Appendix H Preliminary Geotechnical Exploration Report

INTERNATIONAL PARK OF COMMERCE - PHASE 2
SAN JOAQUIN COUNTY, CALIFORNIA

PRELIMINARY GEOTECHNICAL EXPLORATION

SUBMITTED TO
Prologis
615 International Parkway
Tracy, CA 95377

PREPARED BY
ENGEO Incorporated

November 4, 2021
Revised January 29, 2024

PROJECT NO.
9320.006.007

ENGEO
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GEOTECHNICAL
ENVIRONMENTAL
WATER RESOURCES
CONSTRUCTION SERVICES
COASTAL/MARINE GEOTECHNICS

Project No.
9320.006.007

November 4, 2021
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Prologis
615 International Parkway
Tracy, CA 95377

Subject: International Park of Commerce - Phase 2
San Joaquin County, California

PRELIMINARY GEOTECHNICAL EXPLORATION

Dear Ms. Liu:

ENGEO prepared this preliminary geotechnical exploration report for Prologis, as outlined in our agreement dated August 13, 2021 (which is an addendum to our agreement dated May 16, 2014). We characterized the subsurface conditions at the site to provide the enclosed preliminary geotechnical recommendations for design.

If you have any questions or comments regarding this report, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated

Connor Dunn

Steve Harris, GE

REGISTERED PROFESSIONAL ENGINEER
STEVE HARRIS
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1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

ENGEO prepared this preliminary geotechnical exploration report for preliminary design of the International Park of Commerce - Phase 2 project in San Joaquin County, California. We prepared this report as outlined in our agreement dated August 13, 2021 (which is an addendum to our agreement dated May 16, 2014). ENGEO was authorized to conduct the following scope of services.

- Review of available literature and geologic maps
- Subsurface field exploration
- Soil laboratory testing
- Data analysis and conclusions
- Report preparation
- Recommendations for a design-level geotechnical report

For our use, we received the IPC II Conceptual Site Plan prepared by Kier and Wright, dated August 11, 2021.

This report was prepared for the exclusive use of our client and their consultants for design of this project. In the event that any changes are made in the character, design or layout of the development, we must be contacted to review the conclusions and recommendations contained in this report to evaluate whether modifications are recommended. This document may not be reproduced in whole or in part by any means whatsoever, nor may it be quoted or excerpted without our express written consent.

1.2 PROJECT LOCATION AND DESCRIPTION

Figure 1 displays a Site Vicinity Map. The project site is located in San Joaquin County, on the north and south side of the intersection of West Schulte Road and Quality Road. The property is bordered by an industrial facility to the southwest and by agricultural fields on all other sides. The site currently consists of an active almond orchard. Figure 2 shows the site boundaries and our exploratory locations.

We understand that site improvements will consist of a new industrial development with approximately 5.36 million square feet of industrial development, including industrial buildings and new water/wastewater treatment facilities covering approximately 4 acres of the project site. In addition, the project would construct extensions to planned roadways, Promontory Parkway and Pavilion Parkway, which would be continuations from the proposed development west of the site, at IPC Phase 1. The project would also provide upgrades to West Schulte Road. The project proposes to construct approximately 264 acres of industrial land uses, 10 acres of dedicated roadway, water treatment facilities on a 2-acre parcel, and wastewater treatment facilities on a 2-acre parcel, as well as underground the WSID canal that covers approximately 6 acres of the project site.

Structural loads and grading are yet to be determined; however, we assume that structural loads will be representative of this type of construction.

2.0 FINDINGS

2.1 SITE BACKGROUND

We reviewed historical aerial photographs and satellite imagery as well as published geologic and topographic maps containing the subject site. Our review indicated that the property has been used for agricultural purposes since at least 1967.

2.2 GEOLOGY AND SEISMICITY

2.2.1 Geology

The site is located in the Great Valley geomorphic province. The Great Valley is an elongate, northwest-trending structural trough bound by the Coast Range on the west and the Sierra Nevada on the east. The Great Valley has been, and is presently being filled with sediments primarily derived from the Sierra Nevada.

Wagner et al. (1991) mapped the subject site as Alluvial Fan Deposits (Qf – Figure 3). This soil is described as Pleistocene-aged alluvial fan deposits generally consisting of interbedded clay, silt, sand, and gravel.

2.2.2 Seismicity

The site is located in a seismically active region. The site is not located within a currently designated Alquist-Priolo Earthquake Fault Zone and no known surface expressions of active faults are believed to exist within the site. An active fault is defined by the State Mining and Geology Board (California Geological Survey, 2007) as one that has had surface displacement within Holocene time (about the last 11,000 years). According to the 2008 National Seismic Hazard Maps Spatial Query, the two nearest earthquake faults designated as active seismic sources are the Great Valley Fault, located approximately 1 mile south, and the Greenville Fault, located approximately 10 miles west. Other active seismic sources in the region are summarized in the table below. Figure 4 shows the approximate locations of these faults and significant historic earthquake epicenters recorded within the region.

TABLE 2.2.2-1: Faults Capable of Producing Significant Ground Shaking at the Site
Latitude: 37.7198007, **Longitude:** -121.4855804

FAULT NAME	DISTANCE FROM SITE (miles)	DIRECTION FROM SITE	MAXIMUM MOMENT MAGNITUDE
Great Valley	1	South	6.9
Greenville Connected	10	West	7.0
Mount Diablo Thrust	19	West	6.7
Calaveras	23	West	7.0
Hayward-Rodgers Creek	27	West	7.3
North San Andreas	46	West	8.1

Portions of the Great Valley fault are considered seismically active blind thrust faults; however, since the fault segments are not known to extend to the ground surface, the fault is not defined as active by the State Mining and Geology Board as per the definition above and the State of California has not defined Earthquake Fault Zones around postulated traces.

The Great Valley fault is considered capable of causing significant ground shaking at the site, but the recurrence interval is believed longer than for more distant, strike-slip faults. Recent studies suggest that this boundary fault may have been the cause of the Vacaville-Winters earthquake sequence of April 1892 (Eaton, 1986; Wong and Biggar, 1989; Moores and others, 1991). Other large (>M_W7) earthquakes have historically occurred in the Bay Area to the west and along the margins of the Central Valley and many earthquakes of low magnitude occur every year.

2.3 FIELD EXPLORATION

Our field exploration included drilling nine borings and conducting four percolation tests at the locations shown on the Site Plan, Figure 2. We performed our field exploration on September 9 and 10, and October 1, 2021. The location and elevations of our explorations are approximate and were estimated by using mobile GPS and GIS applications on handheld devices; they should be considered accurate only to the degree implied by the method used.

We were initially unable to access all of the planned exploration locations due to active flood irrigation occurring across the central orchard. We later returned to the site to complete the remaining borings but were unable to complete boring 1-B01 due to access issues. This boring should be completed as part of the design-level geotechnical exploration report.

2.3.1 Borings

An ENGEO representative observed the drilling and logged the subsurface conditions at each boring location. We retained a truck-mounted Soil Test Ranger drill rig and a track drill rig both equipped with 4-inch-diameter solid flight augers. The borings were advanced to a maximum depth of approximately 31 feet below existing grade.

Soil samples were collected at frequent intervals using either a 3-inch outside-diameter (O.D.) California-type split-spoon sampler fitted with 6-inch-long brass liners, or a 2-inch O.D. Standard Penetration Test (SPT) split-spoon sampler. The samplers were advanced with a 140-pound hammer with a 30-inch drop, employing a rope-and-cathead hammer system. The penetration of the sampler was field recorded as the number of blows needed to drive the sampler 18 inches in 6-inch increments. The boring logs show the number of blows required for the last 1 foot of penetration, or the number of blows per depth of penetration for samples that met driving refusal. The blow counts depicted on the boring logs have not been converted using any correction factors.

We used the field logs to develop the final logs presented in Appendix A. The logs depict subsurface conditions within the borings at the time the exploration was conducted. Subsurface conditions at other locations may differ from conditions noted at these locations. The passage of time may result in altered subsurface conditions. In addition, stratification lines represent the approximate boundaries between soil types and the transitions may be gradual.

2.3.2 Percolation Testing

Four percolation tests were installed and performed within the vicinity of each of the two proposed detention basins. According to information provided to us by Kier and Wright, we understand that the design basin bottoms are proposed to be at a depth of approximately 15 feet below the ground surface; therefore, we targeted strata within that zone to run our percolation tests. The locations of our percolation tests are shown on the Site Plan, Figure 2, and the boring logs for the test holes can be found in Appendix A. We had to adjust the locations of our planned percolation tests in the field due to access issues and active flood irrigation occurring. This resulted in several percolation tests that are just outside of the basin footprint. However, we believe that the material and locations tested are representative of the conditions at the bottom of the proposed basin locations.

Before installing our percolation tests, we drilled separate borings to 10 feet deeper than the proposed bottom of basin elevations for the purpose of logging the subsurface soil to help target a more permeable layer for testing. We did not encounter any more permeable coarse-grained materials within 10 feet below the planned basin bottoms, so we installed our percolation tests at the planned bottom of basin elevations.

The percolation test holes were drilled using a 4-inch-diameter solid-flight auger. Preparation of the percolation test holes began by placing 2 inches of approximately ½-inch-diameter drain rock in the bottom of each hole. A 3-inch-diameter perforated PVC pipe was then placed in the test holes and surrounded by drain rock extending up to the ground surface. The holes were presoaked prior to performing the percolation tests. Municipal drinking water was used for the percolation testing. It is our opinion that the percolation rate of drinking water should be similar to stormwater.

At the start of each test, the hole was filled with water to approximately 12 inches above the drain rock placed at the bottom of the hole. The water level was then measured at appropriate intervals until the percolation rate stabilized. At the end of each interval, additional water was added, as needed, to reset the water level to approximately 12 inches above the drain rock.

Based on our measured field test results, we converted the uncorrected field percolation rates to infiltration rates using Porchet's Method (Inverse Borehole Method) as summarized in the table below.

TABLE 2.3.2-1: Percolation Testing Results

PERCOLATION TEST HOLE	LOCATION DESCRIPTION	TEST BOTTOM DEPTH (feet)	PROPOSED DEPTH TO BASIN BOTTOM (feet)	RAW FIELD PERCOLATION RATE (inches/hour)	CONVERTED PORCHET DESIGN INFILTRATION RATE (inches/hour)
1-P01	Eastern Basin	14	15	0.64	0.06
1-P02	Eastern Basin	15	15	1.4	0.15
1-P03	Western Basin	14½	15	7.5	0.69
1-P04	Western Basin	15½	15	7.3	0.51

Maintenance should be performed routinely to prevent the accumulation of fine-grained material and or growth of organics in the basins.

2.4 SURFACE CONDITIONS

Site topography increases gradually from north to south. Site elevations range from approximately Elevation 95 feet in the north to Elevation 150 feet in the south (WGS84).

We observed the following site features during our reconnaissance.

- The majority of the site consisted of an orchard with narrow rows and active flood irrigation.
- West Schulte Road crossed the middle of the site from east to west.
- A drainage channel ran across the northern portion of the site from northwest to southeast.
- Dirt access roads ran along the perimeter of the site.

Please refer to the Site Plan, Figure 2, for more information on site features.

2.5 SUBSURFACE CONDITIONS

The soil observed in our explorations generally consisted of very stiff to hard lean clay and silt with varying amounts of sand to the maximum depth explored of 31 feet below the ground surface. The near surface soil consisted of moderately to highly expansive lean to fat clay with Plasticity Index (PI) values between 17 and 38.

Consult the Site Plan and exploration logs for specific subsurface conditions at each location. We include our exploration logs in Appendix A. The logs contain the soil type, color, consistency, and visual classification in general accordance with the Unified Soil Classification System (USCS). The logs graphically depict the subsurface conditions encountered at the time of the exploration.

2.6 GROUNDWATER CONDITIONS

We did not observe static or perched groundwater within any of our explorations performed on site. Fluctuations in the level of groundwater may occur due to variations in rainfall, irrigation practice, and other factors not evident at the time measurements were made.

2.7 LABORATORY TESTING

We performed laboratory tests on selected soil samples to evaluate their engineering properties. For this project, we performed moisture content, dry density, sieve analysis, plasticity index, triaxial, and unconfined compression testing. Select laboratory data is recorded on the boring logs in Appendix A; other laboratory data is included in Appendix B.

3.0 CONCLUSIONS

From a geotechnical engineering viewpoint, in our opinion, the site is suitable for the proposed development, provided the preliminary geotechnical recommendations in this report are properly incorporated into the design plans and specifications.

The primary geotechnical concern that could affect development on the site is the potential for post-construction ground surface movement due to moderately to highly expansive surficial soil. We summarize our conclusions below followed by preliminary recommendations for design and recommendations for a design-level geotechnical report.

3.1 EXISTING FILL

We did not encounter any undocumented fill in our exploratory borings. Non-engineered fill can undergo excessive settlement, especially under new fill or building loads. If any undocumented fill is encountered during grading, it should be removed and replaced with engineered fill. In addition, any loose surface soil should be removed if greater than 12 inches in depth and replaced as engineered fill.

3.2 EXPANSIVE SOIL

We observed potentially expansive lean to fat clay near the surface of the site in our borings. Our laboratory testing indicates that the soil exhibits moderate to high shrink/swell potential with variations in moisture content.

Expansive soil change in volume with changes in moisture. They can shrink or swell and cause heaving and cracking of slabs-on-grade, pavements, and structures founded on shallow foundations. Building damage due to volume changes associated with expansive soil can be reduced by (1) using a rigid mat foundation that is designed to resist the settlement and heave of expansive soil, (2) deepening the foundations to below the zone of moisture fluctuation, i.e. by using deep footings or drilled piers, and/or (3) using footings at normal shallow depths but bottomed on a layer of select fill having a low expansion potential.

To reduce the potential for damage to the planned buildings, we recommend that the upper 18 inches of the building pads extending at least 5 feet laterally beyond building areas be underlain by non-expansive fill. In lieu of importing non-expansive fill, it may be cost effective to chemically treat the upper 18 inches of the building pad with a combination of lime and cement to reduce the expansion potential of the on-site soil. We recommend that other structural elements, such as pavements and flatwork be designed for highly expansive soil conditions.

We also provide specific grading recommendations for compaction of expansive soil at the site. The purpose of these recommendations is to reduce the swell potential of the soil by compacting at a higher moisture content and controlling the amount of compaction. Expansive soil mitigation recommendations are presented in Section 5.2 of this report.

3.3 SEISMIC HAZARDS

Potential seismic hazards resulting from a nearby moderate to major earthquake can generally be classified as primary and secondary. The primary effect is ground rupture, also called surface faulting. The common secondary seismic hazards include ground shaking and ground lurching. The following sections present a discussion of these hazards as they apply to the site. Based on topographic and lithologic data, the risk of regional subsidence or uplift, liquefaction, lateral spreading, landslides, tsunamis or seiches is considered low to negligible at the site.

3.3.1 Ground Rupture

Since there are no known active faults crossing the property and the site is not located within an Earthquake Fault Special Study Zone, it is our opinion that ground rupture is unlikely at the subject property.

3.3.2 Ground Shaking

An earthquake of moderate to high magnitude generated within {the San Francisco Bay} region could cause considerable ground shaking at the site, similar to that which has occurred in the past. To mitigate the shaking effects, structures should be designed using sound engineering judgment and the 2019 California Building Code (CBC) requirements, as a minimum. Seismic design provisions of current building codes generally prescribe minimum lateral forces, applied statically to the structure, combined with the gravity forces of dead-and-live loads. The code prescribed lateral forces are generally considered to be substantially smaller than the comparable forces that would be associated with a major earthquake. Therefore, structures should be able to: (1) resist minor earthquakes without damage, (2) resist moderate earthquakes without structural damage but with some nonstructural damage, and (3) resist major earthquakes without collapse but with some structural as well as nonstructural damage. Conformance to the current building code recommendations does not constitute any kind of guarantee that significant structural damage would not occur in the event of a maximum magnitude earthquake; however, it is reasonable to expect that a well-designed and well-constructed structure will not collapse or cause loss of life in a major earthquake (SEAOC, 1996).

3.3.3 Liquefaction

Soil liquefaction results from loss of strength during cyclic loading, such as imposed by earthquakes. Soil most susceptible to liquefaction are clean, loose, saturated, uniformly graded, fine-grained sand. Empirical evidence indicates that loose to medium-dense gravel, silty sand, and low- to moderate-plasticity silt and clay may be susceptible to liquefaction. In addition, sensitive high-plasticity soil may be susceptible to significant strength loss (cyclic softening) as a result of significant cyclic loading. Due to the fact that groundwater was not encountered in any of our subsurface explorations to the maximum depth explored of 31 feet below ground surface, and that the subsurface generally consists of fine-grained material, we opine that the risk of liquefaction is low during a design-level seismic event.

3.4 FLOODING

Based on a review of the FEMA flood zone maps for the site, the site is designated as Flood Zone X, signifying an area of minimal flood hazard. The Civil Engineer should review pertinent information relating to possible flood levels for the subject site based on final pad elevations and provide appropriate design measures for development of the project, if recommended.

3.5 2019 CBC SEISMIC DESIGN PARAMETERS

The 2019 CBC utilizes design criteria set forth in the ASCE 7-16 Standard. Based on the subsurface conditions encountered, we characterized the site as Site Class D in accordance with the 2019 CBC. We provide the 2019 CBC seismic design parameters in Table 3.5-1 below, which include design spectral response acceleration parameters based on the mapped Risk-Targeted Maximum Considered Earthquake (MCE_R) spectral response acceleration parameters.

TABLE 3.5-1: 2019 CBC Seismic Design Parameters
Latitude: 37.7198007, **Longitude:** -121.4855804

PARAMETER	VALUE
Site Class	D
Mapped MCE_R Spectral Response Acceleration at Short Periods, S_S (g)	1.31
Mapped MCE_R Spectral Response Acceleration at 1-second Period, S_1 (g)	0.45
Site Coefficient, F_A	1
Site Coefficient, F_V	See Section 11.4.8 (ASCE 7-16)
MCE_R Spectral Response Acceleration at Short Periods, S_{MS} (g)	1.31
MCE_R Spectral Response Acceleration at 1-second Period, S_{M1} (g)	See Section 11.4.8 (ASCE 7-16)
Design Spectral Response Acceleration at Short Periods, S_{DS} (g)	0.87
Design Spectral Response Acceleration at 1-second Period, S_{D1} (g)	See Section 11.4.8 (ASCE 7-16)
Mapped MCE Geometric Mean (MCE_G) Peak Ground Acceleration, PGA (g)	0.55
Site Coefficient, F_{PGA}	1.1
MCE_G Peak Ground Acceleration adjusted for Site Class effects, PGA_M (g)	0.61
Long period transition-period, T_L (sec)	8

*Requires site-specific ground motion hazard analysis per ASCE 7-16 Section 11.4.8

We estimate the fundamental periods of the proposed structures to be less than 1.5 T_s (where T_s is 0.64 seconds for this project). Therefore, the structural engineer may consider exception(s) of Section 11.4.8 of ASCE 7-16 as follows.

> "A ground motion hazard analysis is not required for structures… where, structures on Site Class D sites with S_1 greater than or equal to 0.2, provided the value of the seismic response coefficient C_s is determined by Eq. (12.8-2) of ASCE 7-16 for values of $T \leq 1.5T_S$ and taken as equal to 1.5 times the value computed in accordance with Eq. (12.8-3) of ASCE 7-16 for $1.5T_s < T \leq T_L$."

We recommend that we collaborate with the structural engineer of record to further evaluate the effects of taking the exceptions on the structural design and identify the need for performing a site-specific seismic hazard analysis. We can provide a scope for site-specific seismic hazard analysis and ground motion study separately, if needed.

4.0 CONSTRUCTION MONITORING

Our experience and that of our profession clearly indicate that the risk of costly design, construction, and maintenance problems can be significantly lowered by retaining the design geotechnical engineering firm to:

1. Review the final grading and foundation plans and specifications prior to construction to evaluate whether our recommendations have been implemented, and to provide additional or modified recommendations, as needed. This also allows us to check if any changes have occurred in the nature, design or location of the proposed improvements and provides the opportunity to prepare a written response with updated recommendations.

2. Perform construction monitoring to check the validity of the assumptions we made to prepare this report. Earthwork operations should be performed under the observation of our representative to check that the site is properly prepared, the selected fill materials are satisfactory, and that placement and compaction of the fills has been performed in accordance with our recommendations and the project specifications. Sufficient notification to us prior to earthwork is important.

If we are not retained to perform the services described above, then we are not responsible for any party's interpretation of our report (and subsequent addenda, letters, and verbal discussions).

5.0 PRELIMINARY EARTHWORK RECOMMENDATIONS

As used in this report, relative compaction refers to the in-place dry unit weight of soil expressed as a percentage of the maximum dry unit weight of the same soil, as determined by the ASTM D1557 laboratory compaction test procedure, latest edition. Compacted soil is not acceptable if it is unstable; it should exhibit only minimal flexing or pumping, as observed by an ENGEO representative. The term "moisture condition" refers to adjusting the moisture content of the soil by either drying if too wet or adding water if too dry.

We define "structural areas" as any area sensitive to settlement of compacted soil. These areas include, but are not limited to building pads, sidewalks, pavement areas, and retaining walls.

5.1 EXPANSIVE SOIL MITIGATION

As previously mentioned, the surficial soil consists of moderately to highly expansive lean to fat clay. We recommend that the upper 18 inches of the building pads extending at least 5 feet laterally beyond building areas consist of either non-expansive import material or be chemically treated to achieve a total of 18 inches of non-expansive material beneath the foundations. In our experience within the region, this treatment method will effectively mitigate the expansion potential of the soil, provide a higher subgrade modulus and residual strength, and help winterize the site for construction through periods of adverse weather.

5.2 GENERAL SITE CLEARING

Areas to be developed should be cleared of surface and subsurface deleterious materials, including remnant foundations, any undocumented fill, buried utility lines, irrigation lines, debris, and designated trees, shrubs, and associated roots. Following clearing, we recommend that the surface vegetation be mowed as close to the ground as possible and removed from the site. The remaining vegetation should then be either removed or thoroughly disked into the upper 12 inches of the site until approved by ENGEO.

Clean and backfill excavations extending below the planned finished site grades with suitable material compacted to the recommendations presented in Section 5.6. Retain ENGEO to observe and test backfilling.

5.3 SITE PREPARATION

Due to the current site use as an orchard, we anticipate that the orchard removal process will disturb approximately the upper 2 feet of the site. We recommend the following to ensure sufficient removal of tree roots and backfilling of voids created by tree removal.

After the site has been properly cleared and disked, in areas to receive fill, at least 12 inches of soil should be subexcavated and the exposed surface should then be scarified an additional 12 inches, moisture conditioned, and compacted in accordance with the engineered fill recommendations presented below. In areas of planned cut, the depth of subexcavation can be reduced so that the upper 2 feet of the site consists of either cut or engineered fill.

5.4 NON-ENGINEERED FILL

Any undocumented fill encountered during grading should be removed to competent native soil, as determined in the field by ENGEO. These materials should be subexcavated and reworked as engineered fill as recommended in Section 5.6, provided the materials are free of deleterious matter.

5.5 OVER-OPTIMUM SOIL MOISTURE CONDITIONS

The contractor should anticipate encountering excessively over-optimum (wet) soil moisture conditions during winter or spring grading, or during or following periods of rain. Wet soil can make proper compaction difficult or impossible. Wet soil conditions can be mitigated by:

1. Frequent spreading and mixing during warm dry weather,
2. Mixing with drier materials,
3. Mixing with a lime or cement product, or
4. Stabilizing with aggregate or geotextile stabilization fabric, or both.

Options 3 and 4 should be evaluated by ENGEO prior to implementation.

5.6 ACCEPTABLE FILL

On-site material is suitable as fill material provided it is processed to remove concentrations of organic material, debris, and particles greater than 8 inches in maximum dimension. However, as previously mentioned, the upper 18 inches of building pads and 5 feet laterally beyond should be chemically treated or consist of coarse-grained material. The Geotechnical Engineer should be informed if import materials are planned for the site. Allow ENGEO to sample and test proposed imported fill materials at least one week prior to delivery to the site.

Imported fill materials should meet the above requirements and have a plasticity index equal to or less than the on-site material, or less than 12 for non-expansive fill material.

5.7 FILL COMPACTION

5.7.1 Grading in Structural Areas

5.7.1.1 Non-expansive Soil

Perform subgrade compaction prior to fill placement, following cutting operations, and in areas left at grade as follows.

1. Scarify to a depth of at least 12 inches.
2. Moisture condition soil to at least 1 percentage point above the optimum moisture content.
3. Compact the subgrade to at least 95 percent relative compaction.

After the subgrade soil has been compacted, place and compact acceptable fill (defined in Section 5.3) as follows.

1. Spread fill in loose lifts that do not exceed 12 inches.
2. Moisture condition lifts to at least 1 percentage point above the optimum moisture content.
3. Compact fill to a minimum of 95 percent relative compaction.

Compact the pavement Caltrans Class 2 Aggregate Base section to at least 95 percent relative compaction (ASTM D1557). Moisture condition aggregate base to or slightly above the optimum moisture content prior to compaction.

5.7.1.2 Expansive Soil

Perform subgrade compaction prior to fill placement, following cutting operations, and in areas left at grade as follows.

1. Scarify to a depth of at least 12 inches.
2. Moisture condition soil to at least 3 percentage points over the optimum moisture content.
3. Compact the soil to a minimum of 90 percent relative compaction.

After the subgrade has been compacted, place and compact acceptable fill (defined in Section 5.3) as follows.

1. Spread fill in loose lifts that do not exceed 12 inches.
2. Moisture condition lifts to at least 3 percentage points over the optimum moisture content.
3. Compact the soil to a minimum of 90 percent relative compaction.

Compact the pavement Caltrans Class 2 Aggregate Base section to at least 95 percent relative compaction (ASTM D1557). Moisture condition aggregate base to or slightly above the optimum moisture content prior to compaction.

5.7.2 Underground Utility Backfill

5.7.2.1 General

Recommendations for fill compaction of underground utility backfill within structural areas are provided in this section. Jetting of backfill is not an acceptable means of compaction. Where utility trenches cross under the building pads, backfill with native clay soil for pipe bedding and backfill for a distance of 3 feet on each side of the pads. This will help prevent the normally granular bedding materials from acting as a conduit for water to enter beneath the pads. As an alternative, a sand cement slurry (minimum 28-day compressive strength of 500 psi) may be used in place of native clay soil.

The contractor is responsible for conducting all trenching and shoring in accordance with Cal/OSHA requirements. Project consultants involved in utility design should specify pipe-bedding materials.

5.7.2.2 Non-expansive Soil

Place and compact trench backfill as follows.

1. Trench backfill should have a maximum particle size of 6 inches.
2. Moisture condition trench backfill to at least 1 percent above the optimum moisture content. Moisture condition backfill outside the trench.
3. Place fill in loose lifts not exceeding 12 inches.
4. Compact fill to a minimum of 95 percent relative compaction (ASTM D1557).

5.7.2.3 Expansive Soil

Place and compact trench backfill as follows:

1. Trench backfill should have a maximum particle size of 6 inches.
2. Moisture condition trench backfill to at least 3 percentage points above the optimum moisture content. Moisture condition backfill outside the trench.
3. Place fill in loose lifts not exceeding 12 inches.
4. Compact fill to a minimum of 90 percent relative compaction.

5.8 CHEMICALLY TREATED SOIL

Where chemical treatment of the soil is used to mitigate expansive soil conditions, we recommend uniformly mixing the subgrade soil with a chemical stabilization product. Lime or a 50/50 blend of lime and cement such as “Quicklime Plus,” or equal, may be considered. The chemical treatment should be determined so that the resulting mixture is non-expansive. The soil should be moisture conditioned to at least 3 percentage points above the optimum moisture content before mixing. The mixing should be performed in accordance with the current version of Caltrans Standard Specifications with the following exceptions:

1. Following mixing, the treated soil should be allowed to fully hydrate prior to compaction.
2. Following hydration, the treated soil should be compacted according to ASTM D1557 to not less than 90 percent relative compaction at a moisture content at least 2 percentage points over the optimum moisture content to a non-yielding surface.

5.9 SLOPE GRADIENTS

Slopes less than 10 feet high may be constructed at 2:1 (horizontal:vertical) or flatter. The contractor is responsible to construct temporary construction slopes in accordance with Cal/OSHA requirements.

5.10 SURFACE DRAINAGE

The project civil engineer is responsible for designing surface drainage improvements. With regard to geotechnical engineering issues, we recommend that finish grades be sloped away from buildings and pavements to the maximum extent practical to reduce the potentially damaging effects of expansive soil. As a minimum, we recommend the following.

1. Discharge roof downspouts into closed conduits and direct away from foundations to appropriate drainage devices.
2. Do not allow water to pond near foundations, pavements, or exterior flatwork.

6.0 PRELIMINARY FOUNDATION RECOMMENDATIONS

We developed preliminary foundation recommendations using our field exploration, laboratory test results, and engineering analysis. The proposed buildings can be supported on conventional continuous or isolated spread footings in conjunction with slab-on-grade floors.

6.1 BUILDING PAD SUBGRADE PREPARATION

The upper 18 inches of the finished building pad and to 5 feet laterally beyond should consist of non-expansive imported material or be chemically treated to reduce the expansive potential of site soil. The percentage of chemical additive should be determined once the pad is graded. Based on our experience, on a preliminary basis, we estimate that chemical treatment with approximately 4 percent lime or a 50/50 blend of lime and cement (by dry unit weight) may be appropriate to reduce the plasticity of the on-site soil. Chemical treatment should be performed by a specialty contractor experienced in this type of work. In addition, excavations performed in chemically treated soil, such as for utility trenches, should be stockpiled and protected for reuse in the upper backfill area to match the treated section.

6.2 CONVENTIONAL FOOTINGS WITH SLAB-ON-GRADE

Conventional footings may be designed according to the following design criteria; however, these preliminary recommendations should be updated following a design-level geotechnical exploration and review by ENGEO of the actual building plans, and following the site grading.

6.2.1 Footing Dimensions and Allowable Bearing Capacity

The structural engineer should design the footing layout using the criteria presented below.

TABLE 6.2.1-1: Minimum Footing Dimensions

	*MINIMUM DEPTH (inches)	MINIMUM WIDTH (inches)
Continuous Footings	24	18
Isolated Interior	24	24

* below lowest adjacent pad grade

Minimum footing depths shown above are taken from lowest adjacent pad grade. Design foundations recommended above for a maximum allowable bearing pressure of 2,500 pounds per square foot (psf) for dead-plus-live loads.

During construction, footing trenches should be cleared of loose materials and debris. In addition, soil exposed in footing excavations should not be allowed to desiccate prior to placing concrete. ENGEO's field representative should observe and approve the footing excavations prior to concrete placement.

The maximum allowable bearing pressure is a net value; the weight of the footing may be neglected for design purposes. Footings located adjacent to utility trenches should have their bearing surfaces below an imaginary 1:1 (horizontal:vertical) plane projected upward from the bottom edge of the trench to the footing.

6.2.2 Foundation Lateral Resistance

Lateral loads may be resisted by friction along the base and by passive pressure along the sides of foundations. The passive pressure is based on an equivalent fluid pressure in pounds per cubic foot (pcf). We recommend the following allowable values for design:

- Passive Lateral Pressure: 300 pcf
- Coefficient of Friction: 0.30

Increase the above values by one-third for the short-term effects of wind or seismic loading.

Passive lateral pressure should not be used for footings on or above slopes.

6.3 SETTLEMENT

Provided our report recommendations are followed and given the proposed construction (Section 1.2), we estimate total and differential static settlements will be minimal. Additionally, we anticipate the majority of settlement will occur during construction and commissioning.

6.4 INTERIOR CONCRETE SLAB-ON-GRADE FLOORS

Due to the moderate to high expansion potential of the near-surface soil, we recommend that interior concrete floors be supported on at least 18 inches of non-expansive fill or chemically treated subgrade as noted in Section 6.1. Interior concrete floors should be underlain by 4 inches of Class 2 aggregate base. The base should be compacted to at least 95 percent relative compaction (ASTM D1557) to provide firm, uniform support for the slab-on-grade. The 4 inches of aggregate base may be considered part of the non-expansive fill recommended in Section 6.1

Prior to construction of the slab, the surface should be proof-rolled with heavy equipment to check that the base material is uniformly compacted and does not deflect under equipment loads. Prior to placing the base material, the building subgrade should be prepared in accordance with the Earthwork Recommendations.

The project structural engineer should determine the appropriate thickness, concrete strength, and reinforcement of the interior slab-on-grade. The contractor should notify and consult with the structural engineer if slab-on-grade floors will be subject to construction traffic or equipment loads. Additional slab thickness or reinforcement may be needed if the slab-on-grade floors are subject to construction loads.

Post-construction cracking of concrete slabs-on-grade is inherent in any project, especially where soil expansion potential is high. The structural engineer should determine the maximum control joint spacing to minimize cracking.

6.4.1 Slab Moisture Vapor Reduction

When buildings are constructed with concrete slabs, water vapor from beneath the slab will migrate through the concrete and into the building. This water vapor can be reduced but not stopped. Vapor transmission can negatively affect floor coverings and lead to increased moisture within a building. When water vapor migrating through the mat would be undesirable, we recommend the following to reduce, but not stop, water vapor transmission upward through slab-on-grade floors.

1. Install a vapor retarder membrane directly beneath the slab. Seal the vapor retarder at all seams and pipe penetrations. Vapor retarders shall conform to Class A in the current ASTM E 1745 “Standard Specification for Plastic Water Vapor Retarders used in Contact with Soil or Granular Fill under Concrete Slabs.”
2. Concrete shall have a concrete water-cement ratio of no more than 0.50.
3. Provide inspection and testing during concrete placement to check that the proper concrete and water cement ratio are used.

6.4.2 Subgrade Modulus for Structural Slab Design

Provided the structural slab is underlain with a minimum of 18 inches of non-expansive material, a subgrade modulus of 200 psi/in can be used for structural slab design.

6.5 TRENCH BACKFILL

Backfill and compact all trenches below building slabs-on-grade and to 5 feet laterally beyond any edge in accordance with Section 5.7.2.

6.6 EXTERIOR FLATWORK

Exterior flatwork includes items such as concrete sidewalks, steps, and outdoor courtyards exposed to foot traffic only. Provide a minimum section of 4 inches of concrete over 4 inches of aggregate base. Compact the aggregate base to at least 90 percent relative compaction (ASTM D1557). Thicken flatwork edges to at least 8 inches to help control moisture variations in the subgrade and place wire mesh or rebar within the middle third of the slab to help control the width and offset of cracks. Construct control and construction joints in accordance with current Portland Cement Association Guidelines.

7.0 RETAINING WALLS

7.1 LATERAL SOIL PRESSURES

Proposed conventional retaining walls and sound walls should be designed to resist lateral earth pressures from adjoining natural materials and/or backfill and from any surcharge loads. Provided that adequate drainage is included as recommended below, walls not restrained at the top should be designed for active lateral loading conditions, while walls restrained at the top should be designed for at-rest lateral loading conditions. The recommended lateral equivalent fluid pressures for retaining and sound wall design are presented below.

TABLE 7.1-1: Retaining/Sound Wall Design Parameters (Drained)

BACKFILL SLOPE CONDITION	ACTIVE PRESSURE (pcf)	AT-REST PRESSURE (pcf)
Level	40	60
4:1	50	70
3:1	60	80
2:1	75	95

In accordance with 2019 California Building Code requirements, foundation walls and retaining walls supporting more than 6 feet of backfill height are to be designed for dynamic seismic lateral earth pressures corresponding to design earthquake ground motions. We recommend a dynamic seismic lateral earth pressure corresponding to an equivalent fluid pressure of 34 pcf for a yielding wall design. When considering seismic earth pressures for retaining walls, the recommended seismic earth pressure increment should be added to the active earth pressures provided above.

Appropriate surcharge loads from buildings, hardscape, and vehicles should be incorporated when the surcharge loading is situated above a 1:1 (horizontal:vertical) line of projection extending up the rear base edge of the bottom of the footing. A uniform horizontal surcharge load of 50 percent of the vertical surcharge load should be assumed to act over the height of the wall.

If adequate drainage is not provided, we recommend that an additional equivalent fluid pressure of 40 pcf be added to the values recommended above for both restrained and unrestrained walls. Damp-proofing of the walls should be included in areas where wall moisture would be problematic.

Passive pressures acting on foundations may be assumed as 300 pounds per cubic foot (pcf) provided that the area in front of the wall is level for a distance of at least 10 feet or three times the depth of foundation, whichever is greater. The friction factor for sliding resistance may be assumed as 0.30. The upper 1 foot of soil should be excluded from passive pressure computations unless it is confined by pavement or a concrete slab. Passive pressures should be reduced by ½ if used in combination with sliding friction.

7.2 RETAINING WALL DRAINAGE

Construct either graded rock drains or geosynthetic drainage composites behind the retaining walls to reduce hydrostatic lateral forces. For rock drain construction, we recommend two types of rock drain alternatives.

1. A minimum 12-inch-thick layer of Class 2 Permeable Filter Material (Caltrans Specification 68-2.02F) placed directly behind the wall, or
2. A minimum 12-inch-thick layer of washed, crushed rock with 100 percent passing the ¾-inch sieve and less than 5 percent passing the No. 4 sieve. Envelop rock in a minimum 6-ounce, nonwoven geotextile filter fabric.

For both types of rock drains.

1. Place the rock drain directly behind the walls of the structure.
2. Extend rock drains from the wall base to within 12 inches of the top of the wall.
3. Place a minimum of 4-inch-diameter perforated pipe (glued joints and end caps) at the base of the wall, inside the rock drain and fabric, with perforations placed down.
4. Place pipe at a gradient at least 1 percent to direct water away from the wall by gravity to a drainage facility.

ENGEO should review and approve geosynthetic composite drainage systems prior to use.

7.3 BACKFILL

Backfill behind retaining walls should be placed and compacted in accordance with the Earthwork Recommendations contained in this report. Use light compaction equipment within 5 feet of the wall face. If heavy compaction equipment is used, the walls should be temporarily braced to avoid excessive wall movement.

7.4 FOUNDATIONS

Retaining walls may be supported on spread footings designed in accordance with the recommendations presented in Section 6, except the minimum width can be decreased to 12 inches.

8.0 PAVEMENT DESIGN

While no traffic indices (TIs) have been provided, we assumed a range of TIs for development of the pavement sections below. The civil engineer should determine the appropriate traffic indices based on the estimated traffic loads and frequencies.

8.1 FLEXIBLE PAVEMENTS

Based on the clay soil encountered within the upper 5 feet of the site, we assumed an R-Value of 5 for pavement design. Using estimated traffic indices for various pavement loading requirements, we developed the following recommended pavement sections using Topic 633 of the Caltrans Highway Design Manual (including the asphalt factor of safety), presented in the table below.

As an option, you may lime treat the pavement subgrade (minimum of 3 percent lime) in order to increase the subgrade R-Value to a minimum of 40 and reduce the overall pavement section.

Alternatively, a single layer of geogrid (Tensar TX-7 or equivalent) can be placed on top of the subgrade to reduce the overall pavement section. Pavement sections utilizing geogrid reinforcement are also included in Table 8.1-1 below.

TABLE 8.1-1: Recommended Asphalt Concrete Pavement Sections

TRAFFIC INDEX	ASPHALT CONCRETE (inches)	CLASS 2 AB (INCHES)		
		NATIVE SUBGRADE	14 INCHES LIME-TREATED SUBGRADE	TRIAX GEOGRID REINFORCED SUBGRADE
5	3	10	4	6
6	3½	13	6	8
7	4	16	7	10
8	5	18	8	11
9	5½	21	10	13
10	6½	23	11	15
11	7	26	13	17
12	8	28	14	18

While no traffic indices (TIs) have been provided, we assumed a wide range of TIs; the civil engineer should determine the appropriate TI based on the estimated traffic loads and frequencies.

8.2 RIGID PAVEMENTS

We developed the rigid pavement section using the computer program StreetPave 12 by the American Concrete Pavement Association (ACPA), which is based on the ACI 330R design guide. Table 8.2-1 below presents recommended PCCP and aggregate base (AB) thicknesses for various allowable Average Daily Truck Traffic (ADTT) indices that correspond to an R-value of 5 for untreated subgrade and the use of concrete with a Modulus of Rupture equal to 550 psi. Additional assumptions made include a design life of 30 years, ACI Category D traffic spectrum, reliability of 85 percent, percent of Slabs Cracked at and End of Design Life of 15 percent, serviceability factor of 2.25, presence of a concrete shoulder or curb and gutter for edge support, and no dowels used.

As an option, you may lime treat the pavement subgrade (minimum of 3 percent lime) in order to reduce the overall pavement section. We provide additional pavement sections utilizing lime treatment in Table 8.2-1 below.

TABLE 8.2-1: Recommended Concrete Pavement Sections

ADTT	PCCP (inches)		CLASS 2 AB (inches)	MAXIMUM JOINT SPACING (feet)	
	NO SUBGRADE TREATMENT	14 INCHES LIME TREATMENT		NO SUBGRADE TREATMENT	14 INCHES LIME TREATMENT
100	6½	6	4	13	11
300	7½	6½	4	15	12
900	8	7	4	15	13

Note: Calculations are based on the presence of a concrete shoulder or curbs

The civil engineer should determine the appropriate traffic indices based on the estimated traffic loads and frequencies.

8.3 SUBGRADE AND AGGREGATE BASE COMPACTION

Compact finish subgrade and aggregate base in accordance with Section 5.5. Aggregate Base should meet the requirements for ¾-inch maximum Class 2 AB in accordance with Section 26_1.02B of the latest Caltrans Standard Specifications.

9.0 RECOMMENDATIONS FOR DESIGN-LEVEL STUDY

As previously discussed, a site-specific design-level geotechnical exploration should be performed once details of the project have been defined. Preliminary conclusions and recommendations presented herein are based on limited site exploration data. Based on our preliminary findings in this study, we recommend the design-level geotechnical exploration to include supplemental borings and laboratory soil testing to provide design level recommendation for the proposed development.

The goal of the exploration is to allow for more detailed evaluations of the geotechnical issues discussed in this report and afford the opportunity to provide recommendations regarding techniques and procedures to be implemented during construction to mitigate potential geotechnical/geological hazards.

10.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report presents geotechnical recommendations for design of the improvements discussed in Section 1.2 for the International Park of Commerce - Phase 2 GEX project. If changes occur in the nature or design of the project, we should be allowed to review this report and provide additional recommendations, if any. It is the responsibility of the owner to transmit the information and recommendations of this report to the appropriate organizations or people involved in design of the project, including but not limited to developers, owners, buyers, architects, engineers, and designers. The conclusions and recommendations contained in this report are solely professional opinions and are valid for a period of no more than 2 years from the date of report issuance.

We strive to perform our professional services in accordance with generally accepted principles and practices currently employed in the area; there is no warranty, express or implied. There are risks of earth movement and property damages inherent in building on or with earth materials. We are unable to eliminate all risks; therefore, we are unable to guarantee or warrant the results of our services.

This report is based upon field and other conditions discovered at the time of report preparation. We developed this report with limited subsurface exploration data. We assumed that our subsurface exploration data are representative of the actual subsurface conditions across the site. Considering possible underground variability of soil and groundwater, additional costs may be required to complete the project. We recommend that the owner establish a contingency fund to cover such costs. If unexpected conditions are encountered, ENGEO must be notified immediately to review these conditions and provide additional and/or modified recommendations, as necessary.

Our services did not include excavation sloping or shoring, soil volume change factors, flood potential, or a geohazard exploration. In addition, our preliminary geotechnical exploration did not include work to determine the existence of possible hazardous materials. If any hazardous materials are encountered during construction, the proper regulatory officials must be notified immediately.

This document must not be subject to unauthorized reuse, that is, reusing without written authorization of ENGEO. Such authorization is essential because it requires ENGEO to evaluate the document's applicability given new circumstances, not the least of which is passage of time.

Actual field or other conditions will necessitate clarifications, adjustments, modifications, or other changes to ENGEO's documents. Therefore, ENGEO must be engaged to prepare the necessary clarifications, adjustments, modifications, or other changes before construction activities commence or further activity proceeds. If ENGEO's scope of services does not include on-site construction observation, or if other persons or entities are retained to provide such services, ENGEO cannot be held responsible for any or all claims arising from or resulting from the performance of such services by other persons or entities, and from any or all claims arising from or resulting from clarifications, adjustments, modifications, discrepancies, or other changes necessary to reflect changed field or other conditions.

We determined the lines designating the interface between layers on the exploration logs using visual observations. The transition between the materials may be abrupt or gradual. The exploration logs contain information concerning samples recovered, indications of the presence of various materials such as clay, sand, silt, rock, existing fill, etc., and observations of groundwater encountered. The field logs also contain our interpretation of the subsurface conditions between sample locations. Therefore, the logs contain both factual and interpretative information. Our recommendations are based on the contents of the final logs, which represent our interpretation of the field logs.

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FIGURES

BASEMAP SOURCE: ESRI MAPPING SERVICE 2020

ENGEO
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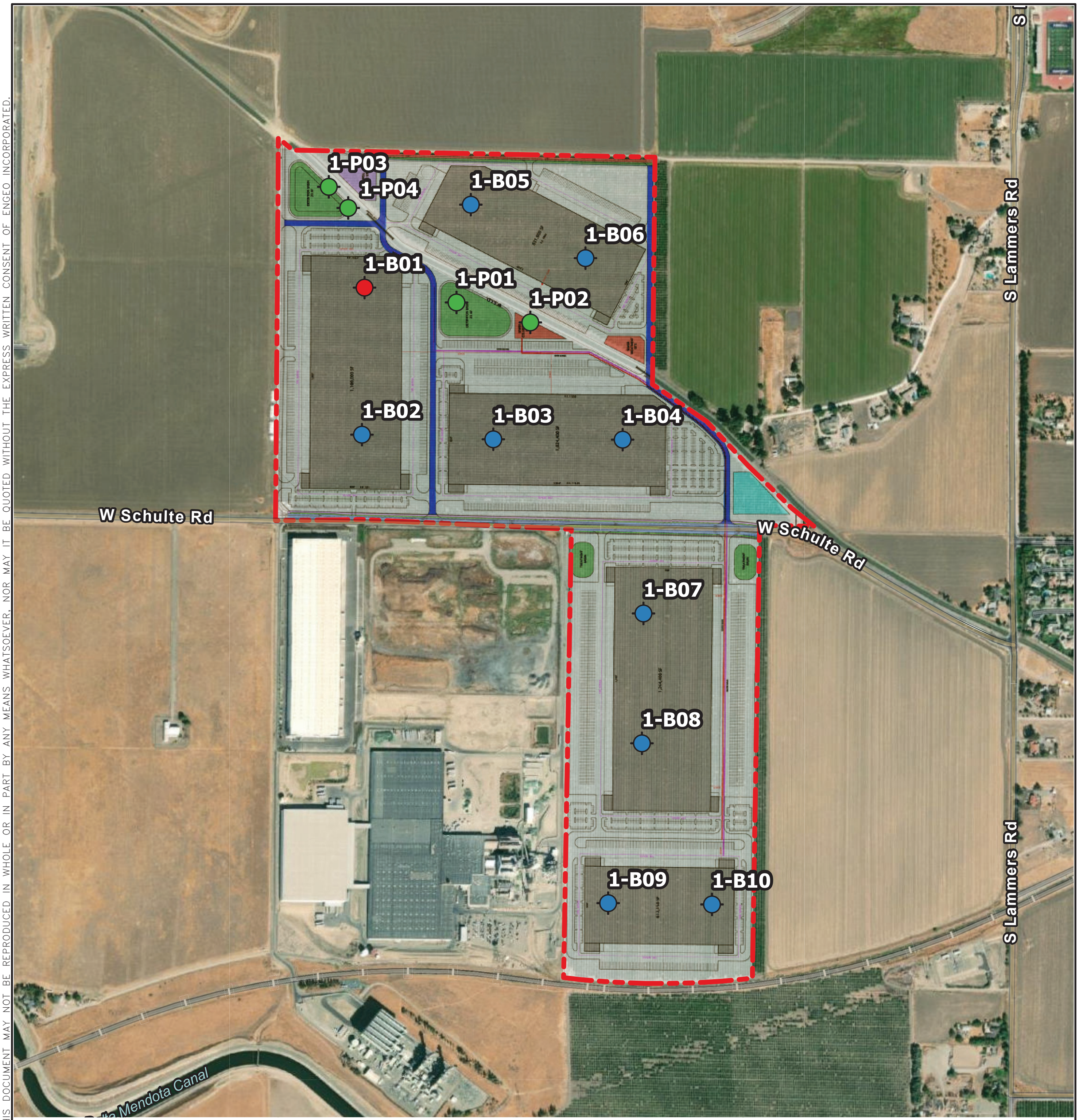
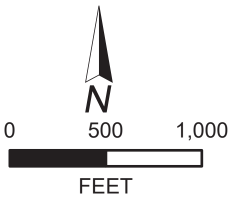
VICINITY MAP
INTERNATIONAL PARK OF COMMERCE - PHASE 2
TRACY, CALIFORNIA

PROJECT NO.: 09320.006.007
SCALE: AS SHOWN
DRAWN BY: QRL
CHECKED BY: SDH
FIGURE NO. 1

PATH: G:\DRAFTING\PROJECTS\9320\9320006007\GEOTECH\GEX\INTERNATIONAL PARK OF COMMERCE – PHASE 2.APRX
LAYOUT: VICINITY USER: QLIANG

ORIGINAL FIGURE PRINTED IN COLOR





EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

▭ PROJECT SITE

● BORING (ENGEO, 2021)

● PERCOLATION TEST (ENGEO, 2021)

● FUTURE BORING TO BE COMPLETED IN DESIGN LEVEL GEOTECHNICAL REPORT

BASEMAP SOURCE: ESRI MAPPING SERVICE 2020, KIER+WRIGHT 2021

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SITE PLAN

INTERNATIONAL PARK OF COMMERCE - PHASE 2

TRACY, CALIFORNIA

PROJECT NO. : 09320.006.007

SCALE: AS SHOWN

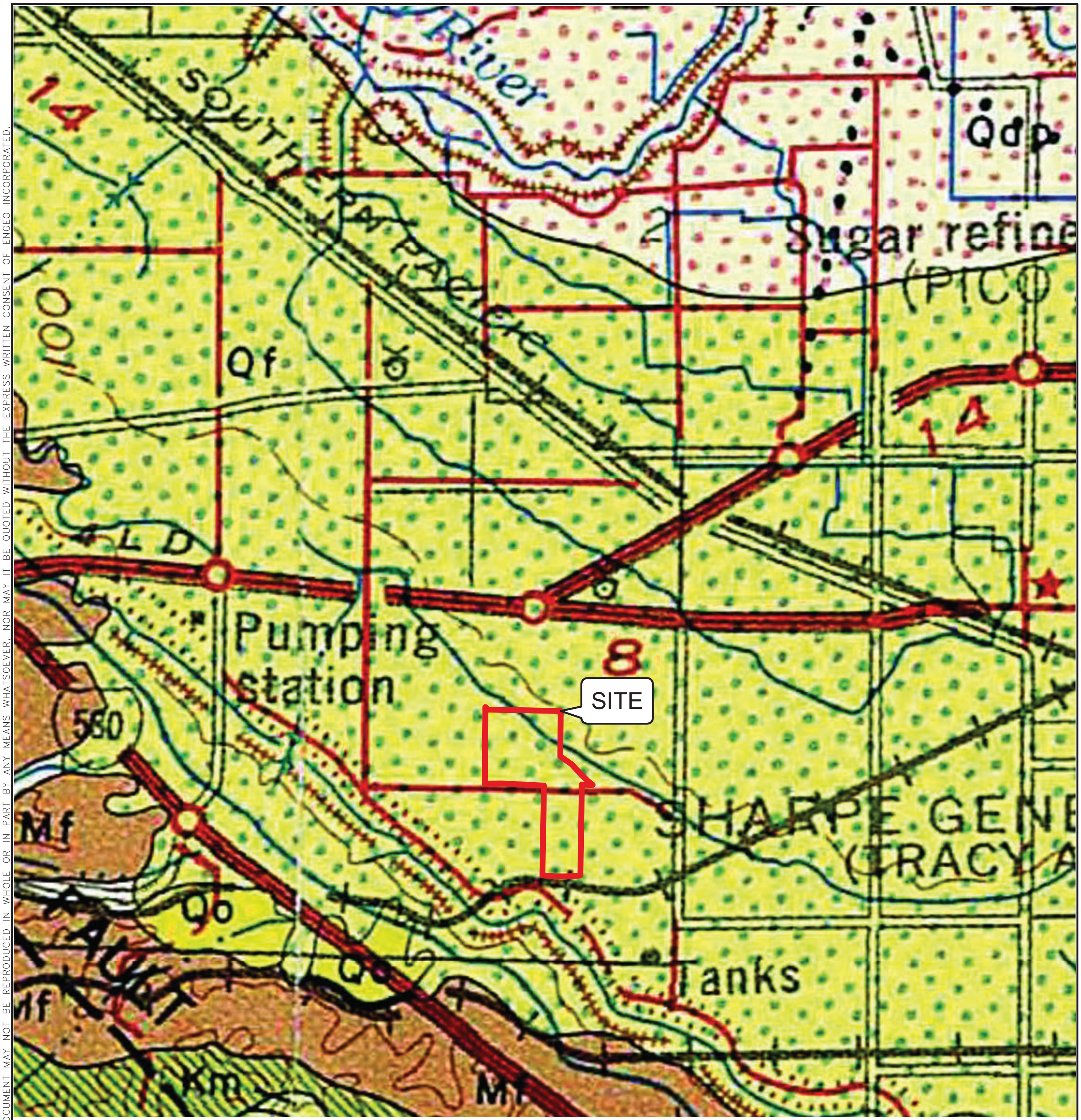
DRAWN BY: QRL

CHECKED BY: SDH

FIGURE NO.
2

PATH: G:\DRAFTING\PROJECTS\9320\9320006007\GEOTECH\GEX\INTERNATIONAL PARK OF COMMERCE - PHASE 2.APRX
LAYOUT: SITE PLAN USER: QLIANG

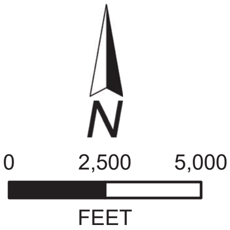
ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

Qdp	DOS PALOS ALLUVIUM
Qf	ALLUVIAL FAN DEPOSITS
Qo	OLDER ALLUVIUM
Mf	FANGLOMERATE
Km	MORENO FORMATION



BASEMAP SOURCE: WAGNER, 1991

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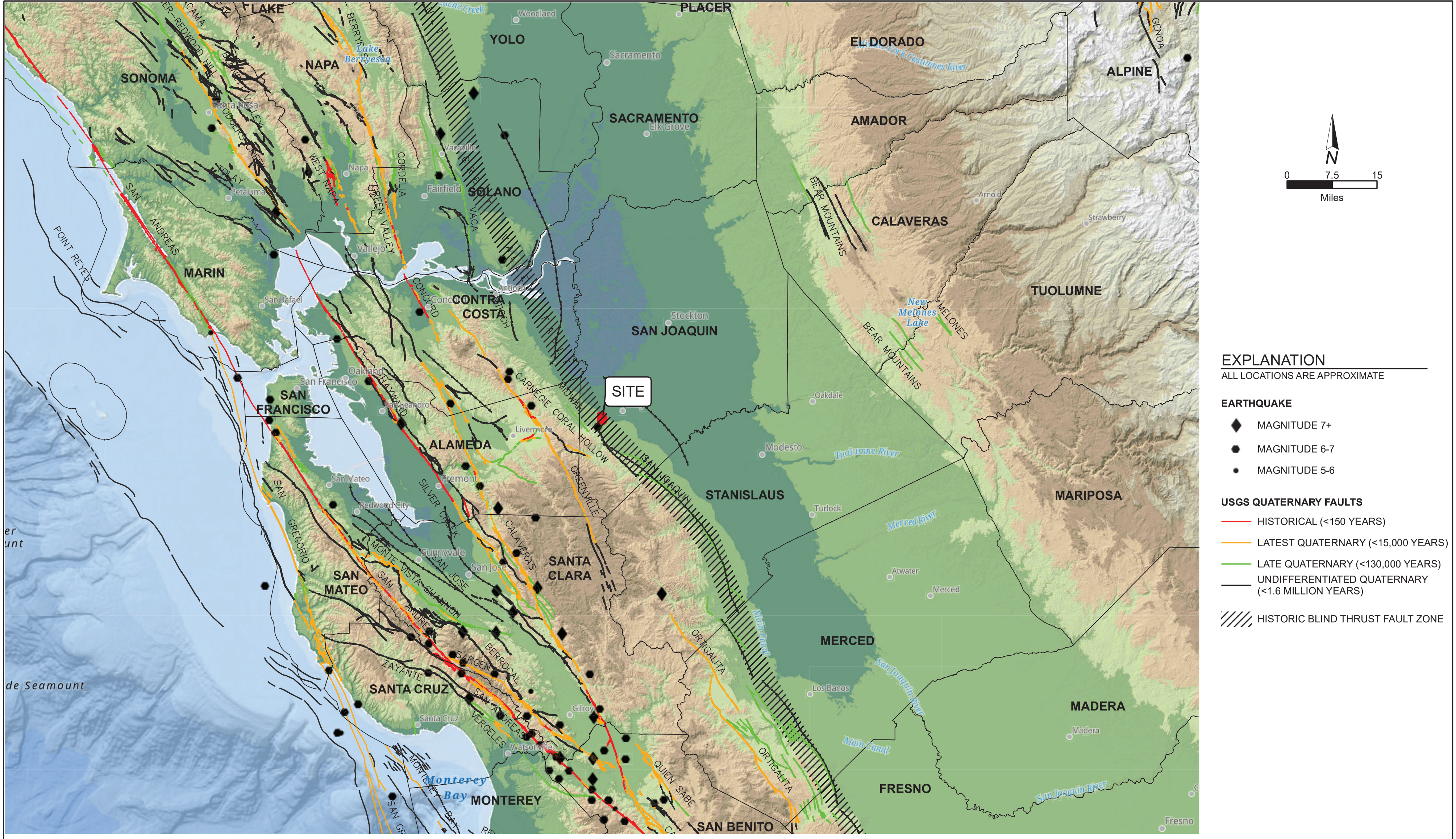
REGIONAL GEOLOGIC MAP

INTERNATIONAL PARK OF COMMERCE - PHASE 2
TRACY, CALIFORNIA

PROJECT NO. : 09320.006.007
SCALE: AS SHOWN
DRAWN BY: QRL
CHECKED BY: SDH
FIGURE NO. 3

PATH: G:\DRAFTING\PROJECTS\9320\9320006007\GEOTECH\GEX\INTERNATIONAL PARK OF COMMERCE – PHASE 2.APRX
LAYOUT: GEOLOGIC USER: QLIANG

ORIGINAL FIGURE PRINTED IN COLOR



EXPLANATION

ALL LOCATIONS ARE APPROXIMATE

EARTHQUAKE

- ◆ MAGNITUDE 7+
- ⬢ MAGNITUDE 6-7
- ● MAGNITUDE 5-6

USGS QUATERNARY FAULTS

- HISTORICAL (<150 YEARS)
- LATEST QUATERNARY (<15,000 YEARS)
- LATE QUATERNARY (<130,000 YEARS)
- UNDIFFERENTIATED QUATERNARY (<1.6 MILLION YEARS)
- ▨ HISTORIC BLIND THRUST FAULT ZONE

BASE MAP SOURCE

ESRI, GEBCO, DELORME, NATURALVUE, SAN JOAQUIN COUNTY GIS/PLANNING, ESRI, HERE, GARMIN, SAFEGRAPH, FAO, METI/
NASA, USGS, BUREAU OF LAND MANAGEMENT, EPA, NPS
COLOR HILLSHADE IMAGE BASED ON THE NATIONAL ELEVATION DATA SET (NED) AT 30 METER RESOLUTION
U.S.G.S. QUATERNARY FAULT DATABASE, 2018
U.S.G.S. HISTORIC EARTHQUAKE DATABASE (1800-PRESENT)

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REGIONAL FAULTING AND SEISMICITY
INTERNATIONAL PARK OF COMMERCE - PHASE 2
TRACY, CALIFORNIA

PROJECT NO.: 09320.006.007
SCALE: AS SHOWN
DRAWN BY: JV
CHECKED BY: SDH
FIGURE NO. 4

PATH: G:\DRAFTING\PROJECTS\9320\9320006007\GEOTECH\GEX\INTERNATIONAL PARK OF COMMERCE – PHASE 2.APRX
LAYOUT: FAULT&SEISMICITY USER: QLIANG

ORIGINAL FIGURE PRINTED IN COLOR

APPENDIX A

KEY TO BORING LOGS
EXPLORATION LOGS
PERCOLATION LOGS

KEY TO BORING LOGS

MAJOR TYPES			DESCRIPTION
COARSE-GRAINED SOILS MORE THAN HALF OF MAT'L LARGER THAN #200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 5% FINES	GW - Well graded gravels or gravel-sand mixtures
			GP - Poorly graded gravels or gravel-sand mixtures
		GRAVELS WITH OVER 12 % FINES	GM - Silty gravels, gravel-sand and silt mixtures
			GC - Clayey gravels, gravel-sand and clay mixtures
	SANDS MORE THAN HALF COARSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 5% FINES	SW - Well graded sands, or gravelly sand mixtures
			SP - Poorly graded sands or gravelly sand mixtures
		SANDS WITH OVER 12 % FINES	SM - Silty sand, sand-silt mixtures
			SC - Clayey sand, sand-clay mixtures
FINE-GRAINED SOILS MORE THAN HALF OF MAT'L SMALLER THAN #200 SIEVE	SILTS AND CLAYS LIQUID LIMIT 50 % OR LESS		ML - Inorganic silt with low to medium plasticity
			CL - Inorganic clay with low to medium plasticity
			OL - Low plasticity organic silts and clays
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50 %		MH - Elastic silt with high plasticity
			CH - Fat clay with high plasticity
			OH - Highly plastic organic silts and clays
	HIGHLY ORGANIC SOILS		PT - Peat and other highly organic soils

For fine-grained soils with 15 to 29% retained on the #200 sieve, the words "with sand" or "with gravel" (whichever is predominant) are added to the group name.

For fine-grained soil with >30% retained on the #200 sieve, the words "sandy" or "gravelly" (whichever is predominant) are added to the group name.

GRAIN SIZES

U.S. STANDARD SERIES SIEVE SIZE				CLEAR SQUARE SIEVE OPENINGS			
	200	40	10	4	3/4 "	3"	12"
SILTS AND CLAYS	SAND			GRAVEL		COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	COARSE		

RELATIVE DENSITY

SANDS AND GRAVELS	BLOWS/FOOT (S.P.T.)
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	OVER 50

CONSISTENCY

SILTS AND CLAYS	STRENGTH*
VERY SOFT	0-1/4
SOFT	1/4-1/2
MEDIUM STIFF	1/2-1
STIFF	1-2
VERY STIFF	2-4
HARD	OVER 4

SAMPLER SYMBOLS

■	Modified California (3" O.D.) sampler
▤	California (2.5" O.D.) sampler
◩	S.P.T. - Split spoon sampler
▯	Shelby Tube
▤	Dames and Moore Piston
▮	Continuous Core
☒	Bag Samples
✋	Grab Samples
NR	No Recovery

MOISTURE CONDITION

DRY	Dusty, dry to touch
MOIST	Damp but no visible water
WET	Visible freewater

LINE TYPES

________	Solid - Layer Break
– – – – – –	Dashed - Gradational or approximate layer break

GROUNDWATER SYMBOLS

▽	Groundwater level during drilling
▼	Stabilized groundwater level

(S.P.T.) Number of blows of 140 lb. hammer falling 30" to drive a 2-inch O.D. (1-3/8 inch I.D.) sampler

* Unconfined compressive strength in tons/sq. ft., asterisk on log means determined by pocket penetrometer

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LOG OF BORING 1-B10

LATITUDE: 37.71419
LONGITUDE: -121.48397

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 9/10/2021
HOLE DEPTH: Approx. 19½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 137 ft.

LOGGED / REVIEWED BY: C. Johnson / ZAC
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits			Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
							Liquid Limit	Plastic Limit	Plasticity Index						
			LEAN CLAY (CL), brown, hard, moist, medium plasticity, 5-10% fine-grained sand												
			SILT WITH SAND (ML), light yellowish brown, very stiff to hard, moist, low plasticity, 15-20% fine- to coarse-grained sand												
	135					58							>4000*	>4.5*	PP+TV
			LEAN CLAY WITH SAND (CL), yellowish brown, hard, moist, medium plasticity, 15-20% fine- to coarse-grained sand, contains carbonates			40								>4.5*	PP
5			SANDY LEAN CLAY (CL), yellowish brown, very stiff, moist, medium plasticity, >30% fine- to coarse-grained sand, <5% fine gravel												
	130					43							>4000*	>4.5*	PP+TV
			LEAN CLAY (CL), yellowish brown, hard, moist, medium plasticity, <5% fine- to coarse-grained sand												
10						36									
			grades to increased sand content												
	125														
						40							3200	>4.5	PP+TV
15															
	120														
						50/6"									
			Bottom of boring at approximately 19 1/2 feet below ground surface. Groundwater not encountered during drilling.												

ENGEO
Expect Excellence

LOG OF BORING 1-B2

LATITUDE: 37.72333
LONGITUDE: -121.49273

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 10/1/2021
HOLE DEPTH: Approx. 21½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 117 ft.

LOGGED / REVIEWED BY: R. Rud / ZAC
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits			Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
							Liquid Limit	Plastic Limit	Plasticity Index						
	115	✋	LEAN CLAY WITH SAND (CL), dark brown, stiff, moist, medium plasticity, 15-20% fine-grained sand, contains organics	▨											
			SANDY SILT (ML), yellowish brown, moist, low plasticity, fine-grained sand, contains carbonates	▥						56					
5		■	SANDY LEAN CLAY (CL), yellowish brown, very stiff to hard, moist, medium plasticity, fine-grained sand, contains carbonates	▨		56								>4.5*	PP
	110														
10		■				32									
	105														
15		■				40								>4.5*	PP
	100														
20		■				36								>4.5*	PP
			Bottom of boring at approximately 21 1/2 feet below ground surface. Groundwater not encountered during drilling.												

ENGEO
Expect Excellence

LOG OF BORING 1-B3

LATITUDE: 37.72327
LONGITUDE: -121.48949

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 10/1/2021
HOLE DEPTH: Approx. 5 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 112 ft.

LOGGED / REVIEWED BY: R. Rud / ZAC
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Hand Auger
HAMMER TYPE: N/A

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits			Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
							Liquid Limit	Plastic Limit	Plasticity Index						
			SANDY LEAN CLAY (CL), dark brown, moist, medium plasticity, fine-grained sand, contains organics	▨											
5	110	✋	SANDY SILT (ML), brown, moist, low plasticity, fine-grained sand	▥											
			Bottom of boring at approximately 5 feet below ground surface. Groundwater not encountered during hand augering.												

ENGEO
Expect Excellence

LOG OF BORING 1-B4

LATITUDE: 37.72329
LONGITUDE: -121.48629

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 10/1/2021
HOLE DEPTH: Approx. 26½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 108 ft.
LOGGED / REVIEWED BY: R. Rud / ZAC
DRILLING CONTRACTOR: Cascade Drilling
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Auto Trip

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits			Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
							Liquid Limit	Plastic Limit	Plasticity Index						
			SANDY LEAN CLAY (CL), dark brown, dry to moist, medium plasticity, fine-grained sand												
		✋													
	105		SANDY SILT (ML), yellowish brown, moist, low plasticity, fine-grained sand												
			SANDY LEAN CLAY (CL), olive brown, moist, medium plasticity, fine-grained sand and silt, contains carbonates												
5		■	SANDY SILT (ML), olive brown, very stiff, moist, low plasticity, fine-grained sand, contains clay fines			42					13	112		3.9	UC
	100														
10		■				47								>4.5*	PP
	95														
15		■				41								>4.5*	PP
	90														
			LEAN CLAY (CL), brown, very stiff to hard, moist, medium plasticity, <5% fine-grained sand												
20		■				29					12	112	5309		UU
	85														
25		■				32								2.5*	PP
			POORLY GRADED SAND (SP), brown, medium dense, moist, fine- to medium-grained sand												
			Bottom of boring at approximately 26 1/2 feet below ground surface. Groundwater not encountered during drilling.												

ENGEO
Expect Excellence

LOG OF BORING 1-B5

LATITUDE: 37.72787
LONGITUDE: -121.49011

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 9/10/2021
HOLE DEPTH: Approx. 26½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 96 ft.

LOGGED / REVIEWED BY: C. Johnson / ZAC
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits			Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
							Liquid Limit	Plastic Limit	Plasticity Index						
	95		LEAN CLAY (CL), dark brown, very stiff to hard, moist, <5% fine- to medium-grained sand	▨											
		■		▨		40					20	106		2.2*	UC
		◣	Yellowish brown, 5-10% fine- to coarse-grained sand	▨		18									
5	90	■		▨		55							>4000*	>4.5*	PP+TV
			SANDY LEAN CLAY (CL), yellowish brown, hard, moist, fine- to coarse-grained sand	▨											
10	85	■		▨		60				62			3,800*	>4.5*	PP+TV
			LEAN CLAY (CL), yellowish brown, hard, moist, <5% fine- to coarse-grained sand	▨											
15	80	■		▨		50/6"							>4000*	>4.5*	PP+TV
20	75	◣		▨		30									
25	70	■		▨		60							3400*	>4.5*	PP+TV
			Bottom of boring at approximately 26 1/2 feet below ground surface. Groundwater not encountered during drilling.												

ENGEO
Expect Excellence

LOG OF BORING 1-B6

LATITUDE: 37.72684 LONGITUDE: -121.48726

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 9/10/2021
HOLE DEPTH: Approx. 29½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 97 ft.
LOGGED / REVIEWED BY: C. Johnson / ZAC
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits			Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
							Liquid Limit	Plastic Limit	Plasticity Index						
			LEAN CLAY (CL), dark brown, very stiff to hard, moist, medium plasticity, 5-10% fine- to coarse-grained sand	▨											
			grades to yellowish brown	▨											
	95	■		▨		68	57	19	38	91			3600*	>4.5*	PP+TV
		◣		▨		13									
5				▨											
			grades to 10-15% fine- to medium-grained sand	▨											
	90	■		▨		48							3400*	4.0*	PP+TV
10		■		▨		65					21	106	9549		UU
	85	■		▨		68							3000*	4.25*	PP+TV
15				▨											
	80	◣		▨		35									
20															

ENGEO
Expect Excellence

LOG OF BORING 1-B6

LATITUDE: 37.72684
LONGITUDE: -121.48726

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 9/10/2021
HOLE DEPTH: Approx. 29½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 97 ft.

LOGGED / REVIEWED BY: C. Johnson / ZAC
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			LEAN CLAY (CL), dark brown, very stiff to hard, moist, medium plasticity, 5-10% fine- to coarse-grained sand	▨											
	75	■		▨		50/6"							3800*	>4.5*	PP+TV
25				▨											
	70			▨											
		■	grades to 15-20% fine- to coarse-grained sand	▨		57							3800*	>4.5*	PP+TV
			Bottom of boring at approximately 29 1/2 feet below ground surface. Groundwater not encountered during drilling.												

ENGEO
Expect Excellence

LOG OF BORING 1-B7

LATITUDE: 37.71989
LONGITUDE: -121.48574

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 9/10/2021
HOLE DEPTH: Approx. 31 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 115 ft.

LOGGED / REVIEWED BY: C. Johnson / ZAC
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			SANDY LEAN CLAY (CL), brown, hard, dry to moist, medium plasticity, 30-35% fine- to coarse-grained sand, <5% fine gravel	▨											
		■		▨		32	47	16	31	69					
		◣		▨		38									
5	110		LEAN CLAY WITH SAND (CL), yellowish brown, hard, moist, medium plasticity, 15-20% fine- to medium-grained sand, contains carbonates	▨											
		◣		▨		33									
			LEAN CLAY (CL), yellowish brown, hard, moist, medium plasticity, 5-10% fine- to medium-grained sand, contains carbonates	▨											
10	105	■		▨		63							4200*	>4.5*	PP+TV
15	100	■		▨		75								>4.5*	PP
20	95	■		▨		67							4600*	>4.5*	PP+TV
25	90														

ENGEO
Expect Excellence

LOG OF BORING 1-B7

LATITUDE: 37.71989
LONGITUDE: -121.48574

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 9/10/2021
HOLE DEPTH: Approx. 31 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 115 ft.

LOGGED / REVIEWED BY: C. Johnson / ZAC
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits			Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
							Liquid Limit	Plastic Limit	Plasticity Index						
		◣	LEAN CLAY (CL), yellowish brown, hard, moist, medium plasticity, 5-10% fine- to medium-grained sand, contains carbonates	▨		32									
30	85	■		▨		50/6"							3200	>4.5	PP+TV
			Bottom of boring at approximately 31 feet below ground surface. Grroundwater not encountered during drilling.												

ENGEO
Expect Excellence

LOG OF BORING 1-B8

LATITUDE: 37.71734
LONGITUDE: -121.48574

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 9/10/2021
HOLE DEPTH: Approx. 19½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 126 ft.

LOGGED / REVIEWED BY: C. Johnson / ZAC
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
	125		LEAN CLAY (CL), brown, moist, medium plasticity, 10-15% fine- to coarse-grained sand, <5% fine gravel												
			LEAN CLAY WITH SAND (CL), yellowish brown, moist, medium plasticity, 15-20% fine- to coarse-grained sand, <5% fine gravel			63								>4.5*	PP
			LEAN CLAY (CL), light yellowish brown, moist, medium plasticity, 10-15% fine- to coarse-grained sand, contains carbonates								15	111	13824		UC
						28									
5															
	120														
						57									
			grades to dark yellowish brown										3400*	>4.5*	PP+TV
10															
	115														
			grades to light yellowish brown, 5-10% fine-grained sand												
						45					10	108	6169		
15															
	110														
			grades to dark yellowish brown, approximately 5% fine-grained sand, contains carbonates												
													3000*	>4.5*	PP+TV
						60									
			Bottom of boring at approximately 19 1/2 feet below ground surface. Groundwater not encountered during drilling.												

ENGEO
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LOG OF BORING 1-B9

LATITUDE: 37.7142
LONGITUDE: -121.48653

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 9/10/2021
HOLE DEPTH: Approx. 24½ ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 143 ft.

LOGGED / REVIEWED BY: C. Johnson / ZAC
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			SANDY LEAN CLAY (CL), brown to light yellowish brown, stiff to hard, dry to moist, medium plasticity, fine- to medium-grained sand, contains carbonates			16	33	16	17	65	9 11	87	2232		UC
5	140		LEAN CLAY WITH SAND (CL), light yellowish brown, very stiff to hard, moist, medium plasticity, 15-20% fine- to coarse-grained sand, contains carbonates			24									
10	135		LEAN CLAY (CL), light yellowish brown, hard, moist, medium plasticity, <5% fine- to medium-grained sand, contains carbonates			68					21	100			
	130		LEAN CLAY WITH SAND (CL), dark yellowish brown, hard, moist, medium plasticity, 15-20% fine- to coarse-grained sand, contains carbonates			50/6"					21	87	3400	>4.5	PP+TV
15	125		LEAN CLAY (CL), dark yellowish brown, hard, moist, medium plasticity, <5% fine- to coarse-grained sand			50					24		3400	>4.5	PP+TV
20	120					53					21	105	3600	>4.5	PP+TV
			Bottom of boring at approximately 24 1/2 feet below ground surface. Groundwater not encountered during drilling.												

ENGEO
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LOG OF BORING 1-P01

LATITUDE: 37.72595
LONGITUDE: -121.49043

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 9/9/2021
HOLE DEPTH: Approx. 25 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 105 ft.

LOGGED / REVIEWED BY: C. Johnson / ZAC
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: N/A

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits			Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
							Liquid Limit	Plastic Limit	Plasticity Index						
			LEAN CLAY (CL), dark brown, stiff to hard, moist, <5% fine- to medium-grained sand	▨											
			Yellowish brown, moist, <5% medium- to coarse-grained sand	▨											
5	100			▨											
10	95			▨											
15	90			▨											
20	85			▨											
25	80		Bottom of boring at approximately 25 feet below ground surface. No groundwater encountered during drilling.												

LOG - GEOTECHNICAL_SU+QU W/ ELEV 1-B5 TO 1-B10, 1-P1, TO 1-P4_DRAFT 1.GPJ ENGEO INC.GDT 11/3/21

ENGEO
Expect Excellence

LOG OF BORING 1-P02

LATITUDE: 37.72557
LONGITUDE: -121.48861

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 9/9/2021
HOLE DEPTH: Approx. 25 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 105 ft.

LOGGED / REVIEWED BY: C. Johnson / ZAC
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: 140 lb. Rope and Cathead

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits: Liquid Limit	Atterberg Limits: Plastic Limit	Atterberg Limits: Plasticity Index	Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
			LEAN CLAY (CL), dark brown, stiff to hard, moist, <5% fine- to medium-grained sand	▨											
			Moist, <5% medium- to coarse-grained sand grades to yellowish brown	▨											
5	100			▨											
10	95			▨											
15	90	◣		▨		48									
20	85			▨											
25	80		Bottom of boring at approximately 25 feet below ground surface. Groundwater not encountered during drilling.												

ENGEO
Expect Excellence

LOG OF BORING 1-P03

LATITUDE: 37.72819
LONGITUDE: -121.4936

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 9/9/2021
HOLE DEPTH: Approx. 15 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 103 ft.

LOGGED / REVIEWED BY: C. Johnson / ZAC
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: N/A

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits			Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
							Liquid Limit	Plastic Limit	Plasticity Index						
			LEAN CLAY (CL), dark brown, moist, <5% fine- to medium-grained sand	▨											
	100			▨											
5			grades to yellowish brown, moist, <5% medium- to coarse-grained sand	▨											
	95			▨											
10				▨											
	90			▨											
15			Bottom of boring at approximately 15 feet below ground surface. Groundwater not encountered during drilling.												

ENGEO
Expect Excellence

LOG OF BORING 1-P04

LATITUDE: 37.72778
LONGITUDE: -121.49313

Geotechnical Exploration
IPC Phase 2
Tracy, California
9320.006.007

DATE DRILLED: 9/9/2021
HOLE DEPTH: Approx. 15 ft.
HOLE DIAMETER: 4.0 in.
SURF ELEV (WGS 84): Approx. 105 ft.

LOGGED / REVIEWED BY: C. Johnson / ZAC
DRILLING CONTRACTOR: West Coast Exploration
DRILLING METHOD: Solid Flight Auger
HAMMER TYPE: N/A

Depth in Feet	Elevation in Feet	Sample Type	DESCRIPTION	Log Symbol	Water Level	Blow Count/Foot	Atterberg Limits			Fines Content (% passing #200 sieve)	Moisture Content (% dry weight)	Dry Unit Weight (pcf)	Shear Strength (psf) *field approximation	Unconfined Strength (tsf) *field approximation	Strength Test Type
							Liquid Limit	Plastic Limit	Plasticity Index						
			LEAN CLAY (CL), dark brown, stiff to hard, moist, <5% fine- to medium-grained sand	▨											
5	100		Yellowish brown, moist, <5% medium- to coarse-grained sand	▨											
10	95			▨											
15	90		Bottom of boring at approximately 15 feet below ground surface. Groundwater not encountered during drilling.												

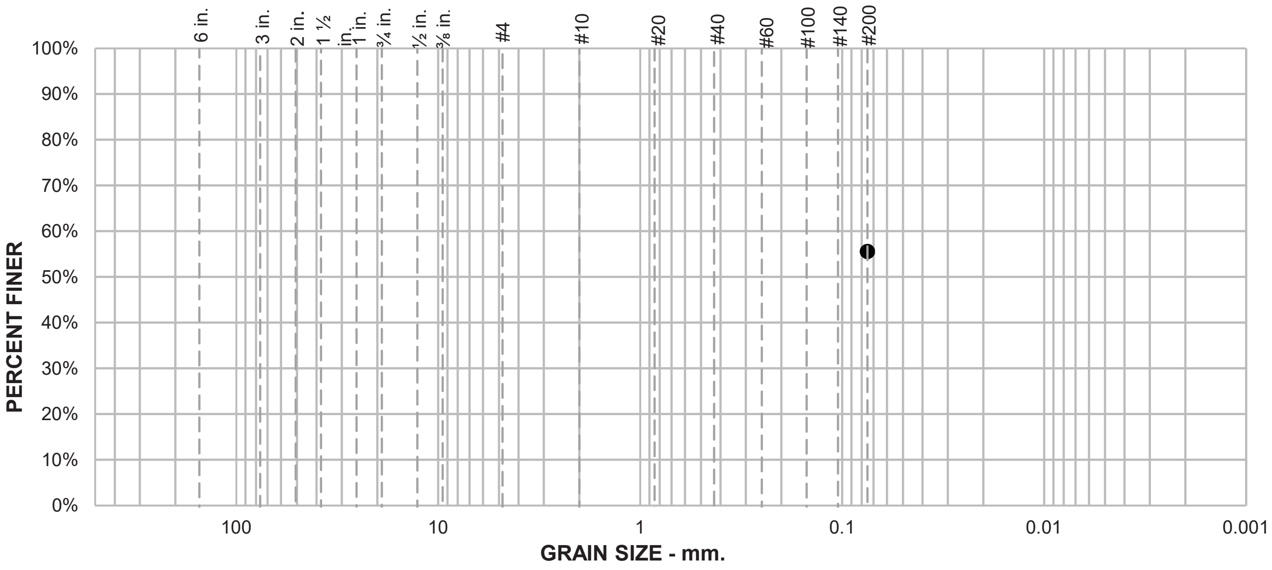
APPENDIX B

LABORATORY TEST DATA

Particle Size Distribution Reports
Moisture Content Report
Moisture-Density Determination Report
Liquid and Plastic Limits Test Report
Unconfined Compression Test Report
Isotropic Unconsolidated Undrained Triaxial Test

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B02@3

DEPTH (ft): 3

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						55.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	55.6		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} =	D_{85} =	D_{60} =
D_{50} =	D_{30} =	D_{15} =
D_{10} =	C_u =	C_c =

CLASSIFICATION

USCS =

REMARKS

Soak time = 180 min
Dry sample weight = 200.5 g

* (no specification provided)

CLIENT: Prologis
PROJECT NAME: International Park of Commerce Offsite
PROJECT NO: 9320.006.007 PH013
PROJECT LOCATION: Tracy, CA
REPORT DATE: 10/26/2021
TESTED BY: R. Montalvo
REVIEWED BY: N. Broussrad

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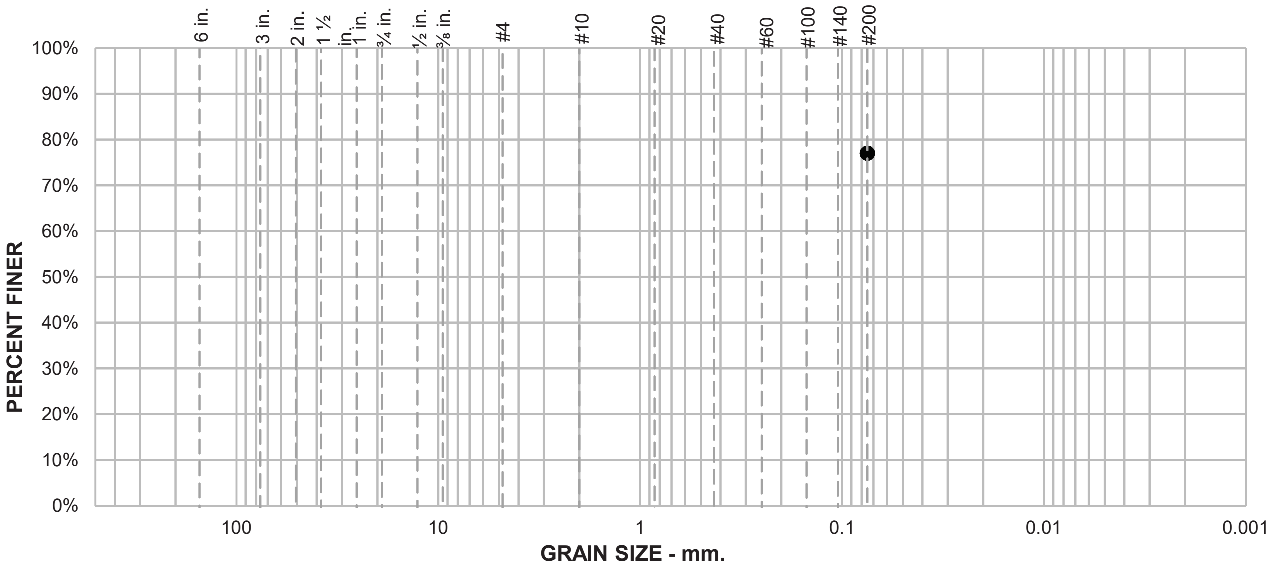
PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B04@1.5

DEPTH (ft): 1.5

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						77.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	77.0		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =

D_{50} = D_{30} = D_{15} =

D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

Soak time = 180 min
Dry sample weight = 225.1 g

* (no specification provided)

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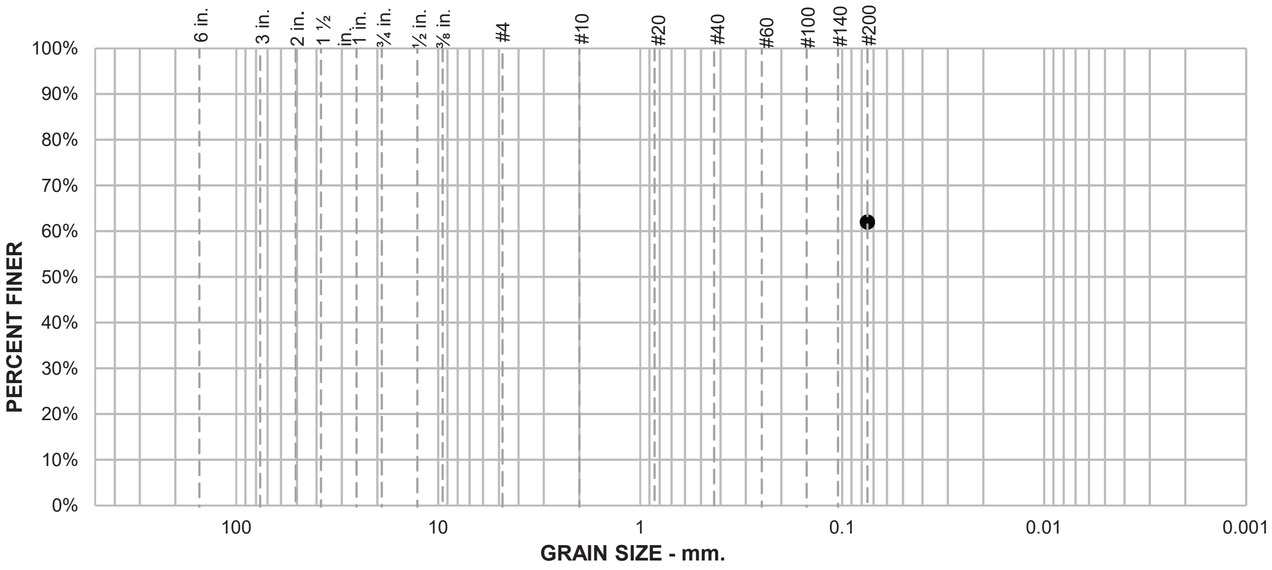
CLIENT: Prologis
PROJECT NAME: International Park of Commerce Offsite
PROJECT NO: 9320.006.007 PH013
PROJECT LOCATION: Tracy, CA
REPORT DATE: 10/26/2021
TESTED BY: R. Montalvo
REVIEWED BY: M. Gilbert

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B05 @ 11'

DEPTH (ft): 11'

LOCATION: 1-B05

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						62.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	62.0		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL =
LL =
PI =

COEFFICIENTS

D_{90} =
D_{85} =
D_{60} =
D_{50} =
D_{30} =
D_{15} =
D_{10} =
C_u =
C_c =

CLASSIFICATION

USCS =

REMARKS

Soak time = 180 min
Dry sample weight = 421.79 g

* (no specification provided)

CLIENT: Prologis
PROJECT NAME: IPC Phase 2 PGEX
PROJECT NO: 9320.006.007 PH013
PROJECT LOCATION: Tracy, CA
REPORT DATE: 9/21/2021
TESTED BY: D. Bryant
REVIEWED BY: K. Lecce

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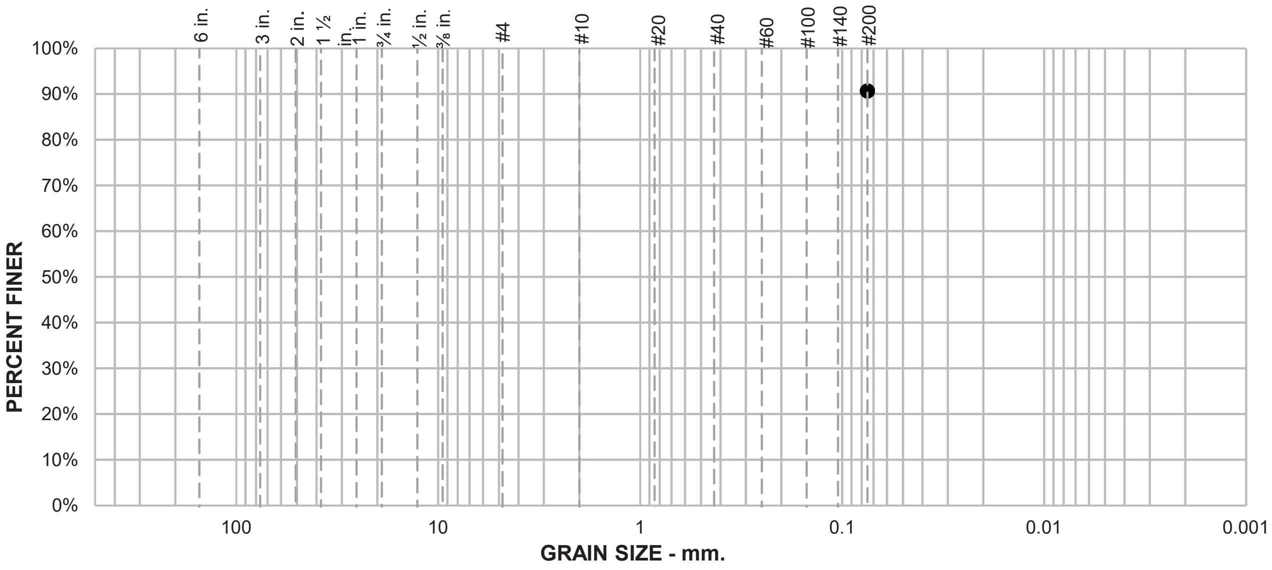
PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B06 @ 3'

DEPTH (ft): 3'

LOCATION: 1-B06

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						90.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	90.7		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = 19

LL = 57

PI = 38

COEFFICIENTS

D_{90} =	D_{85} =	D_{60} =
D_{50} =	D_{30} =	D_{15} =
D_{10} =	C_u =	C_c =

CLASSIFICATION

USCS = CH

REMARKS

PI: ASTM D4318, Wet Method
USCS: ASTM D2487

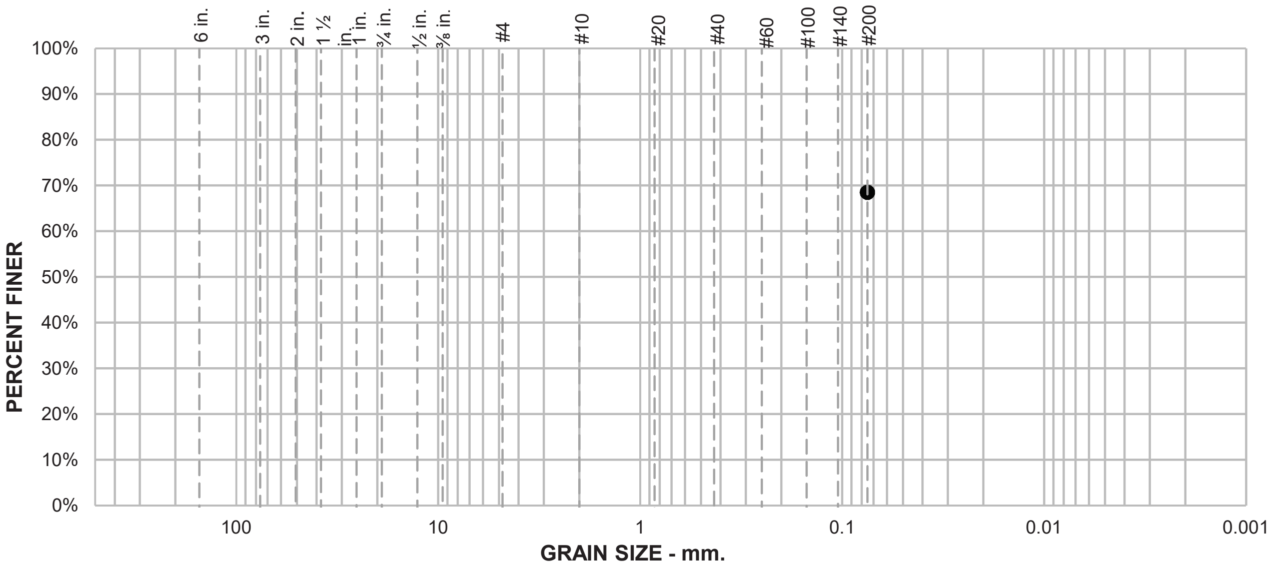
Soak time = 180 min
Dry sample weight = 156.17 g

* (no specification provided)

CLIENT: Prologis
PROJECT NAME: IPC Phase 2 PGEX
PROJECT NO: 9320.006.007 PH013
PROJECT LOCATION: Tracy, CA
REPORT DATE: 9/21/2021
TESTED BY: D. Bryant
REVIEWED BY: K. Lecce

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B07 @ 2'

DEPTH (ft): 2'

LOCATION: 1-B07

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						68.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	68.5		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = 16	LL = 47	PI = 31

COEFFICIENTS

D_{90} =	D_{85} =	D_{60} =
D_{50} =	D_{30} =	D_{15} =
D_{10} =	C_u =	C_c =

CLASSIFICATION

USCS = CL

REMARKS

PI: ASTM D4318, Wet Method
USCS: ASTM D2487

Soak time = 180 min
Dry sample weight = 165.08 g

* (no specification provided)

CLIENT: Prologis

PROJECT NAME: IPC Phase 2 PGEX

PROJECT NO: 9320.006.007 PH013

PROJECT LOCATION: Tracy, CA

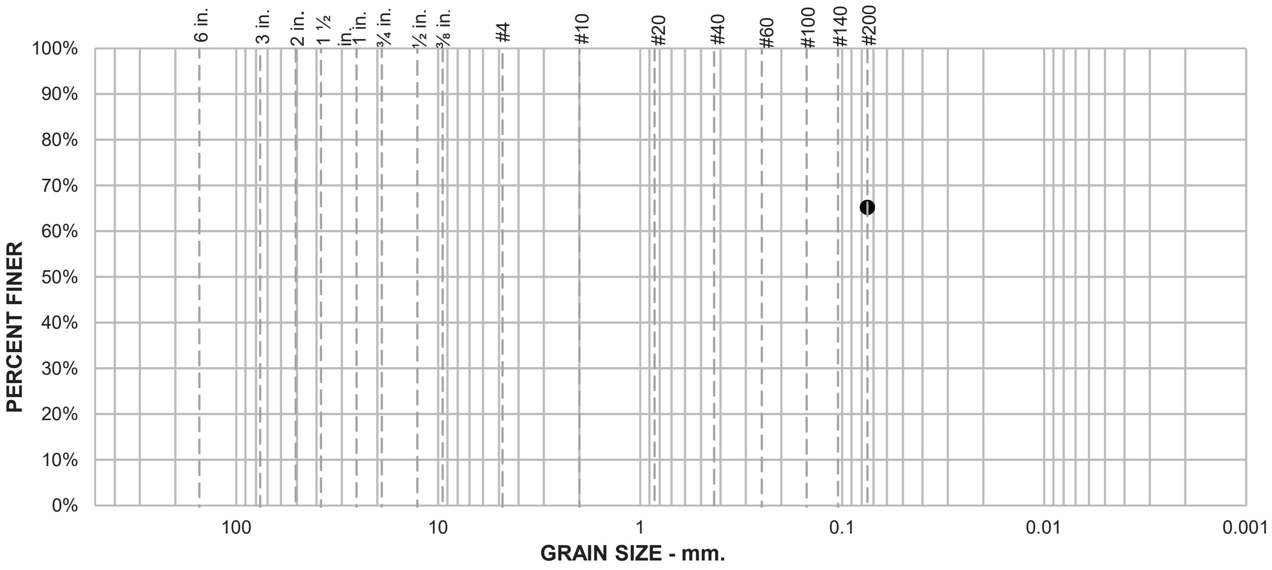
REPORT DATE: 9/21/2021

TESTED BY: D. Bryant

REVIEWED BY: K. Lecce

PARTICLE SIZE DISTRIBUTION REPORT

ASTM D1140, Method B



SAMPLE ID: 1-B09 @ 1.5'

DEPTH (ft): 1.5'

LOCATION: 1-B09

% +75mm	% GRAVEL		% SAND			% FINES	
	COARSE	FINE	COARSE	MEDIUM	FINE	SILT	CLAY
						65.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#200	65.2		

SOIL DESCRIPTION

See exploration logs

ATTERBERG LIMITS

PL = LL = PI =

COEFFICIENTS

D_{90} = D_{85} = D_{60} =

D_{50} = D_{30} = D_{15} =

D_{10} = C_u = C_c =

CLASSIFICATION

USCS =

REMARKS

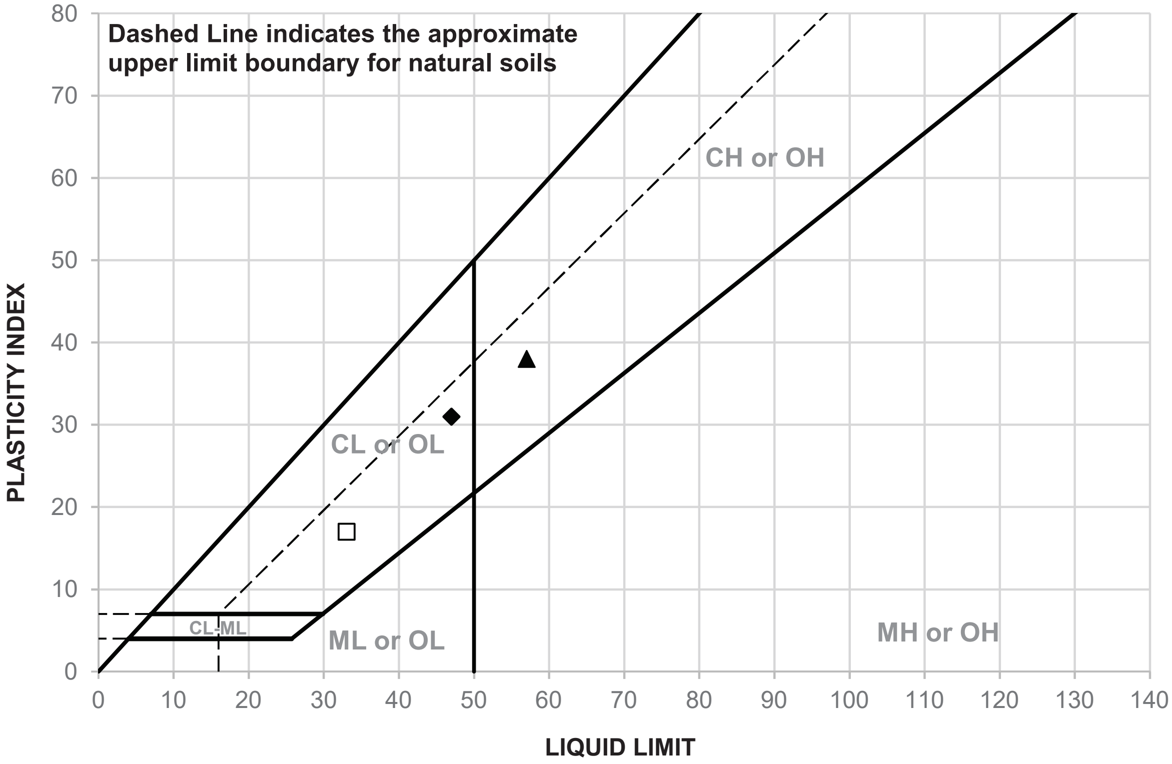
Soak time = 180 min
Dry sample weight = 192.2 g

* (no specification provided)

CLIENT: Prologis
PROJECT NAME: IPC Phase 2 PGEX
PROJECT NO: 9320.006.007 PH013
PROJECT LOCATION: Tracy, CA
REPORT DATE: 9/21/2021
TESTED BY: D. Bryant
REVIEWED BY: K. Lecce

LIQUID AND PLASTIC LIMITS TEST REPORT

ASTM D4318



	SAMPLE ID	DEPTH	MATERIAL DESCRIPTION	LL	PL	PI
▲	1-B06 @ 3'	3 feet	See exploration logs	57	19	38
◆	1-B7 @ 2'	2 feet	See exploration logs	47	16	31
☐	1-B09 @ 1.5'	1.5 feet	See exploration logs	33	16	17

	SAMPLE ID	TEST METHOD	REMARKS
▲	1-B06 @ 3'	PI: ASTM D4318, Wet Method	
◆	1-B7 @ 2'	PI: ASTM D4318, Wet Method	
☐	1-B09 @ 1.5'	PI: ASTM D4318, Wet Method	

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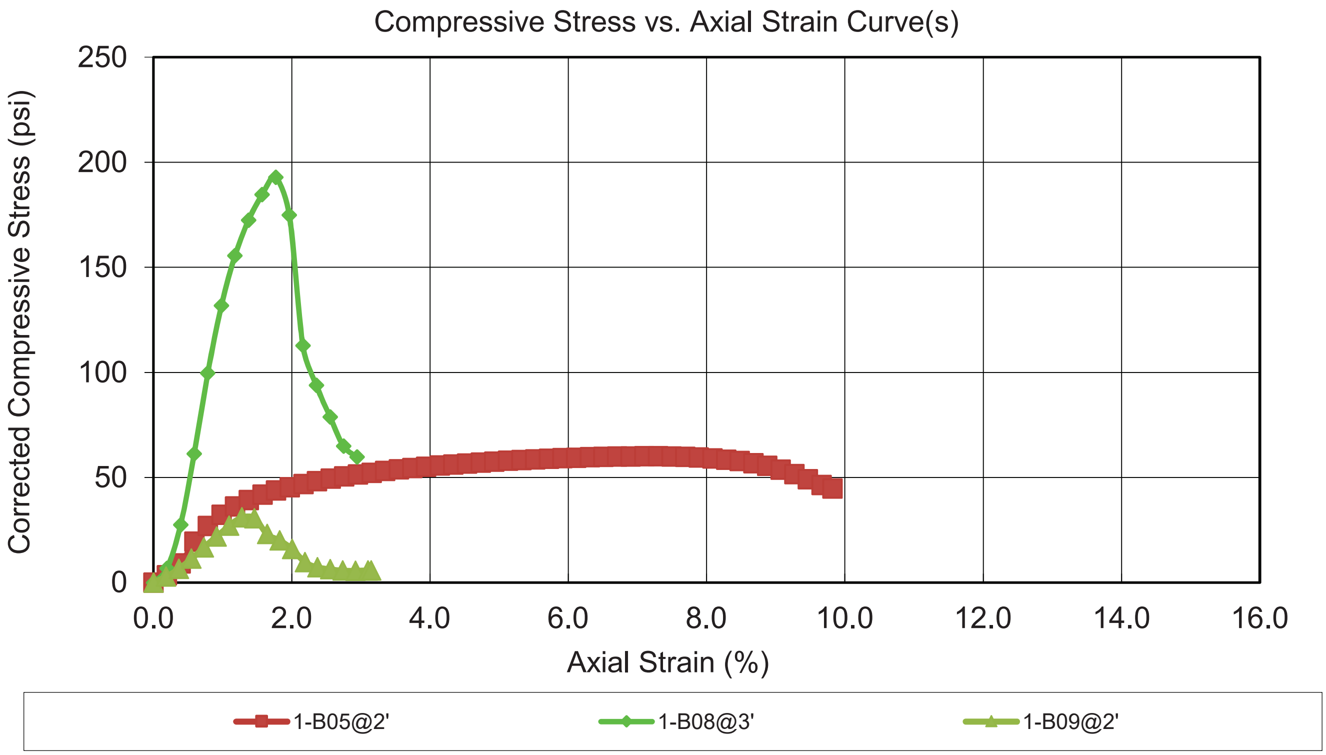
CLIENT: Prologis
PROJECT NAME: IPC Phase 2 PGEX
PROJECT NO: 9320.006.007 PH013
PROJECT LOCATION: Tracy, CA
REPORT DATE: 9/21/2021
TESTED BY: E. Korogianos
REVIEWED BY: K. Lecce

UNCONFINED COMPRESSION TEST REPORT
(ASTM D2166)



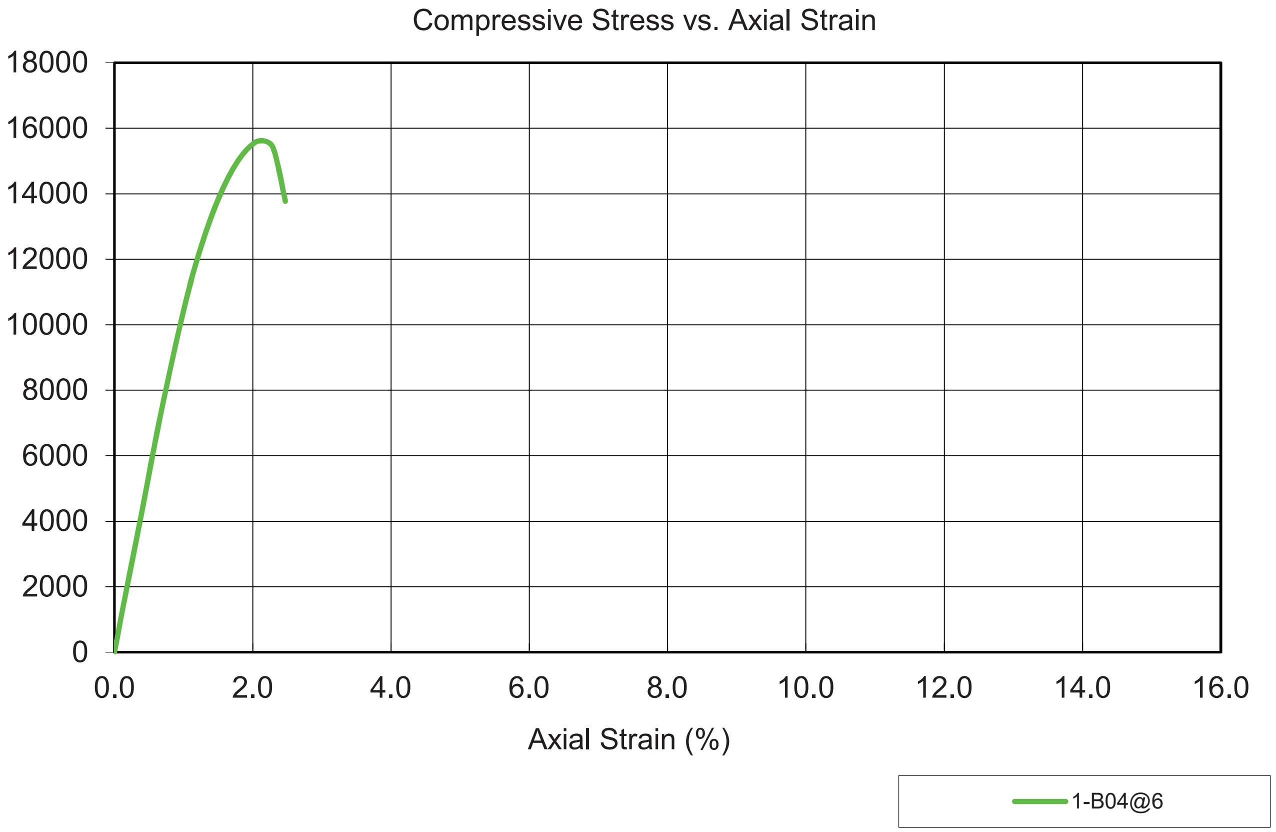
BEFORE TEST	SPECIMEN 1-B05@2'	SPECIMEN 1-B08@3'	SPECIMEN 1-B09@2'
Test Moisture Content (%)	19.87	15.03	10.73
Dry Density (pcf)	105.6	110.6	87.4
Saturation (%)	88.9	76.4	31.0
Void Ratio	0.61	0.54	0.94
Diameter (in)	2.400	2.390	2.390
Height (in)	5.070	5.090	5.480
Height-To-Diameter Ratio	2.11	2.13	2.29
TEST DATA			
Unconfined Compressive Strength (psi)	60	193	31
Undrained Shear Strength (psi)	30.02	96.46	15.51
Strain Rate (in/min)	0.050	0.050	0.050
Specific Gravity (ASSUMED)	2.720	2.720	2.720
Strain at Failure(%)	7.10	1.77	1.28
Test Remarks			

SPECIMEN	DESCRIPTION
1-B05@2'	See exploration logs
1-B08@3'	See exploration logs
1-B09@2'	See exploration logs

PROJECT NAME: IPC Phase 2, PGEX
PROJECT NO: 9320.006.007 PH013
CLIENT: Prologis
LOCATION: Tracy, CA

Test Date: 9/19/2021
Tested By: D. Bryant
Reviewed By: K. Lecce

UNCONFINED COMPRESSION TEST REPORT
(ASTM D2166)



BEFORE TEST	SPECIMEN 1-B04@6
Test Moisture Content (%)	12.52
Dry Density (pcf)	112.0
Saturation (%)	65.9
Void Ratio	0.52
Diameter (in)	2.378
Height (in)	5.667
Height-To-Diameter Ratio	2.38
TEST DATA	
Unconfined Compressive Strength (psf)	15619
Undrained Shear Strength (psf)	7810
Strain Rate (in/min)	0.050
Specific Gravity (ASSUMED)	2.720
Strain at Failure(%)	2.12
Test Remarks	

SPECIMEN	DESCRIPTION
1-B04@6	See exploration logs

PROJECT NAME: International Park of Commerce Offsite
PROJECT NO: 9320.006.007 PH013
CLIENT: Prologis
LOCATION: Tracy, CA

Report Date: 10/26/21
Tested By: R. Montalvo
Reviewed By: N. Broussard

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Isotropic Unconsolidated Undrained Triaxial Test

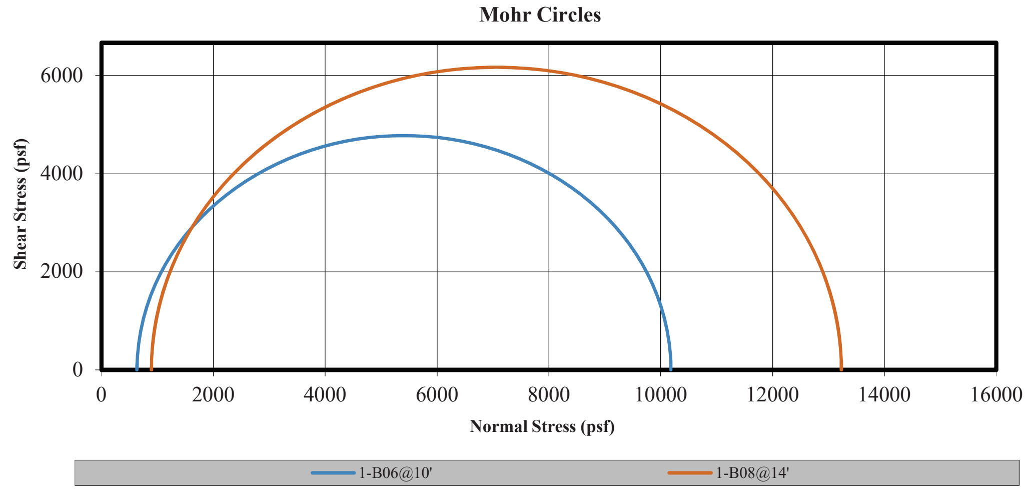
ASTM D2850

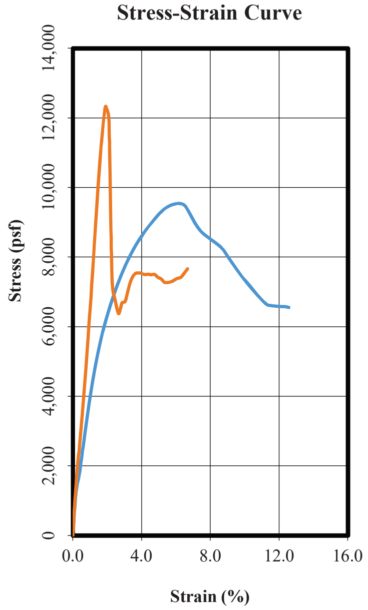
Date: 09/20/21

Checked By: K. Lecce

Date: 9/19/2021

Tested By: D. Bryant





	Specimen			
Before Test	**1-B06@10'**	**1-B08@14'**		
Water Content (%)	20.53	9.95		
Dry Density (pcf)	105.80	107.50		
Saturation (%)	92.42	46.72		
Void Ratio	0.60	0.58		
Diameter (in)	2.400	2.400		
Height (in)	5.390	5.260		
Height-to-Diameter Ratio	2.246	2.192		
ASTM D4318 - Wet Method				
Liquid Limit				
Plastic Limit				
ASTM D854 - Assumed				
Specific Gravity	2.720	2.720		
After Test	**1-B06@10'**	**1-B08@14'**		
Water Content (%)	20.54	9.95		
Saturation (%)	92.43	46.72		
Strain Rate (%/min)				
Peak Deviator Stress (psf)	9548.5	12337.0		
Axial Strain @ Failure (%)	6.123	1.901		
	Cell Pressure			
Cell (psf)	633.6	892.8		
Back (psf)	n/a	n/a		
	Principle Stresses at Failure			
σ1 (psf)	10182.1	13229.8		
σ3 (psf)	633.6	892.8		
Corrected Peak Deviator Stress				

Mohr-Coulomb Parameters with a Non-zero Friction Angle (Ø≠0)	
Cohesion, c (psf)	n/a
Friction Angle Ø	n/a

	Cohesion at Failure with a Zero Friction Angle (Ø=0)			
	4774.2	6168.5		
	n/a	n/a		

Project Information	
Project Name:	IPC Phase 2, PGEX
Project Number:	9320.006.007 PH013
Project Location:	Tracy, CA
Client:	Prologis
Description:	See exploration logs
Test Remarks:	

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Isotropic Unconsolidated Undrained Triaxial Test

ASTM D2850

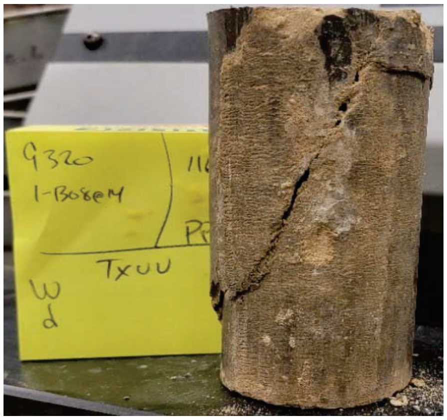
Tested By: D. Bryant Date: 9/19/2021

Checked By: K. Lecce Date: 09/20/21

SPECIMEN PHOTOS

SAMPLE NUMBER: 1-B06@10'

SAMPLE NUMBER: 1-B08@14'



SAMPLE NUMBER:

SAMPLE NUMBER:

Project Information	
Project Name:	IPC Phase 2, PGEX
Project Number:	9320.006.007 PH013
Project Location:	Tracy, CA
Client:	Prologis
Description:	See exploration logs
Test Remarks:	

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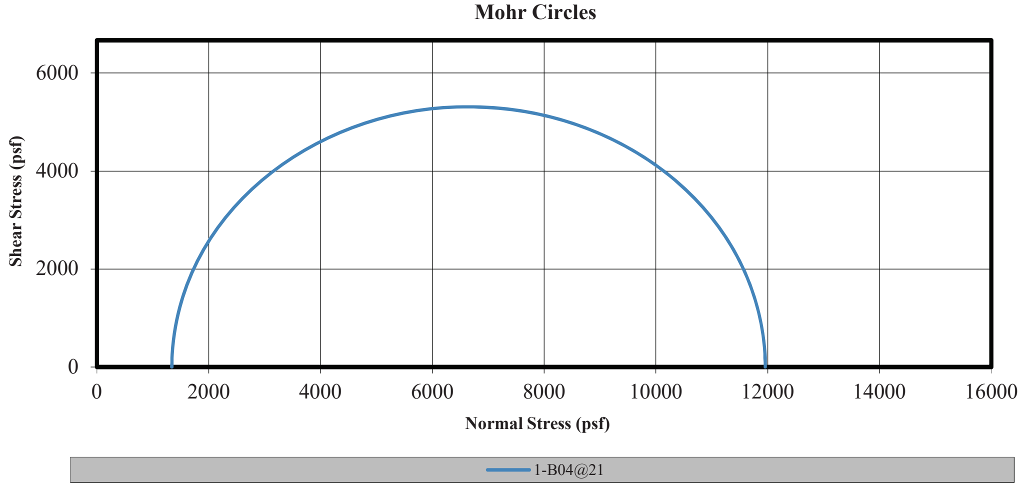
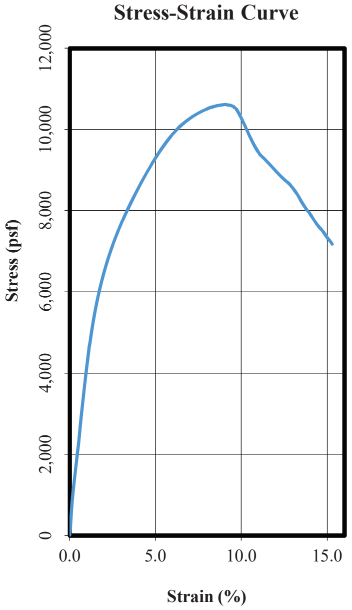
Isotropic Unconsolidated Undrained Triaxial Test

ASTM D2850

Tested By: R. Montalvo Date: 10/21/2021 Checked By: N. Broussard Date: 10/26/21





	Specimen			
Before Test	**1-B04@21**			
Water Content (%)	11.53			
Dry Density (pcf)	111.6			
Saturation (%)	60.07			
Void Ratio	0.522			
Diameter (in)	2.383			
Height (in)	5.950			
Height-to-Diameter Ratio	2.497			
ASTM D4318 - Wet Method				
Liquid Limit	n/a			
Plastic Limit	n/a			
ASTM D854 - Assumed				
Specific Gravity	2.720			
After Test	**1-B04@21**			
Water Content (%)	11.53			
Saturation (%)	60.07			
Strain Rate (%/min)	0.84			
Peak Deviator Stress (psf)	10617			
Axial Strain @ Failure (%)	9.08			
	Cell Pressure			
Cell (psf)	1339.2			
Back (psf)	n/a			
	Principle Stresses at Failure			
σ1 (psf)	11956.4			
σ3 (psf)	1339.2			
Corrected Peak Deviator Stress				

Mohr-Coulomb Parameters with a Non-zero Friction Angle (Ø≠0)	
Cohesion, c (psf)	n/a
Friction Angle Ø	n/a

	Cohesion at Failure with a Zero Friction Angle (Ø=0)			
	5308.6			
	n/a			

Project Information	
Project Name:	International Park of Commerce Offsite
Project Number:	9320.006.007 PH013
Project Location:	Tracy, CA
Client:	Prologis
Description:	See exploration logs
Test Remarks:	

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Isotropic Unconsolidated Undrained Triaxial Test

ASTM D2850

Tested By: R. Montalvo Date: 10/21/2021 Checked By: N. Broussard Date: 10/26/21

SPECIMEN PHOTOS

SAMPLE NUMBER: 1-B04@21	SAMPLE NUMBER:
	
SAMPLE NUMBER:	**SAMPLE NUMBER:**

Project Information	
Project Name:	International Park of Commerce Offsite
Project Number:	9320.006.007 PH013
Project Location:	Tracy, CA
Client:	Prologis
Description:	See exploration logs
Test Remarks:	

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