GEOTECHNICAL INVESTIGATION
PROPOSED RESIDENTIAL DEVELOPMENT
393 SOUTH KIRBY STREET
APN 436-490-011
SAN JACINTO, CALIFORNIA

-Prepared By-

Sladden Engineering

450 Egan Avenue
Beaumont, California 92223
(951) 845-7743

Sladden Engineering

45090 Golf Center Parkway, Suite F, Indio, California 92201 (760) 863-0713 Fax (760) 863-0847
6782 Stanton Avenue, Suite C, Buena Park, CA 90621 (714) 523-0952 Fax (714) 523-1369
450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

February 21, 2022

Project No. 644-22003
22-02-022

Tulloch Holdings, LLC
32823 Temecula Parkway
Temecula, California 92592

Subject: Geotechnical Investigation

Project: Proposed Residential Development
393 South Kirby Street
APN 436-490-011
San Jacinto, California

Sladden Engineering is pleased to present the results of the geotechnical investigation performed for the new residential development proposed for the property (APN 436-490-011) located at 393 South Kirby Street in the City of San Jacinto, California. Our services were completed in accordance with our proposal for geotechnical engineering services dated January 6, 2022 and your authorization to proceed with the work. The purpose of our investigation was to explore the subsurface conditions at the site to provide recommendations for foundation design and for the design of the various site improvements. Evaluation of environmental issues and hazardous wastes was not included within the scope of services provided.

The opinions, recommendations and design criteria presented in this report are based on our field exploration program, laboratory testing and engineering analyses. Based on the results of our investigation, it is our professional opinion that the proposed project should be feasible from a geotechnical perspective provided that the recommendations presented in this report are implemented in design and carried out through construction.

We appreciate the opportunity to provide service to you on this project. If you have any questions regarding this report, please contact the undersigned.

Respectfully submitted,
SLADDEN ENGINEERING

James W. Minor III
Senior Geologist

PROFESSIONAL GEOLOGIST
JAMES W. MINOR III
No. 9735
STATE OF CALIFORNIA

Brett L. Anderson
Principal Engineer

REGISTERED PROFESSIONAL ENGINEER
BRETT L. ANDERSON
No. C45389
CIVIL ENGINEERING
STATE OF CALIFORNIA

SER/jm

Copies: 2/Addressee

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INTRODUCTION

This report presents the results of the geotechnical investigation performed for the new residential development proposed for the property (APN 436-490-011) located at 393 South Kirby Street in the City of San Jacinto, California. The subject site is located at approximately 33.7828 degrees north latitude and 116.9959 degrees west longitude. The approximate location of the site is indicated on the Site Location Map (Figure 1).

Our investigation was conducted in order to evaluate the engineering properties of the subsurface materials, to evaluate their *in-situ* characteristics, and to provide engineering recommendations and design criteria for site preparation, foundation design and the design of various site improvements. This study also includes a review of published and unpublished geotechnical and geological literature regarding seismicity at and near the subject site.

PROJECT DESCRIPTION

Based on the provided site plan (Blaine A. Womer, 2022), it is our understanding that the proposed project will consist of constructing a new residential development on the subject site. A retention basin, open spaces, paved roadways, concrete flatwork and various other associated site improvements are also anticipated for the project. For our analyses, we expect that the proposed structures will consist of relatively light weight wood-frame structures supported on conventional shallow spread footings and concrete slabs-on-grade.

Sladden expects that grading will be limited to minor cuts and fills in order to accomplish the desired elevations and to provide adequate gradients for site drainage. This does not include the removal and re-compaction of the loose surface soil and primary foundation bearing soil within the proposed building pad areas. Upon completion of precise grading plans, Sladden should be retained in order to verify that the recommendations presented within in this report are properly incorporated into the design of the proposed project.

Structural foundation loads were not available at the time of this report. Based on our experience with relatively lightweight structures, we expect that isolated column loads will be less than 20 kips and continuous wall loads will be less than 2.0 kips per linear foot. If these assumed loads vary significantly from the actual loads, we should be consulted to verify the applicability of the recommendations provided.

SCOPE OF SERVICES

The purpose of our investigation was to determine specific engineering characteristics of the surface and near surface soil in order to develop foundation design criteria and recommendations for site preparation. Exploration of the site was achieved by advancing six (6) exploratory boreholes to depths ranging from approximately 11 and 51 feet below the existing ground surface (bgs). Specifically, our site characterization consisted of the following tasks:

- Site reconnaissance to assess the existing surface conditions on and adjacent to the site.
- Advancing six (6) exploratory boreholes to depths ranging from approximately 11 and 51 feet bgs in order to characterize the subsurface soil conditions. Representative samples of the soil were classified in the field and retained for laboratory testing and engineering analyses.
- Performing laboratory testing on selected samples to evaluate their engineering characteristics.
- Reviewing geologic literature and discussing geologic hazards.
- Performing site-specific ground motion analyses for the subject property.
- Performing engineering analyses to develop recommendations for foundation design and site preparation.
- The preparation of this report summarizing our work at the site.

SITE CONDITIONS

The project site is located at 393 South Kirby Street in the City of San Jacinto, California. The site consists of one parcel that is formally identified by the County of Riverside as APN 436-490-011 and occupies approximately 19.08 acres. At the time of our investigation, the property was occupied by an existing residence and barns/sheds located near the southwestern corner of the property. Two wooden shade structures were present near the central portion of the site. A herd of goats were found traversing the site and feeding on scattered grasses and weeds that covered the site surface. The project site is bounded by Ivy Crest Drive to the east, an undeveloped parcel of land and Oostdam Drive to the south, a residential development to the north and by South Kirby Drive to the west.

Based on our review of the San Jacinto 7.5-Minute Quadrangle Map (USGS, 2015) and Google Earth (2022), the site is situated at an approximate elevation of 1,525 feet above mean sea level (MSL).

No natural ponding of water or surface seeps were observed at or near the site during our field investigation conducted on January 26, 2022. Site drainage appears to be controlled via sheet flow and surface infiltration.

GEOLOGIC SETTING

The project site is located in the Peninsular Ranges Physiographic Province of California. The Peninsular Ranges are mountainous areas that extend from the western edge of the continental borderland to the Salton Trough and from the Transverse Ranges Physiographic Province in the north to the tip of Baja California in the south. The Peninsular Ranges Physiographic Province is characterized by northwest-trending topographic and structural features that locally include the San Jacinto Structural Block. The San Jacinto Structural Block is a northwest-southeast trending elongated structural block bounded on the southwest by the San Jacinto Fault and by the San Andreas Fault Zone to the northeast. The province is characterized by elongated, northwest-southeast trending mountain ranges and valleys and is truncated at its northern margin by the east-west grain of the Transverse Ranges. Mountainous areas of the Peninsular Ranges Physiographic Province generally consist of Igneous, metasedimentary and metavolcanic rocks. However, plutonic rocks of the Southern California Batholith are the dominant basement rock exposed.

The site has been mapped by Dibblee (2003) to be immediately underlain by Quaternary-age alluvium (Qa). The geologic setting for the site and site vicinity is illustrated on the Regional Geologic Map (Figure 2).

SUBSURFACE CONDITIONS

The subsurface conditions at the site were investigated by six (6) exploratory boreholes to depths ranging from approximately 11 and 51 feet bgs. The approximate locations of the boreholes are illustrated on the Borehole Location Plan (Figure 3). The boreholes were advanced using a truck-mounted Mobile B-61 drill-rig equipped with 8-inch outside diameter hollow stem augers. A representative of Sladden was on-site to log the materials encountered and retrieve samples for laboratory testing and engineering analysis.

During our field investigation, a thin mantle of artificial fill/disturbed soil was encountered to a depth of approximately three (3) feet below the existing ground surface. Underlying the fill soil and extending to the maximum depths explored, native alluvium was encountered. The site soil consists primarily of silty sand (SM), clayey sand (SC), sandy silt (ML) and sandy clay (CL). Generally, the native earth materials appeared yellowish brown, grayish brown and olive brown, dry to moist, loose to very dense and fine-to-coarse grained. Cohesive layers appeared grayish brown to olive brown, slightly moist to moist, stiff to very stiff and exhibited low to high plasticity characteristics.

The final logs represent our interpretation of the contents of the field logs, and the results of the laboratory observations and tests of the field samples. The final logs are included in Appendix A of this report. The stratification lines represent the approximate boundaries between soil types although the transitions may be gradual and variable across the site.

Groundwater was not encountered within our exploratory bore holes during our field investigation on January 26, 2022. Accordingly, groundwater should not be a factor during construction of the proposed project.

SEISMICITY AND FAULTING

The southwestern United States is a tectonically active and structurally complex region, dominated by northwest trending dextral faults. The faults of the region are often part of complex fault systems, composed of numerous subparallel faults which splay or step from main fault traces. Strong seismic shaking could be produced by any of these faults during the design life of the proposed project.

We consider the most significant geologic hazard to the project to be the potential for moderate to strong seismic shaking that is likely to occur during the design life of the project. The proposed project is located in the highly seismic Southern California region within the influence of several fault systems that are considered to be active or potentially active. An active fault is defined by the State of California as a "sufficiently active and well defined fault" that has exhibited surface displacement within the Holocene epoch (about the last 11,000 years). A potentially active fault is defined by the State as a fault with a history of movement within Pleistocene time (between 11,000 and 1.6 million years ago).

The subject site is not located within a State of California Delineated fault zone (Figure 4).

Table 2 lists the closest known potentially active faults that was generated in part using the EQFAULT computer program (Blake, 2000), as modified using the fault parameters from The Revised 2002 California Probabilistic Seismic Hazard Maps (Cao et al, 2003), Southern Earthquake Data Center (SCEDC, 2022), Riverside County (RCMMC, 2022), and the Quaternary Fault and Fold Database of the United States (USGS, 2022). This table does not identify the probability of reactivation or the on-site effects from earthquakes occurring on any of the other faults in the region.

TABLE 1
CLOSEST KNOWN ACTIVE FAULTS

Fault Name	Distance (Km)	Maximum Event
San Jacinto – San Jacinto Valley	2.0	6.9
San Jacinto – Anza	8.7	7.2
San Andreas – Southern	27.7	7.2*
San Andreas – San Bernardino	27.7	7.5*
Elsinore – Temecula	33.7	6.8
San Jacinto – San Bernardino	34.3	6.7
Elsinore – Glen Ivy	36.1	6.8
Pinto Mountain	39.7	7.0

II. Ground Shaking. The site has been subjected to past ground shaking by faults that traverse the region. Strong seismic shaking from nearby active faults is expected to produce strong seismic shaking during the design life of the proposed project. Based on site-specific ground motion parameters developed for the property (Appendix C), the site modified peak ground acceleration (PGAm) is estimated to be 0.942g.

III. Liquefaction/Seismic Settlement. Liquefaction is the process in which loose, saturated granular soil loses strength as a result of cyclic loading. The strength loss is a result of a decrease in granular sand volume and a positive increase in pore pressures. Generally, liquefaction can occur if all of the following conditions apply; liquefaction-susceptible soil, groundwater within a depth of 50 feet or less, and strong seismic shaking. The site is located within a "moderate" liquefaction potential zone (RCMMC, 2022). Based on the depth to groundwater within the site vicinity the risks associated with liquefaction are considered "low".

IV. Tsunamis and Seiches. Because the site is situated at an elevated inland location and is not immediately adjacent to any impounded bodies of water, risk associated with tsunamis and seiches is considered "negligible".

V. Slope Failure, Landsliding, Rock Falls. The site is located on relatively flat ground and not immediately adjacent to any slopes or hillsides. Therefore, it is our professional opinion that risks associated with slope instability should be considered "negligible".

VI. Expansive Soil. Generally, the near surface soil consists of silty sand (SM) and sandy silt (ML). Based on the results of our laboratory testing (EI = 26), the materials underlying the site are considered to have a "low" expansion potential. The expansion potential of the surface soil should be reevaluated after grading.

VII. Static Settlement. Static settlement resulting from the anticipated foundation loads should be tolerable provided that the recommendations included in this report are considered in foundation design and construction. The ultimate static settlement is expected to be less than 1 inch when using the recommended allowable bearing pressures. As a practical matter, differential static settlement between footings can be assumed as one-half of the total settlement.

VIII. Subsidence. Land subsidence can occur in valleys where aquifer systems have been subjected to extensive groundwater pumping, such that groundwater pumping exceeds groundwater recharge. Generally, pore water reduction can result in a rearrangement of skeletal grains and could result in elastic (recoverable) or inelastic (unrecoverable) deformation of an aquifer system.

IX. Debris Flows. Debris flows are viscous flows consisting of poorly sorted mixtures of sediment and water and are generally initiated on slopes steeper than approximately six horizontal to one vertical (6H:1V)(Boggs, 2001). Based on the flat nature of the site and the composition of the surface soil, we judge that risks associated with debris flows should be considered remote.

SITE SPECIFIC GROUND MOTION PARAMETERS

Sladden has reviewed the 2019 California Building Code (CBC) and ASCE7-16 and developed site specific ground motion parameters for the subject site. The project Seismic Design Maps and site-specific ground motion parameters are summarized in the following table and included within Appendix C. The project Structural Engineer should verify that all design parameters provided are applicable for the subject project.

TABLE 2
GROUND MOTION PARAMETERS

Latitude / Longitude	33.6357/-117.2918
Risk Category	II
Site Class	D
Code Reference Documents	ASCE 7-16; Chapter 11 & 21

Description	**Type**	**Map Based**	**Site-Specific**
MCE_R Ground Motion (0.2 second period)	S_S	2.134	---
MCE_R Ground Motion (1.0 second period)	S_1	0.864	---
Site-Modified Spectral Acceleration Value	S_{MS}	2.134	**2.382**
Site-Modified Spectral Acceleration Value	S_{M1}	null	**2.539**
Numeric Seismic Design Value at 0.2 second SA	S_{DS}	1.423	**1.588**
Numeric Seismic Design Value at 1.0 second SA	S_{D1}	null	**1.693**
Site Amplification Factor at 0.2 second	F_a	1	**1**
Site Amplification Factor at 1.0 second	F_v	null	**2.5**
Site Peak Ground Acceleration	PGA_M	1.041	**0.942**

GEOLOGIC HAZARDS

The subject site is located in an active seismic zone and will likely experience strong seismic shaking during the design life of the proposed project. In general, the intensity of ground shaking will depend on several factors including: the distance to the earthquake focus, the earthquake magnitude, the response characteristics of the underlying materials, and the quality and type of construction. Geologic hazards and their relationship to the site are discussed below.

I. Surface Rupture. Surface rupture is expected to occur along preexisting, known active fault traces. However, surface rupture could potentially splay or step from known active faults or rupture along unidentified traces. Based on our review of Jennings (1994), CDMG (1980), Dibblee (2003) and RCMMC (2022) known faults are not mapped on the site. In addition, no signs of active surface faulting were observed during our review of non-stereo digitized photographs of the site and site vicinity (Google, 2022). Finally, no signs of active surface fault rupture or secondary seismic effects (lateral spreading, lurching etc.) were identified on-site during our field investigation. Therefore, it is our opinion that risks associated with primary surface ground rupture should be considered "low".

X. Flooding and Erosion. No signs of flooding or erosion were observed during our field investigation. However, risks associated with flooding and erosion should be evaluated and mitigated by the project design Civil Engineer.

CONCLUSIONS

Based on the results of our investigation, it is our professional opinion that the project should be feasible from a geotechnical perspective provided that the recommendations included in this report are incorporated into design and carried out through construction. The main geotechnical concerns are the presence of artificial fill soil and the loose and potentially compressible condition of the near surface native soil.

We recommend remedial grading work within the proposed new building areas including over-excavation and re-compaction of the artificial fill soil and the primary foundation bearing soil. Specific recommendations for foundation area preparation are presented in the Earthwork and Grading section of this report.

Caving did occur to varying degrees within each of our exploratory bores and the surface soil may be susceptible to caving within deeper excavations. All excavations should be constructed in accordance with the normal CalOSHA excavation criteria. Based on our observations of the materials encountered, we anticipate that the subsoil will conform to that described by CalOSHA as Type C. Soil conditions should be verified in the field by a "Competent person" employed by the Contractor.

The following recommendations present more detailed design criteria that have been developed based on our field and laboratory investigation.

EARTHWORK AND GRADING

All earthwork including excavation, backfill and preparation of the primary foundation and/or slab bearing soil should be performed in accordance with the geotechnical recommendations presented in this report and portions of the local regulatory requirements, as applicable. All earthwork should be performed under the observation and testing of a qualified geotechnical consultant. The following geotechnical engineering recommendations for the proposed project are based on observations from the field investigation program, laboratory testing and geotechnical engineering analyses.

a. Stripping. Areas to be graded should be cleared of any existing shrubs, foundation elements, utilities, vegetation, associated root systems, and debris. All areas scheduled to receive fill should be cleared of old fills and any irreducible matter. The unsuitable material should be removed off site. Voids left by obstructions should be properly backfilled in accordance with the compaction recommendations of this report.

b. Preparation of New Building Areas: In order to achieve firm and uniform foundation bearing conditions, we recommend over-excavation and re-compaction throughout the proposed new building areas. All low density near surface soil should be removed to a depth of at least 5 feet below existing grade or 3 feet below the bottom of the footings, whichever is deeper. Remedial grading should extend laterally a minimum of five feet beyond the building perimeters. The native soil exposed by over-excavation should be scarified, moisture conditioned to near optimum moisture content and compacted to at least 90 percent relative compaction prior to fill placement. The previously removed soil may then be replaced as engineered fill as recommended below.

c. Compaction: Soil to be used as engineered fill should be free of organic material, debris, and other deleterious substances, and should not contain irreducible matter greater than three inches in maximum dimension. All fill materials should be placed in thin lifts, not exceeding six inches in a loose condition. If import fill is required, the material should be of a low to non-expansive nature and should meet the following criteria:

Plastic Index	Less than 12
Liquid Limit	Less than 35
Percent Soil Passing #200 Sieve	Between 15% and 35%
Maximum Aggregate Size	3 inches

The subgrade and all fill soil should be compacted with acceptable compaction equipment, to at least 90 percent relative compaction. The bottom of the exposed subgrade should be observed by a representative of Sladden Engineering prior to fill placement. Compaction testing should be performed on all lifts in order to ensure proper placement of the fill materials. Table 3 provides a summary of the excavation and compaction recommendations.

TABLE 3
SUMMARY OF RECOMMENDATIONS

*Remedial Grading	Over-excavation and re-compaction within the building envelopes and extending laterally 5 feet beyond the building limits and to a minimum depth of 5 feet below existing grade or 3 feet below the bottom of the footings, whichever is deeper.
Native / Import Engineered Fill	Place in thin lifts not exceeding 6 inches in a loose condition, at near optimum moisture content and compact to a minimum of 90 percent relative compaction.
Asphalt Concrete Sections	Compact the top 12 inches to at least 95 percent compaction at near optimum moisture content.

*Actual depth may vary and should be determined by a representative of Sladden Engineering in the field during construction.

d. Shrinkage and Subsidence: Volumetric shrinkage of the material that is excavated and replaced as controlled compacted fill should be anticipated. We estimate that this shrinkage should be between 10 and 15 percent. Subsidence of the surfaces that are scarified and compacted should be between 1 tenth and 2 tenths of a foot. This will vary depending upon the type of equipment used, the moisture content of the soil at the time of grading and the actual degree of compaction attained.

CONVENTIONAL SHALLOW SPREAD FOOTINGS

Conventional spread footings are expected to provide adequate support for the proposed residential structures. All footings should be founded upon properly compacted engineered fill soil and should have a minimum embedment depth of 12 inches measured from the lowest adjacent finished grade. Continuous and isolated footings should have minimum widths of 12 inches and 24 inches, respectively. Continuous and isolated footings supported upon properly compacted engineered fill soil may be designed using allowable (net) bearing pressures of 1800 and 2000 pounds per square foot (psf), respectively. Allowable increases of 200 psf for each additional 1 foot of width and 250 psf for each additional 6 inches of depth may be used if desired. The maximum allowable bearing pressure should be 2500 psf. The allowable bearing pressures apply to combined dead and sustained live loads. The allowable bearing pressures may be increased by one-third when considering transient live loads, including seismic and wind forces.

Based on the recommended allowable bearing pressures, the total static settlement of the shallow spread footings is anticipated to be less than one-inch provided foundation area preparation conforms to the recommendations included in this report. Static differential settlement is anticipated to be approximately one-half of the total static settlement for similarly loaded footings spaced up to approximately 40 feet apart.

Lateral load resistance for the shallow spread footings will be developed by passive pressure against the sides of the footings below grade and by friction acting at the base of the footings. An allowable passive pressure of 250 psf per foot of depth may be used for design purposes. An allowable coefficient of friction 0.40 may be used for dead and sustained live loads to compute the frictional resistance of the footing placed directly on compacted fill. Under seismic and wind loading conditions, the passive pressure and frictional resistance may be increased by one-third.

All footing excavations should be observed by a representative of the project geotechnical consultant to verify adequate embedment depths prior to placement of forms, steel reinforcement or concrete. The excavations should be trimmed neat, level and square. All loose, disturbed, sloughed or moisture-softened soils and/or any construction debris should be removed prior to concrete placement. Excavated soil generated from footing and/or utility trenches should not be stockpiled within the building envelope or in areas of exterior concrete flatwork. All footings should be reinforced in accordance with the project Structural Engineer's recommendations.

SLABS-ON-GRADE

In order to provide uniform and adequate support, concrete slabs-on-grade must be placed on properly compacted engineered fill soil as outlined in the previous sections of this report. The slab subgrade should remain near optimum moisture content and should not be permitted to dry prior to concrete placement. Slab subgrade should be firm and unyielding. Disturbed soil should be removed and replaced with engineered fill soil compacted to a minimum of 90 percent relative compaction.

Slab thickness and reinforcement should be determined by the Structural Engineer. We recommend a minimum slab thickness of 4.0 inches and minimum reinforcement of #3 bars at 18 inches on center in both directions. All slab reinforcement should be supported on concrete chairs to ensure that reinforcement is placed at slab mid-height. Final floor slab design and reinforcement should be determined by the Structural Engineer based upon post-grading expansion index test results.

Slabs with moisture sensitive surfaces should be underlain with a moisture vapor retarder consisting of a polyvinyl chloride membrane such as 10-mil visqueen, or equivalent. All laps within the membrane should be sealed and at least 2 inches of clean sand should be placed over the membrane to promote uniform curing of the concrete. To reduce the potential for punctures, the membrane should be placed on a pad surface that has been graded smooth without any sharp protrusions. If a smooth surface can not be achieved by grading, consideration should be given to placing a 1-inch thick leveling course of sand across the pad surface prior to placement of the membrane.

RETAINING WALLS

Minor retaining walls may be required to accomplish the proposed construction. Cantilever retaining walls may be designed using "active" pressures. Active pressures may be estimated using an equivalent fluid weight of 35 pcf for level native backfill soil acting in a triangular pressure distribution with drained backfill conditions. "At Rest" pressures should be utilized for restrained walls. "At rest" pressures may be estimated using an equivalent fluid weight of 55 pcf for native backfill soil with level drained backfill conditions.

CORROSION SERIES

The soluble sulfate concentrations of the surface soil were determined to be 40 parts per million (ppm) (S1 Condition). The soil is considered to have a "negligible" corrosion potential with respect to concrete. The use of Type V cement and special sulfate resistant concrete mixes should not be necessary. The soluble sulfate content of the surface soil should be reevaluated after grading and appropriate concrete mix designs should be established based upon post-grading test results.

The pH levels of the surface soil was 7.8. Based on soluble chloride concentration testing (90 ppm) the soil is considered to have a "negligible" corrosion potential with respect to normal grade steel. The minimum resistivity of the surface soil was found to be 1,100 ohm-cm, that suggests the site soil is considered to have a "moderate" corrosion potential with respect to ferrous metal installations.

UTILITY TRENCH BACKFILL

All utility trench backfill should be compacted to a minimum of 90 percent relative compaction. Trench backfill materials should be placed in lifts no greater than six inches in a loose condition, moisture conditioned (or air-dried) as necessary to achieve near optimum moisture content, and mechanically compacted to a minimum of 90 percent relative compaction. A representative of the project soil engineer should test the backfill to verify adequate compaction.

EXTERIOR CONCRETE FLATWORK

In order to provide uniform support and minimize settlement related cracking of concrete flatwork, the subgrade soil within concrete flatwork areas should be compacted to a minimum of 90 percent relative compaction. A representative of the project geotechnical consultant should observe and verify the density and moisture content of the soil prior to concrete placement.

DRAINAGE

All final grades should be provided with positive gradients away from foundations to provide rapid removal of surface water runoff to an adequate discharge point. No water should be allowed to be pond on or immediately adjacent to foundation elements. In order to reduce water infiltration into the subgrade soil, surface water should be directed away from building foundations to an adequate discharge point. Subgrade drainage should be evaluated upon completion of the precise grading plans and in the field during grading.

LIMITATIONS

The findings and recommendations presented in this report are based upon an interpolation of the soil conditions between the exploratory bore locations and extrapolation of these conditions throughout the proposed building areas. Should conditions encountered during grading appear different than those indicated in this report, this office should be notified.

The use of this report by other parties or for other projects is not authorized. The recommendations of this report are contingent upon monitoring of the grading operation by a representative of Sladden Engineering. All recommendations are considered to be tentative pending our review of the grading operation and additional testing, if indicated. If others are employed to perform any soil testing, this office should be notified prior to such testing in order to coordinate any required site visits by our representative and to assure indemnification of Sladden Engineering.

We recommend that a pre-job conference be held on the site prior to the initiation of site grading. The purpose of this meeting will be to ensure a complete understanding of the recommendations presented in this report as they apply to the actual grading performed.

ADDITIONAL SERVICES

Once completed, final project plans and specifications should be reviewed by use prior to construction to confirm that the full intent of the recommendations presented herein have been applied to design and construction. Following review of plans and specifications, observation should be performed by the Soil Engineer during construction to document that foundation elements are founded on/or extend into the properly compacted soil, and that suitable backfill soil is placed upon competent materials and properly compacted at the recommended moisture content.

Tests and observations should be performed during grading by the Soil Engineer or his representative in order to verify that the grading is being performed in accordance with the project specifications. Field density testing shall be performed in accordance with acceptable ASTM test methods. The minimum acceptable degree of compaction should be 90 percent for engineered fill soil and 95 percent for Class II aggregate base as obtained by ASTM Test Method D1557. Where testing indicates insufficient density, additional compactive effort shall be applied until retesting indicates satisfactory compaction.

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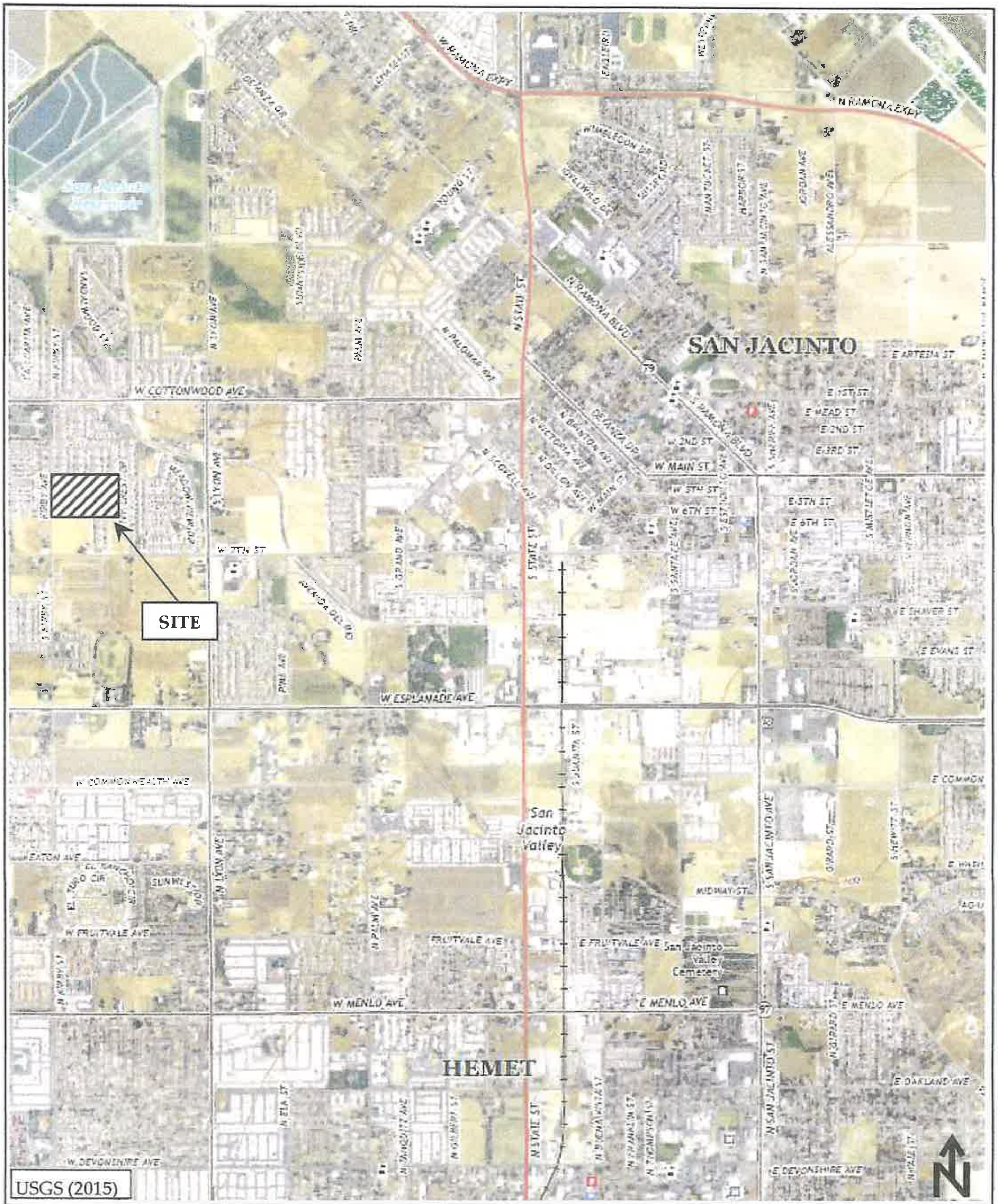
FIGURES



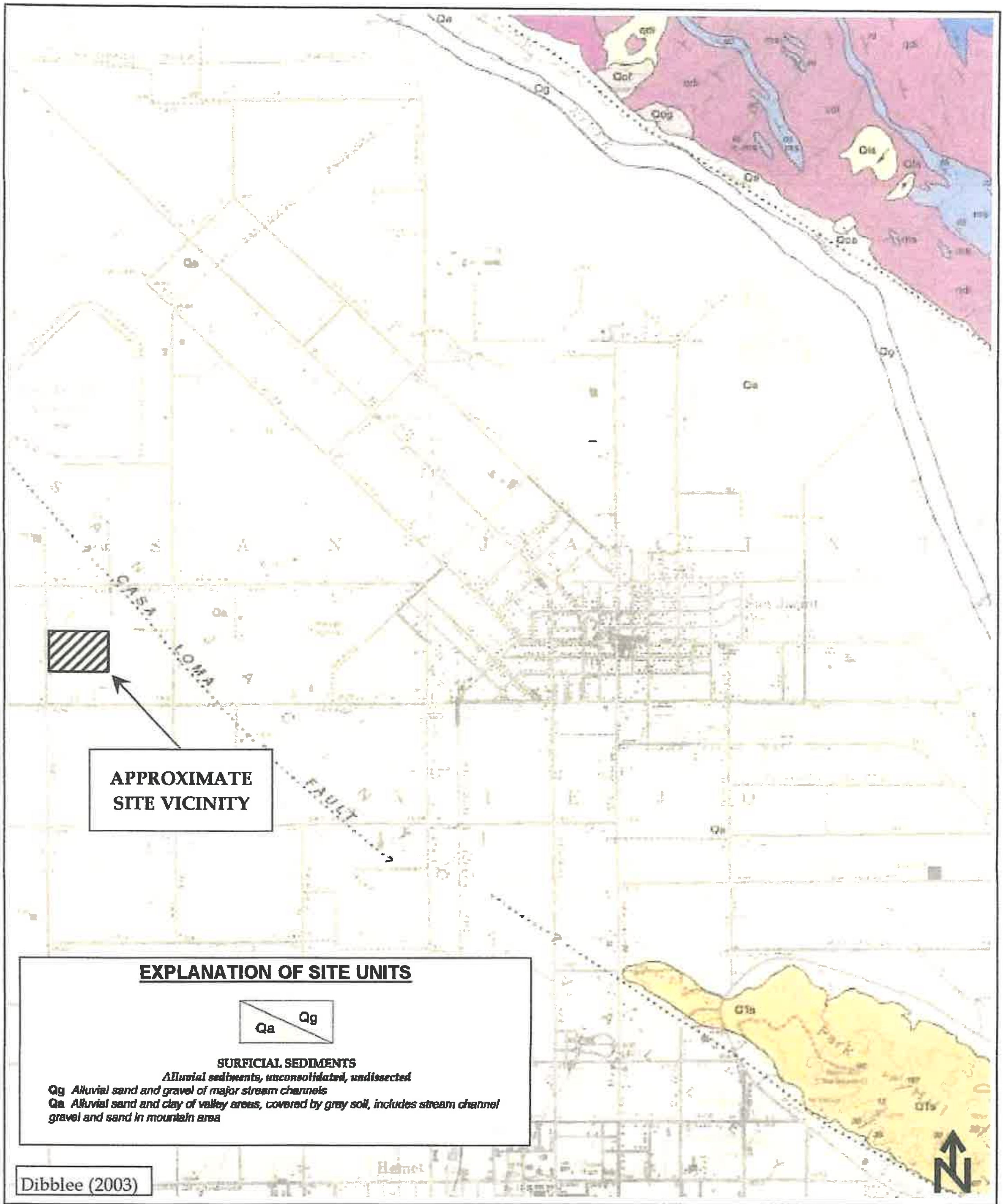
Sladden Engineering

SITE LOCATION MAP

Project Number:	644-22003
Report Number:	22-02-022
Date:	February 14, 2022

FIGURE

1



EXPLANATION OF SITE UNITS

Qa | Qg

SURFICIAL SEDIMENTS

Alluvial sediments, unconsolidated, undissected

Qg *Alluvial sand and gravel of major stream channels*

Qa *Alluvial sand and clay of valley areas, covered by gray soil, includes stream channel gravel and sand in mountain area*

Dibblee (2003)

REGIONAL GEOLOGIC MAP

Project Number:	644-22003
Report Number:	22-02-022
Date:	February 14, 2022

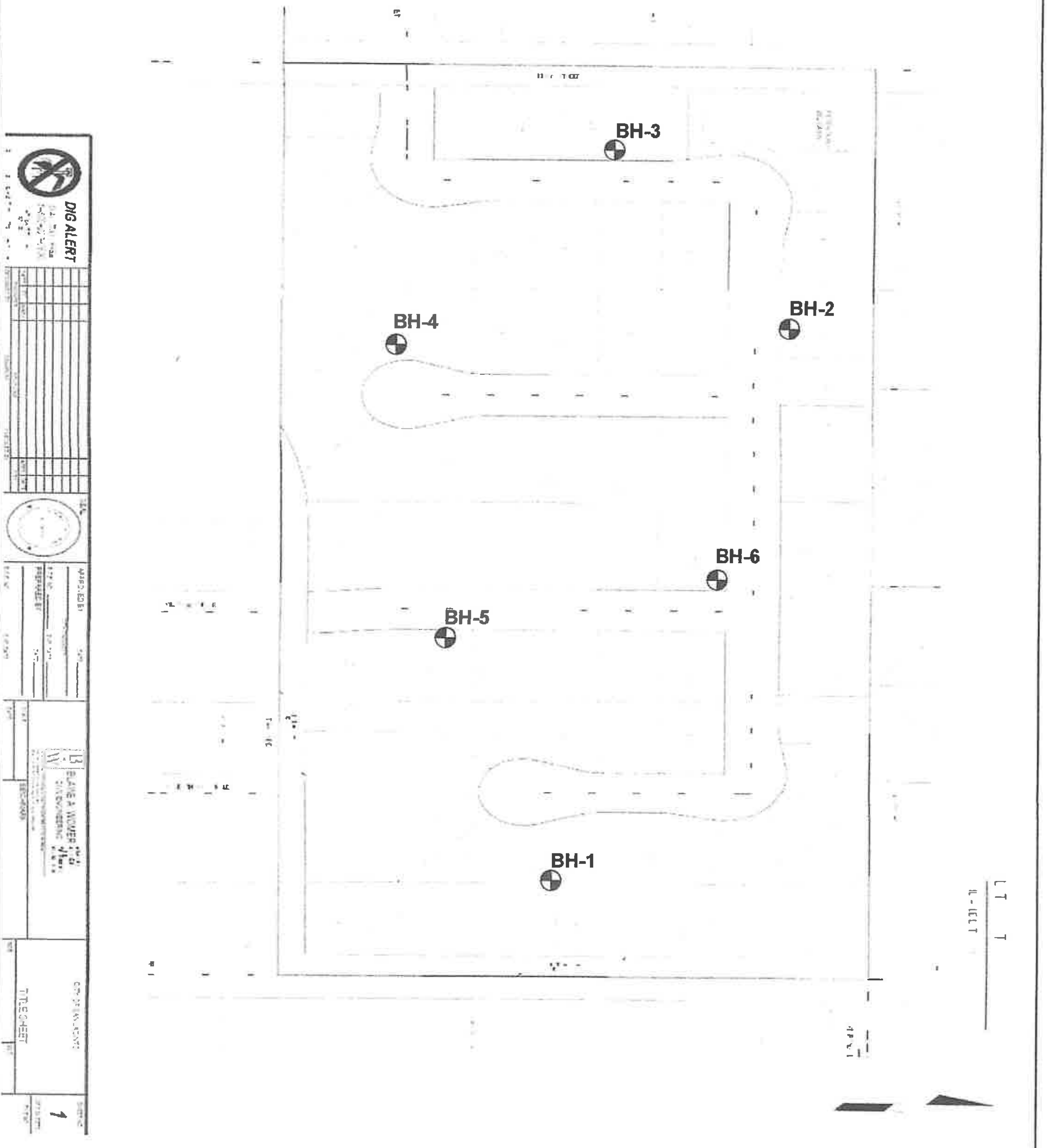
FIGURE

2

Sladden Engineering

EXPLANATION OF MAP SYMBOLS

⊕ **BH-6** Approximate Exploratory Borehole Location



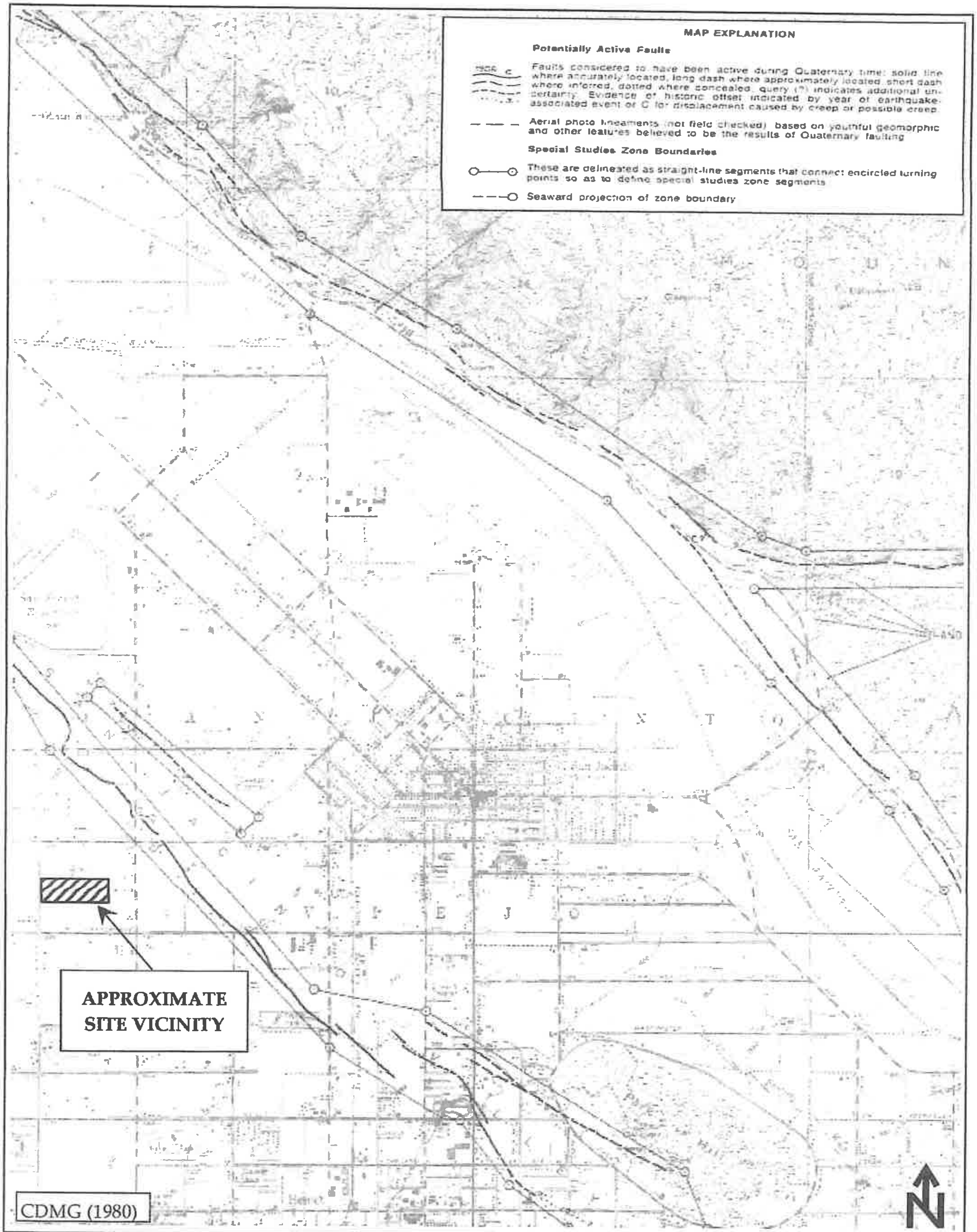
Sladden Engineering

BOREHOLE LOCATION PLAN

Project Number:	644-22003
Report Number:	22-02-022
Date:	February 14, 2022

FIGURE

3



Sladden Engineering

FAULT ZONE MAP

Project Number:	644-22003
Report Number:	22-02-022
Date:	February 14, 2022

FIGURE

4

APPENDIX A

FIELD EXPLORATION

APPENDIX A

FIELD EXPLORATION

For our field investigation six (6) exploratory boreholes were excavated January 26, 2022 utilizing a truck mounted hollow stem auger rig (Mobile B-61). Continuous logs of the materials encountered were made by a representative of Sladden Engineering. Materials encountered in the boreholes were classified in accordance with the Unified Soil Classification System which is presented in this appendix.

Representative undisturbed samples were obtained within our borings by driving a thin-walled steel penetration sampler (California split spoon sampler) or a Standard Penetration Test (SPT) sampler with a 140 pound automatic-trip hammer dropping approximately 30 inches (ASTM D1586). The number of blows required to drive the samplers 18 inches was recorded in 6-inch increments and blowcounts are indicated on the boring logs.

The California samplers are 3.0 inches in diameter, carrying brass sample rings having inner diameters of 2.5 inches. The standard penetration samplers are 2.0 inches in diameter with an inner diameter of 1.5 inches. Undisturbed samples were removed from the sampler and placed in moisture sealed containers in order to preserve the natural soil moisture content. Bulk samples were obtained from the excavation spoils and samples were then transported to our laboratory for further observations and testing.

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobile B-51	Date Drilled:	1/26/2022
Elevation:	1525 Ft (MSL)	Boring No:	BH-1

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density	Depth (Feet)	Graphic Lithology	Description
■	5/7/11	1	26	60.0	4.7	98.7	2		Sandy Silt (ML); grayish brown, slightly moist, stiff, low plasticity, micaceous with trace gravel (Fill/Disturbed).
■	7/9/11			19.7	1.7	104.7	4 6 8		Silty Sand (SM); grayish brown, slightly moist, medium dense, fine-grained, micaceous with trace gravel (Qa).
▮	4/4/4			24.8	3.4		10 12 14		Silty Sand (SM); grayish brown, slightly moist, loose, fine-grained, micaceous with trace gravel (Qa).
■	5/8/8			3.3	1.1	97.5	16 18		Poorly-Graded Sand (SP); light yellowish brown, slightly moist, loose, fine-to-coarse grained (Qa).
▮	3/4/5			59.7	13.4		20 22 24		Sandy Silt (ML); grayish brown, moist, stiff, low plasticity, micaceous with clay (Qa).
■	5/12/17			38.0	12.1	106.3	26 28		Silty Sand (SM); grayish brown, moist, medium dense, fine-grained, micaceous with clay (Qa).
▮	6/11/11			8.2	4.6		30 32 34		Poorly-Graded Sand (SP); light yellowish brown, slightly moist, medium dense, fine-to-coarse grained (Qa).
■	10/16/21			4.3	2.7	99.9	36 38		Poorly-Graded Sand (SP); light yellowish brown, slightly moist, medium dense, fine-to-coarse grained (Qa).
▮	10/11/16			37.4	10.2		40 42 44		Clayey Sand (SC); olive brown, slightly moist to moist, medium dense, fine- to coarse-grained with gravel (Qa).
■	16/22/33			6.3	3.2	113.5	46 48		Well-Graded Gravelly Sand (SW); yellowish brown, slightly moist, dense, fine-to-coarse grained (Qa).
▮	12/17/20			3.2	1.9		50		Well-Graded Gravelly Sand (SW); yellowish brown, slightly moist, dense, fine-to-coarse grained (Qa).

Completion Notes:
Terminated at ~51.5 Feet bgs.
No Bedrock Encountered.
No Grounwater or Seepage Encountered.

PROPOSED RESIDENTIAL DEVELOPMENT
APN 436-490-011

Project No: 644-22003
Report No: 232-02-022

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobile B-51	Date Drilled:	1/26/2022
Elevation:	1525 Ft (MSL)	Boring No:	BH-2

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density	Depth (Feet)	Graphic Lithology	Description
							2	▥	Sandy Silt (ML); grayish brown, slightly moist, low plasticity, micaceous with trace gravel (Fill/Disturbed).
							4	▒	
▣	2/2/3			43.7	6.9		6	▒	Silty Sand (SM); grayish brown, slightly moist, loose, fine-grained, micaceous with trace gravel (Qa).
							8	▒	
■	4/6/6			15.7	4.0	98.3	10	▒	Silty Sand (SM); grayish brown, slightly moist, loose, fine-grained, micaceous with trace gravel (Qa).
							12	▒	
							14	▒	
▣	3/4/4			3.0	1.7		16	░	Poorly-Graded Sand (SP); light yellowish brown, slightly moist, loose, fine-to-coarse grained with gravel (Qa).
							18	░	
■	3/5/6			86.6	32.9	90.9	20	▨	Sandy Clay (CH/CL); olive brown, very moist, medium stiff, high plasticity (Qa).
							22	▨	
							24	▨	
▣	11/12/15			22.6	9.1		26	▒	Clayey Sand (SC); olive brown, moist, medium dense, fine- to coarse-grained with gravel (Qa).
							28	▒	
■	9/12/17			2.3	1.3	97.8	30	░	Poorly-Graded Sand (SP); light yellowish brown, slightly moist, medium dense, fine-to-coarse grained (Qa).
							32	░	
							34	░	
▣	4/5/7			69.8	22.2		36	▨	Sandy Clay (CH/CL); olive brown, very moist, medium stiff, high plasticity (Qa).
							38	▨	
■	7/10/12			46.2	16.1	116.0	40	▒	Clayey Sand (SC); olive brown, moist, medium dense, fine- to coarse-grained with gravel (Qa).
							42	▒	
							44	▒	
▣	6/8/10			38.1	11.6		46	▒	Clayey Sand (SC); olive brown, moist, medium dense, fine- to coarse-grained with gravel (Qa).
							48	▒	
■	14/19/26			21.5	6.6	111.1	50	▒	Clayey Sand (SC); olive brown, slightly moist, medium dense, fine- to coarse-grained with gravel (Qa).

Completion Notes:
Terminated at ~51.5 Feet bgs.
No Bedrock Encountered.
No Grounwater or Seepage Encountered.

PROPOSED RESIDENTIAL DEVELOPMENT
APN 436-490-011

Project No: 644-22003
Report No: 232-02-022

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobile B-51	Date Drilled:	1/26/2022
Elevation:	1525 Ft (MSL)	Boring No:	BH-3

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density	Depth (Feet)	Graphic Lithology	Description
							2	▥	Sandy Silt (ML); grayish brown, slightly moist, low plasticity, micaceous with trace gravel (Fill/Disturbed).
■	4/6/7			58.1	4.8	91.0	4 6 8	▥	Sandy Silt (ML); grayish brown, slightly moist, medium stiff, low plasticity, micaceous with trace gravel (Qa).
◫	3/3/3			32.6	7.4		10 12 14	░	Silty Sand (SM); grayish brown, slightly moist to moist, loose, fine-grained, micaceous with trace gravel (Qa).
■	4/6/10			38.7	8.1	93.8	16 18	░	Silty Sand (SM); grayish brown, slightly moist to moist, loose, fine-grained, micaceous with trace gravel (Qa).
◫	3/5/6			73.5	24.6		20 22	▨	Sandy Clay (CL); olive brown, very moist, stiff, high plasticity (Qa).
							24 26 28 30 32 34 36 38 40 42 44 46 48 50		Terminated at ~21.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.

Completion Notes:

PROPOSED RESIDENTIAL DEVELOPMENT
APN 436-490-011

Project No:	644-22003	Page	3
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SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobile B-51	Date Drilled:	1/26/2022
Elevation:	1525 Ft (MSL)	Boring No:	BH-4

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density	Depth (Feet)	Graphic Lithology	Description
							2	▥	Sandy Silt (ML); grayish brown, slightly moist, low plasticity, micaceous with trace gravel (Fill/Disturbed).
■	5/7/10			80.7	4.6	92.5	4 6 8	▥	Sandy Silt (ML); grayish brown, slightly moist, stiff, low plasticity, micaceous with trace gravel (Qa).
▣	4/4/5			46.6	7.2		10 12 14	▒	Silty Sand (SM); grayish brown, slightly moist to moist, loose, fine-grained, micaceous with trace gravel (Qa).
■	4/7/8			3.3	1.1	101.9	16	░	Poorly-Graded Sand (SP); light yellowish brown, slightly moist, loose, fine-to-coarse grained (Qa).
							18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50		Terminated at ~16.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.

Completion Notes:

PROPOSED RESIDENTIAL DEVELOPMENT
APN 436-490-011

Project No: 644-22003
Report No: 232-02-022

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobile B-51	Date Drilled:	1/26/2022
Elevation:	1525 Ft (MSL)	Boring No:	BH-5

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density	Depth (Feet)	Graphic Lithology	Description
							2	▥	Sandy Silt (ML); grayish brown, slightly moist, low plasticity, micaceous with trace gravel (Fill/Disturbed).
							4	░	
▮	3/3/4			44.1	4.8		6	░	Silty Sand (SM); grayish brown, slightly moist, loose, fine-grained, micaceous with trace gravel (Qa).
							8	░	
■	4/6/7			39.0	7.1	103.6	10	░	Silty Sand (SM); grayish brown, slightly moist to moist, loose, fine-grained, micaceous with trace gravel (Qa).
							12	░	
							14	░	
▮	3/3/4			3.4	2.1		16	░	Poorly-Graded Sand (SP); light yellowish brown, slightly moist, loose, fine-to-coarse grained (Qa).
							18	░	
■	8/9/9			54.7	14.3	86.7	20	▨	Sandy Silt (ML); grayish brown, moist, stiff, low plasticity, micaceous with clay (Qa).
							22		
							24		Terminated at ~21.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.
							26		
							28		
							30		
							32		
							34		
							36		
							38		
							40		
							42		
							44		
							46		
							48		
							50		

Completion Notes:

PROPOSED RESIDENTIAL DEVELOPMENT
APN 436-490-011

Project No: 644-22003
Report No: 232-02-022

SLADDEN ENGINEERING

BORE LOG

Drill Rig:	Mobile B-51	Date Drilled:	1/26/2022
Elevation:	1525 Ft (MSL)	Boring No:	BH-6

Sample	Blow Counts	Bulk Sample	Expansion Index	% Minus #200	% Moisture	Dry Density	Depth (Feet)	Graphic Lithology	Description
							2	▥	Sandy Silt (ML); grayish brown, slightly moist, low plasticity, micaceous with trace gravel (Fill/Disturbed).
■	5/7/11			59.3	5.0	97.4	4 6 8	▥	Sandy Silt (ML); grayish brown, slightly moist, stiff, low plasticity, micaceous with trace gravel (Qa).
▣	3/3/3			23.4	2.9		10 12	░	Silty Sand (SM); grayish brown, slightly moist, loose, fine-grained, micaceous with trace gravel (Qa).
							14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50		Terminated at ~11.5 Feet bgs. No Bedrock Encountered. No Groundwater or Seepage Encountered.

Completion Notes:

PROPOSED RESIDENTIAL DEVELOPMENT
APN 436-490-011

Project No:	644-22003	Page	6
Report No:	232-02-022		

APPENDIX B

LABORATORY TESTING

APPENDIX B

LABORATORY TESTING

Representative bulk and relatively undisturbed soil samples were obtained in the field and returned to our laboratory for additional observations and testing. Laboratory testing was generally performed in two phases. The first phase consisted of testing in order to determine the compaction of the existing natural soil and the general engineering classifications of the soils underlying the site. This testing was performed in order to estimate the engineering characteristics of the soil and to serve as a basis for selecting samples for the second phase of testing. The second phase consisted of soil mechanics testing. This testing including consolidation, shear strength and expansion testing was performed in order to provide a means of developing specific design recommendations based on the mechanical properties of the soil.

CLASSIFICATION AND COMPACTION TESTING

Unit Weight and Moisture Content Determinations: Each undisturbed sample was weighed and measured in order to determine its unit weight. A small portion of each sample was then subjected to testing in order to determine its moisture content. This was used in order to determine the dry density of the soil in its natural condition. The results of this testing are shown on the Boring Logs.

Maximum Density-Optimum Moisture Determinations: Representative soil types were selected for maximum density determinations. This testing was performed in accordance with the ASTM Standard D1557-91, Test Method A. Graphic representations of the results of this testing are presented in this appendix. The maximum densities are compared to the field densities of the soil in order to determine the existing relative compaction to the soil.

Classification Testing: Soil samples were selected for classification testing. This testing consists of mechanical grain size analyses. This provides information for developing classifications for the soil in accordance with the Unified Soil Classification System which is presented in the preceding appendix. This classification system categorizes the soil into groups having similar engineering characteristics. The results of this testing is very useful in detecting variations in the soil and in selecting samples for further testing.

SOIL MECHANIC'S TESTING

Expansion Testing: One (1) bulk sample was selected for Expansion testing. Expansion testing was performed in accordance with the UBC Standard 18-2. This testing consists of remolding 4-inch diameter by 1-inch thick test specimens to a moisture content and dry density corresponding to approximately 50 percent saturation. The samples are subjected to a surcharge of 144 pounds per square foot and allowed to reach equilibrium. At that point the specimens are inundated with distilled water. The linear expansion is then measured until complete.

Direct Shear Testing: One (1) bulk sample was selected for Direct Shear testing. This test measures the shear strength of the soil under various normal pressures and is used to develop parameters for foundation design and lateral design. Tests were performed using a recompacted test specimen that was saturated prior to tests. Tests were performed using a strain controlled test apparatus with normal pressures ranging from 800 to 2300 pounds per square foot.

Consolidation/Hydro-Collapse Testing: Two (2) relatively undisturbed samples were selected for consolidation testing. For this test, a one-inch thick test specimen was subjected to vertical loads varying from 575 psf to 11520 psf applied progressively. The consolidation at each load increment was recorded prior to placement of each subsequent load.

Corrosion Series Testing: The soluble sulfate concentrations of the surface soil were determined in accordance with California Test Method Number (CA) 417. The pH and Minimum Resistivity were determined in accordance with CA 643. The soluble chloride concentrations were determined in accordance with CA 422.

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Maximum Density/Optimum Moisture

ASTM D698/D1557

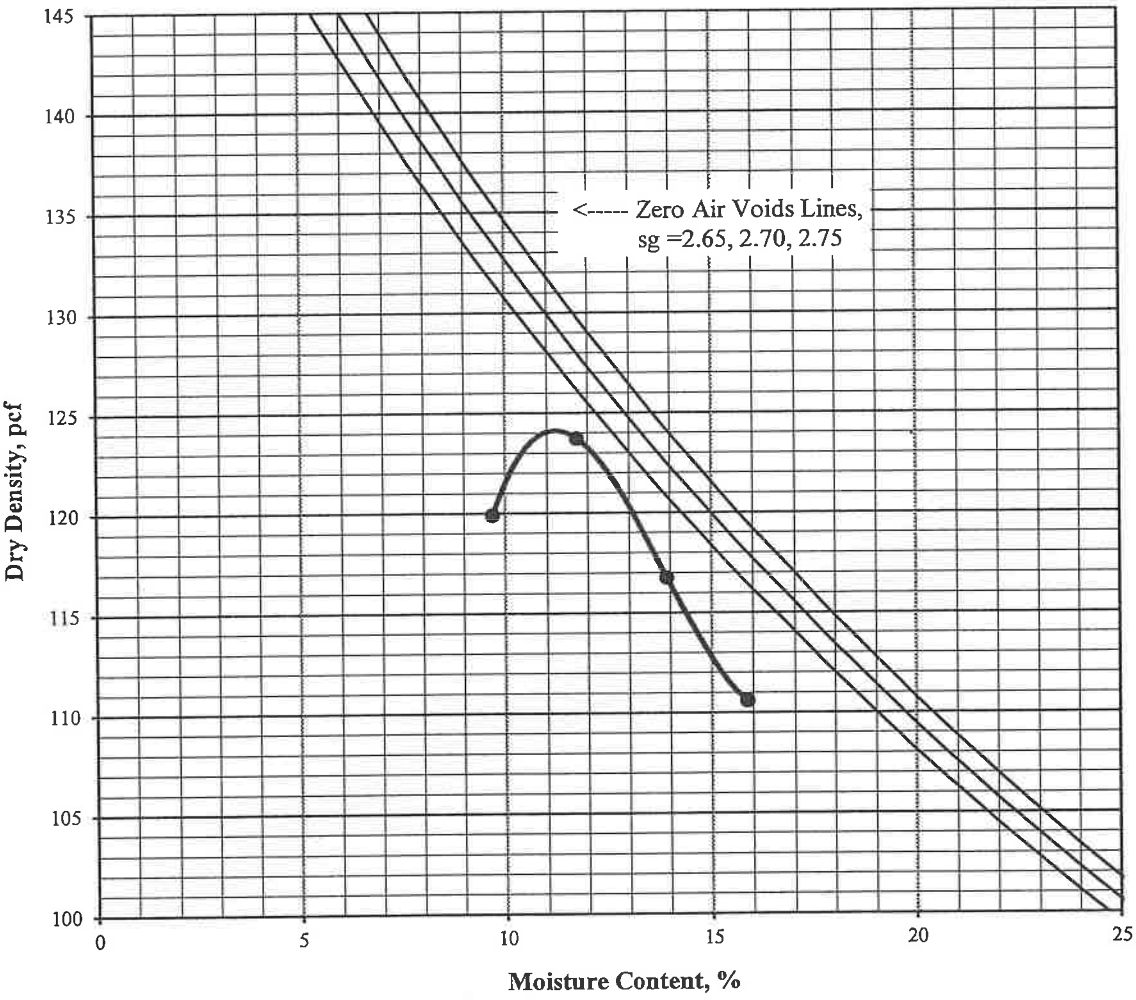
February 18, 2022

ASTM D-1557 A
Rammer Type: Machine

Project Number:	644-22003
Project Name:	393 South Kirby Street
Lab ID Number:	LN6-22044
Sample Location:	BH-1 Bulk 1 @ 0-5'
Description:	Olive Brown Silty Sand (SM)

Maximum Density:	**124 pcf**
Optimum Moisture:	**12%**

Sieve Size	% Retained
3/4"	
3/8"	
#4	0.1



Expansion Index

ASTM D 4829

February 18, 2022

Job Number: 644-22003
Job Name: 393 South Kirby Street
Lab ID Number: LN6-22044
Sample ID: BH-1 Bulk 1 @ 0-5'
Soil Description: Olive Brown Silty Sand (SM)

Wt of Soil + Ring:	576.5
Weight of Ring:	194.8
Wt of Wet Soil:	381.7
Percent Moisture:	9.0%
Sample Height, in	0.95
Wet Density, pcf:	122.1
Dry Denstiy, pcf:	112.1

% Saturation:	48.2

Expansion **Rack # 3**

Date/Time	2/16/2022	3:25 PM
Initial Reading	0.0000	
Final Reading	0.0259	

Expansion Index **26**

(Final - Initial) x 1000

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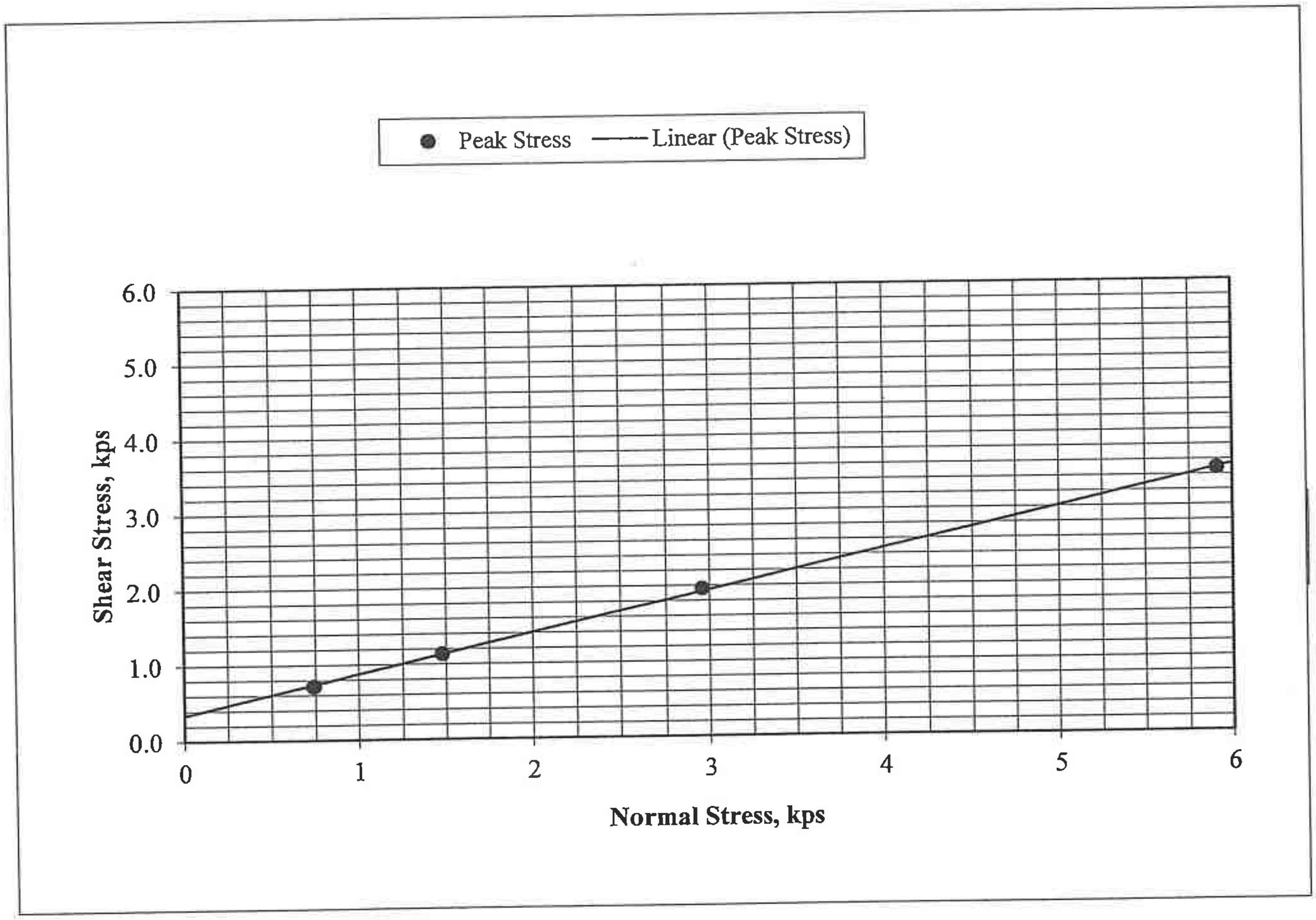
Direct Shear ASTM D 3080-04
(modified for unconsolidated condition)

February 18, 2022

Job Number: 644-22003
Job Name 393 South Kirby Street
Lab ID No. LN6-22044
Sample ID BH-1 Bulk 1 @ 0-5'
Classification Olive Brown Silty Sand (SM)
Sample Type Remolded @ 90% of Maximum Density

Initial Dry Density: 111.3 pcf
Initial Mosture Content: 12.0 %
Peak Friction Angle (Ø): 28°
Cohesion (c): 340 psf

Test Results	1	2	3	4	Average
Moisture Content, %	19.0	19.0	19.0	19.0	19.0
Saturation, %	100.0	100.0	100.0	100.0	100.0
Normal Stress, kps	0.739	1.479	2.958	5.916	
Peak Stress, kps	0.719	1.134	1.962	3.488	



Job Number: 644-22003
Job Name: 393 South Kirby Street
Date: 2/18/2022

Moisture Adjustment		Remolded Shear Weight	
Wt of Soil:	1,000	Max Dry Density:	124.0
Moist As Is:	5.5	Optimum Moisture:	12.0
Moist Wanted:	12.0		
ml of Water to Add:	61.6	Wt Soil per Ring, g:	150.3

UBC

Gradation

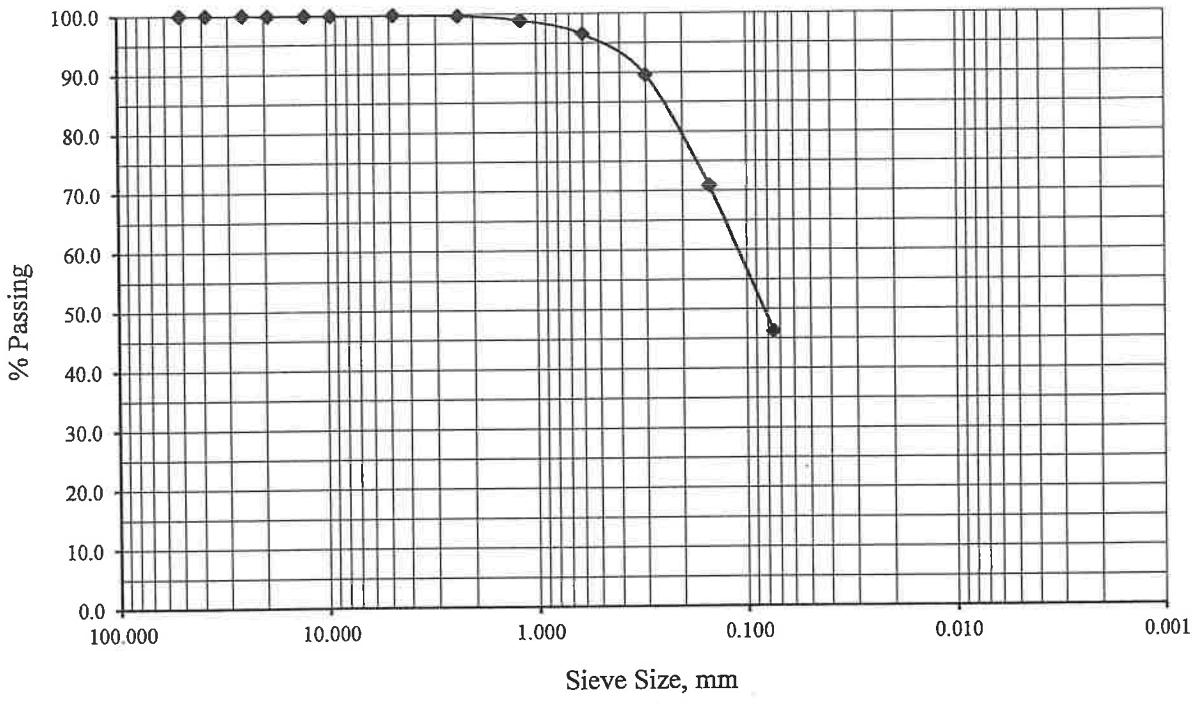
ASTM C117 & C136

February 18, 2022

Project Number: 644-22003
Project Name: 393 South Kirby Street
Lab ID Number: LN6-22044
Sample ID: BH-1 Bulk 1 @ 0-5'

Soil Classification: SM

Sieve Size, in	Sieve Size, mm	Percent Passing
2"	50.8	100.0
1 1/2"	38.1	100.0
1"	25.4	100.0
3/4"	19.1	99.9
1/2"	12.7	99.9
3/8"	9.53	99.9
#4	4.75	99.9
#8	2.36	99.7
#16	1.18	98.9
#30	0.60	96.6
#50	0.30	89.6
#100	0.15	70.9
#200	0.075	46.3



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Gradation

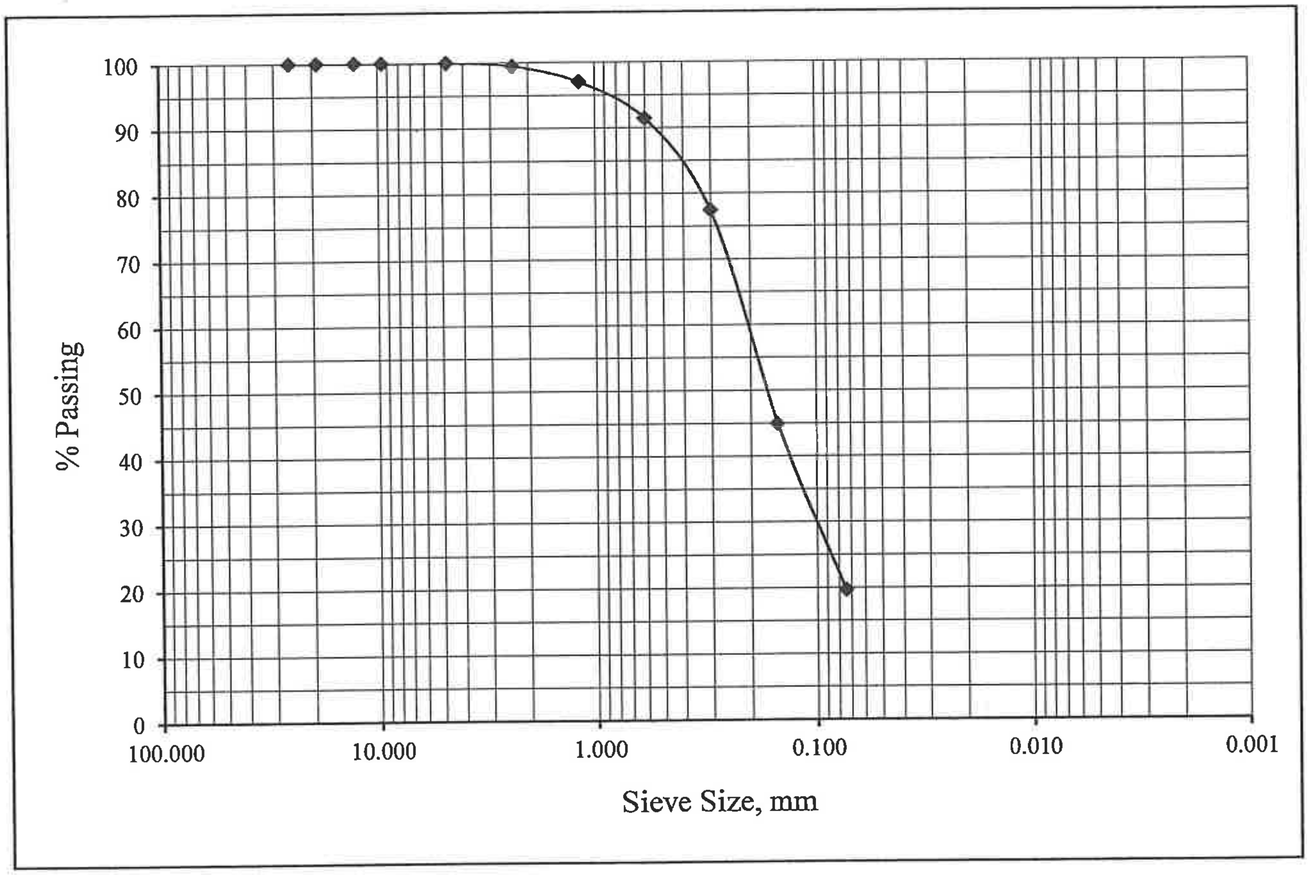
ASTM C117 & C136

February 18, 2022

Project Number: 644-22003
Project Name: 393 South Kirby Street
Lab ID Number: LN6-22044
Sample ID: BH-1 R-2 @ 5'

Soil Classification: SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	100.0
#8	2.36	99.5
#16	1.18	97.1
#30	0.60	91.5
#50	0.30	77.5
#100	0.15	45.0
#200	0.074	19.7



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Gradation

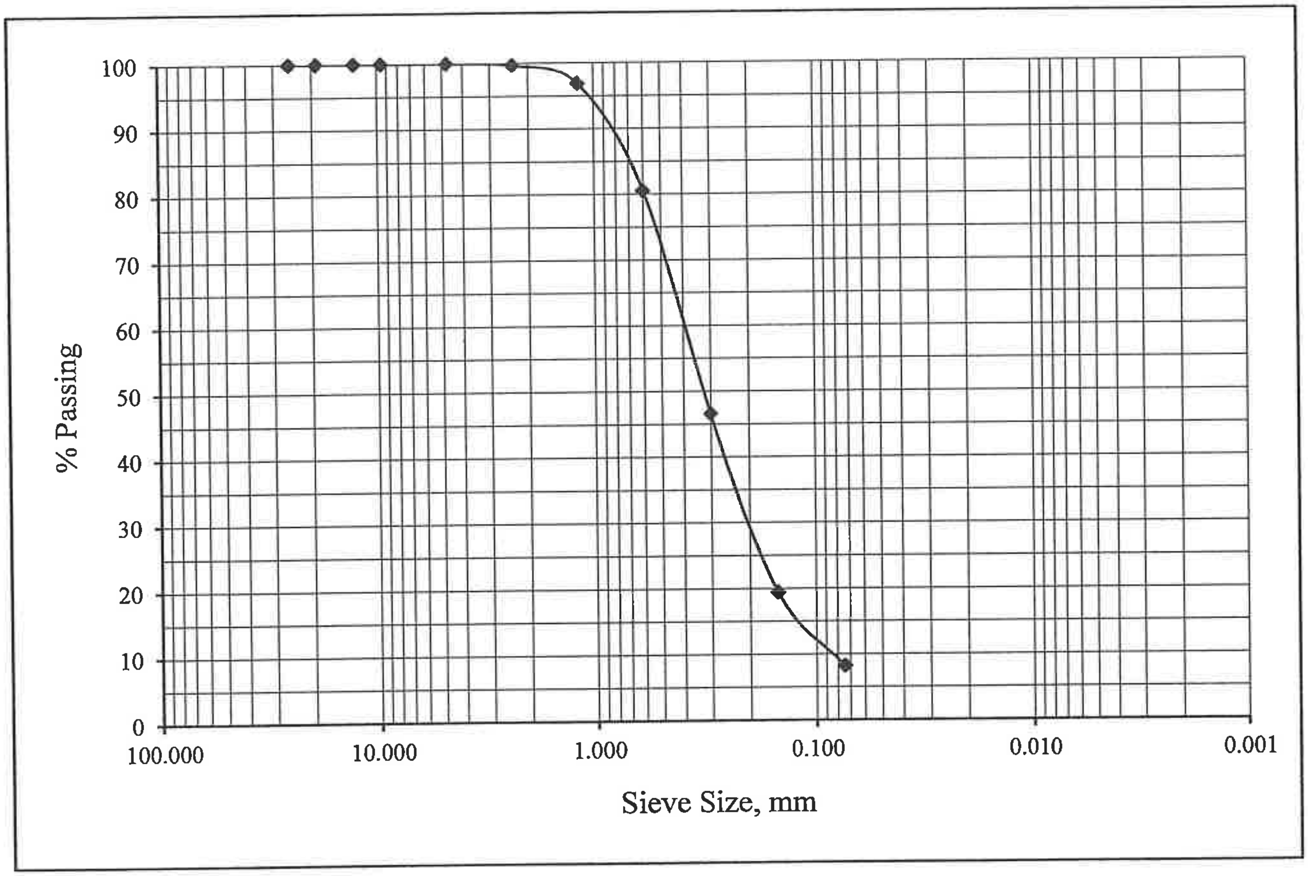
ASTM C117 & C136

February 18, 2022

Project Number: 644-22003
Project Name: 393 South Kirby Street
Lab ID Number: LN6-22044
Sample ID: BH-1 S-7 @ 30'

Soil Classification: SP-SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	100.0
#8	2.36	99.7
#16	1.18	96.9
#30	0.60	80.6
#50	0.30	46.6
#100	0.15	19.4
#200	0.074	8.2



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Gradation

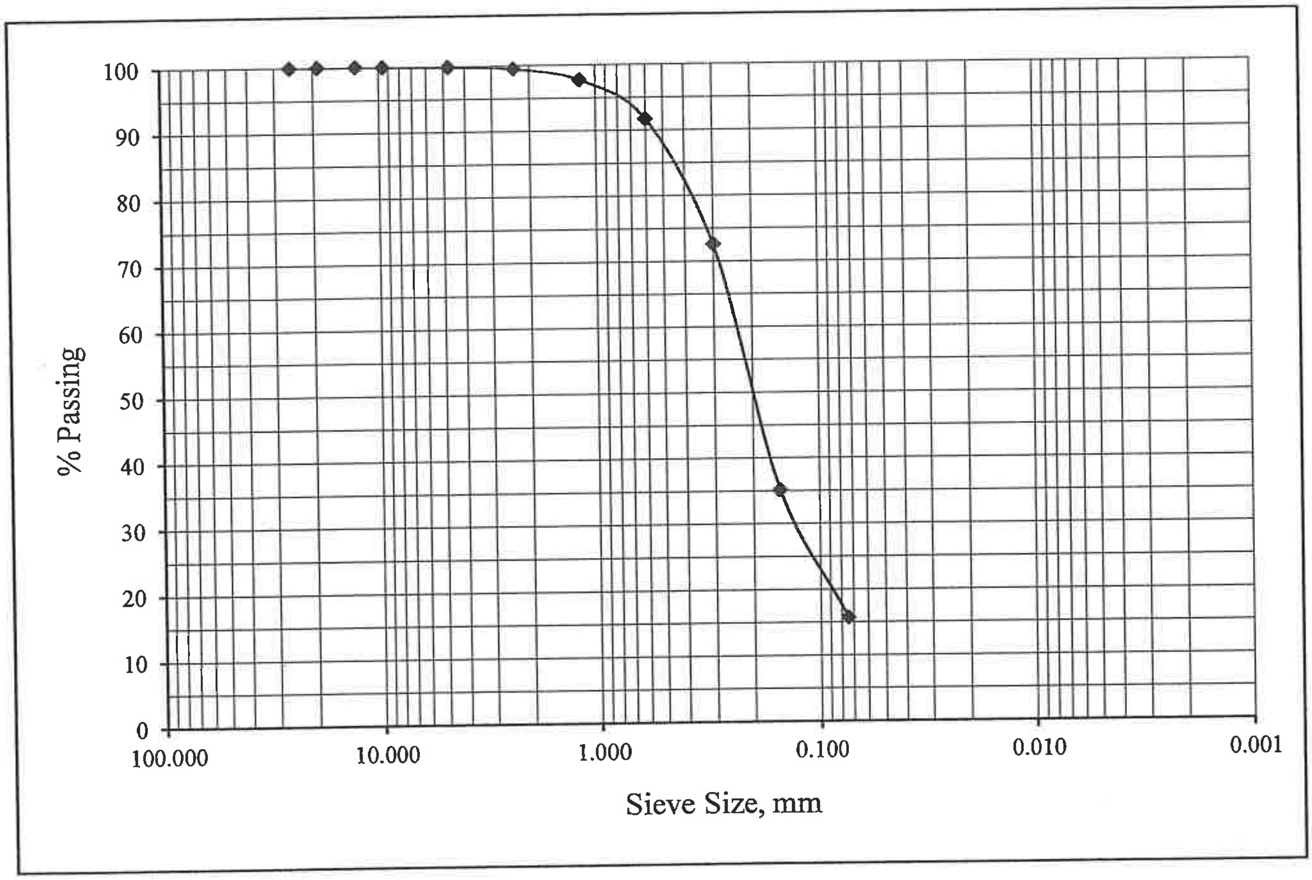
ASTM C117 & C136

February 18, 2022

Project Number: 644-22003
Project Name: 393 South Kirby Street
Lab ID Number: LN6-22044
Sample ID: BH-2 R-2 @ 10'

Soil Classification: SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	99.9
#8	2.36	99.5
#16	1.18	97.8
#30	0.60	91.7
#50	0.30	72.7
#100	0.15	35.1
#200	0.074	15.7



Gradation

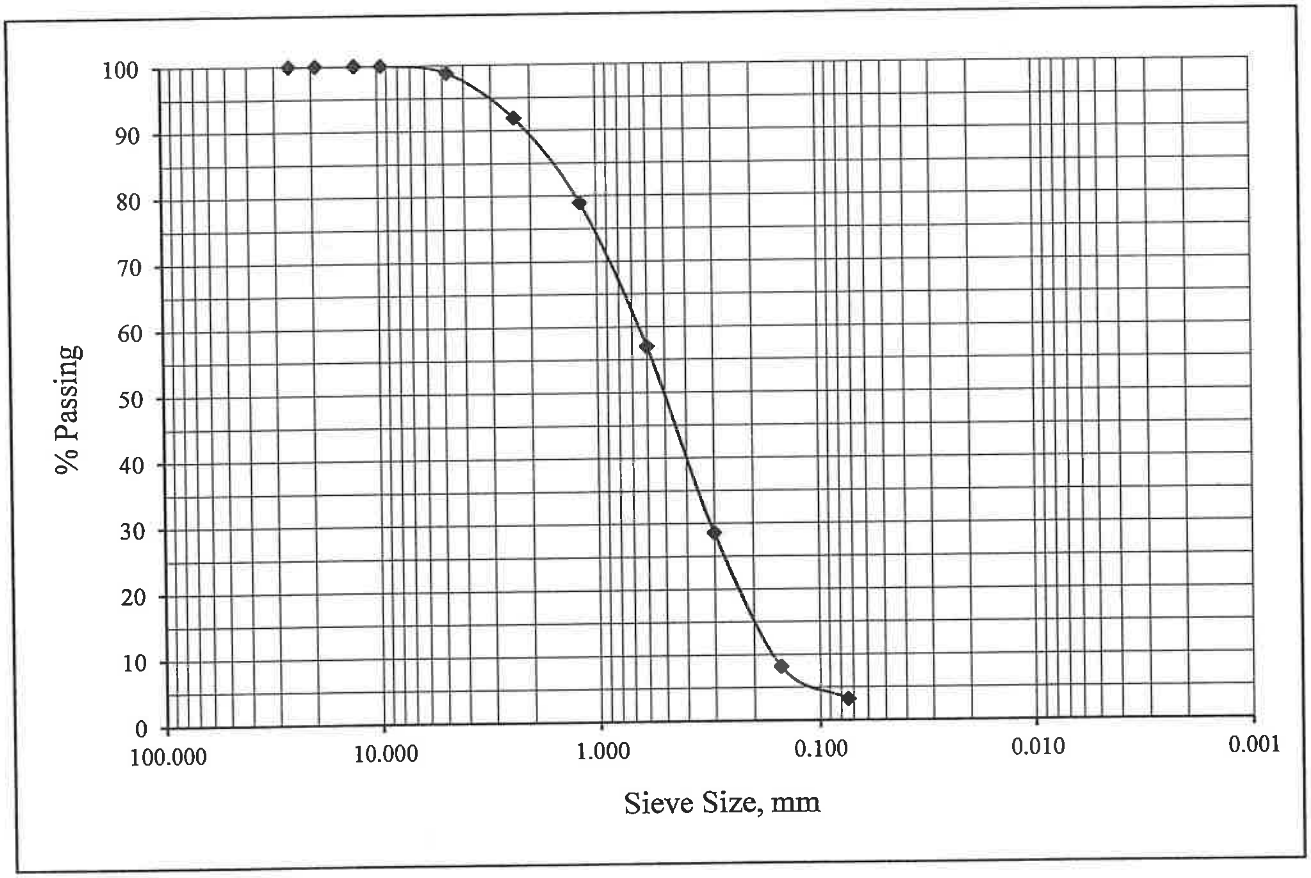
ASTM C117 & C136

February 18, 2022

Project Number: 644-22003
Project Name: 393 South Kirby Street
Lab ID Number: LN6-22044
Sample ID: BH-4 R-3 @ 15'

Soil Classification: SP

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	98.8
#8	2.36	91.9
#16	1.18	79.0
#30	0.60	57.0
#50	0.30	28.6
#100	0.15	8.2
#200	0.074	3.3



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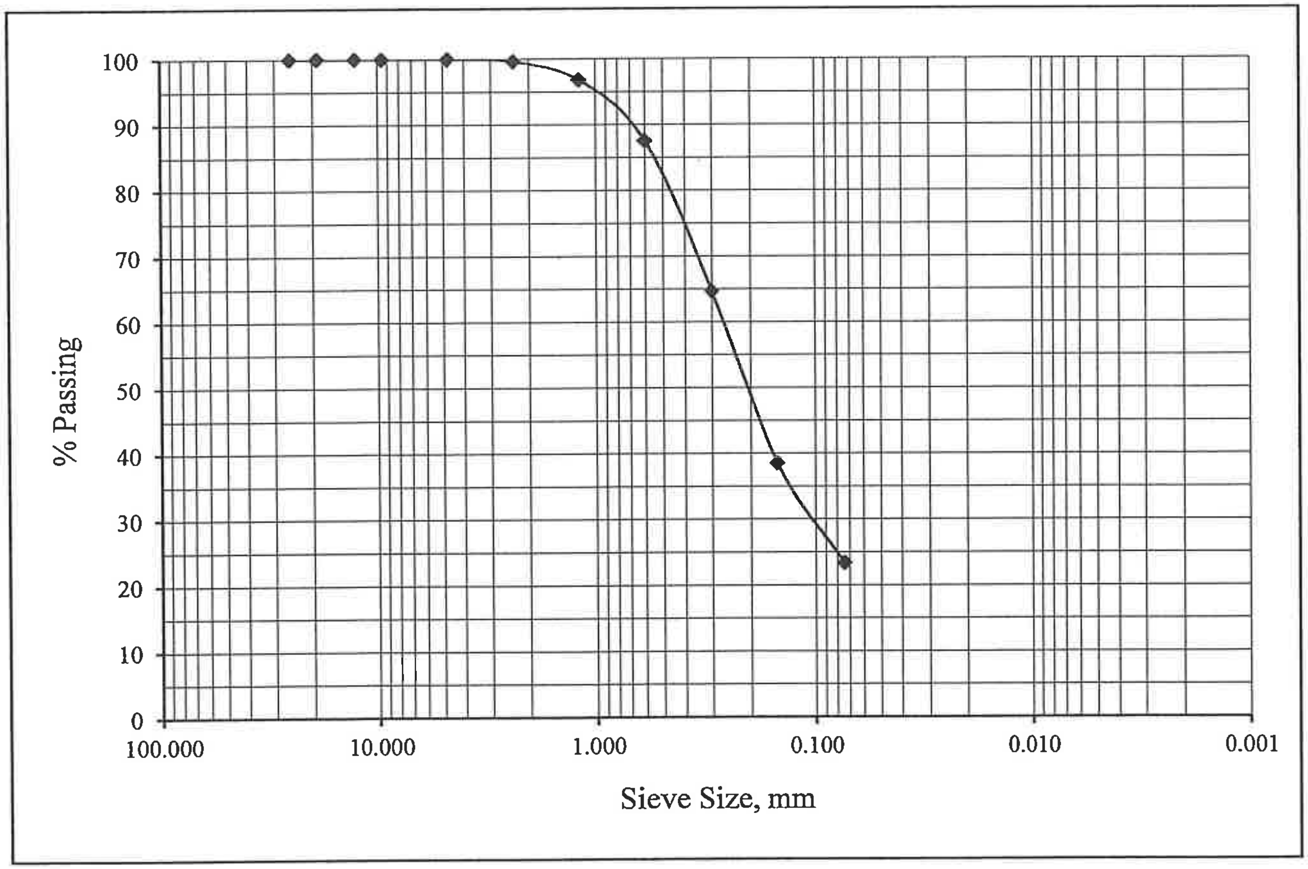
February 18, 2022

Project Number: 644-22003
Project Name: 393 South Kirby Street
Lab ID Number: LN6-22044
Sample ID: BH-6 S-2 @ 10'

Soil Classification: SM

Sieve Size, in	Sieve Size, mm	Percent Passing
1"	25.4	100.0
3/4"	19.1	100.0
1/2"	12.7	100.0
3/8"	9.53	100.0
#4	4.75	100.0
#8	2.36	99.6
#16	1.18	96.8
#30	0.60	87.6
#50	0.30	64.7
#100	0.15	38.6
#200	0.074	23.4



Sladden Engineering
450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

One Dimensional Consolidation

ASTM D2435 & D5333

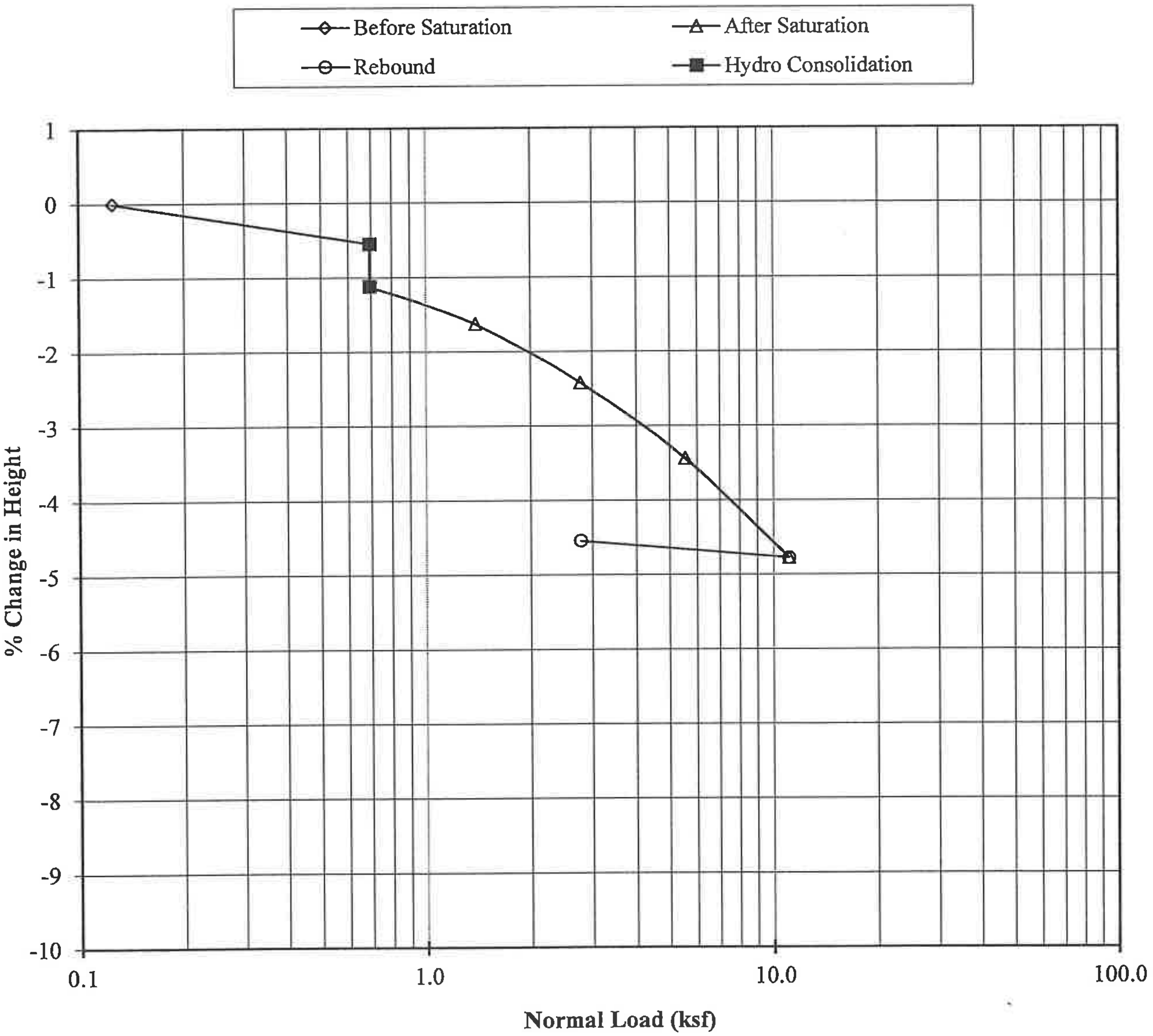
February 18, 2022

Job Number: 644-22003
Job Name: 393 South Kirby Street
Lab ID Number: LN6-22044
Sample ID: BH-1 R-2 @ 5'
Soil Description: Olive Brown Silty Sand (SM)

Initial Dry Density, pcf:	104.9
Initial Moisture, %:	1.7
Initial Void Ratio:	0.589
Specific Gravity:	2.67

Hydrocollapse: 0.6% @ 0.694 ksf

% Change in Height vs Normal Presssure Diagram



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One Dimensional Consolidation

ASTM D2435 & D5333

February 18, 2022

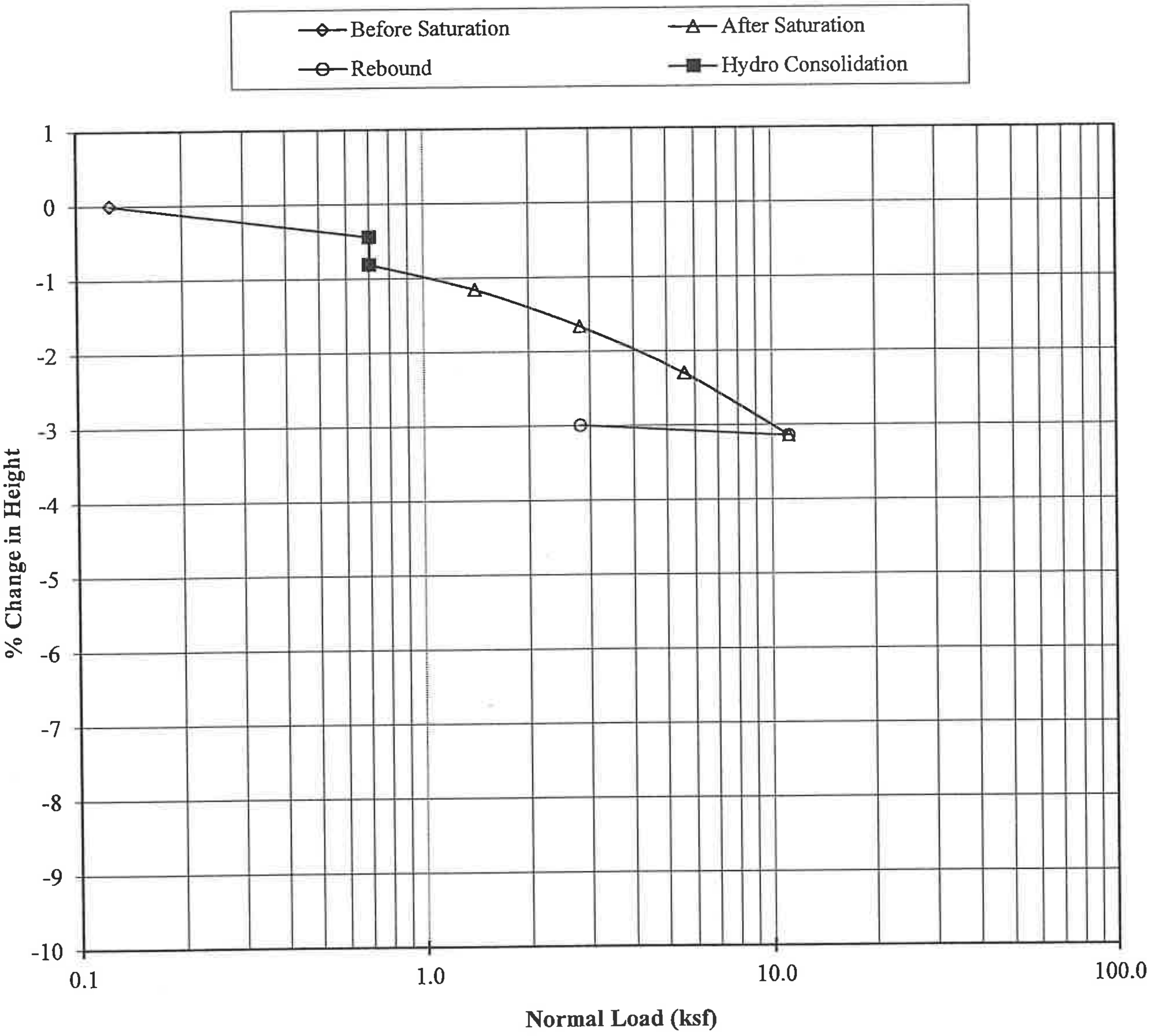
Job Number: 644-22003
Job Name: 393 South Kirby Street

Lab ID Number: LN6-22044
Sample ID: BH-2 R-2 @ 10'
Soil Description: Olive Brown Silty Sand (SM)

Initial Dry Density, pcf:	97.0
Initial Moisture, %:	4.0
Initial Void Ratio:	0.719
Specific Gravity:	2.67

Hydrocollapse: 0.4% @ 0.702 ksf

% Change in Height vs Normal Presssure Diagram



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6782 Stanton Ave., Suite A, Buena Park, CA 90621 (714) 523-0952 Fax (714) 523-1369
45090 Golf Center Pkwy, Suite F, Indio CA 92201 (760) 863-0713 Fax (760) 863-0847
450 Egan Avenue, Beaumont, CA 92223 (951) 845-7743 Fax (951) 845-8863

Date: February 18, 2022

Account No.: 644-22003

Customer: Tulloch Holdings LLC

Location: APN 436-490-011, 393 South Kirby Street, San Jacinto

Analytical Report

Corrosion Series

	pH per CA 643	Soluble Sulfates per CA 417 ppm	Soluble Chloride per CA 422 ppm	Min. Resistivity per CA 643 ohm-cm
BH-1 @ 0-5’	7.8	40	90	1100

APPENDIX C

SEISMIC DESIGN MAP AND REPORT
SITE-SPECIFIC SEISMIC DESIGN PARAMETERS

Project: APN 436-490-011
Project Number: 644-22003
Client: Tulloch Holdings, LLC
Site Lat/Long: 33.7828/ -116.9959
Controlling Seismic Source: San Jacinto

REFERENCE	NOTATION	VALUE
Site Class	C, D, D default, or E	D measured
Site Class D - Table 11.4-1	F_a	1.0
Site Class D - 21.3(ii)	F_v	2.5
$0.2^*(S_{D1}/S_{DS})$	T_0	0.138
S_{D1}/S_{DS}	T_S	0.688
Fundamental Period (12.8.2)	T	Period
Seismic Design Maps or Fig 22-14	T_L	8
Equation 11.4-4 - $2/3^*S_{M1}$	S_{D1}	0.9792*
Equation 11.4-2 - $F_V^*S_1$	S_{M1}	1.4688*

REFERENCE	NOTATION	VALUE
Fv (Table 11.4-2)[Used for General Spectrum]	F_v	1.7
Design Maps	S_s	2.134
Design Maps	S_1	0.864
Equation 11.4-1 - $F_A^*S_S$	S_{MS}	2.134*
Equation 11.4-3 - $2/3^*S_{MS}$	S_{DS}	1.423*
Design Maps	PGA	0.946
Table 11.8-1	F_{PGA}	1.1
Equation 11.8-1 - F_{PGA}^*PGA	PGA_M	1.041*
Section 21.5.3	80% of PGA_M	0.832
Design Maps	C_{RS}	0.891
Design Maps	C_{R1}	0.878

RISK COEFFICIENT

Cr - At Perods <=0.2, $Cr=C_{RS}$	C_{RS}	0.891
Cr - At Periods >=1.0, $Cr=C_{R1}$	C_{R1}	0.878

Cr - At Periods between 0.2 and 1.0 use trendline formula to complete

Period	Cr
0.200	0.891
0.300	0.889
0.400	0.888
0.500	0.886
0.600	0.885
0.680	0.883
1.000	0.878

* **Code based design value.** See accompanying data for Site Specific Design values.

Mapped values from https://seismicmaps.org/

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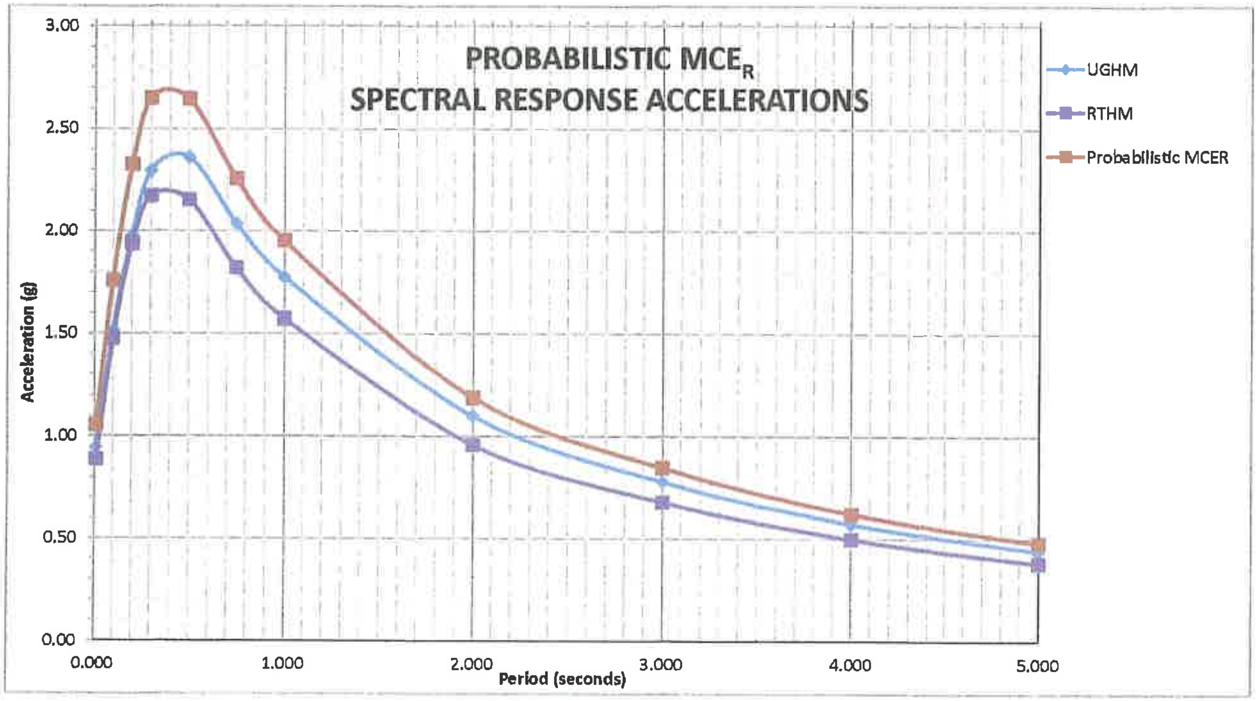
PROBABILISTIC SPECTRA[1]
2% in 50 year Exceedence

Project No: 644-22003

Period	UGHM	RTHM	Max Directional Scale Factor[2]	Probabilistic MCE
0.010	0.942	0.885	1.19	1.053
0.100	1.516	1.475	1.19	1.755
0.200	1.977	1.938	1.20	2.326
0.300	2.293	2.169	1.22	2.646
0.500	2.358	2.150	1.23	2.645
0.750	2.037	1.818	1.24	2.254
1.000	1.774	1.573	1.24	1.951
2.000	1.097	0.957	1.24	1.187
3.000	0.777	0.677	1.25	0.846
4.000	0.570	0.496	1.25	0.620
5.000	0.438	0.379	1.26	0.478

Probabilistic PGA: 0.942

Is Probabilistic $Sa_{(max)}<1.2F_a$? NO



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[1] Data Sources:
https://earthquake.usgs.gov/hazards/interactive/
https://earthquake.usgs.gov/designmaps/rtgm/

[2] Shahi-Baker RotD100/RotD50 Factors (2014)

DETERMINISTIC SPECTRUM

Largest Amplitudes of Ground Motions Considering All Sources Calculated using Weighted Mean of Attenuation Equations[1]

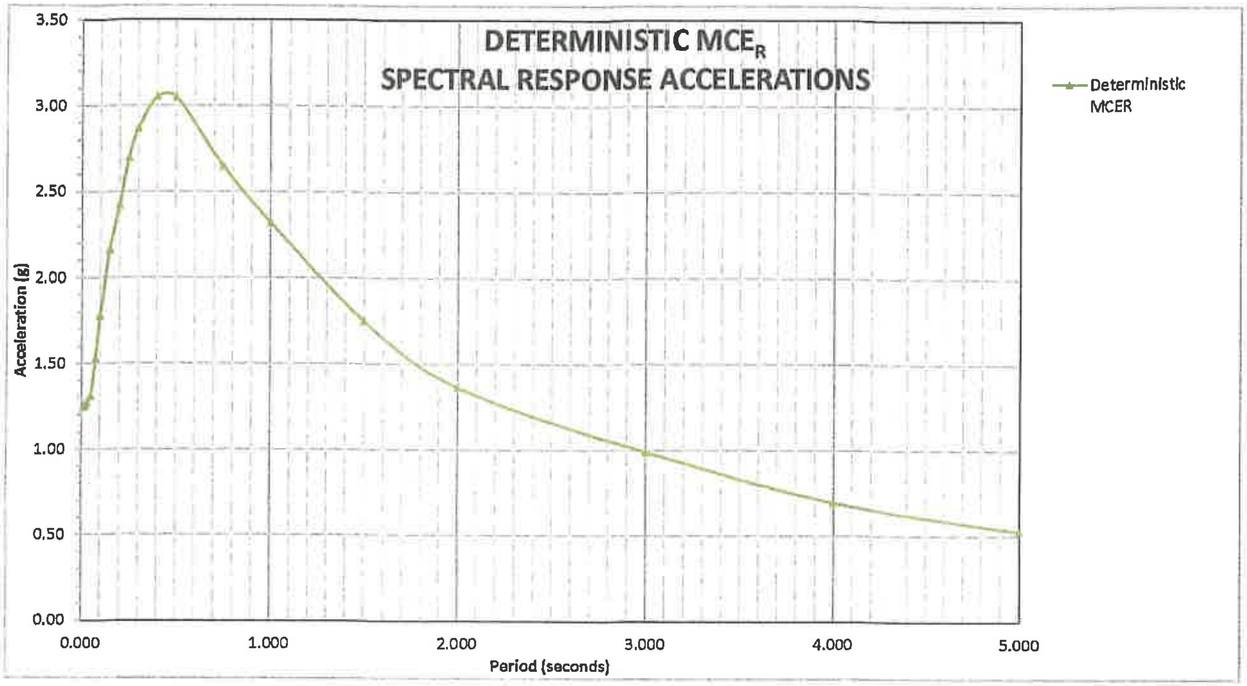
Controlling Source: San Jacinto

Is Probabilistic $Sa_{(max)}$<1.2Fa? NO

Project No: 644-22003

Period	Deterministic PSa Median + 1.σ for 5% Damping	Max Directional Scale Factor[2]	Deterministic MCE	Section 21.2.2 Scaling Factor Applied
0.010	1.047	1.19	1.245	1.245
0.020	1.055	1.19	1.255	1.255
0.030	1.065	1.19	1.267	1.267
0.050	1.098	1.19	1.306	1.306
0.075	1.284	1.19	1.527	1.527
0.100	1.497	1.19	1.781	1.781
0.150	1.801	1.20	2.161	2.161
0.200	2.017	1.20	2.420	2.420
0.250	2.228	1.21	2.695	2.695
0.300	2.351	1.22	2.868	2.868
0.400	2.481	1.23	3.052	3.052
0.500	2.478	1.23	3.048	3.048
0.750	2.133	1.24	2.645	2.645
1.000	1.872	1.24	2.321	2.321
1.500	1.409	1.24	1.747	1.747
2.000	1.099	1.24	1.363	1.363
3.000	0.791	1.25	0.988	0.988
4.000	0.556	1.25	0.695	0.695
5.000	0.416	1.26	0.524	0.524

Is Determinstic $Sa_{(max)}$<1.5*Fa?	NO
Section 21.2.2 Scaling Factor:	N/A
Deterministic PGA:	1.047
Is Deterministic PGA >=F_{PGA}*0.5?	YES



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[1] NGAWest 2 GMPE worksheet and Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3) - Time Dependent Model

[2] Shahi-Baker RotD100/RotD50 Factors (2014)

SITE SPECIFIC SPECTRA

Period	Probabilistic MCE	Deterministic MCE	Site-Specific MCE	Design Response Spectrum (Sa)
0.010	1.053	1.245	1.053	0.702
0.100	1.755	1.781	1.755	1.170
0.200	2.326	2.420	2.326	1.550
0.300	2.646	2.368	2.646	1.764
0.500	2.645	3.048	2.645	1.763
0.750	2.254	2.645	2.254	1.503
1.000	1.951	2.321	1.951	1.300
2.000	1.187	1.363	1.187	0.791
3.000	0.846	0.988	0.846	0.564
4.000	0.620	0.695	0.620	0.413
5.000	0.478	0.524	0.478	0.318

Period	ASCE 7 SECTION 11.4.6 General Spectrum	80% General Response Spectrum
0.005	0.600	0.480
0.010	0.631	0.505
0.020	0.693	0.554
0.030	0.755	0.604
0.050	0.879	0.703
0.060	0.941	0.753
0.075	1.034	0.827
0.090	1.127	0.902
0.100	1.189	0.951
0.110	1.251	1.001
0.120	1.313	1.051
0.136	1.412	1.130
0.150	1.423	1.138
0.160	1.423	1.138
0.170	1.423	1.138
0.180	1.423	1.138
0.200	1.423	1.138
0.250	1.423	1.138
0.300	1.423	1.138
0.400	1.423	1.138
0.500	1.423	1.138
0.600	1.423	1.138
0.640	1.423	1.138
0.680	1.423	1.138
0.850	1.152	0.922
0.900	1.088	0.870
0.950	1.031	0.825
1.000	0.979	0.783
1.500	0.653	0.522
2.000	0.490	0.392
3.000	0.326	0.261
4.000	0.245	0.196
5.000	0.196	0.157

ASCE 7-16: Section 21.4

Site Specific

	Calculated Value	Design Value
SDS:	1.588	1.588
SD1:	1.693	1.693
SMS:	2.382	2.382
SM1:	2.539	2.539
Site Specific PGAm:	0.942	0.942
Site Class:	D measured	

Seismic Design Category - Short*	E
Seismic Design Category - 1s*	E

* Risk Categories I, II, or III

Project No: 644-22003

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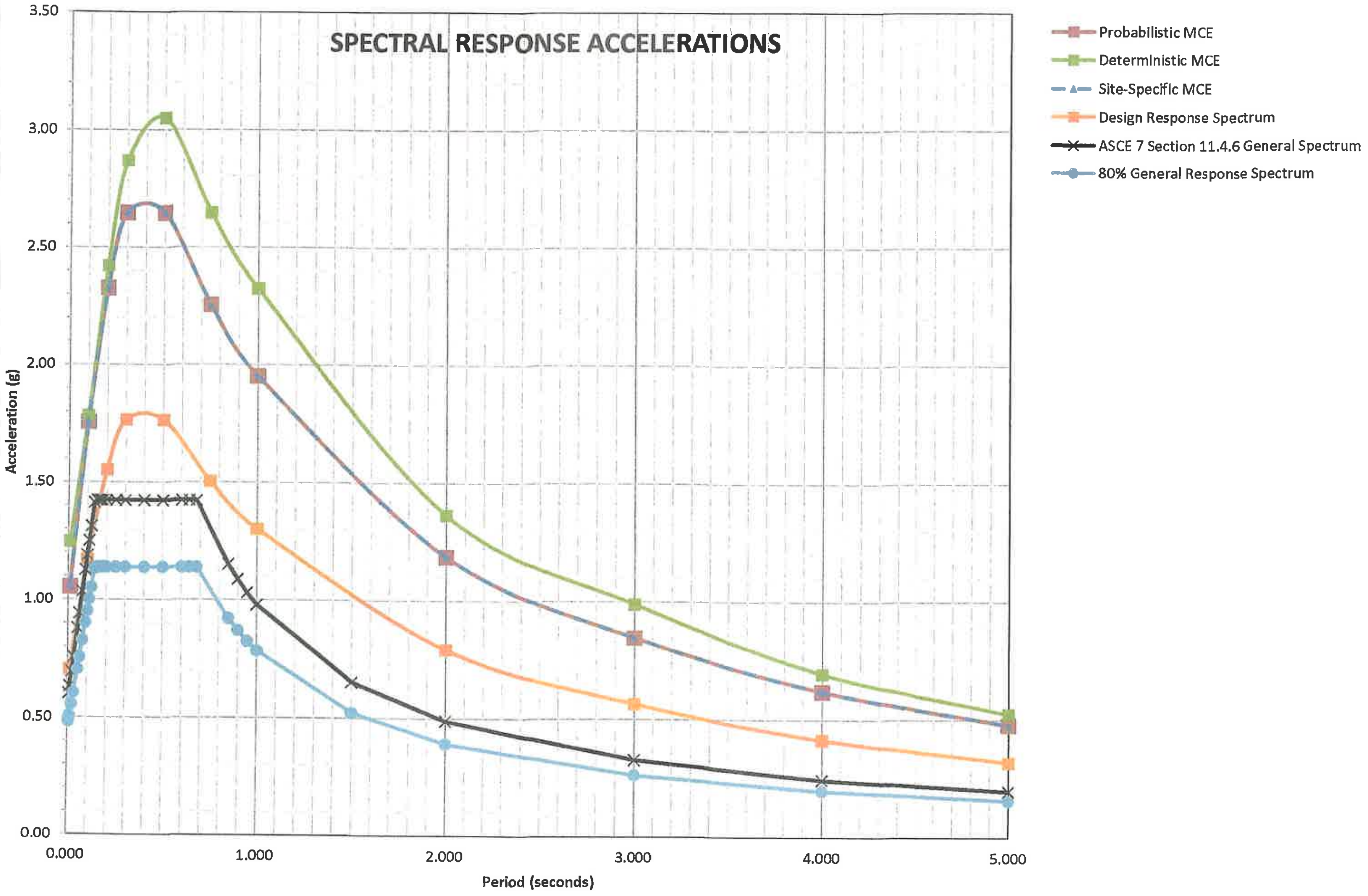
SPECTRAL RESPONSE ACCELERATIONS
Acceleration (g)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
0.000
1.000
2.000
3.000
4.000
5.000
Period (seconds)
Probabilistic MCE
Deterministic MCE
Site-Specific MCE
Design Response Spectrum
ASCE 7 Section 11.4.6 General Spectrum
80% General Response Spectrum

OSHPD

Latitude, Longitude: 33.7828, -116.9959

Date	2/14/2022, 8:40:56 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	2.134	MCE_R ground motion. (for 0.2 second period)
S_1	0.864	MCE_R ground motion. (for 1.0s period)
S_{MS}	2.134	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.423	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.946	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	1.041	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	2.134	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	2.395	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.245	Factored deterministic acceleration value. (0.2 second)
S1RT	0.864	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.984	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.896	Factored deterministic acceleration value. (1.0 second)
PGAd	0.946	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.891	Mapped value of the risk coefficient at short periods
C_{R1}	0.878	Mapped value of the risk coefficient at a period of 1 s

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