Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental, and Civil Engineering

September 1, 2022

Design Collaborative Studios
5762 Lincoln Ave, #381
Cypress, CA 90630

Attention: Mr. David Ke

Subject: Report of Geotechnical Engineering Investigation, Proposed Residential Development, Vacant Lot of Marvin Drive, APN 059-805-123 Yucca Valley, California. CLE Project No.: 21-019-076GE

Gentlemen:

In accordance with your request, CalLand Engineering (CLE) is pleased to submit this Geotechnical Engineering Report for the subject site. The purpose of this report was to evaluate the subsurface conditions and provide recommendations for foundation designs and other relevant parameters of the proposed construction.

Based on the findings and observations during our investigation, the proposed construction of the subject site for the intended use is considered feasible from the geotechnical engineering viewpoints, provided that specific recommendations set forth herein are followed.

This opportunity to be of service is sincerely appreciated. If you have any questions pertaining to this report, please call the undersigned.

Respectfully submitted,
Cal Land Engineering, Inc. (CLE)
dba Quartech Consultants (QCI)

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REPORT OF GEOTECHNICAL ENGINEERING INVESTIGATION

Proposed Residential Development

Vacant Lot of Marvin Drive
APN 059-805-123
Yucca Valley, California

Prepared by
CALLAND ENGINEERING (CLE)
Project No.: 21-019-076GE
September 1, 2022

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1.0 INTRODUCTION

1.1 Purpose

This report presents a summary of our preliminary geotechnical engineering investigation for the proposed construction at the subject site. The purposes of this investigation were to evaluate the subsurface conditions at the area of proposed construction and to provide recommendations pertinent to grading, foundation design and other relevant parameters of the development.

1.2 Scope of Services

Our scope of services included:

- Review of available soil engineering data of the area.
- Our subsurface investigation consisted of excavation of logging and sampling of two 6-inch diameter hand auger borings to a maximum depth of 11.0 feet below the existing grade at the subject site. The exploration was logged by a CLE engineer. Boring logs are presented in Appendix A.
- Laboratory testing of representative samples to establish engineering characteristics of the on-site soil. The laboratory test results are presented in Appendices A and B.
- Engineering analyses of the geotechnical data obtained from our background studies, field investigation, and laboratory testing.
- Preparation of this report presenting our findings, conclusions, and recommendations for the proposed construction.

1.3 Proposed Construction

The subject site would be used for single-family residence constructions and associated improvements. It is our understanding that two-story single family residence with attached carport are proposed to be constructed on the lot. The proposed buildings are anticipated to be two story wood frame structures with concrete slab-on-grade. Column loads are unknown at this time, but are expected to be light to medium. Minor cut and fill grading operation is anticipated to reach the desired grades.

1.4 Site Location

The project site is located south of Ocotillo Drive, between Marvin Drive and Paradise View Road, a relatively short distance west of Yucca Mesa Road, in the City of Yucca Valley, California. The lot size is approximately 4.5 acres. The site is currently vacant. No major surface erosions were observed during our subsurface investigation.

2.0 SUBSURFACE EXPLORATION AND LABORATORY TESTING

2.1 Subsurface Exploration

Our subsurface investigation consisted of excavation of logging and sampling of two 6-inch diameter hand auger borings to a maximum depth of 11.0 feet at the locations shown on the attached Site Plan, Figure 2. The drilling of the borings was supervised and logged by a CLE's engineer. Relatively undisturbed and bulk samples were collected for laboratory testing. Boring logs are presented in Appendix A.

2.2 Laboratory Testing

Representative samples were tested for the following parameters: in-situ moisture content and density, consolidation, direct shear strength, expansion index, percent of fines and corrosion potential. Results of our laboratory testing along with a summary of the testing procedures are presented in Appendix B. In-situ moisture and density test results are presented on the boring logs in Appendix A.

3.0 SUMMARY OF GEOTECHNICAL CONDITIONS

3.1 Soil Conditions

Based on our review of the regional geology map by Dibblee, T.W., 1967 (Figure 1a) and our subsurface exploration, it is concluded that the site is underlain by the previously placed fill and alluvium of sand and gravel. Description of the subsurface materials is provided as follows:

The onsite near surface soils consist predominantly of medium grained silty sand (SM). In general, these soils exist in white to gray, medium dense and slightly moist conditions. Underlying the surface soils, fine grained silty sand (SM), coarse grained sand and silty sand mixtures (SP-SM) and coarse grained reddish brown clayey sand (SC) were disclosed in the borings to the depths explored (11.0 feet below the existing ground surface). These soils exist in medium dense to dense and slightly moist to very moist conditions.

3.2 Groundwater

No groundwater or seepage was encountered in the test borings to the depths explored. Groundwater is not expected during the proposed construction.

4.0 SEISMICITY

4.1 Faulting and Seismicity

The subject site, like the rest of Southern California, is located within a seismically active region as a result of being located near the active margin between the North American and Pacific tectonic plates. The principal source of seismic activity is movement along the northwest-trending regional faults such as the San Andreas, San Jacinto and Elsinore fault zones. These fault systems produce approximately 5 to 35 millimeters per year of slip between the plates.

We consider the most significant geologic hazard to be the potential for moderate to strong seismic shaking that is likely to occur at the subject site. The subject site is located in the highly seismic Southern California region within the influence of several faults that are considered to be Holocene-active or pre-Holocene faults. A Holocene-active fault is defined by the State of California as a fault that has exhibited surface displacement within the Holocene time (about the last 11,700 years). A pre-Holocene fault is defined by the State as a fault whose history of past movement is older than 11,700 years ago and does not meet the criteria for a Holocene-active fault.

These Holocene-active and pre-Holocene faults are capable of producing potentially damaging seismic shaking at the site. It is anticipated that the subject site will periodically experience ground acceleration as the result of small to moderate magnitude earthquakes. Other active faults without surface expression (blind faults) or other potentially active seismic sources that are not currently zoned and may be capable of generating an earthquake are known to be present under in the region.

The subject site is not included within any Earthquake Fault Zones as created by the Alquist-Priolo Earthquake Fault Zoning Act (CGS, 2018). Our review of geologic literature pertaining to the site area indicates that there are no known active or potentially active faults located within or immediately adjacent to the subject property.

As indicated in Table 1, the Pinto Mtn fault zones are considered to have the most significant effect to the site from a design standpoint.

TABLE 1

Characteristics and Estimated Earthquakes for Regional Faults

Fault Name	Approximate Distance to Site (mile)	Maximum Magnitude Earthquake (Mw)
Pinto Mtn	1.5	7.3
Eureka Peak	2.7	6.7
Landers	3.0	7.4
Burnt Mtn	3.3	6.8
So Emerson-Copper Mtn	8.2	7.1
Calico-Hidalgo	11.7	7.4
Johnson Valley (No)	11.9	6.9
North Frontal (East)	13.8	7.0
Pisgah-Bullion Mtn-Mesquite Lk	17.0	7.3

Reference: 2008 National Seismic Hazard Maps - Source Parameters

4.2 Estimated Earthquake Ground Motions

In order to estimate the seismic ground motions at the subject site, CLE has utilized the seismic hazard map published by California Geological Survey. According to this report, the peak ground Alluvium acceleration at the subject site for a 2% and 10% probability of exceedance in 50 years is about 0.792g and 0.478g respectively (2008 USGS Interactive Deaggregation). Site modified peak ground acceleration (PGA_M), corresponding to USGS Design Map Summary Report, ASCE 7-16 Standard, is 1.059 g.

4.3 Seismic Design Criteria

Based on our studies on seismicity, there are no known active faults crossing the property. However, the subject site is located in Southern California, which is a tectonically active area. Based on the ASCE 7-16 Standard, CBC 2019, the following seismic related values may be used:

Seismic Parameters (Latitude: 34.15633341, Longitude: -116.37231807)	Site Class "D"
Mapped 0.2 Sec Period Spectral Acceleration, $\mathbf{S_S}$	2.128g
Mapped 1.0 Sec Period Spectral Acceleration, $\mathbf{S_1}$	0.780g
Site Coefficient for Site Class "D", $\mathbf{F_a}$	1.2
Site Coefficient for Site Class "D", $\mathbf{F_v}$	1.7
Maximum Considered Earthquake Spectral Response Acceleration Parameter at 0.2 Second, $\mathbf{S_{MS}}$	2.554g
Maximum Considered Earthquake Spectral Response Acceleration Parameter at 1.0 Second, $\mathbf{S_{M1}}$	1.326g
Design Spectral Response Acceleration Parameters for 0.2 sec, $\mathbf{S_{DS}}$	1.702g
Design Spectral Response Acceleration Parameters for 1.0 Sec, $\mathbf{S_{D1}}$	0.884g

The Project Structural Engineer should be aware of the information provided above to determine if any additional structural strengthening is warranted.

5.0 SEISMIC HAZARDS

5.1 Liquefaction

Based on our review of the "Earthquake Zones of Required Investigation" by the California Geological Services, CGS, it is concluded that the site is not located in the mapped potential liquefaction areas.

Although the property is not located in seismic induced hazard area, the seismic induced hazard may occur at the site. The property owner should be aware of the potential risks associated with the probability of seismic hazard occurrence. It is recommended that the proposed structures be designed and constructed in accordance with the recommendations presented in this report and the current building codes and supported by the strengthened foundation as recommended in this report to reduce the potential of any adverse effect as the results of the potential earthquake.

5.2 Landsliding

A potential for landsliding is often suggested in areas of moderate to steep terrain that is underlain by weak or un-favorably oriented geological conditions. Neither of these conditions exists at the site. Due to the relatively flat nature of the site, it is our opinion that the potential for landslide is remote.

5.3 Lurching

Soil lurching refers to the rolling motion on the surface due to the passage of seismic surface waves. Effects of this nature are not considered significant on the subject site where the thickness of alluvium does not vary appreciably under structures.

5.4 Surface Rupture

Surface rupture is a break in the ground surface during or as a consequence of seismic activity. The potential for surface rupture on the subject site is considered low due to the absence of known active faults at the site.

5.5 Ground Shaking

Throughout southern California, ground shaking, as a result of earthquakes, is a constant potential hazard. The relative potential for damage from this hazard is a function of the type and magnitude of earthquake events and the distance of the subject site from the event. Accordingly, proposed structures should be designed and constructed in accordance with applicable portions of the building code.

5.6 Other Secondary Hazard

5.6.1 Fault Rupture

The “Earthquake Zones of Required Investigation” by the California Geological Survey (CGS, Formerly Department of Conservation, Division of Mines and Geology) indicated that the site is not located within the Burnt Mountain Fault zone. However, fault Activity Map of California shows that the site is very close and on the edge of the Burnt Mountain Fault. National Seismic Hazard Maps (2008 National Seismic Hazard Maps-Source Parameters) points out that the Pinto Mountain Fault is located approximately 1.5 miles of the site. Therefore, the likelihood of a fault surface rupture is considered to be low.

5.6.2 Seiches and Tsunamis

Seiches are large waves generated in enclosed bodies of water as the results of major ground shaking. The site is located within the residential area in the City of Yucca Valley. No water retaining structures are located immediately adjacent to site. Earthquake induced flooding, tsunamis and seiches is considered unlikely at the site.

5.6.3 Expansive Soils

Soil expansion is the tendency of the soil to expand when the soil contacts with water. Based on our laboratory test of the onsite soils, it is concluded that onsite soils are very low in expansion potential. Foundation design and construction should be designed in accordance with the current building code report to reduce the potential of any adverse effect as the results of the expansive soils.

5.6.4 Oil Field and Historical Oil Wells

Based on our review of the Munger Map Book of the California Oil and Gas Field, no oil wells are located on the subject property or any adjacent properties. It is our opinion that the potential of the presence of the methane zone at the site is considered low. However, should it be determined that the methane study is required, a qualified consultant should be retained for the study.

5.6.5 Subsidence

Land subsidence occurs when large amounts of groundwater, oil or gas have been withdrawn from fine-grained soils. It is our understanding that large scale extraction of groundwater, oil or gas is not planned at the site. The land subsidence at site appears to be unlikely.

6.0 CONCLUSIONS

Based on our subsurface investigation, it is our opinion that the proposed construction is feasible from a geotechnical standpoint, provided the recommendations contained herein are incorporated in the design and construction. The following is a summary of the geotechnical design and construction factors that may affect the development of the site:

6.1 Seismicity

Based on our studies on seismicity, there are no known active faults crossing the property. However, the site is located in a seismically active region and is subject to seismically induced ground shaking from nearby and distant faults, which is a characteristic of all Southern California.

6.2 Seismic Induced Hazard

Based on our review of the "San Bernardino County Land Use Plan, general Plan, Geologic Hazard Overlays" (Figure 1b), it is concluded that the site is not located in the mapped potential liquefaction areas.

6.3 Excavatability

Based on our subsurface investigation, excavation of the subsurface materials should be accomplished with conventional earthwork equipment.

6.4 Surficial Soil Removal and Recompaction

Based on our investigation, it is concluded that the existing surficial soils may not be suitable for structure support as they presently exist and will require remedial grading as discussed herein.

6.5 Groundwater

Groundwater was not encountered during our field exploration. In our opinion, groundwater will not be a problem during construction.

7.0 RECOMMENDATIONS

Based on the subsurface conditions exposed during field investigation and laboratory testing program, it is recommended that the following recommendations be incorporated in the design and construction phases of the project.

7.1 Grading

7.1.1 Site Preparation

Prior to initiating grading operations, any existing vegetation, trash, debris, over-sized materials (greater than 8 inches), and other deleterious materials within construction areas should be removed from the subject site.

7.1.2 Surficial Soil Removals

Based on our field exploration and laboratory data obtained to date, it is recommended that the existing surficial soils be removed to a minimum depth of 4 feet below the existing grade or two feet below the bottom of the footing, whichever is deeper. The recommended removal should be extended at least 4 feet beyond building lines. The existing near surface soils should also be removed to a depth of about 12-inches within the proposed driveway and concrete flatwork areas. Locally deeper removals may be necessary to expose competent natural ground. The actual removal depths should be determined in the field as conditions are exposed. Visual inspection and/or testing may be used to define removal requirements.

7.1.3 Treatment of Removal Bottoms

Soils exposed within areas approved for fill placement should be scarified to a depth of 6 to 10 inches, conditioned to near optimum moisture content, then compacted in-place to minimum project standards.

7.1.4 Structural Backfill

The onsite soils may be used as compacted fill provided they are free of organic materials and debris. Fills should be placed in relatively thin lifts (6 to 8 inches), brought to near optimum moisture content, and then compacted to at least 90 percent relative compaction based on laboratory standard ASTM D-1557-12.

7.2 Shallow Foundation Design

7.2.1 Bearing Value

An allowable bearing value of 2000 pounds per square foot (psf) may be used for design of continuous and pad footings with a minimum of 12 and 24 inches in width, respectively. This value may be increased by one third (1/3) when considering short duration seismic or wind loads.

All proposed footings should be founded on competent soils and at the depth of at least 24 inches below the lowest adjacent grade. All foundation excavations should be approved by the project geotechnical consultant.

7.2.2 Settlement

Settlement of the footings placed as recommended, and subject to no more than allowable loads is not anticipated to exceed 3/4 inch. Differential settlement between adjacent columns is not anticipated to exceed 1/2 inch.

7.2.3 Lateral Pressures

Passive earth pressure may be computed as an equivalent fluid pressure of 300 pcf, with a maximum earth pressure of 2000 psf. An allowable coefficient of friction between soil and concrete of 0.30 may be used with the dead load forces. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one third (1/3).

7.3 Foundation Construction

It is anticipated that the entire structure will be underlain by onsite soils of very low expansion potential. All footings should be founded at a minimum depth of 24 inches below the lowest adjacent ground surface. All continuous footings should have at least two No. 4 reinforcing bar placed both at the top and two No. 4 reinforcing bar placed at the bottom of the footings.

7.4 Concrete Slab and Flatworks

Concrete flatworks and concrete slabs should be a minimum of 4 inches thick and reinforced with a minimum of No. 4 reinforcing bar spaced 16-inch each way or it’s equivalent. All slab reinforcement should be supported to ensure proper positioning during placement of concrete.

In order to comply with the requirements of the 2019 CalGreen Section 4.505.2.1 within the moisture sensitive concrete slabs, a minimum of 4-inch thick base of ½ inch or larger clean aggregate should be provided with a vapor barrier in direct contact with concrete. A 15-mil “Stego Wrap” vapor retarder, with joints lapped not less than 6 inches, should be placed above the aggregate and in direct contact with the concrete slab. As an alternate method, 2 inches of sand then 10-mil polyethylene membrane and another 2 inches of sand over the membrane and under the concrete may be used, provided this request for an alternative method, is approved by City Building Officials.

7.5 Pool/Spa Design Recommendations

Considering that the construction of the pool will be removed the existing soils and excavated soils will then be replaced with the pool and water, the relief of the stress of the underlain soils due the pool construction is approximately balance or less by the applied stress of the pool, resulting negligible net stress. As the result, there consolidation settlement experienced in the planned pool may be minimal.

The following presents our general recommendations for the proposed pools/spas at the subject site. The site's underlying materials have been determined to be high in expansion potential. Provided below are general design, construction and inspection recommendations:

1. Pool walls need to be designed to account for the expansive soil conditions. An equivalent fluid pressure of 85 pcf should be used in the design of pool walls. The entire pool walls shall be designed as "freestanding" walls. Pool shell should be designed on the recommendations of the pool engineer.

2. The actual expansiveness of soils exposed in pool excavations should be determined upon completion of the excavation as pool subgrade soils are exposed.

3. Pools and spas should conform to setback criteria pertaining to slopes as established in applicable section of the current Building Code.

4. Hydrostatic pressure relief valves may be incorporated into the pool and spa design.

5. All fittings and pipe joints, particularly fittings in the side of the pool or spa, should be properly sealed to prevent water from leaking into the adjacent soil materials.

6. An elastic expansion joint (waterproof sealant) should be installed to prevent water from seeping into the soil at all deck joints.

7. A reinforced grade beam should be placed around the skimmers to provide support and mitigate cracking around the skimmer face.

8. The design engineer and/or contractor should determine joint and saw cut locations for the pool deck. However, spacing should not exceed 6 feet.

9. It is imperative that the homeowners into their overall improvement scheme incorporate adequate provisions for surface drainage. Ponding water, ground saturation and flows over slope faces are all situations that must be avoided.

10. The subgrade soils beneath the pool deck should be graded to fall to a central drainage area. The rate of slope to this drainage area would be available starting at the lowest elevation of pool plumbing on the side of the pool (excluding bottom drains).

11. At the central drainage area, a six-inch-square trench (minimum) should be excavated with a minimum 0.5 percent fall to a convenient outlet outside and beyond the pool complex area.

12. To retard irrigation waters from penetrating the subgrade underlying the pool deck, a cut-off wall should be placed along the outer diameter of the deck.

7.5 Temporary Excavation and Backfill

All trench excavations should conform to CAL-OSHA and local safety codes. All utilities trench backfill should be brought to near optimum moisture content and then compacted to obtain a minimum relative compaction of 90 percent of ASTM D-1557-12. All temporary excavations should be observed by a field engineer of this office so as to evaluate the suitability of the excavation to the exposed soil conditions.

It should be noted that the site is underlain by sandy soil of low in apparent cohesion. Caving and/or sloughing may occur during the prolonged trench excavation. It is recommended that limit the length of deep trench excavation at any time and minimize the time between excavation and filling operation. Leaving any excavation open and unsupported greatly increases the risk for caving. Trench backcuts should be excavated and filled continuously in an expeditious manner.

8.0 INSPECTION

As a necessary requisite to the use of this report, the following inspection is recommended:

- Temporary excavations.
- Removal of surficial and unsuitable soils.
- Backfill placement and compaction.
- Utility trench backfill.

The geotechnical engineer should be notified at least 1 day in advance of the start of construction. A joint meeting between the client, the contractor, and the geotechnical engineer is recommended prior to the start of construction to discuss specific procedures and scheduling.

9.0 CORROSION POTENTIAL

Chemical laboratory tests were conducted on the existing onsite near surface materials sampled during CLE's field investigation to aid in evaluation of soil corrosion potential and the attack on concrete by sulfate soils. The testing results are presented in Appendix B.

According to 2019 CBC and ACI 318-19, a "negligible" exposure to sulfate can be expected for concrete placed in contact with the onsite soils. Therefore, Type II cement or its equivalent may be used for this project. Based on the resistivity test results, it is estimated that the subsurface soils are moderately corrosive to buried metal pipe. It is recommended that any underground steel utilities be blasted and given protective coating. Should additional protective measures be warranted, a corrosion specialist should be consulted.

10.0 REMARKS

The conclusions and recommendations contained herein are based on the findings and observations at the exploratory locations. However, soil materials may vary in characteristics between locations of the exploratory locations. If conditions are encountered during construction, which appear to be different from those disclosed by the exploratory work, this office should be notified so as to recommend the need for modifications.

This report has been prepared in accordance with generally accepted professional engineering principles and practice. No warranty is expressed or implied. This report is subject to review by controlling public agencies having jurisdiction.

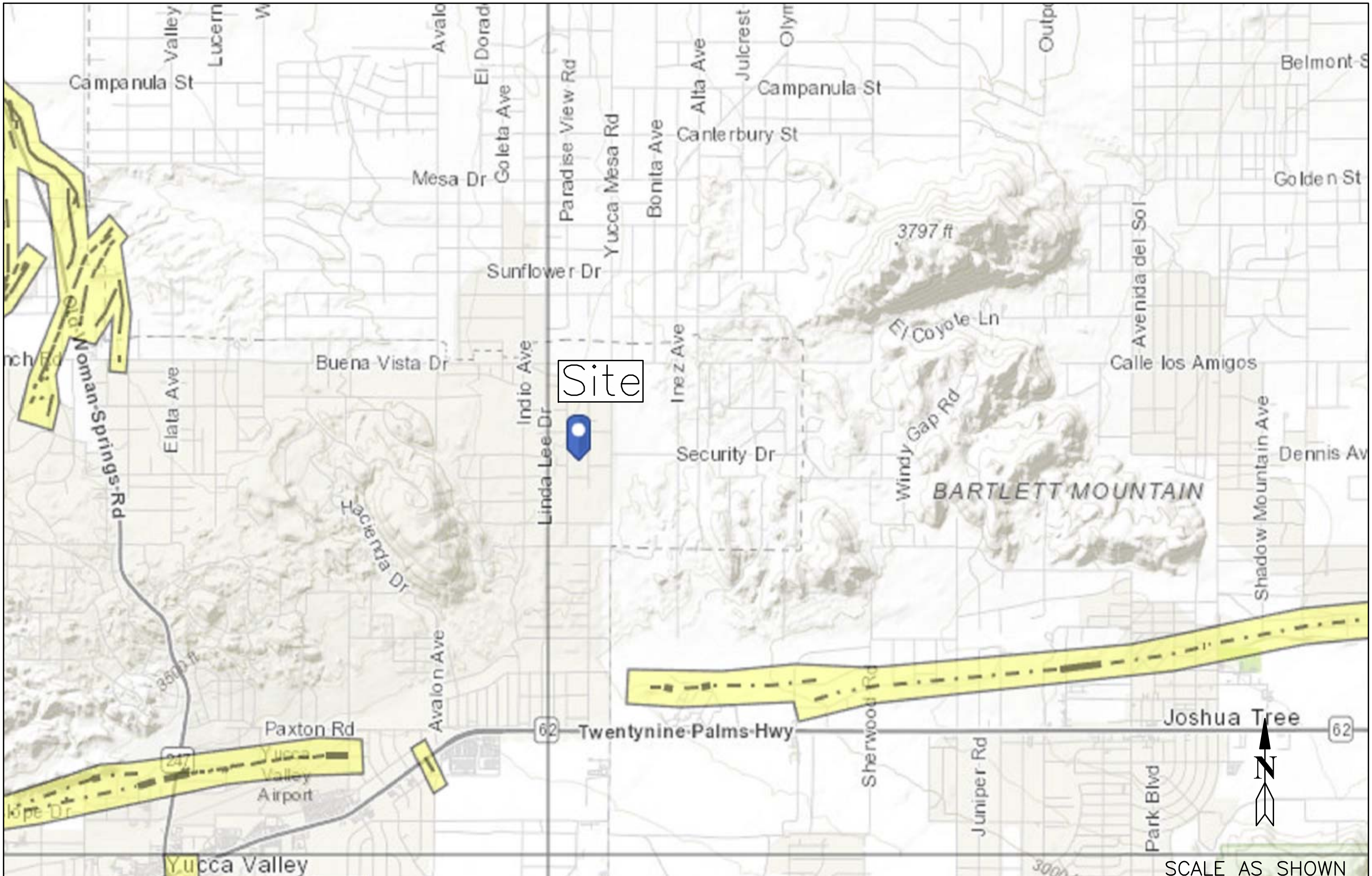
11.0 REFERENCES

"Earthquake Hazards Program, Seismic Design Maps and tools", ASCE 7-16 Standard

https://earthquake.usgs.gov/hazards/interactive/

https://earthquake.usgs.gov/cfusion/hazfaults_2008_search/query_main.cfm
Interactive Deaggregation National Seismic Hazard Maps-Source Parameters

http://cms.sbcounty.gov/lus/planning/zoningoverlaymaps/geologichazardmaps.aspx



Maps modified from "Seismic Hazard Zone" by California Geological Survey

CAL LAND
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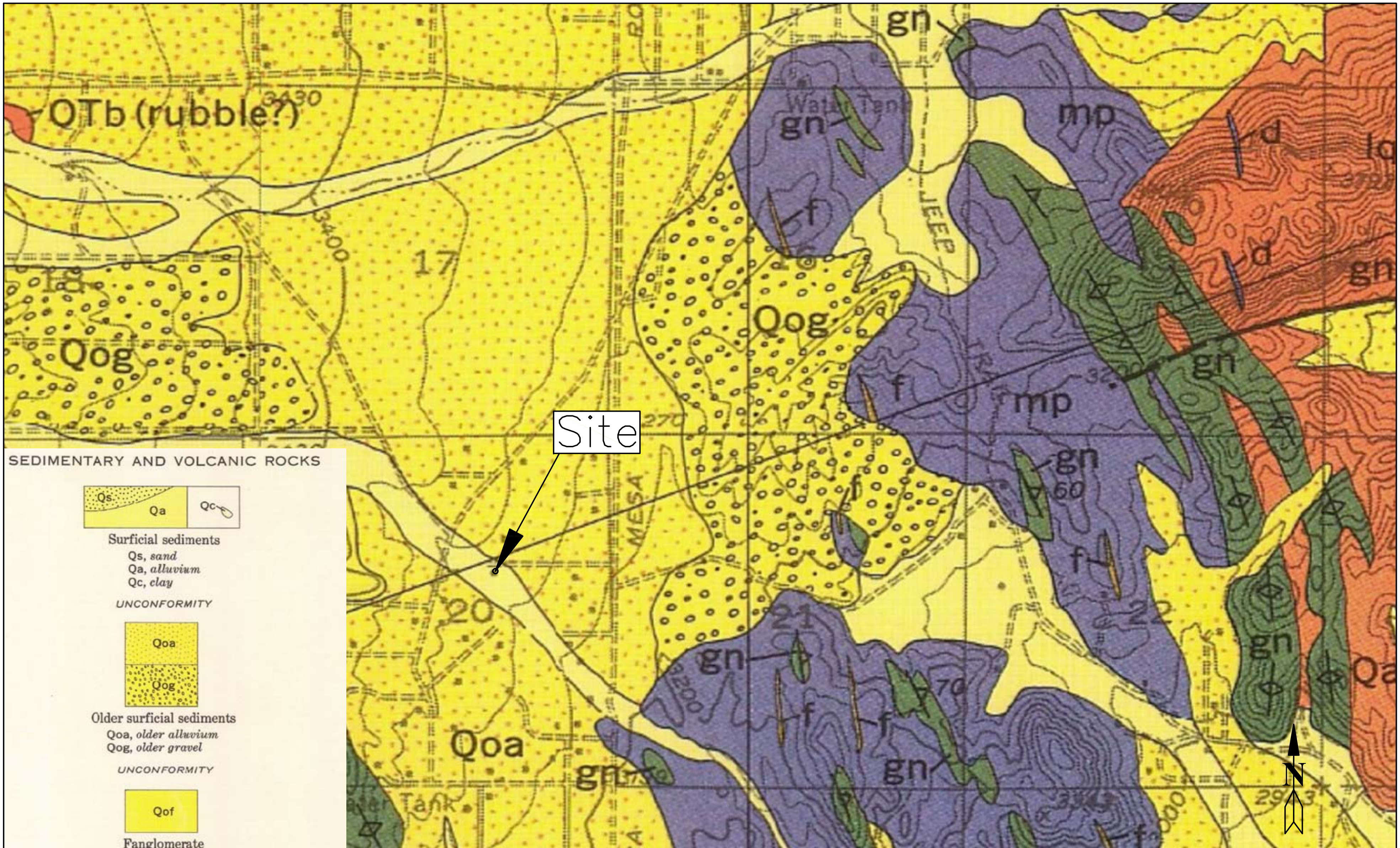
Site Location Map

Vacant Lot of Marvin Drive & Oleander Street, Yucca Valley, California

Project No.: 21–019–076

FIGURE 1



SCALE AS SHOWN

Maps modified from "Geologic map of the Joshua Tree quadrangle, San Bernardino and Riverside Counties, California by Thomas W. Dibblee, 1967

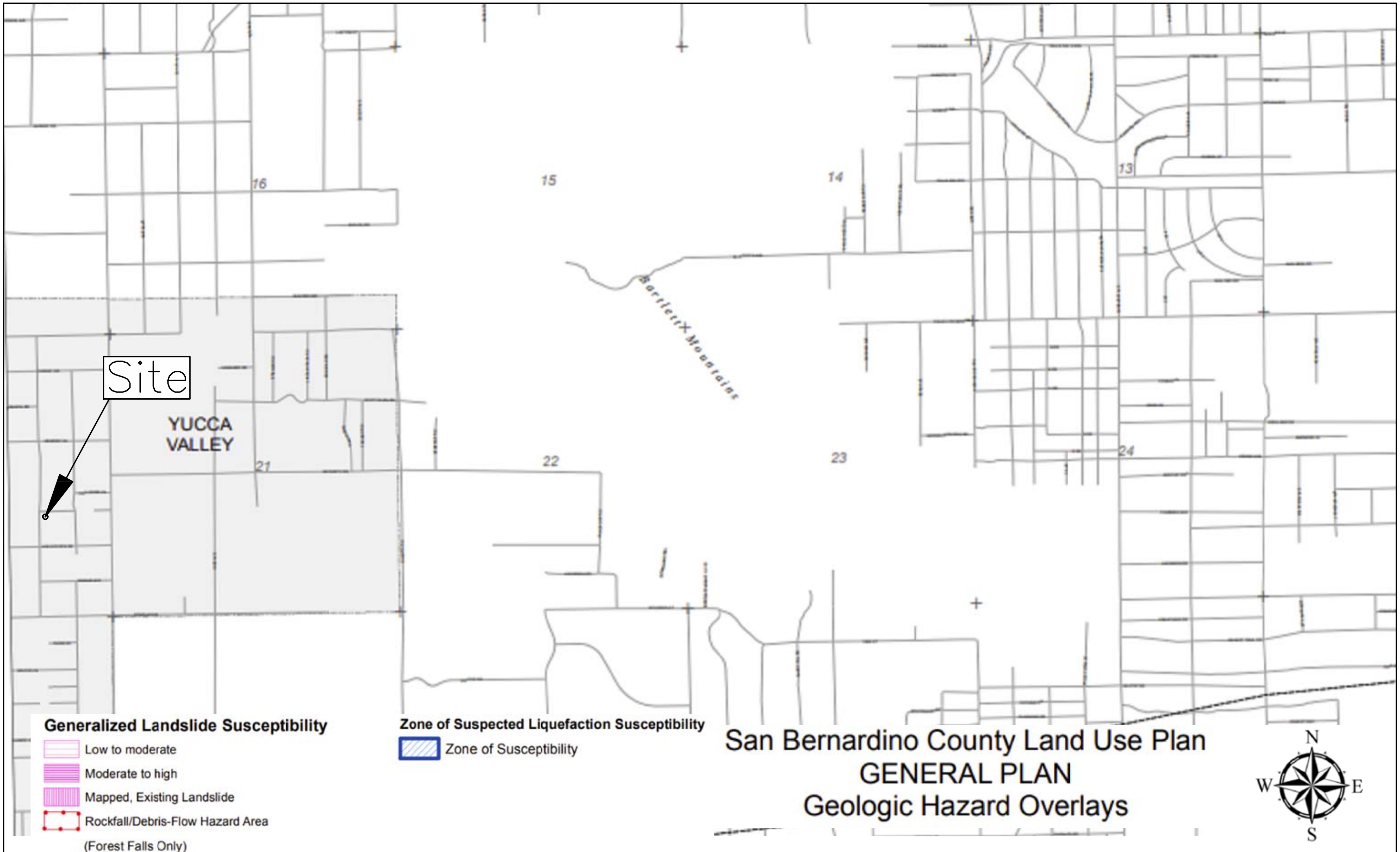
CAL LAND ENGINEERING & ASSOCIATES, Inc.

Regional Geology Map

Vacant Lot of Marvin Drive & Oleander Street, Yucca Valley, California

Project No.: 21-019-076

FIGURE 1a



SCALE AS SHOWN

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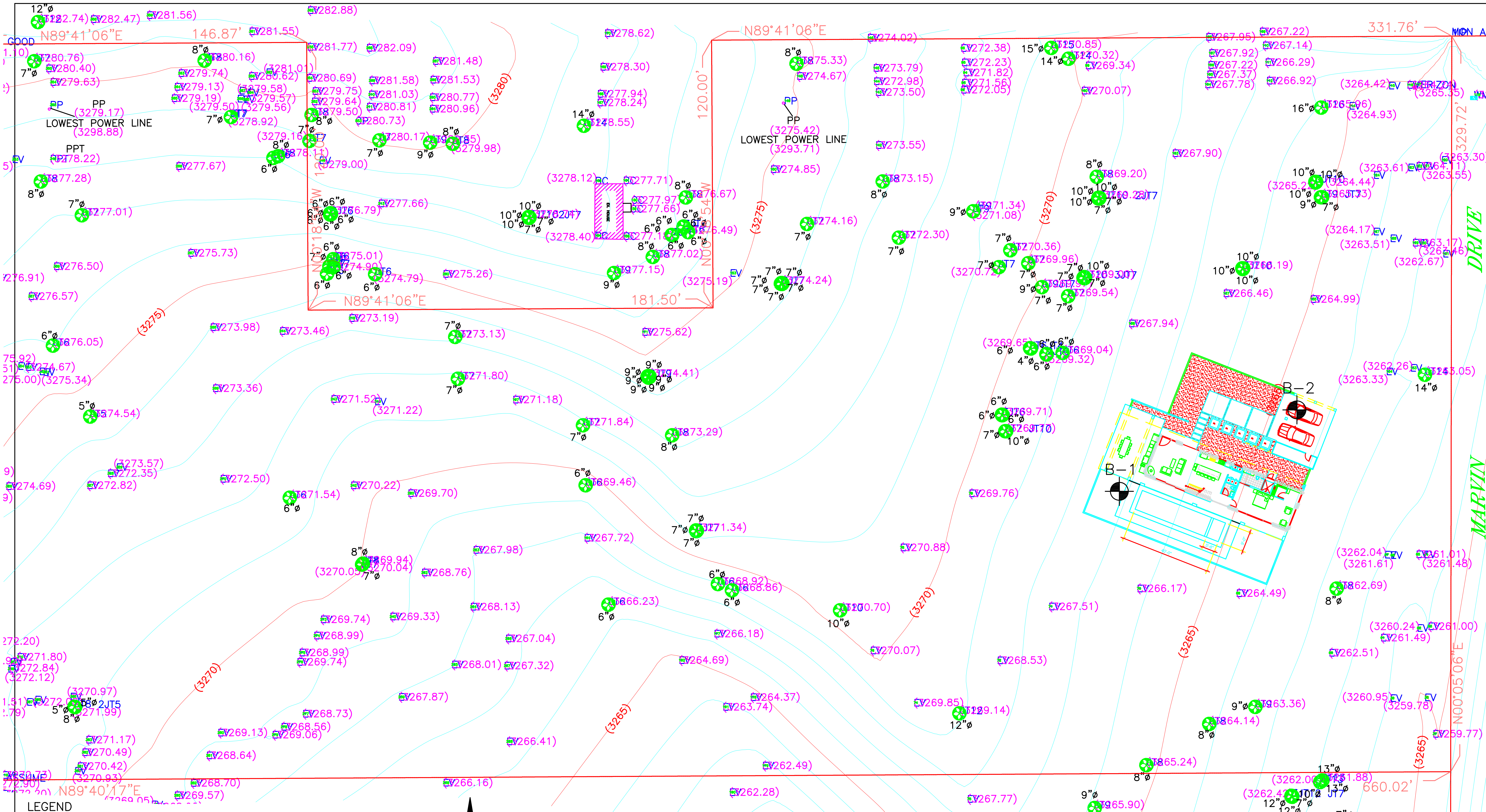
Seismic Hazard Zones Map

Vacant Lot of Marvin Drive & Oleander Street, Yucca Valley, California

Project No.: 21-019-076

FIGURE 1b



LEGEND

B-1 Approximate Boring Location

A—A Cross Section

SCALE: 1" = 40'

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SITE PLAN

Vacant Lot of Marvin Drive & Oleander Street, Yucca Valley, California

Project No.: 21-019-076

FIGURE 2

APPENDIX A
FIELD INVESTIGATION

Subsurface conditions were explored by drilling two 6-inch diameter hand auger borings to a maximum depth of 11.0 feet below the existing grade at the subject site at approximate locations shown on the enclosed Site Plan, Figure 2.

The drilling of the boring was supervised by a CLE's engineer, who continuously logged the borings and visually classified the soils in accordance with the Unified Soil Classification System. Ring and bulk samples were taken at frequent intervals. These samples were obtained by driving a sampler with successive blows of 32-pound hammer dropping from a height of 48inches.

Representative undisturbed samples of the subsurface soils were retained in a series of brass rings, each having an inside diameter of 2.42 inches and a height of 1.00 inch. All ring samples were transported to our laboratory. Bulk surface soil samples were also collected for additional classification and testing.

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BORING LOG B-1

PROJECT LOCATION: Vacant Lot of Marvin Dr, Yucca Valley, CA
PROJECT NO.: 21-019-076

DATE DRILLED: 7/28/2022
SAMPLE METHOD: Hand Auger
ELEVATION: N/A
LOGGED BY: HF

B: Bulk Bag
S: Standard Penetration Test
R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/12"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
	B			SM		2.2	Silty sand, fine grained, white to gray, slightly moist, medium dense Percent of Fines: 19.8
2		R	32	SM	102.6	7.6	Silty sand, fine grained, white to gray, slightly moist, medium dense
5		R	41	SM	113.4	3.4	Silty sand, fine grained, white to gray, slightly moist, medium dense Percent of Fines: 14.1
10		R	50	SC	116.5	13.1	Clayey sand, coarse grained, reddish brown, moist to very moist, dense Percent of Fines: 26.5
15							Total Depth: 11.0 feet No Groundwater Hole Backfilled Hammer Driving Weight: 32 lbs Hammer Driving Height: 48 inches
20							
25							
30							
35							

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BORING LOG B-2

PROJECT LOCATION: Vacant Lot of Marvin Dr, Yucca Valley, CA
PROJECT NO.: 21-019-076

DATE DRILLED: 7/28/2022
SAMPLE METHOD: Hand Auger
ELEVATION: N/A
LOGGED BY: HF

B: Bulk Bag
S: Standard Penetration Test
R: Ring Sample

Depth (ft)	Sample: Bulk	Sample: Undisturbed	Sample: Blows/12"	USCS Symbol	Dry Unit Wt. (pcf)	Moisture (%)	Description of Material
2		R	40	SM	112.5	2.0	Silty sand, medium grained, gravelly, light brown, slighly moist, medium dense
5		R	47	SP/ SM	120.4	1.9	Sand and silty sand, coarse grained, light brown, slighly moist, dense Percent of Fines: 5.3
10							
15							Total Depth: 6.0 feet No Groundwater Hole Backfilled Hammer Driving Weight: 32 lbs Hammer Driving Height: 48 inches
20							
25							
30							
35							

APPENDIX B
LABORATORY TESTING

During the subsurface exploration, CLE personnel collected relatively undisturbed ring samples and bulk samples. The following tests were performed on selected soil samples:

Moisture-Density

The moisture content and dry unit weight were determined for each relatively undisturbed soil sample obtained in the test borings in accordance with ASTM D2937 standard. The results of these tests are shown on the boring logs in Appendix A.

Shear Tests

Shear tests were performed in a direct shear machine of strain-control type in accordance with ASTM D3080 standard. The rate of deformation was 0.010 inch per minute. Selected samples were sheared under varying confining loads in order to determine the Coulomb shear strength parameters: internal friction angle and cohesion. The shear test results are presented in the attached plates.

Consolidation Tests

Consolidation tests were performed on selected undisturbed soil samples in accordance with ASTM D2435 standard. The consolidation apparatus is designed for a one-inch high soil filled brass ring. Loads are applied in several increments in a geometric progression and the resulting deformations are recorded at selected time intervals. Porous stones are placed in contact with the top and bottom of each specimen to permit addition and release of pore fluid. The samples were inundated with water at a load of two kilo-pounds (kips) per square foot, and the test results are shown on the attached Figures.

Expansion Index

Laboratory Expansion Index test was conducted on the existing onsite near surface materials sampled during CLE's field investigation to aid in evaluation of soil expansion potential. The test is performed in accordance with ASTM D-4829. The testing result is presented below:

Sample Location	Expansion Index	Expansion Potential
B-1 @ 0'-4'	2	Very Low

Corrosion Potential

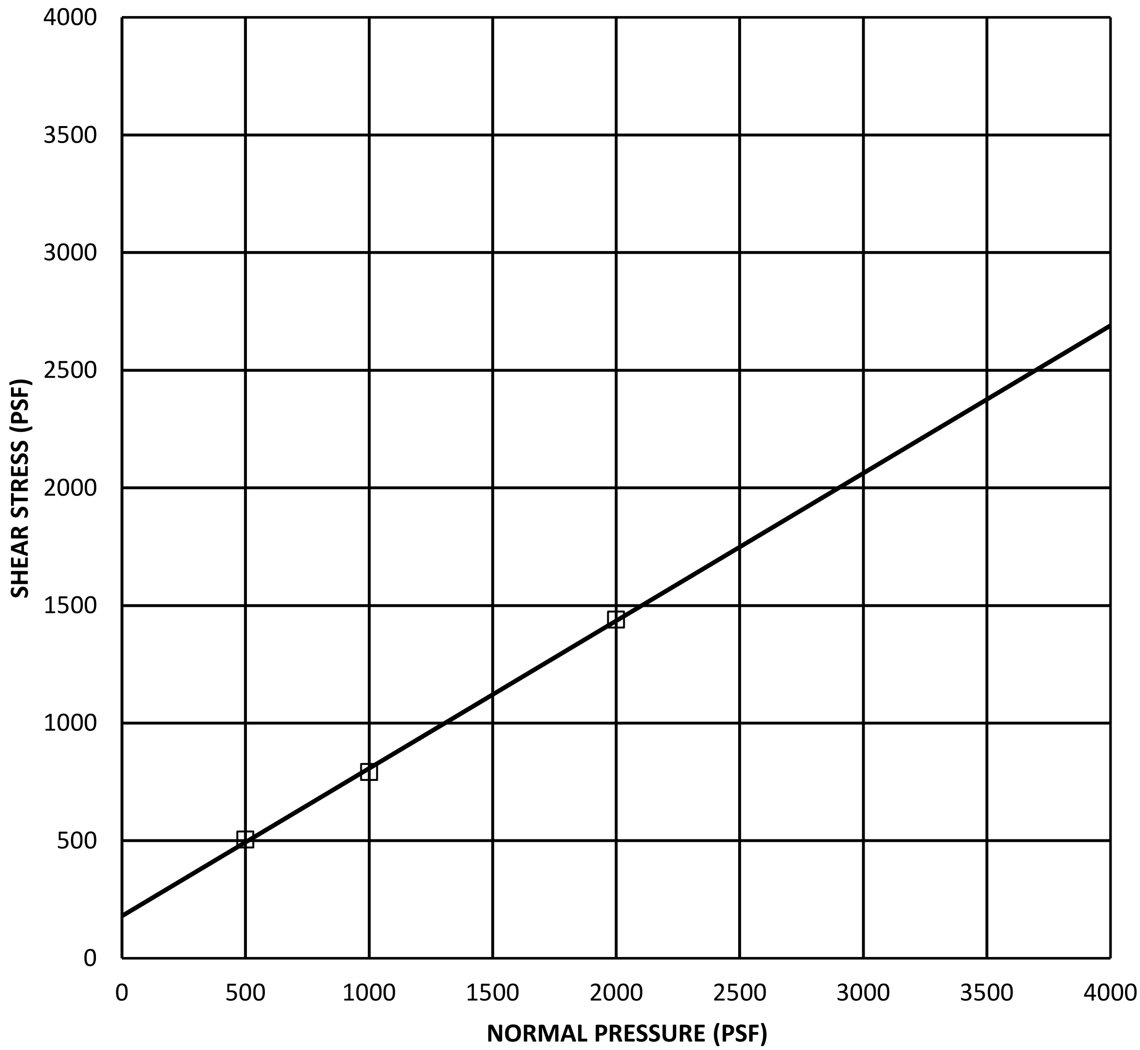
Chemical laboratory tests were conducted on the existing onsite near surface materials sampled during CLE's field investigation to aid in evaluation of soil corrosion potential and the attack on concrete by sulfate soils. These tests are performed in accordance with California Test Method 417, 422, 532, and 643. The testing results are presented below:

Sample Location	pH	Chloride (ppm)	Sulfate (% by weight)	Min. Resistivity (ohm-cm)
B-1 @ 0'-4'	8.72	140	0.0020	6,100

Percent Passing #200 Sieve

Percent of soil passing #200 sieve was determined for selected soil samples in accordance with ASTM D1140 standard. The test results are presented in the following table:

Sample Location	% Passing #200
B-1 @ 0-4'	19.8
B-1 @ 5'	14.1
B-1 @ 10'	26.5
B-2 @ 5'	5.3



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SAMPLE TYPE	SOIL TYPE	COHESION (PSF)	FRICTION ANGLE (DEG)
□	B-1	N/A	2.0	RING	SM	180	32

Vertical Loads (PSF)	Moisture Content Before Test (%)	Moisture Content After Test (%)
500	7.6	23.5
1000	7.6	23.1
2000	7.6	22.7

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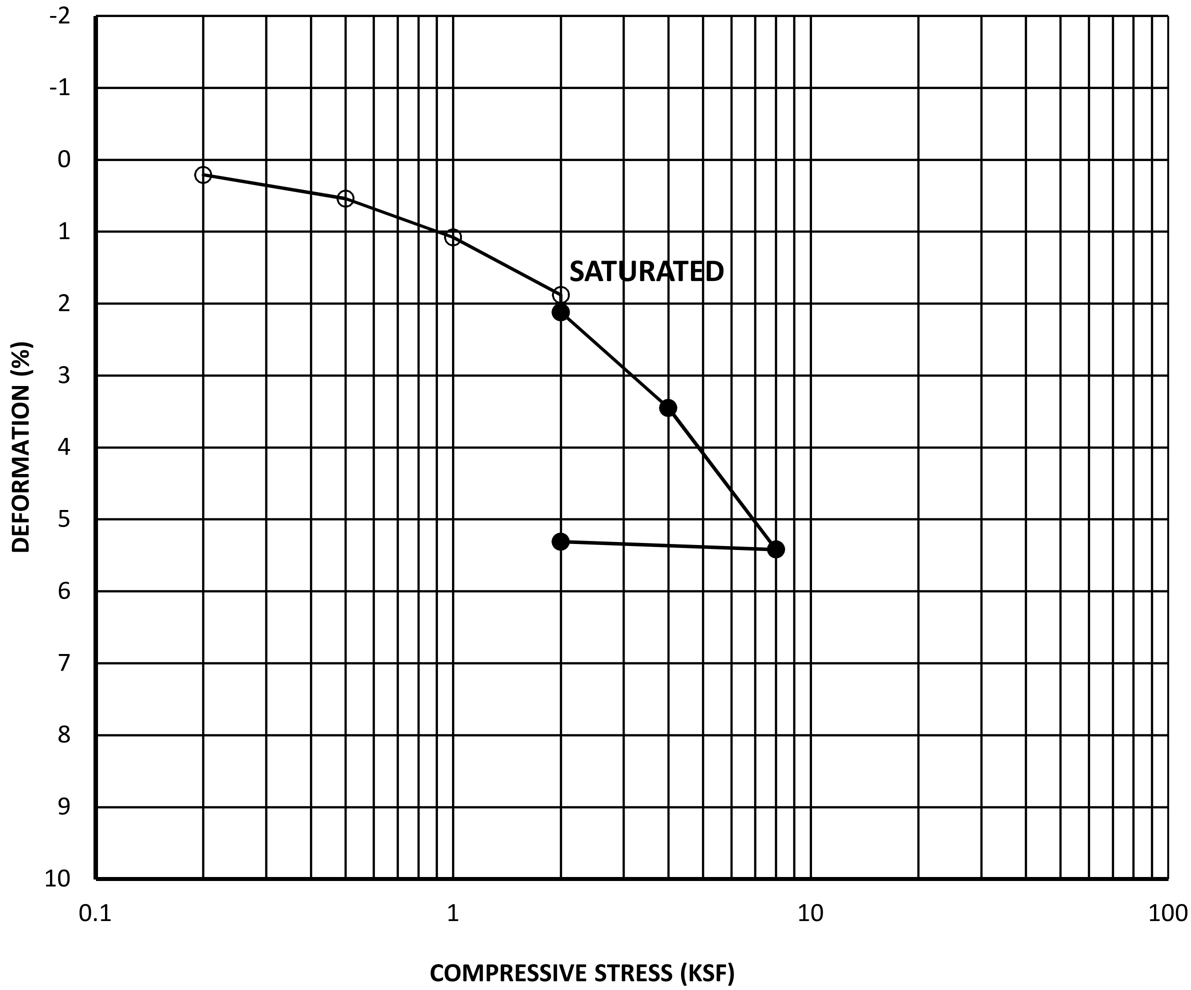

SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-1	N/A	5	SM	3.4	113.4	0.486

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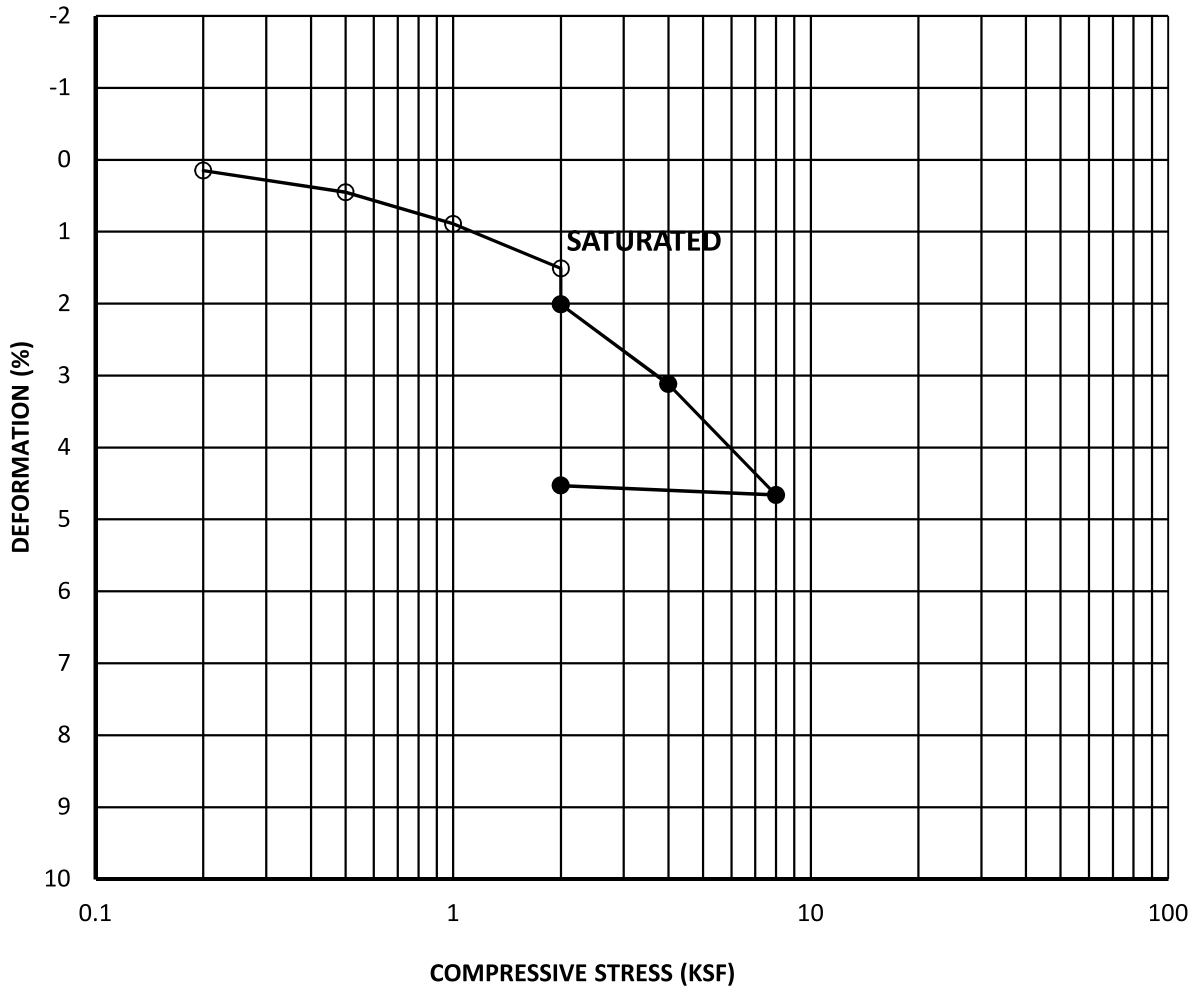
FIGURE 4



SYMBOL	BORING NO.	SAMPLE NO.	DEPTH (FT)	SOIL TYPE	INIT. MOISTURE CONTENT (%)	INIT. DRY DENSITY (PCF)	INIT. VOID RATIO
○	B-2	N/A	5	SP-SM	1.9	120.4	0.399

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FIGURE 5