GLOBAL GEO-ENGINEERING, INC.

February 16, 2023
Project 9421-04

DMS Consultants, Inc.
12377 Lewis Street, Suite 203
Garden Grove, California 92840

Attention: Mr. Surender Dewan, P. E.
President

Subject: Geotechnical Investigation
Proposed Multi-Family Residential Development
236 and 244 Pico Avenue
San Marcos, California

References: *See Appendix A*

Dear Mr. Dewan:

1. INTRODUCTION

a) In accordance with your request, we have conducted a geotechnical investigation for the proposed residential development located in San Marcos, California.

b) We understand that the proposed development will consist of the construction of four 3-story, multi-family residential structures, each unit approximately 1,170-squarefoot, with related parking/driveway areas on a 0.67-acre parcel of land. In addition, an infiltration system is planned to be installed for potential stormwater runoff.

c) Grading and structural plans are not available at present. We are assuming that the existing grades will remain unchanged. We anticipate the loads from the proposed structures will not exceed 3 kip/ft for the continuous footings and 50 kips for the column footings.

2. SCOPE

The scope of services we provided were as follows:

a) Preliminary planning and evaluations, and review of geotechnical reports related to the project site and nearby surrounding area *(See References – Appendix A)*;

3 Corporate Park, Suite 270, Irvine, California 92606
Office (949) 221-0900 Fax (949) 221-0091
Email: global@globalgeo.net

b) Excavation of three (3) borings utilizing a hollow stem auger drill rig to a maximum depth of 40 feet below ground surface. One of the borings was drilled to a depth of 5 feet below ground surface for the purpose of percolation testing;

c) Sampling and logging of subsurface materials encountered in the borings;

d) Field percolation testing to determine the infiltrations rate;

e) Laboratory testing of samples representative of those obtained in the field, in order to evaluate relevant engineering properties;

f) Engineering and geologic analyses of the field and laboratory data;

g) Preparation of a report presenting our findings, conclusions and recommendations.

3. FIELD EXPLORATION AND LABORATORY TESTING

The field exploration program is given in *Appendix B*, which includes the Logs of Borings. The results of the laboratory testing are included in *Appendix C.*

4. SITE DESCRIPTION

4.1 Location

a) The project site is located along the southwest side of Pico Avenue, approximately 280 feet northwest of San Marcos Boulevard, in the city of San Marcos, California.

b) The approximate site location is shown on the *Location Map, Figure 1.*

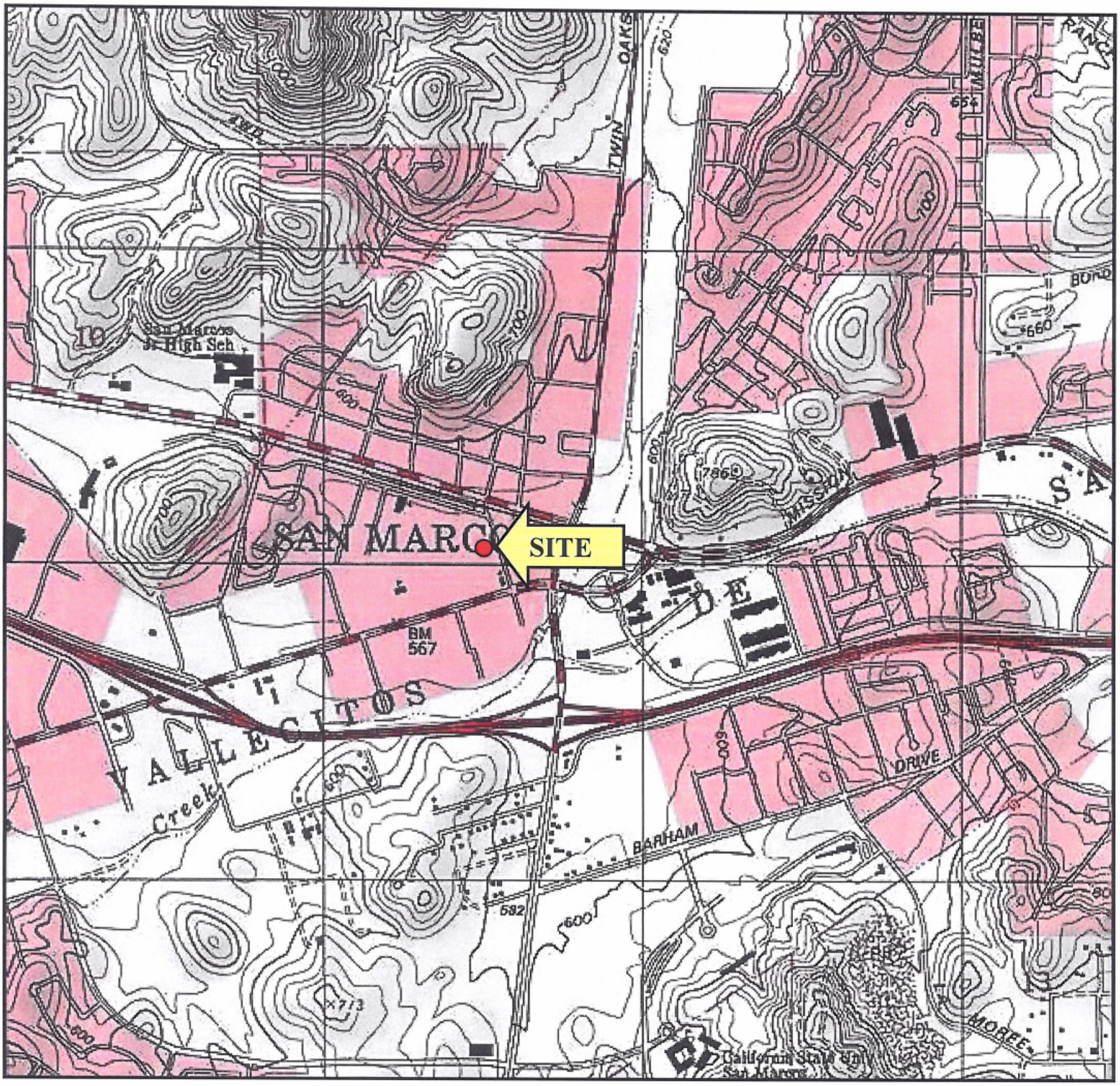
4.2 Existing Surface Conditions

a) The subject property is currently vacant and void of any building structures.

b) The ground surface throughout the project site is relatively level. The natural topography of the site area descends to the south at an approximate gradient of one percent.

c) Surface drainage consists of sheet flow runoff of incident rainfall water derived primarily within the property boundaries and adjacent properties.

LOCATION MAP



BASE MAP: USGS 7.5-Minute Topographic Map,
San Marcos Quadrangle, 1999

2000 0 2000 4000

SCALE FEET

NORTH

GLOBAL GEO-ENGINEERING, INC.

GEOLOGIC AND SOILS ENGINEERING IRVINE, CALIFORNIA

244 Pico Avenue
San Marcos, California

Date: February 2023	**Figure No:**
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4.3 Geology

4.3.1 Regional Geologic Setting

The subject property is located within the Peninsular Ranges Geomorphic Province of California. The Peninsular Ranges consist of a series of mountain ranges separated by longitudinal valleys. The ranges trend northwest-southeast and are sub parallel to faults branching from the San Andreas Fault. The Peninsular Ranges extend from the southern side of the Santa Monica and San Gabriel Mountains into Baja California, Mexico (CDMG, 1997).

4.3.2 Local Geologic Setting

In general, the project site area is underlain by Recent- to Older-aged alluvial deposits which overlie granitic bedrock.

4.4 Subsurface Conditions

a) The subsurface conditions, as encountered in our explorations, are described in the following sections.

b) More detailed descriptions of the subsurface conditions are presented in our *Logs of Borings,* which are enclosed as *Figures B-2* through *B-4* in Appendix B. The locations of the borings are shown on our *Boring Location Plan, Figure B-5.*

4.4.1 Alluvium

a) Alluvial deposits were encountered in all of our borings excavated on-site.

b) The alluvium was found to generally consist of interlayers of Silty SAND, SAND and Sandy to Clayey SILT.

c) The Silty SAND and SAND sediments were generally found to be fine to coarse grained, slightly moist to very moist and medium dense.

d) The Sandy to Clayey SILT deposits were observed to be slightly moist to moist and stiff.

4.4.2 Bedrock

a) Bedrock, classified as Tonalite, was encountered at a depth of 37 feet below ground surface in Boring B-1.

b) The bedrock encountered in our boring was noted to be fine textured and hard.

4.4.3 Groundwater

a) Groundwater was encountered in our deeper boring (Boring B-1) at a depth of 24 feet below ground surface. The static water level was measured at a depth of 23.5 feet below ground surface approximately 30 minutes after termination of drilling.

b) No nearby groundwater wells were found to be listed during our review of the *California Department of Water Resources* internet website.

5. SEISMICITY

5.1 General

a) The property is located in the general proximity of several active and potentially active faults, which are typical for sites in the Southern California region. Earthquakes occurring on active faults within a 70-mile radius are capable of generating ground shaking of engineering significance to the proposed construction.

b) In Southern California, most of the seismic damage to manmade structures results from ground shaking and, to a lesser degree, from liquefaction and ground rupture caused by earthquakes along active fault zones. In general, the greater the magnitude of the earthquake, greater is the potential damage.

5.2 Ground Surface Rupture

a) The closest known active fault is the Elsinore Fault, located at a distance of about 16.3 miles northeast of the project site. Other nearby active or potentially active faults include the Rose Canyon Fault and the San Jacinto Fault located at distances of about 20.8 miles and 40.8 miles, respectively, from the subject property.

b) Due to the distance of the closest active fault to the site, ground rupture is not considered a significant hazard at the site.

5.3 Ground Shaking

a) We utilized the California Office of Statewide Health Planning and Development (OSHPD) Seismic Design Maps internet program to calculate the peak ground acceleration (PGA) at the project site location. Using the ASCE 7-16 standard and Site Class D, the PGA at the subject property resulted to be 0.47g.

b) *Figure 2* shows the geographical relationships among the site locations, nearby faults and the epicenters of significant occurrences. The project site is not located within any State of California delineated Earthquake Fault Zone; however, during historic times, a number of major earthquakes have occurred along the active faults in Southern California. From the seismic history of the region and proximity, the Elsinore Fault and Rose Canyon Fault have the greatest potential for causing earthquake damage related to ground shaking at this site.

5.4 Liquefaction

The subject site is underlain by dense soil layers overlying a Tonalite bedrock. The potential for the liquefaction is considered to be low.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 General

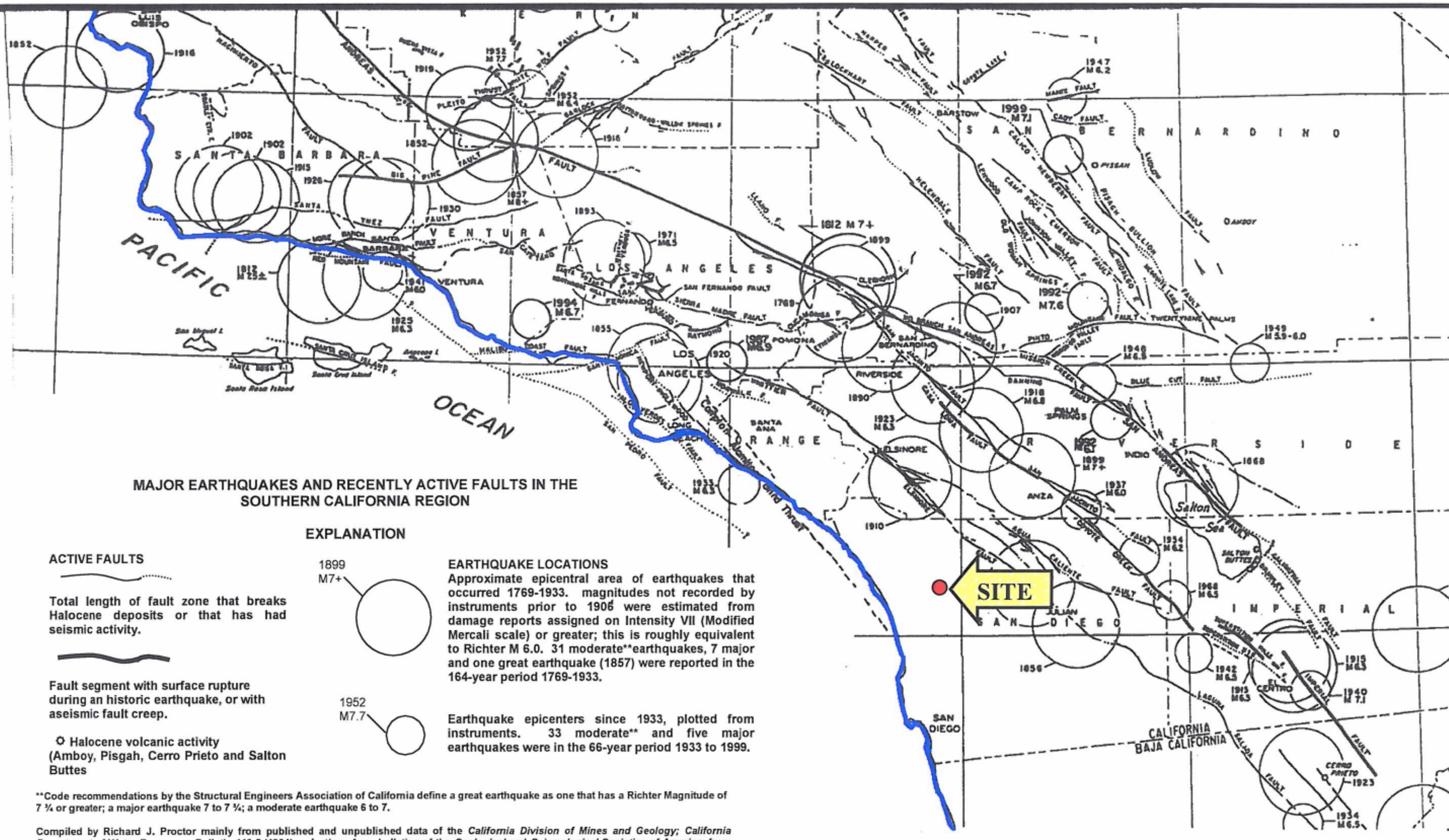
a) It is our opinion that the site will be suitable for the proposed development, from a geotechnical aspect, assuming that our recommendations are implemented.

b) We are of the opinion that the proposed structures can be supported on shallow spread footings founded in the existing competent soils.

c) We consider that the anticipated grading will not adversely affect, nor be adversely affected by adjoining property, with due precautions being taken.

d) The final grading plans and foundation plans/design loads should be reviewed by the Geotechnical Engineer.

e) The design recommendations in the report should be reviewed during the construction phase.



MAJOR EARTHQUAKES AND RECENTLY ACTIVE FAULTS IN THE SOUTHERN CALIFORNIA REGION

EXPLANATION

ACTIVE FAULTS

Total length of fault zone that breaks Halocene deposits or that has had seismic activity.

Fault segment with surface rupture during an historic earthquake, or with aseismic fault creep.

○ Halocene volcanic activity (Amboy, Pisgah, Cerro Prieto and Salton Buttes

1899 M7+

1952 M7.7

EARTHQUAKE LOCATIONS

Approximate epicentral area of earthquakes that occurred 1769-1933. magnitudes not recorded by instruments prior to 1906 were estimated from damage reports assigned on Intensity VII (Modified Mercali scale) or greater; this is roughly equivalent to Richter M 6.0. 31 moderate**earthquakes, 7 major and one great earthquake (1857) were reported in the 164-year period 1769-1933.

Earthquake epicenters since 1933, plotted from instruments. 33 moderate** and five major earthquakes were in the 66-year period 1933 to 1999.

**Code recommendations by the Structural Engineers Association of California define a great earthquake as one that has a Richter Magnitude of 7 ¾ or greater; a major earthquake 7 to 7 ¾; a moderate earthquake 6 to 7.

Compiled by Richard J. Proctor mainly from published and unpublished data of the *California Division of Mines and Geology; California Department of Water Resources Bulletin 116-2* (1964); selections from bulletins of the *Geological* and *Seismological Societies of America*; from C.F. Richter, *Elementary Seismology* (1958); and the *National Atlas*, p. 66, and from Working Group on California Earthquake Probabilities- SSA Bulletin V 85.

GLOBAL GEO-ENGINEERING, INC. GEOLOGIC AND SOILS ENGINEERING IRVINE, CALIFORNIA	244 Pico Avenue San Marcos, California	
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6.2 Grading

6.2.1 Processing of On-Site Soils

a) To provide uniform support conditions, the subgrade soils should be overexcavated to a depth of one foot below the foundation bottom and three feet below the slab-on-grade, subject to review during construction. The overexcavation should laterally extend for a distance of 5 feet.

b) There should be at least one foot of reworked soils or compacted fill below the pavements.

c) Wherever structural fills are to be placed, the upper 6 to 8 inches of the subgrade should, after stripping or overexcavation, first be scarified, reworked and wetted down thoroughly.

d) Any loosening of reworked or native material, consequent to the passage of construction traffic, weathering, etc., should be made good prior to further construction.

e) The depths of overexcavation should be reviewed by the Geotechnical Engineer during the actual construction. Any surface or subsurface obstructions, or questionable material encountered during grading should be brought immediately to the attention of the Geotechnical Engineer for proper exposure, removal or processing as directed. No underground obstructions or facilities should remain in any structural areas. Depressions and/or cavities created as a result of the removal of obstructions should be backfilled properly with suitable material, and compacted.

6.2.2 Material Selection

After the site has been stripped of any debris, vegetation and organic soils, excavated on-site soils are considered satisfactory for reuse in the construction of on-site fills, with the following provisions:

a) Significant water will be required to be added to the existing soils;

b) The organic content does not exceed 3 percent by volume;

c) Large size rocks greater than 8 inches in diameter should not be incorporated in compacted fill;

d) Rocks greater than 4 inches in diameter should not be incorporated in compacted fill to within one foot of the underside of the footings and slabs.

6.2.3 Compaction Requirements

a) Reworking/compaction shall include moisture-conditioning as needed to bring the soils to slightly above the optimum moisture content. All reworked soils and structural fills should be densified to achieve at least 90 percent relative compaction with reference to laboratory compaction standard. The optimum moisture content and maximum dry density should be determined in the laboratory in accordance with ASTM Test Designation D1557.

b) Fill should be compacted in lifts not exceeding 8 inches (loose).

6.2.4 Excavating Conditions

a) Excavation of on-site materials may be accomplished with standard earthmoving or trenching equipment. No hard rock was encountered which will require blasting.

b) Ground water was encountered at a depth of 24 feet below ground surface in our deeper boring. Dewatering is not anticipated in excavations shallower than 24 feet below ground surface.

6.2.5 Shrinkage

For preliminary earthwork calculation, an average shrinkage factor of approximately 5 percent is recommended for the soils (this does not include handling losses).

6.2.6 Expansion Potential

a) Based upon our visual observations, the expansion potential for the on-site soils is considered to be *medium*. The recommendations provided in the following sections will reduce the effects of the expansive subgrade soils.

b) Any imported material, or doubtful material exposed during grading, should be evaluated for its expansive properties.

c) In any event, the subgrade soils should be tested for their expansion potential or during the final stages of grading.

6.2.7 Sulphate Content

a) The sulphate contents of representative samples of the soil are less than 0.1%. The sulphate exposure is considered to be *negligible*. Type II Portland cement is recommended for the construction.

a) The fill materials should be tested for their sulphate content during the final stage of rough grading.

6.2.8 Utility Trenching

a) The walls of temporary construction trenches in fill should stand nearly vertical, with only minor sloughing, provided the total depth does not exceed 3 feet (approximately). Shoring of excavation walls or flattening of slopes may be required, if greater depths are necessary.

b) Trenches should be located so as not to impair the bearing capacity or to cause settlement under foundations. As a guide, trenches should be clear of a 45-degree plane, extending outward and downward from the edge of foundations. Shoring should comply with Cal-OSHA regulations.

c) Existing soils may be utilized for trenching backfill, provided they are free of organic materials.

d) All work associated with trench shoring must conform to the state and federal safety codes.

6.2.9 Surface Drainage Provisions

Positive surface gradients should be provided adjacent to the buildings to direct surface water run-off away from structural foundations and to suitable discharge facilities.

6.2.10 Grading Control

All grading and earthwork should be performed under the observation of a Geotechnical Engineer in order to achieve proper subgrade preparation, selection of satisfactory materials, placement and compaction of all structural fill. Sufficient notification prior to stripping and earthwork construction is essential to make certain that the work will be adequately observed and tested.

6.3 Slab-on-Grade

a) Concrete floor slabs may be founded on the reworked existing soils or compacted fill.

b) The slab should be underlain by four inches of granular material. A plastic vapor barrier is recommended to be placed at the mid-height of the base layer.

c) It is recommended that #4 bars on 12-inch center, both ways, or equivalent be provided as minimum reinforcement in slabs-on-grade. Joints should be provided and slabs supporting no vehicular traffic should be at least 5 inches thick.

d) The FFL should be at least 6 inches above highest adjacent grade.

e) The subgrade soils should be kept moist prior to the concrete pour.

6.4 Spread Foundations

The proposed structures can be founded on shallow spread footings. The criteria presented as follows should be adopted:

6.4.1 Dimensions/Embedment Depths

Number of Stories (floors supported)	**Minimum Width (ft.)**	**Minimum Footing Thickness (in.)**	**Minimum Embedment Below Lowest Finished Surface (ft.)**	
3	1.5	6	Perimeter	2.5
			Interior	2.5
Square Column Footings To 50 kip	2	-		2.5

6.4.2 Allowable Bearing Capacity

Embedment Depth (ft.)	**Allowable Bearing Capacity (lb/ft^2)**
1.0	2,000

(Notes:

- The allowable bearing capacity may be increased by 800 lb/ft^2 for each additional foot increase in the depth or by 200 lb/ft^2 he width to a maximum value of 4,000 lb/ft^2;

- These values may be increased by one-third in the case of short-duration loads, such as induced by wind or seismic forces;
- At least 2x#4 bars should be provided in wall footings, one on top and one at the bottom;
- In the event that footings are founded in structural fills consisting of imported materials, the allowable bearing capacities will depend on the type of these materials, and should be re-evaluated;
- Bearing capacities should be re-evaluated when loads have been obtained and footings sized during the preliminary design;
- Planter areas should not be sited adjacent to walls;
- Footing excavations should be observed by the Geotechnical Engineer;
- Footing excavations should be kept moist prior to the concrete pour;
- It should be insured that the embedment depths do not become reduced or adversely affected by erosion, softening, planting, digging, etc.)

6.4.3 Settlements

Total and differential settlements under spread footings are expected to be within tolerable limits and are not expected to exceed 1 and ¾ inches in a horizontal distance of 40 feet, respectively.

6.5 Lateral Pressures

a) The following lateral pressures are recommended for the design of retaining structures.

		Pressure ($lb/ft^2/ft$ depth)	
Lateral Force	**Soil Profile**	**Unrestrained Wall**	**Rigidly Supported Wall**
Active Pressure	Level	36	-
At-Rest Pressure	Level	-	65
Passive Resistance (ignore upper 1.5 ft.)	Level	300	-

b) Friction coefficient: 0.35 (includes a Factor of Safety of 1.5). While combining friction with passive resistance, reduce passive by 1/3.

c) These values apply to the existing soil, and to compacted backfill generated from in-situ material. Imported material should be evaluated separately. It is recommended that where feasible, imported granular backfill be utilized, for a width equal to approximately one-quarter the wall height, and not less than 1.5 feet.

d) Backfill should be placed under engineering control.

e) Subdrains comprised of 4-inch perforated SDR-35 or equivalent PVC pipe covered in a minimum of one cubic foot per linear foot of filter rock and wrapped in Mirafi 140N filter fabric should be provided behind retaining walls.

6.6 Seismic Coefficients and Liquefaction Potential

a) For seismic analysis of the proposed project in accordance with the seismic provisions of ASCE 7-16, we recommend the following:

ITEM	VALUE
Site Latitude (Decimal-degrees)	33.14197
Site Longitude (Decimal-degrees)	-117.16598
Site Class	D
Risk Category	II
Mapped Spectral Response Acceleration-Short Period (0.2 Sec) - S_S	0.897
Mapped Spectral Response Acceleration-1 Second Period – S_1	0.33
Short Period Site Coefficient-F_a	1.141
Long Period Site Coefficient F_v	1.90
Adjusted Spectral Response Acceleration @ 0.2 Sec. Period (Sms)	1.024
Adjusted Spectral Response Acceleration @ 1Sec.Period (S_{m1})	0.627
Design Spectral Response Acceleration @ 0.2 Sec. Period (S_{Ds})	0.682
Design Spectral Response Acceleration @ 1-Sec. Period (S_{D1})	0.418

b) Ground water was encountered at a depth of 24 feet below ground surface, however, the subject site is underlain by dense soil layers. The potential for liquefaction is considered to be low.

6.7 Pavement Design

6.7.1 Asphalt Pavement Section

a) Based on Traffic Indices (T.I) and on the anticipated "R" – Value of 42 of the subgrade, the following tentative structural pavement sections are recommended.

Location	**T.I.**	**Asphaltic Concrete (inches)**	**Aggregate Base (inches)**
Parking and Driveways	Up to 5.0	3	4
Driveway (light truck traffic)	6.0	3	6

b) The subgrade soils should be tested for R-Value at the conclusion of rough grading and the pavement sections should be finalized then.

6.7.2 Subgrade Preparation

Subgrade soils within the upper 12 inches of finished grade shall be moisture-conditioned where necessary, shall be compacted to at least 90 percent relative compaction per ASTM D1557, and shall be free of any loose or soft areas.

6.7.3 Base Preparation

Unless otherwise specified, the base shall consist of Class II ¾-inch aggregate base or approved Crushed Miscellaneous Base. The base shall be compacted to a minimum of 95 percent relative compaction in accordance with the procedures described in ASTM Test Method D1557.

6.7.4 Concrete Pavement

If proposed, the concrete pavement should be at least 5 inches thick, reinforced with #4 bars on 12 inches center bothways, underlain by 4 inches thick base as recommended above. Thicker concrete section will be required for traffic greater than T.I. of 6.0.

6.8 Corrosion Potential

a) Soil Corrosion potential for metal and concrete was estimated by performing water-soluble sulfate, chloride, pH, and electrical resistivity tests during this investigation.

b) Electrical resistivity is a measure of soil resistance to the flow of corrosion currents. Corrosion currents are generally high in low resistivity soils. The electrical resistivity of a soil decreases primarily with an increase in its chemical and moisture contents.

c) A commonly accepted correlation between electrical resistivity and corrosivity for buried ferrous metals is presented below:

Electrical Resistivity, Ohm-cm	**Corrosion Potential**
Less than 1,000	Severe
1,000-2,000	Corrosive
2,000-10,000	Moderate
Greater than 10,000	Mild

d) Results of electrical resistivity test indicate a value of 3,339 ohm-cm for the near-surface soils. Based on this data, it is our opinion that, in general, on-site near-surface soils are considered *moderately corrosive* in nature. This potential should be considered in design of underground metal pipes.

6.9 Percolation Study

a) A borehole percolation tests as outlines in San Marcos BMP design manual, appendix D, section D.3.2.2 was used to conduct percolation testing. Approximate location of Boring P-1 as shown on the boring location plan enclosed as *Figure B-5*. The filed percolation rate can be converted to 20 minutes/inch.

b) The soils in the upper 5 feet were Clayey Silty SAND underlain by Silty SAND/Sandy SILT. We recommend the basin to be at least 6 feet deep.

c) As more granular soils are anticipated at that depth, we estimate the following infiltration rate. During the grading operation, a percolation test should be conducted to verify the infiltration rate.

Boring No.	**Percolation Rate (inch/hour)**
P-1	3.0

d) These rates are calculated using a factor of safety of 1.0. Appropriate factor of safety should be utilized while designing the basin.

7. LIMITATIONS

a) Soils and bedrock over an area show variations in geological structure, type, strength and other properties from what can be observed, sampled and tested from specimens extracted from necessarily limited exploratory borings. Therefore, there are natural limitations inherent in making geologic and soil engineering studies and analyses. Our findings, interpretations, analyses and recommendations are based on observation, laboratory data and our professional experience; and the projections we make are professional judgments conforming to the usual standards of the profession. No other warranty is herein expressed or implied.

b) In the event that during construction, conditions are exposed which are significantly different from those described in this report, they should be brought to the attention of the Geotechnical Engineer.

The opportunity to be of service is sincerely appreciated. If you have any questions or if we can be of further assistance, please call.

Very truly yours,

GLOBAL GEO-ENGINEERING, INC.

Mohan B. Upasani
Principal Geotechnical Engineer
RGE 2301
(Exp. March 31, 2023)

Kevin B. Young
Principal Engineering Geologist
CEG 2253
(Exp. October 31, 2023)

MBU/KBY: fdg

Enclosures:

Location Map	- Figure 1
Seismicity Map	- Figure 2
References	- Appendix A
Field Exploration	- Appendix B
Unified Soils Classification System	Figure B-1
Logs of Borings	Figures B-2 through B-4
Boring Location Plan	Figure B-5
Laboratory Testing	- Appendix C

APPENDIX A

References

1. California Geological Survey, *Earthquake Fault Zones of Required Investigation,* (Internet).

2. California Division of Mines and Geology, 1996, *Geologic Maps of the Northwestern Part of San Diego County, California,* CDMG Open File Report 96-02.

3. California Office of Statewide Health Planning and Development, Seismic Design Maps Web Tool, ASCE 7-16 Standard (Internet).

4. United States Geological Survey, 1948, San Marcos Quadrangle, 7.5-Minute Topographic Series.

5. United States Geological Survey, 1968, San Marcos Quadrangle, 7.5-Minute Topographic Series.

6. United States Geological Survey, 1968 photorevised 1983, San Marcos Quadrangle, 7.5-Minute Topographic Series.

APPENDIX B

Field Exploration

a) The site was explored on May 17, 2022, utilizing a B-61 Mobile hollow stem drill rig to excavate three borings to a maximum depth of 40 feet below the existing ground surface. One of the borings were subsequently backfilled. Three-inch diameter perforated pipe with gravel rock encasement was installed in Boring P-1 for the purpose of percolation testing

b) The soils encountered in the excavations were logged and sampled by our Engineering Geologist. The soils were classified in accordance with the Unified Soil Classification System described in *Figure B-1*. The Logs of Borings are presented in *Figures B-2 through B-4*. The approximate locations of the borings are shown on the *Boring Location Plan, Plate 1*. The logs, as presented, are based on the field logs, modified as required from the results of the laboratory tests. Driven ring and bulk samples were obtained from the excavations for laboratory inspection and testing. The depths at which the samples were obtained are indicated on the logs.

c) The number of blows of the driving weight during sampling was recorded, together with the depth of penetration, the driving weight and the height of fall. The blows required per foot of penetration for given samples was then calculated and shown on the logs.

d) Groundwater was encountered at a depth of 24 feet below ground surface in Boring B-1.

e) Caving occurred in all of the borings to the depths noted on the logs.

UNIFIED SOILS CLASSIFICATION (ASTM D-2487)

PRIMARY DIVISION			GROUP SYMBOL	SECONDARY DIVISIONS
COARSE GRAINED SOILS More than half of materials is larger than #200 sieve size	GRAVELS More than half of coarse fraction is larger than #4 sieve	Clean Gravels (<5% fines)	GW	Well graded gravels, gravel-sand mixture, little or no fines
			GP	Poorly graded gravels or gravel-sand mixtures, little or no fines
		Gravel with Fines	GM	Silty gravels, gravel-sand-silt mixture. Non-plastic fines.
			GC	Clayey gravels, gravel-sand-clay mixtures. Plastic fines
	SANDS More than half of coarse fraction is smaller than #4 sieve	Clean Sands (<5% fines)	SW	Well-graded gravels, gravel-sand mixtures, little or no fines.
			SP	Poorly graded sands or gravelly sands, little or no fines.
		Sands with Fines	SM	Silty sands, sand-silt mixtures. Non-Plastic fines.
			SC	Clayey sands, sand-clay mixtures. Plastic fines.
FINE GRAINED SOILS More than half of material is smaller than #200 sieve size	SILTS AND CLAYS	LIQUID LIMIT IS LESS THAN 50	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts, with slight plasticity
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL	Organic silts and organic silty clays of low plasticity.
	SILTS AND CLAYS	LIQUID LIMIT IS GREATER THAN 50	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts.
	Highly Organic Soils		PT	Peat and other highly organic soils.

CLASSIFICATION BASED ON FIELD TESTS

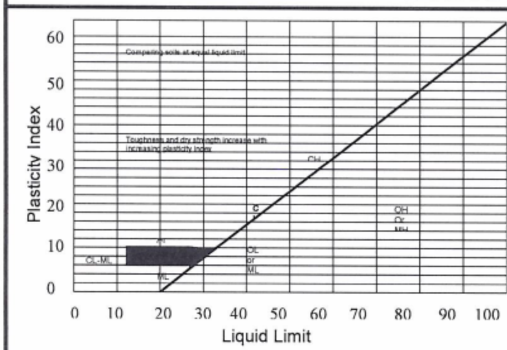
PENETRATION RESISTANCE (PR)	
Sands and Gravels	
Relative Density	Blows/foot
Very loose	0-4
Loose	4-10
Medium Dense	10-30
Dense	30-50
Very Dense	Over 50

Clays and Silts		
Consistency	Blows/foot*	Strength**
Very Soft	0-2	0-½
Soft	2-4	¼-½
Firm	4-8	½-1
Stiff	8-15	1-2
Very Stiff	15-30	2-4
Hard	Over 30	Over 4

*Numbers of blows of 140 lb hammer falling 30 inches to drive a 2-inch O.D. (1 3/8 in. I.D.) Split Barrel sampler (ASTM-1568 Standard Penetration Test)

**Unconfined Compressive strength in tons/sq. ft. Read from pocket penetrometer

CLASSIFICATION CRITERIA BASED ON LAB TESTS



Plasticity chart for laboratory Classification of Fine-grained soils

GW and SW – $C_u = D_{60}/D_{10}$ greater than 4 for GW and 6 for SW; $C_c = (D_{30})^2/D_{10} \times D_{60}$ between 1 and 3

GP and SP – Clean gravel or sand not meeting requirement for GW and SW

GM and SM – Atterberg limit below "A" line or P.I. less than 4

GC and SC – Atterberg limit above "A" line P.I. greater than 7

CLASSIFICATION OF EARTH MATERIAL IS BASED ON FIELD INSPECTION AND SHOULD NOT BE CONSTRUED TO IMPLY LABORATORY ANALYSIS UNLESS SO STATED.

Fines (Silty or Clay)	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Coarse Gravel	Cobbles	Boulders
Sieve Sizes 200	40	10	4	¾"	3"	10"	

GLOBAL GEO-ENGINEERING, INC.

GEOLOGIC AND SOILS ENGINEERING, IRVINE, CALIFORNIA

244 Pico Avenue
San Marcos, California

Date: February 2023

Project No.: 9421-04

Figure No.: B-1

Global Geo-Engineering, Inc.
Irvine, California
Geologists and Geotechnical Engineers

244 Pico Avenue
San Marcos, California

Project 9421-04

LOG OF BORING B-1

Date : May 17, 2022
Logged By : KBY
Diameter of Boring : 6"
Drilling Company : Cal Pac Drilling
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified
Hammer Weight (lbs) : 140
Hammer Drop (in) : 30

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: ▼ Groundwater Encountered; ▽ Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
0							SM		Clayey Silty SAND: fine to medium grained, light reddish brown, slightly moist, medium dense
	Bulk / Ring	7.6	116.7	55					
5							SM/ML		Silty SAND: fine grained, yellow brown, slightly moist, medium dense with SILT interbeds
	Bulk	6.8	112.6	29					
	Ring	12.9	116.2	100					
10									
							ML		Clayey SILT: light reddish to reddish brown, slightly moist to moist, stiff
	Bulk / Ring	15.0	115.5	39					
15									
	Ring	19.3	109.6	38					@19' moist
20									
						▼			
	Ring	15.0	115.4	23			SP		SAND: medium to coarse grained, reddish brown, very moist to wet, medium dense, water encountered
25									

Figure B-2.1

Global Geo-Engineering, Inc. Irvine, California Geologists and Geotechnical Engineers	LOG OF BORING B-1	Drilling Method : Hollow Stem Sampling Method : California Modified Hammer Weight (lbs) : 140 Hammer Drop (in) : 30
244 Pico Avenue San Marcos, California Project 9421-04	Date : May 17, 2022 Logged By : KBY Diameter of Boring : 6" Drilling Company : Cal Pac Drilling Drilling Rig : Mobile B-61	

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: ▼ Groundwater Encountered; ▽ Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
25							SP		
29	Ring	19.5	106.0	18			SP/ML		@29' fine to medium grained with SILT interbeds
34	Ring	17.2	104.9	12					@34' medium grained, olive brown
									ALLUVIUM
37							GR		TONALITE: fine textured, hard
39.5	Ring	9.1	129.3	100					BASEMENT ROCK
40									Bottom of Boring at 40 feet:
45									
50									

Notes:
1. Caving to 23 feet after augers were removed
2. Water encountered at 24', Static water level measured at 23.5'
3. Boring backfilled

Global Geo-Engineering, Inc.
Irvine, California
Geologists and Geotechnical Engineers

244 Pico Avenue
San Marcos, California

Project 9421-04

LOG OF BORING B-2

Date : May 17, 2022
Logged By : KBY
Diameter of Boring : 6"
Drilling Company : Cal Pac Drilling
Drilling Rig : Mobile B-61

Drilling Method : Hollow Stem
Sampling Method : California Modified
Hammer Weight (lbs) : 140
Hammer Drop (in) : 30

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: ▼ Groundwater Encountered; ▽ Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compaction	Water Level	USCS	GRAPHIC	DESCRIPTION
0–3	Ring	13.5	113.8	20			CL/ML		Sandy Silty CLAY: reddish brown, slightly moist, medium stiff with Clayey SILT interbeds
3–9	Ring, Bulk	11.0	107.2	45			ML		Sandy SILT: yellow to light reddish brown, slightly moist, stiff
9–12	Ring	11.2	112.5	35			ML/SM		@9' with Silty SAND interbeds
12–19	Ring	14.0	114.2	48			ML		Clayey SILT: olive gray to light reddish brown, slightly moist, stiff
19–20	Ring	12.0	113.4	20			SM		Clayey Silty SAND: fine to medium grained, light reddish brown, moist, medium dense ALLUVIUM

Bottom of Boring at 20 feet:

Notes:
1. Caving to 15.5 feet after augers were removed
2. No groundwater or seepage encountered
3. Boring backfilled

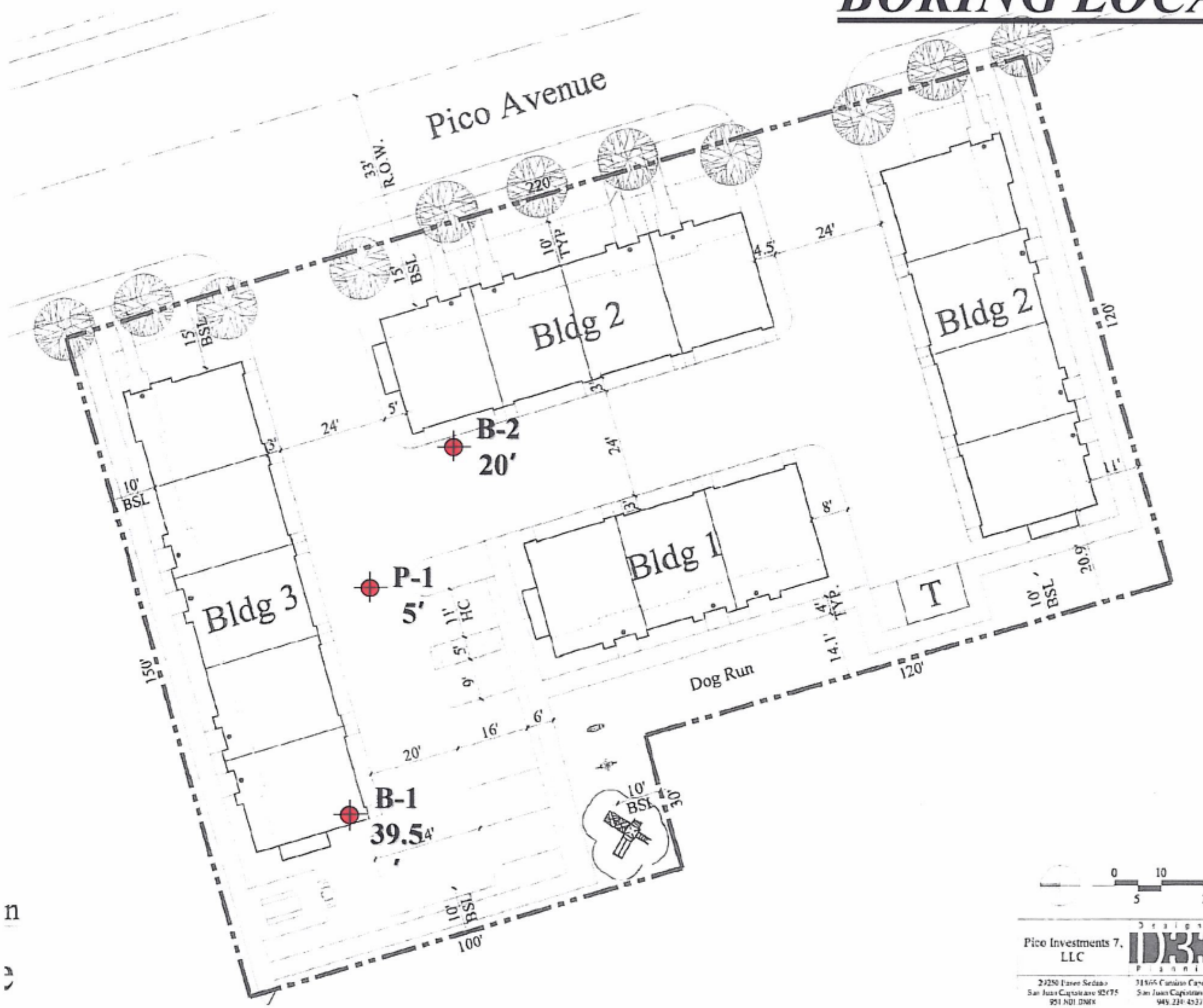
Global Geo-Engineering, Inc. Irvine, California Geologists and Geotechnical Engineers	LOG OF BORING P-1	Drilling Method : Hollow Stem Sampling Method : California Modified Hammer Weight (lbs) : 140 Hammer Drop (in) : 30
244 Pico Avenue San Marcos, California Project 9421-04	Date : May 17, 2022 Logged By : KBY Diameter of Boring : 8" Drilling Company : Cal Pac Drilling Drilling Rig : Mobile B-61	

Sample Type: Ring; Bulk; Standard Penetration Testing

Water Levels: ▼ Groundwater Encountered; ▽ Seepage Encountered

Depth in Feet	Sample	Field Moisture % Dry Weight	Dry Density lb./cubic ft.	Blow Count	Relative Compactior	Water Level	USCS	GRAPHIC	DESCRIPTION
0–5							SM		Clayey Silty SAND: fine grained, reddish brown, slightly moist, medium dense ALLUVIUM
5									Bottom of Boring at 5 feet: Notes: 1. No groundwater or seepage encountered 2. 3-inch perforated pipe installed; Pipe encased with 3/4-inch diameter gravel rock
10									
15									
20									
25									

BORING LOCATION PLAN



Not to Scale

Pico Investments 7, LLC

KEY

- B-2 20′ — Approximate Location of Boring, Showing Total Depth
- P-1 5′ — Approximate Location of Percolation Boring, Showing Total Depth

GLOBAL GEO-ENGINEERING, INC.

GEOLOGIC AND SOILS ENGINEERING IRVINE, CALIFORNIA

244 Pico Avenue
San Marcos, California

Date: February 2023

Project No.: 9421-04

Figure No: B-5

APPENDIX C

Laboratory Testing Program

The laboratory-testing program was directed towards providing quantitative data relating to the relevant engineering properties of the soils. Samples considered representative of site conditions were tested as described below.

a) Moisture and Density

Moisture-density information usually provides a gross indication of soil consistency. Local variations at the time of the investigation can be delineated, and a correlation obtained between soils found on this site and nearby sites. The dry unit weights and field moisture contents were determined for selected samples. The results are shown on the Logs of Borings.

b) Compaction

A representative soil sample was tested in the laboratory to determine the maximum dry density and optimum moisture content, using the ASTM D1557 compaction test method. This test procedure requires 25 blows of a 10-pound hammer falling a height of 18 inches on each of five layers, in a 1/30 cubic foot cylinder. The results of the test are presented below.

Boring No.	Sample Depth (ft.)	Soil Description	Optimum Moisture Content (%)	Maximum Dry Density (lb/ft^3)
B-1	1-3	Clayey Silty SAND	9.9	127.3

c) Direct Shear

Direct shear tests were made on remolded samples, using a direct shear machine at a constant rate of strain. Variable normal or confining loads are applied vertically and the soil shear strengths are obtained at these loads. The angle of internal friction and the cohesion are then evaluated. The samples were tested at saturated moisture contents. The results are shown below in terms of the Coulomb shear strength parameters.

Boring No.	Sample Depth (ft)	Soil Description	Coulomb Cohesion (lb/ft^2)	Angle of Internal Friction (°)	Peak/Residual
B-1	1-3	Clayey Silty SAND	250 250	29 29	Peak Ultimate

d) Sulfate Content

A representative soil sample was analyzed for its sulphate content. The results are given below:

Boring No.	Sample Depth (ft.)	Soil Description	Sulphate Content (%)
B-1	1-3	Clayey Silty SAND	0.0026

e) Chloride Content

A representative soil sample was analyzed for chloride content in accordance with California Test Method CA422. The result is given below:

Boring No.	Sample Depth (ft)	Soil Description	Chloride Content (%)
B-1	1-3	Clayey Silty SAND	0.0023

f) Resistivity and pH

A representative soil sample was analyzed in accordance with California Test Methods CA532 and CA643 to determine the minimum resistivity and pH. The result is provided below:

Boring No.	Sample Depth (ft)	Soil Description	pH	Minimum Resistivity (Ohm-cm)
B-1	1-3	Clayey Silty SAND	8.1	3,339

g) Expansion Potential

Surface soils were collected in the field and tested in the laboratory in accordance with the ASTM Test Designation D4829. The degree of expansion potential is determined from soil volume changes occurring during saturation of the specimen. The results of the tests are presented below:

Boring No.	Sample Depth (ft)	Soil Description	Expansion Index	Expansion Potential
B-2	2	Sandy Silty CLAY	70	Medium