APPENDIX E1

PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT & ORGANIC SOIL/MANURE EVALUATION REPORT

Converse Consultants
Geotechnical Engineering
Environmental & Groundwater Science
Inspection & Testing Services

PRELIMINARY GEOTECHNICAL INVESTIGATION REPORT & ORGANIC SOIL/MANURE EVALUATION REPORT

EUCLID MIXED USE SPECIFIC PLAN PROJECT

Southeast Corner of Euclid Avenue and Schaefer Avenue
City of Ontario, San Bernadino County, California

CONVERSE PROJECT NO. 21-81-154-02

Prepared For:

EUCLID LAND INVESTMENTS
C/O RCCD, INC.
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Anaheim Hills, California 92808

Presented By:

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March 30, 2022

March 30, 2022

Mr. Jason Lee
Vice President
Euclid Land Investments
c/o RCCD, Inc.
8101 E. Kaiser Boulevard, Suite 140
Anaheim Hills, California 92808

Subject: **PRELIMINARY GEOTECHNICAL INVESTIGATION AND ORGANIC SOIL/MANURE EVALUATION REPORT**
Euclid Mixed Use Specific Plan Project
Southeast Corner of Euclid Avenue and Schaefer Avenue
City of Ontario, San Bernardino County, California
Converse Project No. 21-81-154-00 (02)

Dear Mr. Lee:

Converse Consultants (Converse) is pleased to submit this Preliminary Geotechnical Investigation and Organic Soil/Manure Evaluation Report to assist with the proposed Euclid Mixed Use Specific Plan business park development located at the southeast corner of Euclid Avenue and Schaefer Avenue, in the City of Ontario, San Bernardino County, California. This report was prepared in accordance with our proposal dated January 4, 2021 and your approval of our proposal dated January 5, 2022.

Based upon our field investigation, laboratory data, and analyses, the project site is considered feasible from a geotechnical standpoint, provided the recommendations presented in this report are incorporated into the design and development of the project.

We appreciate the opportunity to be of service to Euclid Land Investments. Should you have any questions, please do not hesitate to contact us at 909-796-0544.

CONVERSE CONSULTANTS

Hashmi S. E. Quazi, PhD, GE, PE
Principal Engineer

Dist.: 1/Addressee (e-mail)
HSQ/RLG/CN/kvg

PROFESSIONAL CERTIFICATION

This report has been prepared by the individuals whose seals and signatures appear herein.

The findings, recommendations, specifications, or professional opinions contained in this report were prepared in accordance with generally accepted professional engineering, engineering geologic principles, and practice in this area of Southern California. There is no warranty, either expressed or implied.

Catherine Nelson, GIT
Senior Staff Geologist

Robert Gregorek, PG, CEG
Senior Geologist

Hashmi S. E. Quazi, PhD, PE, GE
Principal Engineer

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APPENDICES

1.0 INTRODUCTION

This preliminary geotechnical investigation, organic soil/manure evaluation prepared by Converse for the 59.6-acre L-shaped shaped active dairy and agricultural site located at the southeast corner of Euclid Avenue and Schaefer Avenue, in the City of Ontario, San Bernardino County, California. The approximate location of the proposed project is shown in Figure No. 1, *Approximate Project Location Map.*

The purpose of this investigation was to evaluate the current nature and engineering properties of the subsurface soils and groundwater conditions and to provide geotechnical recommendations for the proposed residential development.

This report was prepared for the project described herein and is intended for use solely by Euclid Land Investments and their authorized agents. This report may be made available to the prospective bidders for bidding purposes. However, the bidders are responsible for their own interpretation of the site conditions between and beyond the boring locations, based on factual data contained in this report. This report may not contain sufficient information for use by others and/or other purposes.

2.0 PREVIOUS SITE INVESTIGATIONS

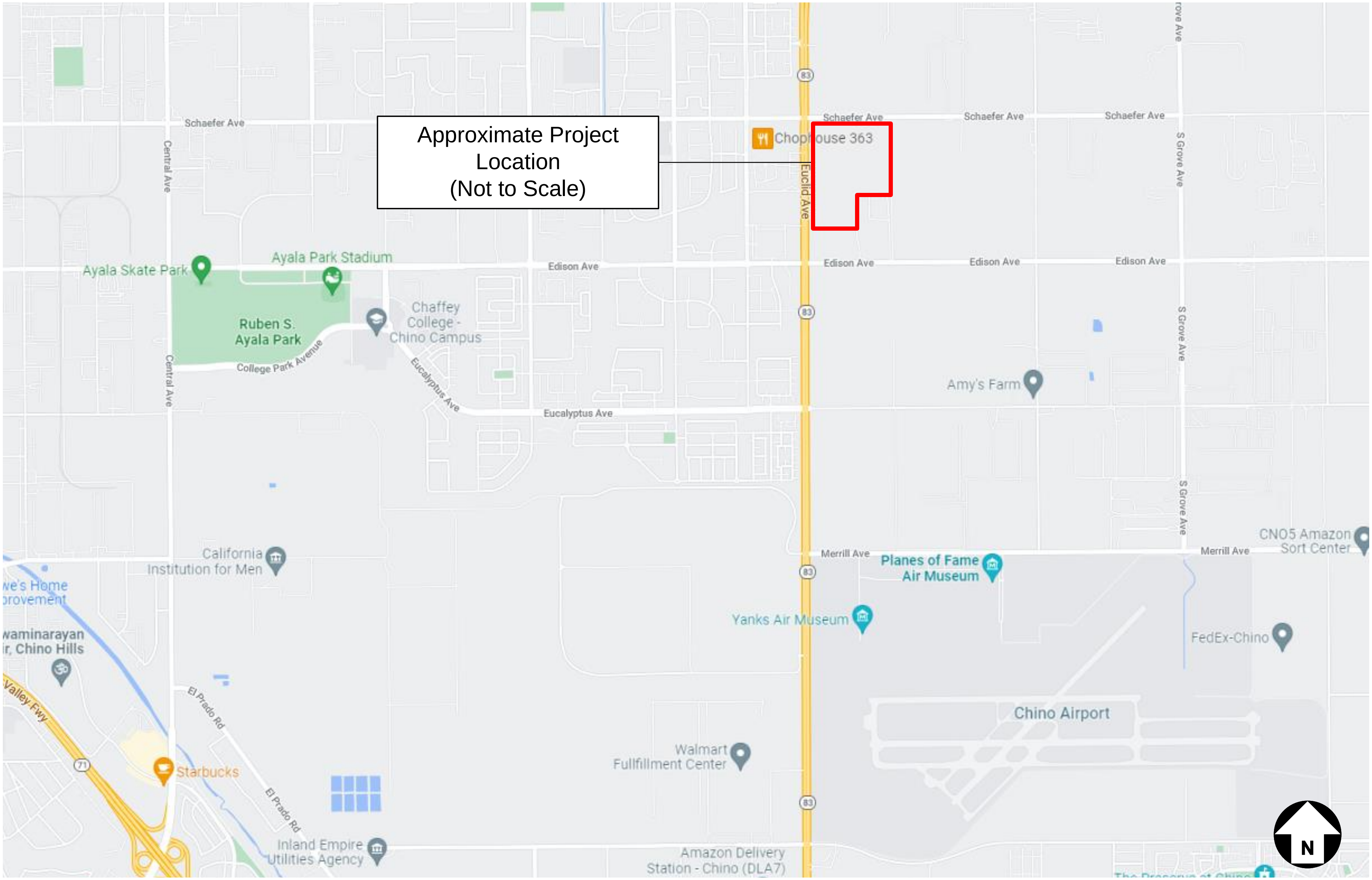
The referenced geotechnical evaluation of a soil stockpile at the subject site was performed Converse Consultants in 2021, with the data incorporated into this report. To the best of our knowledge no other previous geotechnical investigations or reports were prepared for the development of the site at this time.

3.0 SITE DESCRIPTION AND BACKGROUND

The 59.6-acre L-shaped shaped active dairy and agricultural site is located at the southeast corner of Euclid Avenue and Schaefer Avenue, in the City of Ontario, San Bernardino County, California. The property is bounded to the north by Schaefer Avenue, to the west by Euclid Avenue, to the south and east by existing active and abandoned dairies.

The site slopes gently from the northeast to the southwest and south. Drainage appears to flow south and southwest. Site elevations range from approximately 730 feet above mean sea level (msl) in the northeast portion of the site to approximately 690 feet above msl in the southwest portion of the site.

The present site conditions are depicted in Photographs Nos. 1 through 5.



Project: Euclid Mixed Use Specific Plan Project
Location: Southeast Corner of Euclid Avenue and Schaefer Avenue
City of Ontario, San Bernadino County, California

For: Euclid Land Investments c/o RCCD Inc.

Approximate Project Location Map

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Figure No.
1

Photograph No. 1: Current site conditions, facing northeast.

Photograph No. 2: Current site conditions, facing southeast.

Photograph No. 3: Current site conditions, facing southwest.

Photograph No. 4: Current site conditions at large southeastern berm, facing southeast.

Photograph No. 5: Current site conditions at stockpile in western cow pens, facing north.

4.0 PROJECT DESCRIPTION

Based on conversations with Mr. Jason Lee of Euclid Land Investments the property will be developed for business park use. No development or grading plans are available, at this time. However, grading is anticipated to have cuts and fills of up to 5 feet to 10 feet or less. The structures will likely be one to two-story tilt up buildings founded on shallow footings with slab-on-grade with concrete wall, steel and possible block wall construction. Associated with the development will likely be above and below ground utilities, access roads, and interior streets.

5.0 SCOPE OF WORK

The scope of Converse's investigation is described in the following sections.

5.1 Project Set-up

The project set-up consisted of the following tasks.

- Review of existing plans, reports, and data relevant to the project.
- Conducted a site reconnaissance to mark the exploration locations and to verify drill rig/backhoe access to the proposed locations were available.
- Notified Underground Service Alert (USA) at least 48 hours prior to conducting field work to clear the exploration locations of any conflict with existing underground utilities.

- Engaged a drill rig company to conduct exploratory borings and a backhoe company to excavate exploratory test pits.

5.2 Subsurface Exploration

Six exploratory borings (BH-01 through BH-06) were drilled using a truck-mounted CME 75 drill rig equipped with 8-inch diameter hollow-stem augers to investigate the subsurface conditions on January 20, 2022. The borings were drilled to depths ranging from 16.5 feet to 51.5 feet below the existing ground surface (bgs).

Thirteen exploratory test pits (TP-01 through TP-13) were excavated using a backhoe equipped with 24-inch-wide bucket to investigate the subsurface conditions on January 21 and 24, 2022. The test pits were excavated between 4.0 feet and 11.5 feet below the existing ground surface (bgs).

In addition, 8 exploratory test pits (TP-01 through TP-8) were previously excavated using a backhoe equipped with 24-inch-wide bucket to solely investigate the subsurface conditions of a soil stockpile on July 28, 2021, and obtain samples for organic content, expansion potential and corrosivity tests. The test pits were excavated from approximately 9.0 feet to 12.0 feet below the existing ground surface (bgs). Detailed logs of these previous test pits were not performed except for documenting the type of soil and the depth of fill soils.

The approximate locations of the current exploratory borings and test pits are shown on Figure No. 2, *Approximate Boring, Test Pit, and Overexcavation Locations Map*. A detailed discussion of the subsurface exploration is presented in Appendix A, *Field Exploration*.

5.3 Laboratory Testing

Representative samples of the site soils were tested in the laboratory to aid in soil classification, and to evaluate relevant engineering properties. These tests included the following.

- *In-situ* moisture contents and dry densities (ASTM D2216 and D2937)
- Organic Content (ASTM D2974, Methods A and C)
- Expansion Index (ASTM D4829)
- R-value (California Test 301)
- Soils Corrosivity (CTM 643, 422, 417, 532)
- Collapse (ASTM D5333)
- Grain size analysis (ASTM D6913)
- Maximum dry density and optimum-moisture content (ASTM D1557)
- Direct shear (ASTM D3080)
- Consolidation (ASTM D2435)

For *in-situ* moisture and dry density data, see the logs of boring in Appendix A, *Field Exploration*. For a description of the laboratory test methods and test results, see Appendix B, *Laboratory Testing Program*.

5.4 Analysis and Report Preparation

Data obtained from the field exploration and laboratory testing program was assembled and evaluated. Geotechnical analyses of the compiled data were performed, followed by the preparation of this report to present our findings, conclusions, and recommendations for the project.

6.0 SITE CONDITIONS

A general description of the subsurface conditions, various materials and groundwater conditions encountered at the site during our field exploration is discussed below.

6.1 Subsurface Profile

Based on our field exploration and laboratory test results, the subsurface soil at the project site consisted primarily of manure, organic artificial fill soil, topsoil, alluvium and older alluvium.

The various subsurface profiles and description of the earth material soils encountered are discussed below.

Manure/Highly Organic Soil: The site is partially covered by generally approximately 0.3 foot to 6.0 feet and locally, within the fill berm within the central eastern portion of the site, as much as 16.0 feet to 23.0 feet of manure or highly organic soils due to the site being on an active dairy farm. This manure and highly organic soils will need to be removed from the site prior to any developing. The approximate locations and depth of this material is shown on Figure No. 2, *Approximate Boring, Test Pit, and Overexcavation Locations Map*.

Organic Artificial Fill Soil: Due of the current dairy and agricultural use the surface of the majority of the project site is generally partially covered by up to approximately 0.9 foot to 10.0 feet of partially organic artificial fill soil. The average depth is approximately 5.0 feet. This material was encountered within some of the exploratory excavations and was generally comprised of silty sand, which was fine to coarse-grained, with trace to few gravel to 1.5-inches maximum dimension with occasional scattered cobbles to 10-inches maximum dimension, trace clay, some desiccation, some localized debris, some roots and rootlets, contained trace to few organics, medium dense to dense, moist and various shades of brown and orange. However, in the fill stockpile area within the central portion of the site these artificial fill soils were generally comprised of a mixture of silty sand, clayey sand, sandy silt and sandy clay and silty clay, which were fine to coarse-grained, with trace to few organics/manure, loose to medium dense, moist to wet and various shades of brown, yellow, gray and black. In addition, the fill stockpile approximate locations and depths of this material is shown on Figure No. 2, *Approximate Boring, Test Pit, and Overexcavation Locations Map*.

Topsoil: Topsoil was encountered at the surface or below the artificial fill within some of the exploratory excavations at depths ranging from approximately 4.0 feet to 8.0 feet bgs. This material was generally comprised of silty sand and sandy silt, which was fine to coarse-grained, with scattered gravel to 1-inch maximum dimension, trace clay, slightly to very desiccated, trace to few organics, some roots and rootlets, medium dense/stiff, moist and various shades of brown, yellow, gray and green. Based on exploratory excavations the topsoil ranged from up to about 2.0 feet to 5.0 feet thick

Alluvium: Holocene alluvium was encountered below the artificial fill and topsoil in the majority of the exploratory excavations at depths ranging from approximately 0.9 feet to 7.5 feet bgs. Where observed, this material was generally comprised of sand, silty sand, clayey sand, sandy silt and some sandy clay, which was fine to medium-grained, with trace gravel to 1-inch maximum dimension, slightly to very desiccated, some oxidation staining, some pinhole pores, locally micaceous, medium dense to very dense/medium stiff to very stiff, moist and various shades of brown, orange, green and gray. Based on some of the exploratory borings the alluvium ranged from up to about 6.0 feet to 16.5 feet thick. Portions of the upper 0.5 foot to 2.0 feet are low in density.

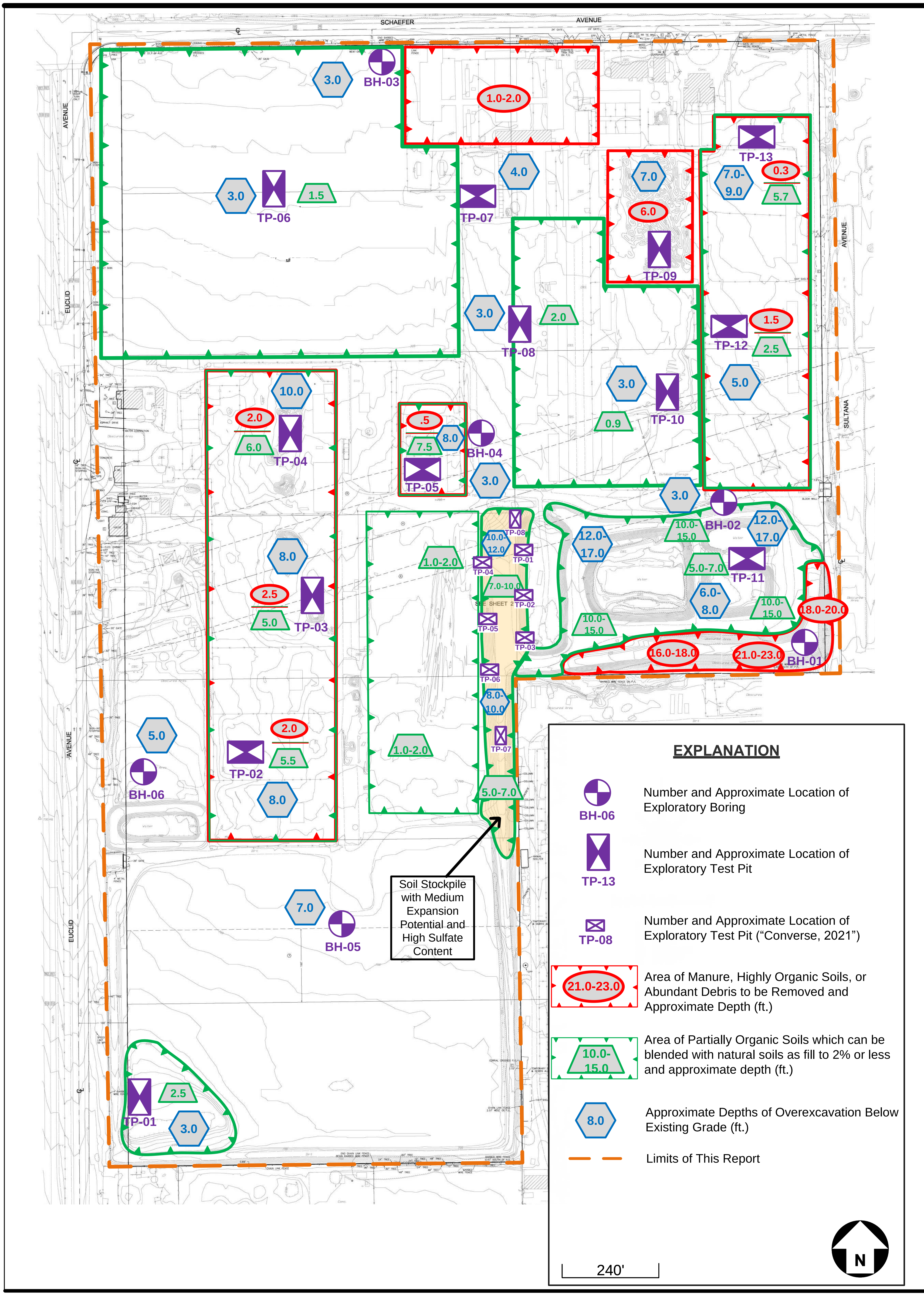
Older Alluvium: Early Holocene to late Pleistocene older alluvium was encountered at depths ranging from approximately 11.0 feet to 15.0 feet bgs. Where observed, this material was generally comprised of sand, silty sand and sandy clay, which was fine to coarse-grained, with trace to few gravel to 1-inch maximum dimension, slightly to very desiccated, moderate oxidation staining, medium dense to very dense/medium stiff to stiff and various shades of brown, orange, and red.

For a detailed description of the subsurface materials encountered in the exploratory borings and test pits, see the logs, Drawing Nos. A-2 through A-20*,* in Appendix A, *Field Exploration.*

6.2 Groundwater

Groundwater was not encountered during our field investigation explored of 51.5 feet.

For comparison, regional groundwater data from the GeoTracker database (SWRCB, 2021) was reviewed to evaluate the current and historical groundwater levels. No site with groundwater data was identified within a 1.0-mile radius of the project site.



Project: Euclid Mixed Use Specific Plan Project

Location: Southeast Corner of Euclid Avenue and Schaefer Avenue
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Approximate Boring, Test Pit, and Overexcavation Locations Map

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Figure No.
2

The National Water Information System (USGS, 2021) was reviewed for current and historical groundwater data from sites within an approximately 1.0-mile radius of the project site and no groundwater data was identified.

The California Department of Water Resources database (DWR, 2021) was reviewed for historical groundwater data from sites within a 1.0-mile radius of the project site. One site was identified within a 1.0-mile radius of the project site that contained groundwater elevation data. Details of that record are listed below.

- Well Name CHINO-1208672 (Station 340045N1176407W001), located approximately 1,650 feet east of the Project site, reported groundwater at depths ranging from 137.01 to 145.74 feet bgs between 2011 and 2021.

Based on the available data and the findings of our investigation, the historical high groundwater level and the current groundwater level is estimated to be deeper than 137 feet bgs. Groundwater is not expected to be encountered during construction of the proposed project. It should be noted that the groundwater level could vary depending upon the seasonal precipitation and possible groundwater pumping activity in each site vicinity. Perched water layers at depth may be present locally, particularly following high precipitation and irrigation events.

6.3 Expansive Soils

Expansive soils are characterized by their ability to undergo significant volume changes (shrink or swell) due to variations in moisture content. Changes in soil moisture content can result from precipitation, landscape irrigation, utility leakage, roof drainage, perched groundwater, drought, or other factors and may result in unacceptable settlement or heave of structures or concrete slabs supported on grade. Depending on the extent and location below finish subgrade, expansive soils can have a detrimental effect on structures.

Based on the 2 current laboratory tests conducted during this investigation and the 2 previous laboratory tests conducted during our previous geotechnical evaluation of the 9 feet to 10-foot-high soil stockpile, in the central portion of the site. The expansion index of the upper 5.0 feet to 9.0 feet of the general site soils was 0 to 4, corresponding to a very low potential and of the stockpiled soils was 53 to 79 corresponding to a medium expansion potential. The estimated location of the medium expansion potential soils is indicated on Figure No. 2, *Approximate Boring, Test Pit and Overexcavation Locations Map*.

6.4 Collapse Potential

Soil deposits subjected to collapse/hydro-consolidation generally exist in regions of moisture deficiency. Collapsible soils are generally defined as soils that have potential to suddenly decrease in volume upon increase in moisture content even without an increase in external loads. Moreover, some soils may have a different degree of collapse/hydro-consolidation based on the amount of proposed fill or structure loads. Soils susceptible to collapse/ hydro-consolidation include wind-blown silt, weakly cemented sand, and silt where the cementing agent is soluble (e.g., soluble gypsum, halite), alluvial or colluvial deposits within semi-arid to arid climate, and certain weathered bedrock above the groundwater table.

Granular soils may have a potential to collapse upon wetting in arid climate regions. Collapse/hydro-consolidation may occur when the soluble cements (carbonates) in the soil matrix dissolve, causing the soil to densify from its loose/low density configuration from deposition.

The degree of collapse of a soil can be defined by the collapse potential value, which is expressed as a percent of collapse of the total sample using the Collapse Potential Test (ASTM D4546). According to the ASTM guideline, the severity of collapse potential is commonly evaluated by the following Table No. 1, *Collapse Potential Values*.

Table No. 1, Collapse Potential Values

Collapse Potential Value (%)	Severity of Problem
0	None
0.1 to 2	Slight
2.1 to 6.0	Moderate
6.0 to 10.0	Moderately Severe
>10	Severe

Two collapse tests were conducted for this project. Based on the laboratory test result a collapse potential of 0.1 percent at a depth of 3.0 feet bgs in boring BH-03 was measured. A collapse potential of 0.2 percent at a depth of 2.5 feet bgs in boring BH-04 was measured. Two consolidation tests were conducted for this project. A collapse potential of 0.1 percent at a depth of 5.0 feet bgs in boring BH-02 was measured. No collapse potential at a depth of 8.0 feet bgs in boring BH-08 was measured. These indicate only a slight problem at the site. Collapse potential distress is typically considered a concern when collapse potential is over 2% (LA County, 2013).

6.5 Excavatability

The subsurface materials of the project are expected to be excavatable by conventional heavy-duty earth moving and trenching equipment.

The phrase “conventional heavy-duty excavation equipment” is intended to include commonly used equipment such as excavators, scrapers, and trenching machines. It does not include hydraulic hammers (“breakers”), jackhammers, blasting, or other specialized equipment and techniques used to excavate hard earth materials. Selection of an appropriate excavation equipment models should be done by an experienced earthwork contractor.

6.6 Subsurface Variations

Based on results of the subsurface exploration and our experience, some variations in the continuity and nature of subsurface soil conditions within the project site should be anticipated. Because of the uncertainties involved in the nature and depositional characteristics of the earth material, care should be exercised in interpolating or extrapolating subsurface conditions between or beyond the boring locations.

6.7 Caving

Caving was not encountered in any of the exploratory borings or test pits. Localized caving may occur in excavations that extend into granular soils that are encountered on-site.

7.0 ENGINEERING GEOLOGY

The regional and local geology within the proposed project area is discussed below.

7.1 Regional Geology

The project site is located within the northern Peninsular Ranges Geomorphic Province of Southern California. The Peninsular Ranges Geomorphic Province consists of a series of northwest-trending mountain ranges and valleys bounded on the north by the San Bernardino and San Gabriel Mountains, on the west by the Los Angeles Basin, and on the south by the Pacific Ocean.

The province is a seismically active region characterized by a series of northwest-trending strike-slip faults. The most prominent of the nearby fault zones include the San Jacinto, Cucamonga, and San Andreas Fault Zones, all of which have been known to be active during Quaternary time.

Topography within the province is generally characterized by broad alluvial valleys separated by linear mountain ranges. This northwest-trending linear fabric is created by the regional faulting within the granitic basement rock of the Southern California Batholith. Broad, linear, alluvial valleys have been formed by erosion of these principally granitic mountain ranges.

The project site is located within the Chino Basin between the Chino Hills to the southwest and San Gabriel Basin to the north. The Elsinore Fault Zone is located approximately four miles south of the project site. This fault is a north to northwest trending reverse fault that dips steeply towards the southwest. The Chino-Central Avenue Fault acts as a groundwater barrier along the western margin of the Chino Basin.

7.2 Local Geology

The project site is primarily underlain by Young alluvial-fan deposits, (Middle Holocene), consisting of slightly to moderately consolidated silt, sand, and coarse-grained sand to alluvial-fan deposits with boulders, having slightly to moderately dissected surfaces.

8.0 FAULTING AND SEISMICITY

The location of the site with respect to active faults and associated seismicity is discussed below.

8.1 Faulting

The project site is situated in a seismically active region. As is the case for most areas of Southern California, ground-shaking resulting from earthquakes associated with nearby and more distant faults may occur at the project site. During the life of the project, seismic activity associated with active faults can be expected to generate moderate to strong ground shaking at the site. Review of recent seismological and geophysical publications indicates that the seismic hazard for the project is high.

The project site is not located within a currently mapped State of California or San Bernadino County Earthquake Fault Zone for surface fault rupture.

Table No. 2, *Summary of Regional Faults,* summarizes selected data of known faults capable of seismic activity within 100 kilometers of the proposed pump station (coordinate 34.0018N and 117.6480W). The data presented below was calculated using the National Seismic Hazard Maps Database and other published geologic data.

Table No. 2, Summary of Regional Faults

Fault Name and Section	Closest Distance (km)	Slip Sense	Length (km)	Slip Rate (mm/year)	Maximum Magnitude
Chino, alt 2	6.6	strike slip	29	1	6.80
Chino, alt 1	6.81	strike slip	24	1	6.70
San Jose	12	strike slip	20	0.5	6.70
Cucamonga	15.55	thrust	28	5	6.70
Elsinore	15.56	strike slip	241	n/a	7.85
Sierra Madre Connected	15.96	reverse	76	2	7.30
Sierra Madre	15.96	reverse	57	2	7.20
Puente Hills (Coyote Hills)	23.41	thrust	17	0.7	6.90

Fault Name and Section	Closest Distance (km)	Slip Sense	Length (km)	Slip Rate (mm/year)	Maximum Magnitude
San Jacinto	29.77	strike slip	241	n/a	7.88
Clamshell-Sawpit	32.18	reverse	16	0.5	6.70
S. San Andreas	34.77	strike slip	512	n/a	8.18
Puente Hills (Santa Fe Springs)	35.15	thrust	11	0.7	6.70
Raymond	36.36	strike slip	22	1.5	6.80
Cleghorn	38.24	strike slip	25	3	6.80
San Joaquin Hills	38.42	thrust	27	0.5	7.10
Elysian Park (Upper)	42.46	reverse	20	1.3	6.70
Puente Hills (LA)	44.4	thrust	22	0.7	7.00
Newport Inglewood Connected alt 2	48.22	strike slip	208	1.3	7.50
Newport Inglewood Connected alt 1	48.41	strike slip	208	1.3	7.50
Newport-Inglewood, alt 1	48.41	strike slip	65	1	7.20
Verdugo	48.91	reverse	29	0.5	6.90
North Frontal (West)	49.38	reverse	50	1	7.20
Newport-Inglewood (Offshore)	51.85	strike slip	66	1.5	7.00
Hollywood	55.38	strike slip	17	1	6.70
Santa Monica Connected alt 2	60	strike slip	93	2.4	7.40
Palos Verdes	62.85	strike slip	99	3	7.30
Palos Verdes Connected	62.85	strike slip	285	3	7.70
Sierra Madre (San Fernando)	67.18	thrust	18	2	6.70
San Gabriel	68.09	strike slip	71	1	7.30
Santa Monica, alt 1	71	strike slip	14	1	6.60
Santa Monica Connected alt 1	71	strike slip	79	2.6	7.30
Northridge	75.56	thrust	33	1.5	6.90
Helendale-So Lockhart	80.16	strike slip	114	0.6	7.40
Malibu Coast, alt 1	81.15	strike slip	38	0.3	6.70
Malibu Coast, alt 2	81.15	strike slip	38	0.3	7.00
Anacapa-Dume, alt 2	83.62	thrust	65	3	7.20
Coronado Bank	83.89	strike slip	186	3	7.40
Pinto Mtn	85.79	strike slip	74	2.5	7.30
Santa Susana, alt 1	86.02	reverse	27	5	6.90
North Frontal (East)	86.51	thrust	27	0.5	7.00
Holser, alt 1	94.98	reverse	20	0.4	6.80
Anacapa-Dume, alt 1	96.85	thrust	51	3	7.20
Rose Canyon	99.69	strike slip	70	1.5	6.90

(Source: https://earthquake.usgs.gov/cfusion/hazfaults_2008_search/)

8.2 Seismic Design Parameters

Seismic parameters based on the 2019 California Building Code (CBSC, 2019) and ASCE 7-16 are provided in the following table. These parameters were determined using the coordinate (33.9265N and 117.6052W) and the Seismic Design Maps ATC online tool.

Table No. 3, CBC Seismic Design Parameters

Seismic Parameters	
Site Coordinates	34.0018N and 117.6480W
Site Class	D*
Risk Category	II
Mapped Short period (0.2-sec) Spectral Response Acceleration, S_s	1.621g
Mapped 1-second Spectral Response Acceleration, S_1	0.582g
Site Coefficient (from Table 11.4-1), F_a	1.000
Site Coefficient (from Table 11.4-2), F_v	1.718
MCE 0.2-sec period Spectral Response Acceleration, S_{MS}	1.621g
MCE 1-second period Spectral Response Acceleration, SM_1	0.999g
Design Spectral Response Acceleration for short period S_{DS}	1.081g
Design Spectral Response Acceleration for 1-second period, S_{D1}	0.666g
Site Modified Maximum Peak Ground Acceleration, PGA_M	0.735g

** Stiff Soil Classification*

8.3 Secondary Effects of Seismic Activity

In general, secondary effects of seismic activity include surface fault rupture, soil liquefaction, landslides, lateral spreading, and settlement due to seismic shaking, tsunamis, seiches, and earthquake-induced flooding. The site-specific potential for each of these seismic hazards is discussed in the following sections.

Surface Fault Rupture: No portion of the project site is located within a currently designated State of California or San Bernadino County Earthquake Fault Zone (CGS, 2007and San Bernadino County, 2021). The potential for surface rupture resulting from the movement of nearby or distant faults is not known with certainty but is considered very low.

Liquefaction: Liquefaction is defined as the phenomenon in which a cohesionless soil mass within the upper 50 feet of the ground surface suffers a substantial reduction in its shear strength, due the improvement of excess pore pressures. During earthquakes, excess pore pressures in saturated soil deposits may develop as a result of induced cyclic shear stresses, resulting in liquefaction.

Soil liquefaction generally occurs in submerged granular soils and non-plastic silts during or after strong ground shaking. There are several general requirements for liquefaction to occur and they are as follows.

- Soils must be submerged.
- Soils must be loose to medium-dense.
- Ground motion must be intense.
- Duration of shaking must be sufficient for the soils to lose shear resistance.

Based on review of hazard maps, the site is located within a State of California or San Bernadino County designated zone of liquefaction susceptibility (CGS, 2007; San Bernadino County, (2021). Based groundwater being deeper than approximately 137 feet bgs we estimate that the liquefaction induced settlement of the site is negligible.

Seismic Settlement: Dynamic dry settlement may occur in loose, granular, unsaturated soils during a large seismic event. Based on dense soil conditions, site-specific boring logs, soil types, soil conditions and blow counts, dry seismic settlement is expected to be minimal.

Landslides: Seismically induced landslides and slope failures are common occurrences during or soon after large earthquakes. Due to the flat nature of the project site, the potential for seismically induced landslides affecting the pump station is considered to be very low.

Lateral Spreading: Seismically induced lateral spreading involves primarily lateral movement of earth materials over underlying materials which are liquefied due to ground shaking. It differs from the slope failure in that complete ground failure involving large movement does not occur due to the relatively smaller gradient of the initial ground surface. Lateral spreading is demonstrated by near-vertical cracks with predominantly horizontal movement of the soil mass involved. Generally due to the negligible risk for liquefaction and flat nature of project site, the risk of lateral spreading is considered low.

Tsunamis: Tsunamis are large waves generated in open bodies of water by fault displacement or major ground movement. Due to the inland location of the project site, tsunamis are not considered to be a risk.

Seiches: Seiches are large waves generated in enclosed bodies of water in response to ground shaking. There are no enclosed bodies of water near the project site, therefore, seiching is not considered to be a risk during construction.

Earthquake-Induced Flooding: Dams or other water-retaining structures may fail as a result of large earthquakes. The project site is not located within a designated dam inundation area (DSOD, 2021).

9.0 LABORATORY TEST RESULTS

Laboratory testing was performed to determine the physical and chemical characteristics and engineering properties of the subsurface soils. Current physical test results are included in Appendix A, *Field Exploration* and Appendix B, *Laboratory Testing Program*. Discussions of the various test results are presented below.

9.1 Physical Testing

- *In-situ* Moisture and Dry Density: *In-situ* dry densities and moisture contents of the site soils were determined in accordance with ASTM Standard D2216 and D2937. Dry densities of the soils in borings BH-02 to BH-06 ranged from 81 to 121 pounds per cubic foot (pcf) with moisture contents of 8 to 34 percent. Dry densities of the manure and highly organic soils in boring BH-01 ranged from 47 to 71 pounds per cubic foot (pcf) with moisture contents of 23 to 97 percent. Results are presented on the Log of Borings and Test Pits in Appendix A, *Field Exploration.*

- Organic Content: Twelve organic content tests were performed during the current geotechnical investigation and eight organic content tests were performed during the previous geotechnical evaluation of the soil stockpile, within the central portion of the site, in accordance with ASTM Standard D2974 on representative bulk soil samples. The amount of organic material present in the organic artificial fill soils ranged from 0.8 to 8.7% and in the undisturbed natural soils ranged from 1.5 to 2.2%

- Expansion Index: Two representative bulk soil samples were tested during the current geotechnical investigation of the general site soils to evaluate the expansion potential in accordance with ASTM Standard D4829. The test results indicated an expansion index of 0 to 4, corresponding to very low expansion potential.

  In addition, two representative bulk soil samples were tested during the previous geotechnical evaluation of the soil stockpile, within the central portion of the site, to evaluate the expansion potential in accordance with ASTM Standard D4829. The test results indicated an expansion index of 53 to 79, corresponding to medium expansion potential.

- R-Value: One representative bulk sample was tested in accordance with Caltrans Test Method 301. The result of the R-value test was 65.

- Collapse Potential: Two representative samples were tested to determine the collapse potential in accordance with the ASTM Standard D4596. The test results of 0.1 and 0.2 percent, corresponds to a slight collapse potential.

- Grain Size Analysis: Three representative samples were tested to determine the relative grain size distribution in accordance with the ASTM Standard D6913. Test results are graphically presented in Drawing No. B-1, *Grain Size Distribution Results.* Based on the test results, soils are typically silty sand and sandy silt.

- Maximum Dry Density and Optimum Moisture Content: Two typical moisture-density relationships of representative soil samples were tested, in accordance with ASTM Standard D1557, with the results presented in Drawing No. B-2, *Moisture-Density Relationship Results*, in Appendix B, *Laboratory Testing Program.* The laboratory maximum dry densities were 117.0 and 120.2 pounds per cubic feet (pcf), with optimum moisture contents of 13.7 and 10.3 percent, respectively.

- Direct Shear: Two direct shear tests were performed in accordance with ASTM Standard D3080. One test was performed on relatively undisturbed samples and one test was performed on a sample remolded to 90 percent of the maximum dry density under soaked moisture condition in accordance with ASTM Standard D3080. The results of the direct shear tests are presented in Drawing Nos. B-3 through B-4, *Direct Shear Test Results* in Appendix B, *Laboratory Testing Program*.

- Consolidation Test – Two consolidation tests were performed on relatively undisturbed samples of the site soil, in accordance with ASTM Standard D2435. The test results are shown on Drawing No. B-5 and B-6, *Consolidation Test Results,* in Appendix B, *Laboratory Testing Program.*

9.2 Chemical Testing - Corrosivity Evaluation

One representative soil sample was tested during the current geotechnical investigation and four representative soil samples were tested during the previous geotechnical evaluation of the soil stockpile, within the central portion of the site, to determine minimum electrical resistivity, pH, and chemical content, including soluble sulfate and chloride concentrations. The purpose of these tests was to determine the corrosion potential of site soils when placed in contact with common pipe materials. The tests were performed by AP Engineering and Testing, Inc. (Pomona, CA) in accordance with California Test Methods 643, 422, and 417. The current and previous test results are presented in Appendix B, *Laboratory Testing Program and* are summarized in below.

- The pH measurements of the samples tested ranged from 8.1 to 8.7.

- The sulfate contents of the samples tested ranged from 43 ppm to 3,872 ppm (0.043 percent to 0.3872 percent by weight), respectively.
- The chloride concentrations of the samples tested ranged from 25 ppm to 227 ppm.
- The minimum electrical resistivities when saturated ranged from 300 ohm-cm and 1,703 ohm-cm.

10.0 EARTHWORK AND SITE GRADING RECOMMENDATIONS

Earthwork for the project will include grading, trench excavation, pipe subgrade preparation, pipeline bedding placement and trench backfill, as well as roadway pavement construction. Recommendations for earthwork are presented in the following subsections. General Earthwork Specifications are presented in Appendix C*, Earthwork Specifications.*

10.1 General

This section contains our general recommendations regarding earthwork for the proposed mixed use business park development of Euclid Mixed Use Specific Plan in the City of Ontario, San Bernardino County, California.

These recommendations are based on the results of our field exploration and laboratory testing as well as our experience with similar projects, and data evaluation as presented in the preceding sections. These recommendations may require modification by the geotechnical consultant based on observation of the actual field conditions during remedial grading.

Prior to the start of construction, all underground existing utilities and appurtenances should be located at the project site. Such utilities should either be protected in-place or removed and replaced during construction as required by the project specifications. All excavations should be conducted in such a manner as not to cause loss of bearing and/or lateral support of existing structures or utilities.

All existing structures, debris, deleterious material and surficial soils containing roots and perishable materials should be stripped and removed from the project site. Deleterious material, including manure, significant organics, highly organic disturbed fill soils, concrete, and debris generated during excavation, should not be placed as fill.

It should be the responsibility of the contractor to maintain safe working conditions during all phases of construction.

10.2 Private Sewage System Abandonment

From a geotechnical standpoint, any seepage pits, other private sewage systems, and/or other subsurface structures that may be encountered should be located, mapped on the grading plans, removed and/or properly abandoned. Abandonment and/or removal of septic systems that may exist should be in accordance with local codes and recommendations by Converse. Seepage pits, if abandoned in-place, should be pumped clean, backfilled with gravel or clean sand jetted into place, and then capped with a minimum of 2 feet of a 2-sack or greater slurry or concrete for a minimum distance of 2 feet outside the edge of the seepage pit. The top of the slurry or concrete cap should be at a minimum 10 feet below proposed grade.

10.3 Overexcavation

The site is generally underlain by approximately 3.0 to 9.0 feet of potentially compressible soils (artificial fill, topsoil and the upper low-density portions of the alluvium), and locally as much as 10.0 feet to 17.0 feet in fill stockpile areas, which may be prone to future settlement under the surcharge of foundation, improvements and/or fill loads. Therefore, these materials should be over-excavated to competent alluvium, within all areas of proposed structures and other improvements, and replaced with compacted fill soils. Within the entire level portions of the building pad areas, over-excavations should also extend at least 5.0 feet below proposed pad grade, or at least 3.0 feet below the lowest proposed footings, within the proposed building areas, whichever is deeper. Within any proposed wall footings areas over-excavation should also be a minimum of 5.0 feet below proposed pad grade or 2.0 feet below the proposed wall footings areas, whichever is deeper. All over-excavations should extend at least 5.0 feet or equal to the depth of over-excavation, whichever is greater, outside the entire level portions of the building pad area.

The final bottom surfaces of all excavations should be observed and approved by the project geotechnical consultant prior to placing any fill or structures. However, localized, deeper over-excavation could be encountered, based on findings in subsurface explorations and testing by the geotechnical consultant during grading of the final bottom surfaces of all excavations.

The estimated locations and approximate depths of over-excavation of unsuitable, compressible soil materials are indicated on Figure No. 2, *Approximate Boring, Test Pit and Overexcavation Locations Map*.

If isolated pockets of very soft, loose, eroded, or pumping soil are encountered, the unstable soil should be excavated as needed to expose undisturbed, firm, and unyielding soils.

The contractor should determine the best manner to conduct the excavations, such that there are no losses of bearing and/or lateral support to the existing structures or utilities (if any).

Areas to receive fill and/or other surface improvements should be scarified to a minimum depth of 6 inches, brought to a near-optimum moisture condition, and recompacted to at least 90 percent relative compaction (based on ASTM Test Method D1557).

10.4 Cut and Shallow Fill Under Building Pad Areas

Fill building pads with shallow cut and fill areas should be capped with a minimum of 5.0 feet of engineered structural fill, so that all footings for structures and walls are founded into engineered fill with a minimum of 3.0 feet of fill below footings for proposed structures and 2.0 feet below footings for proposed walls. Over-excavation should extend to the entire level portions of the building pad area with proposed structures or walls, to the depth of fill.

10.5 Cut/Fill Transition and Fill Differentials

To mitigate distress to structures related to the potential adverse effects of excessive differential settlement, cut/fill transitions should be eliminated from all level portions of the building pad areas. This should be accomplished by overexcavating the entire “cut” portion of the building pad area by at least 5.0 feet below proposed grade and replacing the excavated materials as properly compacted fill, so that all footings for structures and walls are founded into engineered fill with a minimum of 3.0 feet of fill below footings for proposed structures and 2.0 feet below footings for proposed walls. Recommended depths of over-excavation are provided in the following table.

Table No. 4, Overexcavation Depth for Cut/Fill Transitions

Depth of Fill (“Fill” Portion)	Depth of Overexcavation (“Cut” Portion)
Up to 5.0 feet	5.0 feet
Greater than 5.0 feet	One-third the maximum thickness of fill placed on the “fill” portion (15 feet maximum)

10.6 Engineered Fill

No fill should be placed until excavations and/or natural ground preparation have been observed by the geotechnical consultant. The native soils encountered within the project sites are generally considered suitable for re-use as compacted fill. Excavated soils should be processed, including removal of roots and debris, removal of oversized particles, mixing, and moisture conditioning, before placing as compacted fill. On-sites soils used as fill should meet the following criteria.

- No particles larger than 8 inches in largest dimension.
- Rocks larger than 4 inches should not be placed within the upper 12 inches of subgrade soils.
- Free of all significant organic matter, debris, or other deleterious material.
- Expansion index of 50 or less.
- Sand Equivalent greater than 15 (greater than 30 for pipe bedding).
- Contain less than 30 percent by weight retained in 3/4-inch sieve.
- Contain less than 40 percent fines (passing #200 sieve).

Based on field investigation and laboratory testing results, on-sites soils may be suitable as fill materials.

Imported materials, if required, should meet the above criteria prior to being used as compacted fill. Any imported fills should be tested and approved by geotechnical representative at least 72 hours prior to delivery to the site.

10.7 Organic Content

Based on the laboratory test results of the approximately the upper 0.9 foot to 10.0 feet of the partially organic fill soils on portions of the site has about 0.8 percent to 8.7 percent of organic content. This would be an average organic content of about 4.8 percent, for an average depth of approximately 5.0 feet, in the subject areas. Laboratory testing also indicated that generally the undisturbed natural soils below these depths (alluvium) had natural organic contents of about 1.5 percent to 2.1 percent. Therefore, these partially organic should be blended with undisturbed natural soils or removed from the site.

Fill materials should contain no more than 2 percent overall organics. The partially organic soils can be blended with the on-site natural soils at a ratio of at least 3 to 1 (natural soils/clean imported soils to partially organic soils) and placed as compacted fill, provided they are completely mixed during fill placement. The type of equipment and method of placement; blending and mixing of the partially organic materials with onsite natural soils or clean imported soils to be utilized by the grading contractor, should be reviewed and accepted by the geotechnical consultant prior to implementation. A possible method of placement that could be considered would be to place the partially organic materials at an angle to the pattern of the placement of the onsite natural soils or clean imported soils. The testing frequency for verifying the percent organic content should be established by the geotechnical consultant prior to fill placement once the method of blending, placement, and mixing of the partially organic materials with onsite natural soils or clean imported soils. The estimated locations and approximate depths of partially organic to be removed from the site or blended are also indicated on Figure No. 2, *Approximate Boring, Test Pit and Overexcavation Locations Map*.

10.8 Compacted Fill Placement

All surfaces to receive structural fills should be scarified to a depth of 12 inches. The soil should be moisture conditioned to within ±3 percent of optimum moisture content for coarse soils and 0 to 2 percent above optimum moisture content for fine soils. The scarified soils should be recompacted to at least 90 percent of the laboratory maximum dry density.

Fill soils should be thoroughly mixed, and moisture conditioned to within ±3 percent of optimum moisture content for coarse soils and 0 to 2 percent above optimum moisture content for fine soils. Fill soils should be evenly spread in horizontal lifts not exceeding 8 inches in uncompacted thickness.

Fill soils should be thoroughly mixed, and moisture conditioned to at least 0 to 2 percent above optimum moisture content. Fill soils should be evenly spread in horizontal lifts not exceeding 8 inches in uncompacted thickness.

All fill placed at the site should be compacted to at least 90 percent of the laboratory maximum dry density as determined by ASTM Standard D1557 test method unless a higher compaction is specified herein. The upper 12 inches of subgrade soils underneath pavements intended to support vehicle loads should be scarified, moisture conditioned, and compacted to at least 95 percent of the laboratory maximum dry density.

Fill materials should not be placed, spread or compacted during unfavorable weather conditions. When site grading is interrupted by heavy rain, filling operations should not resume until the geotechnical consultant approves the moisture and density conditions of the previously placed fill.

Observations and field tests should be performed by the project soils consultant to confirm that the required degree of compaction has been obtained. Where compaction is less than that specified, additional compactive effort should be made with adjustment of the moisture content as necessary, until the specified compaction is obtained.

Additional expansion index and corrosion testing should be completed after all fill has been placed and compacted at the site in order to confirm the soil properties and revise the foundation design parameters if necessary.

10.9 Backfill Recommendations Behind Walls

Compaction of backfill adjacent to retaining walls, which may be proposed, can produce excessive lateral pressures. Improper types and locations of compaction equipment and/or compaction techniques may damage the walls. The use of heavy compaction equipment should not be permitted within a horizontal distance of 5 feet from the wall.

Backfill behind any structural walls within the recommended 5-foot zone should be compacted using lightweight construction equipment such as handheld compactors to avoid overstressing the walls.

10.10 Shrinkage and Subsidence

The volume of excavated and recompacted soils will decrease as a result of grading. The shrinkage would depend on, among other factors, the depth of cut and/or fill, and the grading method and equipment utilized. Based on our exploration as well as previous experience in the other projects in close vicinity of this site, for the preliminary estimation, shrinkage factors for various units of earth material at the site may be taken as presented below.

- The shrinkage factor (defined as a percentage of soil volume reduction when moisture conditioned and compacted to the average of 92 percent relative compaction) for the upper 15 feet of soils is estimated to range from approximately 0 to 14 percent. An average value of 6 percent to 10 percent may be used for preliminary earthwork planning.
- Subsidence (defined as the settlement of native materials from the equipment load applied during grading and proposed fill loads) would depend on the construction methods including type of equipment utilized. Ground subsidence is estimated to be approximately 0.20 foot to 0.25 foot.

Although these values are only approximate, they represent our best estimates of the factors to be used to calculate lost volume that may occur during grading. If more accurate shrinkage and subsidence factors are needed, it is recommended that field-testing using the actual equipment and grading techniques be conducted.

10.11 Site Drainage

Adequate positive drainage should be provided away from the structures and excavation areas to prevent ponding and to reduce percolation of water into the foundation soils. A desirable drainage gradient is 1 percent for paved areas and 2 percent in landscaped areas. Surface drainage should be directed to suitable non-erosive devices.

10.12 Utility Trench Backfill

The following sections present earthwork recommendations for utility trench backfill, including subgrade preparation and trench zone backfill.

Open cuts adjacent to existing roadways or structures are not recommended within a 1:1 (horizontal: vertical) plane extending down and away from the roadway or structure perimeter (if any).

Soils from the trench excavation should not be stockpiled more than 6 feet in height or within a horizontal distance from the trench edge equal to the depth of the trench. Soils should not be stockpiled behind the shoring, if any, within a horizontal distance equal to the depth of the trench, unless the shoring has been designed for such loads.

10.12.1 Pipeline Subgrade Preparation

The final subgrade surface should be level, firm, uniform, and free of loose materials and properly graded to provide uniform bearing and support to the entire section of the pipe placed on bedding material. Protruding oversize particles larger than 2 inches in dimension, if any, should be removed from the trench bottom and replaced with compacted on-site materials.

Any loose, soft and/or unsuitable materials encountered at the pipe subgrade should be removed and replaced with an adequate bedding material. During the digging of depressions for proper sealing of the pipe joints, the pipe should rest on a prepared bottom for as near its full length as is practicable.

10.12.2 Pipe Bedding

Bedding is defined as the material supporting and surrounding the pipe to 1 foot above the pipe. Recommendations for pipe bedding are provided below.

To provide uniform and firm support for the pipe, compacted granular materials such as clean sand, gravel or ¾-inch crushed aggregate, or crushed rock may be used as pipe bedding material. Typically, soils with sand equivalent value of 30 or more are used as pipe bedding material. The pipe designer should determine if the soils are suitable as pipe bedding material.

The type and thickness of the granular bedding placed underneath and around the pipe, if any, should be selected by the pipe designer. The load on the rigid pipes and deflection of flexible pipes and, hence, the pipe design, depends on the type and the amount of bedding placed underneath and around the pipe.

Bedding materials should be vibrated in-place to achieve compaction. Care should be taken to densify the bedding material below the spring line of the pipe. Prior to placing the pipe bedding material, the pipe subgrade should be uniform and properly graded to provide uniform bearing and support to the entire section of the pipe placed on bedding material. During the digging of depressions for proper sealing of the pipe joints, the pipe should rest on a prepared bottom for as near its full length as is practicable.

Based on the design groundwater depth, migration of fines from the surrounding native and/or fill soils may not be considered in selecting the gradation of any imported bedding material.

10.12.3 Trench Zone Backfill

The trench zone is defined as the portion of the trench above the pipe bedding extending up to the final grade level of the trench surface. Excavated sites soil free of oversize particles and deleterious matter may be used to backfill the trench zone. Detailed trench backfill recommendations are provided below.

- Trench excavations to receive backfill should be free of trash, debris or other unsatisfactory materials at the time of backfill placement.
- Trench zone backfill should be compacted to at least 90 percent of the laboratory maximum dry density as per ASTM D1557 test method. At least the upper 1 foot of trench backfill underlying pavement should be compacted to at least 95 percent of the laboratory maximum dry density as per ASTM D1557 test method.
- Particles larger than 1 inch should not be placed within 12 inches of the pavement subgrade. No more than 30 percent of the backfill volume should be larger than ¾-inch in the largest dimension. Gravel should be well mixed with finer soil. Rocks larger than 3 inches in the largest dimension should not be placed as trench backfill.
- Trench backfill should be compacted by mechanical methods, such as sheepsfoot, vibrating or pneumatic rollers or mechanical tampers to achieve the density specified herein. The backfill materials should be brought to within ± 3 percent of optimum moisture content for coarse-grained soil, and between optimum and 2 percent above optimum for fine-grained soil, then placed in horizontal layers. The thickness of uncompacted layers should not exceed 8 inches. Each layer should be evenly spread, moistened or dried as necessary, and then tamped or rolled until the specified density has been achieved.
- The contractor should select the equipment and processes to be used to achieve the specified density without damage to adjacent ground, structures, utilities and completed work.
- It should be the responsibility of the contractor to maintain safe working conditions during all phases of construction.
- The field density of the compacted soil should be measured by the ASTM D1556 (Sand Cone) or ASTM D6938 (Nuclear Gauge) or equivalent.
- Trench backfill should not be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations should not resume until field tests by the project's geotechnical consultant indicate that the moisture content and density of the fill are in compliance with project specifications.

11.0 DESIGN RECOMMENDATIONS

Design recommendations for the structures are provided in the following section.

11.1 General Evaluation

The various design recommendations provided in this section are based on the laboratory testing as well as the assumption that in preparing the site, the earthwork recommendations provided in this report will be implemented.

11.2 Preliminary Shallow Foundation Design Parameters

The proposed one- and two-story concrete tilt up buildings and possible retaining walls may be supported on continuous or isolated spread footings founded completely within in competent compacted fill. The design of the shallow foundations should be based on the recommended parameters presented in the table below.

Table No. 5, Recommended Foundation Parameters

Parameter	1-Story Value	2-Story Value
Minimum continuous width (interior and exterior)	12 inches	15 inches
Minimum continuous or isolated footing depth of embedment below lowest adjacent grade (interior and exterior)	15 inches	18 inches
Allowable net bearing capacity	3,000 psf	3,300 psf

Isolated interior and exterior footings should be at least 24 inches wide. The footing dimensions and reinforcement should be based on structural design. The allowable bearing capacity can be increased by 500 pounds per square foot (psf) with each foot of additional embedment and 100 psf with each foot of additional width up to a maximum of 4,000 psf.

The net allowable bearing values indicated above are for the dead loads and frequently applied live loads and are obtained by applying a factor of safety of 3.0 to the net ultimate bearing capacity. If normal code requirements are applied for design, the above vertical bearing value may be increased by 33 percent for short duration loadings, which will include loadings induced by wind or seismic forces.

11.3 Lateral Earth Pressures and Resistance to Lateral Loads

In the following subsections, the lateral earth pressures and resistance to lateral loads are estimated by using on-site native soils strength parameters obtained from laboratory testing.

11.3.1 Active Earth Pressures

The active earth pressure behind any buried walls or foundation depends primarily on the allowable wall movement, type of backfill materials, backfill slopes, wall or foundation inclination, surcharges, and any hydrostatic pressures. The lateral earth pressures for the project site are presented in the following table.

Table No. 6, Active and At-Rest Earth Pressures

Loading Conditions	Lateral Earth Pressure[1] (psf)	Lateral Earth Pressure[2] (psf)
	Level backfill	2:1 backfill
Active earth conditions (wall is free to deflect at least 0.001 radian)	40	60
At-rest (wall is restrained)	60	110

These pressures assume no surcharge and no hydrostatic pressure. If water pressure is allowed to build up behind the structure, the active pressures should be reduced by 50 percent and added to a full hydrostatic pressure to compute the design pressures against the structure.

11.3.2 Passive Earth Pressure

Resistance to lateral loads can be assumed to be provided by a combination of friction acting at the base of foundations and by passive earth pressure. A coefficient of friction of 0.35 between formed concrete and soil may be used with the dead load forces. An allowable passive earth pressure of 250 psf per foot of depth may be used for the sides of footings poured against recompacted soils. A factor of safety of 1.5 was applied in calculating passive earth pressure. The maximum value of the passive earth pressure should be limited to 2,500 psf for compacted fill.

Vertical and lateral bearing values indicated above are for the total dead loads and frequently applied live loads. If normal code requirements are applied for design, the above vertical bearing and lateral resistance values may be increased by 33 percent for short duration loading, which will include the effect of wind or seismic forces.

Due to the low overburden stress of the soil at shallow depth, the upper 1 foot of passive resistance should be neglected unless the soil is confined by pavement or slab.

11.4 Retaining Walls Drainage

The recommended lateral earth pressure values do not include lateral pressures due to hydrostatic forces. Therefore, wall backfill should be free draining and provisions should be made to collect and dispose of excess water that may accumulate behind earth retaining structures. Behind wall drainage may be provided by free-draining gravel surrounded by synthetic filter fabric or by prefabricated, synthetic drain panels or weep holes. In either case, drainage should be collected by perforated pipes and directed to a sump, storm drain, or other suitable location for disposal. We recommend drain rock should consist of durable stone having 100 percent passing the 1-inch sieve and less than 5 percent passing the No. 4 sieve. Synthetic filter fabric should have an equivalent opening size (EOS), U.S. Standard Sieve, of between 40 and 70, a minimum flow rate of 110 gallons per minute per square foot of fabric, and a minimum puncture strength of 110 pounds.

11.5 Slabs-on-Grade

Slabs-on-grade should be supported on properly compacted fill. Compacted fill used to support slabs-on-grade should be placed and compacted in accordance with Section 10.8 *Compacted Fill Placement*.

Slabs should be designed and constructed as promulgated by the American Concrete Institute (ACI) and the Portland Cement Association (PCA). Care should be taken during concrete placement to avoid slab curling. Prior to the slab pour, all utility trenches should be properly backfilled and compacted.

Concrete floors should be underlain with a moisture-vapor retarder consisting of a 10-mil thick vapor barrier. Laps within the membrane should be sealed and overlapped at least 6 inches. Two (2) inches or more of clean sand should be placed above and below the membrane. These recommendations must be confirmed (and/or modified) by the foundation engineer with our concurrence, based upon the performance expectations of the foundation. It is the responsibility of the contractor to ensure that the moisture/vapor barrier systems are placed in accordance with the project plans and specifications, and that the moisture/vapor retarder materials are free of tears and punctures prior to concrete placement. Additional moisture reduction and/or prevention measures may be needed, depending on the performance requirements of future interior floor coverings.

In hot weather, the contractor should take appropriate curing precautions after placement of concrete to minimize cracking or curling of the slabs. The potential for slab cracking may be lessened by the addition of fiber mesh to the concrete and/or control of the water/cement ratio (maximum 0.45).

Concrete should be cured by protecting it against loss of moisture and rapid temperature change for at least 7 days after placement. Moist curing, waterproof paper, white polyethylene sheeting, white liquid membrane compound, or a combination thereof may be used after finishing operations have been completed. The edges of concrete slabs exposed after removal of forms should be immediately protected to provide continuous curing.

11.6 Expansion Potential

Based on the results of the expansion testing of representative site soils, the general on-site soils have an expansion index of 0 to 4 for an expansion potential of **Very Low**, however based on the laboratory test results portions of the subject stockpiled fill soil materials, in the central portion of the site exhibited have expansion index of 53 to 79 for an expansion potential of **Medium**, in accordance with 2019 CBC. Based on experience in the area the majority of soils on the site are anticipated to be sandier and exhibit expansion potentials of **Very Low** to possibly **Low**. Therefore, consideration should be made to place these stockpiled fill soils in deeper fills (at least 5 feet below proposed grade), landscape areas or non-structural fills or blended with sandier soils on site, outside of the subject fill stockpile, to reduce the expansion potential, of the stockpiled soils. The estimated location of the medium expansion potential soils is indicated on Figure No. 2, *Approximate Boring, Test Pit and Overexcavation Locations Map*.

The expansion indices of the final finish-grade soils will vary from the results obtained during our current and previous investigations. The expansion potential of the finish-grade soils should be tested at the completion of grading.

11.6.1 Very Low Expansion Potential

The following are additional recommendations where foundation soils exhibit **Very Low** expansion potential (E.I. of 0 to 20) as classified in accordance with 2019 CBC.

Slabs-on-grade should have a minimum thickness of 5 inches for support of nominal live loads and reinforced with No. 3 bars spaced 24 inches or less on-centers, both ways. Slab reinforcement should be supported on concrete chairs so that the desired placement is properly placed per the design engineer. Structural design elements of slabs-on-grade, including but not limited to thickness, reinforcement, joint spacing of more heavily loaded slabs will be dependent upon the anticipated loading conditions and the modulus of subgrade reaction (200 kcf) of the supporting materials and should be designed by a structural engineer.

Subgrade for slabs-on-grade should be firm and uniform. All loose or disturbed soils including under-slab utility trench backfill should be recompacted. Prior to placing concrete, the subgrade soils below all floor slabs should be pre-watered to achieve a moisture content that is equal to 100% of the optimum moisture content of the subgrade soils. The moisture content should penetrate to a minimum depth of 12 inches. This should promote uniform curing of the concrete and minimize the development of shrinkage cracks.

11.6.2 Low Expansion Potential

The following are additional recommendations where foundation soils exhibit **Low** expansion potential (E.I. of 21 to 50) as classified in accordance with 2019 CBC.

Slabs-on-grade should have a minimum thickness of 5 inches for support of nominal live loads and reinforced with No. 3 bars spaced 18 inches or less on-centers, both ways. Slab reinforcement should be supported on concrete chairs so that the desired placement is properly placed per the design engineer. Structural design elements of slabs-on-grade, including but not limited to thickness, reinforcement, joint spacing of more heavily loaded slabs will be dependent upon the anticipated loading conditions and the modulus of subgrade reaction (200 kcf) of the supporting materials and should be designed by a structural engineer.

Subgrade for slabs-on-grade should be firm and uniform. All loose or disturbed soils including under-slab utility trench backfill should be recompacted. Prior to placing concrete, the subgrade soils below all floor slabs should be pre-watered to achieve a moisture content that is equal to 110% of the optimum moisture content of the subgrade soils. The moisture content should penetrate to a minimum depth of 12 inches. This should promote uniform curing of the concrete and minimize the development of shrinkage cracks.

11.7 Settlement

The total settlement of shallow footings, designed as recommended above, from static structural loads and short-term settlement of properly compacted fill is anticipated to be 0.5 inch or less. The static differential settlement can be taken as equal to one-half of the static total settlement over a lateral distance of 40 feet.

11.8 Pipe Design for Underground Utilities

Structural design of pipes requires proper evaluation of all possible loads acting on pipes. The stresses and strains induced on buried pipes depend on many factors, including the type of soil, density, bearing pressure, angle of internal friction, coefficient of passive earth pressure, and coefficient of friction at the interface between the backfill and native soils. The recommended values of the various soil parameters for the pipe design are provided in Table No. 7, *Soil Parameters for Pipe Design*.

Where pipes are connecting to rigid structures near, or at its lower levels, and then are subjected to significant loads as the backfill is placed to finish grade, we recommend that provisions be incorporated in the design to provide support of these pipes where they exit the structure. Consideration can be given to flexible connections, concrete slurry support beneath the pipes where they exit the structures, overlaying and supporting the pipes with a few inches of compressible material, (i.e., Styrofoam, or other materials), or other techniques. Automatic shutoffs should be installed to limit the potential leakage from seismic event related damage.

Table No. 7, Soil Parameters for Pipe Design

Soil Parameters	Parameters
Total unit weight of compacted backfill (assuming 92% average relative compaction), γ	122 pcf

Soil Parameters	Parameters
Angle of internal friction of soils, ϕ	31º
Soil cohesion, c	195 psf
Coefficient of friction between concrete and native soils, fs	0.35
Coefficient of friction between pipe and native soils, fs	0.25 for metal or HDPE pipe 0.30 for CML&C pipe
Bearing pressure against Compacted Fill or Natural Soils	3,000 psf
Coefficient of passive earth pressure, Kp	3.12
Coefficient of active earth pressure, Ka	0.32
Modulus of Soil Reaction, E'	1,500 psi

11.9 Soil Corrosivity

The results of chemical testing of representative site soils with respect to common construction materials such as concrete and steel are presented in Appendix B, *Laboratory Testing Program*, and a general discussion are presented below.

The sulfate contents of the sampled *of the general site soils* correspond to American Concrete Institute (ACI) exposure category S0 for these sulfate concentrations (ACI 318-14, Table 19.3.1.1). No concrete type restrictions are specified for exposure category S0 (ACI 318-14, Table 19.3.2.1). A minimum compressive strength of 2,500 psi is recommended.

However, the sulfate content of *the soil stockpile, within the central portion of the site,* tested correspond to American Concrete Institute (ACI) exposure category S2 for this sulfate concentration (ACI 318-14, Table 19.3.1.1). ACI recommends a minimum compressive strength of 4,500 psi for exposure category S2 in ACI 318-14, Table 19.3.2.1. A minimum compressive strength of 4,500 psi is recommended. A maximum water cement ratio of 0.40 is recommended. Cementitious materials should be Type V. of the stockpiled soils was 53 to 79 corresponding to a medium expansion potential. Therefore, consideration should be made to place these stockpiled fill soils in deeper fills (at least 5 feet below proposed grade), landscape areas or non-structural fills or blended with other soils on site, outside of the subject fill stockpile, to reduce the high sulfate potential, of the stockpiled soils. The estimated location of the high sulfate content soils is indicated on Figure No. 2, *Approximate Boring, Test Pit and Overexcavation Locations Map*.

We anticipate that concrete structures such as footings, slab, and concrete pad will be exposed to moisture from precipitation and irrigation. Based on the site locations and the results of chloride testing of the sites soils, we do not anticipate that concrete structures will be exposed to external sources of chlorides, such as deicing chemicals, salt, brackish water, or seawater. ACI specifies exposure category C1 where concrete is exposed to moisture, but not to external sources of chlorides (ACI 318-14, Table 19.3.1.1). ACI provides concrete design recommendations in ACI 318-14, Table 19.3.2.1, including a compressive strength of at least 2,500 psi and a maximum chloride content of 0.3 percent.

According to Romanoff, 1957, the following table provides general guideline of soil corrosion based on electrical resistivity.

Table No. 8, Correlation Between Resistivity and Corrosion

Soil Resistivity (ohm-cm) per Caltrans CT 643	Corrosivity Category
Over 10,000	Mildly corrosive
2,000 – 10,000	Moderately corrosive
1,000 – 2,000	corrosive
Less than 1,000	Severe corrosive

The measured value of the minimum electrical resistivities when saturated ranged from 300 Ohm-cm to 1,703 Ohm-cm. This indicates that the soils tested are <u>corrosive to severely corrosive</u> to ferrous metals in contact with the soil (Romanoff, 1957). Metal piping should be corrosion-protected, or consideration should be given to using plastic piping metal. <u>Converse does not practice in the area of corrosion consulting. A qualified corrosion consultant should provide appropriate corrosion mitigation measures for ferrous metals in contact with the site soils</u>.

11.10 Asphalt Concrete Pavement

One soil sample was tested by Converse to determine the R-value of the subgrade soils. Based on laboratory testing, the R-value was 65. For pavement design, we have utilized a maximum design R-value of 50, and City of Ontario designated design Traffic Indices (TIs) ranging from 5.0 to 10.0.

Based on the above information, asphalt concrete and aggregate base thickness results are presented using the Caltrans Highway Design Manual (Caltrans, 2020), Chapter 630 with a safety factor of 0.2 for asphalt concrete/aggregate base section and 0.1 for full depth asphalt concrete section. Preliminary asphalt concrete pavement sections are presented in the following table below. City of Ontario minimum asphalt pavement and aggregate base thickness requirements were also considered in the pavement designs.

Table No. 9, Recommended Preliminary Pavement Sections

R-value	Traffic Index (TI)	Pavement Section		
		Option 1		Option 2
		Asphalt Concrete (inches)	Aggregate Base (inches)	Full AC Section (inches)
50	5.0 (alleys)	4.0	6.0	4.5
	5.5 (interior street)	4.0	6.0	5.0
	8.0 (exterior street)	6.0	8.0	8.0
	10.0 (exterior street)	7.0	8.0	10.0

At or near the completion of grading, subsurface samples should be tested to evaluate the actual subgrade R-value for final pavement design.

Prior to placement of aggregate base, at least the upper 12 inches of finish grade should be scarified, moisture-conditioned if necessary, and recompacted to at least 95 percent of the laboratory maximum dry density as defined by ASTM Standard D1557 test method.

Base materials should conform with Section 200-2.2,"*Crushed Aggregate Base*," of the current Standard Specifications for Public Works Construction (SSPWC; Public Works Standards, 2018) and should be placed in accordance with Section 301.2 of the SSPWC.

Asphaltic concrete materials should conform to Section 203 of the SSPWC and should be placed in accordance with Section 302-5 of the SSPWC.

11.11 Concrete Flatwork

Except as modified herein, concrete walks, driveways, access ramps, curb and gutters should be constructed in accordance with Section 303-5, *Concrete Curbs, Walks, Gutters, Cross-Gutters, Alley Intersections, Access Ramps, and Driveways*, of the Standard Specifications for Public Works Construction (Public Works Standards, 2018).

The subgrade soils under the above-mentioned improvements should consist of compacted fill placed as described in section 10.8 of this report. Prior to placement of concrete, the upper 12 inches of finish grade should be moisture conditioned to within 3 percent of optimum moisture content for coarse-grained soils and 0 and 2 percent above optimum for fine-grained soils.

The thickness of driveways for passenger vehicles should be at least 4 inches, or as required by the civil or structural engineer. Transverse control joints for driveways should be spaced not more than 10 feet apart. Driveways wider than 12 feet should be provided with a longitudinal control joint.

Concrete walks subjected to pedestrian and bicycle loading should be at least 4 inches thick, or as required by the civil or structural engineer. Transverse joints should be spaced 15 feet or less and should be cut to a depth of one-fourth the slab thickness.

Positive drainage should be provided away from all driveways and sidewalks to prevent seepage of surface and/or subsurface water into the concrete base and/or subgrade.

12.0 CONSTRUCTION RECOMMENDATIONS

Temporary sloped excavation recommendations are presented in the following sections.

12.1 General

Prior to the start of construction, all existing underground utilities (if any) should be located at the project site. Such utilities should either be protected in-place or removed and replaced during construction as required by the project specifications.

Vertical braced excavations can be considered for the foundations. Sloped excavations may not be feasible in locations adjacent to existing utilities, pavement, or structure (if any). Recommendations pertaining to temporary excavations are presented in this section.

Excavations near existing structures may require vertical side wall excavation. Where the side of the excavation is a vertical cut, it should be adequately supported by temporary shoring to protect workers and any adjacent structures.

All applicable requirements of the California Construction and General Industry Safety Orders, the Occupational Safety and Health Act, and the Construction Safety Act should be met. The soils exposed in cuts should be observed during excavation by the geotechnical consultant and the competent person designated by the contractor. If potentially unstable soil conditions are encountered, modifications of slope ratios for temporary cuts may be required.

12.2 Temporary Sloped Excavations

Temporary open-cut trenches may be constructed with side slopes as recommended in the following table. Temporary cuts encountering soft and wet fine-grained soils; dry loose, cohesionless soils or loose fill from trench backfill may have to be constructed at a flatter gradient than presented below.

Table No. 10, Slope Ratios for Temporary Excavations

Soil Type	OSHA Soil Type	Depth of Cut (feet)	Recommended Maximum Slope (Horizontal:Vertical)[1]
Silty Sand (SM)	C	0-10	1.5:1

[1] Slope ratio assumed to be uniform from top to toe of slope.

For shallow excavations up to 4 feet bgs can vertical. For steeper temporary construction slopes or deeper excavations, or unstable soil encountered during the excavation, shoring or trench shields should be provided by the contractor to protect the workers in the excavation. Design recommendations for temporary shoring are provided in the following section.

Surfaces exposed in slope excavations should be kept moist but not saturated to retard raveling and sloughing during construction. Adequate provisions should be made to protect the slopes from erosion during periods of rainfall. Surcharge loads, including construction materials, should not be placed within 5 feet of the unsupported slope edge. Stockpiled soils with a height higher than 6 feet will require greater distance from trench edges.

13.0 GEOTECHNICAL SERVICES DURING CONSTRUCTION

The project geotechnical consultant should review plans and specifications as the project design progresses. Such review is necessary to identify design elements, assumptions, or new conditions which require revisions or additions to our geotechnical recommendations.

The project geotechnical consultant should be present to observe conditions during construction. Geotechnical observation and testing should be performed as needed to verify compliance with project specifications. Additional geotechnical recommendations may be required based on subsurface conditions encountered during construction.

14.0 CLOSURE

This report is prepared for the project described herein and is intended for use solely by Euclid Land Investments and their authorized agents, to assist in the development of the proposed project. Our findings and recommendations were obtained in accordance with generally accepted professional principles practiced in geotechnical engineering. We make no other warranty, either expressed or implied.

Converse Consultants is not responsible or liable for any claims or damages associated with interpretation of available information provided to others. Site exploration identifies actual soil conditions only at those points where samples are taken, when they are taken. Data derived through sampling and laboratory testing is extrapolated by Converse employees who render an opinion about the overall soil conditions. Actual conditions in areas not sampled may differ. In the event that changes to the project occur, or additional, relevant information about the project is brought to our attention, the recommendations contained in this report may not be valid unless these changes and additional relevant information are reviewed, and the recommendations of this report are modified or verified in writing. In addition, the recommendations can only be finalized by observing actual subsurface conditions revealed during construction. Converse cannot be held responsible for misinterpretation or changes to our recommendations made by others during construction.

As the project evolves, a continued consultation and construction monitoring by a qualified geotechnical consultant should be considered an extension of geotechnical investigation services performed to date. The geotechnical consultant should review plans and specifications to verify that the recommendations presented herein have been appropriately interpreted, and that the design assumptions used in this report are valid. Where significant design changes occur, Converse may be required to augment or modify the recommendations presented herein. Subsurface conditions may differ in some locations from those encountered in the explorations, and may require additional analyses and, possibly, modified recommendations.

Design recommendations given in this report are based on the assumption that the recommendations contained in this report are implemented. Additional consultation may be prudent to interpret Converse's findings for contractors, or to possibly refine these recommendations based upon the review of the actual site conditions encountered during construction. If the scope of the project changes, if project completion is to be delayed, or if the report is to be used for another purpose, this office should be consulted.

15.0 REFERENCES

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Appendix A

Field Exploration

APPENDIX A

FIELD EXPLORATION

Our field investigation included a site reconnaissance and a subsurface exploration program consisting of drilling exploratory borings and excavating test pits. During the site reconnaissance, the surface conditions were noted, and the test pit and boring locations were marked in the field using the referenced topographic maps and from approximate distances from local streets as a guide and should be considered accurate only to the degree implied by the method used to locate them. Description of the field investigation method is presented below.

Exploratory Borings

Six exploratory borings (BH-01 through BH-06) were drilled on January 20, 2022, within the project site to investigate the subsurface conditions. The borings were drilled to depths ranging from 16.5 to 51.5 feet (bgs).

The borings were advanced using a truck-mounted drill rig equipped with 8-inch diameter hollow-stem augers for soils sampling. Encountered materials were continuously logged by a Converse geologist and classified in the field by visual classification in accordance with the Unified Soil Classification System. Where appropriate, the field descriptions and classifications have been modified to reflect laboratory test results.

Relatively undisturbed samples were obtained using California Modified Samplers (2.4 inches inside diameter and 3.0 inches outside diameter) lined with thin sample rings. The steel ring sampler was driven into the bottom of the borehole with successive drops of a 140-pound driving weight falling 30 inches. Blow counts at each sample interval are presented on the boring logs. Samples were retained in brass rings (2.4 inches inside diameter and 1.0 inch in height) and carefully sealed in waterproof plastic containers for shipment to the Converse laboratory. Representative bulk samples were collected from selected depths and placed in large plastic bags for delivery to our laboratory.

Standard Penetration Testing (SPT) were also performed in borings (BH-04 and BH-05) in accordance with the ASTM Standard D1586 using a standard (1.4 inches inside diameter and 2.0 inches outside diameter) split-barrel sampler. The mechanically driven hammer for the SPT sampler was 140 pounds, falling 30 inches for each blow. The recorded blow counts for every 6 inches for a total of 1.5 feet of sampler penetration are shown on the Logs of Borings.

Following completion of logging and sampling, borings BH-01 through BH-06 were backfilled with excavated soil cuttings and compacted by pushing down with the auger using the weight of the drill rig. If construction is delayed the ground surface at the boring locations may settle over time. We recommend the owner monitor the boring locations and backfill any depressions that occur or provide protection around the boring locations to prevent trip and fall injuries from occurring.

Test Pits

Thirteen exploratory test pits (TP-01 through TP-13) were excavated using a backhoe equipped with 24-inch-wide bucket to investigate the subsurface conditions on January 21, 2022 and January 24, 2022. The test pits were excavated between 4.0 feet and 11.0 feet below the existing ground surface (bgs).

During exploration, encountered materials were continuously logged by a Converse geologist and classified in the field by visual classification in accordance with the Unified Soil Classification System. Where appropriate, the field descriptions and classifications have been modified to reflect laboratory test results.

Representative bulk samples were collected from selected depths and placed in large plastic bags for delivery to our laboratory.

Test pits were backfilled in lifts with excavated soil, tamped, and then wheel rolled at the surface using the bucket under the weight of the backhoe. If construction is delayed the ground surface at the test pit locations may settle over time. We recommend the owner monitor the test pit locations and backfill any depressions that occur or provide protection around the test pit locations to prevent trip and fall injuries from occurring.

For a key to soil symbols and terminology used in the test pit and boring logs, refer to Drawing Nos. A-1a and A-1b, *Unified Soil Classification and Key to Boring Log and Test Pit Symbols*. For logs of Borings and Test Pits, see Drawings No. A-2 through A-20, *Logs of Borings and Test Pits*.

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS GRAPH	SYMBOLS LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

FIELD AND LABORATORY TESTS

- **C** Consolidation (ASTM D 2435)
- **CL** Collapse Potential (ASTM D 4546)
- **CP** Compaction Curve (ASTM D 1557)
- **CR** Corrosion, Sulfates, Chlorides (CTM 643-99; 417; 422)
- **CU** Consolidated Undrained Triaxial (ASTM D 4767)
- **DS** Direct Shear (ASTM D 3080)
- **EI** Expansion Index (ASTM D 4829)
- **M** Moisture Content (ASTM D 2216)
- **OC** Organic Content (ASTM D 2974)
- **P** Permeablility (ASTM D 2434)
- **PA** Particle Size Analysis (ASTM D 6913 [2002])
- **PI** Liquid Limit, Plastic Limit, Plasticity Index (ASTM D 4318)
- **PL** Point Load Index (ASTM D 5731)
- **PM** Pressure Meter
- **PP** Pocket Penetrometer
- **R** R-Value (CTM 301)
- **SE** Sand Equivalent (ASTM D 2419)
- **SG** Specific Gravity (ASTM D 854)
- **SW** Swell Potential (ASTM D 4546)
- **TV** Pocket Torvane
- **UC** Unconfined Compression - Soil (ASTM D 2166)
  Unconfined Compression - Rock (ASTM D 7012)
- **UU** Unconsolidated Undrained Triaxial (ASTM D 2850)
- **UW** Unit Weight (ASTM D 2937)

BORING LOG SYMBOLS

DRILLING METHOD SYMBOLS

Auger Drilling

Mud Rotary Drilling

Dynamic Cone or Hand Driven

Diamond Core

SAMPLE TYPE

STANDARD PENETRATION TEST
Split barrel sampler in accordance with ASTM D-1586-84 Standard Test Method

DRIVE SAMPLE 2.42" I.D. sampler (CMS).

DRIVE SAMPLE No recovery

BULK SAMPLE

GROUNDWATER WHILE DRILLING

GROUNDWATER AFTER DRILLING

UNITED SOIL CLASSIFICATION AND KEY TO BORING LOG SYMBOLS

Converse Consultants

Euclid Mixed Use Specific Plan Project
Southeast Corner of Euclid Avenue and Schaefer Avenue
City of Ontario, San Bernardino County, California
For: Euclid Land Investments c/o RCCD, Inc.

Project No. 21-81-154-02

Drawing No. A-1a

CONSISTENCY OF COHESIVE SOILS

Descriptor	Unconfined Compressive Strength (tsf)	SPT Blow Counts	Pocket Penetrometer (tsf)	CA Sampler	Torvane (tsf)	Field Approximation
Very Soft	<0.25	< 2	<0.25	<3	<0.12	Easily penetrated several inches by fist
Soft	0.25 - 0.50	2 - 4	0.25 - 0.50	3 - 6	0.12 - 0.25	Easily penetrated several inches by thumb
Medium Stiff	0.50 - 1.0	5 - 8	0.50 - 1.0	7 - 12	0.25 - 0.50	Can be penetrated several inches by thumb with moderate effort
Stiff	1.0 - 2.0	9 - 15	1.0 - 2.0	13 - 25	0.50 - 1.0	Readily indented by thumb but penetrated only with great effort
Very Stiff	2.0 - 4.0	16 - 30	2.0 - 4.0	26 - 50	1.0 - 2.0	Readily indented by thumbnail
Hard	>4.0	>30	>4.0	>50	>2.0	Indented by thumbnail with difficulty

APPARENT DENSITY OF COHESIONLESS SOILS

Descriptor	SPT N_{60}- Value (blows / foot)	CA Sampler
Very Loose	<4	<5
Loose	4- 10	5 - 12
Medium Dense	11 - 30	13 - 35
Dense	31 - 50	36 - 60
Very Dense	>50	>60

MOISTURE

Descriptor	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

PERCENT OF PROPORTION OF SOILS

Descriptor	Criteria
Trace (fine)/ Scattered (coarse)	Particles are present but estimated to be less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

SOIL PARTICLE SIZE

Descriptor		Size
Boulder		> 12 inches
Cobble		3 to 12 inches
Gravel	Coarse	3/4 inch to 3 inches
	Fine	No. 4 Sieve to 3/4 inch
Sand	Coarse	No. 10 Sieve to No. 4 Sieve
	Medium	No. 40 Sieve to No. 10 Sieve
	Fine	No. 200 Sieve to No. No. 40 Sieve
Silt and Clay		Passing No. 200 Sieve

PLASTICITY OF FINE-GRAINED SOILS

Descriptor	Criteria
Nonplastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled, and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll, and not much time is required to reach the plastic limit; it cannot be rerolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

CEMENTATION/ Induration

Descriptor	Criteria
Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

NOTE: This legend sheet provides descriptions and associated criteria for required soil description components only. Refer to Caltrans Soil and Rock Logging, Classification, and Presentation Manual (2010), Section 2, for tables of additional soil description components and discussion of soil description and identification.

UNITED SOIL CLASSIFICATION AND KEY TO BORING LOG SYMBOLS

Converse Consultants

Euclid Mixed Use Specific Plan Project
Southeast Corner of Euclid Avenue and Schaefer Avenue
City of Ontario, San Bernardino County, California
For: Euclid Land Investments c/o RCCD, Inc.

Project No. 21-81-154-02

Drawing No. A-1b

Log of Boring No. BH-01

Dates Drilled: 1/20/2022 Logged by: Catherine Nelson Checked By: Robert Gregorek

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 720 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ARTIFICIAL FILL **SILTY SAND (SM):** fine to medium-grained, mostly manure/organics, grass and rootlets, abundant debris, medium dense, moist, dark brown.						
					4/11/11	80	49	
5					4/9/15	23	71	
					5/11/14	32	66	
10					5/7/14	97	44	
15		- @ 15.0': dense.			14/20/17	36	47	
		End of Boring at 16.5 feet bgs. Groundwater not encountered. Boring backfilled with soil cuttings and compacted by pushing down with an auger using the drill rig weight on 01/20/2022.						

Log of Boring No. BH-02

Dates Drilled: 1/20/2022 Logged by: Catherine Nelson Checked By: Robert Gregorek

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 707 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ALLUVIUM **SILTY SAND (SM):** fine-grained, trace clay, slightly to moderately desiccated, oxidation staining, very dense, moist, greenish to orangish brown.	X		9/28/34	8	102	
5		- @ 5.0': trace caliche, few pinhole porosity, dense	X		15/17/20	18	109	C
		SANDY SILT (ML): fine-grained sand, trace clay, pinhole porosity, moderately to very desiccated, black oxidation spots, very stiff, moist, greenish to orangish brown.	X	X	7/16/17	16	112	
10		- @10.0': little clay	X	X	7/13/22	28	94	
15		- @15.0': trace clay	X		16/17/18	15	104	
		End of Boring at 16.5 feet bgs. Groundwater not encountered. Boring backfilled with soil cuttings and compacted by pushing down with an auger using the drill rig weight on 01/20/2022.						

Log of Boring No. BH-03

Dates Drilled: 1/20/2022 Logged by: Catherine Nelson Checked By: Robert Gregorek

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 718 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		TOPSOIL **SILTY SAND (SM):** fine to coarse-grained, moist, dark brown.						
5		**ALLUVIUM** **SANDY SILT (ML):** fine-grained sand, slightly desiccated, stiff, moist, dark orangish brown.			2/5/10	13	110	CL EI, R, CR
		SILTY SAND (SM): fine-grained, trace to little caliche, slightly to moderately desiccated, dense, moist, greenish gray to brown.			11/14/20	13	121	
10		**SAND (SP):** fine-grained, trace clay and silt, micaceous, slightly desiccated, oxidation staining, dense, moist, grayish to yellowish brown.			13/25/25	6	118	
					15/20/21	8	102	
15		**OLDER ALLUVIUM** **SANDY CLAY (CL):** fine-grained sand, slightly desiccated, oxidation spots, stiff, moist, greenish to orangish brown.			8/7/8	34	81	
		End of Boring at 16.5 feet bgs. Groundwater not encountered. Boring backfilled with soil cuttings and compacted by pushing down with an auger using the drill rig weight on 01/20/2022.						

Log of Boring No. BH-04

Dates Drilled: 1/20/2022 Logged by: Catherine Nelson Checked By: Robert Gregorek

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 710 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	SUMMARY OF SUBSURFACE CONDITIONS	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
	This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.						
0	**TOPSOIL** **SILTY SAND (SM):** fine to medium-grained, trace gravel up to 1 inch maximum dimension, trace clay, trace organics, slightly desiccated, moist, brown.		X				PA
2.5	**ALLUVIUM** **SILTY SAND (SM):** fine-grained, trace gravel up to 1 inch maximum dimension, trace clay, slightly desiccated, medium dense, moist, dark orangish brown.	X		3/6/10	12	113	CL
5		X	X	9/17/20	19	114	DS
7.5	**SANDY SILT (ML):** fine-grained sand, trace gravel up to 1 inch maximum dimension, trace clay, trace to some caliche, slightly to moderately desiccated, pinhole porosity, oxidation staining, very stiff, moist, greenish gray to orangish brown. - @ 7.5': moderately desiccated, stiff, light grayish brown	X	X	6/9/11	22	107	
10	- @ 10.0': black oxidation spots, yellowish to greenish brown	X		8/13/15	17	107	
15	**OLDER ALLUVIUM** **SILTY SAND (SM):** fine-grained, few gravel up to 1 inch maximum dimension, trace clay, slightly desiccated, oxidation staining, very dense, moist, greenish gray to orangish brown.	X		15/37/50	13	124	PA
20	- @ 20.0': fine to coarse-grained, dark orange oxidation, dense, light grayish brown to yellowish brown	X (SPT)		11/14/21			
25	- @ 25.0': moderately to very desiccated, more fines, very dense	X		25/50-6"	9	100	PA
30	**SAND (SP):** fine to coarse-grained, some gravel and cobbles up to 5 inches maximum dimension, trace clay, slightly to moderately desiccated, oxidation staining, dense, moist, orangish grayish brown.	X (SPT)		17/20/27			

Converse Consultants

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Project No. 21-81-154-02 Drawing No. A-5a

Log of Boring No. BH-04

Dates Drilled: 1/20/2022 Logged by: Catherine Nelson Checked By: Robert Gregorek

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 710 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		OLDER ALLUVIUM **SAND (SP):** fine to coarse-grained, trace clay, slightly to moderately desiccated, oxidation staining, dense, moist, orangish grayish brown.	■		9/19/28	15	118	
		SILTY SAND (SM): fine to medium-grained, trace clay, trace caliche, slightly desiccated, few black oxidation spots, dense, moist, light grayish brown to brown.						
40		- @ 40.0': more clay, medium dense	☒		4/6/8			
45		**SAND (SP):** fine to medium-grained, trace clay and silt, moderately desiccated, friable, dense, yellowish greenish brown.	■		15/20/28	18	113	
50		- @ 50.0': medium dense	☒		5/9/9			
		End of Boring at 51.5 feet bgs. Groundwater not encountered. Boring backfilled with soil cuttings and compacted by pushing down with an auger using the drill rig weight on 01/20/2022.						

Log of Boring No. BH-05

Dates Drilled: 1/20/2022 Logged by: Catherine Nelson Checked By: Robert Gregorek

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 697 Depth to Water (ft, bgs): NOT ENCOUNTERED

SUMMARY OF SUBSURFACE CONDITIONS

This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.

Depth (ft)	Summary of Subsurface Conditions	Samples (Drive / Bulk)	Blows	Moisture (%)	Dry Unit Wt. (pcf)	Other
0	**ARTIFICIAL FILL** **SILTY SAND (SM):** fine to medium-grained, trace clay, pinhole porosity, very desiccated, roots and rootlets, few organics, medium dense, dark brown.	Drive, Bulk	7/12/12	8	101	CP, DS
4	**TOPSOIL** **SANDY SILT (ML):** fine-grained sand, trace clay, slightly to moderately desiccated, oxidation staining, stiff, moist, dark orangish brown.	Drive	6/10/10	16	94	
7	**ALLUVIUM** **SANDY CLAY (CL):** fine-grained sand, very desiccated, trace to little caliche, black oxidation spots, very stiff, moist, greenish grayish brown.	Drive, Bulk	7/11/16	18	100	CP
10	- @ 10.0': orangish brown	Drive, Bulk	7/12/12	32	96	
13	**OLDER ALLUVIUM** **SAND (SP):** fine to medium-grained, trace clay and silt, slightly desiccated, black oxidation spots, medium dense, moist, greenish to orangish brown.	Drive	5/8/13	25	103	
20	- @ 20.0': oxidation staining, light greenish brown to orangish brown.	SPT	11/12/16			
25	- @ 25.0': very dense.	Drive	17/28/38	8	113	
30	**SILTY CLAY (CL):** fine-grained, trace of fine grained sand, slightly desiccated, oxidation spots, medium stiff, moist, grayish greenish brown.	SPT	2/3/7			

End of Boring at 31.5 feet bgs.
Groundwater not encountered.
Boring backfilled with soil cuttings and compacted by

Log of Boring No. BH-05

Dates Drilled: 1/20/2022 Logged by: Catherine Nelson Checked By: Robert Gregorek

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 697 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		pushing down with an auger using the drill rig weight on 01/20/2022.						

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Project No. **21-81-154-02** Drawing No. **A-6b**

Log of Boring No. BH-06

Dates Drilled: 1/20/2022 Logged by: Catherine Nelson Checked By: Robert Gregorek

Equipment: 8" HOLLOW STEM AUGER Driving Weight and Drop: 140 lbs / 30 in

Ground Surface Elevation (ft): 702 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		TOPSOIL **SILTY SAND (SM):** fine to medium-grained, trace clay, slightly desiccated, oxidation spots, medium dense, moist, dark brown.						
			■	⊠	6/6/11	16	108	
5		**ALLUVIUM** **SANDY SILT (ML):** fine-grained, trace clay, pinhole porosity, moderately desiccated, caliche, few oxidation spots, stiff, moist, light grayish brown to greenish brown.	■	⊠	6/10/14	21	107	
			■		4/8/12	18	107	C
10								
		OLDER ALLUVIUM **SAND (SP):** fine-grained, trace clay, trace silt, slightly to moderately desiccated, oxidation staining, moist, medium dense, greenish brown to orangish brown.	■		10/11/12	14	119	
15		- @ 15.0': fine to medium-grained, micaceous, dense, light grayish brown	■		16/24/20	12	97	
		End of Boring at 16.5 feet bgs. Groundwater not encountered. Boring backfilled with soil cuttings and compacted by pushing down with an auger using the drill rig weight on 01/20/2022.						

Converse Consultants

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Project No. 21-81-154-02

Drawing No. A-7

Log of Test Pit No. TP-01

Dates Drilled: 1/21/2022 Logged by: Catherine Nelson Checked By: Robert Gregorek

Equipment: 24" WIDE BACKHOE BUCKET Driving Weight and Drop: N/A

Ground Surface Elevation (ft): 691 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ARTIFICIAL FILL **SILTY SAND (SM):** fine to coarse-grained, few gravel up to 1.5 inches maximum dimension, trace clay, moderately desiccated, large caliche nodules up to 2 inches maximum dimension, few organics, moist to wet, brown to dark brown.						OC
5		**ALLUVIUM** **SAND (SP):** fine-grained, trace clay, trace silt, slightly desiccated, moist, greenish gray brown.						
		End of test pit at 4.0 feet bgs. Groundwater not encountered. Test pit backfilled with soil cuttings and compacted by pushing down the bucket using the backhoe weight on 01/21/2022.						

Log of Test Pit No. TP-02

Dates Drilled: 1/24/2022 Logged by: Stephen McPherson Checked By: Robert Gregorek

Equipment: 24" WIDE BACKHOE BUCKET Driving Weight and Drop: N/A

Ground Surface Elevation (ft): 702 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		MANURE **Some Silty Sand,** fine to coarse-grained, moist, dark brown						
5		**ARTIFICIAL FILL** **SILTY SAND (SM):** fine to coarse-grained, moderately desiccated, caliche, red oxidation spots, few organics, some debris, moist, brown.						OC
		ALLUVIUM **CLAYEY SAND (CL):** fine to medium-grained sand, moist, light gray to greenish gray.						
		End of test pit at 8.0 feet bgs. Groundwater not encountered. Test pit backfilled with soil cuttings and compacted by pushing down the bucket using the backhoe weight on 01/24/2022.						

Log of Test Pit No. TP-03

Dates Drilled: 1/24/2022 Logged by: Stephen McPherson Checked By: Robert Gregorek

Equipment: 24" WIDE BACKHOE BUCKET Driving Weight and Drop: N/A

Ground Surface Elevation (ft): 705 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		MANURE **Some Silty Sand,** fine to coarse-grained, moist, dark brown to black						OC
5		**ARTIFICIAL FILL** **SILTY SAND (SM):** fine to coarse-grained, trace clay, few organics, some debris, moderately desiccated, moist, brown.						
10		**ALLUVIUM** **CLAYEY SAND (CL):** fine to medium-grained, moist, gray to greenish brown.						

End of test pit at 8.5 feet bgs.
Groundwater not encountered.
Test pit backfilled with soil cuttings and compacted by pushing down the bucket using the backhoe weight on 01/24/2022.

Converse Consultants

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Drawing No. A-10

Log of Test Pit No. TP-04

Dates Drilled: 1/24/2022 | Logged by: Stephen McPherson | Checked By: Robert Gregorek

Equipment: 24" WIDE BACKHOE BUCKET | Driving Weight and Drop: N/A

Ground Surface Elevation (ft): 710 | Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		MANURE **Some Silty Sand,** fine to coarse-grained, moist, dark brown		X				
		ARTIFICIAL FILL **SILTY SAND (SM):** fine to coarse-grained, scattered gravel up to 1 inch maximum dimension, roots and rootlets, few organics, some debris, trace caliche, moderately desiccated, moist, brown.		X				OC
5								
		TOPSOIL **SILTY SAND (SM):** fine to medium-grained, trace caliche, moist, black.		X				
10		**ALLUVIUM** **SAND (SP):** fine-grained, light oxidation staining (red) moist, greenish to orangish brown.						
		CLAYEY SAND (CL): fine to medium-grained sand, pinhole porosity, moderately to very desiccated trace caliche, moist, light grayish brown.						
15								

End of test pit at 11.5 feet bgs.
Groundwater not encountered.
Test pit backfilled with soil cuttings and compacted by pushing down the bucket using the backhoe weight on 01/24/2022.

Log of Test Pit No. TP-05

Dates Drilled: 1/24/2022 Logged by: Stephen McPherson Checked By: Robert Gregorek

Equipment: 24" WIDE BACKHOE BUCKET Driving Weight and Drop: N/A

Ground Surface Elevation (ft): 709 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		MANURE **Some Silty Sand,** fine to coarse-grained, moist, dark brown to black						OC
5		**ARTIFICIAL FILL** **SILTY SAND (SM):** fine to coarse-grained, scattered gravel up to 1 inch maximum diamension, trace organics, some debris, pinhole porosity, oxidation staining (red, black, orange and yellow), moist, orangish brown to brown.						
10		**ALLUVIUM** **SAND (SP):** fine-grained, trace clay and silt, pinhole porosity, slightly to moderately desiccated, oxidation staining (black), moist, greenish to orangish brown.						
		End of test pit at 8.0 feet bgs. Groundwater not encountered. Test pit backfilled with soil cuttings and compacted by pushing down the bucket using the backhoe weight on 01/24/2022.						

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Drawing No. A-12

Log of Test Pit No. TP-06

Dates Drilled: 1/21/2022 Logged by: Catherine Nelson Checked By: Robert Gregorek

Equipment: 24" WIDE BACKHOE BUCKET Driving Weight and Drop: N/A

Ground Surface Elevation (ft): 716 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ARTIFICIAL FILL **SILTY SAND (SM):** fine to coarse-grained, trace clay, moderately desiccated, roots and rootlets, trace organics, worms, some debris, moist, brown to dark brown.						OC
5		**ALLUVIUM** **SAND (SP):** fine-grained, trace clay and silt, slightly desiccated, moist, greenish brown to brown.						OC
		SANDY SILT (ML): fine-grained sand, trace clay, trace caliche, moderately to very desiccated, moist, light grayish brown.						
10		End of test pit at 10.0 feet bgs. Groundwater not encountered. Test pit backfilled with soil cuttings and compacted by pushing down the bucket using the backhoe weight on 01/21/2022.						

Log of Test Pit No. TP-07

Dates Drilled: 1/24/2022 Logged by: Stephen McPherson Checked By: Robert Gregorek

Equipment: 24" WIDE BACKHOE BUCKET Driving Weight and Drop: N/A

Ground Surface Elevation (ft): 715 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		TOPSOIL **SILTY SAND (SM):** fine to coarse-grained, slightly to moderately desiccated, oxidation staining, moist, greenish brown to orangish brown. @ 1.5': increase in coarse grains, greenish gray to yellowish brown						
5		**ALLUVIUM** **SAND (SP):** fine to medium-grained, trace clay and silt, slightly to moderately desiccated, moist, greenish gray to light brown.						
		End of test pit at 4.5 feet bgs. Groundwater not encountered. Test pit backfilled with soil cuttings and compacted by pushing down the bucket using the backhoe weight on 01/24/2022.						

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Project No. **21-81-154-02**

Drawing No. **A-14**

Log of Test Pit No. TP-08

Dates Drilled: 1/21/2022 Logged by: Catherine Nelson Checked By: Robert Gregorek

Equipment: 24" WIDE BACKHOE BUCKET Driving Weight and Drop: N/A

Ground Surface Elevation (ft): 713 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ARTIFICIAL FILL **SILTY SAND (SM):** fine to coarse-grained, scattered gravel up to 1 inch maximum dimension, scattered cobbles up to 10 inches maximum dimension, trace clay, trace organics, roots and rootlets, moderately to very desiccated, moist, brown to dark brown.						OC
								OC
5		**ALLUVIUM** **SANDY SILT (ML):** fine-grained sand, trace clay and caliche, few pinhole porosity, very desiccated, moist, greenish gray to light brown.						
		SAND (SP): fine-grained, slightly desiccated, moist, light grayish brown to orangish brown.						

End of test pit at 5.0 feet bgs.
Groundwater not encountered.
Test pit backfilled with soil cuttings and compacted by pushing down the bucket using the backhoe weight on 01/21/2022.

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Project No. 21-81-154-02

Drawing No. A-15

Log of Test Pit No. TP-09

Dates Drilled: 1/24/2022 Logged by: Stephen McPherson Checked By: Robert Gregorek

Equipment: 24" WIDE BACKHOE BUCKET Driving Weight and Drop: N/A

Ground Surface Elevation (ft): 714 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
5		**ARTIFICIAL FILL** **SILTY SAND (SM):** fine to coarse-grained, scattered gravel up to 1 inch maximum dimension, few roots and rootlets, some organics, abundant debris, moist, brown to dark brown.		X				
		ALLUVIUM **SAND (SP):** fine-grained, trace silt, pinhole porosity, slightly to moderately desiccated, black oxidation spots, moist, greenish brown to reddish brown.		X				
		End of test pit at 8.0 feet bgs. Groundwater not encountered. Test pit backfilled with soil cuttings and compacted by pushing down the bucket using the backhoe weight on 01/24/2022.						

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Project No. 21-81-154-02

Drawing No. A-16

Log of Test Pit No. TP-10

Dates Drilled: 1/21/2022 Logged by: Catherine Nelson Checked By: Robert Gregorek

Equipment: 24" WIDE BACKHOE BUCKET Driving Weight and Drop: N/A

Ground Surface Elevation (ft): 710 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ARTIFICIAL FILL **SILTY SAND (SM):** fine to coarse-grained, few gravel up to 1.5 inches maximum dimension, trace clay, few organics, roots and rootlets, moderately to very desiccated, moist, brown to dark brown.		X				OC
		ALLUVIUM **SAND (SP):** fine-grained, trace clay and silt, slightly to moderately desiccated, moist, greenish gray to yellowish brown.		X				EI
5		**SANDY SILT (ML):** fine to coarse-grained sand, trace clay, pinhole porosity, slightly desiccated, moist, light grayish brown.						
10								

End of test pit at 5.0 feet bgs.
Groundwater not encountered.
Test pit backfilled with soil cuttings and compacted by pushing down the bucket using the backhoe weight on 01/21/2022.

Converse Consultants

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Project No. 21-81-154-02

Drawing No. A-17

Log of Test Pit No. TP-11

Dates Drilled: 1/24/2022 | Logged by: Stephen McPherson | Checked By: Robert Gregorek

Equipment: 24" WIDE BACKHOE BUCKET | Driving Weight and Drop: N/A

Ground Surface Elevation (ft): 700 | Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		ARTIFICIAL FILL **SILTY SAND (SM):** fine to coarse-grained, trace organics, roots and rootlets, some debris up to 8 inches maximum dimension, moderately desiccated, moist with standing water at bottom of the test pit, greenish gray to orangish brown.						OC
5		End of test pit at 5.0 feet bgs. Groundwater not encountered. Test pit backfilled with soil cuttings and compacted by pushing down the bucket using the backhoe weight on 01/24/2022.						

Converse Consultants

Euclid Mixed Use Specific Plan Project
Southeast Corner of Euclid Avenue and Schaefer Avenue
City of Ontario, San Bernadino County, California
For: Euclid Land Investments c/o RCCD, Inc.

Project No. **21-81-154-02**

Drawing No. **A-18**

Log of Test Pit No. TP-12

Dates Drilled: 1/24/2022 Logged by: Stephen McPherson Checked By: Robert Gregorek

Equipment: 24" WIDE BACKHOE BUCKET Driving Weight and Drop: N/A

Ground Surface Elevation (ft): 710 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES DRIVE	SAMPLES BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		MANURE **Some Silty Sand,** fine to coarse-grained, moist, brown to dark brown						
		ARTIFICIAL FILL **SILTY SAND (SM):** fine to medium-grained, trace organics, very desiccated, moist, grayish brown.						OC
5		**ALLUVIUM** **SANDY SILT (ML):** fine-grained sand, pinhole porosity, moderately to very desiccated, moist, greenish to yellowish brown.						
		End of test pit at 5.0 feet bgs. Groundwater not encountered. Test pit backfilled with soil cuttings and compacted by pushing down the bucket using the backhoe weight on 01/24/2022.						

Log of Test Pit No. TP-13

Dates Drilled: 1/24/2022 Logged by: Stephen McPherson Checked By: Robert Gregorek

Equipment: 24" WIDE BACKHOE BUCKET Driving Weight and Drop: N/A

Ground Surface Elevation (ft): 717 Depth to Water (ft, bgs): NOT ENCOUNTERED

Depth (ft)	Graphic Log	SUMMARY OF SUBSURFACE CONDITIONS This log is part of the report prepared by Converse for this project and should be read together with the report. This summary applies only at the location of the Boring and at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with the passage of time. The data presented is a simplification of actual conditions encountered.	SAMPLES: DRIVE	SAMPLES: BULK	BLOWS	MOISTURE (%)	DRY UNIT WT. (pcf)	OTHER
		MANURE **Some Silty Sand,** fine to coarse-grained, moist, dark brown to brown						OC
		CONCRETE (SLURRY) **AGGREGATE CONCRETE SLURRY** fine to coarse-grained, concrete and cement mixture, gray						
5		**ARTIFICIAL FILL** **SAND (SP):** fine to medium-grained, trace clay, trace silt, few organics, some debris, slightly desiccated, moist, greenish brown to orangish brown.						

End of test pit at 6.0 feet bgs.
Groundwater not encountered.
Test pit backfilled with soil cuttings and compacted by pushing down the bucket using the backhoe weight on 01/24/2022.

Appendix B

Laboratory Testing Program

APPENDIX B

LABORATORY TESTING PROGRAM

Tests were conducted in our laboratory on representative soil samples for the purpose of classification and evaluation of their physical properties and engineering characteristics. The amount and selection of tests were based on the geotechnical parameters required for this project. Test results are presented herein and on the Logs of Borings and Test Pits, in Appendix A, *Field Exploration*. The following is a summary of the various laboratory tests conducted for this project.

In-Situ Moisture Content and Dry Density

In-situ dry density and moisture content tests were performed on relatively undisturbed ring samples, in accordance with ASTM Standard D2216 and D2937 to aid in soils classification and to provide qualitative information on strength and compressibility characteristics of the site soils. For test results, see the Logs of Borings and Test Pits in Appendix A, *Field Exploration*.

Organic Content

Tests were performed on twelve select samples during the current geotechnical investigation and eight select samples during the previous geotechnical evaluation tests were performed of the soil stockpile, within the central portion of the site, to determine the organic content, in accordance with the ASTM Standard D2974 test, Methods A and C. Test results are summarized in the table below.

Table No. B-1, Summary of Organic Content Test Results

Test Pit No.	Depth (feet)	Soil Description	Total Organic Content (%)
TP-01	0.0-1.3	Silty Sand (SM), Fill	8.3
TP-02	2.0-7.5	Silty Sand (SM), Fill	6.0
TP-03	2.5-4.5	Silty Sand (SM), Fill	8.2
TP-04	2.0-6.0	Silty Sand (SM), Fill	5.4
TP-05	0.5-5.0	Silty Sand (SM), Fill	1.9
TP-06	0.0-1.5	Silty Sand (SM), Fill	8.7
TP-06	4.8-10.0	Sandy Silt (SM), Native	2.1
TP-08	0.0-2.0	Silty Sand (SM), Fill	7.7
TP-08	3.0-5.0	Sand (SP), Native	1.5
TP-10	0.0-0.9	Silty Sand (SM), Fill	7.4
TP-11	0.0-2.0	Silty Sand (SM), Fill	2.1

Test Pit No.	Depth (feet)	Soil Description	Total Organic Content (%)
TP-12	1.5-4.0	Silty Sand (SM), Fill	2.5

Table No. B-1a, Summary of Organic Content Test Results (Stockpile, Converse, 2021)

Test Pit No.	Depth (feet)	Soil Description	Total Organic Content (%)
TP-01	0.0-7.0	Silty Sand /Sandy Silt (SM/ML), trace clay, Fill	1.7
TP-02	0.0-7.5	Silty Sand /Sandy Silt (SM/ML), trace clay, Fill	2.0
TP-03	0.0-8.0	Silty Sand (SM), trace clay, Fill	0.8
TP-04	0.0-7.0	Silty Sand/Clayey Sand (SM/SC), Fill	4.2
TP-05	0.0-7.5	Silty Sand/Clayey Sand (SM/SC), Fill	4.2
TP-06	0.0-10.0	Silty Clay (CL), Fill	2.8
TP-07	0.0-9.0	Sandy Clay (CL), Fill	5.6
TP-08	0.0-5.0	Silty Sand (SM), trace clay, Fill	4.2

Expansion Index

Two representative bulk samples were tested during the current geotechnical investigation and two bulk samples were tested during the previous geotechnical evaluation of the soil stockpile, within the central portion of the site, to evaluate the expansion potential of materials encountered at the site in accordance with ASTM D4829 Standard. The test results are presented in the following table.

Table No. B-2, Expansion Index Test Results

Test Pit No.	Depth feet)	Soil Description	Expansion Index	Expansion Potential
BH-03	3.0-9.0	Silty Sand/Sandy Silt (SM/ML)	4	Very Low
TP-10	3.0-5.0	Silty Sand (SM)	0	Very Low

Table No. B-2a, Expansion Index Test Results (Stockpile, Converse, 2021)

Test Pit No.	Depth feet)	Soil Description	Expansion Index	Expansion Potential
TP-06	0.0-10.0	Silty Clay (CL)	79	Medium
TP-07	0.0-9.0	Sandy Clay (CL)	53	Medium

R-value

One representative bulk soil sample was tested for resistance value (R-value) in accordance with California Test Method CT301. This test provides a relative measure of soil strength for use in pavement design. The test result is presented in the table below.

Table No. B-3, R-Value Test Result

Test Pit No.	Depth (feet)	Soil Classification	Measured R-value
BH-03	3.0-9.0	Silty Sand/Sandy Silt (SM/ML)	65

Soil Corrosivity

Two representative soil samples were tested during the current geotechnical investigation and four bulk samples were tested during the previous geotechnical evaluation of the soil stockpile, within the central portion of the site, to determine minimum electrical resistivity, pH, and chemical content, including soluble sulfate and chloride concentrations. The purpose of this test was to determine the corrosion potential of site soils when placed in contact with common construction materials. The tests were performed by AP Engineering and Testing, Inc. (Pomona, CA) in accordance with Caltrans Test Methods 643, 422 and 417. Test results are presented in the following table.

Table No. B-4, Summary of Soil Corrosivity Test Results

Boring No.	Depth (feet)	pH	Soluble Sulfates (CA 417) (ppm)	Soluble Chlorides (CA 422) (ppm)	Min. Resistivity (CA 643) (Ohm-cm)
BH-03	3.0-9.0	8.7	43	25	1,703

Table No. B-4a, Soil Corrosivity Test Result (Stockpile, Converse, 2021)

Boring No.	Depth (feet)	pH	Soluble Sulfates (CA 417) (ppm)	Soluble Chlorides (CA 422) (ppm)	Min. Resistivity (CA 643) (Ohm-cm)
TP-01	0.0-7.0	8.6	289	48	1,031
TP-04	0.0-7.0	8.3	2,073	95	233
TP-05	0.0-7.5	8.6	2,759	146	300
TP-07	0.0-9.0	8.1	3,872	227	322

Collapse

To evaluate the moisture sensitivity (collapse/swell potential) of the encountered soils, two collapse tests were performed in accordance with the ASTM Standard D4546 laboratory procedure. The samples were loaded to approximately 2 kips per square foot (ksf), allowed to stabilize under load, and then submerged. The test results are presented in the following table.

Table No. B-5, Collapse Test Results

Boring No.	Depth (feet)	Soil Classification	Percent Swell (+) Percent Collapse (-)	Collapse Potential
BH-03	3.0-4.5	Sandy Silt (ML)	-0.1	Slight
BH-04	2.5-4.0	Silty Sand (SM)	-0.2	Slight

Grain-Size Analysis

To assist in soil classification, mechanical grain-size analyses was performed on three select samples in accordance with the ASTM Standard D6913 test method. Grain-size distribution is summarized in the table below and plotted in Drawing No. B-1, *Grain Size Distribution Results*.

Table No. B-6, Grain Size Distribution Test Results

Test Pit No.	Depth (ft)	Soil Classification	% Gravel	% Sand	%Silt	%Clay
BH-04	0.0-4.0	Silty Sand (SM), trace gravel	4.0	56.6	39.4	
BH-04	15.0-16.5	Silty Sand (SM), few gravel	6.0	60.5	33.5	
BH-04	25.0-26.5	Silty Sand (SM)	0.0	68.9	31.1	

Maximum Dry Density and Optimum Moisture Content

Laboratory maximum dry density-optimum moisture content relationship tests were performed on two representative bulk samples. These tests were conducted in accordance with the ASTM Standard D1557 test method. The test results are presented in Drawing No. B-2, *Moisture-Density Relationship Results,* and is summarized in the following table.

Table No B-7, Summary of Moisture-Density Relationship Results

Test Pit No.	Depth (feet)	Soil Description	Optimum Moisture (%)	Maximum Density (lb./cft)
BH-05	0.0-4.0	Silty Sand (SM), Dark Brown	13.7	117.0
BH-05	7.0-13.0	Silty Sand (SM), Grayish Brown	10.3	120.2

Direct Shear

Two direct shear tests were performed; one direct shear tests were performed on relatively undisturbed samples and one direct shear test was performed on a sample remolded to 90% of the maximum dry density under soaked moisture conditions in accordance with ASTM D3080. For each test, three samples contained in brass sampler rings were placed, one at a time, directly into the test apparatus and subjected to a range of normal loads appropriate for the anticipated conditions. The samples were then sheared at a constant strain rate of 0.02 inch/minute. Shear deformation was recorded until a maximum of about 0.25-inch shear displacement was achieved. Ultimate strength was selected from the shear-stress deformation data and plotted to determine the shear strength parameters. For test data, including sample density and moisture content, see Drawings No. B-3 and B-4*, Direct Shear Test Results,* and the following table.

Table No. B-8, Summary of Direct Shear Test Results

Test Pit No.	Depth (feet)	Soil Description	Peak Strength Parameters	
			Friction Angle (degrees)	Cohesion (psf)
BH-04	5.0-6.5	Silty Sand (SM)	33	220
*BH-05	0.0-4.0	Silty Sand (SM)	29	160

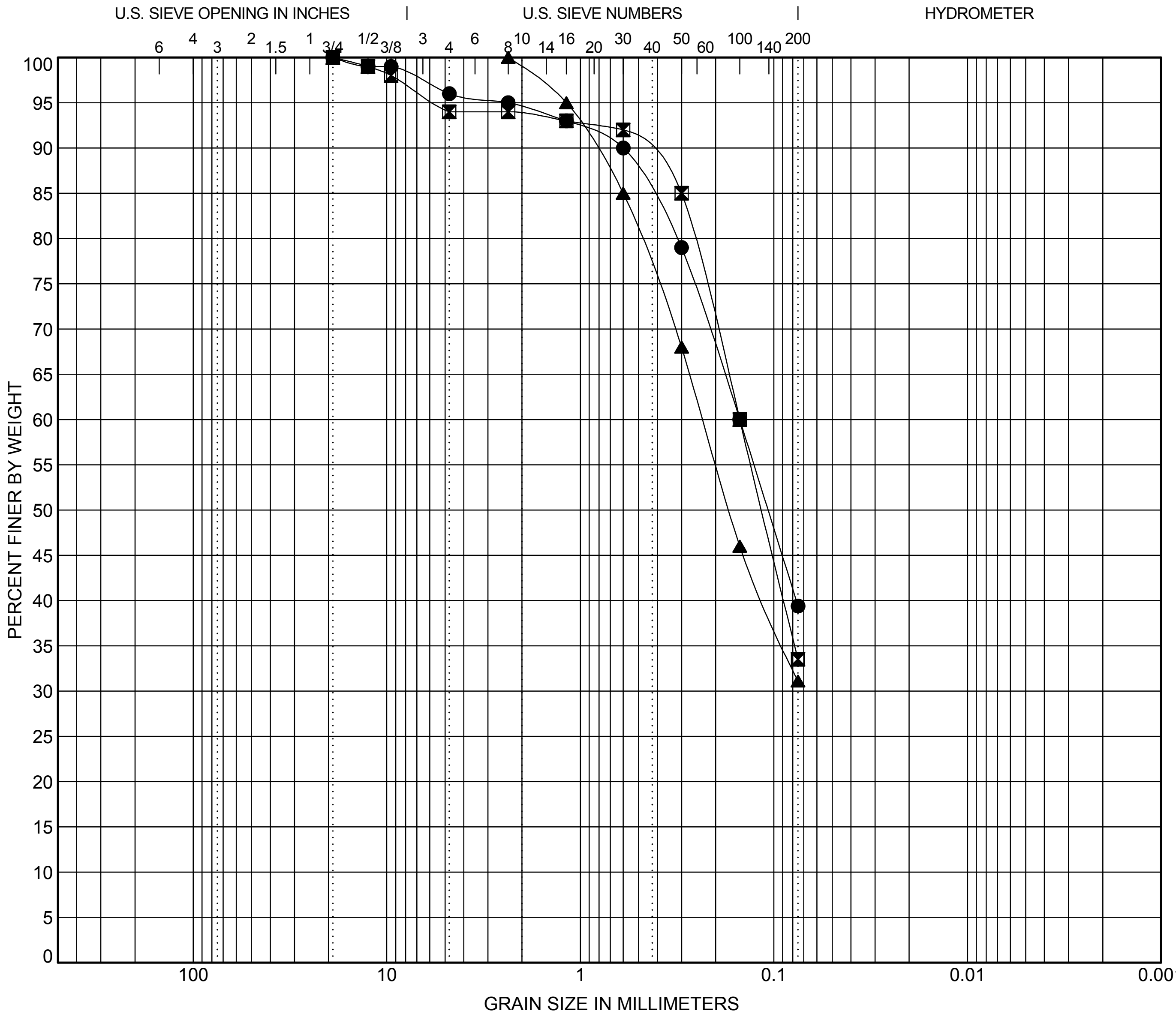
*Remolded to 90% of the maximum dry density

Consolidation

Two consolidation tests were conducted in accordance with ASTM Standard D2435 method. Data obtained from the test performed on relatively undisturbed ring samples were used to evaluate the settlement characteristics of the on-site soils under load. Preparation for these tests involved trimming the sample, placing it in a 1-inch-high brass ring, and loading it into the test apparatus, which contained porous stones to accommodate drainage during testing. Normal axial loads were applied to one end of the sample through the porous stones, and the resulting deflections were recorded at various time periods. The load was increased after the sample reached a reasonable state of equilibrium. Normal loads were applied at a constant load-increment ratio, successive loads being generally twice the preceding load. For test results, including sample density and initial moisture content, see Drawings No. B-5 and B-6, *Consolidation Test Results*.

Sample Storage

Soil samples presently stored in our laboratory will be discarded 30 days after the date of this report, unless this office receives a specific request to retain the samples for a longer period.



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Boring No.	Depth (ft)	Description	LL	PL	PI	Cc	Cu
●	**BH-04**	**0-4**	**SILTY SAND (SM), Trace Gravel**					
⊠	**BH-04**	**15-16.5**	**SILTY SAND (SM), Few Gravel**					
▲	**BH-04**	**25-26.5**	**SILTY SAND (SM)**					

	Boring No.	Depth (ft)	D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**BH-04**	**0-4**	**19**	**0.15**			**4.0**	**56.6**	**39.4**	
⊠	**BH-04**	**15-16.5**	**19**	**0.15**			**6.0**	**60.5**	**33.5**	
▲	**BH-04**	**25-26.5**	**2.36**	**0.233**			**0.0**	**68.9**	**31.1**	

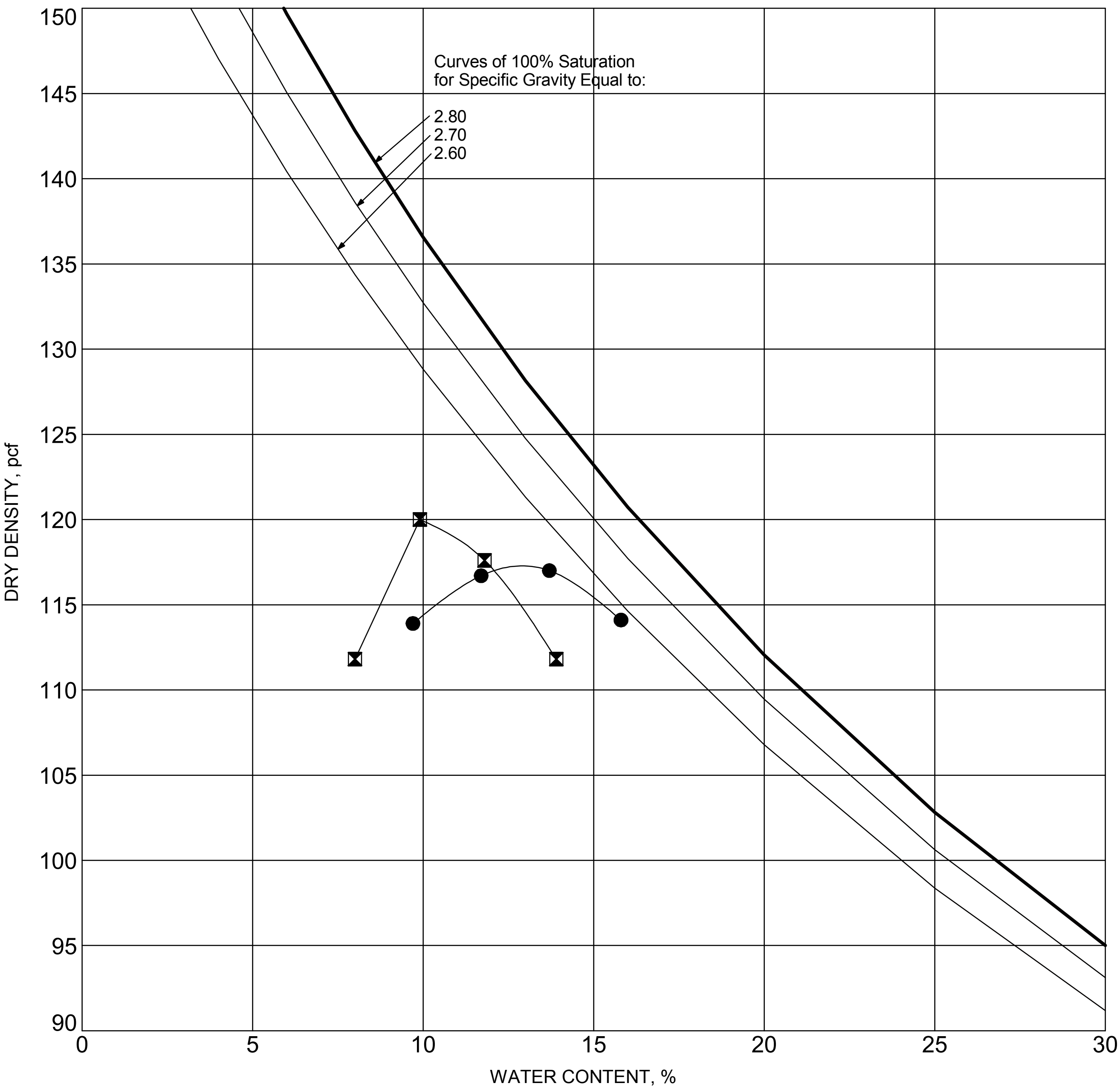
GRAIN SIZE DISTRIBUTION RESULTS

Converse Consultants

Euclid Mixed Use Specific Plan Project
Southeast Corner of Euclid Avenue and Schaefer Avenue
City of Ontario, San Bernadino County, California
For: Euclid Land Investments c/o RCCD, Inc.

Project No. **21-81-154-02**

Drawing No. **B-1**



SYMBOL	BORING NO.	DEPTH (ft)	DESCRIPTION	ASTM TEST METHOD	OPTIMUM WATER, %	MAXIMUM DRY DENSITY, pcf
●	BH-05	0-4	SILTY SAND (SM), DARK GRAY	D1557 - A	13.7	117
⧗	BH-05	7-13	SILTY SAND (SM), GRAYISH BROWN	D1557 - A	10.3	120.2

MOISTURE-DENSITY RELATIONSHIP RESULTS

Converse Consultants

Euclid Mixed Use Specific Plan Project
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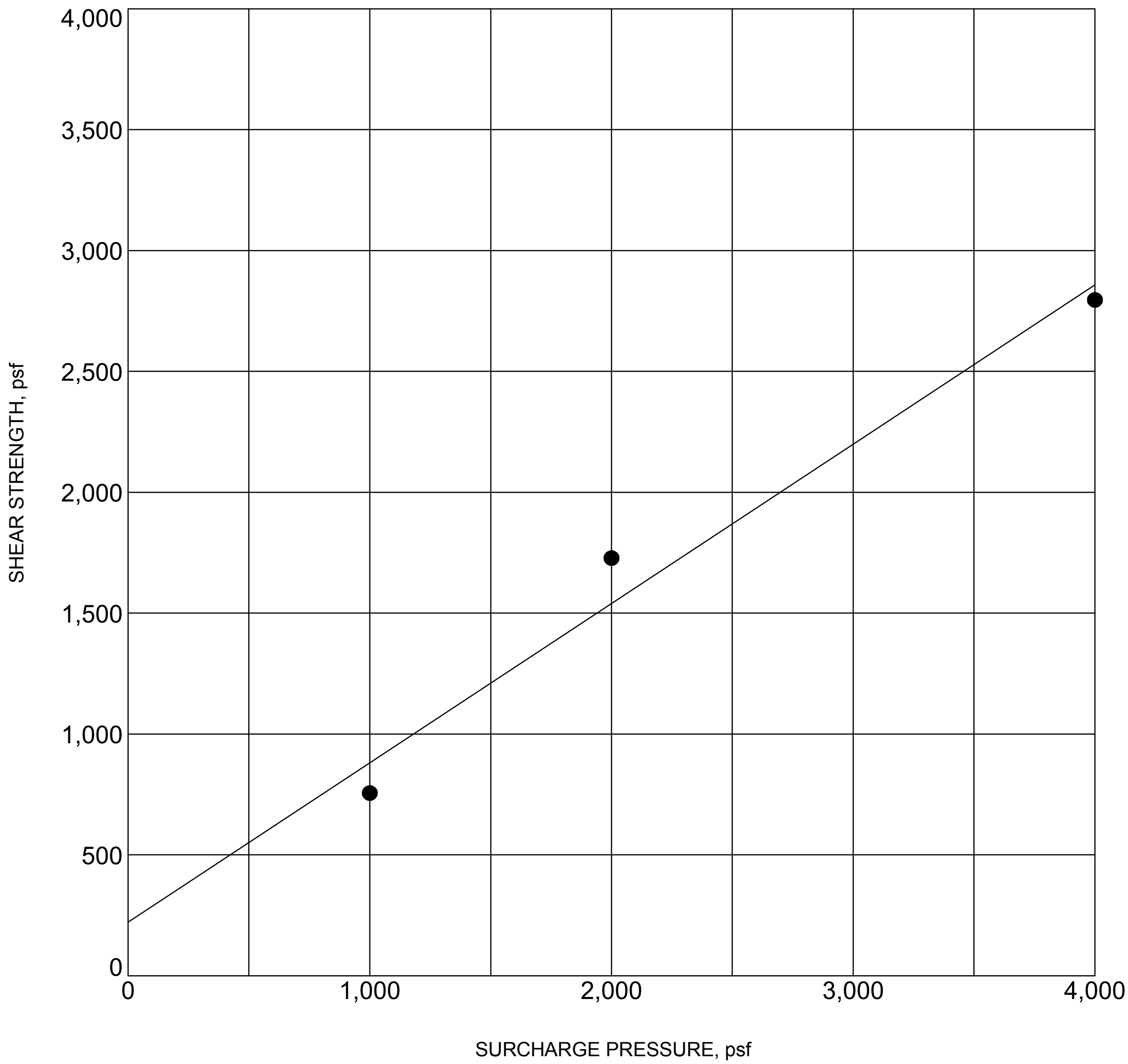
For: Euclid Land Investments c/o RCCD, Inc.

Project No.
21-81-154-02

Drawing No.
B-2

Project ID: 21-81-154-02.GPJ; Template: COMPACTION



BORING NO.	:	**BH-04**	DEPTH (ft)	:	**5-6.5**
DESCRIPTION	:	**SILTY SAND (SM)**			
COHESION (psf)	:	**220**	FRICTION ANGLE (degrees):		**33**
MOISTURE CONTENT (%)	:	**19.0**	DRY DENSITY (pcf)	:	**109.0**

NOTE: Ultimate Strength.

DIRECT SHEAR TEST RESULTS

Converse Consultants

Euclid Mixed Use Specific Plan Project
Southeast Corner of Euclid Avenue and Schaefer Avenue
City of Ontario, San Bernadino County, California
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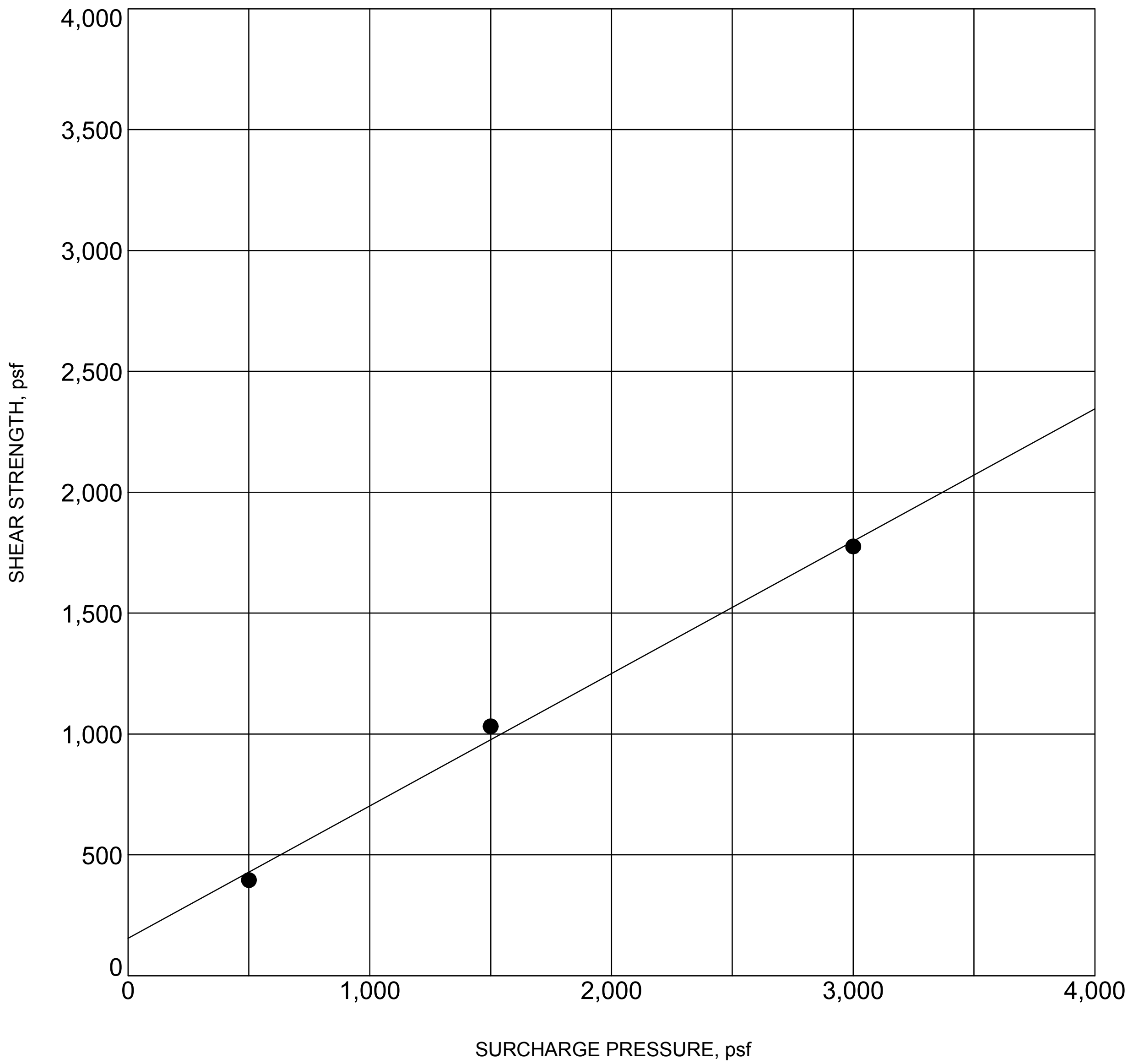
Project No. **21-81-154-02**

Drawing No. **B-3**



BORING NO. :	***BH-05**	DEPTH (ft) :	**0-4**
DESCRIPTION :	**SILTY SAND (SM)**		
COHESION (psf) :	**160**	FRICTION ANGLE (degrees):	**29**
MOISTURE CONTENT (%) :	**14.0**	DRY DENSITY (pcf) :	**105.0**

*(Remolded to 90% of the laboratory maxiumum dry density)

NOTE: Ultimate Strength.

DIRECT SHEAR TEST RESULTS

Converse Consultants

Euclid Mixed Use Specific Plan Project
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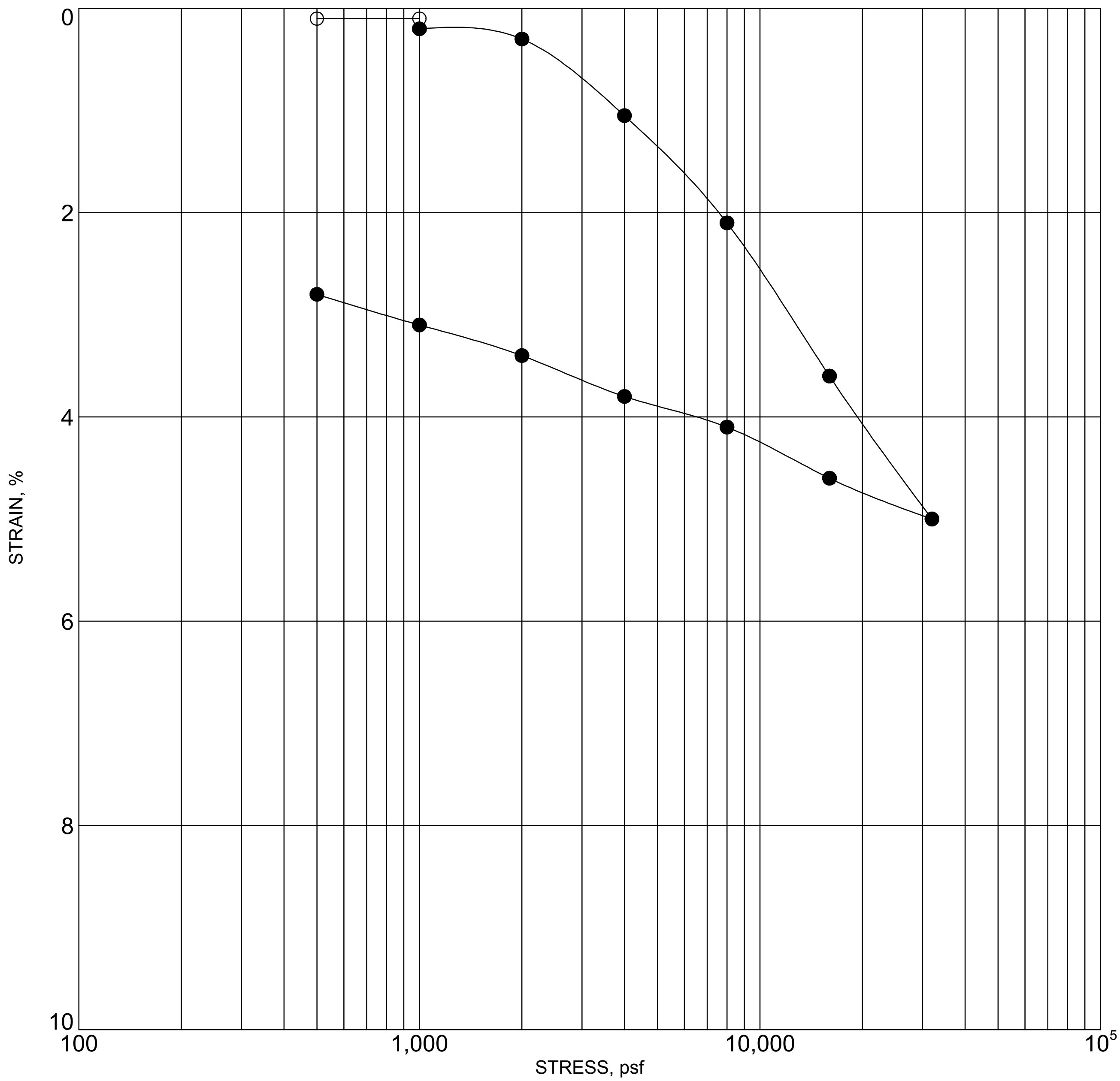
For: Euclid Land Investments c/o RCCD, Inc.

Project No. **21-81-154-02**

Drawing No. **B-4**



BORING NO. :	BH-02	DEPTH (ft) :	5.0-6.5
DESCRIPTION :	SILTY SAND (SM)		

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	**18**	**109**	**93**	**0.512**
FINAL				

NOTE: SOLID CIRCLES INDICATE READINGS AFTER ADDITION OF WATER

CONSOLIDATION TEST RESULTS

Converse Consultants

Euclid Mixed Use Specific Plan Project
Southeast Corner of Euclid Avenue and Schaefer Avenue
City of Ontario, San Bernadino County, California
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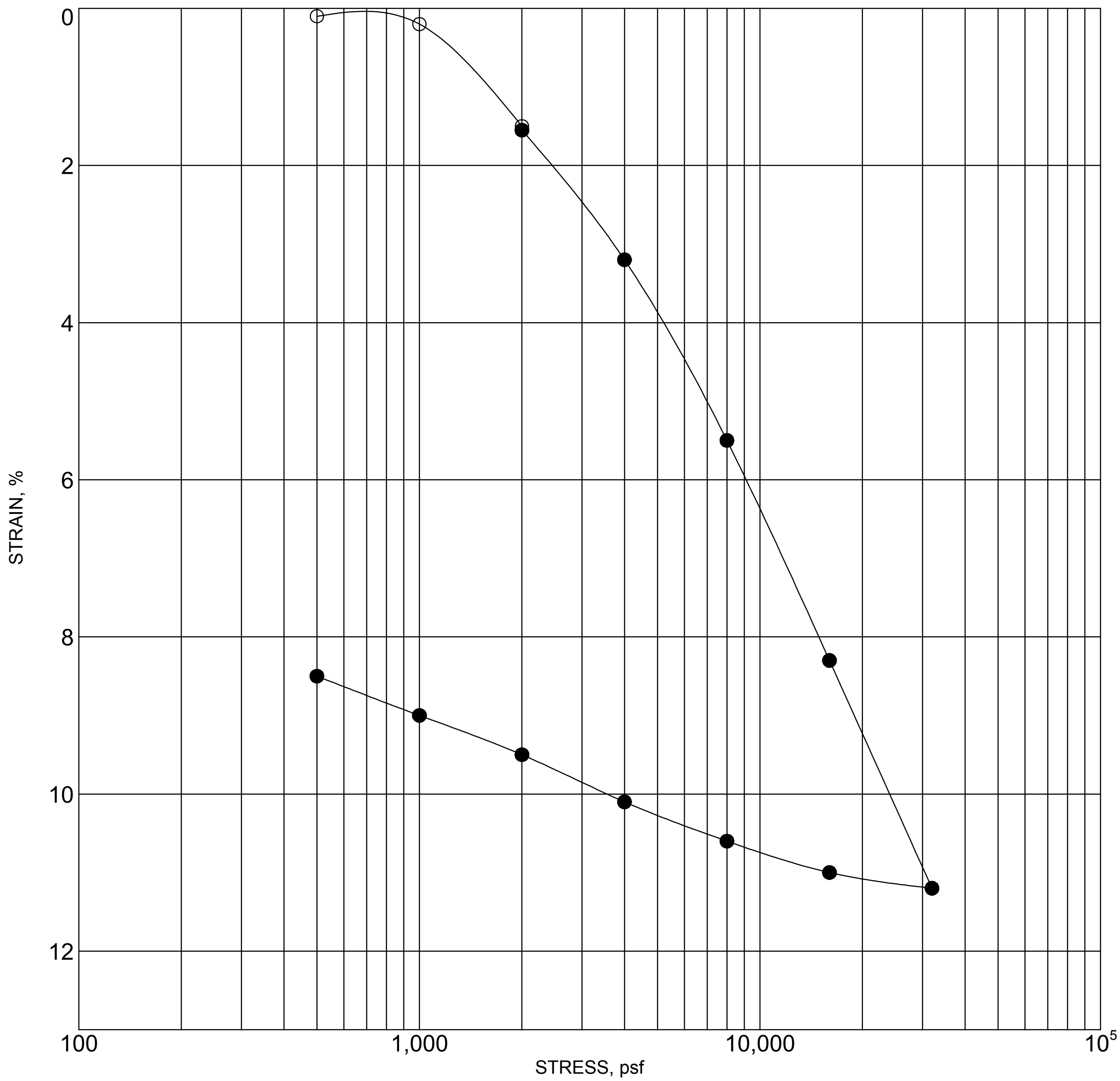
Project No.	Drawing No.
21-81-154-02	**B-5**



BORING NO. :	BH-06	DEPTH (ft) :	8.0-9.5
DESCRIPTION :	SANDY SILT (ML)		

	MOISTURE CONTENT (%)	DRY DENSITY (pcf)	PERCENT SATURATION	VOID RATIO
INITIAL	18	106.9	88	0.541
FINAL				

NOTE: SOLID CIRCLES INDICATE READINGS AFTER ADDITION OF WATER

CONSOLIDATION TEST RESULTS

Converse Consultants

Euclid Mixed Use Specific Plan Project
Southeast Corner of Euclid Avenue and Schaefer Avenue
City of Ontario, San Bernadino County, California
For: Euclid Land Investments c/o RCCD, Inc.

Project No.	Drawing No.
21-81-154-02	**B-6**

Appendix C

Earthwork Specifications

APPENDIX C

EARTHWORK SPECIFICATIONS

C1.1 Scope of Work

The work includes all labor, supplies and construction equipment required to construct the building pads in a good manner, as shown on the drawings and herein specified. The major items of work covered in this section include the following.

- Site Inspection
- Authority of Geotechnical Engineer
- Site Clearing
- Excavations
- Preparation of Fill Areas
- Placement and Compaction of Fill
- Observation and Testing

C1.2 Site Inspection

1. The Contractor should carefully examine the site and make all inspections necessary in order to determine the full extent of the work required to make the completed work conform to the drawings and specifications. The Contractor should satisfy himself as to the nature and location of the work, ground surface and the characteristics of equipment and facilities needed prior to and during prosecution of the work. The Contractor should satisfy himself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered. Any inaccuracies or discrepancies between the actual field conditions and the drawings, or between the drawings and specifications must be brought to the Owner's attention in order to clarify the exact nature of the work to be performed.

2. This *Geotechnical Investigation and Organic Soil/Manure Evaluation Report* by Converse Consultants may be used as a reference to the surface and subsurface conditions on this project. The information presented in this report is intended for use in design and is subject to confirmation of the conditions encountered during construction. The exploration logs and related information depict subsurface conditions only at the particular time and location designated on the boring logs. Subsurface conditions at other locations may differ from conditions encountered at the exploration locations. In addition, the passage of time may result in a change in subsurface conditions at the exploration locations. Any review of this information should not relieve the Contractor from performing such independent investigation

and evaluation to satisfy himself as to the nature of the surface and subsurface conditions to be encountered and the procedures to be used in performing his work.

C1.3 Authority of the Geotechnical Engineer

1. The Geotechnical Engineer will observe the placement of compacted fill and will take sufficient tests to evaluate the uniformity and degree of compaction of filled ground.
2. As the Owner's representative, the Geotechnical Engineer will (a) have the authority to cause the removal and replacement of loose, soft, disturbed and other unsatisfactory soils and uncontrolled fill; (b) have the authority to approve the preparation of native ground to receive fill material; and (c) have the authority to approve or reject soils proposed for use in building areas.
3. The Civil Engineer and/or Owner will decide all questions regarding (a) the interpretation of the drawings and specifications, (b) the acceptable fulfillment of the contract on the part of the Contractor and (c) the matters of compensation.

C1.4 Site Clearing

1. Clearing and grubbing should consist of the removal from areas to be graded: all existing pavement, utilities, and vegetation.
2. Organic and inorganic materials resulting from the clearing and grubbing operations should be hauled away from the areas to be graded.

C1.5 Excavations

Based on observations made during our field explorations, the surficial soils can be excavated with conventional earthwork equipment.

C1.6 Preparation of Fill Areas

1. All highly organic soils, manure and debris should be removed from the proposed foundation, improvements and/or fill areas.
2. After the required removals have been made, the exposed earth materials (undocumented artificial fill, topsoil and the upper low-density portions of the alluvium), should be overexcavated to provide a zone of structural fill for the support of footings, slabs-on-grade, and exterior flatwork or proposed improvements. All loose, soft or disturbed earth materials should be removed from the bottom of excavations before placing structural fill. Any structures will require

a minimum of 3.0 feet of compacted fill beneath building footings and 2.0 feet below any proposed wall footings or 5.0 feet blow proposed grade, whichever is deeper

3. The subgrade in all areas to receive fill should be scarified to a minimum depth of 6 inches. Scarification may be terminated on moderately hard to hard, cemented earth materials with the approval of the Geotechnical Engineer. The soil moisture should be adjusted to at least 2 percent above optimum for fine-grained soils and within 3 percent of optimum moisture content for granular soils, and then compacted to at least 90 percent of the laboratory maximum dry density as determined by ASTM Standard D1557 test method.
4. Compacted fill may be placed on native soils that have been properly scarified and recompacted as discussed above.
5. All areas to receive compacted fill will be observed and approved by the Geotechnical Engineer before the placement of fill.

C1.7 Placement and Compaction of Fill

1. Compacted fill placed for the construction of the embankment or for any planned structures will be considered structural fill. Structural fill may consist of approved on-site soils or imported fill that meets the criteria indicated below.
2. Fill consisting of selected on-site earth materials or imported soils approved by the Geotechnical Engineer should be placed in layers on approved earth materials. Soils used as compacted structural fill should have the following characteristics:
    a. All fill soil particles should not exceed 8 inches in nominal size and should not have an organic content greater than 2%, as well as free of matter and miscellaneous inorganic debris and inert rubble.
    b. Imported fill materials should have an Expansion Index (EI) less than 20. All imported fill should be compacted to at least 90 percent of the laboratory maximum dry density (ASTM Standard D1557) at about 2 percent above optimum moisture for fine-grained soils, and within 3 percent of optimum for granular soils.
3. Fill exceeding 5 feet in height should not be placed on native slopes that are steeper than 5:1 horizontal:vertical (H:V). Where native slopes are steeper than 5:1 H:V, and the height of the fill is greater than 5 feet, the fill should be benched into competent materials. The height and width of the benches should be at least 2 feet.
4. Representative samples of materials being used, as compacted fill will be analyzed in the laboratory by the Geotechnical Engineer to obtain information on their physical properties. Maximum laboratory density of each soil type used in the

compacted fill will be determined by the ASTM Standard D1557 compaction method.

5. Fill materials should not be placed, spread or compacted during unfavorable weather conditions. When site grading is interrupted by heavy rain, filling operations should not resume until the Geotechnical Engineer approves the moisture and density conditions of the previously placed fill.
6. It should be the Grading Contractor's obligation to take all measures deemed necessary during grading to provide erosion control devices in order to protect slope areas and adjacent properties from storm damage and flood hazard originating on this project. It should be the Contractor's responsibility to maintain slopes in their as-graded form until all slopes are in satisfactory compliance with job specifications, all berms have been properly constructed, and all associated drainage devices meet the requirements of the Civil Engineer.

C1.8 Fill Slope Construction

1. Fill slopes placed above existing surfaces or cut slopes should be constructed with keyways.
2. Where fill is placed against existing slopes steeper than 5:1 H:V, the new fill slopes should be keyed and benched to provide increased lateral support after removal of the unsuitable surficial soils, when present.

C1.9 Observation and Testing

1. During the progress of grading and trench backfill, the Geotechnical Engineer will provide observation of the fill placement operations.
2. Field density tests of all compacted fill will be made during grading and trench backfill to provide an opinion on the degree of compaction being obtained by the Contractor. Where compaction of less than specified herein is indicated, additional compactive effort with adjustment of the moisture content should be made as necessary, until the required degree of compaction is obtained.
3. A sufficient number of field density tests will be performed to provide an opinion to the degree of compaction achieved. In general, density tests will be performed on each one-foot lift of fill, but not less than one for each 500 cubic yards of fill placed.

March 27, 2023

Mr. Jason Lee
Vice President
Euclid Land Investments
c/o RCCD, Inc.
8101 E. Kaiser Boulevard, Suite 140
Anaheim Hills, California 92808

Subject: **UPDATED GEOTECHNICAL SEISMIC DESIGN PARAMETERS**
Euclid Mixed Use Specific Plan Project
Southeast Corner of Euclid Avenue and Schaefer Avenue
City of Ontario, County of San Bernardino, California
Converse Project No. 21-81-154-02

Reference: Converse Consultants, 2022, Preliminary Geotechnical Investigation and Organic Soil/Manure Report, Euclid Mixed Use Specific Plan Project, Southeast Corner of Euclid Avenue and Schaefer Avenue, City of Ontario, County of San Bernardino, California, Converse Project No. 21-81-154-02, dated March 30, 2022.

Dear Mr. Lee:

Pursuant to your request, Converse Consultants (Converse) has prepared this updated geotechnical foundation design parameters letter for the Euclid Mixed Use Specific Plan Project, located at the southeast corner of Euclid Avenue and Schaefer Avenue, in the City of Ontario, San Bernardino County, California. This letter provides updated geotechnical seismic design parameters, to the current 2022 CBC, for the proposed mixed use business park development.

The seismic design soil parameters are presented below in Table No. 1.

CBC SEISMIC DESIGN PARAMETERS

Seismic parameters based on the 2022 California Building Code (CBC, 2022) and ASCE 7-16 are provided in the following table. These parameters were determined using the coordinate (33.9265N and 117.6052W) and the Seismic Design Maps ATC online tool.

Table No. 1, CBC 2022 Seismic Design Parameters

Seismic Parameters	
Site Coordinates	34.0018N and 117.6480W
Site Class	D
Risk Category	II
Mapped Short period (0.2-sec) Spectral Response Acceleration, S_s	1.621g
Mapped 1-second Spectral Response Acceleration, S_1	0.583g
Site Coefficient (from Table 11.4-1), F_a	1.0
Site Coefficient (from Table 11.4-2), F_v	2.5
MCE 0.2-sec period Spectral Response Acceleration, S_{MS}	1.161g
MCE 1-second period Spectral Response Acceleration, SM_1	1.455g
Design Spectral Response Acceleration for short period S_{DS}	1.081g
Design Spectral Response Acceleration for 1-second period, S_{D1}	0.970g
Maximum Peak Ground Acceleration, PGA_M	0.735g

We appreciate the opportunity to provide continuing geotechnical services on this project to Euclid Land Investment. If you have any questions, or if we can provide any additional assistance, please call the undersigned at 909-796-0544.

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CONVERSE CONSULTANTS

Robert L. Gregorek II, CEG, PG
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