REPORT TO

MR. GEORGE LI
SAN BRUNO, CALIFORNIA

FOR

PROPOSED RESIDENCE

EL NIDO ROAD
PORTOLA VALLEY, CALIFORNIA

ENGINEERING GEOLOGIC RECONNAISSANCE AND GEOTECHNICAL INVESTIGATION

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PREPARED BY

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GEOTECHNICAL CONSULTANTS

File No. SV1784
September 12, 2018

Mr. George Li
146 Lassen Drive
San Bruno, CA 94066

Subject: Proposed Residence
El Nido Road, Lot 140
Los Trancos Woods / Portola Valley, California
ENGINEERING GEOLOGIC RECONNAISSANCE AND GEOTECHNICAL INVESTIGATION

Dear Mr. Li:

We are pleased to transmit herein the results of our engineering geologic reconnaissance and geotechnical investigation for the proposed residence. The subject site is located on El Nido Road, Lot 140 in Los Trancos Woods, unincorporated San Mateo County, California.

Our findings indicate that the site is suitable for the proposed development provided the recommendations contained in this report are carefully followed. Field reconnaissance, drilling, sampling, and laboratory testing of the surface and subsurface material evaluated the suitability of the site. The following report details our investigation, outlines our findings, and presents our conclusions based on those findings.

If you have any questions or require additional information, please feel free to contact our office at your convenience.

Very truly yours,

SILICON VALLEY SOIL ENGINEERING

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SV1784.EGR&GI/Copies: 1 to Mr. George Li

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INTRODUCTION

Per your authorization, Silicon Valley Soil Engineering (SVSE) conducted an engineering geologic reconnaissance and geotechnical investigation. The purpose of this investigation was to determine the nature of the surface and subsurface soil conditions at the project site through field investigations and laboratory testing. This report presents an explanation of our investigative procedures, results of the testing program, our conclusions, and our recommendations for earthwork and foundation design to adapt the proposed development to the existing soil conditions.

SITE LOCATION AND DESCRIPTION

The subject site is the proposed new residence located on El Nido Road, Lot 140 in the community of Los Trancos Woods, near Portola Valley, in an unincorporated area of San Mateo County, California (Location Map, Figure 1). Based on the preliminary information, the development will include the construction of a single-family residence with associated improvements on the relatively uniform sloping lot. The approximate recommended building envelope and our borings are shown on the Site Plan and Geologic Map, Figure 2A.

At the time of our investigation, the site was a rectangular-shaped parcel located within a moderately sloping portion of the Santa Cruz Mountain foothills. The parcel was approximately 62 feet wide parallel to El Nido Road and approximately 126 feet extending up slope on the south side and perpendicular to El Nido Road. The property totals approximately 0.19 acres.

There is currently no vehicular access onto the property. The ground surface is covered with vegetation consisting of grasses, shrubs, and various isolated trees. There are currently no structures present on the site. Residences on adjacent lots are located upslope to the south and laterally on the east with additional residences nearby to the west and the north.

Vertical elevations range from 1158 feet at the upslope property line to 1106 feet along the toe of the slope adjacent to El Nido Road. The site slopes down at an average gradient of 2.4 to 1 (horizontal to vertical), equivalent to 41 percent. This average gradient includes an approximately 4 to 5 foot high 1:1 to 1:1.5 foot cut immediately above the adjacent El Nido Road.

FIELD INVESTIGATION

Our current field investigation included a site reconnaissance by our soil engineer and engineering geologist to identify potential geologic hazards, and the drilling of two soil borings to evaluate the subsurface soil characteristics. The borings were drilled on June 19, 2018, each to a depth of 15.0 feet below the existing ground surface elevation. The borings were drilled with a tripod-mounted drill rig using 4-inch diameter solid stem augers. The approximate location of these borings is shown on Figure 2.

The soils encountered were logged continuously in the field during the drilling operation. Relatively undisturbed soil samples were obtained by hammering a 2.0-inch outside diameter (O.D.) split-tube sampler for a Standard Penetration Test (SPT), ASTM Standard D1586, into the ground at various depths. A 2.5-inch diameter split-tube sampler (Modified California) sampler was utilized to obtain soil sample for direct shear tests at the depths of 1.5 feet to 3 feet. A 140- pound hammer with a free fall of 30 inches was used to drive the sampler 18 inches into the ground. Blow counts were recorded on each 6-inch increment of the sampled interval. The blows required to advance the sampler the last 12 inches of the 18 inch sampled interval were recorded on the boring logs as penetration resistance. These values were also used to evaluate the liquefaction potential of the subsurface soils.

In addition, disturbed bulk samples of the near-surface soil were collected for laboratory analyses. The Exploratory Boring Logs contained in the Appendix are a graphic representation of the encountered soil profile, and also show the depths at which the relatively undisturbed soil samples were obtained.

LABORATORY INVESTIGATION

A laboratory-testing program was performed to determine the physical and engineering properties of the soils underlying the site. Moisture content and dry density tests were performed on the relatively undisturbed soil samples in order to determine soil consistency and the moisture variation throughout the explored soil profile (Table I). The strength parameters of the foundation soils were determined from direct shear tests that were performed on selected relatively undisturbed soil samples (Table I). Atterberg Limits tests were also performed on the near-surface soil to assist in the classification of these soils and to obtain an evaluation of their expansion and shrinkage potential (Figure 4). A laboratory compaction test was performed on the near-surface material per the ASTM D1557 test procedure (Figure 5). The results of the laboratory-testing program are presented in the Tables and Figures at the end of this report.

SOIL CONDITIONS

Similar soil profiles were encountered in each of the two borings to the depths explored. The borings initially encountered approximately 3 inches of organic material, underlain by 5 feet of colluvium consisting of dark brown, moist, stiff sandy clay. The surficial soil graded to brown, dry, hard, sandstone. The borings were each terminated at a depth of 15 feet. A graphic description of the explored soil profiles is presented in the Exploratory Boring Logs contained in the Appendix.

Groundwater was not encountered to the depths explored. It should be noted that the groundwater level will fluctuate as a result of seasonal changes and hydrogeological variations such as groundwater pumping and/or recharging.

GEOLOGY

Geologic Setting

The site is located within the central region of the Coast Ranges Geomorphic Province, which extends from the Oregon border south to the Transverse Ranges. The general topography is characterized by sub-parallel, northwest trending mountain ranges and intervening valleys. The region has undergone a complex geologic history of sedimentation, volcanic activity, folding, faulting, uplift and erosion. The site is located along the northeast margin of the Santa Cruz Mountains, with the alluviated San Francisco Bay Plain to the northeast and the elevated mountains to the southwest. Faulting in the San Francisco Bay Region is shown on Figure 3, Regional Fault Location Map.

The immediate site vicinity is generally underlain by deposits of the Upper Pliocene and Lower Pleistocene Santa Clara Formation, consisting of irregularly bedded mudstone, sandstone and conglomerate. In addition, various rock types of the Cretaceous Franciscan Assemblage occur, particularly northeast (downslope) of the site.

There are no nearby mapped bedding plane attitudes. One measurement to the west indicates northwest-southeast trending strata, inclined at 70 degrees to the northeast, and thus steeper than the overall slope. Our experience in the vicinity indicates similarly trending strata.

Regional landslide mapping by Brabb and Pampeyan (1972) and Leighton and Associates (1976) indicate that most of the Los Trancos Woods area is underlain by "probable" large deep-seated landslide deposits. The Geologic Map of the Town of Portola Valley also shows large landslides toeing-out downslope of the property to the north. The landslide inventory map incorporated into the CGS Seismic Hazards Zones Report for the Mindego Hill Quadrangle (2005) also places the site within a laterally extensive area of landsliding underlying essentially all of the Los Trancos community.

The State of California Seismic Hazards Zones map indicates that the site is within an area of potential Earthquake Induced Landslides (CGS, 2005) and the Earthquake Fault Zone map indicates that is within an Alquist-Priolo Earthquake Fault Zone (CDMG, 1974). The Seismic Hazards Zones map indicates that the site is not located within any identified zones of liquefaction hazard.

Fault Rupture Potential

The site and vicinity are underlain by a single bedrock unit, the Santa Clara Formation. There are no indications of faulting within or projecting towards the site. Various publications place the generally acknowledged active trace of the San Andreas Fault approximately 500 feet northeast of the site. These publications include Alquist-Priolo Earthquake Fault Zone map (CDMG, 1974); Brabb & Pampeyan (1972); Brabb & Olson (1986); and Brabb et al (2000).

Seismic Setting

The San Francisco Bay Area is located in an active seismic area. The faults most likely to produce large earthquakes locally include the Hayward, Calaveras San Andreas, and San Gregorio Faults. The San Andreas Fault is in the near site vicinity, approximately 0.1 miles to the northeast; the San Gregorio Fault is located approximately 10 miles to the west; the Hayward and Calaveras Faults area approximately 19 and 24 miles northeast of the site, respectively. The estimated maximum magnitude of earthquakes along these faults, and selected historical earthquakes with an estimated magnitude greater than 6.0, are presented in the following Table 1.

Table 1. Earthquake Magnitudes and Historical Earthquakes
New Residence
El Nido Road, Lot 140
Los Trancos Woods, California

Fault	Maximum Magnitude	Historical Earthquakes		Estimated Magnitude
San Andreas	8.3	1989	Loma Prieta	6.9
		1906	San Francisco	8.3
		1865	N. of 1989 Loma Prieta EQ	6.5
		1838	San Francisco-Peninsula Seg.	6.8
		1836	East of Monterey	6.5
Hayward	7.3	1868	Hayward	6.8
		1858	Hayward	6.8
Calaveras	7.3	1984	Morgan Hill	6.2
		1911	Morgan Hill	6.2
		1897	Gilroy	6.3
San Gregorio	7.3	1926	Monterey Bay	6.1

The property will experience high intensity ground shaking in the future during moderate and large magnitude earthquakes on the San Andreas or other active Bay Area fault zones. A study by the Working Group on California Earthquake Probabilities, which is associated with the U.S. Geological Survey and other agencies, suggests there is a 72% chance of one or more large magnitude (6.7 or greater) earthquakes in the San Francisco Bay region within the next 30 years (Working Group, 2015). The Hayward Fault has the highest likelihood of a large earthquake, estimated at 27 percent; the San Andreas and Calaveras faults likelihood of similar events are 6 and 7 percent, respectively. A large magnitude earthquake along any of the active or potentially active fault zones in the San Francisco Bay Area could result in surface rupture along the fault and/or secondary ground failure from strong seismic shaking.

SITE GEOLOGY AND RECONNAISSANCE OBSERVATIONS

Our engineering geologic reconnaissance was conducted August 23, 2018, and included walking within and adjacent to the site and a driving reconnaissance of the accessible surrounding area.

Observations

Our observations are shown on Figure 2A. The ground surface slopes relatively uniformly down to El Nido Road. There are no areas of artificial fill and no excavations excepting the low cut directly above El Nido Road. There are minor indications of surficial soil slumping along the road cut, but no indications of larger-scale slope failures. The ground surface, as indicated by our soil borings, appears to be underlain by a relatively uniform thickness of colluvium. There are no bedrock outcrops.

There are no indications of wet areas or springs. There are no geomorphic indications of faults. There are no geomorphic indications of landsliding, soil slumps, debris flows, extensive creep or other soil failures.

Air Photo and LIDAR Interpretation

Our study included the interpretation of seven stereoscopic sets of black and white and color vertical aerial photographs, flown from 1955 through 2005. The photographs ranged in scale from 1:7,200 to 1:31,500, and thus provided varying perspectives of the site and vicinity, from detail to a larger view.

El Nido Road and most of the Los Trancos Woods road network are present by 1955, and many of the existing residences have been constructed. The site is located below the crest of a linear ridge, and from the earliest images, is covered with a dense tree canopy. There are no indications of faulting or slope instability at the site in any of the photographs. The LIDAR imagery is uniform and there are no indications of faulting or slope instability.

SLOPE STABILITY

The area of Los Trancos Woods which surrounds the site is mapped within old slides as shown on Brabb & Pampeyan (1972b) and Leighton Associates (1976). Based on our detailed site mapping and air photo interpretation, the site is located at the margin of older questionable dormant slides. There are no indications that these mapped landslides are capable of further movement under static conditions, although intense seismic shaking may result in some movement. The owner should understand that there is some unknown level of risk, shared with all of the other residences in the vicinity of Los Trancos Woods, of future movement on these landslides, primarily from a major earthquake.

LIQUEFACTION

Liquefaction is the transformation of loose saturated silts and sands with less than 15% clay-sized particles from a solid state to semi-liquid state. This occurs under vibratory conditions such as those induced by a seismic event. To help evaluate liquefaction potential, samples of potentially liquefiable soil were obtained by hammering the split tube sampler into the ground. The number of blows required for driving the sampler the last 12 inches of the 18 inch sampled interval were recorded on the log of test boring.

The results from our exploratory borings show that stiff sandy clay overlying hard sandstone. Due to drilling refusal, we were unable to penetrate to greater depth, but based on the elevated blow counts and presence of hard sandstone at depth in each of the borings, it is unlikely that relatively loose sediments which would be susceptible to liquefaction are present at greater depth. Therefore, in our opinion there is a low potential for liquefaction to occur at the site.

INUNDATION POTENTIAL BY FLOODING, TSUNAMI, SEICHE

The subject site is located on El Nido Road, Lot 140 in Los Trancos Woods, San Mateo County, California. The site is located approximately 350 feet above the nearest stream capable of flooding. According to the Limerinos and others, 1973 report, the site is not located in an area that has potential for inundation as the result of a 100-year flood (Limerinos; 1973). The site is located inland from low-lying areas subject to inundation by tsunami. There are no upstream dams, reservoirs or lakes with the potential for catastrophic failure due to seismic shaking.

CONCLUSIONS

1. The site covered by this investigation is suitable for the proposed residence provided the recommendations set forth in this report are carefully followed.

2. Based on the laboratory testing results of the near-surface soil, the native surface soil at the project site has been found to have a low expansion potential when subjected to fluctuations in moisture.

3. We recommend skin friction drilled concrete pier and grade beam type of foundations support the proposed structures.

4. We recommend a reference to our report should be stated in the grading and foundation plans that includes the report file number and date.

5. On the basis of the engineering reconnaissance and exploratory borings, it is our opinion that trenches to excavate to depths less than 5 feet below the existing ground surface will not need shoring. However, for trenches greater than 5 feet in depth, shoring will be required.

6. All earthwork including grading, backfilling and foundation drilling and excavation shall be observed and inspected by a representative from Silicon Valley Soil Engineering (SVSE). Contact our office 48 hours prior to commencement of any earthwork for inspection.

7. We did not conduct detailed analyses of slope stability. However, there are no indications from our air photo interpretation of previous slope stability hazards, and much of the slope is underlain by bedrock at shallow depth. Therefore, in our opinion, there is minimal risk of slope failure impacting the proposed development.

8. Specific recommendations are presented in the remainder of this report.

RECOMMENDATIONS:

GRADING

1. The placement of fill and control of any grading operations at the site should be performed in accordance with the recommendations of this report. These recommendations set forth the minimum standards to satisfy other requirements of this report.

2. All existing surface and subsurface structures, if any, which will not be incorporated in the final development, shall be removed from the project site prior to any grading operations. These objects should be accurately located on the grading plans to assist the field engineer in establishing proper control over their removal. All utility lines, if any, must be removed prior to any grading at the site.

3. The depressions left by the removal of subsurface structures should be cleaned of all debris, backfilled and compacted with clean, native soil. This backfill must be engineered fill and should be conducted under the supervision of a SVSE representative.

4. All organic surface material and debris including grass and weeds shall be stripped prior to any other grading operations, and transported away from all areas that are to receive structures or structural fills. Soil containing organic material may be stockpiled for later use in landscaping areas only.

5. After removing all the subsurface structures, if any, and after stripping the organic material from the soil, the building pad area should be scarified by machine to a depth of 12 inches and thoroughly cleaned of vegetation and other deleterious matter.

6. After stripping, scarifying and cleaning operations, native soil should be compacted to not less than 90% relative maximum density using ASTM

D1557 procedure over the entire building pad, 5 feet beyond the perimeter of the pad, and 3 feet beyond the edge of driveway area.

7. All engineered fill or imported soil should be placed in uniform horizontal lifts of not more than 8 inches in un-compacted thickness and compacted to not less than 90% relative maximum density. The baserock, however, should be compacted to not less than 95% relative maximum density. Before compaction begins, the fill shall be brought to a water content that will permit proper compaction by either; 1) aerating the material if it is too wet, or 2) spraying the material with water if it is too dry. Each lift shall be thoroughly mixed before compaction to assure a uniform distribution of water content.

8. When fill material includes rocks, nesting of rocks will not be allowed and all voids must be carefully filled by proper compaction. Rocks larger than 4 inches in diameter should not be used for the final 2 feet of building pad.

9. SVSE should be notified at least two days prior to commencement of any grading operations so that our office may coordinate the work in the field with the contractor. All imported borrow must be approved by SVSE before being brought to the site. Import soil must have a plasticity index no greater than 15, an R-Value greater than 25, and environmentally clean (non-hazardous).

10. We recommend that the final grading plan should be reviewed by our office prior to submitting to the appropriate local agency and/or to construction.

11. All grading work shall be observed and approved by a representative from SVSE. The geotechnical engineer shall prepare a final report upon completion of the grading operations.

WATER WELLS

12. Any water wells and/or monitoring wells on the site, which are to be abandoned, shall be capped according to the requirements of the San Mateo County Environmental Heath Services Division. The final elevation of the top of the well casing must be a minimum of 3 feet below the adjacent grade prior to any grading operation.

CUT AND FILL SLOPES

13. The amount of cut and/or fill that can be safely done on this project depends on the steepness of the slopes, stability of the subsurface material on the slopes and the control of the drainage at the top of the slope. Cut slopes shall not exceed 2 (horizontal) to 1 (vertical), with an 8 feet wide bench for each 15 feet of vertical section.

14. Fill Slopes shall not exceed 2 (horizontal) to 1 (vertical), with an 8 feet wide bench for each 15 feet of vertical height. Fill slopes shall not exceed 20 feet in vertical height and shall be properly and consecutively keyed into natural slopes steeper than 6:1 with a 10 feet wide base key that has 2% downward gradient into the slope. The details of fill slope is shown in Figure 6. A subdrain system shall be installed at the base key and properly discharge to the nearest catch basin and/or drain inlet. The base key shall be backfilled with native soil and compacted to no less than 90% relative maximum density. The detail of the subdrain cross section is shown in Figure 7. Rounding of the upper few feet of all slopes is recommended to reduce sloughing. The cut and fill slopes shall be inspected by a representative of our firm. Additional recommendations may be required at the time of construction.

15. It is recommended that overflow of water on the surface of the slopes be prevented. Berms shall be constructed on the crests of all new earth

slopes in a manner to divert the water away from the edge of the slope. Concrete lined drainage ditches shall be constructed on the inside edges of the benches to collect and discharge the run off water to proper vertical drainage channels and/or drainage pipes.

16. The surface of the slopes shall be compacted to provide a surface free of loose material. It is suggested that vegetation be planted on the surface of the slope after the completion of the grading operation as soon as possible. Minor sloughing of slopes should be anticipated. Proper maintenance on these slopes will be required at all times.

17. We recommend that the grading plans be reviewed by our office prior to submitting to the appropriate local agency and/or to construction.

FOUNDATION DESIGN CRITERIA

18. We recommend skin friction drilled concrete pier and grade beam type of foundations support for the proposed structures.

19. Skin friction piers shall have a minimum diameter of 18 inches and penetrate a minimum of 15 feet below adjacent grade and a minimum of 3 feet into bedrock. These piers can be designed with an allowable skin friction value of 600 psf. This value is for dead plus live loads and may be increased by 1/3 for short term seismic and wind loads.

20. All piers should be reinforced with at least four No. 5 bars, which shall run the entire length of the piers, with the piers tied at least 12 inches into the grade beam's upper section.

21. The grade beams should have a minimum width of 12 inches and be founded a minimum depth of 6 inches below adjacent pad grades and should be reinforced with a minimum of two No. 4 bars, one near the top

and one near the bottom. Grade beams should be kept to a minimum width of 12 inches in order to minimize any effect of uplift pressures.

22. The final design of the foundations and reinforcing required shall be determined by the project structural engineer responsible for the foundation design. We recommend that the foundation plans be reviewed by our office prior to submitting to the appropriate local agency and/or to construction.

2016 CBC SEISMIC VALUES

23. Chapter 16 of the 2016 California Building Code (CBC) outlines the procedure for seismic design. The site categorization and site coefficients are shown in the following table.

Classification/Coefficient	Design Value
Site Class (ASCE 7-10, Table 20.3-1; 2016 CBC, Section 1613A.3.2)	D
Risk Category	I,II,III
Site Latitude	37.347742° N.
Site Longitude	122.200453° W.
0.2-second Mapped Spectra Acceleration[1], S_S (Section 1613A.3.1)*	2.747g
1-second Mapped Spectra Acceleration[1], S_1 (Section 1613A.3.1)*	1.233g
Short-Period Site Coefficient, F_a Table 1613A.3.3(1)*	1.0
Long-Period Site Coefficient, F_V Table 1613A.3.3(2)*	1.5
0.2-second Period, Maximum considered Earthquake Spectral Response Acceleration, S_{MS} ($S_{MS} = F_aS_S$: Section 1613A.3.3)*	2.747g
1-second Period, Maximum Considered Earthquake Spectral Response Acceleration, S_{M1} ($S_{M1} = F_VS_1$: Section 1613A.3.3)*	1.849g
0.2-second Period, Designed Spectra Acceleration, S_{DS} ($S_{DS} = 2/3S_{MS}$: Section 1613A.3.4)*	1.831g
1-second Period, Designed Spectra Acceleration, S_{D1} ($S_{D1} = 2/3S_{M1}$: Section 1613A.3.4)*	1.233g

[1] For Site Class B, 5 percent damped.
*2016 CBC

RETAINING WALLS

24. Any facilities that will retain a soil mass, such as retaining walls, shall be designed for a lateral earth pressure (active) equivalent to 50 pounds equivalent fluid pressure for horizontal backfill, 55 pounds equivalent fluid pressure for 3:1 sloped backfill, and 65 pounds for 2:1 sloped backfill. If the retaining walls are restrained from free movement at both ends, the walls shall be designed for the earth pressure resulting from 60 pounds equivalent fluid pressure, to which shall be added surcharge loads. The structural engineer shall discuss the surcharge loads with the geotechnical engineer prior to designing the retaining walls.

25. In designing for allowable resistive lateral earth pressure (passive), a value of 250 pounds equivalent fluid pressure may be used with the resultant acting at the third point. The top foot of native soil shall be neglected for computation of passive resistance.

26. A friction coefficient of 0.3 shall be used for retaining wall design. This value may be increased by 1/3 for short-term seismic loads.

27. The above values assume a drained condition and a moisture content compatible with those encountered during our investigation.

28. To provide lateral support for the retaining wall, the piers should have a minimum of 8 feet embedment depth with diameter of 12 inch minimum.

29. Drainage should be provided behind the retaining wall. The drainage system should consist of perforated pipe placed at the base of the retaining wall and surrounded by ¾ inch drain rock wrapped in a filter fabric. The drain rock wrapped in fabric should be at least 12 inches wide and extend from the base of the wall to within 1.5 feet of the ground surface. The upper 1.5 feet of backfill should consist of compacted native

soil. The retaining wall drainage system should drain to an appropriate discharge facility.

30. As an alternative to the drain rock and fabric. Miradrain 2000 or approved equivalent may be used behind the retaining wall. The drain mat should extend from the base of the wall to within two feet of the ground surface. A perforated pipe should be placed at the base of the wall in direct contact with the drain mat. The pipe should drain to an appropriate discharge facility.

31. We recommend a thorough review by our office of all designs pertaining to facilities retaining a soil mass.

CONCRETE SLAB-ON-GRADE CONSTRUCTION (GARAGE)

32. Based on the laboratory testing results of the near-surface soil, the native surface soil at the project site has been found to have a low expansion potential when subjected to fluctuations in moisture.

33. Concrete floor slabs-on-grade shall be underlain by a minimum of 5 inches of 3/4 inch clean washed crushed rock (recycled crushed asphalt concrete is not acceptable) and shall be poured structurally independent of the foundations or any fixed members when possible. The subgrade should be compacted to not less than 90% relative maximum density.

34. Vapor barrier membrane (Stego 15 mil) should be placed between the finished grade and the concrete slab if a floor covering including sealant would be applied to the concrete slab. The vapor barrier should be taped at the seams and/or mastic sealed at the protrusions.

35. Prior to placing the vapor membrane and/or pouring concrete, the slab grade shall be moistened with water to reduce the swell potential, if deemed necessary, by the field engineer at the time of construction.

EXCAVATION

36. No difficulties due to soil conditions are anticipated in excavating the on-site material. Conventional earth moving equipment will be adequate for this project.

37. Any vertical cuts deeper than 5 feet must be properly shored. The minimum cut slope for excavation to the desired elevation is one horizontal to one vertical. The cut slope should be increased to 2:1 if the excavation is conducted during the rainy season or when the soil is highly saturated with water.

DRAINAGE

38. It is considered essential that positive drainage be provided during construction and be maintained throughout the life of the proposed structures.

39. The final exterior grade adjacent to the proposed building should be such that the surface drainage will flow away from the structures. Rainwater discharge at downspouts should be directed onto pavement sections, splash blocks, or other acceptable facilities, which will prevent water from collecting in the soil adjacent to the foundations.

40. Utility lines that cross under or through perimeter footings should be completely sealed to prevent moisture intrusion into the areas under the slab and/or footings. The utility trench backfill should be of impervious material and this material should be placed at least 4 feet on either side of the exterior footings.

41. Consideration should be given to collection and diversion of roof runoff and the elimination of planted areas or other surfaces, which could retain water in areas adjoining the building. In unpaved areas, it is recommended

that protective slopes be stabilized adjoining perimeter building walls. These slopes should be extended to a minimum of 5 feet horizontally from building walls with a minimum outfall of 5 percent.

ON-SITE UTILITY TRENCHING

42. All on-site utility trenches must be backfilled with native on-site material or imported fill and compacted to at least 90% relative maximum density in accordance with ASTM D1557. Backfill should be placed in 8 inch lifts and compacted. Jetting of trench backfill is not recommended. An engineer from our firm should be notified at least 48 hours before the start of any utility trench backfilling operations.

43. If utility trench excavation is to encounter groundwater, our office should be notified for dewatering recommendations.

SUBDRAIN

44. If there is seepage water present in any other cut slopes, a subdrain system should also be constructed in the seepage area. The subdrain system should prevent water intrusion into the foundations of the proposed structures. Details of the subdrain system construction are shown in Figure 7. The subdrain system should conduct seepage water to the nearest catch basin or drainage facility.

LIMITATIONS AND UNIFORMITY OF CONDITIONS

1. The recommendations presented herein are based on the soil conditions revealed by our test borings and evaluated for the proposed construction planned at the present time. If any unusual soil conditions are encountered during the construction, or if the proposed construction will differ from that planned at the present time, Silicon Valley Soil Engineering (SVSE) should be notified for supplemental recommendations.

2. This report is issued with the understanding that it is the responsibility of the owner, or his representative, to ensure that the necessary steps are taken to see that the contractor carries out the recommendations of this report in the field.

3. The findings of this report are valid, as of the present time. However, the passing of time will change the conditions of the existing property due to natural processes, works of man, from legislation or the broadening of knowledge. Therefore, this report is subjected to review and should not be relied upon after a period of three years.

4. The conclusions and recommendations presented in this report are professional opinions derived from current standards of geotechnical practice and no warranty is intended, expressed, or implied, is made or should be inferred.

5. The area of the borings is very small compared to the site area. As a result, buried structures such as septic tanks, storage tanks, abandoned utilities, or etc. may not be revealed in the borings during our field investigation. Therefore, if buried structures are encountered during grading or construction, our office should be notified immediately for proper disposal recommendations.

6. Standard maintenance should be expected after the initial construction has been completed. Should ownership of this property change hands, the prospective owner should be informed of this report and recommendations so as not to change the grading or block drainage facilities of this subject site.

7. This report has been prepared solely for the purpose of geotechnical investigation and does not include investigations for toxic contamination studies of soil or groundwater of any type. If there are any environmental concerns, our firm can provide additional studies.

8. Any work related to grading and/or foundation operations during construction performed without direct observation from SVSE personnel will invalidate the recommendations of this report and, furthermore, if we are not retained for observation services during construction, SVSE will cease to be the Geotechnical Engineer of Record for this subject site.

REFERENCES

Aerial Photographs

Black and white vertical stereo pairs.

Source	Images	Date	Scale
PAS	AV-170-18-23/24	6/3/55	1:10,000
PAS	AV-432-16-21/22	5/8/61	1:12,000
PAS	AV-1045-17-23/24	5/2/72	1:12,000
WAC	88CA-29-92/93	9/12/88	1:31,500
PAS	SMT-AV-6600-15-20/21	6/26/00	1:12,000
PAS	KAV-9010-105-1/2	3/16/05	1:10,000
PAS	KAV-9200-63-2/3	10/21/05	1:7,200

PAS - Pacific Aerial Surveys, Oakland, California
USGS - United States Geological Survey Library, Menlo Park, California
WAC - WAC Corporation, Eugene, Oregon.

Reports and Publications

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Brabb, E.E, Graymer, R.W, and Jones, D.L, 2000, Geologic Map and Database of the Palo Alto 30 X 60 Minute Quadrangle, California: U.S. Geological Survey Miscellaneous Field Studies Map 2332, Version 1, Map Scale 1: 100,000.

Brabb, E.E, and Olson, Jean A, 1986, "Map Showing Faults and Earthquake Epicenters in San Mateo County, California", USGS Miscellaneous Investigations Series Map I-1257F, scale 1:62,500.

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Hays, W.W., 1980 - Procedures for Estimating Earthquake Ground Motions, Geological Survey Professional Paper 1114.

Leighton Associates, 1976, "Geotechnical Hazard Synthesis Map, San Mateo County, California, Planning Department, San Mateo County, California", Scale 1:24,000.

Limerinos J.T., Lee K.W., Lugo P.E., 1973 - Flood Prone Areas in the San Francisco Bay Region, California U.S.G.S. Open file report.

Rogers T.H., and Williams J.W., 1974 - Potential seismic hazards in Santa Clara County, California Special Report, No. 107, California Division of Mines and Geology.

USGS (March 19, 2018), U.S. Seismic Design Maps http://earthquake.usgs.gov/designmaps/us/application.php.

Working Group on California Earthquake Probabilities (WGCEP), 2015, Long-Term Time-Dependent Probabilities for the Third Uniform California Earthquake Rupture Forecast, Version 3 (UCERF 3), U.S. Geological Survey Open File Report 2013.

2016 (CBC) California Building Code, Title 24, Part 2.

TABLES

TABLE I

SUMMARY OF LABORATORY TESTS

Sample No.	Depth (Feet)	In-Place Conditions		Unconfined Compressive Strength (k.s.f.)	Direct Shear Testing	
		Moisture Content (% Dry Wt.)	Dry Density (p.c.f.)		Unit Cohesion (k.s.f.)	Angle of Internal Friction (degrees)
1-1	3.0	12.4	90.3		0.8	22
1-2	5.0	11.0	114.5			
1-3	10.0	6.1	120.7			
1-4	15.0	5.4	123.8			
2-1	3.0	10.3	91.4			
2-2	5.0	10.6	94.9			
2-3	10.0	6.5	121.5			
2-4	15.0	5.1	124.6			

TABLE II

PROPOSED ASPHALT PAVEMENT SECTIONS

Location: Proposed Residence
El Nido Road, Lot 140
Portola Valley, California

	DRIVEWAY		
Design R-Value	10.0		
Traffic Index	4.5		
Gravel Equivalent	18.0		
Recommended Alternate Pavement Sections:	1A	1B	1C
Asphalt Concrete	3.0"	3.5"	4.0"
Class II Baserock (R=78 min.) compacted to at least 95% relative maximum density	8.0"	7.0"	6.0"
Subgrade soil scarified and compacted to at least 95% relative maximum density	12.0"	12.0"	12.0"

TABLE III

PROPOSED CONCRETE PAVEMENT SECTIONS

Location: Proposed Residence
El Nido Road, Lot 140
Portola Valley, California

	DRIVEWAY*	PEDESTRIAN** WALK/PATIO
Recommended Concrete Pavement Sections:		
P.C. Concrete*	6.0"	4.0"
Class II Baserock (R=78 min.) compacted to at least 95% relative maximum density	6.0"	4.0"
Subgrade soil scarified and compacted to at least 95% relative maximum density	12.0"	12.0"

* Reinforcement: Rebar No. 4 at 18" on-center, maximum spacing both ways. Control joints maximum spacing at 10' by 10'.

** Reinforcement: Rebar No. 3 at 18" on-center, maximum spacing both ways.

TABLE IV

PROPOSED PAVER PAVEMENT SECTIONS

Location: Proposed Residence
El Nido Road, Lot 140
Portola Valley, California

	DRIVEWAY AREA**		
Recommended Paver Pavement Sections:	1A*	1B	1C
Vehicular Rated Pavers	Min. 3.25" ± Permeable Paver with Subdrain	Min. 3.25" ± Permeable Paver without Subdrain	Min. 3.25" ± Non-Permeable Paver without Subdrain
ASTM No. 8 Bedding Course & Paver Filler	2.0"	2.0"	2.0"
3/4" Clean Crushed Rock (ASTM No. 57 Stone)	10.0" +	4.0"	---
ASTM No. 2 Stone	---	12.0"	---
Class II Baserock (R=78 min.) compacted to at least 95% relative maximum density	---	---	8.0"
Subgrade soil scarified and compacted to at least 90% relative maximum density	12.0"	12.0"	12.0"

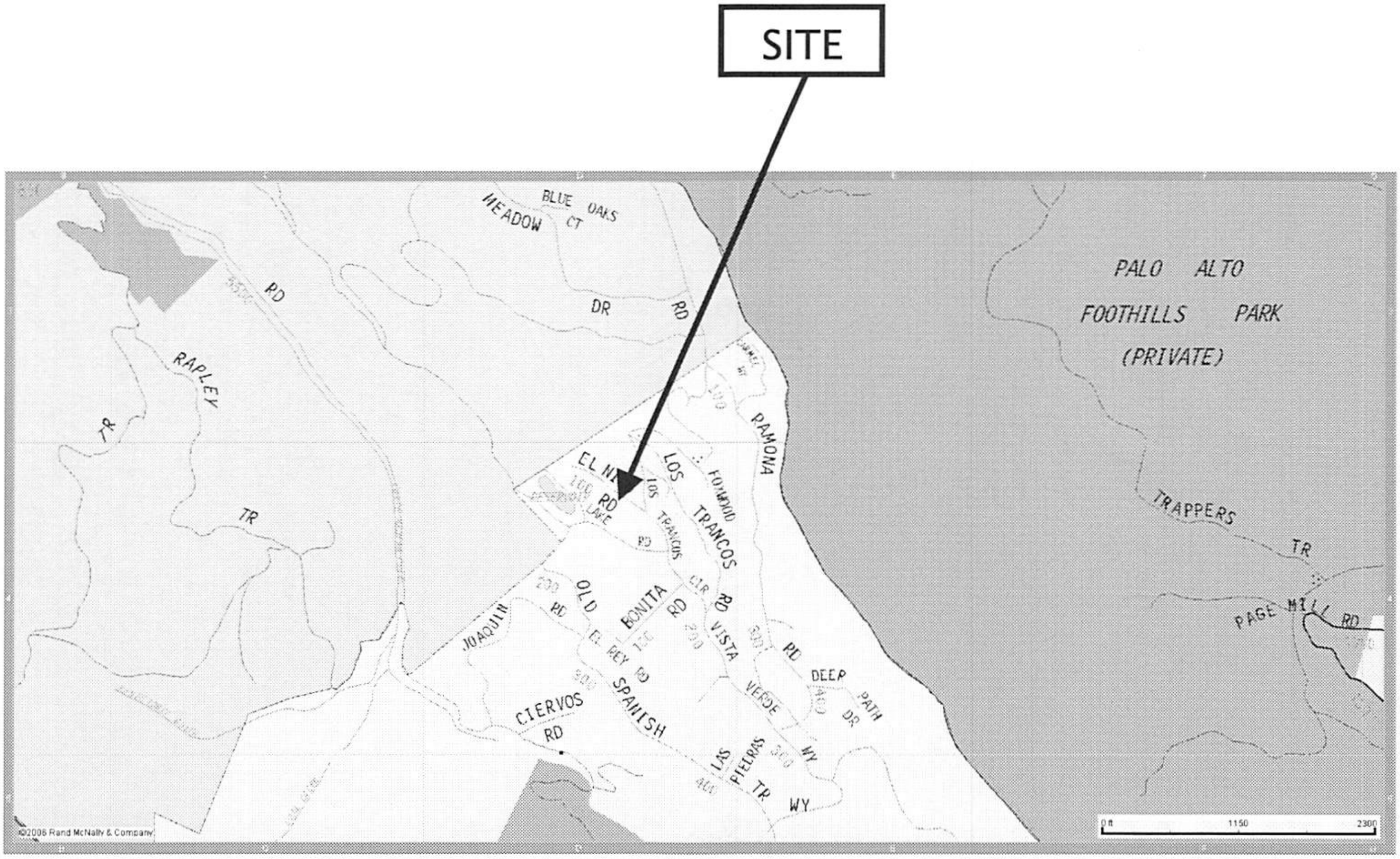
* The subgrade should be lined with a geotextile membrane Mirafi 500X, Geogrid, or equivalent. The membrane should be place and overlapped properly for drainage. The subgrade should be sloped at a minimum of 2% towards the subdrain system away from the building foundation. The Mirafi 500X should not cover the subdrain system.

The subdrain system should consist of a 4-inch diameter perforated pipe surrounded by ¾ inch drain rock wrapped in a filter fabric. The drain rock wrapped in fabric should be at least 12 inches wide and 12 inches below the finished subgrade elevation. The drainage system should be sloped to a discharge facility.

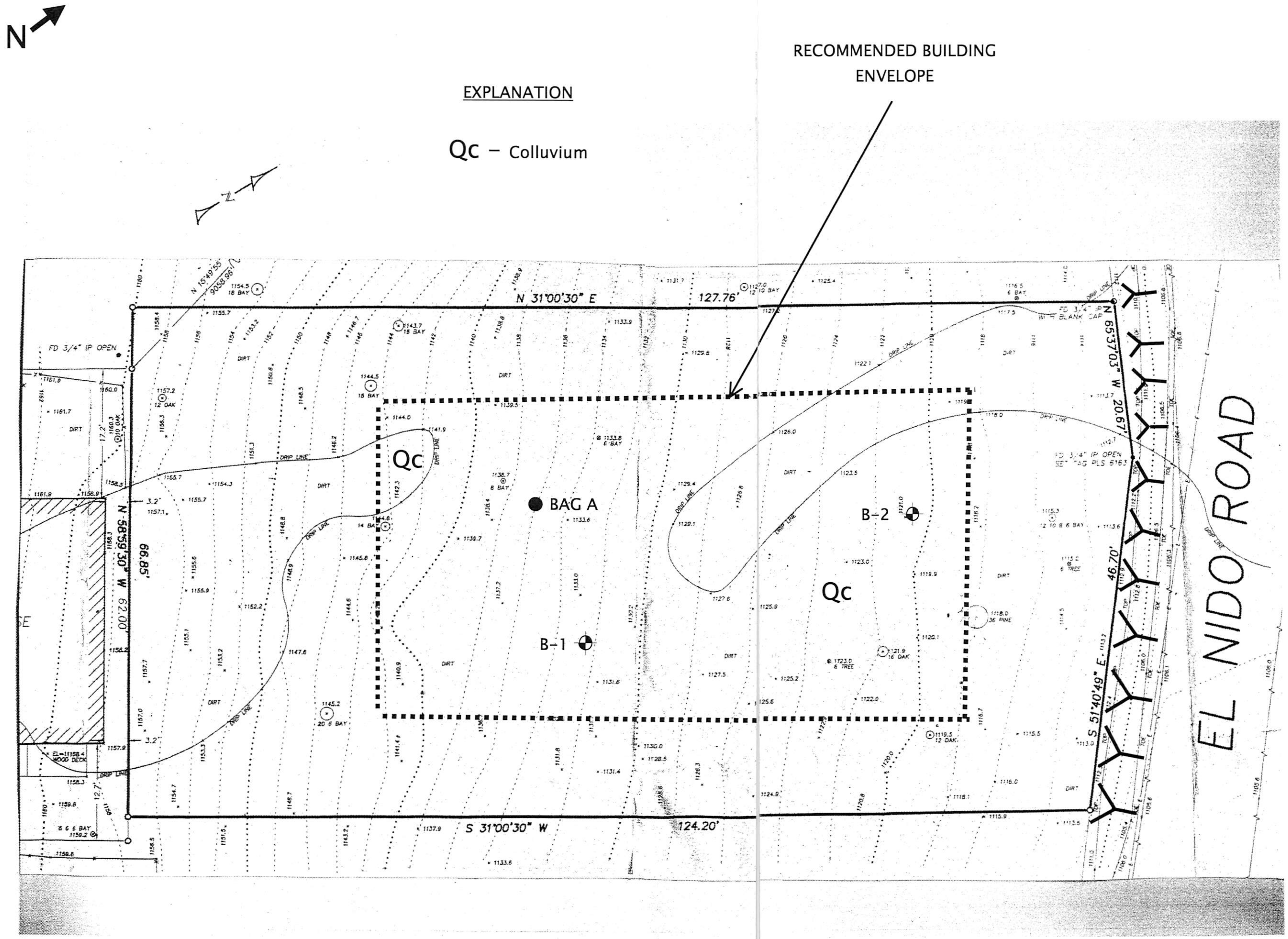
+ Class II Permeable Baserock compacted to at least 92% relative maximum density

** The pavers should be bordered with a concrete curb/band. Typically, minor maintenance would be required during the life of the pavers.

FIGURES



Silicon Valley Soil Engineering 2391 Zanker Road, #350 San Jose, CA 95131 (408) 324-1400	**VICINITY MAP** Proposed Residence El Nido Road, Lot 140 Portola Valley, California	File No.: SV1784 Drawn by: V.V. Scale: NOT TO SCALE	FIGURE 1 September 2018



NOTE: DENOTES APPROXIMATE EXPLORATORY BORING LOCATION

DENOTES APPROXIMATE BAG SAMPLE LOCATION

Y EXCAVATED CUT

Silicon Valley Soil Engineering

2391 Zanker Road, #350
San Jose, CA 95131
(408) 324-1400

SITE PLAN AND GEOLOGIC MAP

Proposed Residence

El Nido Road, Lot 140
Portola Valley, California

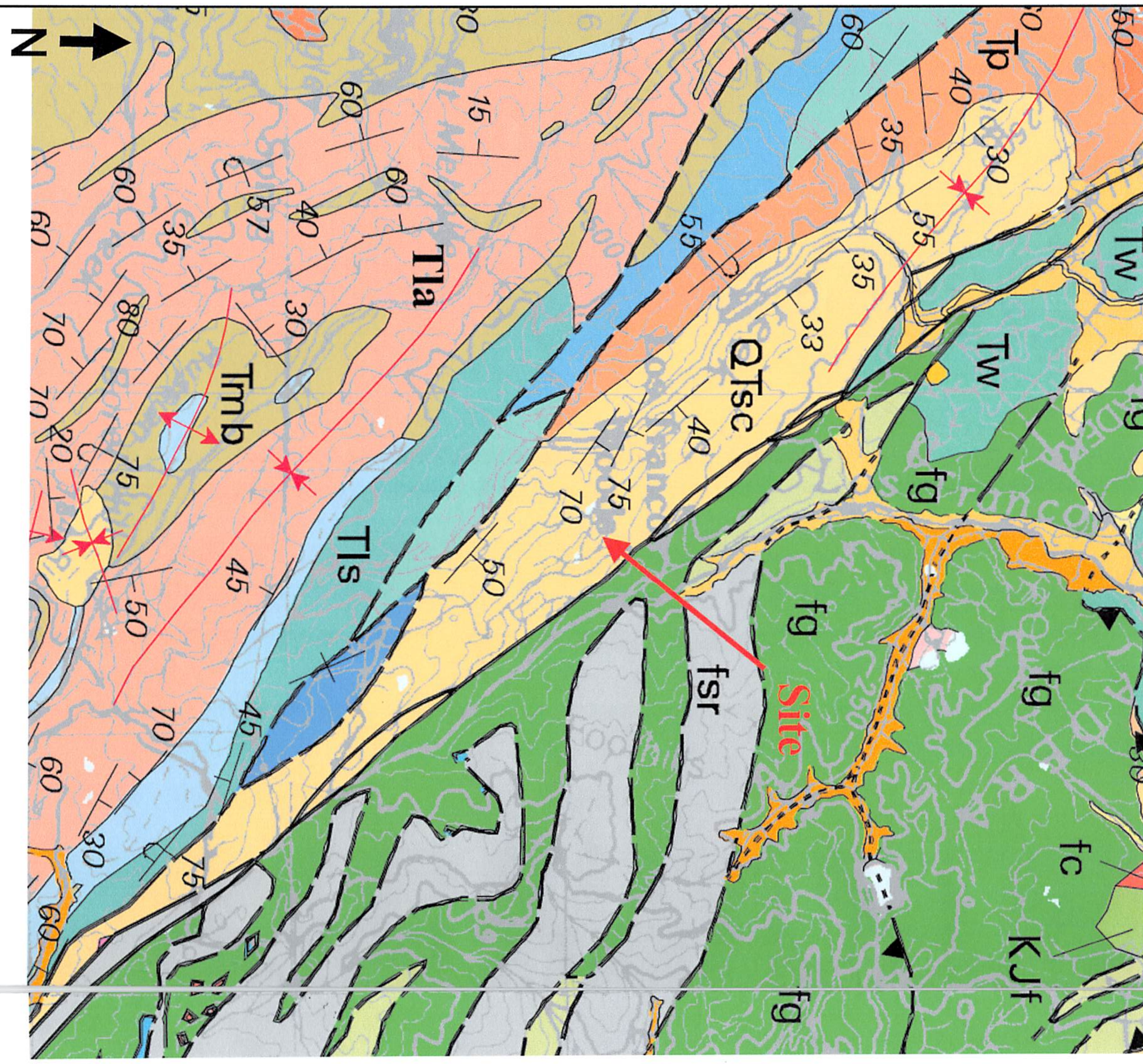
File No.: SV1784

Drawn by: V.V.

Scale: 1 inch = 13 feet

FIGURE 2A

September 2018

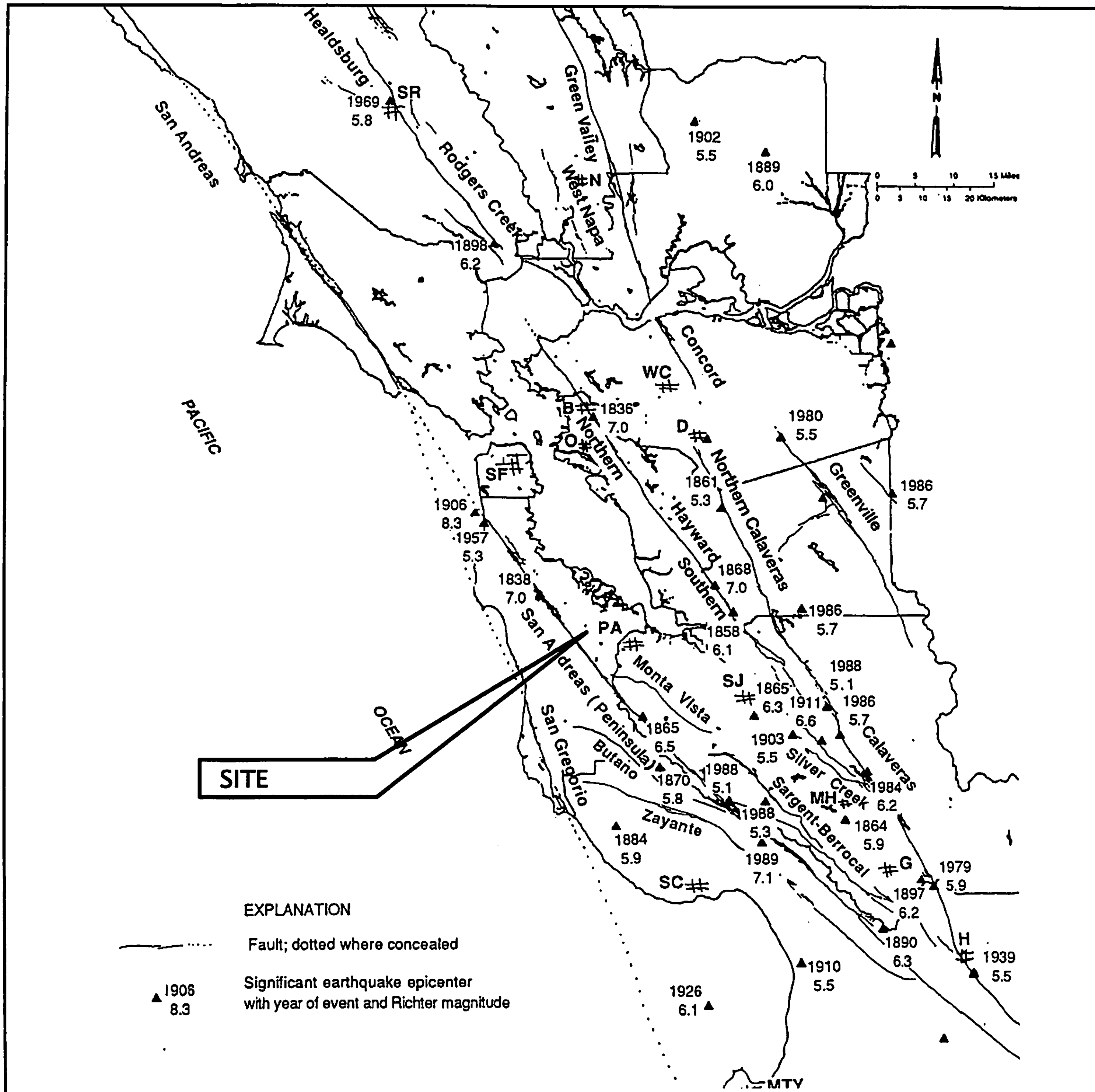


EXPLANATION

QTsc	Santa Clara Formation (lower Pleistocene and upper Pliocene)
Tla	Lambert Shale (lower Miocene and Oligocene)
Tls	Lambert Shale and San Lorenzo Formation, undivided (Lower Miocene, Oligocene, and middle/upper Eocene)
Tmb	Mindego Basalt and related volcanic rocks (Miocene and/or Oligocene
Tb	Butano Sandstone (middle and lower Eocene)
Tw	Whiskey Hill Formation (middle and lower Eocene)
fg	Franciscan Assemblage greenstone (Cretaceous and Jurassic)
fsr	Franciscan Assemblage sheared rock (melange) (Cretaceous and Jurassic)

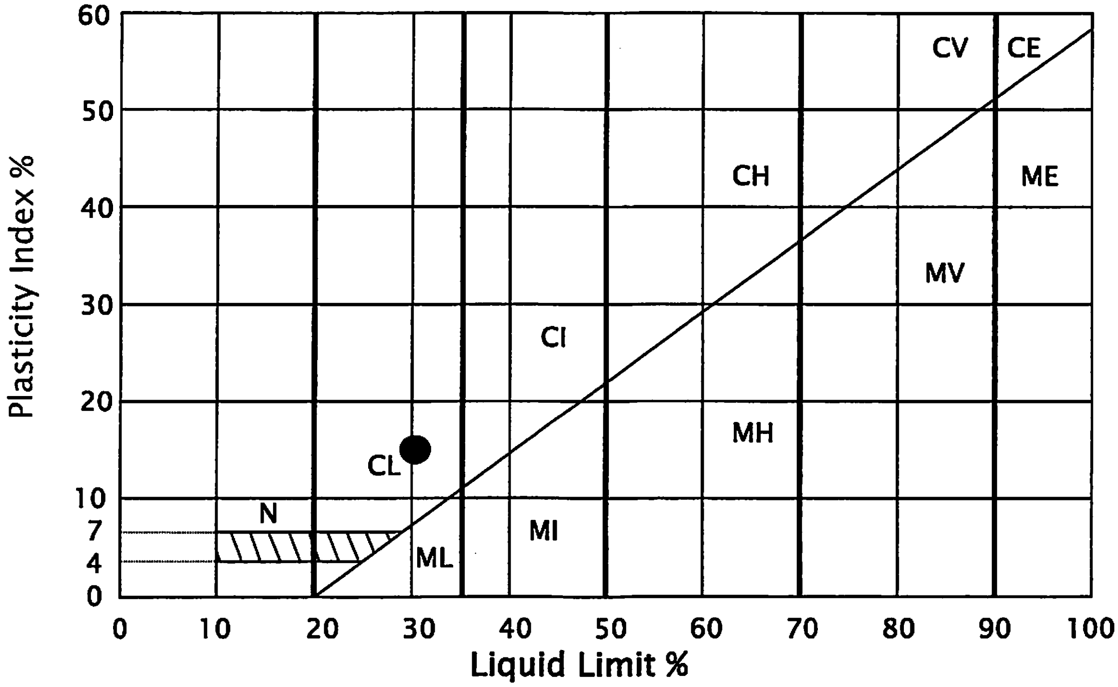
Source: Brabb et al, 2000

Silicon Valley Soil Engineering 2391 Zanker Road, #350 San Jose, CA 95131 (408) 324-1400	VICINITY GEOLOGIC MAP Proposed Residence El Nido Road, Lot 140 Portola Valley, California	File No.: SV1784 Drawn by: V.V. Scale: N/A	FIGURE 2B September 2018



Silicon Valley Soil Engineering 2391 Zanker Road, #350 San Jose, CA 95131 (408) 324-1400	**REGIONAL FAULT LOCATION MAP** Proposed Residence El Nido Road, Lot 140 Portola Valley, California	File No.: SV1784 Drawn by: V.V. Scale: NOT TO SCALE	FIGURE 3 September 2018

PLASTICITY CHART

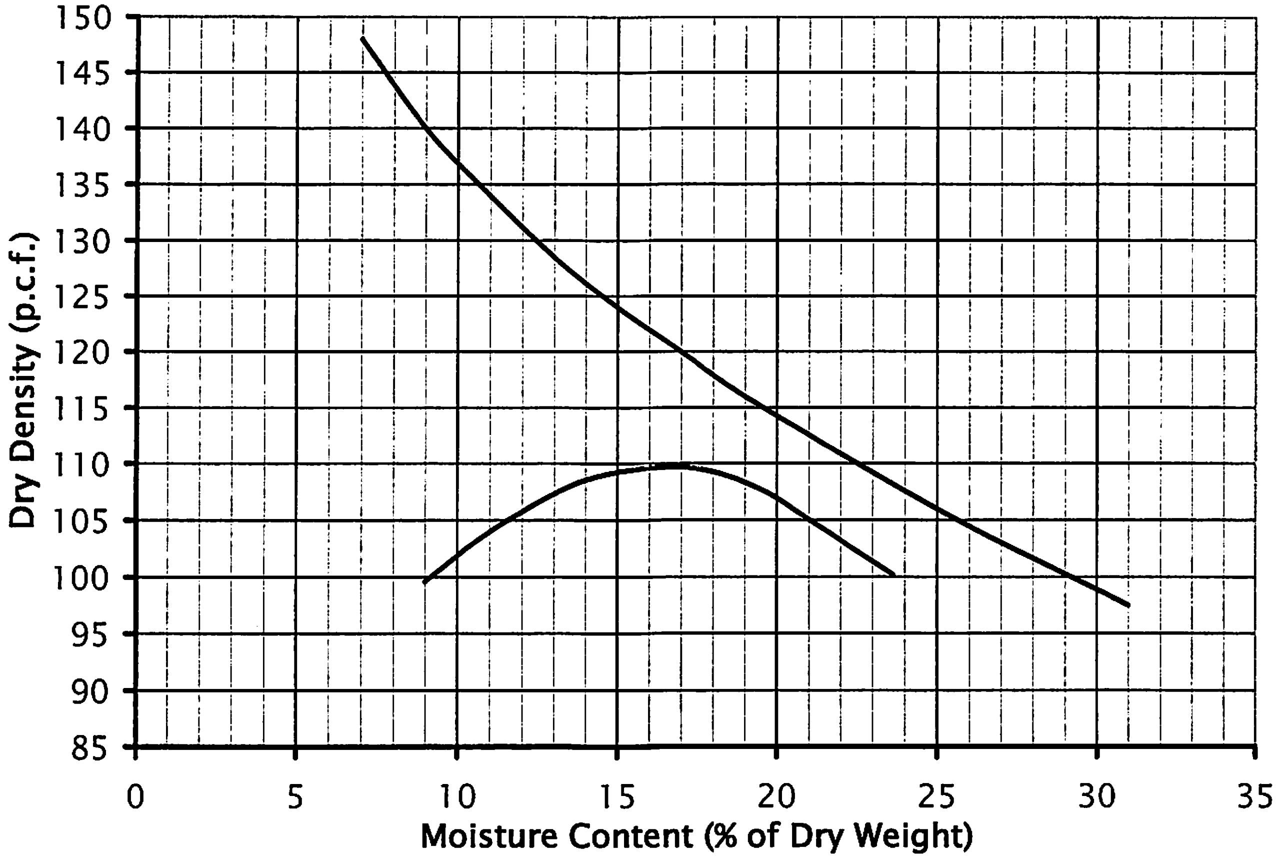


PLASTICITY DATA

Key Symbol	Hole No.	Depth ft.	Liquid Limit %	Plasticity Index %	Unified Soil Classification Symbol *
●	BAG A	0-1	30	15	CL

*Soil type classification Based on British suggested revisions to Unified Soil Classification System

Silicon Valley Soil Engineering 2391 Zanker Road, #350 San Jose, CA 95131 (408) 324-1400	**PLASTICITY INDEX** Proposed Residence El Nido Road, Lot 140 Portola Valley, California	File No.: SV1784 Drawn by: V.V. Scale: NOT TO SCALE	FIGURE 4 September 2018



SAMPLE: A

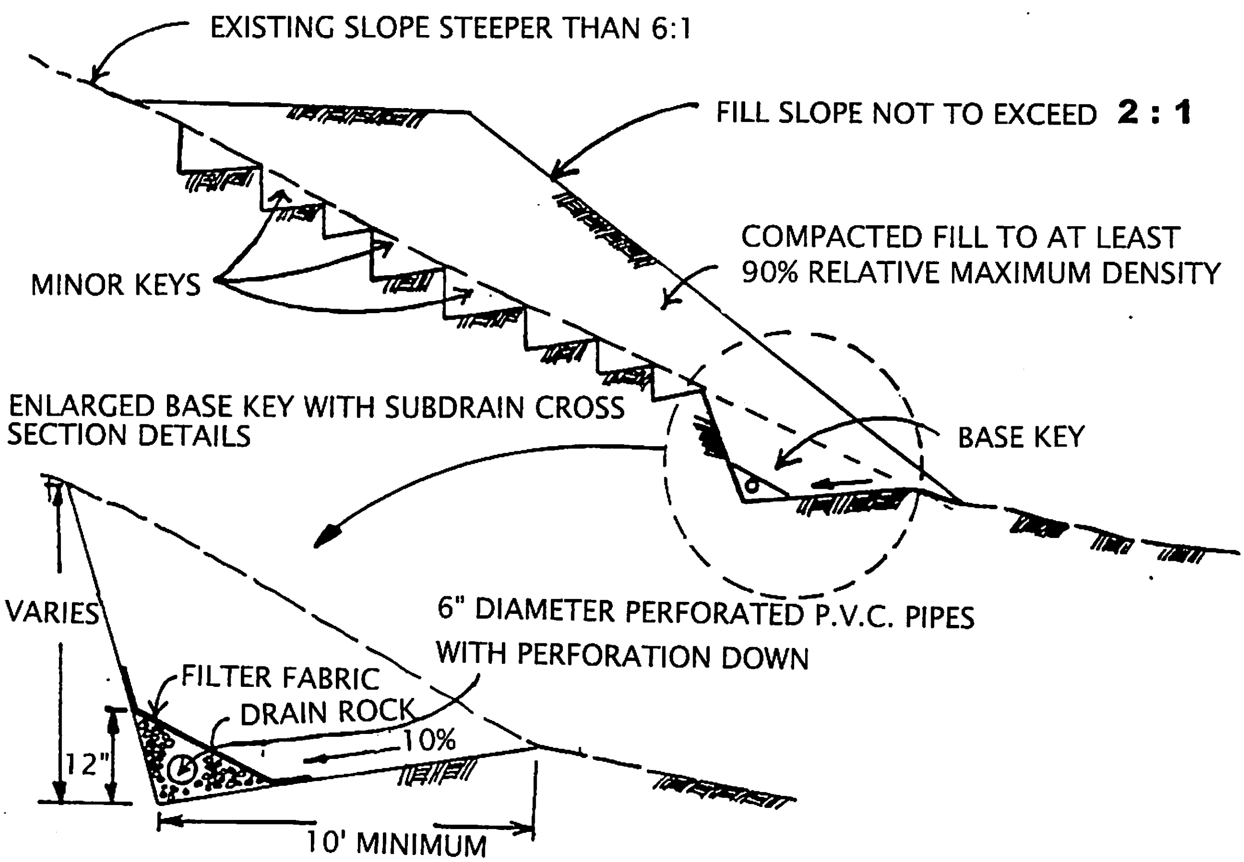
DESCRIPTION: Dark Brown Sandy CLAY (Colluvium)

LABORATORY TEST PROCEDURE: ASTM D1557

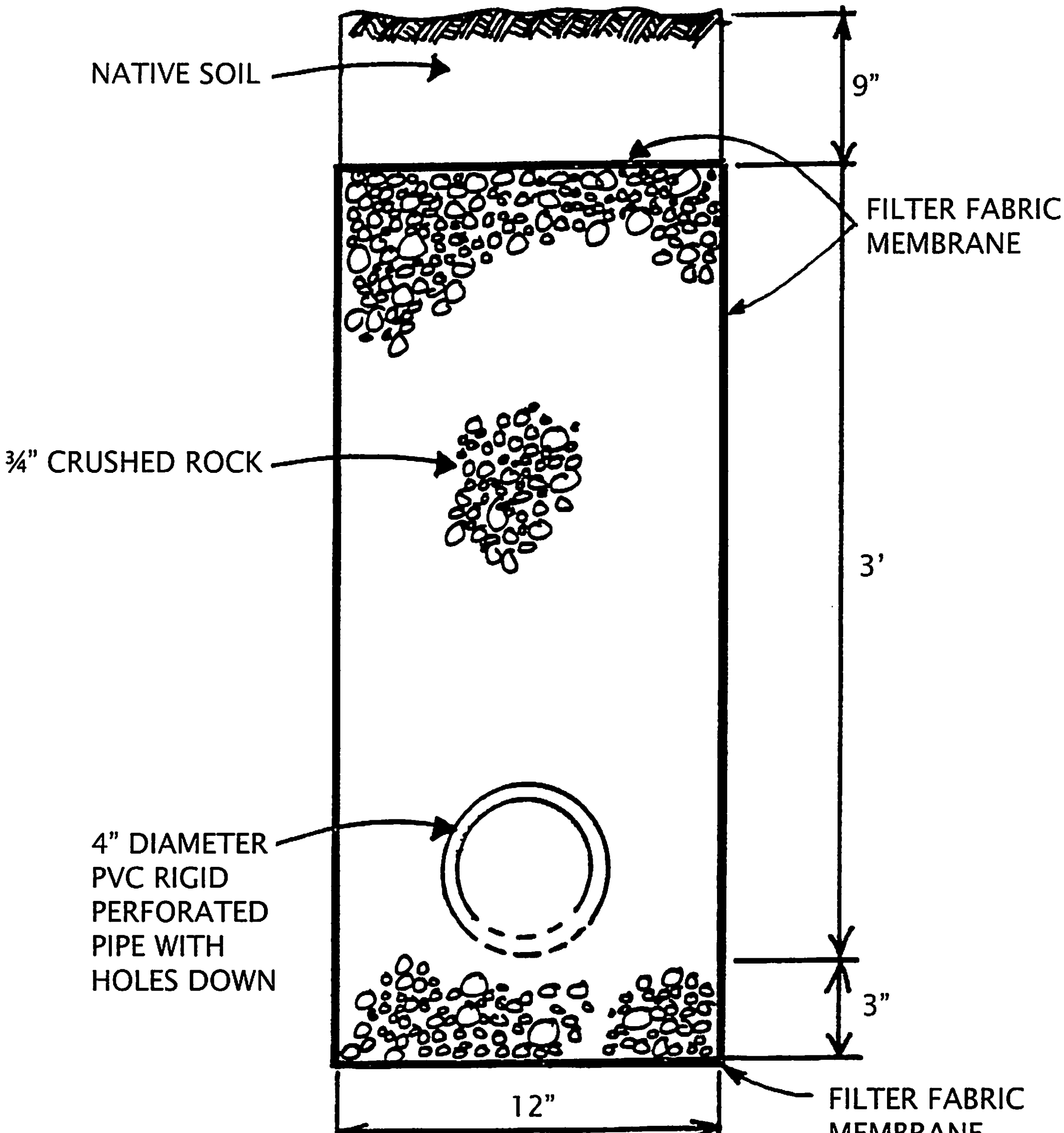
MAXIMUM DRY DENSITY: 110.0 p.c.f.

OPTIMUM MOISTURE CONTENT: 17.0 %

Silicon Valley Soil Engineering 2391 Zanker Road, #350 San Jose, CA 95131 (408) 324-1400	**COMPACTION TEST A** Proposed Residence El Nido Road, Lot 140 Portola Valley, California	File No. SV1784 Drawn by: V.V. Scale: NOT TO SCALE	FIGURE 5 September 2018



Silicon Valley Soil Engineering 2391 Zanker Road, #350 San Jose, CA 95131 (408) 324-1400	**FILL SLOPE DETAILS** Proposed Residence El Nido Road, Lot 140 Portola Valley, California	File No.: SV1784	FIGURE 6
		Drawn by: V.V.	
		Scale: NOT TO SCALE	September 2018



SUBDRAIN CROSS SECTION

Silicon Valley Soil Engineering 2391 Zanker Road, #350 San Jose, CA 95131 (408) 324-1400	**SUBDRAIN SYSTEM** Proposed Residence El Nido Road, Lot 140 Portola Valley, California	File No.: SV1784 Drawn by: V.V. Scale: NOT TO SCALE	FIGURE 7 September 2018

APPENDICES

MODIFIED MERCALLI SCALE

METHOD OF SOIL CLASSIFICATION

KEY TO LOG OF BORING

EXPLORATORY BORING LOGS (B-1 AND B-2)

GENERAL COMPARISON BETWEEN EARTHQUAKE MAGNITUDE AND THE EARTHQUAKE EFFECTS DUE TO GROUND SHAKING

Earthquake Category	Richter Magnitude	Modified Mercalli Intensity Scale* (After Housner, 1970)	Damage to Structure
		I – Detected only by sensitive instruments.	
	2.0	II – Felt by few persons at rest, especially on upper floors; delicate suspended objects may swing.	
	3.0	III – Felt noticeably indoors, but not always recognized as an earthquake; standing cars rock slightly, vibration like passing truck.	No Damage
Minor		IV – Felt indoors by many, outdoors by a few; at night some awaken; dishes, windows, doors disturbed; cars rock noticeably.	
	4.0	V – Felt by most people; some breakage of dishes, windows, and plaster; disturbance of tall objects.	Architec-tural Damage
		VI – Felt by all; many are frightened and run outdoors; falling plaster and chimneys; damage small.	
5.3	5.0	VII – Everybody runs outdoors. Damage to building varies, depending on quality of construction; noticed by drivers of cars.	
Moderate	6.0	VIII – Panel walls thrown out of frames; fall of walls, monuments, chimneys; sand and mud ejected; drivers of cars disturbed.	
6.9		IX – Buildings shifted off foundations, cracked, thrown out of plumb; ground cracked, underground pipes broken; serious damage to reservoirs and embankments.	Structural Damage
Major	7.0	X – Most masonry and frame structures destroyed; ground cracked; rail bent slightly; landslides.	
7.7		XI – Few structures remain standing; bridges destroyed; fissures in ground; pipes broken; landslides; rails bent.	
Great	8.0	XII – Damage total; waves seen on ground surface; lines of sight and level distorted; objects thrown into the air; large rock masses displaced.	Near Total Destruction

*Intensity is a subject measure of the effect of the ground shaking, and is not engineering measure of the ground acceleration.

File No. SV1784

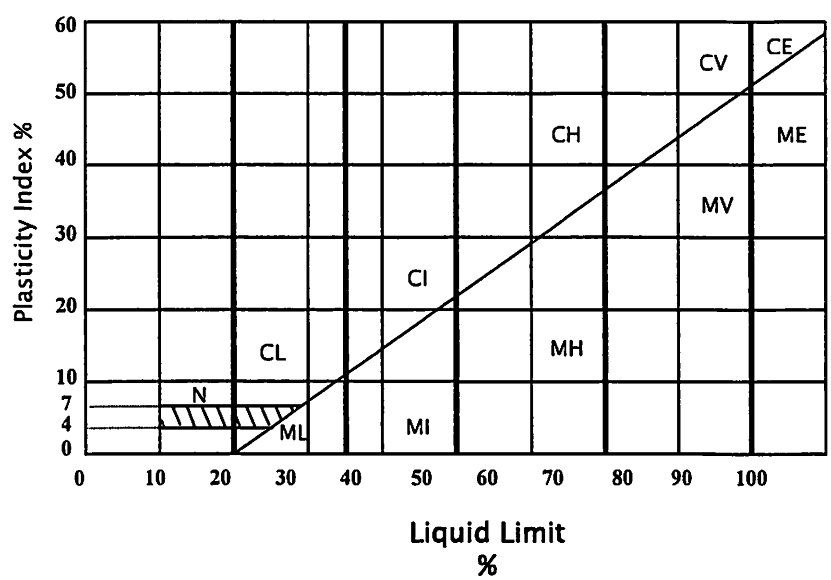
METHOD OF SOIL CLASSIFICATION CHART

MAJOR DIVISIONS		SYMBOL	TYPICAL NAMES
COARSE GRAINED SOILS (More than 1/2 of soil > no. 200 sieve size)	GRAVELS (More than 1/2 of coarse fraction > no. 4 sieve size)	GW	Well graded gravel or gravel-sand mixtures, little or no fines
		GP	Poorly graded gravel or gravel-sand moistures, little or no fines
		GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey Gravels, gravel-sand-clay mixtures
	SANDS (More than 1/2 of coarse fraction < no. 4 sieve size	SW	Well graded sands or gravelly sands, no fines
		SP	Poorly graded sands or gravelly sands, no fines
		SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE GRAINED SOILS (More than 1/2 of soil < no. 200 sieve size)	SILTS & CLAYS LL < 50	ML	Inorganic silts and very fine sand, rock, flour, silty or clayey fine sand or clayey silt/slight plasticity
		CL	Inorganic clay of low to medium plasticity, gravelly clayes, sandy clay, silty clay, lean clays
		OL	Organic siltys and organic silty clay of low plasticity
	SILTS & CLAYS LL > 50	MH	Inorganic silts, micaceous or diatocaceous fine sandy, or silty soils, elastic silt
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silty clays, organic silts
HIGHLY ORGANIC SOIL		PT	Peat and other highly organic soils

CLASSIFICATION CHART - UNIFIED SOIL CLASSIFICATION SYSTEM

CLASSIFICATION	RANGE OF GRAIN SIZES	
	U.S. Standard Sieve Size	Grain Size In Millimeters
BOULDERS	Above 12"	Above 305
COBBLES	12" to 3"	305 to 76.2
GRAVELS Coarse Fine	3" to No. 4 3" to 3/4" 3/4" to No. 4	76.2 to 4.76 76.2 to 19.1 19.1 to 4.76
SAND Coarse Medium Fine	No. 4 to No. 200 No. 4 to No. 10 No.10 to No. 40 No.40 to No. 200	4.76 to 0.074 4.76 to 2.00 2.00 to 0.420 0.420 to 0.074
SILT AND CLAY	Below No. 200	Below 0.074

PLASTICITY INDEX CHART



Project: Proposed Residence Project Location: El Nido Road, Lot 140 Portola Valley, California Project Number: SV1784	Silicon Valley Soil Engineering 2391 Zanker Road, Suite 350 San Jose, CA 95131 (408) 324-1400	Key to Log of Boring Sheet 1 of 1

Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Direct Shear Test - Cohesion in ksf	Direct Shear Test - Internal Friction Angle in degrees	Liquid Limit - LL, %	Plasticity Index - PI, %
1	2	3	4	5	6	7	8	9	10	11	12	13

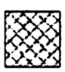
COLUMN DESCRIPTIONS

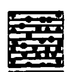
1. Depth (feet): Depth in feet below the ground surface.
2. Sample Type: Type of soil sample collected at the depth interval shown.
3. Sample Number: Sample identification number.
4. Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.
5. Material Type: Type of material encountered.
6. Graphic Log: Graphic depiction of the subsurface material encountered.
7. MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
8. Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.
9. Dry Unit Weight, pcf: Dry weight per unit volume of soil sample measured in laboratory, in pounds per cubic foot.
10. Direct Shear Test - Cohesion in ksf: Cohesion is the y-axis intercept of the failure envelope tangent to the Mohr circles.
11. Direct Shear Test - Internal Friction Angle in degrees: The internal friction angle (Phi) is the angle inclination of the failure envelope.
12. Liquid Limit - LL, %: Liquid Limit, expressed as a water content.
13. Plasticity Index - PI, %: Plasticity Index, expressed as a water content.

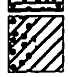
FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

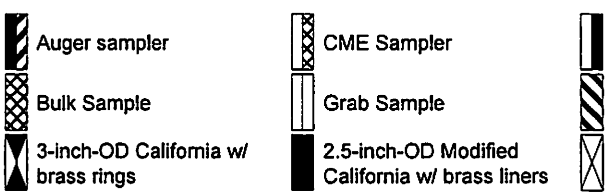
MATERIAL GRAPHIC SYMBOLS


Grass and/or topsoil


Sandstone


Clayey SAND to Sandy CLAY (SC-CL)

TYPICAL SAMPLER GRAPHIC SYMBOLS



Auger sampler
CME Sampler
Pitcher Sample
Bulk Sample
Grab Sample
2-inch-OD unlined split spoon (SPT)
3-inch-OD California w/ brass rings
2.5-inch-OD Modified California w/ brass liners
Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)
Water level (after waiting)
Minor change in material properties within a stratum
Inferred/gradational contact between strata
Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

Project: Proposed Residence **Project Location:** El Nido Road, Lot 140 Portola Valley, California **Project Number:** SV1784	**Silicon Valley Soil Engineering** **2391 Zanker Road, Suite 350** **San Jose, CA 95131** **(408) 324-1400**	Log of Boring B-1 **Sheet 1 of 1**

Date(s) Drilled **06/19/18**	Logged By **V.V.**	Checked By
Drilling Method **Solid Stem Auger**	Drill Bit Size/Type **4-inch**	Total Depth of Borehole **15.0 feet**
		Approximate Surface Elevation **feet**
Groundwater Level and Date Measured	Sampling Method(s) **Modified California**	Hammer Data **140 lbs**
Borehole Backfill **Grout**	Location	

Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Direct Shear Test - Cohesion in ksf	Direct Shear Test - Internal Friction Angle in degrees	Liquid Limit - LL, %	Plasticity Index - PI, %
0 – 0.25				Grass		3.0 inches of organic material						
0.25 – 5				SC-CL		Dark Brown Sandy CLAY (Colluvium) Moist, stiff						
	■	1-1	14				12.4	90.3	0.8	22		
	■	1-2	55+				11.0	114.5				
5 – 15				Sandstone		Brown SANDSTONE Dry, hard						
	■	1-3	55+				6.1	120.7				
	■	1-4	55+				5.4	123.8				
15						Boring terminated at 15.0 feet						

Depth scale: 0, 5, 10, 15, 20, 25, 30

Project: Proposed Residence Project Location: El Nido Road, Lot 140 Portola Valley, California Project Number: SV1784	**Silicon Valley Soil Engineering** **2391 Zanker Road, Suite 350** **San Jose, CA 95131** **(408) 324-1400**	Log of Boring B-2 **Sheet 1 of 1**

Date(s) Drilled **06/19/18**	Logged By **V.V.**	Checked By
Drilling Method **Solid Stem Auger**	Drill Bit Size/Type **4-inch**	Total Depth of Borehole **15.0 feet**
		Approximate Surface Elevation **feet**
Groundwater Level and Date Measured	Sampling Method(s) **Modified California**	Hammer Data **140 lbs**
Borehole Backfill **Grout**	Location	

Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Material Type	Graphic Log	MATERIAL DESCRIPTION	Water Content, %	Dry Unit Weight, pcf	Direct Shear Test - Cohesion in ksf	Direct Shear Test - Internal Friction Angle in degrees	Liquid Limit - LL, %	Plasticity Index - PI, %
0				Grass		3.0 inches of organic material						
0.25				SC-CL		Dark Brown Sandy CLAY (Colluvium) Moist, stiff						
		2-1	22				10.3	91.4				
		2-2	55+				10.6	94.9				
5				Sandstone		Brown SANDSTONE Dry, hard						
		2-3	55+				6.5	121.5				
10												
		2-4	55+				5.1	124.6				
15						Boring terminated at 15.0 feet						
20												
25												
30												