface to a depth of 100 feet. The results for each survey location are summarized in Table 1. As indicated on in Table 1, the V_{S30} values varied widely across the site depending on volcanic bedrock depth with site classes ranging from Site Class D (stiff soil) to Site Class B (rock).

TABLE 1
CALCULATED SITE V_{S30}

Survey Line	V_{s30} (ft/sec)	NEHRP Site Class	Representative Planned Building/Structure
SW/SR21-1	1,028	D	Parking Structure
SW/SR21-2	3,784	B	Sports Field
SW/SR21-3	4,039	B	Building D
SW/SR21-4	1,450	C	
SW/SR21-5	3,399	B	Building C
SW/SR21-6	3,284	B	
SW/SR21-7	1,583	C	Building B
SW/SR21-8	1,126	D	Building E
SW/SR21-9	1,094	D	Building A

Seismic Refraction Methods

The seismic refraction method is based on the principle that seismic waves travel through different subsurface geologic conditions at different velocities. In order to resolve a subsurface layer boundary using the seismic refraction method, a density or velocity change must occur at that layer boundary. Seismic refraction surveying involves measuring the time required for a seismic compression wave (P-wave) to travel from a shot point to a series of co-linear geophones. These arrival times are plotted on time-distance graphs and interpreted using the generalized reciprocal method. The results provide a two-dimensional picture of subsurface conditions and show the interpreted distribution of P-wave velocity as a function of depth along the profile.

The interpretation of seismic refraction data depends on several assumptions including:

- The subsurface is composed of a series of discrete homogeneous layers, which may vary laterally in seismic velocity;
- The boundaries between these layers consist of a significant seismic velocity contrast and are laterally continuous to be individually resolved;
- The thicknesses of these layers are great enough to critically refract seismic source energy to produce a detectable refracted wave arrival at the surface;
- The seismic velocity of successive layers increases with depth.

All the assumptions above are unlikely to be completely fulfilled, and the extent to which each assumption is valid varies greatly from site to site. Consequently, the interpreted seismic refraction profiles typically show a simplified bulk average subsurface P-wave velocity distribution. The degree of simplification depends on the extent the above assumptions are violated at the site.

Seismic Refraction Procedures

Seismic refraction measurements were collected on August 12, 2021, along the same nine geophysical survey lines that were used for the surface wave measurements (SW/SR21-1 through SW/SR21-9). The seismic refraction data were collected using a Geometrics S12 seismograph with twelve, 4.5 Hz geophones. Geophones were linearly spaced at 20-foot intervals (15 feet for SW/SR21-8) and were in-line with the source for a total line length of 220 feet (except for SW/SR21-8, which was 165 feet long). P-waves were produced by striking a ground plate with a sledgehammer.

The P-wave sources were placed at five locations along the survey lines. Shots were performed at 0 feet (one end of the line), 50 feet, 110 feet (center of line), 170 feet, and 220 feet (opposite end of line). With this configuration, the maximum seismic refraction exploration depth was approximately 50 to 60 feet below ground surface for the lines. Seismic refraction travel times were plotted on time-distance graphs and interpreted using seismic tomography methods with Oyo Corporation's SeisImager/2D software.

Seismic Refraction Results

Velocity profiles of the seismic refraction measurements are presented on Figures 11 through 19 for seismic refraction lines SW/SR21-1 through SW/SR21-9, respectively. The seismic refraction models represent the soil/bedrock depths and velocities that would account for the measured travel times. In general, P-wave velocities below about 2,500 to 3,000 ft/s are judged to represent fill and older alluvium, and P-wave velocities above about 2,500 to 3,000 ft/ are judged to represent volcanic bedrock. These interpretation are inferred and would need to be confirmed by direct observation of samples collected from borings.

Figure 20 shows Caterpillar's rippability chart for the D8R/D8T with a multi or single shank No. 8 Series D ripper or equivalent (Caterpillar Inc., 2018)[3]. This chart relates P-wave velocity to the ability of the Caterpillar equipment to excavate different geologic materials. Based on this chart, the volcanic rock (basalt) at the site with measured P-wave velocities of less than about 6,300 ft/s are considered rippable using a D8R/D8T ripper. Volcanic rock with P-wave velocities between 6,300 and 8,000 ft/s are considered marginally rippable.

Table 2 summarizes the estimated rippability of surface materials along the seismic refraction lines and includes an estimated depth to the top of bedrock. As shown on Table 2, the seismic refraction measurements indicate that marginally rippable volcanic rock (6,300 ft/s > P-wave velocity < 8,000 ft/s) may be encountered beneath SW/SR21-2 (Sports Field) at depths between about 15 and 30 feet, bgs, SW/SR21-3 (Building D) at depths between about 10 and 15 feet, bgs, and SW/SR21-5 (Building C) at depths between about 5 and 30 feet, bgs. Additionally, non-rippable bedrock may be encountered beneath SW/SR21-2 (Sports Field) at depths greater than about 20 to 30 feet, bgs and SW/SR21-3 (Building D) at depths greater than about 15 and 20 feet, bgs. The remaining areas

[3] Caterpillar Inc. (2018). Caterpillar Performance Handbook 48: Caterpillar, Inc., Peoria, IL, p. 19-76.

surveyed indicate the subsurface material is rippable to depths of about 40 feet, bgs or greater. It is noted that material rippability is controlled by contractor means and methods, and that thresholds presented here are based on rippablity charts for a D8R ripper within volcanic rock as presented in Caterpillar (2018).

TABLE 2
SUMMARY OF RIPPABILITY BASED ON P-WAVE VELOCITY MEASUREMENTS

Survey Line	Nearest Planned Building/ Structure	Estimated Depth to Top of Bedrock [1] (ft, bgs)	Approximate Depth to Base of Rippable Zone (P-wave = 6,300 ft/s) [2] (ft, bgs)	Approximate Depth to Base of Marginally Rippable Zone (P-wave= 8,000 ft/s) [2] (ft, bgs)
SW/SR21-1	Parking Structure	>30	>50	>50
SW/SR21-2	Sports Field	<5	15 – 30	20 – 30
SW/SR21-3	Building D	<5 – 5	10 – 15	15 – 20
SW/SR21-4	Buildings D and E	10 – 15	>50	>50
SW/SR21-5	Building C	0 – 10	5 – 30	>50
SW/SR21-6	Between Buildings C and D	<5	<5 – 50	>50
SW/SR21-7	Building B	>20	40	>50
SW/SR21-8	Building E	>30	>40	>40
SW/SR21-9	Building A	>40	>50	>50

Note: [1] Bedrock depth estimated based on a review of measured P and S-wave velocities. These results are inferred and would need to be confirmed by direct observation of samples collected from borings.
[2] Estimated ripper performance P-wave velocity thresholds based on Caterpillar (2018) for a Caterpillar D8R with a multi or single shank No. 8 Series D ripper or equivalent within volcanic rock.

Limitations

The technical results and professional judgments presented herein are based on limited observations, geophysical measurements (as described above), and our general experience in the field of geophysics. GeoPentech does not guarantee the performance of the project in any respect, only that the information provided meets the standard of care of the profession at this time under the same scope limitations imposed by the project.

We trust the contents of this letter will meet your current needs. If you have questions or require additional information, please call.

Very Truly Yours,

GeoPentech

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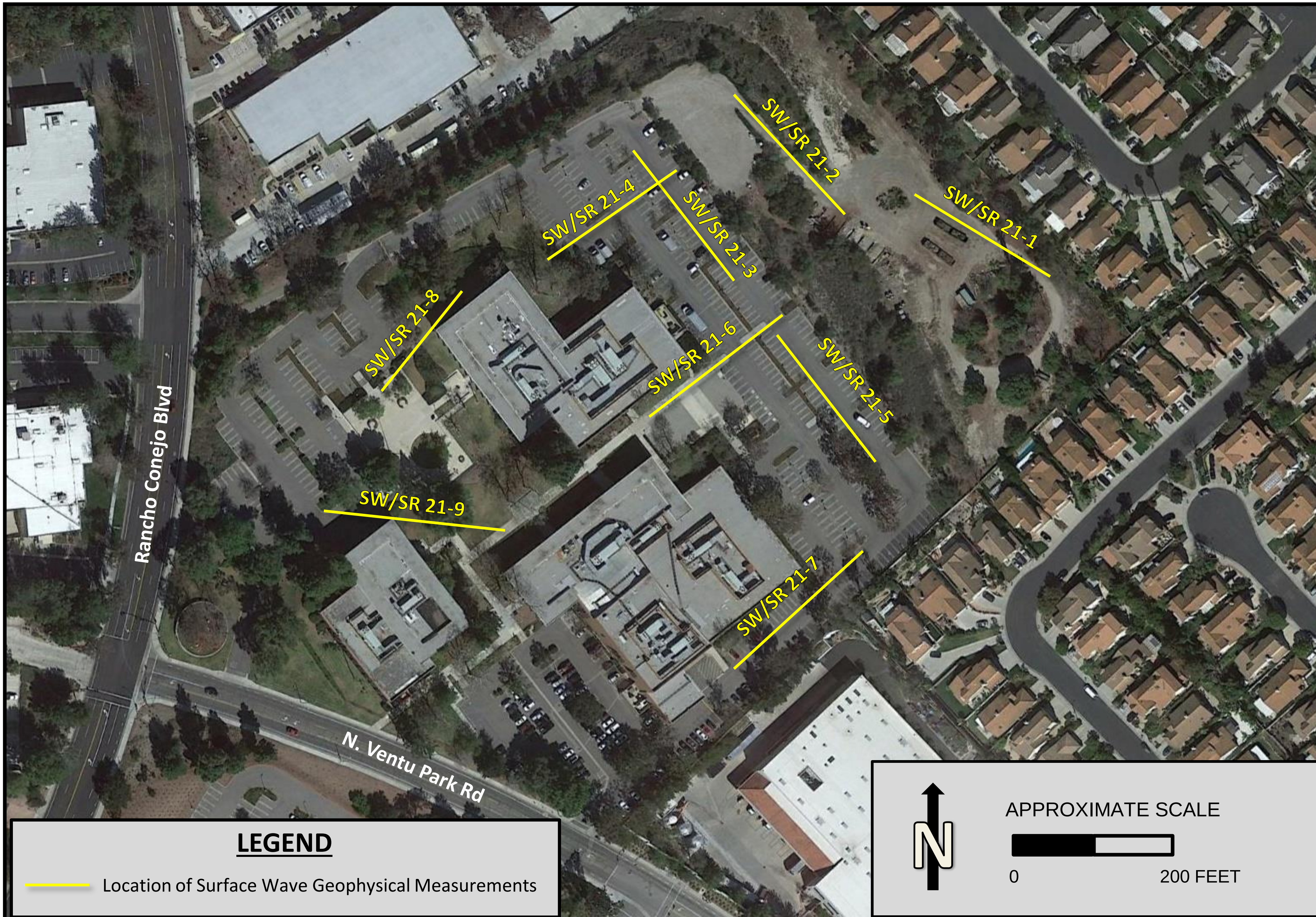
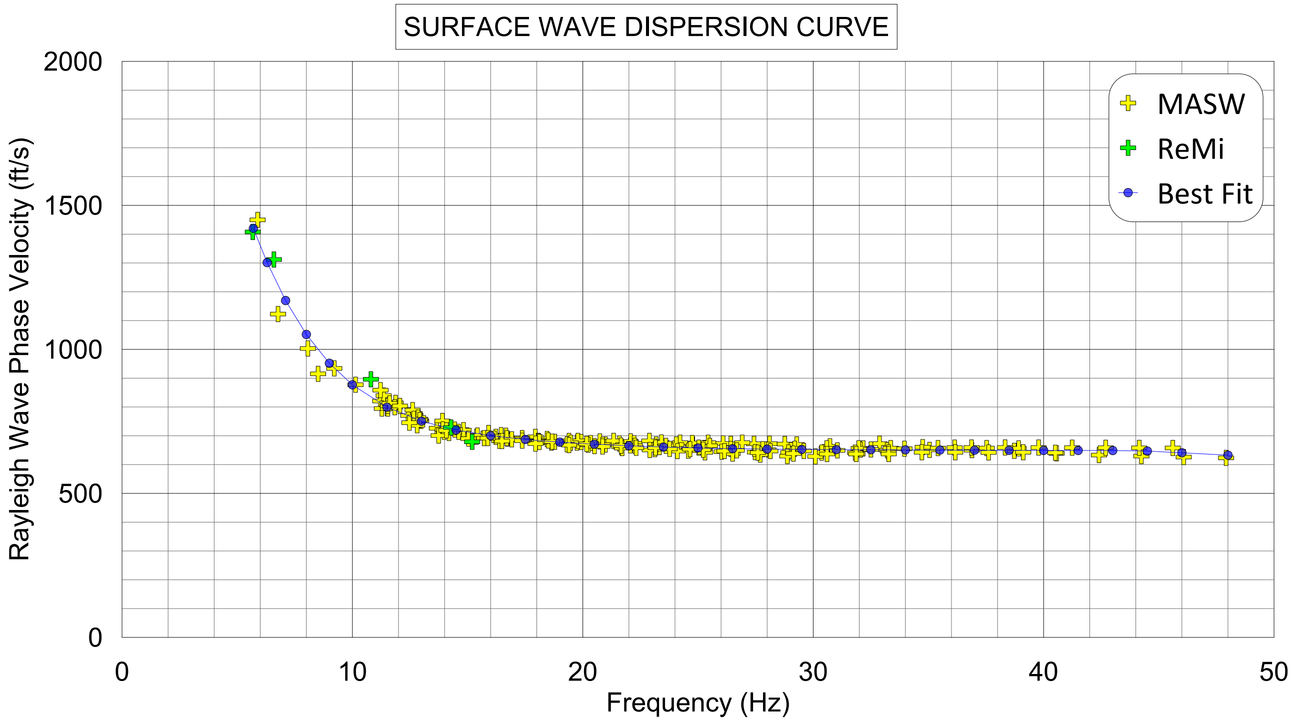
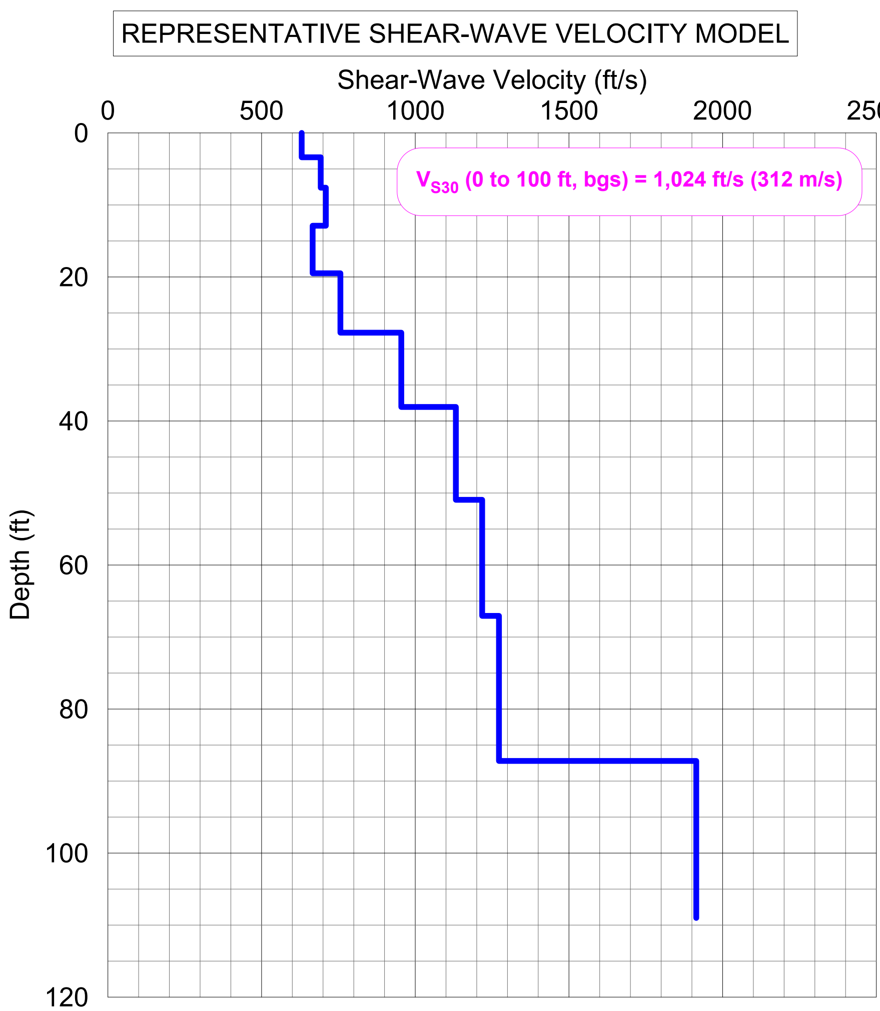


SITE MAP

GeoPentech	Project No.: **21070A**	Project: **1100 Rancho Conejo Blvd**	Date: **AUG 2021**	Figure: **1**

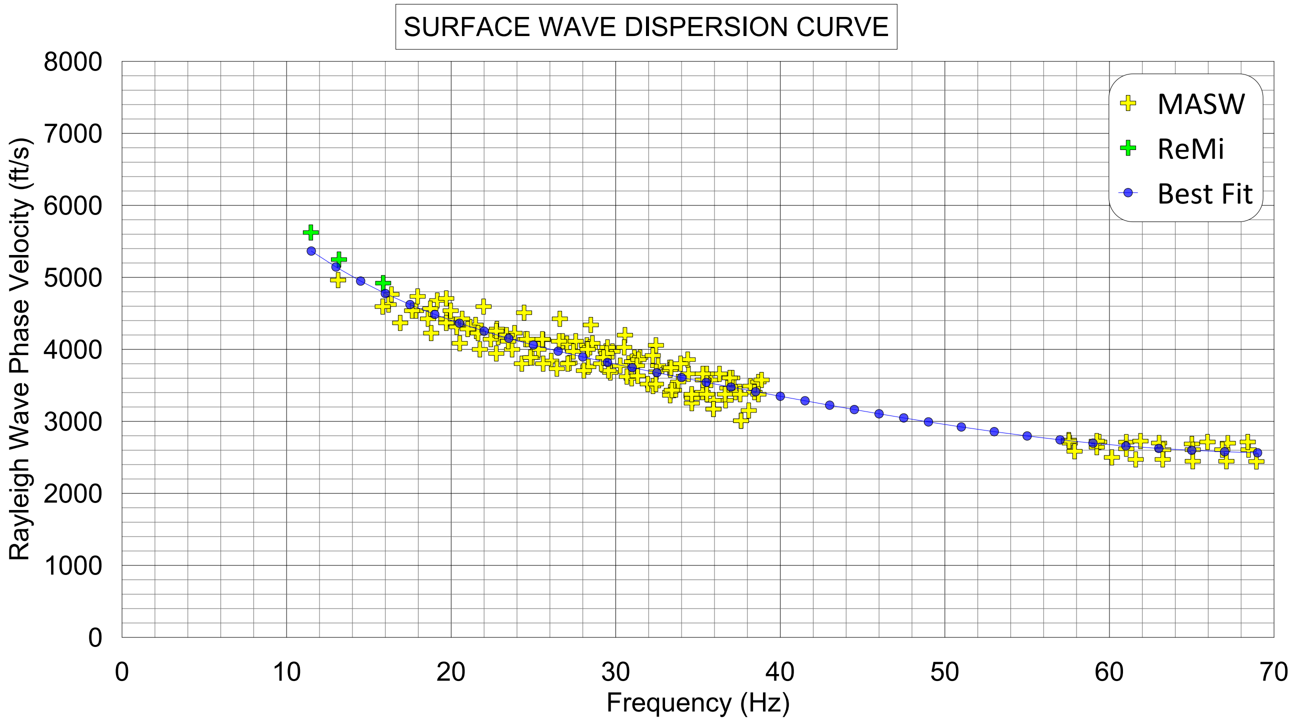


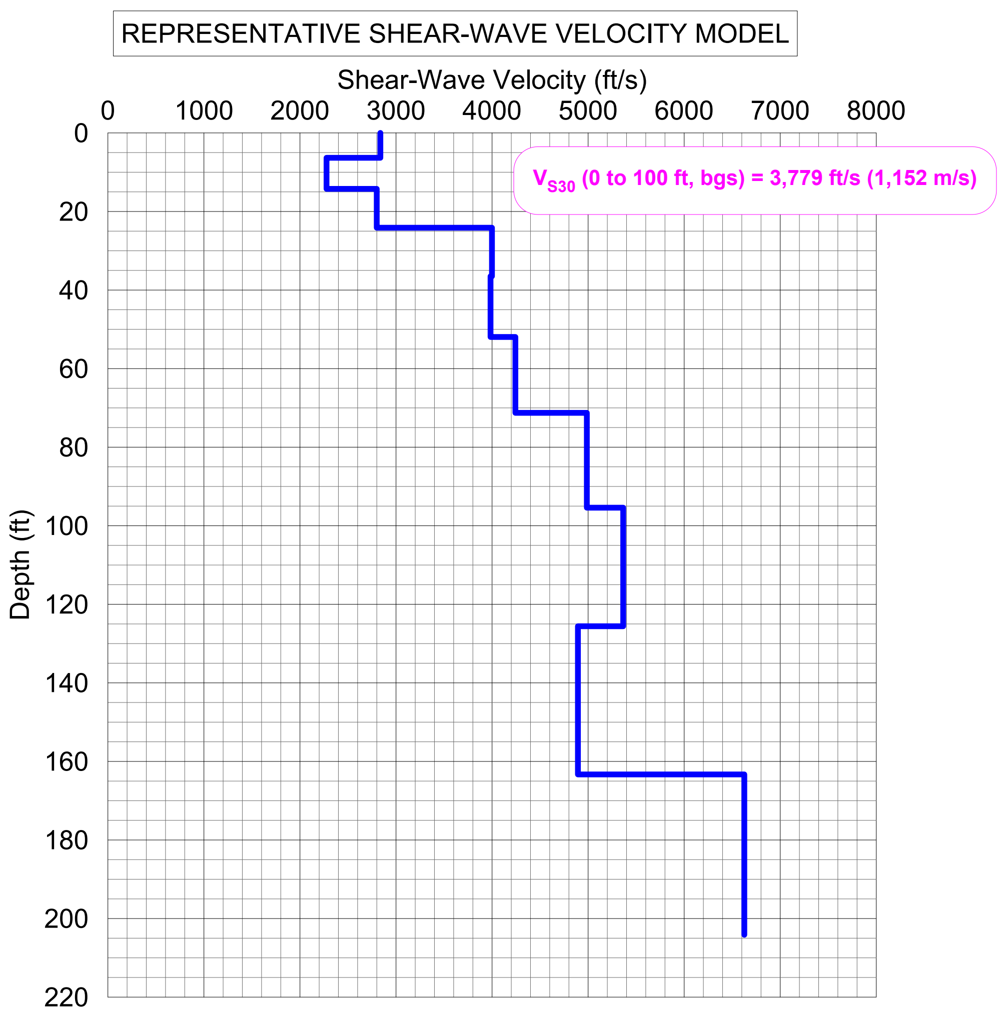


SW21-1: S-WAVE VELOCITY COMBINED SOURCE MODEL

Project No.: 21070A	Project: 1100 Rancho Conejo Blvd	Date: SEP 2021	Figure 2

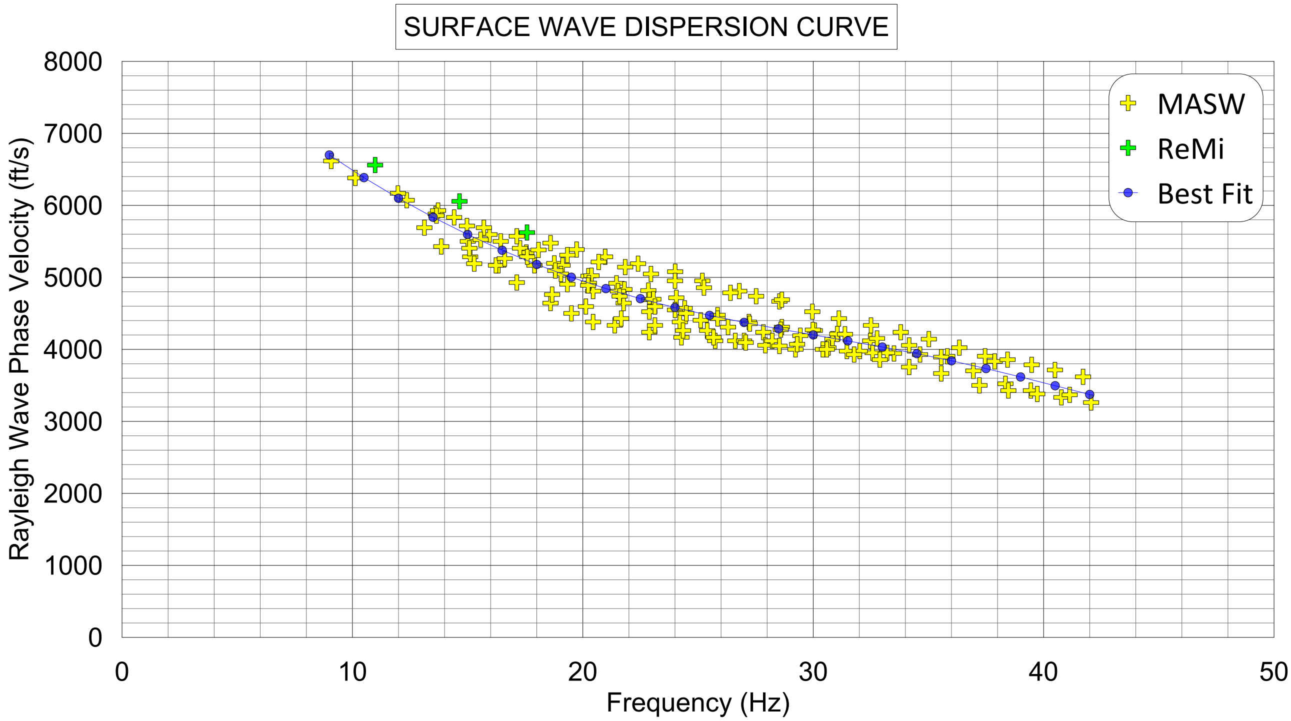
GeoPentech

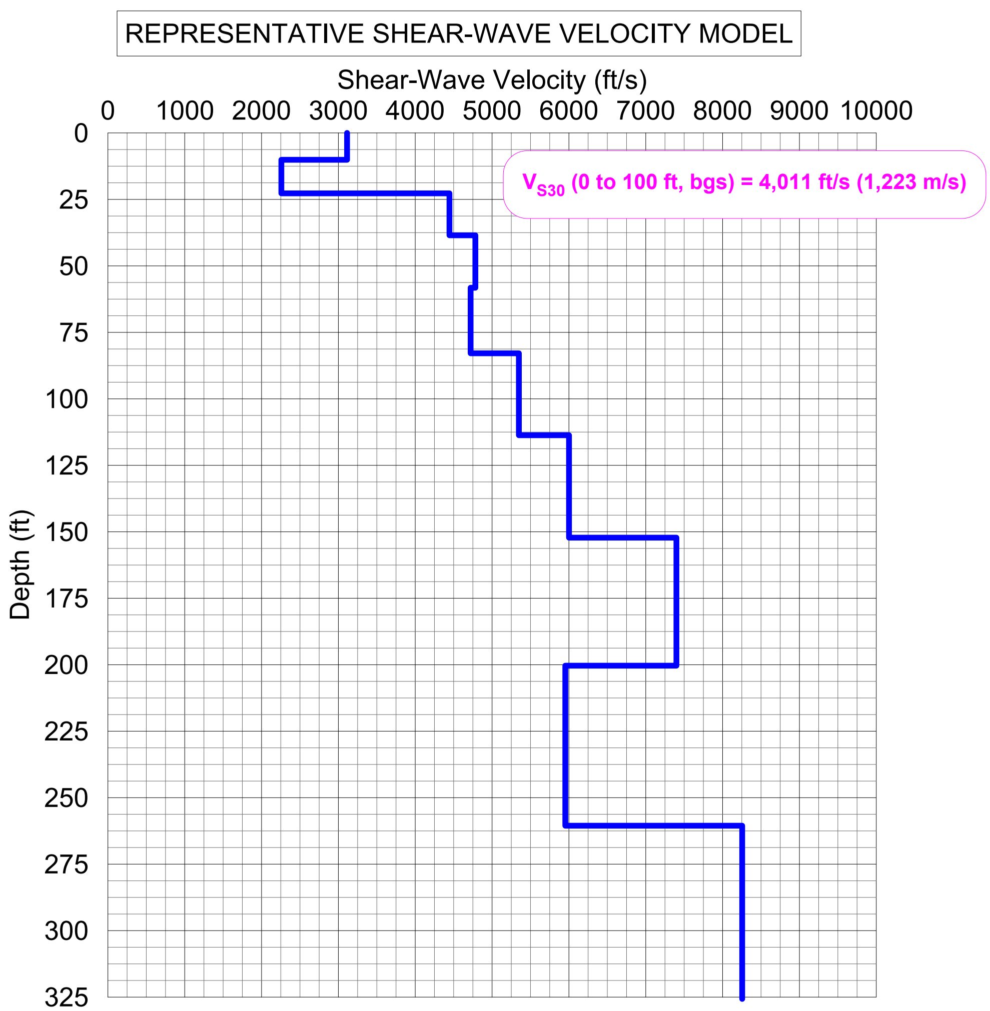




SW21-2: S-WAVE VELOCITY COMBINED SOURCE MODEL			
Project No.: 21070A	Project: 1100 Rancho Conejo Blvd	Date: SEP 2021	Figure 3

GeoPentech

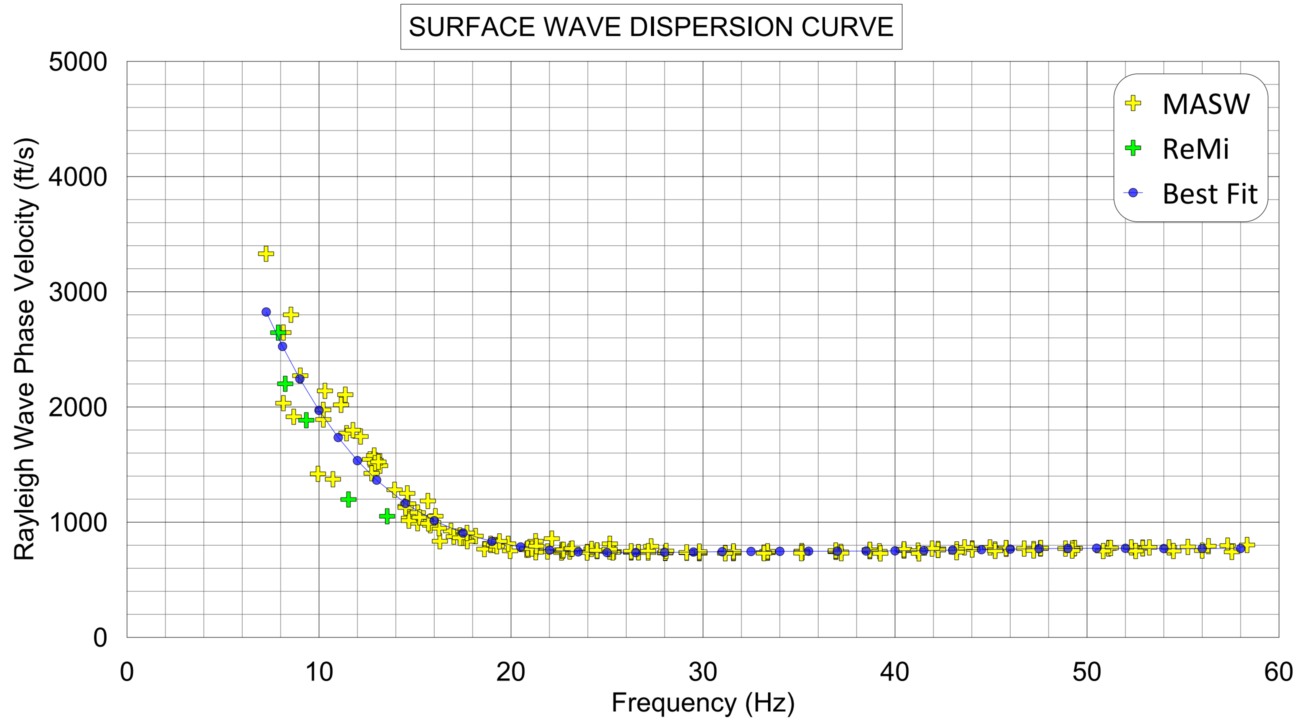


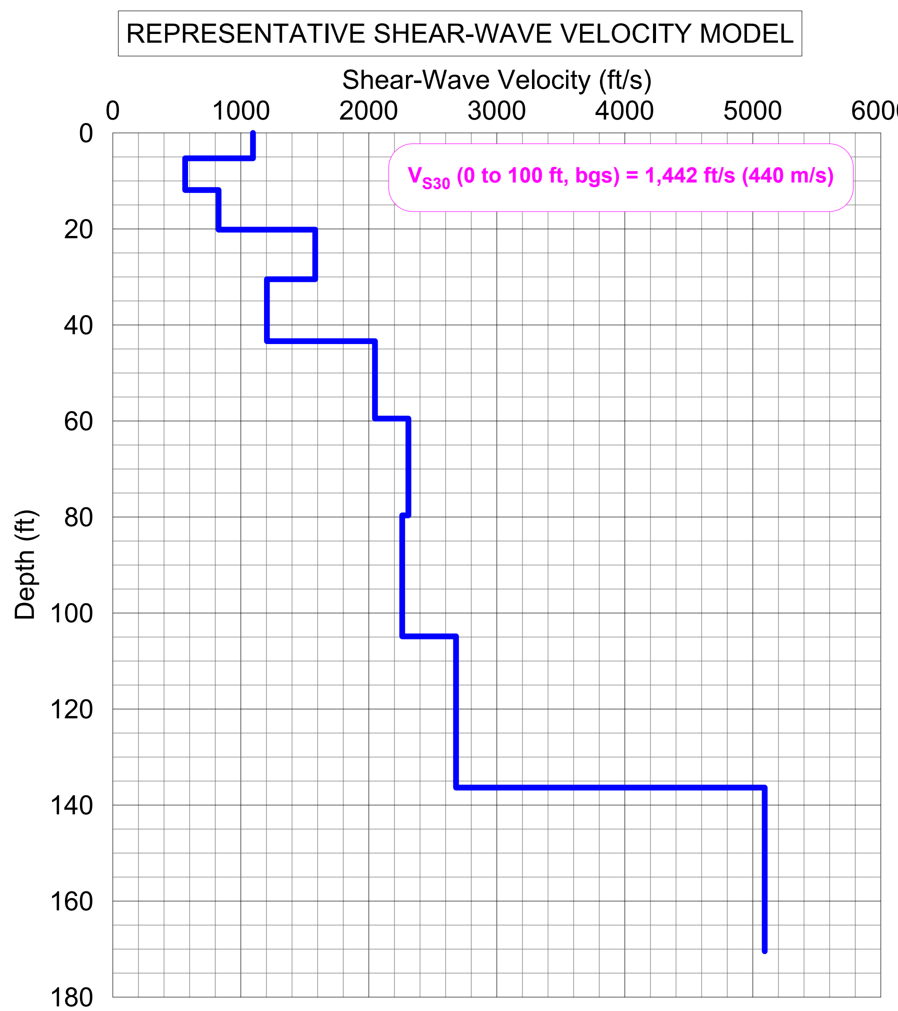


SW21-3: S-WAVE VELOCITY COMBINED SOURCE MODEL

Project No.: 21070A	Project: 1100 Rancho Conejo Blvd	Date: SEP 2021	Figure 4

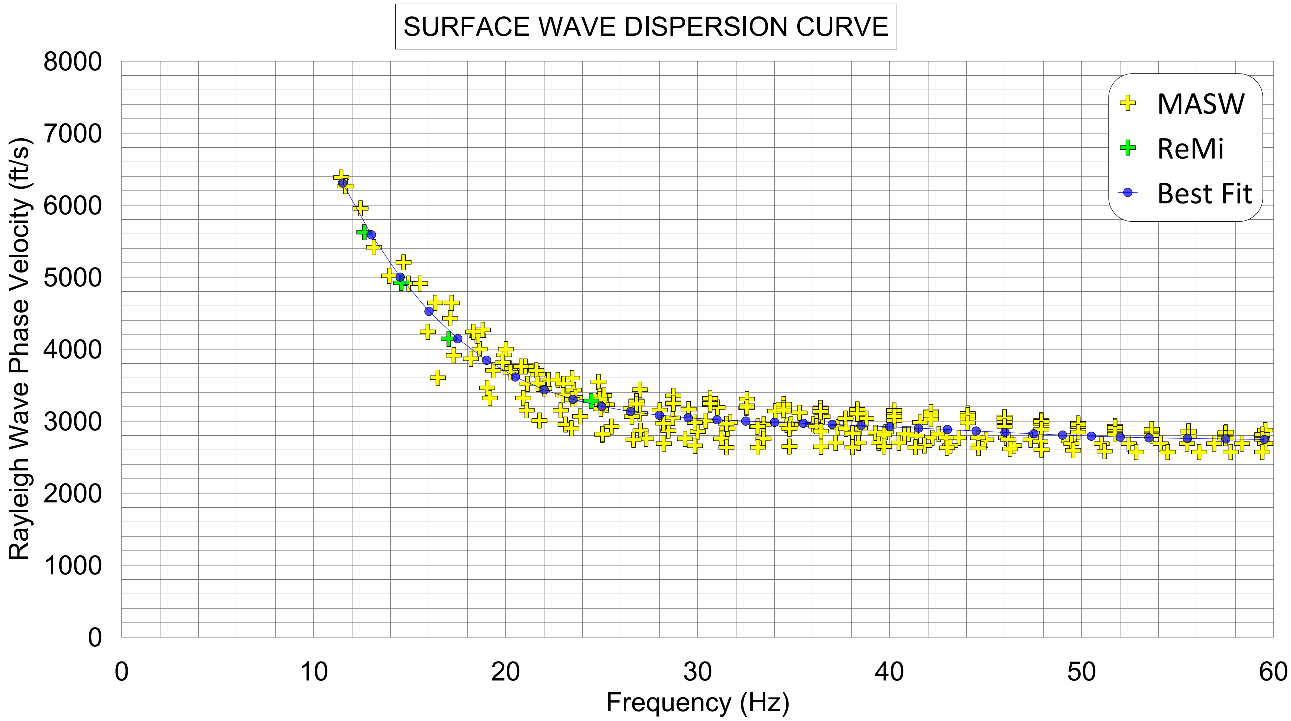
GeoPentech

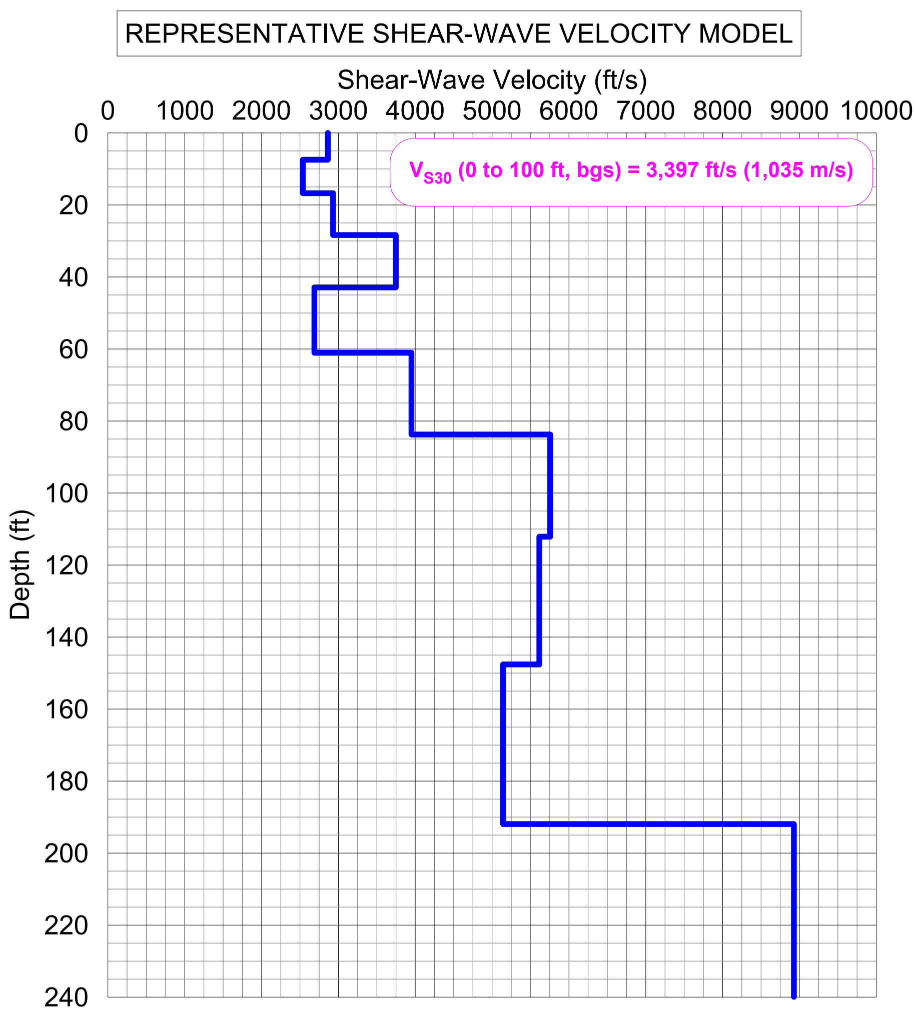




SW21-4: S-WAVE VELOCITY COMBINED SOURCE MODEL			
Project No.: 21070A	Project: 1100 Rancho Conejo Blvd	Date: SEP 2021	Figure 5

GeoPentech

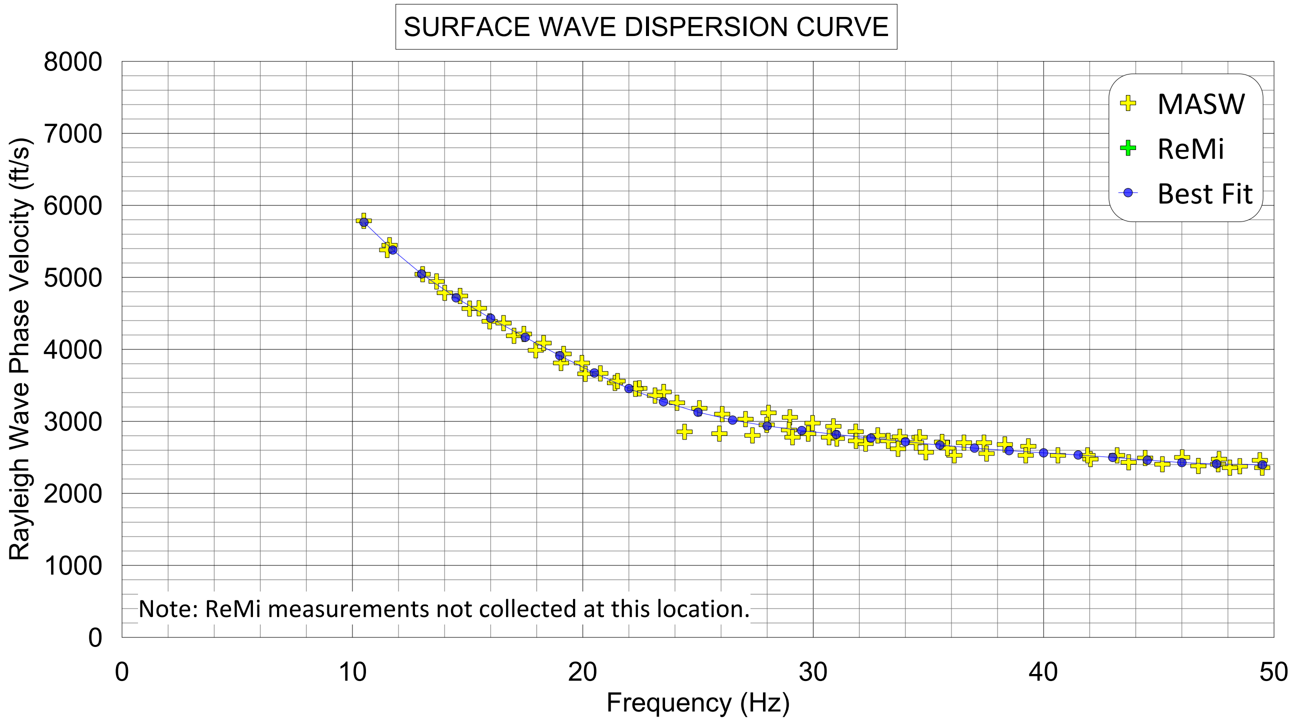


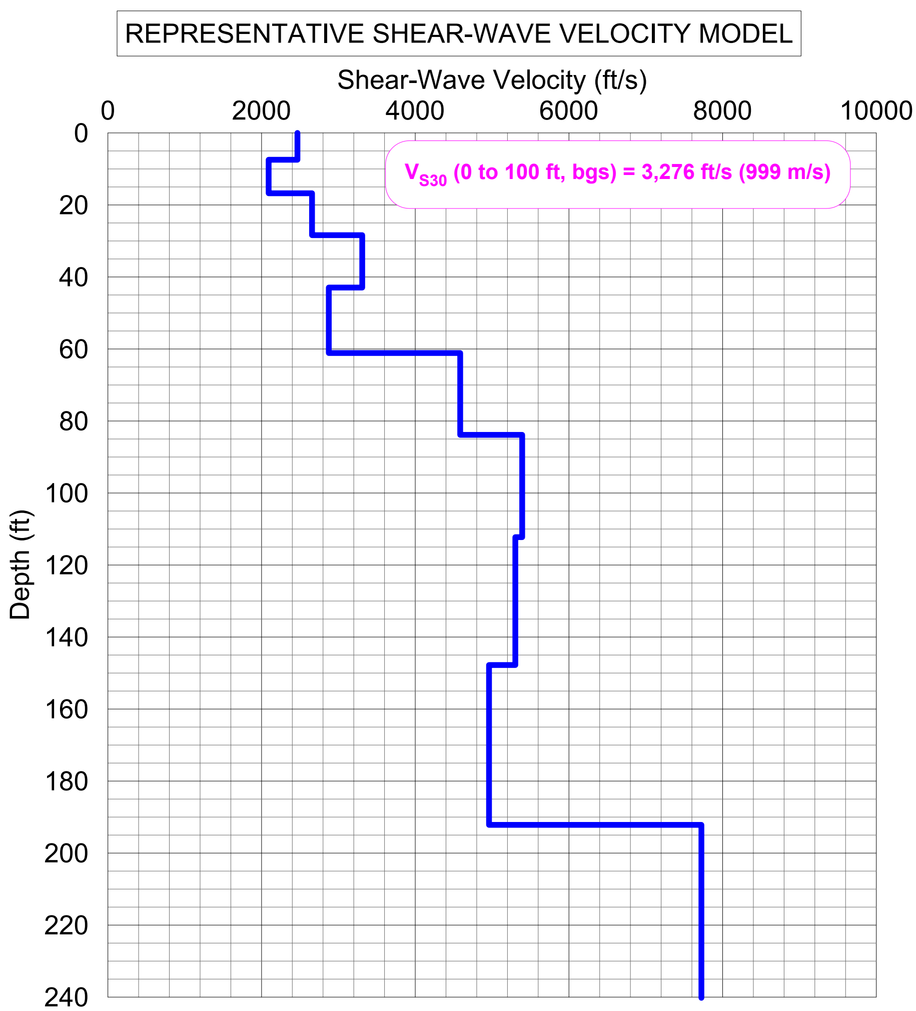


SW21-5: S-WAVE VELOCITY COMBINED SOURCE MODEL

Project No.: 21070A	Project: 1100 Rancho Conejo Blvd	Date: SEP 2021	Figure 6

GeoPentech



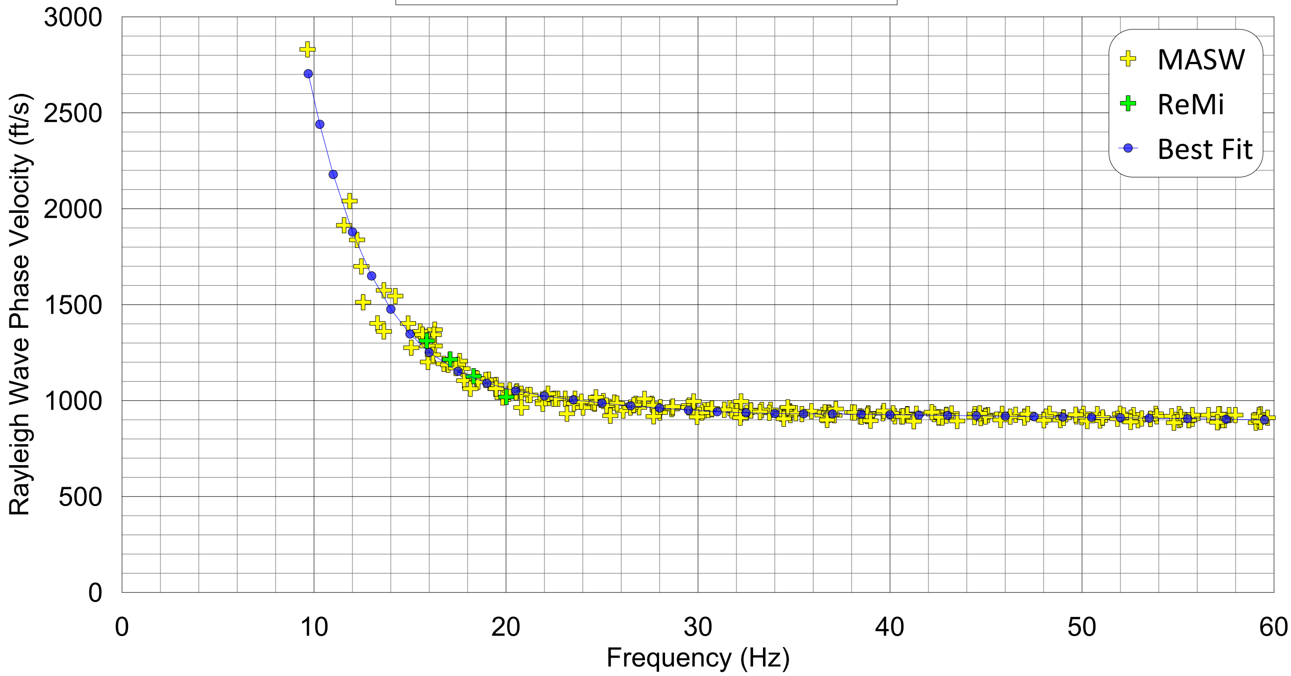


SW21-6: S-WAVE VELOCITY COMBINED SOURCE MODEL

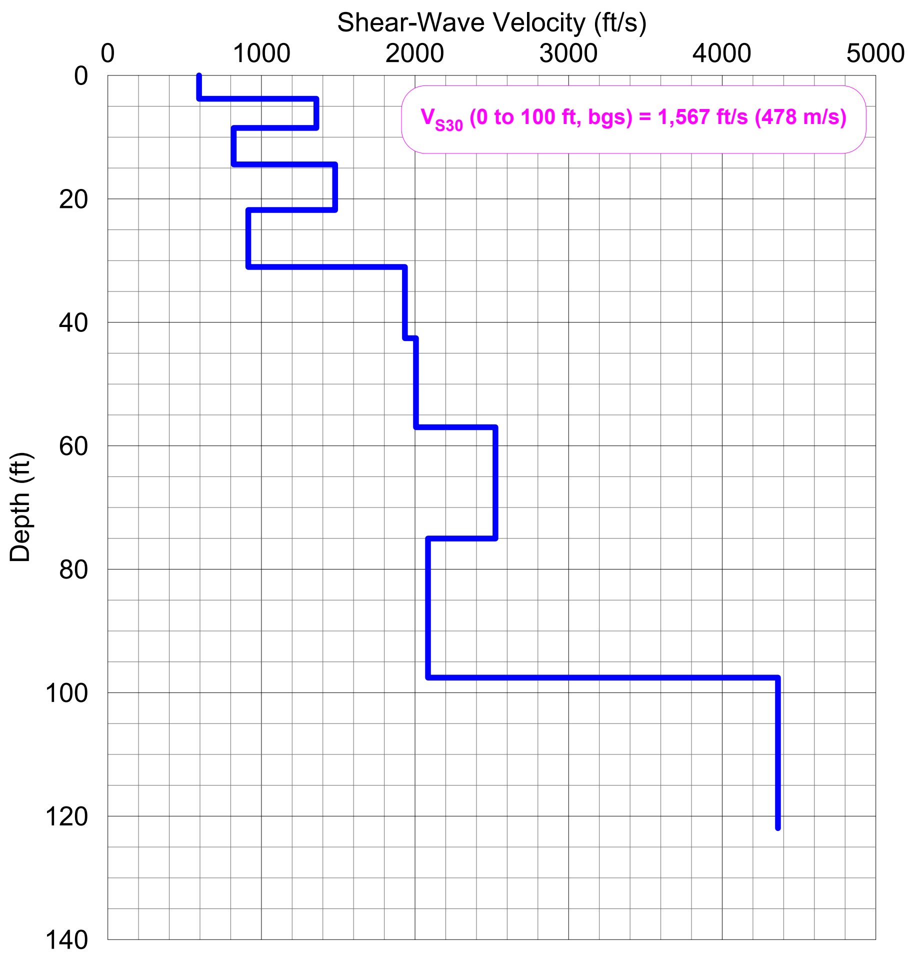
Project No.: 21070A	Project: 1100 Rancho Conejo Blvd	Date: SEP 2021	Figure 7

GeoPentech

SURFACE WAVE DISPERSION CURVE



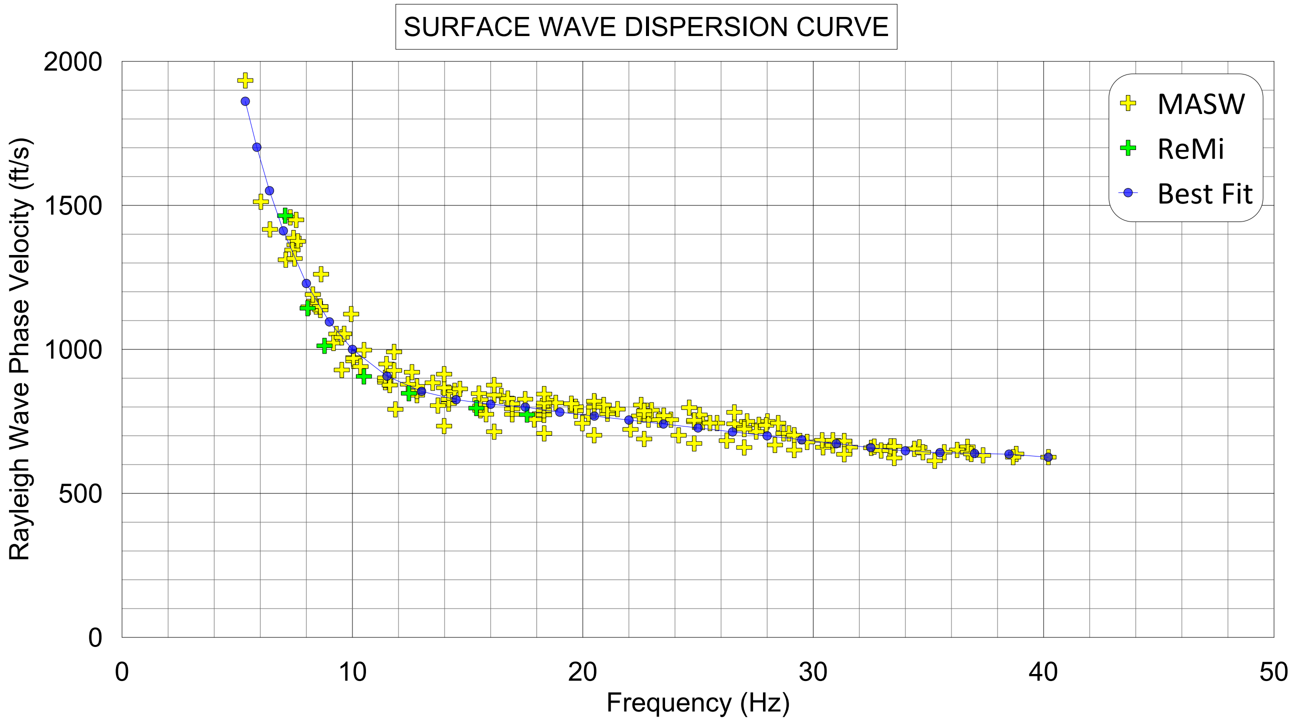
REPRESENTATIVE SHEAR-WAVE VELOCITY MODEL

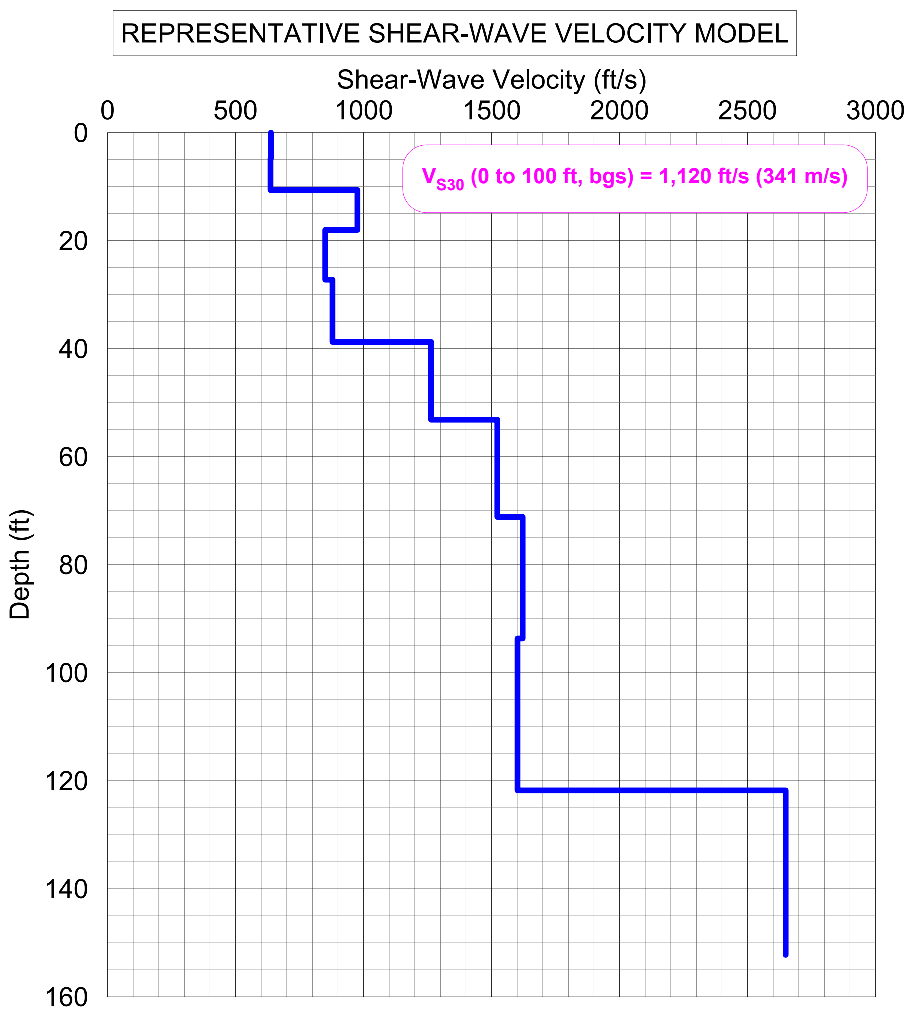


SW21-7: S-WAVE VELOCITY COMBINED SOURCE MODEL

Project No.: 21070A	Project: 1100 Rancho Conejo	Date: SEP 2021	Figure 8

GeoPentech

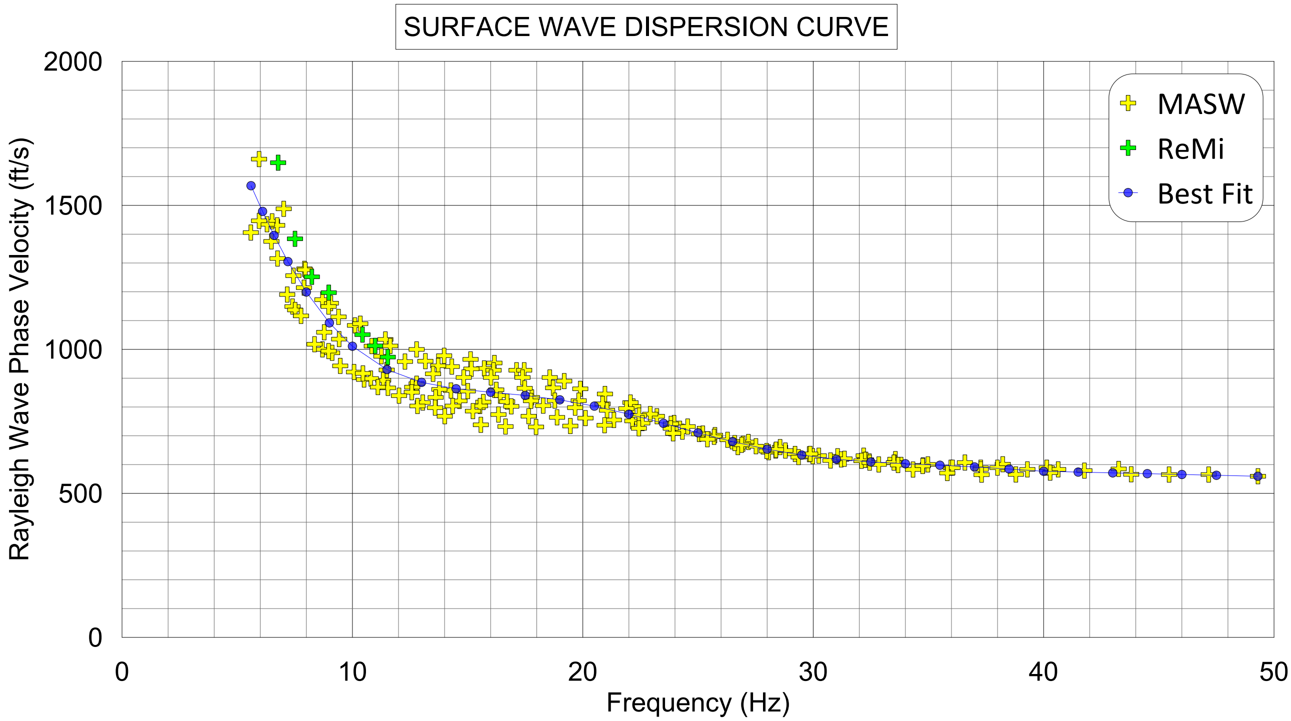


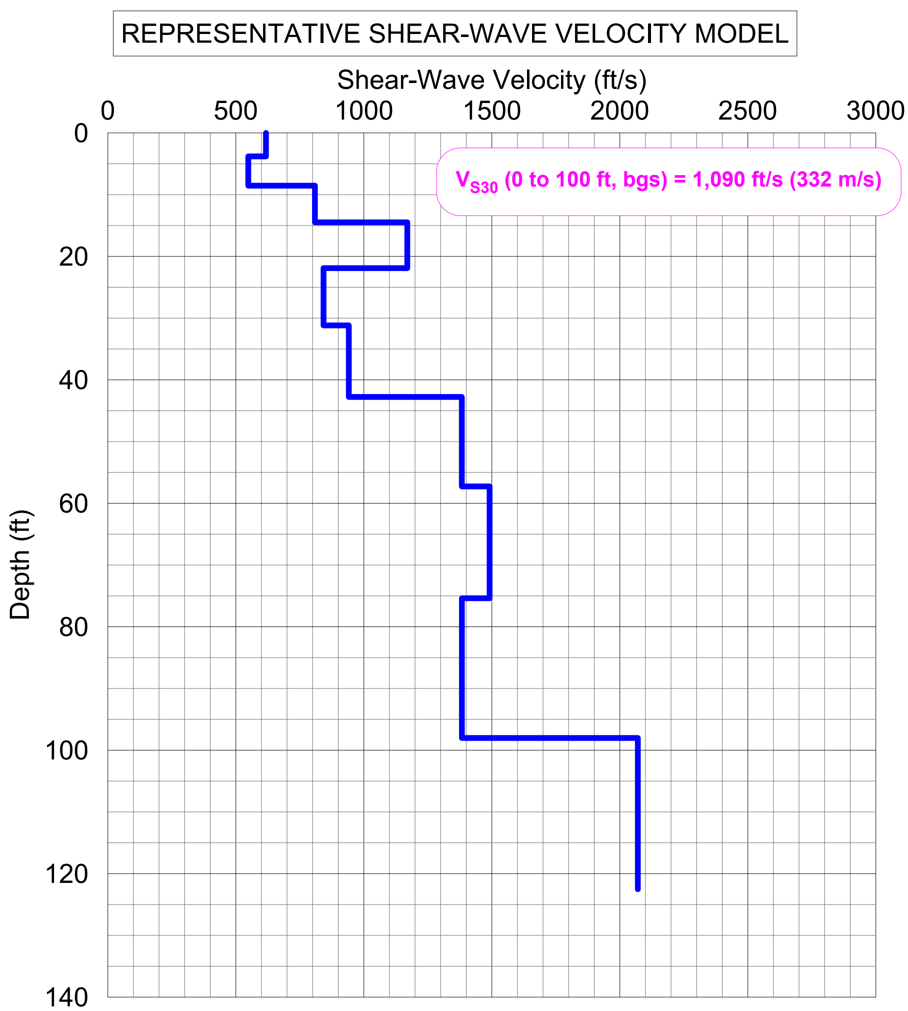


SW21-8: S-WAVE VELOCITY COMBINED SOURCE MODEL

Project No.: 21070A	Project: 1100 Rancho Conejo Blvd	Date: SEP 2021	Figure 9

GeoPentech

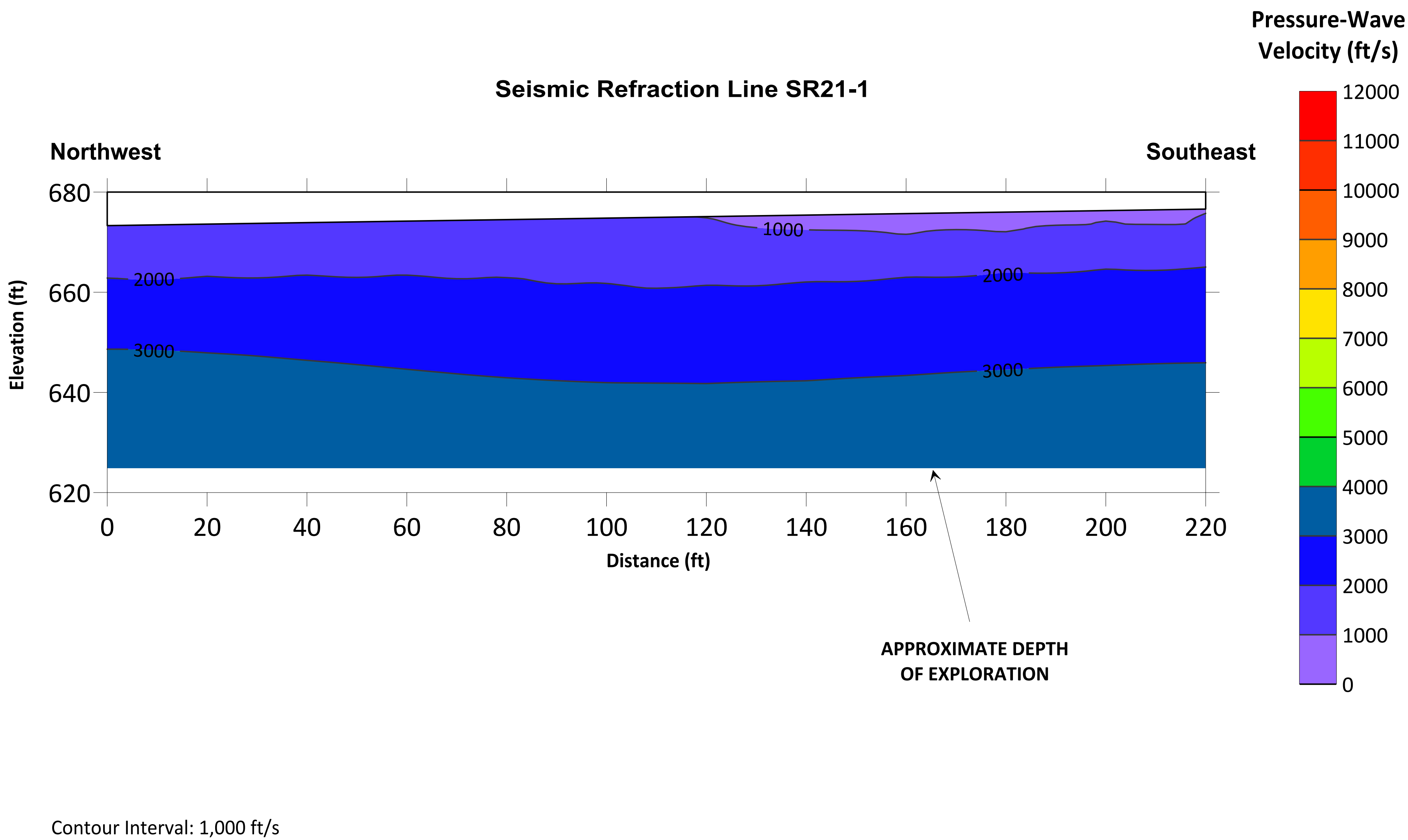




SW21-9: S-WAVE VELOCITY COMBINED SOURCE MODEL

Project No.: 21070A	Project: 1100 Rancho Conejo Blvd	Date: SEP 2021	Figure 10

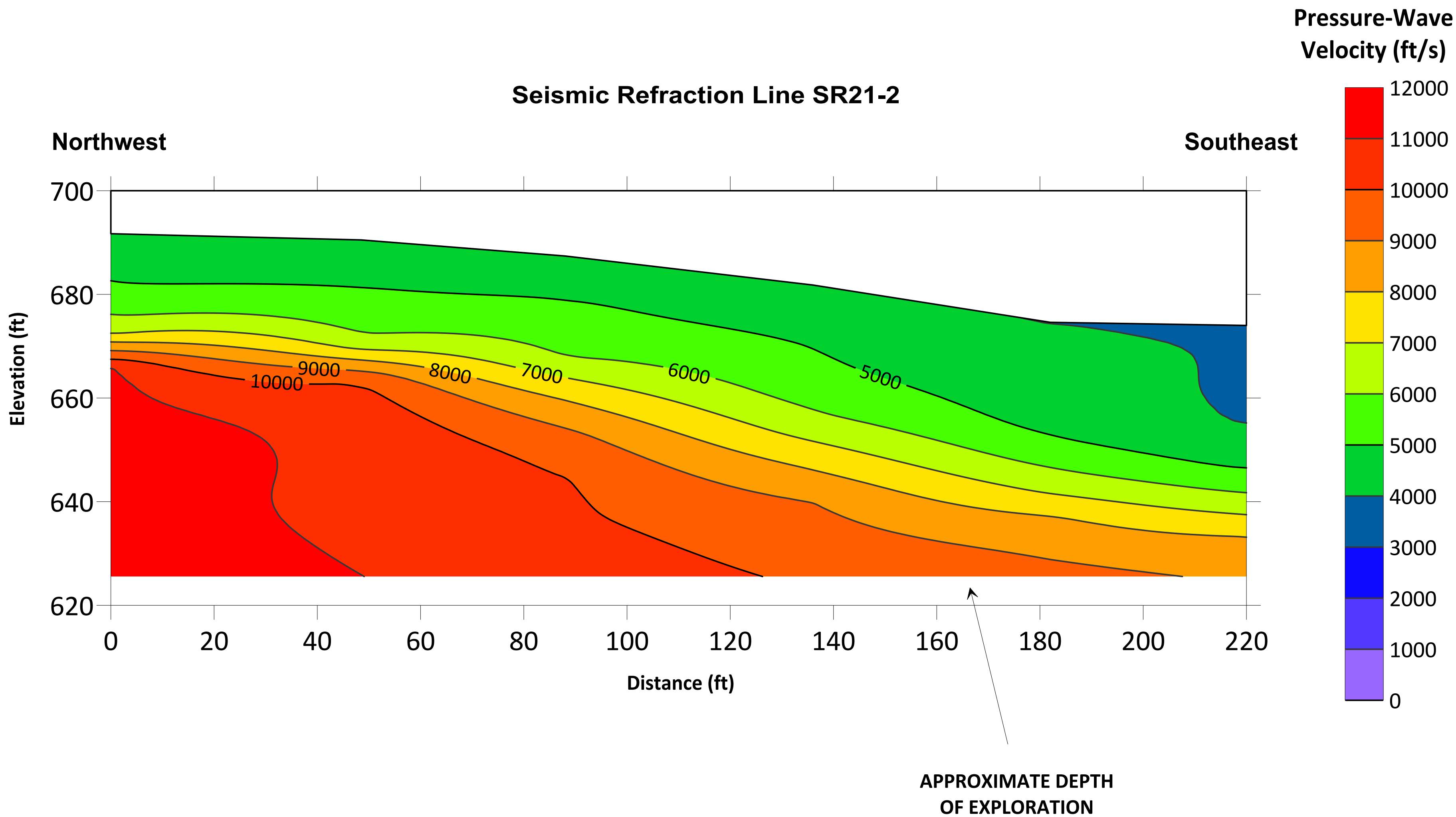
GeoPentech



SEISMIC REFRACTION - LINE 1 P-WAVE VELOCITY PROFILE

Date: SEP 2021	Project No.: 20070A	Project: 1100 RANCHO CONEJO BLVD	Figure 11

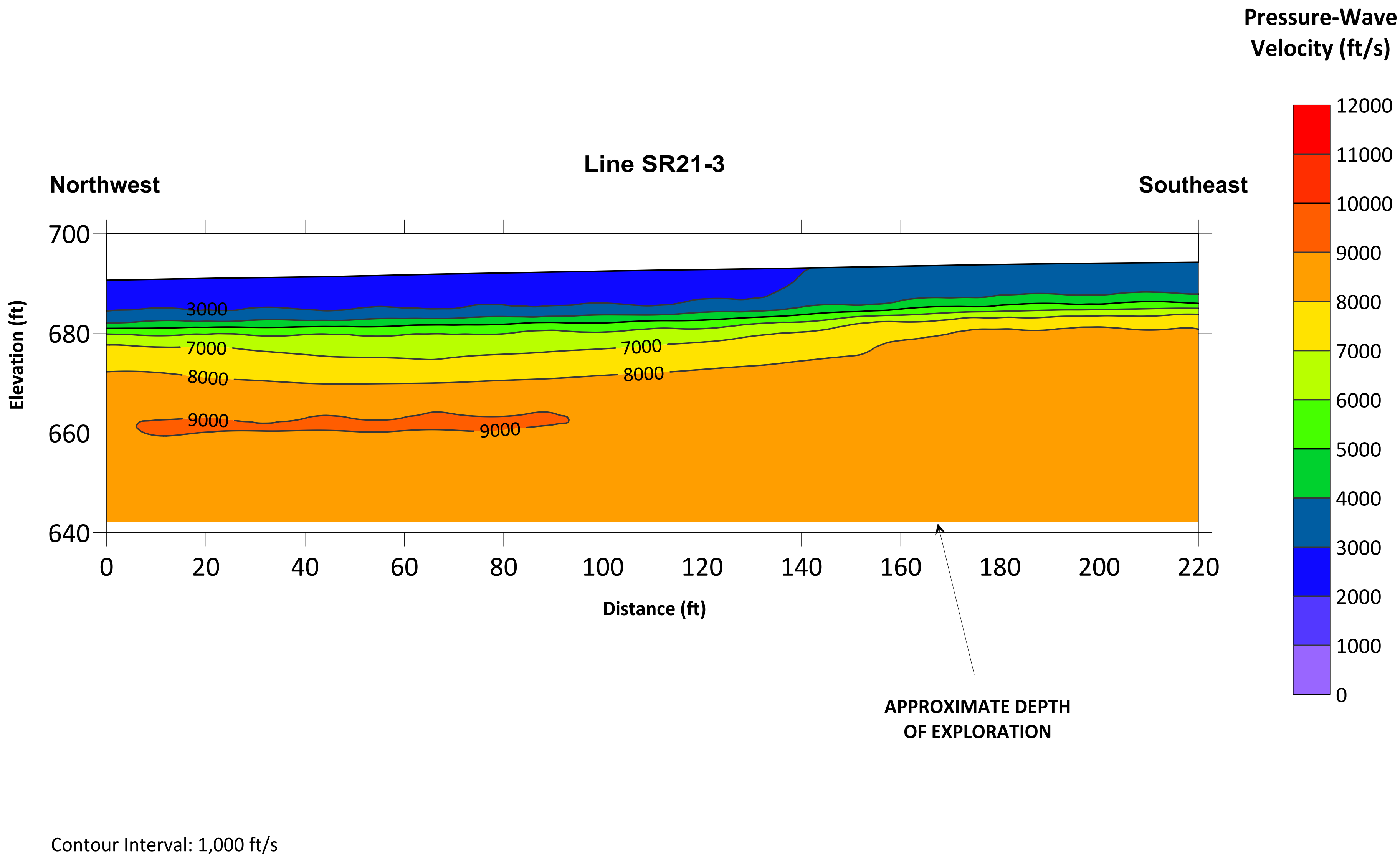
GeoPentech



Contour Interval: 1,000 ft/s

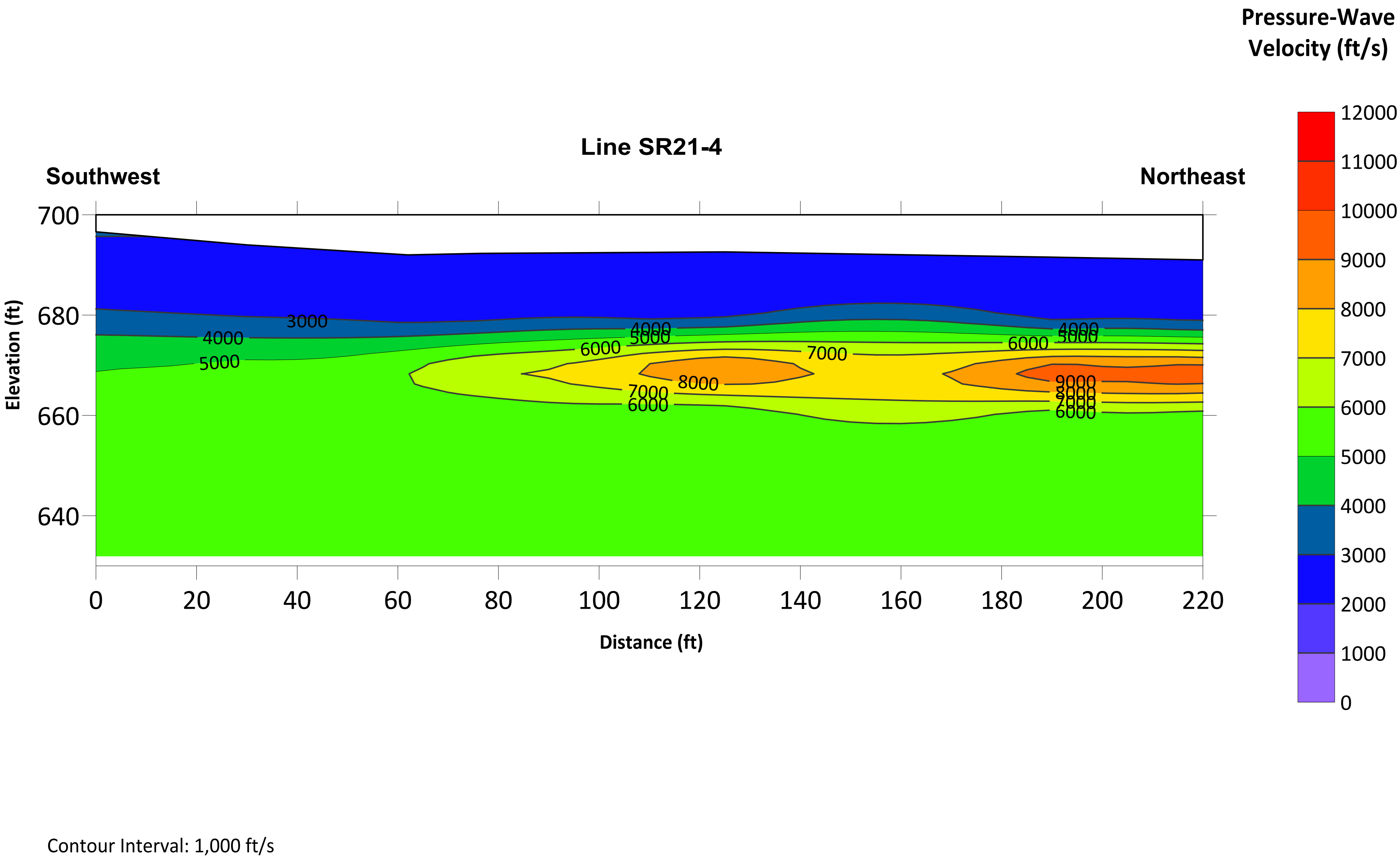
SEISMIC REFRACTION - SR21-2 P-WAVE VELOCITY PROFILE			
Date: SEP 2021	Project No.: 20070A	Project: 1100 RANCHO CONEJO BLVD	Figure 12

GeoPentech



SEISMIC REFRACTION - SR21-3 P-WAVE VELOCITY PROFILE			
Date: SEP 2021	Project No.: 20070A	Project: 1100 RANCHO CONEJO BLVD	Figure 13

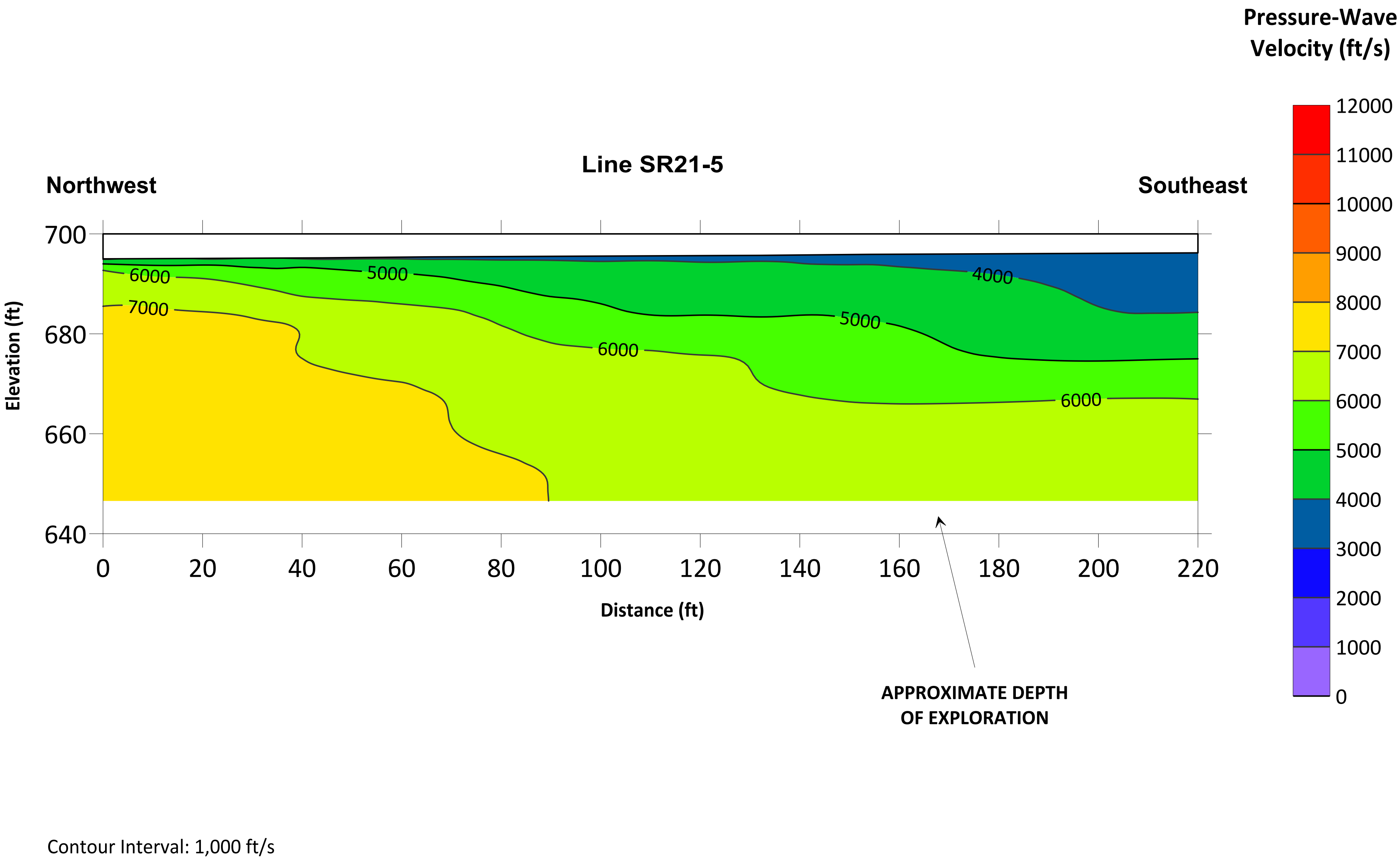
GeoPentech



SEISMIC REFRACTION - SR21-4 P-WAVE VELOCITY PROFILE

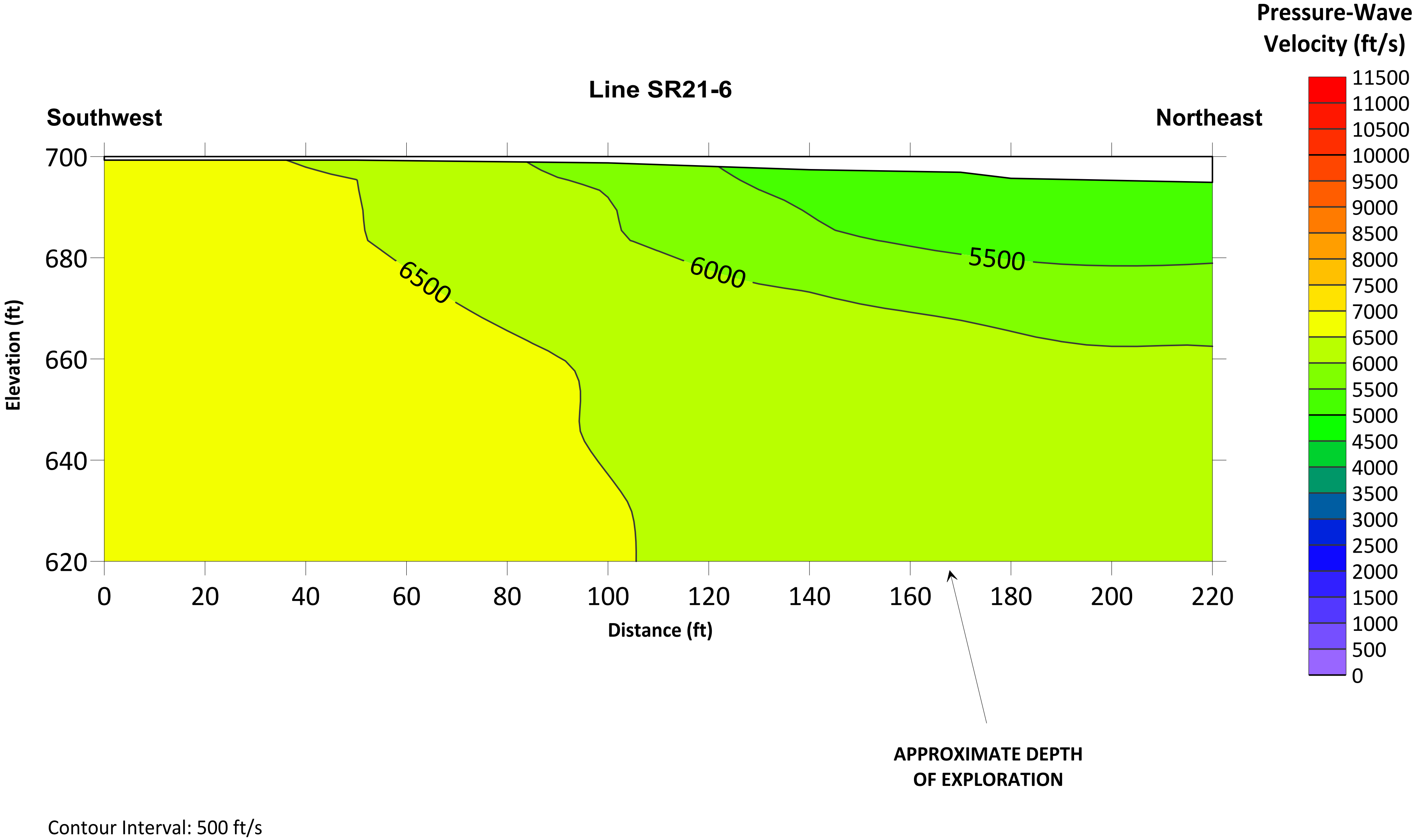
Date: SEP 2021	Project No.: 20070A	Project: 1100 RANCHO CONEJO BLVD	Figure 14

GeoPentech



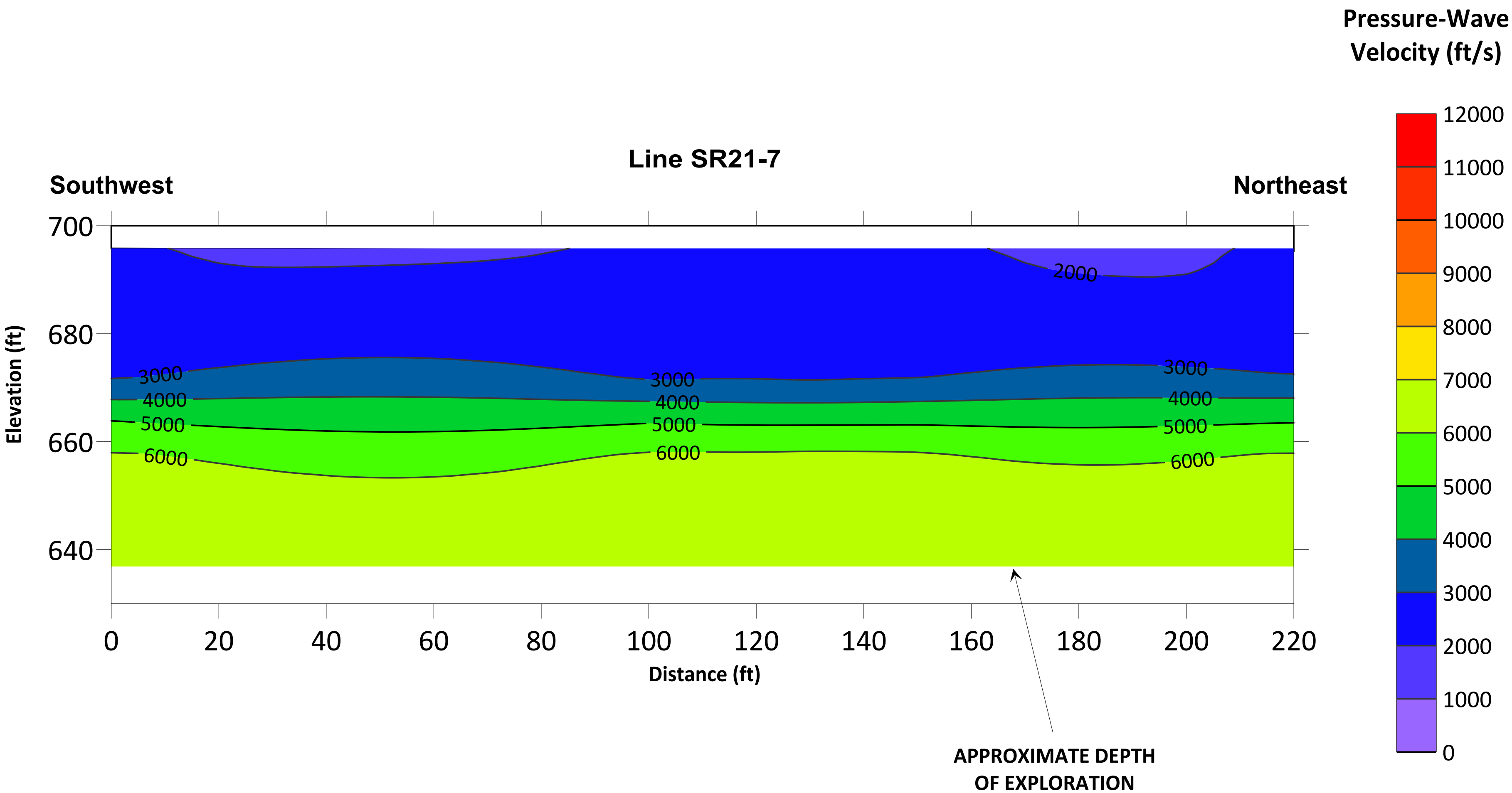
SEISMIC REFRACTION - SR21-5 P-WAVE VELOCITY PROFILE			
Date: SEP 2021	Project No.: 20070A	Project: 1100 RANCHO CONEJO BLVD	Figure 15

GeoPentech



SEISMIC REFRACTION - SR21-6 P-WAVE VELOCITY PROFILE			
Date: SEP 2021	Project No.: 20070A	Project: 1100 RANCHO CONEJO BLVD	Figure 16

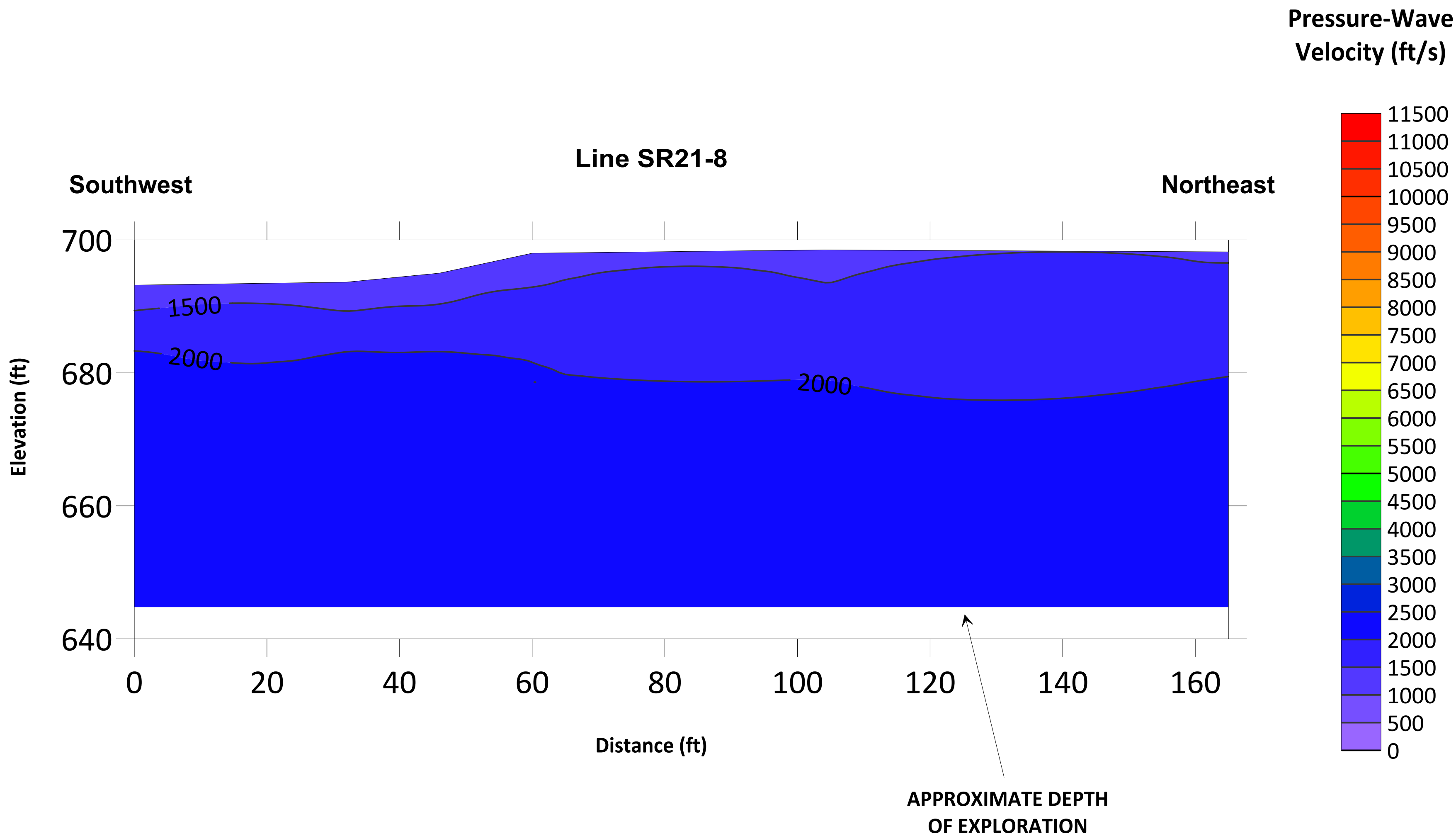
GeoPentech



Contour Interval: 1,000 ft/s

SEISMIC REFRACTION - SR21-7 P-WAVE VELOCITY PROFILE			
Date: SEP 2021	Project No.: 20070A	Project: 1100 RANCHO CONEJO BLVD	Figure 17

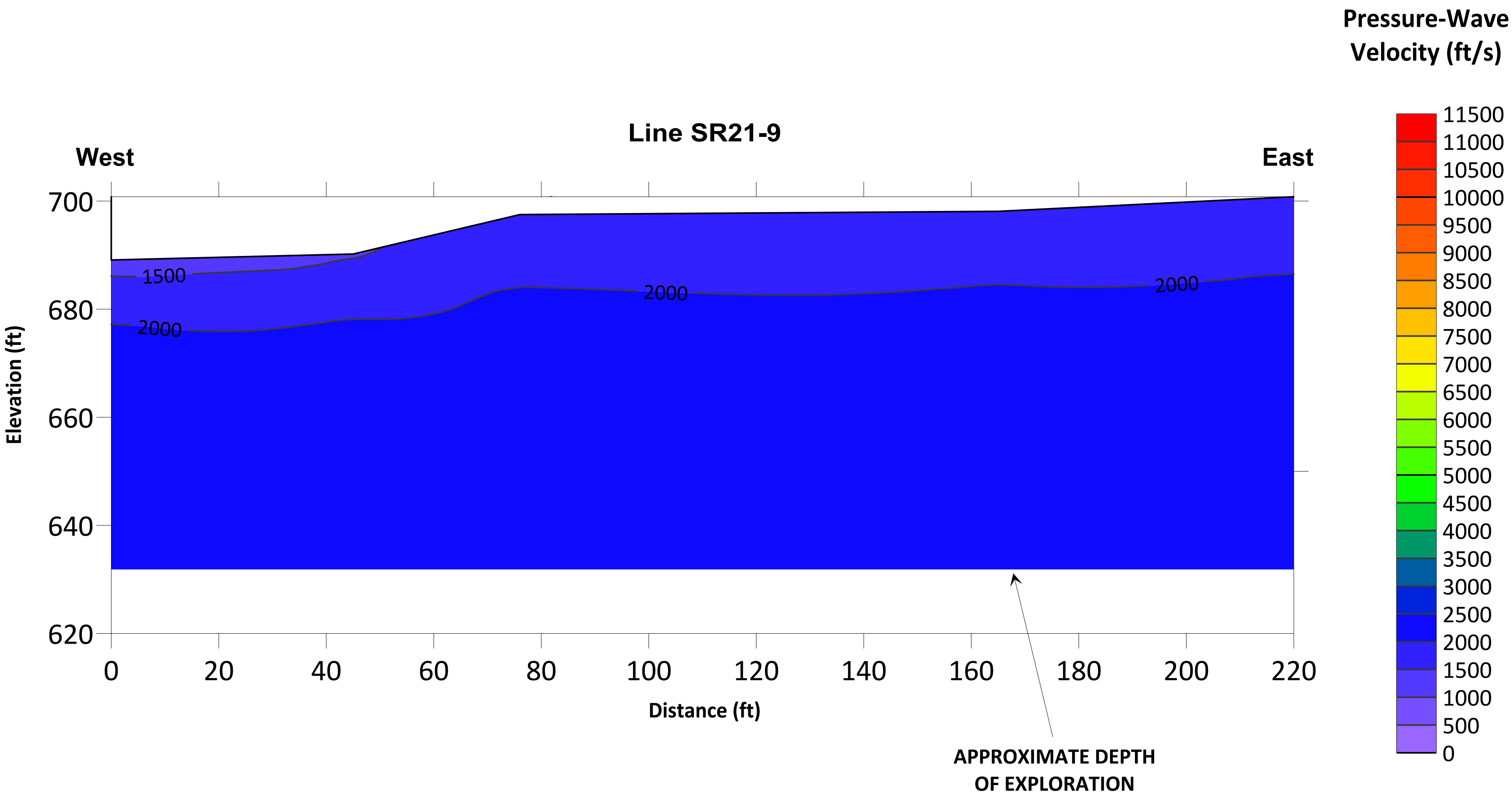
GeoPentech



Contour Interval: 500 ft/s

SEISMIC REFRACTION - SR21-8 P-WAVE VELOCITY PROFILE			
Date: SEP 2021	Project No.: 20070A	Project: 1100 RANCHO CONEJO BLVD	Figure 18

GeoPentech



Contour Interval: 500 ft/s

SEISMIC REFRACTION - SR21-9 P-WAVE VELOCITY PROFILE			
Date: SEP 2021	Project No.: 20070A	Project: 1100 RANCHO CONEJO BLVD	Figure 19

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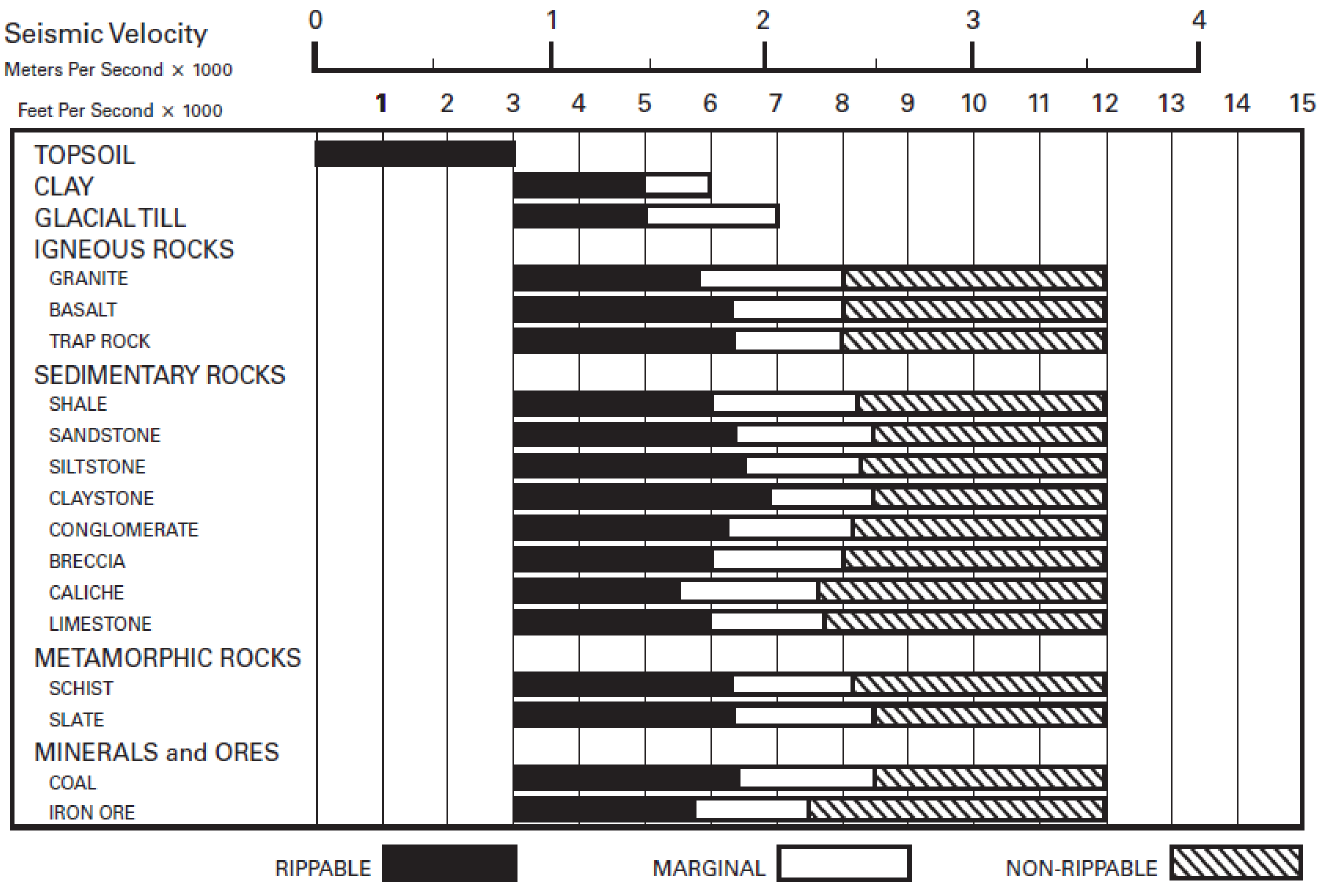
Rippers | Ripper Performance
● D8R/D8T

D8R/D8T
● Multi- or Single Shank No. 8 Ripper
● Estimated by Seismic Wave Velocities



Source: Caterpillar Inc. (2018). Caterpillar Performance Handbook 48: Caterpillar, Inc., Peoria, IL, page 19-76.

CATERPILLAR INC. RIPPABILITY CHART FOR D8R/D8T

Project No.: 21070A	Project: 1100 Rancho Conejo Blvd.	Date: SEP 2021	Figure 20

GeoPentech

June 13, 2021 via email: alozano@geoteq.com

Geotechnologies, Inc.
439 Western Ave.
Glendale, CA, 91201

Attention: Andres Lozano

Re: Soil Corrosivity Study
ARE LA Region No. 7, LLC
Thousand Oaks, CA
HDR #21-0467SCS, GI #22144

Introduction

Laboratory tests have been completed on four soil samples provided for the referenced project. The purpose of these tests was to determine whether the soils are likely to have deleterious effects on underground utility piping, hydraulic elevator cylinders, and concrete structures. HDR assumes that the provided samples are representative of the most corrosive soils at the site.

The proposed structures have one to three stories and no subterranean levels. The site is located at 1100 Rancho Conejo Boulevard in Thousand Oaks, California, and the water table is reportedly greater than 50 feet deep.

The scope of this study is limited to a determination of soil corrosivity and general corrosion control recommendations for materials likely to be used for construction. HDR's recommendations do not constitute, and are not meant as a substitute for, design documents for the purpose of construction. If the architects and/or engineers desire more specific information, designs, specifications, or review of design, HDR will be happy to work with them as a separate phase of this project.

Soil Corrosivity Testing

Laboratory Testing

The electrical resistivity of each sample was measured in a soil box per ASTM International (ASTM) G187 in its as-received condition and again after saturation with distilled water. Resistivities are at about their lowest value when the soil is saturated. The pH of the saturated samples was measured per ASTM G51. A 5:1 water:soil extract from each sample was chemically analyzed for the major soluble salts commonly found in soil per ASTM D4327, ASTM D6919, and American Water Works Association (AWWA) Standard Method 2320-B.

The laboratory analyses were performed under HDR laboratory number 21-0467SCS. The full set of test results are shown in the attached Table 1.

Discussion

A major factor in determining soil corrosivity is electrical resistivity. The electrical resistivity of a soil is a measure of its resistance to the flow of electrical current. Corrosion of buried metal is an electrochemical process in which the amount of metal loss due to corrosion is directly proportional to the flow of electrical current (DC) from the metal into the soil. Corrosion currents, following Ohm's Law, are inversely proportional to soil resistivity. Lower electrical resistivities result from higher moisture and soluble salt contents and indicate corrosive soil. A correlation between electrical resistivity and corrosivity toward ferrous metals is shown in Table 1.[1]

Table 1: Soil Corrosivity Categories.

Soil Resistivity (ohm-cm)	Corrosivity Category
Greater than 10,000	Mildly Corrosive
2,001 to 10,000	Moderately Corrosive
1,001 to 2,000	Corrosive
0 to 1,000	Severely Corrosive

Other soil characteristics that may influence corrosivity towards metals are pH, soluble salt content, soil types, aeration, anaerobic conditions, and site drainage.

Electrical resistivities were in the mildly corrosive and corrosive categories with as-received moisture. When saturated, the resistivities were in the corrosive category. One as-received resistivity was at or near its saturated value. Some resistivities dropped considerably with added moisture because the samples were dry as-received.

Soil pH values varied from 7.1 to 7.4. This range is nearly neutral to mildly alkaline.[2] These values do not particularly increase soil corrosivity.

The soluble salt content of the samples was low.

Per ACI-318, the soil is classified as S0 with respect to sulfate concentration.[3]

The nitrate concentration was high enough to be aggressive to copper in sample B8. Nitrate was detected in low concentration in the other samples. Ammonium was not detected.

Tests were not made for sulfide and oxidation-reduction (redox) potential because these samples did not exhibit characteristics typically associated with anaerobic conditions.

In conclusion, this soil is classified as corrosive to ferrous metals, aggressive to copper, and negligible (S0) for sulfate attack on concrete.

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[1] *Romanoff, Melvin. Underground Corrosion, NBS Circular 579. Reprinted by NACE. Houston, TX, 1989, pp. 166–167.*

[2] *Romanoff, Melvin. Underground Corrosion, NBS Circular 579. Reprinted by NACE. Houston, TX, 1989, p. 8.*

[3] *American Concrete Institute (ACI) 318-19 Table 19.3.1.1.*

Corrosion Control Recommendations

The life of buried materials depends on thickness, strength, loads, construction details, soil moisture, etc., in addition to soil corrosivity, and is, therefore, difficult to predict. Of more practical value are corrosion control methods that will increase the life of materials that would be subject to significant corrosion. The following recommendations are based on the evaluation of soil corrosivity described above. Unless otherwise indicated, these recommendations apply to the entire site or alignment.

All Pipe

1. On all pipes, appurtenances, and fittings not protected by cathodic protection, coat bare metal such as valves, bolts, flange joints, joint harnesses, and flexible couplings with wax tape per AWWA C217 after assembly.

2. Where metallic pipelines penetrate concrete structures such as building floors, vault walls, and thrust blocks use plastic sleeves, rubber seals, or other dielectric material to prevent pipe contact with the concrete and reinforcing steel.

3. To prevent differential aeration corrosion cells, provide at least 2 inches of pipe bedding or backfill material all around metallic piping, including the bottom. Do not lay pipe directly on undisturbed soil.

Steel Pipe

1. Underground steel pipe with rubber gasketed, mechanical, grooved end, or other nonconductive type joints should be bonded for electrical continuity. Electrical continuity is necessary for corrosion monitoring and cathodic protection.

2. Install corrosion monitoring test stations to facilitate corrosion monitoring and the application of cathodic protection:

    a. At each end of the pipeline.

    b. At each end of all casings.

    c. Other locations as necessary so the interval between test stations does not exceed 1,200 feet.

3. To prevent dissimilar metal corrosion cells and to facilitate the application of cathodic protection, electrically isolate each buried steel pipeline per NACE International (NACE) SP0286 from:

    a. Dissimilar metals.

    b. Dissimilarly coated piping (cement-mortar vs. dielectric).

    c. Above ground steel pipe.

    d. All existing piping.

4. Choose one of the following corrosion control options:

OPTION 1

a. Apply a suitable dielectric coating intended for underground use such as:

i. Polyurethane per AWWA C222 *or*

ii. Extruded polyethylene per AWWA C215 *or*

iii. A tape coating system per AWWA C214 *or*

iv. Hot applied coal tar enamel per AWWA C203 *or*

v. Fusion bonded epoxy per AWWA C213.

b. Apply cathodic protection to steel piping as per NACE SP0169.

OPTION 2

As an alternative to the coating systems described in Option 1 and cathodic protection, apply a ¾-inch cement mortar coating per AWWA C205 or encase all buried portions of metallic piping so that there is a minimum of 3 inches of concrete cover provided over and around surfaces of pipe, fittings, and valves using any type of ASTM C150 cement. Install joint bonds, test stations, and insulated joints to provide for corrosion monitoring and/or the future application of cathodic protection if needed.

NOTE: Some steel piping systems, such as oil, gas, insulated, or high-pressure piping systems, have special corrosion and cathodic protection requirements that must be evaluated for each specific application.

Ductile Iron Pipe

1. To prevent dissimilar metal corrosion cells and to facilitate the application of cathodic protection, electrically insulate underground iron pipe from dissimilar metals and from above ground iron pipe with insulating joints per NACE SP0286.

2. Bond all nonconductive type joints for electrical continuity. Electrical continuity is necessary for corrosion monitoring and cathodic protection.

3. Install corrosion monitoring test stations to facilitate corrosion monitoring and the application of cathodic protection:

   a. At each end of the pipeline.

   b. At each end of any casings.

   c. Other locations as necessary so the interval between test stations does not exceed 1,200 feet.

4. Choose one of the following corrosion control options:

OPTION 1

a. Apply a suitable coating intended for underground use such as:

   i. Polyethylene encasement per AWWA C105; *or*

   ii. Epoxy coating; *or*

   iii. Polyurethane; *or*

   iv. Wax tape.

   NOTE: The thin factory-applied asphaltic coating applied to ductile iron pipe for transportation and aesthetic purposes does not constitute a corrosion control coating.

b. Apply cathodic protection to ductile iron piping as per NACE SP0169.

OPTION 2

As an alternative to the coating systems described in Option 1 and cathodic protection, encase all buried portions of metallic piping so that there is a minimum of 3 inches of concrete cover provided over and around surfaces of pipe, fittings, and valves using any type of ASTM C150 cement. Install joint bonds, test stations, and insulated joints to provide for corrosion monitoring and/or the future application of cathodic protection if needed.

NOTE: Some iron piping systems, such as for fire water piping, have special corrosion and cathodic protection requirements that must be evaluated for each specific application.

Cast Iron Soil Pipe

1. Protect cast iron soil pipe with either a double wrap 4-mil or single wrap 8-mil polyethylene encasement per AWWA C105.

2. It is not necessary to bond the pipe joints or apply cathodic protection.

3. Provide 6 inches of clean sand backfill all around the pipe. Use the following parameters for clean sand backfill:

   a. Minimum saturated resistivity of no less than 3,000 ohm-cm; *and*

   b. pH between 6.0 and 8.0.

   c. All backfill testing should be performed by a corrosion engineering laboratory.

Copper Tubing

1. Use Type K or Type L copper tubing as required by the applicable local plumbing code. Type M tubing should not be used for buried applications.[4]

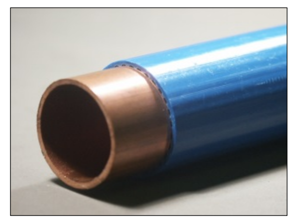
2. Electrically insulate underground copper pipe from dissimilar metals and from above ground copper pipe with insulating devices per NACE SP0286.

3. Electrically insulate cold water piping from hot water piping systems.

4. Protect buried copper tubing by one of the following measures:

    a. Prevent soil contact. Soil contact may be prevented by placing the tubing above ground or encasing the tubing using PVC pipe with solvent-welded joints. Either seal the PVC pipe at both ends or terminate both ends above-grade in a manner that doesn't allow water to infiltrate; or

    b. Install copper pipe with a factory-applied coating that is at least 25 mils in thickness. Use Kamco's Aqua Shield™, Mueller Streamline's Plumbshield™, or equal. The coating must be continuous with no cuts or defects.



    c. Insulate the pipe by installing 12-mil polyethylene pipe wrapping tape with butyl rubber mastic over a suitable primer. Protect wrapped copper tubing by applying cathodic protection per NACE SP0169.

Plastic and Vitrified Clay Pipe

1. No special corrosion control measures are required for plastic and vitrified clay piping placed underground.

2. Protect all metallic fittings and valves with wax tape per AWWA C217, or with epoxy and appropriately designed cathodic protection system per NACE SP0169.

Concrete Structures and Pipe

1. From a corrosion standpoint, any type of ASTM C150 cement may be used for concrete structures and pipe because the sulfate concentration is negligible (S0), from 0 to 0.10 percent. Use a minimum strength of 2,500 psi per applicable codes.[5,6,7]

2. Standard concrete cover over reinforcing steel may be used for concrete structures and pipe in contact with these soils due to the low chloride concentrations found on site.[8]

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[4] *2016 California Plumbing Code (CPC), July 1, 2018 Supplement, Section 604.3.*

[5] *2018 International Building Code (IBC) which refers to American Concrete Institute (ACI) 318-19 Table 19.3.2.1*

[6] *2015 International Residential Code (IRC) which refers to American Concrete Institute (ACI) 318-19 Table 19.3.2.1*

[7] *2016 California Building Code (CBC) which refers to American Concrete Institute (ACI) 318-19 Table 19.3.2.1*

[8] *Design Manual 303: Concrete Cylinder Pipe. Ameron. p.65*

Limit the water-soluble chloride ion content in the concrete mix design to less than 0.3 percent by weight of cement.

NOTE: Interior surfaces of concrete structures and pipe used to transport wastewater may require additional corrosion protection measures, such as linings, based on the flow conditions and wastewater characteristics. These considerations are beyond the scope of this report.

Hydraulic Elevators

1. Choose one of the following corrosion control options for the hydraulic steel cylinders.

   OPTION 1

   a. Coat hydraulic elevator cylinders with a suitable dielectric coating intended for underground use such as:

      i. Polyurethane per AWWA C222 or

      ii. Extruded polyethylene per AWWA C215 or

      iii. A tape coating system per AWWA C214 or

      iv. Hot applied coal tar enamel per AWWA C203 or

      v. Fusion bonded epoxy per AWWA C213.

   b. Electrically insulate each cylinder from building metals by installing dielectric material between the piston platen and car, insulating the bolts, and installing an insulated joint in the oil line; and

   c. Apply cathodic protection to hydraulic cylinders as per NACE SP0169.

   OPTION 2

   As an alternative to electrical insulation and cathodic protection, place each cylinder in a plastic casing with a plastic watertight seal at the bottom.

2. The elevator oil line should be placed above ground if possible but, if underground, should be protected by one of the following corrosion control options:

   OPTION 1

   a. Provide a bonded dielectric coating,

   b. Electrically isolate the pipeline, and

   c. Apply cathodic protection to steel piping as per NACE SP0169.

   OPTION 2

   Place the oil line in a PVC casing pipe with solvent-welded joints and sealed at both ends to prevent contact with soil and moisture.

Closure

The analysis and recommendations presented in this report are based upon data obtained from the laboratory samples. This report does not reflect variations that may occur across the site or due to the modifying effects of construction. If variations appear, HDR should be notified immediately so that further evaluation and supplemental recommendations can be provided.

HDR's services have been performed with the usual thoroughness and competence of the engineering profession. No other warranty or representation, either expressed or implied, is included or intended.

Please call if you have any questions.

Respectfully Submitted,
HDR Engineering, Inc.

Steven Pierce, EIT
Corrosion EIT

Sean Hoss, PE

Enc: Table 1 – Laboratory Tests on Soil Samples

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Table 1 - Laboratory Tests on Soil Samples

Geotechnologies, Inc.
ARE LA Region No. 7, LLC
Your #22144, HDR Lab #21-0467SCS
3-Jun-21

Sample ID			B1 @ 1-5'	B8 @ 1-5'	B14 @ 1-5'	B21 @ 1-5'
Resistivity		**Units**				
as-received		ohm-cm	1,400	124,000	20,000	24,400
saturated		ohm-cm	1,520	1,280	1,920	1,800
pH			7.1	7.1	7.2	7.4
Electrical Conductivity		mS/cm	0.15	0.18	0.11	0.16
Chemical Analyses						
Cations						
calcium	Ca^{2+}	mg/kg	91	84	63	89
magnesium	Mg^{2+}	mg/kg	0.6	19	9.3	13
sodium	Na^{1+}	mg/kg	126	133	92	95
potassium	K^{1+}	mg/kg	1.7	5.4	6.1	6.4
ammonium	NH_4^{1+}	mg/kg	ND	ND	ND	ND
Anions						
carbonate	CO_3^{2-}	mg/kg	39	27	30	59
bicarbonate	HCO_3^{1-}	mg/kg	287	293	268	119
fluoride	F^{1-}	mg/kg	6.6	2.4	4.7	2.1
chloride	Cl^{1-}	mg/kg	21	23	8.3	33
sulfate	SO_4^{2-}	mg/kg	64	115	16	131
nitrate	NO_3^{1-}	mg/kg	7.6	53	3.9	3.2
phosphate	PO_4^{3-}	mg/kg	ND	1.1	ND	ND
Other Tests						
sulfide	S^{2-}	qual	na	na	na	na
Redox		mV	na	na	na	na

Resistivity per ASTM G187, pH per ASTM G51, Cations per ASTM D6919, Anions per ASTM D4327, and Alkalinity per APHA 2320-B.

Electrical conductivity in millisiemens/cm and chemical analyses were made on a 1:5 soil-to-water extract.

mg/kg = milligrams per kilogram (parts per million) of dry soil.

Redox = oxidation-reduction potential in millivolts

ND = not detected

na = not analyzed

431 West Baseline Road · Claremont, CA 91711
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Geotechnical Associates, Inc.
Applied Earth Sciences and Environmental Studies

766 Lakefield Road, Suite C
Westlake Village
California 91361
805-497-2109
FAX 805-373-6938

Project #
File Name DP 92
File #
Office of Record

March 5, 1996

Dinwiddie Construction Company
1145 Wilshire Boulevard
Los Angeles, California 90017-1903

Work Order: G1583-7-11
Log Number: 499

Attention: Mr. Fred Leivo

Subject: Geotechnical Site Update, Proposed Parking Lot Addition Adjacent Amgen Buildings 36 and 37, 1100 Rancho Conejo Boulevard, City of Thousand Oaks, California.

INTRODUCTION

This report contains our geotechnical site update for the proposed parking lot addition adjacent Amgen Buildings 36 and 37 at 1100 Rancho Conejo Boulevard in the city of Thousand Oaks, California. This update is based wholly on the information contained in the referenced reports and a recent visit to the subject lot by a representative of this office. The visit was performed to visually evaluate changes in the surface condition of the site subsequent to the referenced rough grading report (Gorian 1973). Our understanding of the project is based on a grading plan prepared by Crosby Mead Benton and Associates (dated January 15, 40 scale).

PROJECT CONSIDERATIONS

Based on the referenced grading plan, the proposed project will consist of abandoning, demolishing, and reconstructing portions of the existing parking lot east of Building #37. New portions of the parking lot will be added to extend east of Building #36.

Gorian and Associates, Inc. provided geotechnical engineering services during the previous rough grading for the site (Gorian 1973). The previous rough grading within the area of proposed improvements consisted primarily of cuts of up to approximately 12 feet and fills of up to approximately 20 feet to obtain designed finish grades (see attached Geotechnical Map).

SURFACE CONDITIONS

The area near Building #37 consists of an existing asphalt parking lot. The area adjacent Building #36 supports mature landscaping. The landscaping is bounded by a dirt access road designated as a "future drive" on the attached Geotechnical Map (Gorian 1973). The access road surface soils appear saturated from recent winter rains and disturbed due to vehicular traffic. The area north of the access road is substantially unimproved and supports native vegetation, some trash and debris stockpiles. This area also appears to be a temporary horticultural storage area.

SUBSURFACE CONDITIONS

Bedrock underlying the site consists of the Conejo Volcanics of Miocene-age. An outcropping exposing the Conejo Volcanics was observed during our recent site visit on the existing knoll to the north of Building #37. This rock is anticipated to be locally hard. Cutting the rock may produce oversize material. The referenced report indicates cuts of up to 12 feet performed with a D-9 bulldozer (double shank). Use of similar equipment should be anticipated. Additional rock hardness information can be obtained with a seismic traverse if requested.

As previously described, engineered compacted fill soils were placed during rough grading for the site (Gorian, 1973). The maximum depth of existing fill within the proposed parking lot improvement area is approximately 20 feet. Approximate limits of engineered fill are shown on the attached Geotechnical Map.

Disturbed surface soils, shallow landscape fills, and shallow nonengineered access road fills cover the remainder of the proposed parking lot improvement area. Depth of these materials appears to extend approximately 1 to 3 feet.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL

The subject site was evaluated from a geotechnical standpoint for the construction of the proposed parking lot. The site may be developed as shown on the referenced grading plan prepared by Crosby Mead Benton and Associates, (1996), provided that recommendations presented herein are followed and incorporated into the design and construction of the project.

SITE PREPARATION AND GRADING

General

The following site preparation and grading recommendations are for reconditioning and grading of the proposed parking lot addition. All aspects of grading including site preparation, grading, and fill placement should be per the city of Thousand Oaks Building Code.

Vegetation/Debris Removal

Any vegetation within the area of construction should be removed prior to the grading operations. Any demolition debris must be removed from all areas of construction.

Rock Hardness

Bedrock underlying the site consists of the Conejo Volcanics of Miocene-age. This rock is anticipated to be locally hard and excavation may produce oversize material. The referenced report indicates cuts of up to 12 feet performed with a D-9 bulldozer (double shank) and use of similar equipment should be anticipated. Additional rock hardness information can be obtained with a seismic traverse if requested.

Soil Removal
Existing loose surface soils, non-engineered fills, and landscape fills should be removed to firm native materials or previously compacted fill. Removals may range from 1 to 3 feet from existing grades.

After the removals are completed as addressed above, the exposed soil/bedrock should be observed by the project geotechnical consultant to evaluate if additional removals are needed. If bentonitic beds are encountered in bedrock cuts, the undercut may need to be deepened to 6 feet. Existence or absence of bentonitic beds must be evaluated during grading by the project geotechnical consultant. No fill soils should be placed until the geotechnical observation of removal areas is completed and if necessary, the project civil engineer has surveyed the removal limits.

Soil Compaction
All soil compaction should be to a minimum of 90% relative compaction. Relative compaction is the ratio of the in-place (in situ) dry soil density to the maximum dry soil density as determined per ASTM D 15557.

In-Place Soil Processing
Prior to placing fill, the exposed surface should be processed. Processing consists of (1) scarifying the exposed surface to a depth of 6 to 8 inches until the surface is free from uneven features, (2) conditioning the scarified material to a minimum of 2% above the optimum moisture content, and (3) recompacting the scarified material.

Fill Placement
Fill soils should be moisture conditioned to a minimum of 2% above optimum moisture content, placed in maximum 8 inch uniform lifts, and compacted.

MANUFACTURED SLOPE CONSTRUCTION AND MAINTENANCE

General
Permanent cut and fill slopes may be constructed at a maximum gradient of 2(h):1(v). All manufactured slopes will require maintenance.

Cut Slopes
The proposed cut slopes are not anticipated to expose adverse geologic conditions. However, all cut slopes must be observed by the project geotechnical consultant to verify the absence of adverse geologic conditions. The need for any remedial grading on the slopes can be determined once the planned cuts are completed.

Fill Slopes
Fill slopes should be keyed and benched into compacted engineered fill or firm competent bedrock. All keyways should be a minimum of 15 feet wide and cut to a minimum depth of 2 feet at the toe into competent in-place materials. The keyway should be tilted into the slope and should be at least 3 feet deep at the heel (measured from below the slope toe

elevation). The keyway must be observed by the project geotechnical consultant prior to placing any fill.

Where possible, the outer slope faces should be overfilled and trimmed back to provide for firm, well-compacted surfaces. If the slopes are not overfilled and trimmed, it will be necessary to sheepsfoot and/or grid roll the slopes. Slope faces should be tested and reworked as necessary to achieve the 90 percent relative compaction required.

Slope Maintenance

All slopes will require maintenance to reduce the risk of erosion and degradation with time due to a natural or man-made conditions. Future performance of the slopes will depend on the control of the burrowing animals and maintenance of the brow ditches, drainage structures, and the slope vegetation as discussed below.

All graded or exposed natural slopes must be maintained with dense, deep rooting (minimum 2± feet deep), drought resistant groundcover and shrubs or trees. Where necessary a reliable irrigation system should be installed on the slopes, adjusted so over-watering does not occur, and periodically checked for leakage. Excess watering of the slopes can cause erosion and surficial failures, and must be avoided. Care should be taken to maintain a uniform, near optimum moisture content in the slopes, and to avoid over-drying, or excess irrigation. Slopes should not be over-watered and should not be watered before forecasted rain.

All drainage structures (including both those at the surface and those buried) should be kept in good condition and clean the entire length to the outlet. Final grading of the site should provide positive drainage away from natural slopes, and water should not be allowed to pond or gather in the natural slope area. Burrowing animals, particularly ground squirrels, can destroy slopes; therefore, where present, immediate measures should be taken to evict them.

SITE DRAINAGE

Positive drainage must be provided away from the structures during and after construction. The city of Thousand Oaks Building Code requires the building pad to drain at a minimum gradient of 2% away from the building toward an approved drainage course, or to provide alternate drainage. Planters near a structure should be constructed so that irrigation water will not saturate the soils underlying the buildings footings and slabs. Therefore, a concrete floor with a drain connected to the site drainage system should be considered for planters. Trees and large shrubbery should not be planted where roots can grow under foundations and flatwork as they mature.

PRELIMINARY PAVEMENT DESIGN

Preliminary structural sections are provided in the following table are based on previous pavement design for the parking areas, provided in Gorian Novermber 20, 1973. These sections should be confirmed when the actual pavement subgrade is exposed at the conclusion of grading. The upper 6 inches of subgrade and the base material should be compacted to at least 95 relative compaction prior to placing the asphalt.

ASPHALTIC CONCRETE PAVEMENT DESIGN

Facility	Assumed Traffic Index	Recommended Structural Section
Parking Stalls	4.0	3" AC/6" AB
Minor Drive Areas	4.5	3" AC/8" AB

AC = Asphaltic Concrete
AB = Class II Aggregate Base

Planter areas should be graded so excess water drains onto and not beneath the adjacent AC pavement and curbs. The concrete curbs near slopes should have sufficient embeddment to resist movement such a that due to auto impact. The minimum setback should be 5 feet measured horizontally from the bottom edge of the curb to the slope face. Also, adjacent the planters, consideration should be given to deepening the curbs so the bottom of the curb is at the pavement subgrade level. Ponding of water adjacent paved areas could result in excessive moisture infiltration beneath concrete and pavement resulting in unstable subgrade soils and/or expansive uplift action.

SIDEWALKS
A 4-inch thick layer of sand or aggregate base should be placed beneath walkways due to the moderate degree of expansiveness for the subject subgrade soils. Walkway subgrade soils should be properly compacted and premoistened to at least 3% above the optimum moisture for a minimum depth of 12". Failure to properly premoisten the subgrade soils could result in uplifting of the concrete due to soil expansion caused by future migration of water beneath the walks. Also, drainage must be provide away from the edge of all concrete pavement.

CLOSURE

This report was prepared within the scope of generally accepted geotechnical practices under the direction of a licensed geotechnical engineer. No warranty, express or implied, is made as to conclusions and professional advice included in this report. Geotechnical Associates, Inc. disclaims any and all responsibility and liability for problems which may occur if the recommendations presented in this report are not followed.

The report was prepared for use by the owner and his design consultants to be used solely for design and construction of the project as described herein. These recommendations should not be extrapolated to other areas or used for other facilities without consulting Geotechnical Associates, Inc.

Grading at the site should be performed in accordance with the current City of Thousand Oaks building ordinance. Due to possible subsurface variations, all aspects of field construction addressed in this report should be observed by the project geotechnical consultant. The services of the geotechnical consultant should not be construed to relieve the owner or contractors of their responsibilities or liabilities.

oOo

Please contact us if you have any questions regarding the information and recommendations contained in this report or require additional consultation.

Respectfully submitted,

GEOTECHNICAL ASSOCIATES, INC.

By: Paul Wasserman
Field Engineer

By: Jerome J. Blunck
GE 151

REGISTERED PROFESSIONAL ENGINEER
JEROME JON BLUNCK
No. 151
Exp. 12/31/96
GEOTECHNICAL
STATE OF CALIFORNIA

Attachments: Geotechnical Map (Gorian 1973)

Distribution: Addressee (4)

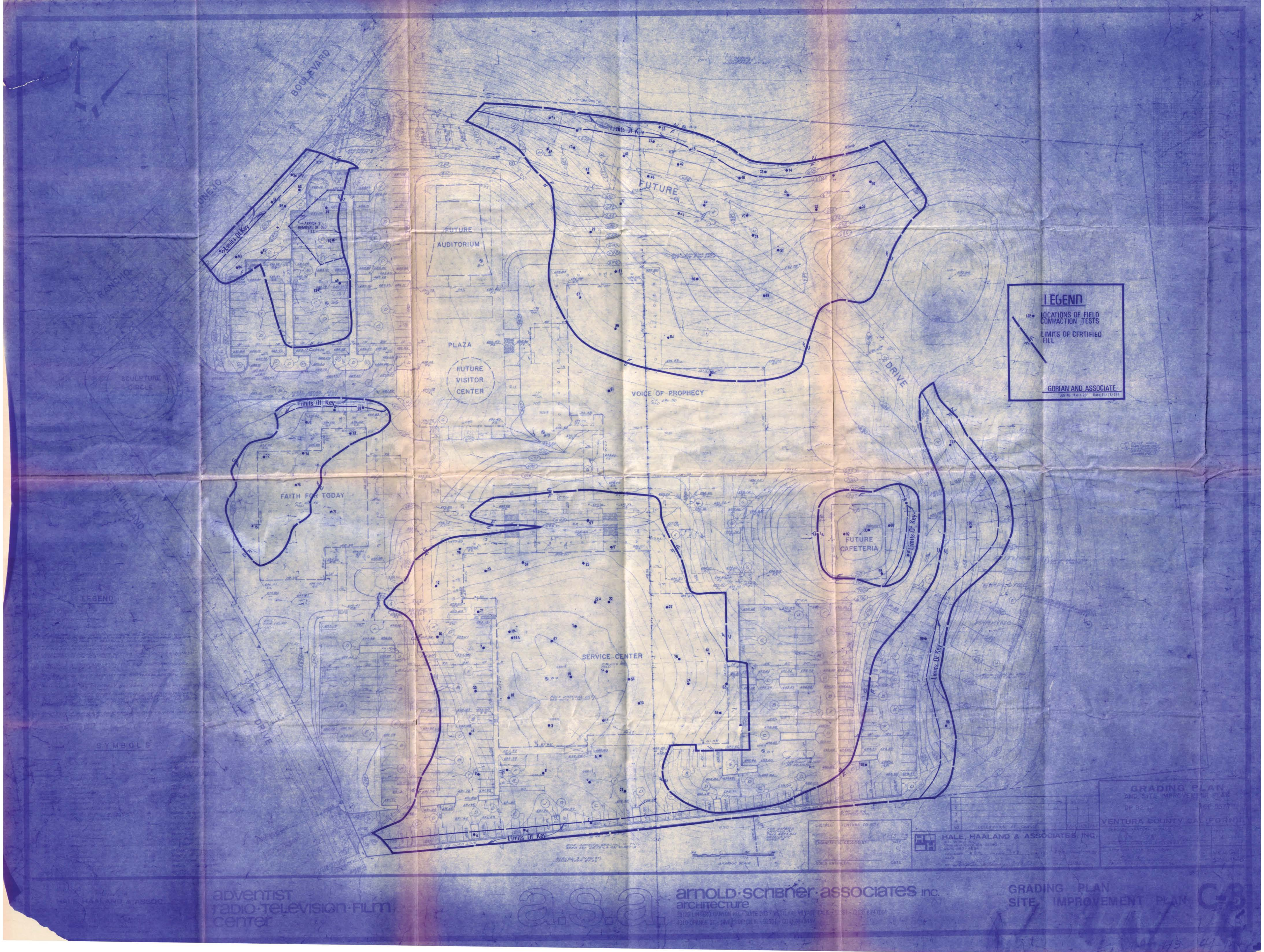
PW/JJB/lw

REFERENCES

Crosby Mead Benton and Associates, (1996) 40-Scale Grading Plan, Buildings 35, 36, and 37, Amgen, Inc., Thousand Oaks. Dated January 15.

Gorian and Associates, Inc., November 16, 1973, Report on Controlled Grading, S.D.A. Communications Center, Newbury Park, California. Work Order: 44-1-20, Log Number: 1187.

Gorian and Associates, Inc., November 20, 1973, Pavement Design for Parking Areas, SDA Communications Center, Rancho Conejo, Ventura County. Work Order: 44-1-30, Log Number: 1193.



LEGEND
102 ● LOCATIONS OF FIELD COMPACTION TESTS
LIMITS OF CERTIFIED FILL
GORIAN AND ASSOCIATE
Job No. 44-1-20 Date: 11/17/73
BOULEVARD
RANCHO CONEJO
Limits Of Key
FUTURE
FUTURE AUDITORIUM
PLAZA
FUTURE VISITOR CENTER
VOICE OF PROPHECY
DRIVE
SCULPTURE CIRCLE
FAITH FOR TODAY
FUTURE CAFETERIA
SERVICE CENTER
HAALAND
LEGEND
SYMBOLS
GRADING PLAN
AND SITE IMPROVEMENT PLAN
VENTURA COUNTY CALIFORNIA
HALE, HAALAND & ASSOCIATES, INC.
NO. DESCRIPTION OF CHANGE
adventist radio·television·film center
a.s.a.
arnold·scribner·associates inc.
architecture
GRADING PLAN
SITE IMPROVEMENT PLAN
C-8

DP 92 M1&2

Geotechnical Associates, Inc.
Applied Earth Sciences and Environmental Studies

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805-497-2109
FAX 805-373-6938

November 26, 1996

Dinwiddie Construction Company
1145 Wilshire Boulevard
Los Angeles, California 90017-1903

Work Order: G1583-36/37-20
Log Number: 838

Attention: Mr. Fred Leivo

Subject: Rough Grading Compaction Test Report, Proposed Parking Lot Addition (Project No. DP 92), Amgen Buildings 36 and 37, 100 Rancho Conejo Boulevard, City of Thousand Oaks, California.

INTRODUCTION

This report presents geotechnical information regarding rough grading for the proposed parking lot addition adjacent Amgen Buildings 36 and 37 at 1100 Rancho Conejo Boulevard. Summarized herein are our geotechnical observations during the rough grading operations and compaction test results.

SITE GRADING

GENERAL

Portions of the proposed parking lot addition were previously graded during rough grading for the site in 1973. Information pertaining to that grading is presented in the referenced report (Gorian 1973). Recently, additional cuts and fills of up to approximately 22 feet were performed to achieve design finish grades per the 20-scale grading plan by Crosby Mead Benton & Associates (revised 10/31/96). An approximate 25 foot high 2(h):1(v), fill slope along the north property line was extended out up to approximately 40 feet. The grading contractor for the project was Leko Construction, Inc.

SITE PREPARATION

Site preparation was performed within all areas to receive fill prior to starting the grading operations. Preparation consisted of stripping and removal as necessary of significant vegetation, trash, and debris. Minor remaining vegetation was blended with native soils during grading operations.

Loose or disturbed surface soils were removed in firm native materials or previous compacted fills. Removals ranged from 2 to 5 feet below existing grades. Subsequent to removals the upper 12 inches of exposed soils were processed and recompacted before placing fill. The soils were compacted to a minimum of 90% relative compaction.

GRADING OPERATIONS
The site was graded primarily by performing cuts and fills of up to approximately 22 feet. The slope along the north property line was extended up to approximately 40 feet. Based on our compaction tests and observations, fill soils were cleaned of debris or significant vegetation, moisture conditioned to near the optimum moisture content, placed in thin lifts, and compacted to a minimum of 90% relative compaction.

FILL SLOPES
The slope extension along the north property line was constructed to a maximum height of 25 feet at a 2(h):1(v) gradient. A minimum 15-foot wide keyway was constructed into firm material at the toe of the fill slope. Benching into firm soil was performed where necessary as fill progressed. Slope faces were compacted with a sheepsfoot roller during construction and subsequently trackwalked.

COMPACTION TESTING
Compaction tests and observations were conducted during the grading operations per the City of Thousand Oaks Grading Code. Density determinations were accomplished by conducting sand cone tests per ASTM D 1556 or nuclear gauge tests per ASTM D 2922. Some sand cone density tests were not feasible due to the rocky nature of fill soils derived from volcanic bedrock cuts. Inspection pits were performed to confirm that fills were properly moisture conditioned and no voids were present. Approximate compaction test locations are shown on the attached Geotechnical Map, with the test results summarized on the enclosed Table I.

CONCLUSIONS AND RECOMMENDATIONS

GENERAL
The subject parking and drive expansion areas were substantially graded as recommended in the referenced reports based on our compaction tests and observations. The graded areas are considered suitable (safe for the intended use) for proposed parking lot construction from a geologic and geotechnical engineering standpoint. Slope maintenance is discussed in Appendix B.

SITE DRAINAGE

Positive drainage must be provided away from slopes and structures during and after construction. Landscaped areas should not be over irrigated. Planters near structure should be constructed so irrigation water will not saturate the soils underlying the footings and slabs. The building pad must be graded at a minimum gradient away from the building toward an approved drainage course, or alternate drainage must be provided. The minimum gradient should be 1% in paved areas, and 2% in landscaped areas adjacent the structure.

CLOSURE

This report was prepared under the direction of a registered geotechnical engineer. This report and our work are not to be construed as a warranty of the contractors' work, nor does it cover work performed without our knowledge or approval. Geotechnical Associates, Inc. disclaims any and all responsibility and liability for problems that may occur if recommendations presented in this report are not followed.

oOo

Please call if you have any questions regarding this report or require additional information.

Respectfully submitted,
GEOTECHNICAL ASSOCIATES, INC.

By: Paul Wasserman
Field Supervisor

By: Jerome J. Blunck
GE 151

REGISTERED PROFESSIONAL ENGINEER
JEROME JON BLUNCK
No. 151
Exp. 12/31/96
GEOTECHNICAL
STATE OF CALIFORNIA

Distribution: Addressee (6)

Attachments: References
Appendix A, Laboratory Testing
Appendix B, Slope Maintenance Certification
Table I
Geotechnical Map

PW/JJB

REFERENCES

Crosby Mead Benton and Associates, (1996) 40-Scale Grading Plan, Buildings 35, 36, and 37, Amgen, Inc., Thousand Oaks. Dated January 15.

Geotechnical Associates, Inc., (1996a) Geotechnical Site Update, Proposed Parking Lot Addition Adjacent Amgen Buildings 36 and 37, 1100 Rancho Conejo Boulevard, City of Thousand Oaks, California. Work Order: G1583-7-11, Log Number: 499. Dated March 5.

Geotechnical Associates, Inc., (1996b) Plan Review, Building 36 Modifications, 1100 Rancho Conejo Boulevard, City of Thousand Oaks, California. Work Order: G1583-36/37-11, Log Number: 748. Dated September 18.

Gorian and Associates, Inc., (1973), Report on Controlled Grading, S.D.A. Communications Center, Newbury Park, California. Work Order: 44-1-20, Log Number: 1187. Dated November 16.

Gorian and Associates, Inc., (1973), Pavement Design for Parking Areas, SDA Communications Center, Rancho Conejo, Ventura County. Work Order: 44-1-30, Log Number: 1193. Dated November 20.

APPENDIX A

LABORATORY TESTING

Maximum Density-Optimum Moisture Curves

A maximum density-optimum moisture curve was established for each significant soil type encountered per ASTM D 1557. The test results are as follows:

Soil Type	Visual Soil Classification	Maximum Dry Density-pcf	Optimum Moisture Content-%
I	Dark brown clayey sand with rock fragments	116.5	14.0
II	Brown sandy clay with rock fragments	114.5	15.5
III	Light brown slightly clayey silty sand with rock fragments	121.5	15.0

APPENDIX B

SLOPE MAINTENANCE

Slopes constructed within the site will require maintenance or protection to reduce the risk of erosion and degradation with time due to natural or man-made conditions. Slopes should be planted and irrigated as described below or the slope surface protected using products such as polymer film coatings applied directly to the slope faces. Polymer coatings should be maintained until slope faces are properly landscaped. Slope coatings would reduce the need for irrigation during the interim period until slopes are planted. In addition, a jute matting or similar protection should be installed along the bottom of the slope along the north property line due to the rocky nature of soils exposed on the lower 5 feet of the slope face.

The rate of slope degradation can be reduced with proper slope care. Care should be taken to maintain a uniform, near optimum moisture content in the outer zone of slope faces. Over-drying or excessive irrigation of the slope soils must be avoided. Maintaining a uniform moisture condition in the soils will reduce the potential for softening and strength loss, which may otherwise lead to surficial slumping of slope faces. The moisture control is particularly important in areas where highly expansive soils are present. Slopes comprised of expansive soil have a tendency to creep downhill as the soil experiences shrink-swell cycles. In addition to moisture control, continuous maintenance of the slopes should include immediate planting with deep rooting, drought resistant vegetation, maintaining positive drainage away from the tops of all slopes, proper maintenance of erosion and drainage control devices and rodent control. Access, including foot traffic, should be limited to avoid local disturbance to the surficial soils.

Brow ditches and drainage terraces should be cleaned each fall before the rainy season, and if necessary, after each rainstorm. Brow ditches should be checked and kept clear the entire length and should outlet at an approved drainage course. Automatic irrigation systems should be interrupted when rain is expected, and should not be reset until irrigation is needed. This is to avoid watering slopes prior to or during rainstorms. Burrowing animals can destroy slopes; therefore, measures should be employed to immediately eliminate any animals burrowing into the slopes.

Current and future owners should be advised of the responsibility to maintain the slopes on their property. The future performance of the slopes will depend on control of burrowing animals and maintenance of brow ditches, drains and slope landscaping as discussed above.

TABLE I

RESULTS OF COMPACTION TESTS

W.O. G1583-36/37-20 **NAME: Dinwiddie Construction** **Report Date: 11/15/96**
Log Number: 838

TEST NO.	DATE	TEST ELEVATION (FT.)	MOISTURE CONTENT (%)	UNIT DRY DENSITY (LBS/CU.FT.)	RELATIVE COMPACTION (%)	SOIL TYPE	REMARKS
1	10/02/96	680.5	20.0	107.0	91	I	
2	10/02/96	857.3	15.7	103.8	90	II	
3	10/02/96	660.3	16.0	104.4	91	II	
4	10/02/96	683.5	15.0	115.4	98	I	
5	10/02/96	688.0	15.9	104.2	90	I	
6	10/02/96	689.2	14.1	105.4	90	I	
7	10/03/96	689.0	16.2	Too rocky to test.	93	III	
8	10/03/96	688.2	17.1	Too rocky to test.	94	III	
9	10/03/96	688.0	17.8	Too rocky to test.	92	III	
10	10/03/96	684.5	16.9	Too rocky to test.	91	III	
11	10/04/96	663.3	15.9	Too rocky to test.	90	III	
12	10/04/96	663.6	16.7	Too rocky to test.	91	III	
13	10/07/96	666.0	9.0	114.8	94	III	
14	10/07/96	663.9	11.7	112.3	92	III	
15	11/07/96	665.7	9.7	119.0	98	III	
16	10/07/96	668.0	9.7	105.3	90	I	
17	10/08/96	669.0	12.1	110.7	91	III	
18	10/08/96	671.2	17.9	103.7	91	II	
19	10/08/96	673.4	9.9	113.4	93	III	
20	10/08/96	673.0	18.1	104.6	91	II	
21	10/08/96	677.8	17.5	106.2	93	II	
22	10/08/96	675.0	17.4	105.8	92	II	
23	10/09/96	679.1	21.6	102.7	90	II	

TEST NO.	DATE	TEST ELEVATION (FT.)	MOISTURE CONTENT (%)	UNIT DRY DENSITY (LBS/CU.FT.)	RELATIVE COMPACTION (%)	SOIL TYPE	REMARKS
24	10/09/96	676.0	17.6	104.8	92	II	
25	10/09/96	679.5	11.5	117.5	97	III	
26	10/09/96	677.8	10.1	111.7	92	III	
27	10/10/96	681.5	17.7	106.4	91	I	
28	10/10/96	681.9	9.8	116.8	96	III	
29	10/10/96	682.8	11.3	113.0	93	III	
30	10/18/96	684.0	16.8	109.4	91	III	
31	10/18/96	684.5	15.9	111.4	94	III	

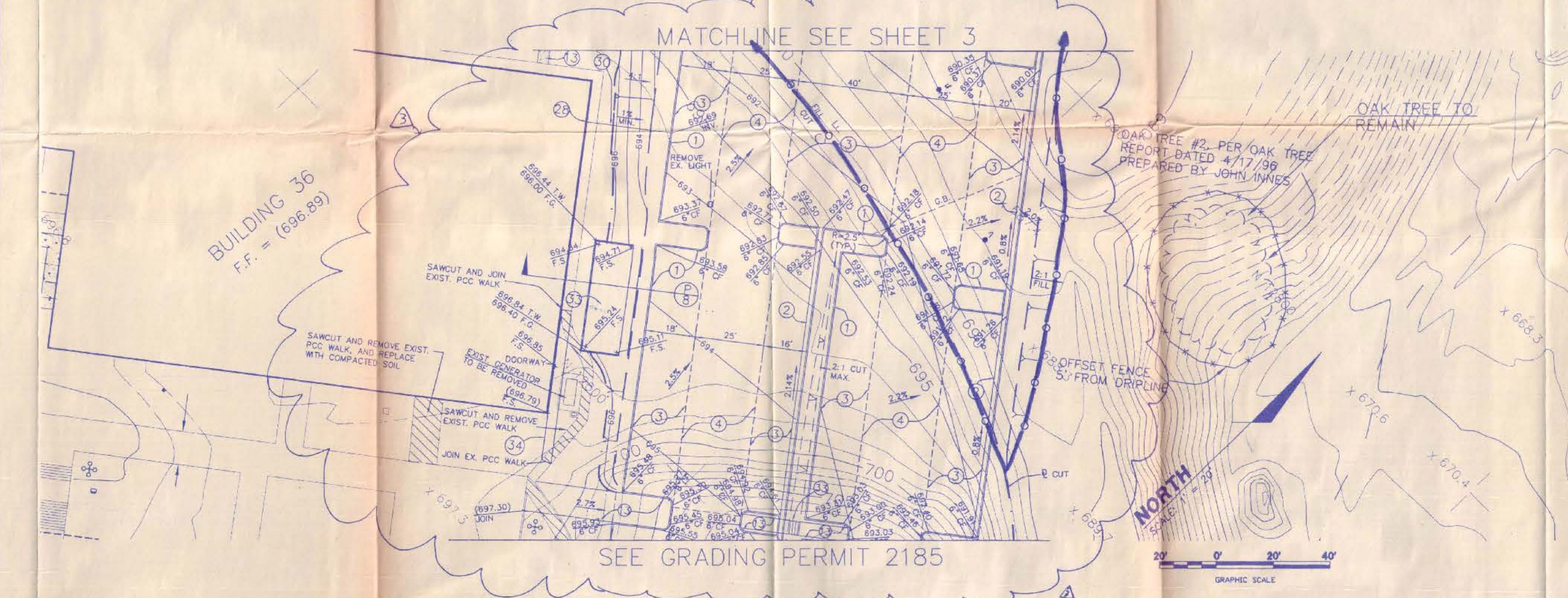
Geotechnical Associates, Inc. Applied Earth Sciences and Environmental Studies				
Job No. G1583-36/37-20			Date: 11-26-96	
Scale: 1" = 20'	Drawn by: JGR	Approved by:	Log No.: 838	

GEOTECHNICAL MAP

EXPLANATION

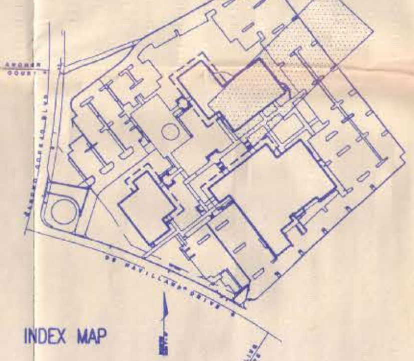
31 ● APPROXIMATE LOCATION OF FIELD COMPACTION TEST

APPROXIMATE LIMIT OF COMPACTED FILL



NOTE:

(28) = TYP. CONSTRUCTION NOTE No. SEE SHEET 8 FOR APPLICABLE CONSTRUCTION NOTE.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REV	SYMBOL	DESCRIPTION OF CHANGE	R.C.E.	DATE	TYP.CHNG	P.D.E.	DATE

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Engineers · Planners · Surveyors
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Encino, California 91316
(818) 343-5384
MATTHEW W. COWDEN — DATE

REVIEWED FOR PERMIT ISSUANCE BY CITY OF THOUSAND OAKS

PROJECT DEVELOPMENT ENGINEER	DATE
CITY ENGINEER	DATE
PLANNING DEPT.	DATE

FINE GRADING, PAVING AND DRAINAGE PLAN

PROJECT NO. DP 92 (MINOR MOD. No. 2)
PARKING ADDITION: AMGEN BUILDINGS 36 & 37

CITY OF THOUSAND OAKS DWG. NO. 92-58A

SHEET 2 OF 9

AG36FG22.DWG OCTOBER 11, 1996

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Building Numbers 36 & 37
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Thousand Oaks, California 91320

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Gensler and Associates
Architects
2500 Broadway, Suite 300
Santa Monica, California 90404.3082
310.449.5800

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1	08/07/96	ADDENDUM C							
2	09/12/96	BULLETIN No. 5							
3	10/14/96	BULLETIN No. 9							

Project Name	AMGEN BUILDING NUMBERS 36 & 37
Project Number	787-1
Description	PARKING ADDITION: MINOR MOD. 2 FINE PAVING AND DRAINAGE PLAN
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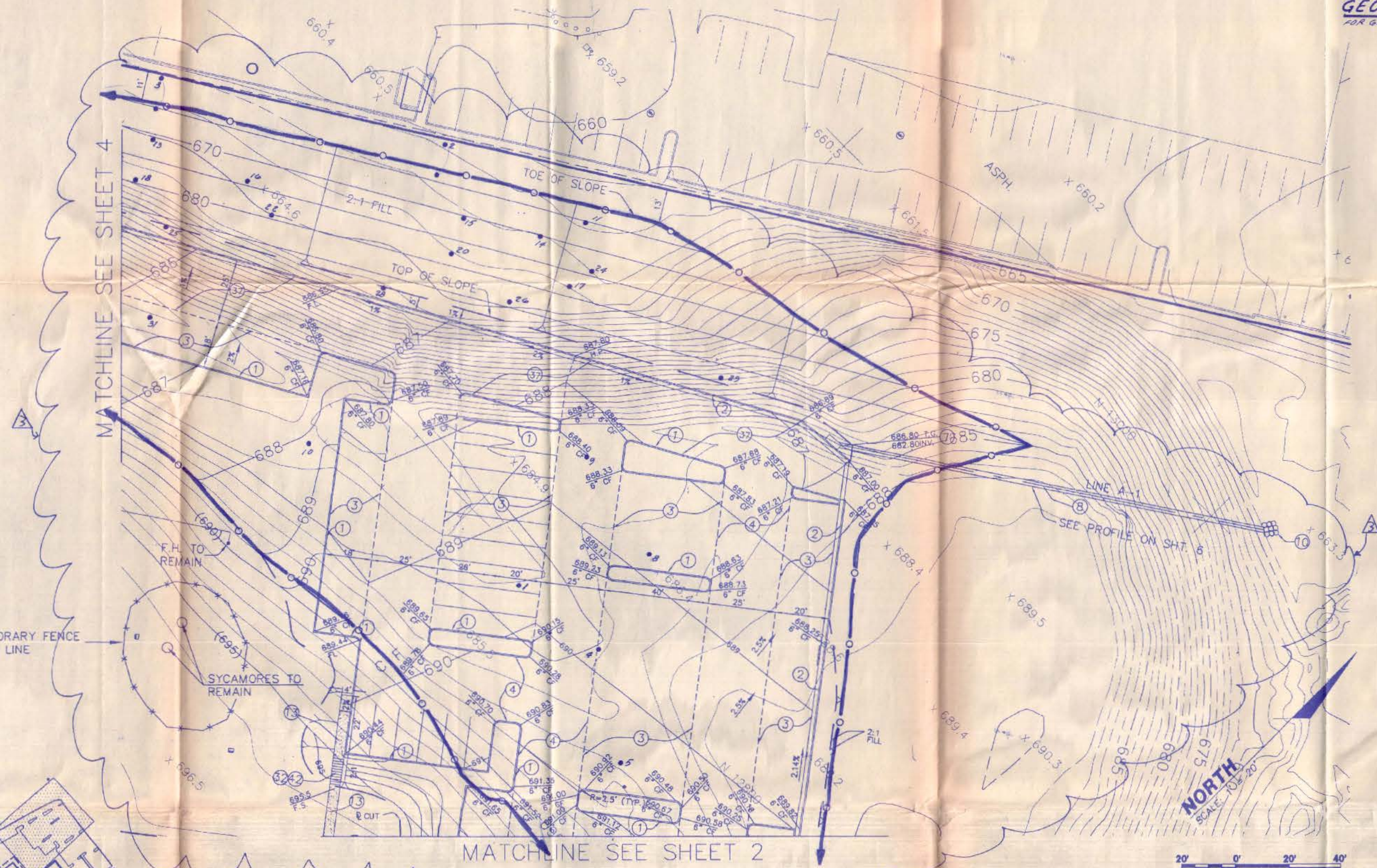

20' 0' 20' 40'
GRAPHIC SCALE

NOTE:

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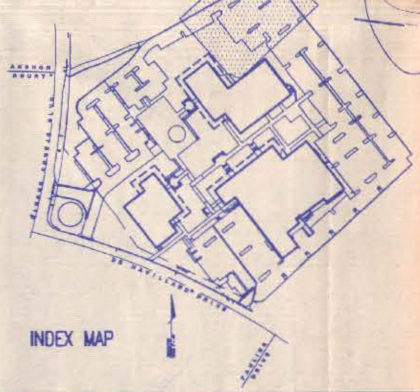

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FINE GRADING, PAVING AND DRAINAGE PLAN

PROJECT NO. DP 92 (MINOR MOD. No. 2)
PARKING ADDITION: AMGEN BUILDINGS 36 & 37

CITY OF THOUSAND OAKS DWG. NO. 92-58A

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3	10/14/96	BULLETIN No. 9							

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Project Number	787-1
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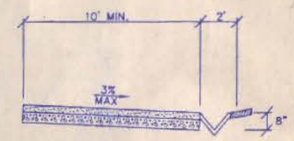

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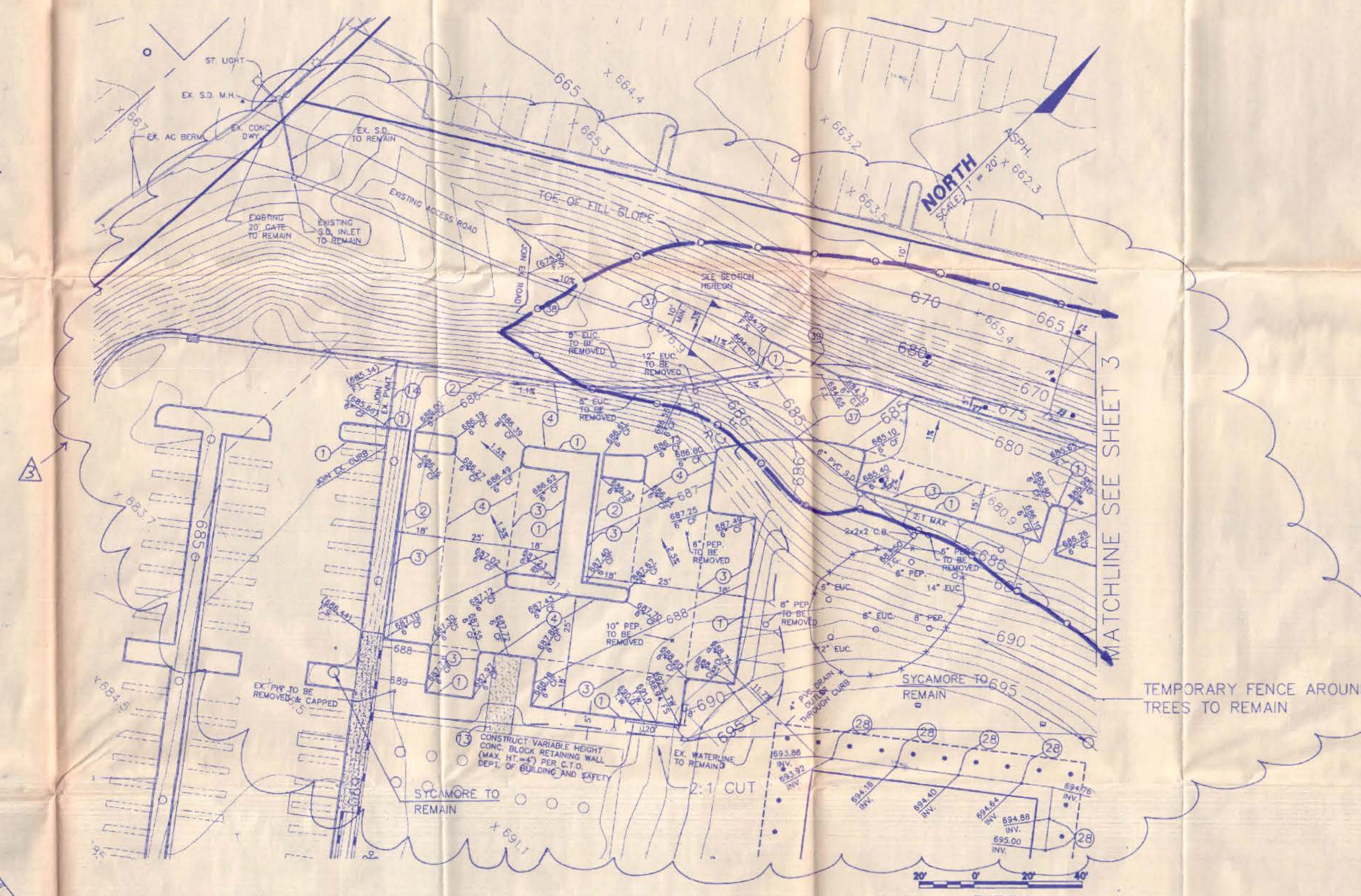

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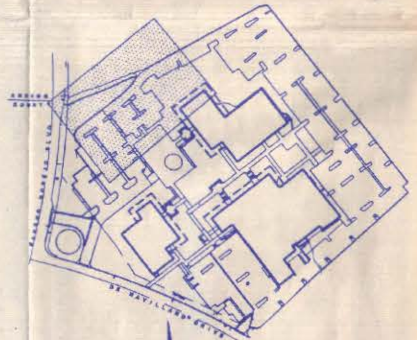

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PLANNING DEPT.	DATE

FINE GRADING, PAVING AND DRAINAGE PLAN

PROJECT NO. DP 92 (MINOR MOD. No. 2)
PARKING ADDITION: AMGEN BUILDINGS 36 & 37

CITY OF THOUSAND OAKS DWG. NO. 92-58A

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2	09/12/96	BULLETIN No. 5							
3	10/14/96	BULLETIN No. 9 △							

Project Name	AMGEN
	BUILDING NUMBERS 36 & 37
Project Number	787-1
Description	PARKING ADDITION: MINOR MOD. 2
	FINE PAVING AND DRAINAGE PLAN
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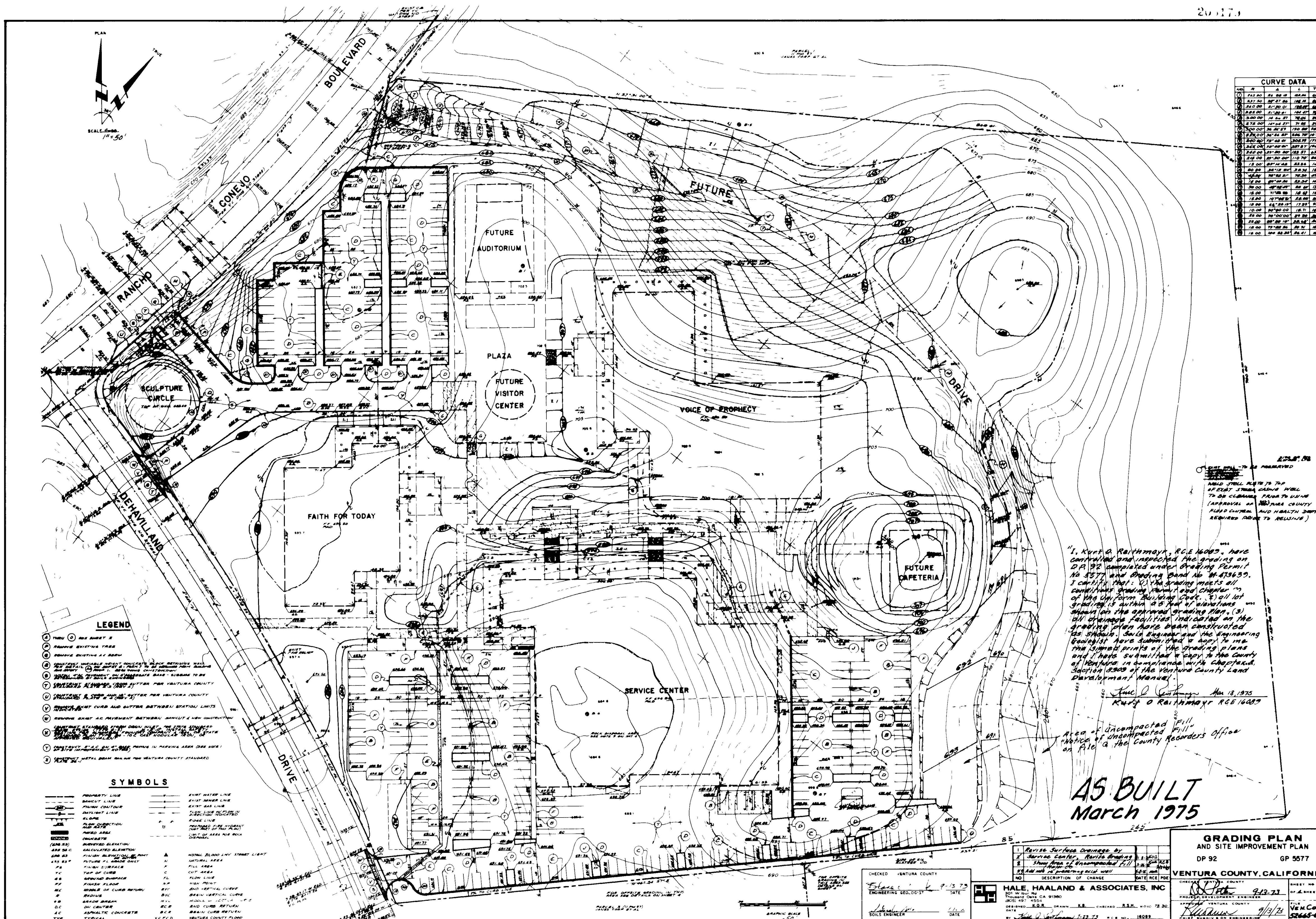

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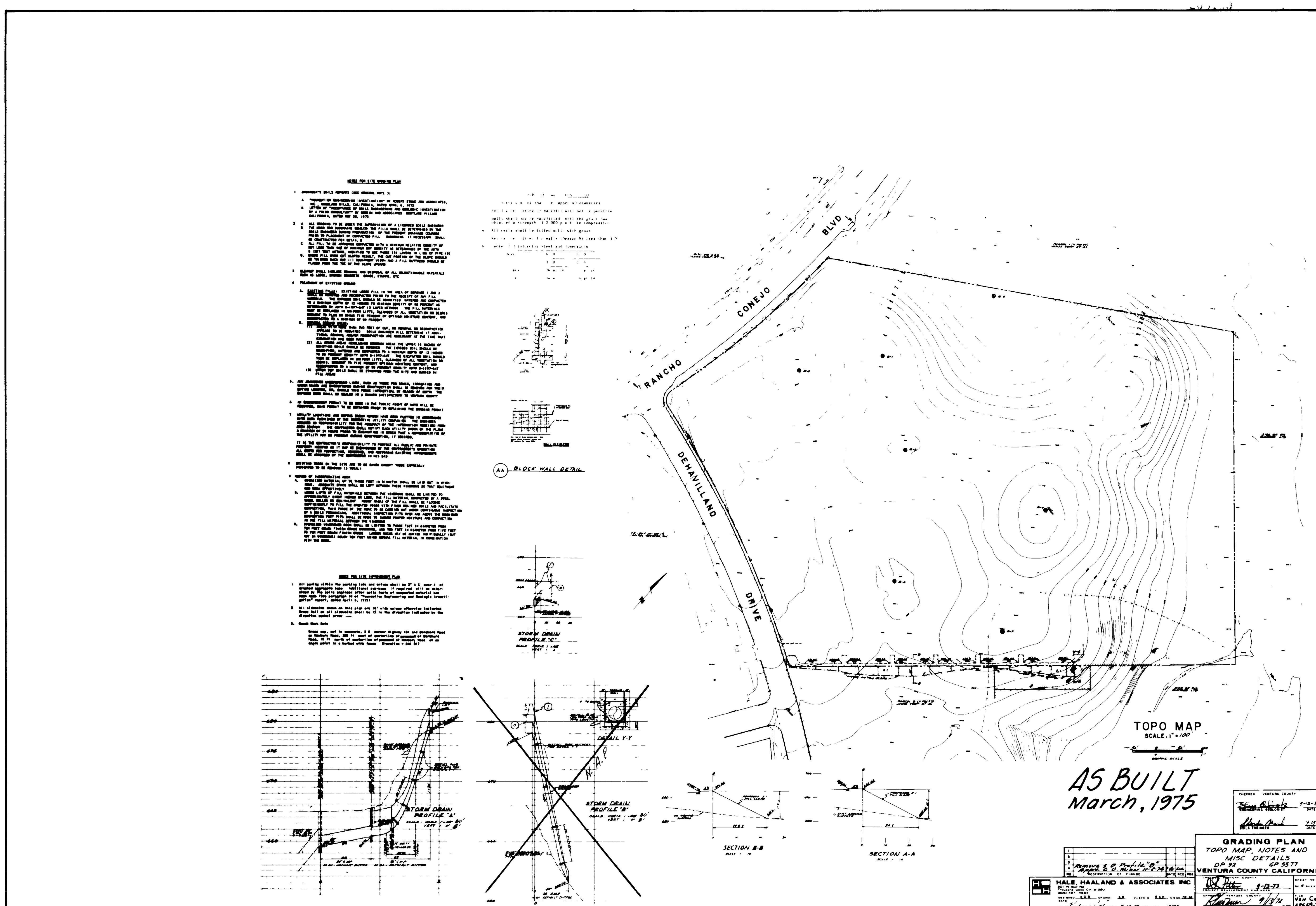
3 OF 4

251-1717/1722 G

92-58 A



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4 of 4

251-1717/1722 G

92-58A

GENERAL NOTES

1 Grading shall be in accordance with Ventura County Ordinance Code Division 3 which adopts by reference UBC Chapter 70, Excavation and Grading and the Ventura County Standard Land Development Specifications and the Land Development Manual

2 A preconstruction conference of all interested parties shall be held prior to any construction or grading

3 All recommendations made by the Soils Engineer (and Engineering Geologist, where employed) contained in the reports referenced hereon as approved or conditioned by the County shall be considered a part of this grading plan

4 All graded surfaces subject to erosion shall be protected according to the specifications for erosion control approved by the Building Official Protection shall be provided and fully functional by November 1 for such completed surfaces

5 All deleterious material, i e lumber, logs, brush or any other organic materials or rubbish shall be removed from all areas to receive compacted fill

6 Unsuitable material, such as top soil, weathered bedrock etc shall be removed as required by Soils Engineer (and Engineering Geologist where employed) from all areas to receive compacted fill or drainage structures

7 All areas to receive compacted fill shall be inspected and approved by the Soils Engineer (and Engineering Geologist, where employed) after removal of unsuitable material and excavation of keyways and benches and prior to placement of subsurface drainage systems or any fill

8 All soil or rock materials deemed unsuitable for placement in compacted fill shall be removed from the site Any material such as concrete or imported materials shall be approved by the Soils Engineer prior to use in compacted fill Where excavated material is blocky it will be broken into suitable particle sizes none larger than eight inches in largest dimension, before being used as fill in conformance with Sec 7402 of the Land Development Manual (LDM)

9 The Soils Engineer shall direct the removal or treatment of any existing underground structures such as septic tanks, irrigation lines etc

10 Any water well located within the site shall be reported to the Health Department of Ventura County prior to its modification or destruction (Ventura County Ordinance No 2372) Special procedures are required for abandonment

11 All excavated back slopes and keys for buttress fills must be examined by the Engineering Geologist and Soils Engineer to insure that all potential planes of failure have been exposed in the excavation and will be adequately supported by the proposed buttress Field certification to be submitted by the consultants

12 Storm damage prevention measures or preventive devices required by the Building Official shall be installed by November 1 or as grading progresses and maintained until April 15 of the succeeding year or unless early removal is agreed to by the Building Official

13 The Soils Engineer shall submit recommendations for corrective work to insure slope stability where unstable material is exposed at the tops of cuts

14 Benchmark *See sheet 4*

15 Finished slopes Cut *2 1* Fill *2 1* Daylight Line

16 Unless otherwise specified, corrugated steel and aluminum pipe shall be bituminous coated in accordance with Standard Land Developement Specifications (SLDS)

17 Terrace drains, interceptor drains and downdrains shall be constructed of 3" P C C (or gunite) reinforced with 6"x 6"x #10 x #10 W W M and shall be of either semi-circular or triangular cross section At their respective junctions, the invert of downdrains shall be one foot below the projection of the invert of the interceptor or terrace drains Junctions shall be warped and sufficient pavement shall be provided to prevent erosion by splashing

18 Materials for interceptor drains terrace drains and downdrains shall meet Standard Land Development Specifications, Subsection 201-1 and 400 except that the concrete lined swales, V-ditches paved terrace drains, downdrains, berms velocity reducers and other erosion protecting devices shall be of Class 470-C-2000 unless otherwise specified

19 Quantities - Cut *72,400* cu yds Fill *84,500* cu yds
Export ______ cu yds Import *12,100* cu yds

20 Grading Bond # *M 473639* Amount $ *30,000*
Encroachment Permit # *2614*
Flood Control Encroachment Permit # ______

21 Interim soils and geologic reports shall be submitted to the County as required by the Building Official

22 "As Built" soils engineering (and if applicable, engineering geology) reports, summarizing all work performed and concluding that fills have been placed according to the approved plans and stating that all geologic features are grossly stable as graded shall be submitted to the County prior to approval of the rough grading by the Building Official

"As Built" Certificate
I hereby certify that work shown on drawings 52663 through 52672 marked "As Built" has been constructed in conformance with lines and grades as shown on said plans, drawings and referred specifications

Kurt O Reithmayr RCE # 16089 — *March 18, 1975* Date

CHECKED VENTURA COUNTY
[signature] ENGINEERING GEOLOGIST — *1-15-73* DATE
[signature] SOILS ENGINEER — *7-13-73* DATE

ENGINEERED GRADING INSPECTION CERTIFICATE

Job Address or Tract No *NORTHEAST CORNER OF RANCHO CONEJO BLVD & DE HAVILLAND DR* Locality *NEWBURY PARK*
Owner *SEVENTH DAY ADVENTIST RADIO, TELEVISION & FILM CENTER* Permit No *5577*

ROUGH GRADING CERTIFICATION

(A) BY SOILS ENGINEER

I certify that the rough grading work incorporates all recommendations contained in the report or reports for which I am responsible and all recommendations that I have made based on field inspection of the work and testing during grading I further certify that where the reports of an Engineering Geologist relative to this site have recommended the installation of buttress fills or other similar stabilization measures such earth work construction has been completed in accordance with the approved design

LOT NOS *Entire Site*
See Reports dated *Nov 19, 1973* for test data recommended allowable soil bearing values and other special recommendations
Remarks ______

Soils Engineer *Gerald Gorian* (Signature) Reg No *14698* Date *Apr. 8 '75*

(B) BY ENGINEERING GEOLOGIST

I certify that the rough grading work incorporates all of the recommendations contained in the report or reports for which I am responsible and all recommendations that I have made based on field inspection of the work during grading

LOT NOS *This rough grading certification for S.D.A.*
Remarks *R, T & F.C. site applies only to gross stability of cut slopes in bedrock and is not an analysis of commentary on fill, drainage or other conditions (ie footing depths, slope swelling etc)*

Engineering Geologist *E.L. Morley, Jr.* (Signature) Cert No *20*
Date *3/27/75*

(C) BY CIVIL ENGINEER

I certify to the satisfactory completion of rough grading including grading to approximate final elevations, property lines located and staked, cut and fill slopes correctly graded and located in accordance with the approved design, swales and terraces graded ready for paving, berms installed, and required drainage slopes provided on the building pads I further certify that where report or reports of an engineering Geologist and/or Soils Engineer have been prepared relative to this site, the recommendations contained in such reports have been incorporated in the design

LOT NOS ______
Remarks ______

Civil Engineer *Kurt O Reithmayr* (Signature) Reg No *C16089* Date *3-20-75*

FINAL GRADING CERTIFICATION

BY CIVIL ENGINEER

I certify to the satisfactory completion of grading in accordance with the approved plans All drainage devices required by the Grading Permit grading plans and Grading Ordinance have been installed Erosion treatment of slopes and irrigation systems (where required) have been installed Adequate provisions have been made for drainage of surface waters from each building site except where building permits have been issued

LOT NOS ______
Remarks ______

Civil Engineer *Kurt O Reithmayr* (Signature) Reg No *C-16089* Date *3-20-75*

The Soils Engineer (and the Engineering Geologist, where employed) has submitted to me signed prints of the grading plans and I have submitted them to the County of Ventura in compliance with Section 8309 of the Land Development Manual

Civil Engineer *Kurt O Reithmayr* (Signature) Reg No *C-16089* Date *3-20-75*

GRADING CONTRACTOR CERTIFICATION

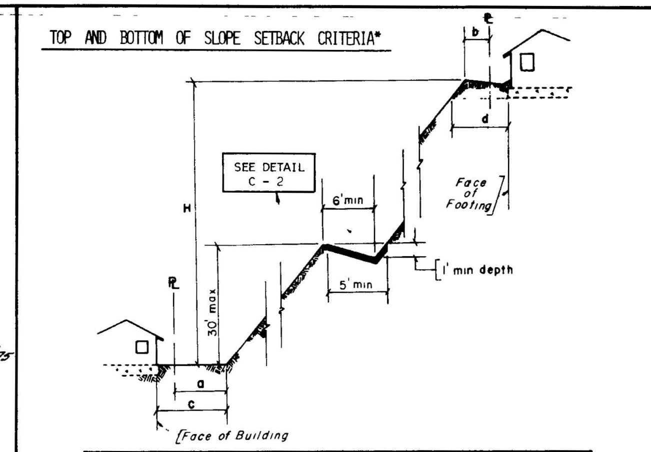
Job Address or Tract No ______ Locality ______
Owner ______ Permit No ______

I certify that the grading was done in accordance with the plans and specifications the grading ordinance and the recommendations of the Civil Engineer, Soils Engineer and Engineering Geologist It is understood that this certification includes only those aspects of the work that can be determined by me as a competent grading contractor, without special equipment or professional skills

Grading Contractor ______ (Signature) ______ License No ______

Instructions The owner may sign if the grading was not done by a licensed Grading Contractor

TOP AND BOTTOM OF SLOPE SETBACK CRITERIA*

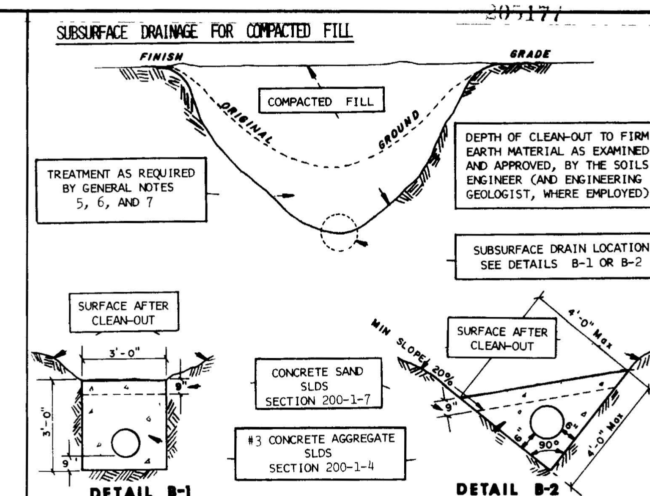


H/IN FEET	a	b	c	d
0 - 5	0	1'	3'	5'
5 - 10	(H/2)'	(H/5)'	3'	5'
11 - 30	(H/2)'	3'	(H/2)'	7'
31 & over	15'	3'	15'	10'

* FROM U B C SEC 7011 AND LAND DEVELOPMENT MANUAL SEC. 7404
℄ Site Boundary

DETAIL A

SUBSURFACE DRAINAGE FOR COMPACTED FILL



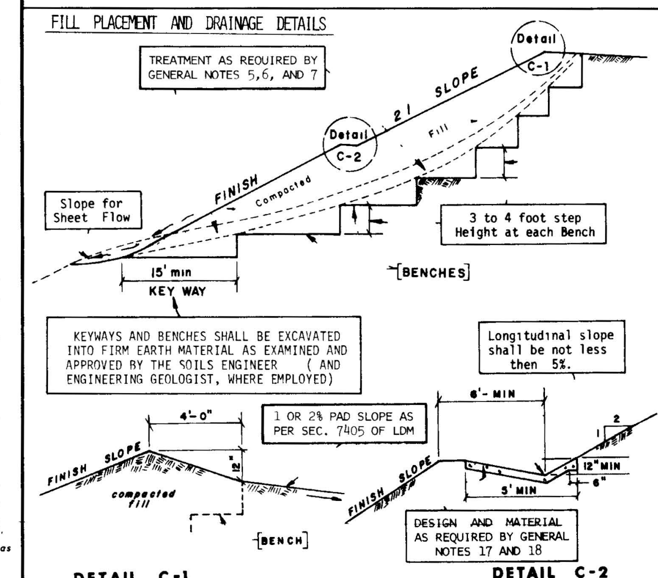
a. SUBDRAINS SHALL BE ASBESTOS CEMENT PERFORATED PIPE, CORRUGATED OR SPIRAL BITUMINOUS COATED STEEL OR ALUMINIUM PERFORATED PIPE, OR PLASTIC AS APPROVED

b SUBDRAINS SHALL BE 6" MIN INTERNAL DIAMETER WHERE LENGTH OF RUN IS 500 FEET OR LESS, AND 8" MIN. INTERNAL DIAMETER FOR LENGTH OF RUN OVER 500 FEET.

[PERFORATED SIDE OF PIPES SHALL BE PLACED DOWNWARD]

DETAIL B

FILL PLACEMENT AND DRAINAGE DETAILS

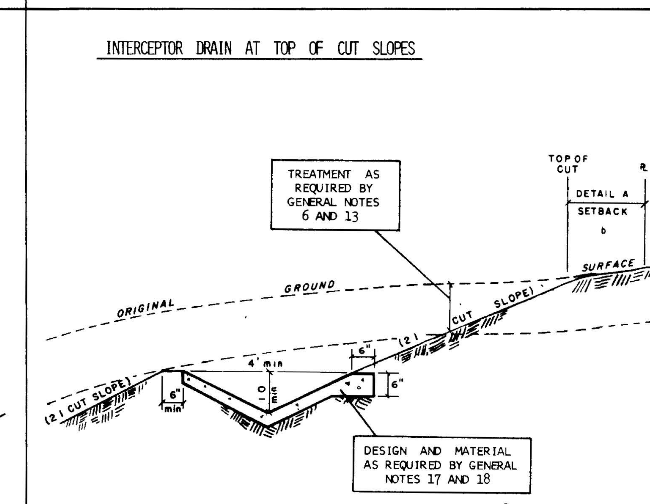


DETAIL C-1
TYPICAL BERM AT TOP OF ALL FILL SLOPES

DETAIL C-2
TYPICAL TERRACE DRAIN FOR CUT OR FILL SLOPES

DETAIL C

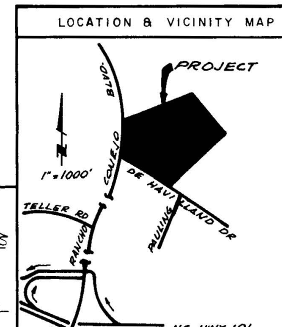
INTERCEPTOR DRAIN AT TOP OF CUT SLOPES



TOP OF CUT INTERCEPTOR DRAINS SHALL BE FOUNDED IN FIRM EARTH MATERIAL AS DETERMINED BY THE SOILS ENGINEER, TO RESIST EROSION, SLOUGHING OR CREEP WHICH COULD DAMAGE THE DRAIN.

AS BUILT DETAIL D *March, 1975*

LOCATION & VICINITY MAP



APPROVAL BY CONSULTANTS

THIS GRADING PLAN is acceptable in regard to soils (and geologic, - if applicable) conditions and conforms to the recommendations of the supportive reports dated

SOILS ENGINEERING reports *APRIL 6* 19*72* / *MAY 28 1973*
ENGINEERING GEOLOGY report *APRIL 6* 19*72* / *MAY 28 1973*

By *[signature]* Soils Engineer — *14698* R C.E
Company *GORIAN & ASSOCIATES* *July 24* 19*73*
By *[signature]* Engineering Geologist — *CEG 20* CERT NO
Company *GORIAN & ASSOCIATES* *7-24* 19*73*

	DESCRIPTION OF CHANGE	RCE	DATE	VEN CO SUB /ENGR	DATE
1					
2					
3					
4					
5					

PREPARED BY *HALE, HAALAND & ASSOC INC* W O NO *73-30* *THOUSAND OAKS, CA*
Kurt O Reithmayr *16089* RCE *7-23-73* DATE

CHECKED VENTURA COUNTY
D.A. Potter PROJECT DEVELOPMENT ENGINEER *9-13-73* DATE

APPROVED VENTURA COUNTY
[signature] CHIEF, SUBDIVISION ENGINEER *9/13/73* DATE

~~CAUTION PRELIMINARY GRADING PLAN~~

~~This plan is approved as a preliminary grading plan only This approval does not include approval for construction of any placement of base materials, or construction of curb and gutter or any other street improvements~~

~~Grades are subject to change before approval of the road improvement plans This note must be removed by change order at the time the road improvement plans are submitted for approval~~

VENTURA COUNTY, CALIFORNIA

GRADING PLAN

STANDARD DETAILS AND NOTES
DP 92
GP 5577

SEVENTH DAY ADVENTIST RADIO, TELEVISION AND FILM CENTER

92-58A

92-58A 1 OF 4

Sheet 1 OF 4 VENTURA COUNTY DRAWING NO *52663* F2/D-1