

**Fresno Area Express Improvement
Project
Geotechnical Investigation Report**



Prepared for:
City of Fresno
2223 G Street, FAX Maintenance
Fresno, California 93076

Prepared by:
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Project No. 2270445501

October 18, 2018
(Revised November 1, 2018)



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October 18, 2018 (Revised November 1, 2018)

Mr. Brian Barr
Fresno Department of Transportation / FAX Maintenance Division
2223 G Street
Fresno, California 93706

RE: **GEOTECHNICAL INVESTIGATION REPORT**
Fresno Area Express Improvement Project
2223 G Street
Fresno, California 93706


Dear Mr. Barr:

This letter transmits Stantec's geotechnical investigation report for the proposed Fresno Area Express (FAX) Improvement Project located in Fresno, California. The purpose of this report is to evaluate the subsurface conditions and provide geotechnical recommendations for the proposed improvements at the FAX maintenance yard.

We appreciate the opportunity to work with you on this project. If you have any questions, please call us at the numbers below.

Respectfully submitted,

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FRESNO AREA EXPRESS IMPROVEMENT PROJECT GEOTECHNICAL INVESTIGATION REPORT

Introduction
November 1, 2018

1. INTRODUCTION

This report presents the results of Stantec's geotechnical investigation for the proposed improvements to the existing FAX maintenance facility in Fresno, California. The project location is shown on the Site Location Map, Figure 1 and the approximate area of the proposed development is shown on the Site Vicinity Map, Figure 2.

1.1 PROPOSED DEVELOPMENT

We understand the proposed FAX maintenance facility improvements will include construction of a 20-foot by 50-foot addition and a 25-foot by 90-foot addition to the existing bus carwash, three solar parking canopies totaling approximately 15,400 square feet (sf), two new guard sheds, removal of the four existing underground storage tanks, and replacement of approximately 2.5 acres of pavement and landscape areas. The site is currently at the proposed rough grade elevation. The area of the proposed site improvements is shown on the Subsurface Exploration Map, Figure 3.

1.2 PURPOSE AND SCOPE OF WORK

1.2.1 Purpose

The purpose of this report is to evaluate the subsurface conditions at the site and provide geotechnical recommendations for design and construction of the proposed project. This report has been prepared in general accordance with accepted geotechnical engineering principles and in general conformance with the approved proposal.

1.2.2 Scope of Work

Our scope of work consisted of the following:

- Review available subsurface information for the site and nearby locations,
- Perform a site reconnaissance to evaluate general geotechnical and site conditions,
- Perform a field subsurface exploration program consisting of drilling nine hollow stem auger (HSA) borings and two cone penetrometer test (CPT) soundings,
- Perform geotechnical laboratory tests on selected samples,
- Perform geotechnical engineering analyses, and

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- Preparation of this geotechnical investigation report for the proposed project.

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Field Investigation
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2. FIELD INVESTIGATION

2.1 PRE-DRILLING PROCEDURES

Underground Service Alert (USA) was notified before commencing subsurface exploration activities to identify underground utilities that could conflict with the proposed borings. In addition, a private utility locator was retained to clear the boring locations for potential conflicts with underground utilities.

2.2 DRILLING OPERATIONS

Nine test borings (B-1 through B-9) were drilled using a CME 65 drill rig equipped with hollow-stem augers on August 24, 2018 through August 25, 2018 by Technicon Engineering Services, Inc. The borings were advanced to depths of approximately 5.5 feet to 51.5 feet below the existing ground surface (bgs), and their approximate locations are shown on the Subsurface Exploration Map, Figure 3. The borings were logged by a Stantec field geologist, who also collected samples of the materials encountered for examination and laboratory testing.

2.3 SAMPLING

Relatively undisturbed samples were obtained using a modified California (CAL) sampler, which is a ring-lined split tube sampler with a 3-inch outer diameter and 2½-inch inner diameter. CAL sampling followed ASTM D3550 (Standard Practice for Ring-Lined Barrel Sampling of Soils) procedures. Disturbed samples were obtained using a Standard Penetration Test (SPT) sampler, which is a split tube sampler with a 2-inch outer diameter and 1⅝-inch inner diameter. SPTs were performed in general accordance with ASTM D1586 (Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils), and D6066 (Standard Practice for Determining the Normalized Penetration Resistance of Sands for Evaluation of Liquefaction Potential). Disturbed bulk samples were also obtained from the drill cuttings.

The CAL and SPT samplers were driven with a 140-pound weight dropping 30 inches. The number of blows per 6-inch increment is noted on the borings logs. Technicon provided hammer energy reports dated July 16, 2015 and January 24, 2016. The reports indicate that the average hammer energy efficiency on the drill rig used at the project was 81.4% and 80%, respectively.

Samples were classified in the field using the Unified Soil Classification System (USCS), in accordance with ASTM D2488 (Standard Practice for Description and Identification of Soils [Visual-Manual Method]) procedures. The laboratory testing confirmed or modified field classifications as necessary for presentation on the boring logs. Soil samples were removed from the samplers, placed in appropriate containers, and transported in accordance with ASTM D4220 (Standard Practice for Preserving and Transporting Soil Samples). Upon completion, borings were backfilled

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with soil and capped with concrete in the upper three feet. The boring logs are included in Appendix A.

2.4 CONE PENETRATION TESTS

Two CPT's were completed on September 24, 2018 by Middle Earth Geo Testing Inc. under the direction of a Stantec engineer. The CPT soundings were performed in general accordance with ASTM D6441 (Standard Test Method for Mechanical Cone Penetration Tests of Soils).

The CPT's were advanced using a truck mounted CPT rig to a maximum depth of approximately 51.5 feet bgs at the locations shown on Figure 2. Piezo-cone penetrometers were advanced using a push rod equipped with an instrumented penetrometer tip. Relatively continuous tip, side friction, and dynamic pore pressure data were collected for each CPT sounding. Upon completion, the non-collapsed portion of the CPT holes were filled with grout. The CPT report is included in Appendix A.

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Laboratory Testing
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3. LABORATORY TESTING

The following laboratory tests were performed in general accordance with ASTM, California, and AASHTO Test procedures:

- In-Situ Moisture and Density (ASTM D2216)
- Direct Shear (ASTM D3080)
- Sieve Analysis (ASTM D422 and ASTM C136)
- No. 200 Sieve Wash (ASTM D1140)
- Atterberg Limits (ASTM D4318)
- R-Value (ASTM D2844)
- Chemical Tests for Corrosion Potential (CA DOT test methods)

The laboratory test results are presented in Appendix B.

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Geologic Setting and Site Conditions
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4. GEOLOGIC SETTING AND SITE CONDITIONS

4.1 REGIONAL GEOLOGY

The site is located in the southern portion of the Great Valley Geomorphic Province in Central California. This region is characterized as a 50-mile-wide and 400-mile-long sediment- filled trough in which the sediments have been deposited, almost continuously, since the Jurassic period.

Geology of the Great Valley generally consists of marine and continental deposits resting on a basement complex of metamorphic and igneous rocks. Locally, the site resides within the San Joaquin Valley. Geology within the San Joaquin Valley and the project area mainly consists of Jurassic to recent, marine, alluvial, and lake deposits that are several thousand feet thick.

The regional surficial geology is described as Quaternary Alluvial Fan deposits of the Holocene era consisting of granitic sand and silt (CDMG, 1965).

4.2 SURFACE CONDITIONS

The site is occupied by the existing FAX maintenance yard, which is approximately 11 acres in size, located within the larger City of Fresno complex, which is approximately 38 acres in size, that encompasses several other departments. The FAX maintenance yard includes large paved parking and driveway areas, an 11,000 sf administrative building, a 40,000 sf service building, an 8,000 sf carwash, a 19,000 sf and 34,000 sf solar canopy, and landscape areas. The project site is bound by G Street followed by vacant land to the northeast, the eastbound onramp to California (CA) Highway 180 from northbound CA Highway 99 to the northwest and southwest, and the City of Fresno Sanitation, Sewer Maintenance, and General Services divisions to the southeast.

The project site area is generally flat. Based on Google Earth®, the ground surface ranges from an approximate elevation of 284 feet at the southwestern portion of the site to 288 feet at the northeastern portion of the site (WGS84 Datum).

4.3 SUBSURFACE CONDITIONS

The materials encountered in our borings consist of undocumented fill (Af) and Quaternary Age Alluvial Sand deposits (Qf). A brief description of the subsurface conditions is provided in this section. Detailed descriptions of the subsurface conditions are provided in the boring logs included in Appendix A.

Undocumented Fill - Undocumented fill was encountered in soil boring B5 completed at the site and extends to a depth of approximately 4.3 feet bgs. An approximate 5 to 14-inch thick pavement section consisting of asphalt concrete with and without crushed rock base course was

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encountered at the exploration locations B2 through B9. The fill material underlying the pavement section at soil boring B5 generally consists of silty sand (Unified Soil Classification Symbol (USCS): SM).

Alluvial Fan Deposits (Qf) – Recent Holocene deposits were encountered from the ground surface in all soil borings, with the exception of soil boring B-5, and extend to depths of at least 51.5 feet bgs. The Holocene deposits encountered at the soil boring locations primarily consist of sand with variable amounts of silt and clay (SW, SP, SW-SM, SP-SM, SC, and SM), sandy clay (CL), and sandy silt (ML). The sandy deposits encountered were very loose to very dense and generally moist. The fine-grained deposits were very stiff to hard and moist.

Groundwater - Groundwater was not encountered during this investigation. We understand that groundwater was encountered as shallow as 103 feet bgs in a groundwater monitoring well located approximately 1.7 miles east of the site (Technicon, 2015) and approximately 5 feet higher in elevation. Groundwater levels may fluctuate in the future due to rainfall, irrigation, broken pipes, or changes in site drainage.

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Geologic Hazards
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5. GEOLOGIC HAZARDS

5.1 FAULTING AND SURFACE FAULT RUPTURE

The site is located in a seismically active area. The estimated distance from the site to selected nearby mapped active faults is presented in the table below.

Table 1. Faults in Site Vicinity

| Fault | Distance (miles) ⁽¹⁾ | Maximum Moment Magnitude ⁽¹⁾ |
|-----------------------------------|--|--|
| Great Valley 11 | 39.5 | 6.6 |
| Great Valley 12 | 39.5 | 6.4 |
| Great Valley 13 (Coalinga) | 40.6 | 7.1 |
| Great Valley 14 (Kettleman Hills) | 46.0 | 7.2 |
| Great Valley 10 | 47.2 | 6.5 |
| Great Valley 9 | 52.4 | 6.8 |
| Ortogonalita | 60.4 | 7.1 |
| San Andreas – Creeping Segment | 65.1 | -- |

¹ Measured from 2008 National Seismic Hazard Maps - USGS (USGS, 2008).

As noted above, the closest known active fault is the Great Valley 11 Fault, located approximately 39.5 miles southwest of the site. No active faults are known to underlie or project toward the site. Therefore, the probability of surface fault rupture at the site from a known active fault is considered low.

5.2 CALIFORNIA BUILDING CODE SEISMIC CRITERIA

A geologic hazard likely to affect the project is ground-shaking as a result of movement along an active fault zone in the vicinity of the subject site. The seismic parameters in accordance with the 2016 California Building Code (CBC) are presented below:

Table 2. 2016 CBC Seismic Parameters and Peak Ground Acceleration

| Parameter | Value |
|--|--|
| Site Coordinates | Latitude : 36.74278° Longitude : -119.8083° |
| Mapped Spectral Acceleration Value at Short Period: S_s | 0.663g |
| Mapped Spectral Acceleration Value at 1-Second Period: S₁ | 0.264g |
| Seismic Site Classification | D |
| Short Period Site Coefficient: F_a | 1.270 |
| 1-Second Period Site Coefficient: F_v | 1.872 |
| Site Class Adjusted Acceleration Value at Short Period: S_{MS} | 0.841g |
| Site Class Adjusted Acceleration Value at 1-Second Period: S_{M1} | 0.494g |

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Table 2. 2016 CBC Seismic Parameters and Peak Ground Acceleration

| Parameter | Value |
|--|--------|
| Design Spectral Response Acceleration at Short Periods: S_{DS} | 0.561g |
| Design Spectral Response Acceleration at 1-Second Period: S_{D1} | 0.329g |
| Peak Ground Acceleration adjusted for Site Class Effects: PGA_M | 0.321g |

ASCE 7-10 – Report generated through USGS Seismic Design Maps website (USGS, 2018).

5.3 LIQUEFACTION AND DYNAMIC SETTLEMENT

Liquefaction is the transformation of a deposit of soil from a solid state to a liquefied state as a consequence of increased pore pressure and reduced effective stress. Often, this transformation results from the cyclic loading of an earthquake and the soil acquires “mobility” sufficient to permit both horizontal and vertical movements. Soils that are most susceptible to liquefaction are clean, loose, saturated (below groundwater), and uniformly graded sands. The vast majority of liquefaction hazards are associated with sandy soils and silty soils of low plasticity. Cohesive soils are generally not considered susceptible to soil liquefaction, although they can be subject to cyclic softening if they are soft enough, and if the seismic demand is relatively high.

The site is not located in a California Geological Survey Liquefaction Hazard Zone. This zone is defined as areas where historical occurrence of liquefaction, or local geological, geotechnical and groundwater conditions indicate a potential for permanent ground displacements such that mitigation would be required.

Loose to very dense cohesionless soil is generally present from ground surface to a depth of at least 51.5 feet at the site. This soil is generally not susceptible to liquefaction due to the depth to groundwater. Accordingly, the onsite soils are not considered to be susceptible to liquefaction induced settlement.

5.4 LIQUEFACTION INDUCED LATERAL SPREADING

Liquefaction induced lateral spreading can occur in areas of sloping ground, or towards a free face. Given the low potential for liquefaction, the depth to groundwater and soil conditions, the potential for liquefaction induced lateral spreading is considered low.

5.5 FLOODING, TSUNAMIS AND SEICHES

The site is not located within a FEMA flood zone, therefore, damage due to flooding is considered low.

The site property is not located within a Tsunami Inundation Area; therefore, damage due to tsunamis is considered low.

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5.6 EXPANSIVE SOILS

The near-surface soils (upper approximate 10 feet) have a low expansion potential. Our soil classifications and laboratory test results show that the near surface (upper 10 feet) samples tested are granular with non-plastic fines. Accordingly, mitigation for expansive soils is not considered necessary for onsite soils at this site.

If imported soils are used for earthwork, Stantec recommends that the proposed soils be tested for expansion potential prior to import. Imported soils should be approved by the Geotechnical Engineer before being imported.

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Conclusions
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6. CONCLUSIONS

Based on our field exploration, laboratory testing and engineering and geologic analyses, it is our opinion that the subject property is suitable for construction of the proposed retail gasoline facility from a geotechnical engineering and engineering geology viewpoint; however, there are existing geotechnical conditions associated with the site that warrant mitigation and/or consideration during the planning stages. The main geotechnical conclusions for the project are presented in the following paragraphs.

- The site is underlain by shallow undocumented fill and Quaternary Age Alluvial Fan deposits from the ground surface in all soil borings and extend to depths of at least 51.5 feet bgs. The undocumented fill and alluvial fan deposits encountered primarily consist of sand with variable amounts of silt and clay (SW, SP, SW-SM, SP-SM, SC, and SM), sandy clay (CL), and sandy silt (ML). Undocumented fill extends to a depth of approximately 4.3 feet in one of the borings performed.
- Groundwater was not encountered during this investigation. We understand that groundwater was encountered as shallow as 103 feet bgs in a groundwater monitoring well located approximately 1.7 miles east of the site (Technicon, 2015) and approximately 5 feet higher in elevation.
- The liquefaction and lateral spread potential at the site is considered low.
- Based on the low potential for liquefaction induced settlement, conventional shallow foundations appear to be a suitable option for support of the proposed bus wash building addition and parking lot canopies.
- No active faults are known to underlie or project toward the site. Therefore, the probability of surface fault rupture occurring at the site from a known active fault is considered low.

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7. RECOMMENDATIONS

7.1 EARTHWORK

The following recommendations are provided regarding specific aspects of the proposed earthwork construction. These recommendations should be considered subject to revision based on additional geotechnical evaluation of the conditions observed by the Geotechnical Engineer during grading operations.

7.1.1 Site Preparation

Site preparation should begin with the removal of existing buried slabs and foundations, vegetation, highly organic soil, leach lines, septic tanks, and any other unsuitable materials, as applicable. Existing underground utilities within the proposed construction areas should be completely removed and/or rerouted. Grading should conform to the guidelines presented in the 2016 California Building Code (CBC, 2016), as well as the pertinent requirements of the City of Fresno and Fresno County.

7.1.2 Remedial Grading

Bus Wash Foundation and Guard Shack Areas:

To provide uniform support for the proposed bus wash additions and guard shack buildings, removal of the existing soils to a minimum depth of 2 feet below the bottom of the footings across the entire structure footprint is recommended. Removal, replacement, and compaction should be completed laterally at least five feet beyond the outside edge of the footings or slab unless constrained by existing structures. The bottom of the over excavation should be scarified to a depth of 8-inches, moisture conditioned to within 2 percentage points of the optimum moisture content and compacted to at least 90% relative compaction based on the ASTM D1557 laboratory test procedure. All references to optimum moisture content and relative compaction in this report are based on this test method.

Concrete Pavement and Hardscape:

Remedial grading for pavement and hardscape areas should include scarifying the upper 12 inches of the subgrade soil, moisture conditioning to slightly above the optimum moisture content, and recompacting to a dry density of at least 95% of the laboratory maximum dry density. Subgrade elevation is defined as the top of soil elevation provided in the grading plan. Hardscape subgrade should be compacted to at least 90% relative compaction.

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Field Observations:

The Geotechnical Engineer should check the bottom of excavations. If soft, loose, or otherwise unsuitable soils are encountered, the depth of removal may need to be extended.

7.1.3 Fill Placement and Compaction

Excavated materials determined by the Geotechnical Engineer to be satisfactory can be reused as compacted fill. We anticipate that the majority of the excavated materials can be re-used as compacted fill soils. The Geotechnical Engineer should approve the fill material before placement.

Where large compaction equipment is used, fill should be placed in 6- to 8-inch thick loose, horizontal lifts, moisture conditioned to within 2 percentage points of the optimum moisture content and compacted to at least 90% relative compaction. Thinner lifts will be required for smaller compaction equipment. The maximum dry density and optimum moisture content for the evaluation of relative compaction should be determined in accordance with ASTM D1557.

7.1.4 Yielding Subgrade Conditions

The soil encountered at the bottom of the remedial grading excavations can exhibit “pumping” or yielding if they become saturated in response to periods of significant precipitation, such as during the winter rainy season. If this occurs, corrective measures should be performed with oversight from the Geotechnical Engineer.

In order to help stabilize the yielding subgrade soils within the bottom of the removal areas, the contractor can consider the placement of stabilization fabric or geo-grid over the yielding areas, depending on the relative severity of the yielding.

Mirafi 600X (or approved equivalent) stabilization fabric may be used for areas with low to moderate yielding conditions. Geo-grid such as Tensar TX-5 may be used for areas with moderate to severe yielding conditions. Uniform sized, ¾- to 2-inch crushed rock should be placed over the stabilization fabric or geo-grid. A 6- to 12-inch thick section of crushed rock will typically be necessary to stabilize yielding ground.

If significant voids are present in the crushed gravel, a filter fabric should be placed over the crushed gravel to prevent migration of fines into the gravel and thus potential settlement of the overlying fill. Fill soils, which should be placed and compacted in accordance with the recommendations presented herein, should then be placed over the fabric or geo-grid until design grades are reached. The crushed gravel and stabilization fabric or geo-grid should extend at least 5 feet laterally beyond the limits of the yielding areas.

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7.1.5 Dewatering

Groundwater was not encountered during our investigation to a maximum depth of 51.5 feet bgs. Accordingly, we do not anticipate that groundwater will be a significant consideration for this project.

7.1.6 Expansive Soil

The near-surface soils (upper approximate 10 feet) have a low expansion potential. Our soil classifications and laboratory test results show that the near surface (upper 10 feet) samples tested are granular with non-plastic fines. Accordingly, mitigation for expansive soils is not considered necessary at this site. The grading and foundation recommendations presented in this report reflect a low expansion potential.

7.1.7 Imported Material

Imported materials, if used for fill, should be predominately granular, contain no rocks or lumps greater than 3 inches in maximum dimension, and have an Expansion Index less than 20, and a Plasticity Index less than 15. Imported materials should be reviewed and approved by the Geotechnical Engineer before being brought to the site.

7.1.8 Site Excavation Characteristics

It is anticipated that excavations can be achieved with conventional earthwork equipment in good working order.

7.1.9 Oversized Material

Excavations may generate oversized material. Oversized material is defined as rocks or cemented clasts greater than 3 inches in largest dimension. Oversized material should be broken down to no greater than 3 inches in largest dimension for use in fill or be removed from the site.

7.1.10 Temporary Excavations

The existing native soils can be considered Type B for excavation in accordance with OSHA and Cal-OSHA requirements. Temporary excavations should be shored or excavated with a slope not steeper than 1:1 (horizontal to vertical) in accordance with OSHA and Cal-OSHA requirements.

The excavations should be inspected daily by the contractor's Competent Person before personnel are allowed to enter the excavation. Any zones of potential instability, sloughing or raveling should be brought to the attention of the Geotechnical Engineer and corrective action implemented before personnel begin working in the excavation. Excavated soils should not be stockpiled behind temporary excavations within a distance equal to the depth of the excavation.

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Stantec should be notified if other surcharge loads are anticipated so that lateral load criteria can be developed for the specific situation. If temporary slopes are to be maintained during the rainy season, berms are recommended near the tops of slopes to prevent runoff water from entering the excavation and eroding the slope faces.

7.1.11 Temporary Cantilever Shoring

Temporary excavations to depths up to approximately 20 feet bgs are anticipated for removal of the existing USTs. Where cantilevered shoring is used in lieu of sloping the temporary excavation sidewalls, the shoring design may be tentatively based upon an ultimate active earth pressure equal to a fluid weighing 40 pounds per cubic foot (pcf). Passive pressures above the groundwater level may be based on a fluid weighing 300 pcf.

These pressures are based on level ground conditions in front and behind the wall. The earth pressures indicated above do not include a safety factor; therefore, the shoring design should include an appropriate safety factor for the overall performance of the system.

7.1.12 Braced Shoring System

For braced shoring above the groundwater level, a uniform rectangular pressure distribution should be used from top to bottom of the shoring equivalent to the following,

$$\text{Bracing:} \quad 30H \text{ psf/ft}$$

where H is the depth of the excavation, in feet.

These pressures are based on level ground conditions in front and behind the wall. The earth pressures indicated above do not include a safety factor; therefore, the shoring design should include an appropriate safety factor for the overall performance of the system.

7.1.13 Pipelines

Typical pipe bedding as specified in the Standard Specifications for Public Works Construction (GREENBOOK) may be used. As a minimum, it is recommended that pipe be supported on at least 4 inches of granular bedding material, such as 3/4-inch rock or clean coarse sand with less than 5 percent fines and a sand equivalent of 40 or more as evaluated by ASTM D2419.

The bedding should extend from the bottom of the trench to at least 1 foot above the top of the pipe. Sand bedding should be mechanically compacted to at least 90 percent relative compaction. Jetting of sand bedding should not be permitted.

Onsite material, imported select material, or 2-sack cement/sand slurry may be used as backfill in trenches above the pipe bedding. The material selected should match the engineering

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characteristics of the soils adjacent to the trench. Utility trench backfill beneath structures and hardscape should be compacted to at least 90% relative compaction.

The modulus of soil reaction (E') is used to characterize the stiffness of soil backfill placed along the sides of buried flexible pipelines. For the purpose of evaluating deflection due to the load associated with trench backfill over the pipe, a value of 1,500 pounds per square inch (lbs/in²) is recommended for the general site conditions assuming granular bedding material (sand or gravel) is placed around the pipe.

7.1.14 Surface Drainage

Final surface grades around structures should be designed to collect and direct surface water away from the structure and toward appropriate drainage facilities. The ground around the structure should be graded so that surface water flows rapidly away from the structure without ponding. In general, we recommend that the ground adjacent to the structure slope away at a gradient of at least 2%. Densely vegetated areas where runoff can be impaired should have a minimum gradient of at least 5% within the first 5 feet from the structure. Roof gutters with downspouts that discharge directly into a closed drainage system are recommended on structures. Drainage patterns established at the time of fine grading should be maintained throughout the life of the proposed structures. Site irrigation should be limited to the minimum necessary to sustain landscape growth. Should excessive irrigation, impaired drainage, or unusually high rainfall occur, saturated zones of perched groundwater can develop. Saturated soil zones may result in increased maintenance and could impact structure stability.

7.1.15 Grading Plan Review

Stantec should review the grading plans and earthwork specifications to ascertain whether the intent of the recommendations contained in this report have been implemented, and that no revised recommendations are needed due to changes in the development scheme.

7.2 FOUNDATIONS

7.2.1 Shallow Foundations

Conventional shallow foundations (spread footings/strip footings) are considered suitable for support of the proposed bus wash building expansion provided the recommendations in this report are incorporated into the design.

The following foundation recommendations are minimum criteria based on geotechnical considerations. They should not be considered a structural design, nor should they be considered to preclude more restrictive criteria by governing agencies or the structural engineer. The design of the foundation system should be performed by the project structural engineer.

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Conventional Shallow Foundations:

An allowable bearing pressure of 2,500 pounds per square foot (psf) may be used for conventional square or rectangular shallow foundations founded in properly compacted fill prepared in accordance with the recommendations of this report. The bearing capacity can be increased by one third for transient loading conditions such as earthquake and wind.

Additional parameters for shallow foundations are provided below.

Minimum Footing Width: 18 inches for continuous footings
24 inches for square/rectangular footings

Minimum Footing Depth: 18 inches below lowest adjacent soil grade

Minimum Reinforcement: Two No. 5 bars at both top and bottom in continuous footings.

7.2.2 Canopy Foundations

Typical shallow drilled pier footings for the parking canopy columns are expected to provide adequate support for the proposed structures provided that the recommendations provided herein are incorporated in the design. We understand that typical canopy column footings will consist of reinforced concrete drilled piers having a minimum diameter or width of 2.0 feet and embedded a minimum depth of 10 feet bgs. Based on these assumptions and the anticipated subsurface conditions, an allowable bearing pressure of 4,000 psf may be used in the design. For resistance to transient lateral loads, such as earthquake and wind loads, the aforementioned allowable bearing capacity may be increased by one-third.

7.2.3 Foundation Settlement

The following settlements are estimated.

Settlement: Less than 1-inch total settlement
½ inch differential settlement over 30 feet

7.2.4 Lateral Resistance

Lateral loads will be resisted by friction between the bottoms of footings and passive pressure on the faces of footings and other structural elements below grade. An allowable coefficient of friction of 0.3 can be used.

Passive pressure can be computed using an ultimate equivalent fluid pressure of 300 lbs/ft³ for level ground conditions. Reductions for sloping ground should be made. The upper 1 foot of soil should not be relied on for passive support unless the ground is covered with pavements or slabs.

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The earth pressure indicated above does not include a safety factor; therefore, the footing design should include an appropriate safety factor for the overall performance of the system.

7.2.5 Foundation Plan Review

Stantec should review the foundation plans to ascertain that the intent of the recommendations in this report has been implemented and that revised recommendations are not necessary as a result of changes after this report was completed.

7.2.6 Foundation Excavation Observations

A representative working under direct supervision of the Geotechnical Engineer should observe the foundation excavations prior to forming or placing reinforcing steel.

7.3 SLABS-ON-GRADE

7.3.1 Interior Slabs on Grade

The top 24 inches of material below interior concrete slabs-on-grade should have an expansion index of 20 or less. The project structural engineer should design the interior concrete slabs-on-grade floor. However, we recommend a minimum thickness of 5 inches.

A vapor barrier should be placed beneath slabs where moisture sensitive floor coverings will be installed. If plastic is used, a minimum 10-mil is recommended. The plastic should comply with ASTM E1745. Installation should comply with ASTM E1643. Current construction practice typically includes placement of a 2-inch thick sand cushion between the bottom of the concrete slab and the moisture vapor retarder/barrier. This cushion can provide some protection to the vapor retarder/barrier during construction and may assist in reducing the potential for edge curling in the slab during curing. However, the sand layer also provides a source of moisture to the underside of the slab that can increase the time required to reduce vapor emissions to limits acceptable for the type of floor covering placed on top of the slab. The slab can be placed directly on the vapor retarder/barrier. The floor covering manufacturer should be contacted to determine the volume of moisture vapor allowable and any treatment needed to reduce moisture vapor emissions to acceptable limits for the particular type of floor covering installed. The project team should determine the appropriate treatment for the specific application.

In addition to the moisture vapor barrier, a capillary moisture break can be constructed below the slab to further reduce moisture transmission from the subgrade soil, if desired. The capillary moisture break should consist of at least 4-inches of clean, free-draining gravel or crushed rock placed below the moisture vapor retarder/barrier. The components of the capillary moisture break should meet the particle-size gradation presented in Table 3.

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Table 3. Gradation for Capillary Moisture Break

| Gradation for Capillary Moisture Break | |
|--|--------------------------|
| Sieve Size | Percentage Passing Sieve |
| 1 inch | 100 |
| 3/4 inch | 30-75 |
| 1/2 inch | 5-10 |
| 3/8 inch | 0-2 |

7.3.2 Exterior Slabs on Grade (Sidewalks)

Exterior slabs not subject to vehicular traffic should have a minimum thickness of 4 inches and be reinforced with at least No. 3 bars at 24 inches on center each way or fibermesh. Slabs should be provided with crack control joints placed in accordance with the American Concrete Institute (ACI) guidelines. The project architect or civil engineer should select the final joint patterns.

7.4 CORROSIVITY

Three samples of the onsite soils were tested to provide a preliminary indication of the corrosion potential of the onsite soils. The test results are presented in Appendix B. A brief discussion of the corrosion test results is provided in the following text.

- The samples tested had a soluble sulfate concentration of 45 parts per million (ppm) to 57 ppm, which indicates the samples have a low sulfate corrosion potential relative to concrete. It should be noted that soluble sulfate in the irrigation water supply, and/or the use of fertilizer may cause the sulfate content in the surficial soils to increase with time. This may result in a higher sulfate exposure than that indicated by the test results reported herein. Studies have shown that the use of improved cements in the concrete, and a low water-cement ratio will improve the resistance of the concrete to sulfate exposure.
- The samples tested had a chloride concentration of 34 ppm to 41 ppm, which indicates the samples have a low chloride corrosion potential relative to metal.
- The samples tested had a minimum resistivity of 5,246 ohm-cm to 7,228 ohm-cm, which indicates the samples have a moderate corrosive potential.
- The samples tested had a pH of 7.3 to 8.9, which indicates the samples are slightly to strongly alkaline.

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Caltrans currently considers a site to be corrosive to foundation elements if one or more of the following conditions exist: Chloride concentration is greater than or equal to 500 ppm, sulfate concentration is greater than or equal to 1,500 ppm, or the pH is 5.5 or less.

Based on Caltrans criteria, the test results indicate the site is not considered to be a corrosive environment for structures. However, other samples at the site could yield significantly different concentrations to those described above. Therefore, additional testing may be performed to further evaluate corrosion during the planning or construction stages and to evaluate the as-graded corrosion potential of the onsite soils after site grading. We recommend evaluation by a corrosion engineer should be performed.

7.5 PAVEMENT

7.5.1 Asphalt Concrete Pavement

An R-Value of 40 has been assumed for preliminary design of pavement sections based on laboratory test results and visual observation of the on-site material in the upper 5 feet. The actual R-value of the subgrade soils should be determined after grading to provide final pavement design. Flexible pavement sections have been calculated in general conformance with Caltrans guidelines. The project civil engineer and owner should review the pavement designations to determine appropriate locations for pavement thickness. Based on an assumed R-value of 40, the following pavement structural sections have been calculated.

Table 4. Flexible Pavement Sections

| Traffic Type | Traffic Index | Asphalt Concrete (inches) | Aggregate Base* (inches) |
|------------------------|----------------------|----------------------------------|---------------------------------|
| Automobile Parking | 5.0 | 3 | 4.5 |
| Automobile Drive Lanes | 5.5 | 3 | 5.0 |
| Medium Truck Traffic | 6.0 | 4 | 5.0 |
| Heavy Truck Traffic | 7.0 | 4.5 | 6.5 |

***Aggregate Base should conform to Class 2 Aggregate Base in accordance with the Caltrans Standard Specifications or Crushed Miscellaneous Base in accordance with the Standard Specifications for Public Works Construction.**

Prior to placing base materials, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned to slightly above the optimum moisture content, and recompacted to a dry density of at least 95% of the laboratory maximum. The base material should also be compacted to slightly above the optimum moisture content and a dry density of at least 95% of the laboratory maximum.

Rigid concrete pavement (described below) should be placed in driveway entrance aprons and trash bin loading/storage areas. Concrete pavement design is provided in the following section.

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7.5.2 Concrete Pavement

Concrete pavements have been calculated in general conformance with the procedure recommended by the American Concrete Institute (ACI 330R-08) using the parameters presented in Table 5. The following design parameters were used in our analyses.

Table 5. Concrete Pavement Parameters

| Design Parameter | Value |
|---------------------------------------|------------|
| Modulus of Subgrade Reaction (k) | 150 pci |
| Modulus of Concrete Rupture (M_R) | 550 psi |
| Concrete Compressive Strength | 3,700 psi |
| Traffic Categories (TC) | A and C |
| Average Daily Truck Traffic (ADTT) | 10 and 100 |

Based on the parameters above, we recommend the following minimum concrete pavement thickness.

Table 6. Recommended Concrete Pavement Sections

| Traffic Type | Pavement Thickness (inches) | Aggregate Base (inches) |
|---|-----------------------------|-------------------------|
| Automobile Parking and Driveways (TC = A) | 6 | 6 |
| Heavy Truck Traffic and Fire Lane Areas (TC = C) | 8 | 6 |

The project civil engineer should confirm whether the assumed ADTT is appropriate for the anticipated traffic level. Concrete compressive strength for pavement should be at least 3,700 psi. Minimum reinforcement should consist of #3 bars on 24-inch centers. Crack control joints should be placed in accordance with the American Concrete Institute (ACI) guidelines.

Prior to placing concrete, the upper 12 inches of the subgrade soil should be scarified, moisture conditioned to slightly above the optimum moisture content, and recompact to a dry density of at least 90% of the laboratory maximum.

7.6 POST INVESTIGATION SERVICES

Post investigation services are an important and necessary continuation of this investigation, and it is recommended that Stantec be retained as the Geotechnical Engineer to perform such services. Final project grading and foundation plans, foundation details and specifications should be reviewed by Stantec prior to construction to check that the intent of the recommendations

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presented herein have been applied to the design. Following review of plans and specifications, observation during construction should be performed to correlate the findings of this exploration with the actual subsurface conditions exposed.

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Closure
November 1, 2018

8. CLOSURE

Our conclusions, recommendations, and discussions presented herein are based upon an evaluation and interpretation of the findings from the field and laboratory programs, with interpolation and extrapolation of subsurface conditions between and beyond the exploration locations. This report contains information that is valid as of the report's date and to the extent directly known to Stantec. However, conditions can change with the passage of time or construction subsequent to this report's preparation that may invalidate, either partially or wholly, the conclusions and recommendations presented herein.

Inherent in most projects performed in the heterogeneous subsurface environment, continuing subsurface explorations and analyses may reveal conditions that are different than those described in this report. The findings and recommendations contained in this report were developed in accordance with generally accepted, current professional principles and practice ordinarily exercised, under similar circumstances, by geotechnical engineers and engineering geologists practicing in this locality. No other warranty, express or implied, is made.

FRESNO AREA EXPRESS IMPROVEMENT PROJECT GEOTECHNICAL INVESTIGATION REPORT

References
November 1, 2018

9. REFERENCES

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FRESNO AREA EXPRESS IMPROVEMENT PROJECT GEOTECHNICAL INVESTIGATION REPORT

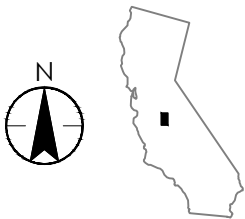
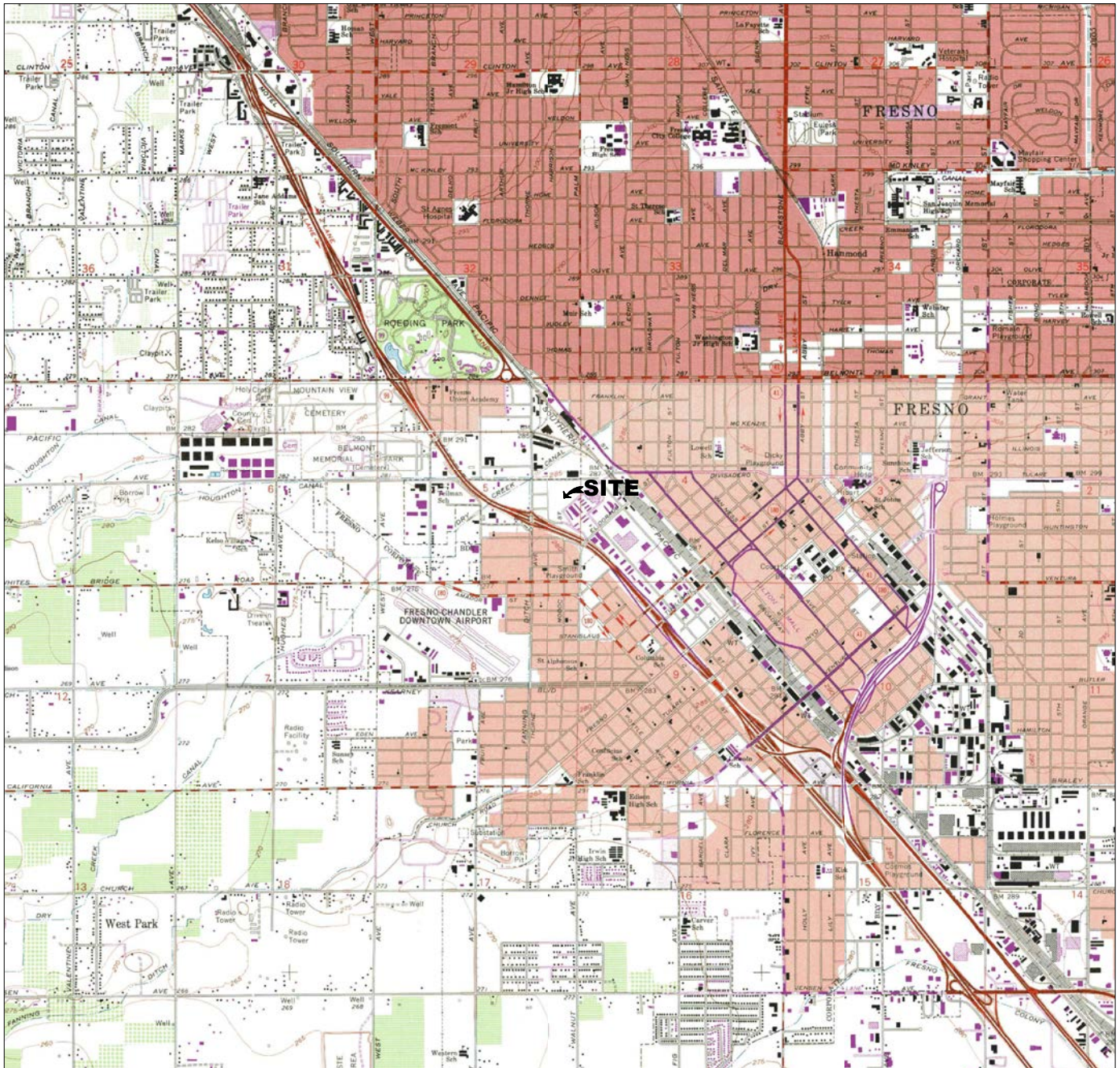
References

November 1, 2018

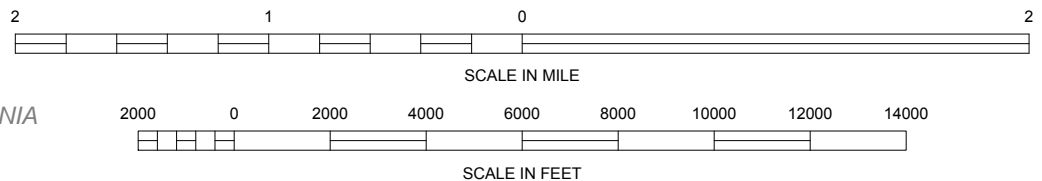
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FIGURES



CALIFORNIA



REFERENCE: USGS 7.5 X 15 MINUTE QUADRANGLE; FRESNO NORTH, 1981.



735 EAST CARNEGIE DRIVE, SUITE 280
SAN BERNARDINO, CA 92408
PHONE: (909) 335-6116 FAX: (909) 335-6120

FOR:

FRESNO AREA EXPRESS
MAINTENANCE FACILITY
2223 G STREET
FRESNO, CALIFORNIA 93706

JOB NUMBER:

2270445501

DRAWN BY:

JEF

CHECKED BY:

JEF

APPROVED BY:

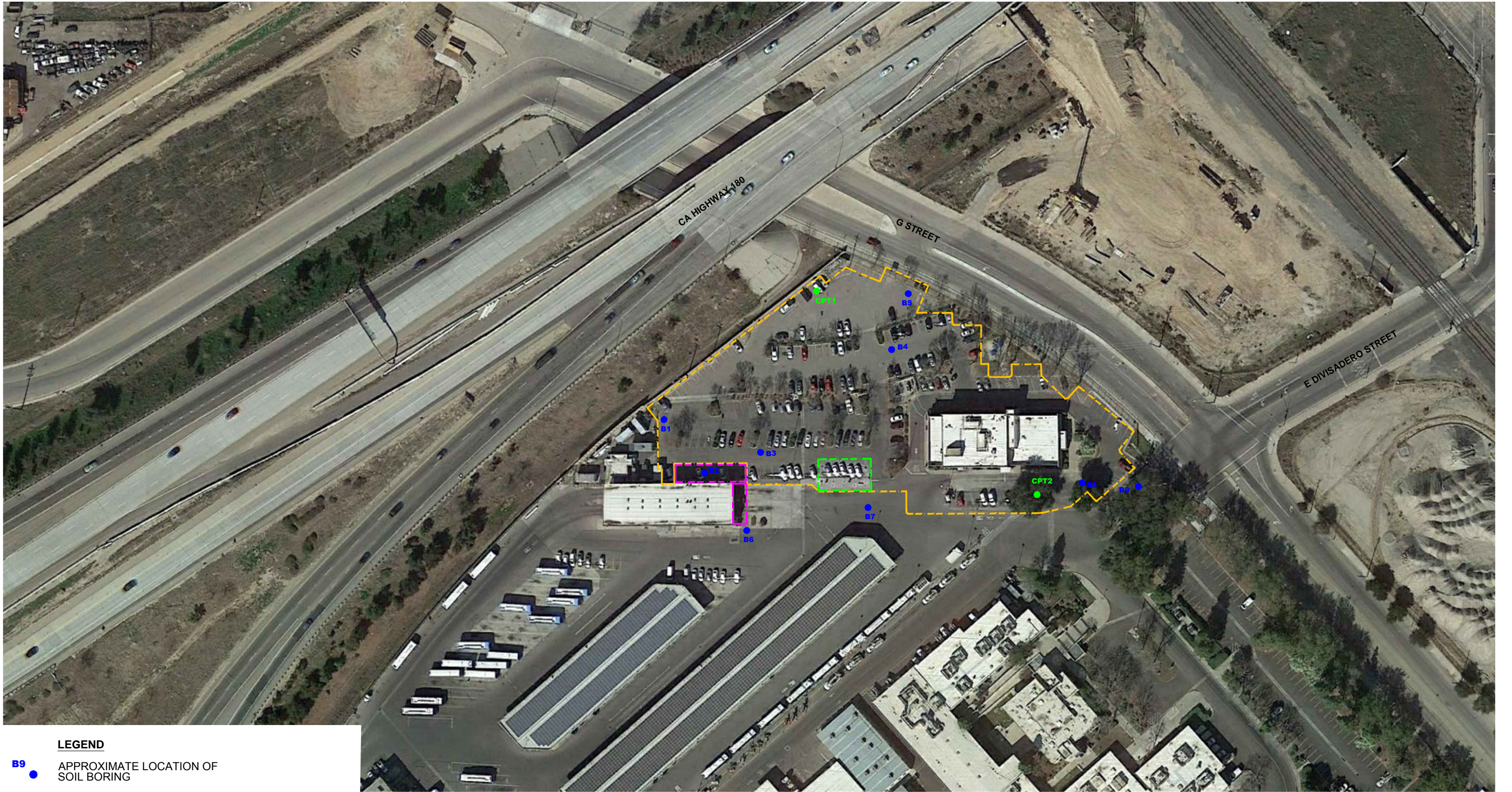
JEF

FIGURE:

1

DATE:

10/14/18



LEGEND

- **B9** APPROXIMATE LOCATION OF SOIL BORING
- **CPT2** APPROXIMATE LOCATION OF CPT SOUNDING
- APPROXIMATE LOCATION OF PROPOSED BUS WASH EXPANSION
- APPROXIMATE LOCATION OF PROPOSED PARKING CANOPY
- APPROXIMATE LOCATION OF EXISTING UNDERGROUND STORAGE TANKS (TO BE REMOVED)
- APPROXIMATE LIMITS OF PROPOSED PARKING AREA

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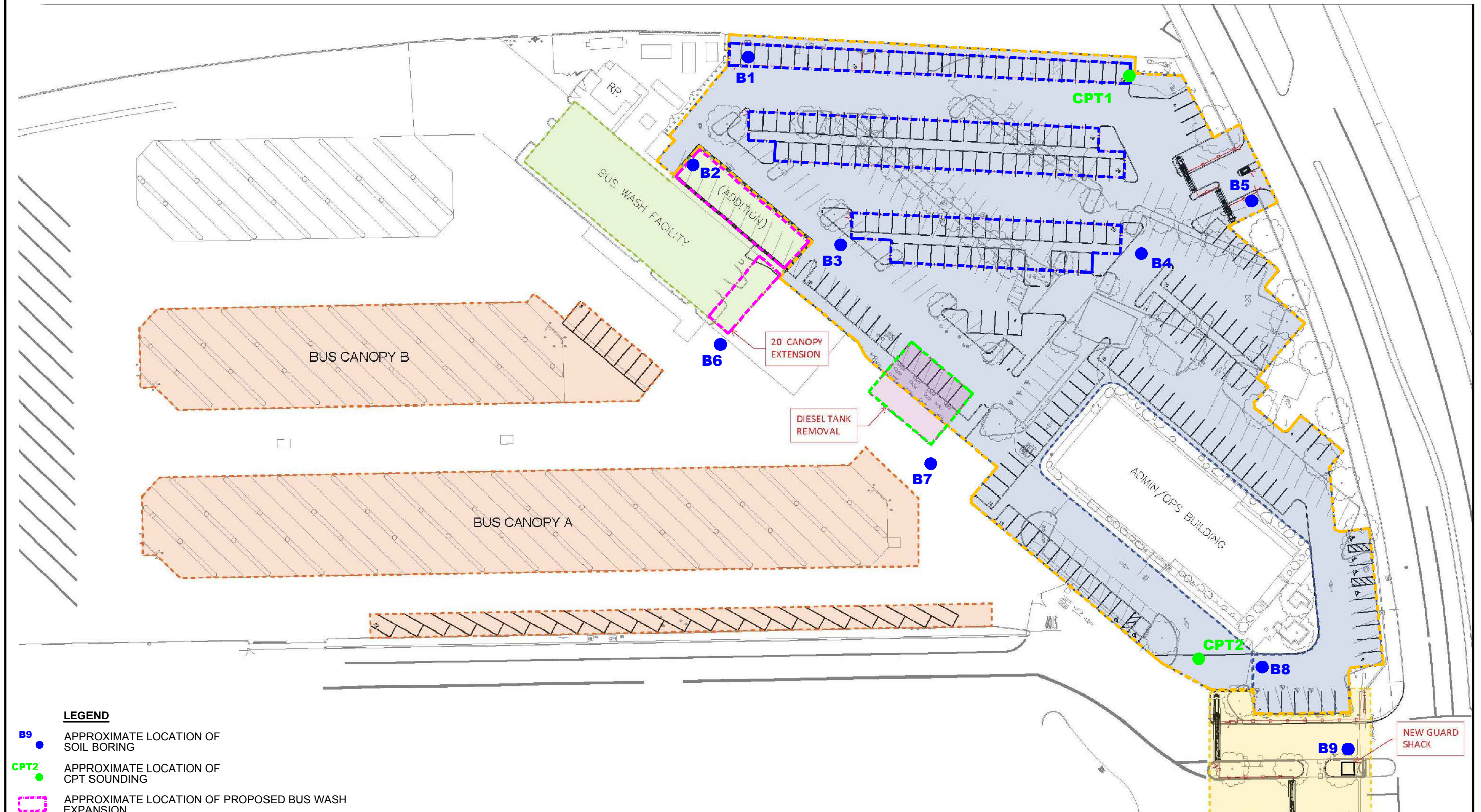
0 120 240

SCALE (FEET)



735 EAST CARNEGIE DRIVE, SUITE 280
SAN BERNARDINO, CA 92408
PHONE: (909) 335-6116 FAX: (909) 335-6120

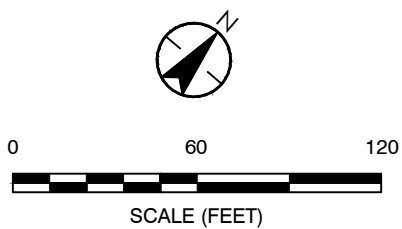
| | | | | |
|--|------------------|--------------------|---------------------|-------------------|
| FOR: FRESNO AREA EXPRESS MAINTENANCE FACILITY 2223 G STREET FRESNO, CALIFORNIA 93706 | | SITE VICINITY MAP | | FIGURE: 2 |
| JOB NUMBER: 2270445501 | DRAWN BY: JEF | CHECKED BY: JEF | APPROVED BY: JEF | DATE: 10/14/18 |




LEGEND

- B9** ● APPROXIMATE LOCATION OF SOIL BORING
- CPT2** ● APPROXIMATE LOCATION OF CPT SOUNDING
- [Pink dashed box]** APPROXIMATE LOCATION OF PROPOSED BUS WASH EXPANSION
- [Blue dashed box]** APPROXIMATE LOCATION OF PROPOSED PARKING CANOPY
- [Green dashed box]** APPROXIMATE LOCATION OF EXISTING UNDERGROUND STORAGE TANKS (TO BE REMOVED)
- [Orange dashed box]** APPROXIMATE LIMITS OF PROPOSED PARKING AREA

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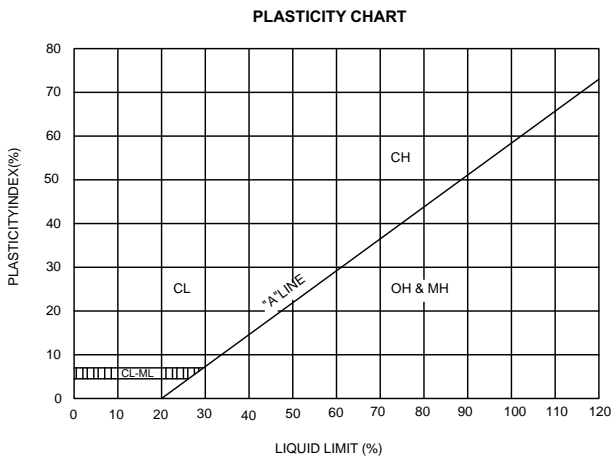
| | | | | | |
|--|--|------------------|----------------------------|---------------------|---------------------|
|  735 EAST CARNEGIE DRIVE, SUITE 280 SAN BERNARDINO, CA 92408 PHONE: (909) 335-6116 FAX: (909) 335-6120 | FOR: FRESNO AREA EXPRESS MAINTENANCE FACILITY 2223 G STREET FRESNO, CALIFORNIA 93706 | | SUBSURFACE EXPLORATION MAP | | FIGURE: 3 |
| | JOB NUMBER: 2270445501 | DRAWN BY: JEF | CHECKED BY: JEF | APPROVED BY: JEF | DATE: 10/14/18 |

APPENDIX A BORING LOGS

UNIFIED SOIL CLASSIFICATION (ASTM D-2487)

| MATERIAL TYPES | CRITERIA FOR ASSIGNING SOIL GROUP NAMES | | | GROUP SYMBOL | SOIL GROUP NAMES & LEGEND | |
|--|--|---|-------------------------------------|--------------|---------------------------|--|
| COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE | GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE | *CLEAN GRAVELS <5% FINES | Cu>4 AND 1<Cc<3 | GW | WELL-GRADED GRAVEL | |
| | | | Cu>4 AND 1>Cc>3 | GP | POORLY-GRADED GRAVEL | |
| | | *GRAVELS WITH FINES >12% FINES | FINES CLASSIFY AS ML OR CL | GM | SILTY GRAVEL | |
| | | | FINES CLASSIFY AS CL OR CH | GC | CLAYEY GRAVEL | |
| | SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE | *CLEAN SANDS <5% FINES | Cu>6 AND 1<Cc<3 | SW | WELL-GRADED SAND | |
| | | | Cu>6 AND 1>Cc>3 | SP | POORLY-GRADED SAND | |
| | | *SANDS AND FINES >12% FINES | FINES CLASSIFY AS ML OR CL | SM | SILTY SAND | |
| | | | FINES CLASSIFY AS CL OR CH | SC | CLAYEY SAND | |
| FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE | SILTS AND CLAYS LIQUID LIMIT<50 | INORGANIC | PI>7 AND PLOTS>"A" LINE | CL | LEAN CLAY | |
| | | | PI>4 AND PLOTS<"A" LINE | ML | SILT | |
| | | ORGANIC | LL (oven dried)/LL (not dried)<0.75 | OL | ORGANIC CLAY OR SILT | |
| | SILTS AND CLAYS LIQUID LIMIT>50 | INORGANIC | PI PLOTS >"A" LINE | CH | FAT CLAY | |
| | | | PI PLOTS <"A" LINE | MH | ELASTIC SILT | |
| | | ORGANIC | LL (oven dried)/LL (not dried)<0.75 | OH | ORGANIC CLAY OR SILT | |
| HIGHLY ORGANIC SOILS | | PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR | | PT | PEAT | |

* Dual symbols required for fines content between 5% and 12%



SAMPLER TYPES

| | | | |
|--|---------------------------------|--|-------------|
| | SPT | | Shelby Tube |
| | Modified California (2.5" I.D.) | | No Recovery |
| | Rock Core | | Grab Sample |

ADDITIONAL TESTS

| | |
|---------------------------------------|--|
| COR - CHEMICAL ANALYSIS (CORROSIVITY) | PI - PLASTICITY INDEX |
| CD - CONSOLIDATED DRAINED TRIAXIAL | EI - EXPANSION INDEX |
| CN - CONSOLIDATION | TC - CYCLIC TRIAXIAL |
| CU - CONSOLIDATED UNDRAINED TRIAXIAL | TV - TORVANE SHEAR |
| DS - DIRECT SHEAR | UC - UNCONFINED COMPRESSION |
| PP - POCKET PENETROMETER (TSF) | (1.5) - (WITH SHEAR STRENGTH IN KSF) |
| #200 - Percent Passing #200 SIEVE | UU - UNCONSOLIDATED UNDRAINED TRIAXIAL |
| RV - R-VALUE | |
| SA - SIEVE ANALYSIS: % PASSING | |
| - WATER | |
| - LEVEL | |

| PENETRATION RESISTANCE (RECORDED AS BLOWS / FOOT) | | | | |
|---|-------------|--------------|-------------|------------------|
| SAND & GRAVEL | | SILT & CLAY | | |
| RELATIVE DENSITY | BLOWS/FOOT* | CONSISTENCY | BLOWS/FOOT* | STRENGTH** (KSF) |
| VERY LOOSE | 0 - 4 | VERY SOFT | 0 - 2 | 0 - 0.25 |
| LOOSE | 4 - 10 | SOFT | 2 - 4 | 0.25 - 0.5 |
| MEDIUM DENSE | 10 - 30 | MEDIUM STIFF | 4 - 8 | 0.5-1.0 |
| DENSE | 30 - 50 | STIFF | 8 - 15 | 1.0 - 2.0 |
| VERY DENSE | OVER 50 | VERY STIFF | 15 - 30 | 2.0 - 4.0 |
| | | HARD | OVER 30 | OVER 4.0 |

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

** UNDRAINED SHEAR STRENGTH IN KIPS/SQ. FT. AS DETERMINED BY LABORATORY TESTING OR APPROXIMATED BY THE STANDARD PENETRATION TEST, POCKET PENETROMETER, TORVANE, OR VISUAL OBSERVATION.

LEGEND TO BORING LOGS AND SOIL DESCRIPTIONS



PROJECT: **Fresno Area Express Facility**
 LOCATION: **2223 G Street, Fresno, California**
 PROJECT NUMBER: **2270445501**

DRILLING: STARTED **9/25/18** COMPLETED: **9/25/18**
 INSTALLATION: STARTED **9/25/18** COMPLETED: **9/25/18**
 DRILLING COMPANY: **Technicon Engineering Services, Inc.**
 DRILLING EQUIPMENT: **CME 65**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING EQUIPMENT: **Split Spoon**



WELL / TEST PIT / BOREHOLE NO:

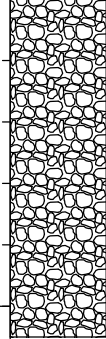
B1 PAGE 1 OF 1



NORTHING (ft):
 LATITUDE: **36° 44' 34.76"**
 GROUND ELEV (ft): **286**
 INITIAL DTW (ft): **NE**
 STATIC DTW (ft): **NE**
 WELL CASING DIAMETER (in): **---**
 LOGGED BY: **J. Sargent**

EASTING (ft):
 LONGITUDE: **119° 48' 32.92"**
 TOC ELEV (ft):
 BOREHOLE DEPTH (ft): **5.5**
 WELL DEPTH (ft): **---**
 BOREHOLE DIAMETER (in): **6**
 CHECKED BY: **J. Fischer**

| Time & Depth (feet) | Graphic Log | USCS | Description | Sample | Time Sample ID | Geotechnical Lab Testing | Blow Count | PID Reading (ppmv) | Depth (feet) | Borehole Backfill |
|---------------------|-------------|------|---|---|----------------|--------------------------|------------|--------------------|--------------|-------------------|
| | | | <u>QUATERNARY ALLUVIAL FAN DEPOSITS (Qf)</u> | | | | | | | |
| | | SM | SILTY SAND ; SM; 10YR 4/4 dark yellowish brown; 70% fine to medium grained sand; 30% fines; moist; no staining; no odor. |  | B1-2' | | | | | |
| 5 | | | |  | B1-5' | | | | 5 | |
| | | | Hole terminated at 5.5 feet. | | | | | | | |
| 10 | | | | | | | | | 10 | |
| 15 | | | | | | | | | 15 | |
| 20 | | | | | | | | | 20 | |



Backfilled with soil cuttings

PROJECT: **Fresno Area Express Facility**
 LOCATION: **2223 G Street, Fresno, California**
 PROJECT NUMBER: **2270445501**

DRILLING: STARTED **9/25/18** COMPLETED: **9/25/18**
 INSTALLATION: STARTED **9/25/18** COMPLETED: **9/25/18**
 DRILLING COMPANY: **Technicon Engineering Services, Inc.**
 DRILLING EQUIPMENT: **CME 65**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

B2 PAGE 1 OF 1



NORTHING (ft):
 LATITUDE: **36° 44' 34.28"**
 GROUND ELEV (ft): **285**
 INITIAL DTW (ft): **NE**
 STATIC DTW (ft): **NE**
 WELL CASING DIAMETER (in): **---**
 LOGGED BY: **J. Sargent**

EASTING (ft):
 LONGITUDE: **119° 48' 32.48"**
 TOC ELEV (ft):
 BOREHOLE DEPTH (ft): **21.5**
 WELL DEPTH (ft): **---**
 BOREHOLE DIAMETER (in): **6**
 CHECKED BY: **J. Fischer**

| Time & Depth (feet) | Graphic Log | USCS | Description | Sample | Time Sample ID | Geotechnical Lab Testing | Blow Count | PID Reading (ppmv) | Depth (feet) | Borehole Backfill |
|---------------------|-------------|------|---|--------|----------------|--------------------------|-------------------|--------------------|--------------|-------------------|
| | | | 3" Asphalt Concrete (AC) | | | | | | | |
| | | | 6" Aggregate Base (AB) | | | | | | | |
| | | SM | QUATERNARY ALLUVIAL FAN DEPOSITS (Qf) SILTY SAND ; SM; 10YR 4/4 dark yellowish brown; 79% fine to coarse grained sand; 21% fines; moist; no staining; no odor. | | B2-2' | SA | | | | |
| 5 | | | Loose below 5 feet. | | B2-5' | DS | 4 4 5 | | 5 | |
| | | | | | B2-7' | | 6 5 6 | | | |
| 10 | | | 60% fine to medium grained sand; 40% fines; very dense; friable below 10 feet. | | B2-10' | MD | 4 32 50-5" | | 10 | |
| 15 | | SC | CLAYEY SAND ; SC; 10YR 4/6 dark yellowish brown; 55% very fine to fine grained sand; 45% medium plasticity fines; moist; very dense; no staining; no odors. | | B2-15' | | 11 32 50-2" | | 15 | |
| 20 | | ML | SANDY SILT ; ML; 2.5Y 4/2 dark grayish brown; 40% very fine to fine grained sand; 60% non-plastic fines; moist; very stiff; no staining; no odors. | | B2-20' | MD | 6 7 9 | | 20 | |
| | | | Hole terminated at 21.5 feet. | | | | | | | |

← Backfilled with soil cuttings

PROJECT: **Fresno Area Express Facility**
 LOCATION: **2223 G Street, Fresno, California**
 PROJECT NUMBER: **2270445501**

DRILLING: STARTED **9/25/18** COMPLETED: **9/25/18**
 INSTALLATION: STARTED **9/25/18** COMPLETED: **9/25/18**
 DRILLING COMPANY: **Technicon Engineering Services, Inc.**
 DRILLING EQUIPMENT: **CME 65**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

B3 PAGE 1 OF 3



NORTHING (ft):
 LATITUDE: **36° 44' 34.55"**
 GROUND ELEV (ft): **286**
 INITIAL DTW (ft): **NE**
 STATIC DTW (ft): **NE**
 WELL CASING DIAMETER (in): **---**
 LOGGED BY: **J. Sargent**

EASTING (ft):
 LONGITUDE: **119° 48' 31.64"**
 TOC ELEV (ft):
 BOREHOLE DEPTH (ft): **51.5**
 WELL DEPTH (ft): **---**
 BOREHOLE DIAMETER (in): **6**
 CHECKED BY: **J. Fischer**

| Time & Depth (feet) | Graphic Log | USCS | Description | Sample | Time Sample ID | Geotechnical Lab Testing | Blow Count | PID Reading (ppmv) | Depth (feet) | Borehole Backfill |
|---------------------|-------------|-------|---|--------|----------------|--------------------------|------------------|--------------------|--------------|-------------------|
| | | | 5" AC | | | | | | | |
| | | | 1" AB | | | | | | | |
| | | | QUATERNARY ALLUVIAL FAN DEPOSITS (Qf) | | | | | | | |
| | | SM | SILTY SAND ; SM; 10YR 4/4 dark yellowish brown; 80% fine to coarse grained sand; 20% fines; moist; no staining; no odor. | | B3-2' | SA | | | | |
| 5 | | | Loose below 5 feet. | | B3-5' | DS | 3 4 5 | | 5 | |
| | | | | | B3-7' | | 3 3 4 | | | |
| 10 | | SW-SM | WELL GRADED SAND WITH SILT ; SW-SM; 10YR 4/4 dark yellowish brown; 94% fine to coarse grained sand; 6% fines; moist; very dense below 10 feet. | | B3-10' | SA, MD | 4 11 50-5" | | 10 | |
| 15 | | | Medium dense below 15 feet. | | B3-15' | | 4 13 13 | | 15 | |
| | | CL | SANDY CLAY ; CL; 10YR 6/3 pale brown; 30% fine to medium grained sand; 70% low to medium plasticity fines; moist; very stiff; mottled texture; minor iron staining; no odor (Pocket Penetrometer (PP) = 2.5 tons per square foot (TSF)). | | | | | | | |
| 20 | | SC | CLAYEY SAND ; SC; 10YR 5/4 yellowish brown; 60% fine to medium grained sand; 40% low to medium plasticity fines; moist; medium dense; no staining; no odor. | | B3-20' | MD | 25 10 11 | | 20 | |
| | | SP | POORLY GRADED SAND ; SP; 10YR 6/2 light brownish gray; 90% medium grained sand; 5% coarse grained sand; 5% fines; moist; soil very loose in sampler; no staining; no odor. | | | | | | | |

← Backfilled with soil cuttings

PROJECT: **Fresno Area Express Facility**
 LOCATION: **2223 G Street, Fresno, California**
 PROJECT NUMBER: **2270445501**

DRILLING: STARTED **9/25/18** COMPLETED: **9/25/18**
 INSTALLATION: STARTED **9/25/18** COMPLETED: **9/25/18**
 DRILLING COMPANY: **Technicon Engineering Services, Inc.**
 DRILLING EQUIPMENT: **CME 65**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

B3 PAGE 2 OF 3



NORTHING (ft):
 LATITUDE: **36° 44' 34.55"**
 GROUND ELEV (ft): **286**
 INITIAL DTW (ft): **NE**
 STATIC DTW (ft): **NE**
 WELL CASING DIAMETER (in): **---**
 LOGGED BY: **J. Sargent**

EASTING (ft):
 LONGITUDE: **119° 48' 31.64"**
 TOC ELEV (ft):
 BOREHOLE DEPTH (ft): **51.5**
 WELL DEPTH (ft): **---**
 BOREHOLE DIAMETER (in): **6**
 CHECKED BY: **J. Fischer**

GEO FORM 304 FAX BORING LOGS_FINAL.GPJ SECOR INTL_GDT 10/19/18

| Time & Depth (feet) | Graphic Log | USCS | Description | Sample | Time Sample ID | Geotechnical Lab Testing | Blow Count | PID Reading (ppmv) | Depth (feet) | Borehole Backfill |
|---------------------|-------------|------|--|--------|----------------|--------------------------|----------------|--------------------|--------------|-------------------|
| | | SW | WELL GRADED SAND ; SW; 10YR 6/2 light brownish gray; 95% fine to coarse grained sand; 5% fines; moist; loose; no staining; no odor. | | B3-25' | | 3 4 6 | | | |
| 30 | | CL | SANDY CLAY ; CL; 10YR 6/2 light brownish gray; <5% coarse grained sand; 30% very fine to fine grained sand; 70% medium plasticity fines; moist; hard; no staining; no odor (PP = 3.75 TSF). | | B3-30' | | 3 15 37 | | 30 | |
| 35 | | SM | SILTY SAND ; SM; 10YR 4/6 dark yellowish brown; 65% very fine to medium grained sand; 35% fines; moist; dense; no staining; no odor. | | B3-35' | | 12 23 21 | | 35 | |
| 40 | | | <5% fine rounded gravel; 75% fine to coarse grained sand; 25% fines; medium dense below 40 feet. | | B3-40' | | 9 12 13 | | 40 | |
| 45 | | SM | SILTY SAND WITH GRAVEL ; SM; 10YR 4/6 dark yellowish brown; 15% fine gravel; 65% fine to coarse grained sand; 20% fines; moist; dense; no staining; no odor. | | B3-45' | | 8 10 25 | | 45 | |
| | | | | | | | | | | |

← Backfilled with soil cuttings

PROJECT: **Fresno Area Express Facility**
 LOCATION: **2223 G Street, Fresno, California**
 PROJECT NUMBER: **2270445501**

DRILLING: STARTED **9/25/18** COMPLETED: **9/25/18**
 INSTALLATION: STARTED **9/25/18** COMPLETED: **9/25/18**
 DRILLING COMPANY: **Technicon Engineering Services, Inc.**
 DRILLING EQUIPMENT: **CME 65**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING EQUIPMENT: **Split Spoon**




WELL / TEST PIT / BOREHOLE NO:

B3 PAGE 3 OF 3



NORTHING (ft):
 LATITUDE: **36° 44' 34.55"**
 GROUND ELEV (ft): **286**
 INITIAL DTW (ft): **NE**
 STATIC DTW (ft): **NE**
 WELL CASING DIAMETER (in): **---**
 LOGGED BY: **J. Sargent**

EASTING (ft):
 LONGITUDE: **119° 48' 31.64"**
 TOC ELEV (ft):
 BOREHOLE DEPTH (ft): **51.5**
 WELL DEPTH (ft): **---**
 BOREHOLE DIAMETER (in): **6**
 CHECKED BY: **J. Fischer**

| Time & Depth (feet) | Graphic Log | USCS | Description | Sample | Time Sample ID | Geotechnical Lab Testing | Blow Count | PID Reading (ppmv) | Depth (feet) | Borehole Backfill |
|---------------------|---|------|---|---|----------------|--------------------------|----------------|--------------------|--------------|---|
| |  | SM | SILTY SAND ; SM; 2.5Y 5/3 light olive brown; 70% very fine to fine grained sand; 30% fines; moist; dense; no staining; no odor. Hole terminated at 51.5 feet. |  | B3-50' | | 17 26 18 | | |  ← Backfilled with soil cuttings |
| 55 | | | | | | | | | 55 | |
| 60 | | | | | | | | | 60 | |
| 65 | | | | | | | | | 65 | |
| 70 | | | | | | | | | 70 | |

PROJECT: **Fresno Area Express Facility**
 LOCATION: **2223 G Street, Fresno, California**
 PROJECT NUMBER: **2270445501**

DRILLING: STARTED **9/24/18** COMPLETED: **9/24/18**
 INSTALLATION: STARTED **9/24/18** COMPLETED: **9/24/18**
 DRILLING COMPANY: **Technicon Engineering Services, Inc.**
 DRILLING EQUIPMENT: **CME 65**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

B4 PAGE 1 OF 1



NORTHING (ft):
 LATITUDE: **36° 44' 35.72"**
 GROUND ELEV (ft): **286**
 INITIAL DTW (ft): **NE**
 STATIC DTW (ft): **NE**
 WELL CASING DIAMETER (in): **---**
 LOGGED BY: **J. Sargent**

EASTING (ft):
 LONGITUDE: **119° 48' 29.9"**
 TOC ELEV (ft):
 BOREHOLE DEPTH (ft): **11.5**
 WELL DEPTH (ft): **---**
 BOREHOLE DIAMETER (in): **6**
 CHECKED BY: **J. Fischer**

| Time & Depth (feet) | Graphic Log | USCS | Description | Sample | Time Sample ID | Geotechnical Lab Testing | Blow Count | PID Reading (ppmv) | Depth (feet) | Borehole Backfill |
|---------------------|-------------|------|---|--------|----------------|--------------------------|-------------|--------------------|--------------|-------------------|
| | | | 4" AC 5" AB | | | | | | | |
| | | SM | QUATERNARY ALLUVIAL FAN DEPOSITS (Qf) SILTY SAND ; SM; 10YR 4/4 dark yellowish brown; 3% coarse grained sand; 77% fine to medium grained sand; 20% fines; moist; no staining; no odor. | | B4-2' | SA | | | | |
| 5 | | | Loose below 5 feet. | | B4-5' | MD | 3 6 9 | | 5 | |
| | | | Medium dense below 7 feet | | B4-7' | | 4 4 6 | | | |
| 10 | | | 60% very fine to fine grained sand; 40% fines; very dense below 10 feet. | | B4-10' | MD | 18 50-5" | | 10 | |
| | | | Hole terminated at 11.5 feet. | | | | | | | |
| 15 | | | | | | | | | 15 | |
| 20 | | | | | | | | | 20 | |

Backfilled with soil cuttings

PROJECT: **Fresno Area Express Facility**
 LOCATION: **2223 G Street, Fresno, California**
 PROJECT NUMBER: **2270445501**

DRILLING: STARTED **9/24/18** COMPLETED: **9/24/18**
 INSTALLATION: STARTED **9/24/18** COMPLETED: **9/24/18**
 DRILLING COMPANY: **Technicon Engineering Services, Inc.**
 DRILLING EQUIPMENT: **CME 65**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

B5 PAGE 1 OF 1



NORTHING (ft):
 LATITUDE: **36° 44' 36.56"**
 GROUND ELEV (ft): **288**
 INITIAL DTW (ft): **NE**
 STATIC DTW (ft): **NE**
 WELL CASING DIAMETER (in): **---**
 LOGGED BY: **J. Sargent**

EASTING (ft):
 LONGITUDE: **119° 48' 29.32"**
 TOC ELEV (ft):
 BOREHOLE DEPTH (ft): **11.5**
 WELL DEPTH (ft): **---**
 BOREHOLE DIAMETER (in): **6**
 CHECKED BY: **J. Fischer**

| Time & Depth (feet) | Graphic Log | USCS | Description | Sample | Time Sample ID | Geotechnical Lab Testing | Blow Count | PID Reading (ppmv) | Depth (feet) | Borehole Backfill |
|---------------------|-------------|------|--|--------|----------------|--------------------------|------------------|--------------------|--------------|-------------------------------|
| | | | 5" AC | | | | | | | |
| | | | 6" AB | | | | | | | |
| | | | ARTIFICIAL FILL (Af) | | B5-Bulk | CORR, R-VALUE | | | | |
| | | SM | SILTY SAND ; SM; 10YR 4/4 dark yellowish brown; 3% fine to coarse gravel; 74% fine grained sand; 23% fines; moist; no staining; no odor; minor brick fragments. | | B5-2' | SA | | | | |
| 5 | | SM | QUATERNARY ALLUVIAL FAN DEPOSITS (Qf) SILTY SAND ; SM; 10YR 4/4 dark yellowish brown; 3% fine to coarse gravel; 74% fine grained sand; 23% fines; moist; loose; no staining; no odor. 4% fine to coarse gravel; 81% fine to medium grained sand; 15% fines; medium dense below 7 feet. | | B5-5' | DS | 2 3 4 | | 5 | |
| | | | | | B5-7' | SA | 5 6 6 | | | |
| 10 | | | 60% very fine to fine grained sand; 40% fines; very dense below 10 feet | | B5-10' | MD | 6 33 50-2" | | 10 | Backfilled with soil cuttings |
| 15 | | CL | SANDY CLAY ; CL; 10YR 5/4 yellowish brown; 40% very fine to fine grained sand; 60% low to medium plasticity fines; moist; very stiff (PP = 3.25 TSF). | | B5-15' | | 8 10 12 | | 15 | |
| 20 | | SP | POORLY GRADED SAND ; SP; 2.5Y 6/4 light yellowish brown; 95% fine to medium grained sand; 5% fines; moist; medium dense. | | B5-20' | MD | 7 10 11 | | 20 | |
| | | | Hole terminated at 21.5 feet. | | | | | | | |

PROJECT: **Fresno Area Express Facility**
 LOCATION: **2223 G Street, Fresno, California**
 PROJECT NUMBER: **2270445501**

DRILLING: STARTED **9/25/18** COMPLETED: **9/25/18**
 INSTALLATION: STARTED **9/25/18** COMPLETED: **9/25/18**
 DRILLING COMPANY: **Technicon Engineering Services, Inc.**
 DRILLING EQUIPMENT: **CME 65**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

B6 PAGE 1 OF 2



NORTHING (ft):
 LATITUDE: **36° 44' 33.58"**
 GROUND ELEV (ft): **286**
 INITIAL DTW (ft): **NE**
 STATIC DTW (ft): **NE**
 WELL CASING DIAMETER (in): **---**
 LOGGED BY: **J. Sargent**

EASTING (ft):
 LONGITUDE: **119° 48' 31.75"**
 TOC ELEV (ft):
 BOREHOLE DEPTH (ft): **31.5**
 WELL DEPTH (ft): **---**
 BOREHOLE DIAMETER (in): **6**
 CHECKED BY: **J. Fischer**

| Time & Depth (feet) | Graphic Log | USCS | Description | Sample | Time Sample ID | Geotechnical Lab Testing | Blow Count | PID Reading (ppmv) | Depth (feet) | Borehole Backfill |
|---------------------|-------------|------|---|--------|----------------|--------------------------|---------------|--------------------|--------------|---------------------------------|
| | | | 5" AC | | | | | | | |
| | | | 4" AB | | | | | | | |
| | | SM | QUATERNARY ALLUVIAL FAN DEPOSITS (Qf) SILTY SAND ; SM; 10YR 4/4 dark yellowish brown; 70% fine to medium grained sand; 30% fines; moist; no staining; no odor. | | B6-2' | | | | | |
| 5 | | | Loose below 5 feet. | | B6-5' | | 5 4 3 | | 5 | |
| | | | 80% fine to medium grained sand; 20% fines; loose below 7 feet. | | B6-7' | DS | 4 5 6 | | | |
| 10 | | | 10YR 5/6 strong brown; 65% very fine to fine grained sand; 35% fines; very dense below 10 feet. | | B6-10' | | 5 44 42 | | 10 | |
| 15 | | CL | SANDY CLAY ; CL; 2.5Y 5/3 light olive brown; 44% very fine to fine grained sand; 56% medium to high plasticity fines; moist; hard; no staining; no odor (PP = 5.0 TSF). | | B6-15' | #200, AL, MD | 25 50-4" | | 15 | ← Backfilled with soil cuttings |
| 20 | | | Stiff; reduction in fines plasticity; some mottling; minor iron oxide staining below 20 feet (PP = 1.75 TSF). | | B6-20' | | 5 4 5 | | 20 | |

PROJECT: **Fresno Area Express Facility**
 LOCATION: **2223 G Street, Fresno, California**
 PROJECT NUMBER: **2270445501**






DRILLING: STARTED **9/25/18** COMPLETED: **9/25/18**
 INSTALLATION: STARTED **9/25/18** COMPLETED: **9/25/18**
 DRILLING COMPANY: **Technicon Engineering Services, Inc.**
 DRILLING EQUIPMENT: **CME 65**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

B6 PAGE 2 OF 2



NORTHING (ft): EASTING (ft):
 LATITUDE: **36° 44' 33.58"** LONGITUDE: **119° 48' 31.75"**
 GROUND ELEV (ft): **286** TOC ELEV (ft):
 INITIAL DTW (ft): **NE** BOREHOLE DEPTH (ft): **31.5**
 STATIC DTW (ft): **NE** WELL DEPTH (ft): **---**
 WELL CASING DIAMETER (in): **---** BOREHOLE DIAMETER (in): **6**
 LOGGED BY: **J. Sargent** CHECKED BY: **J. Fischer**

| Time & Depth (feet) | Graphic Log | USCS | Description | Sample | Time Sample ID | Geotechnical Lab Testing | Blow Count | PID Reading (ppmv) | Depth (feet) | Borehole Backfill |
|---------------------|---|-------|---|---|----------------|--------------------------|---------------|--------------------|--------------|---|
| |  | | Very stiff below 25 feet (PP = 1.5 TSF) |  | B6-25' | | 4 8 13 | | |  |
| 30 | | | Hard below 30 feet. |  | B6-30' | | 7 19 26 | | 30 | |
| |  | SP-SM | POORLY GRADED SAND WITH SILT ; SP-SM; 2.5Y 5/3 light olive brown; 90% very fine to fine grained sand; 10% fines; moist; dense; no staining; no odor. Hole terminated at 31.5 feet. | | | | | | | |
| 35 | | | | | | | | | 35 | |
| 40 | | | | | | | | | 40 | |
| 45 | | | | | | | | | 45 | |

PROJECT: **Fresno Area Express Facility**
 LOCATION: **2223 G Street, Fresno, California**
 PROJECT NUMBER: **2270445501**

DRILLING: STARTED **9/24/18** COMPLETED: **9/24/18**
 INSTALLATION: STARTED **9/24/18** COMPLETED: **9/24/18**
 DRILLING COMPANY: **Technicon Engineering Services, Inc.**
 DRILLING EQUIPMENT: **CME 65**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

B7 PAGE 1 OF 2



NORTHING (ft):
 LATITUDE: **36° 44' 34"**
 GROUND ELEV (ft): **284**
 INITIAL DTW (ft): **NE**
 STATIC DTW (ft): **NE**
 WELL CASING DIAMETER (in): ---
 LOGGED BY: **J. Sargent**

EASTING (ft):
 LONGITUDE: **119° 48' 29.87"**
 TOC ELEV (ft):
 BOREHOLE DEPTH (ft): **31.5**
 WELL DEPTH (ft): ---
 BOREHOLE DIAMETER (in): **6**
 CHECKED BY: **J. Fischer**

| Time & Depth (feet) | Graphic Log | USCS | Description | Sample | Time Sample ID | Geotechnical Lab Testing | Blow Count | PID Reading (ppmv) | Depth (feet) | Borehole Backfill |
|---------------------|-------------|------|---|--------|----------------|--------------------------|----------------|--------------------|--------------|---------------------------------|
| | | | 3" AC 9" AB | | | | | | | |
| | | SM | QUATERNARY ALLUVIAL FAN DEPOSITS (Qf) SILTY SAND ; SM; 10YR 4/4 dark yellowish brown; 4% fine gravel; 82% fine to medium grained sand; 14% fines; moist; no staining; no odor. | | B7-2' | SA | | | | |
| 5 | | | 10% fine rounded gravel; 65% fine to medium grained sand; 25% fines; medium dense below 5 feet | | B7-5' | MD | 14 11 7 | | 5 | |
| | | | 80% very fine to fine grained sand; 20% fines; very dense below 7 feet. | | B7-7' | | 12 27 32 | | | |
| 10 | | | 65% very fine to fine grained sand; 35% fines. | | B7-10' | MD | 9 32 35 | | 10 | |
| 15 | | SP | POORLY GRADED SAND ; SP; 10YR 6/3 pale brown; 95% fine grained sand; 5% fines; moist; medium dense; no staining; no odor. | | B7-15' | | 8 7 9 | | 15 | ← Backfilled with soil cuttings |
| 20 | | SW | WELL GRADED SAND ; SW; 10YR 5/4 yellowish brown; 95% fine to coarse grained sand; 5% fines; moist. medium dense; no staining; no odor. | | B7-20' | MD | 7 16 20 | | 20 | |

PROJECT: **Fresno Area Express Facility**
 LOCATION: **2223 G Street, Fresno, California**
 PROJECT NUMBER: **2270445501**

DRILLING: STARTED **9/24/18** COMPLETED: **9/24/18**
 INSTALLATION: STARTED **9/24/18** COMPLETED: **9/24/18**
 DRILLING COMPANY: **Technicon Engineering Services, Inc.**
 DRILLING EQUIPMENT: **CME 65**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

B7 PAGE 2 OF 2



NORTHING (ft):
 LATITUDE: **36° 44' 34"**
 GROUND ELEV (ft): **284**
 INITIAL DTW (ft): **NE**
 STATIC DTW (ft): **NE**
 WELL CASING DIAMETER (in): **---**
 LOGGED BY: **J. Sargent**

EASTING (ft):
 LONGITUDE: **119° 48' 29.87"**
 TOC ELEV (ft):
 BOREHOLE DEPTH (ft): **31.5**
 WELL DEPTH (ft): **---**
 BOREHOLE DIAMETER (in): **6**
 CHECKED BY: **J. Fischer**

| Time & Depth (feet) | Graphic Log | USCS | Description | Sample | Time Sample ID | Geotechnical Lab Testing | Blow Count | PID Reading (ppmv) | Depth (feet) | Borehole Backfill |
|---------------------|-------------|-------|---|--------|----------------|--------------------------|---------------|--------------------|--------------|-------------------|
| | | SP-SM | POORLY GRADED SAND WITH SILT ; SP-SM; 10YR 6/3 pale brown; 85% fine grained sand; 15% fines; moist; loose; no staining; no odor. | | B7-25' | | 4 5 5 | | | |
| 30 | | CL | SANDY CLAY ; CL; 2.5Y 5/2 grayish brown; 40% very fine to fine grained sand; 60% medium plasticity fines; moist; hard; no staining; no odor (PP = 3.5 TSF). Hole terminated at 31.5 feet. | | B7-30' | | 6 29 30 | | 30 | |
| 35 | | | | | | | | | 35 | |
| 40 | | | | | | | | | 40 | |
| 45 | | | | | | | | | 45 | |

PROJECT: **Fresno Area Express Facility**
 LOCATION: **2223 G Street, Fresno, California**
 PROJECT NUMBER: **2270445501**

DRILLING: STARTED **9/24/18** COMPLETED: **9/24/18**
 INSTALLATION: STARTED **9/24/18** COMPLETED: **9/24/18**
 DRILLING COMPANY: **Technicon Engineering Services, Inc.**
 DRILLING EQUIPMENT: **CME 65**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

B8 PAGE 1 OF 1



NORTHING (ft):
 LATITUDE: **36° 44' 33.95"**
 GROUND ELEV (ft): **287**
 INITIAL DTW (ft): **NE**
 STATIC DTW (ft): **NE**
 WELL CASING DIAMETER (in): **---**
 LOGGED BY: **J. Sargent**

EASTING (ft):
 LONGITUDE: **119° 48' 26.87"**
 TOC ELEV (ft):
 BOREHOLE DEPTH (ft): **21.5**
 WELL DEPTH (ft): **---**
 BOREHOLE DIAMETER (in): **6**
 CHECKED BY: **J. Fischer**

| Time & Depth (feet) | Graphic Log | USCS | Description | Sample | Time Sample ID | Geotechnical Lab Testing | Blow Count | PID Reading (ppmv) | Depth (feet) | Borehole Backfill |
|---------------------|-------------|-------|--|--------|----------------|--------------------------|-------------------|--------------------|--------------|---------------------------------|
| | | | 5" AC | | | | | | | |
| | | SM | QUATERNARY ALLUVIAL FAN DEPOSITS (Qf) SILTY SAND ; SM; 10YR 4/4 dark yellowish brown; 86% fine to medium grained sand; 14% fines; moist; no staining; no odor. | | B8-2' | SA | | | | |
| 5 | | SP-SM | POORLY GRADED SAND WITH SILT ; SP-SM; 2.5Y 6/4 light yellowish brown; 90% very fine to fine grained sand; 10% fines; moist; loose; no staining; no odor. Dense below 7 feet. | | B8-5' | SA | 2 3 2 | | 5 | |
| | | | | | B8-7' | MD | 11 10 30 | | | |
| 10 | | SC | CLAYEY SAND ; SC; 10YR 4/6 dark yellowish brown; 60% very fine to fine grained sand; 40% medium to high plasticity fines; moist; very dense; no staining; no odor. | | B8-10' | | 14 14 50-5" | | 10 | ← Backfilled with soil cuttings |
| 15 | | SP-SM | POORLY GRADED SAND WITH SILT ; SP-SM; 10YR 6/2 light brownish gray; 85% very fine to fine grained sand; 15% fines; moist; very dense; no staining; no odor. | | B8-15' | MD | 13 29 27 | | 15 | |
| 20 | | SM | SILTY SAND ; SM; 2.5Y 5/4 light olive brown; 60% very fine grained sand; 40% fines; moist; loose ; no staining; no odor. | | B8-20' | | 4 6 6 | | 20 | |
| | | | Hole terminated at 21.5 feet. | | | | | | | |

PROJECT: **Fresno Area Express Facility**
 LOCATION: **2223 G Street, Fresno, California**
 PROJECT NUMBER: **2270445501**

DRILLING: STARTED **9/25/18** COMPLETED: **9/25/18**
 INSTALLATION: STARTED **9/25/18** COMPLETED: **9/25/18**
 DRILLING COMPANY: **Technicon Engineering Services, Inc.**
 DRILLING EQUIPMENT: **CME 65**
 DRILLING METHOD: **Hollow Stem Auger**
 SAMPLING EQUIPMENT: **Split Spoon**

WELL / TEST PIT / BOREHOLE NO:

B9 PAGE 1 OF 1



NORTHING (ft):
 LATITUDE: **36° 44' 34.18"**
 GROUND ELEV (ft): **287**
 INITIAL DTW (ft): **NE**
 STATIC DTW (ft): **NE**
 WELL CASING DIAMETER (in): **---**
 LOGGED BY: **J. Sargent**

EASTING (ft):
 LONGITUDE: **119° 48' 25.74"**
 TOC ELEV (ft):
 BOREHOLE DEPTH (ft): **21.5**
 WELL DEPTH (ft): **---**
 BOREHOLE DIAMETER (in): **6**
 CHECKED BY: **J. Fischer**

| Time & Depth (feet) | Graphic Log | USCS | Description | Sample | Time Sample ID | Geotechnical Lab Testing | Blow Count | PID Reading (ppmv) | Depth (feet) | Borehole Backfill |
|---------------------|-------------|------|---|--------|----------------|--------------------------|---------------|--------------------|--------------|-------------------|
| | | | 8" AC | | | | | | | |
| | | | 6" AB | | | | | | | |
| | | SM | QUATERNARY ALLUVIAL FAN DEPOSITS (Qf) SILTY SAND ; SM; 7.5YR 4/6 strong brown; 83% very fine to fine grained sand; 17% fines; moist; no staining; no odor. | | B9-Bulk | CORR | | | | |
| | | | | | B9-2' | SA | | | | |
| 5 | | | 75% very fine to fine grained sand; 25% fines; loose below 5 feet. | | B9-5' | SA | 6 7 8 | | 5 | |
| | | | Very dense below 7 feet. | | B9-7' | | 24 50-2" | | | |
| 10 | | | | | B9-10' | MD | 18 50-2" | | 10 | |
| | | SC | CLAYEY SAND ; SC; 10YR 6/3 pale brown; 60% very fine to fine grained sand; 40% medium plasticity fines; moist; very dense; no staining; no odor. | | B9-15' | | 9 28 30 | | 15 | |
| 15 | | | | | B9-20' | MD | 9 15 19 | | 20 | |
| 20 | | | Medium dense below 20 feet. | | | | | | | |
| | | | Hole terminated at 21.5 feet. | | | | | | | |

Backfilled with soil cuttings

APPENDIX B

LABORATORY TEST RESULTS

SUMMARY OF SOIL DENSITY TEST RESULTS
ASTM D 2216

| Boring Location | Sample Depth (ft) | Wet Density (lb/ft³) | Dry Density (lb/ft³) | Moisture Content (percent) |
|------------------------|--------------------------|-----------------------------|-----------------------------|-----------------------------------|
| B2-15' | 15 | 120.4 | 114.4 | 5.2 |
| B3-10' | 10 | 120.3 | 111.9 | 7.6 |
| B3-20' | 20 | 87.4 | 85.8 | 1.8 |
| B4-5' | 5 | 123.4 | 117.7 | 4.9 |
| B4-10' | 10 | 128.4 | 116.3 | 10.5 |
| B5-10' | 10 | 117.6 | 114.3 | 2.9 |
| B5-20' | 20 | 105.3 | 98.5 | 6.9 |
| B6-15' | 15 | 130.0 | 113.4 | 14.6 |
| B7-5' | 5 | 116.3 | 111.6 | 4.2 |
| B7-10' | 10 | 117.4 | 107.2 | 9.5 |
| B7-20' | 20 | 107.1 | 99.7 | 7.4 |
| B8-7' | 7 | 118.9 | 114.6 | 3.7 |
| B8-15' | 15 | 117.8 | 108.2 | 8.8 |
| B9-10' | 10 | 113.9 | 109.7 | 3.9 |
| B9-20' | 20 | 105.2 | 100.8 | 4.4 |

APPENDIX/DIVIDER TITLE

Project Name FAX Facility Improvement Project
 Source Grab

 Project Number 2270445501

 Lab ID B2-2'

 Preparation Method ASTM D 1140 Method A

 Date Received 09-28-2018

 Preparation Date 09-28-2018

Particle Shape _____

 Test Date 09-29-2018

Particle Hardness _____

 Sample Dry Mass (g) 340.80

 Moisture Content (%) 4.7

Analysis based on total sample.

| Sieve Size | Grams Retained | % Retained | % Passing |
|------------|----------------|------------|-----------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| No. 4 | 1.00 | 0.3 | 99.7 |
| No. 8 | 12.90 | 3.8 | 95.9 |
| No. 16 | 36.10 | 10.6 | 85.3 |
| No. 30 | 53.20 | 15.6 | 69.7 |
| No. 50 | 58.60 | 17.2 | 52.5 |
| No. 100 | 68.30 | 20.0 | 32.5 |
| No. 200 | 39.40 | 11.6 | 20.9 |
| Pan | 71.30 | 20.9 | --- |

 % Gravel 0.3

 % Sand 78.8

 % Fines 20.9

 Fines Classification ML

 D₁₀ (mm) N/A

 D₃₀ (mm) N/A

 D₆₀ (mm) N/A

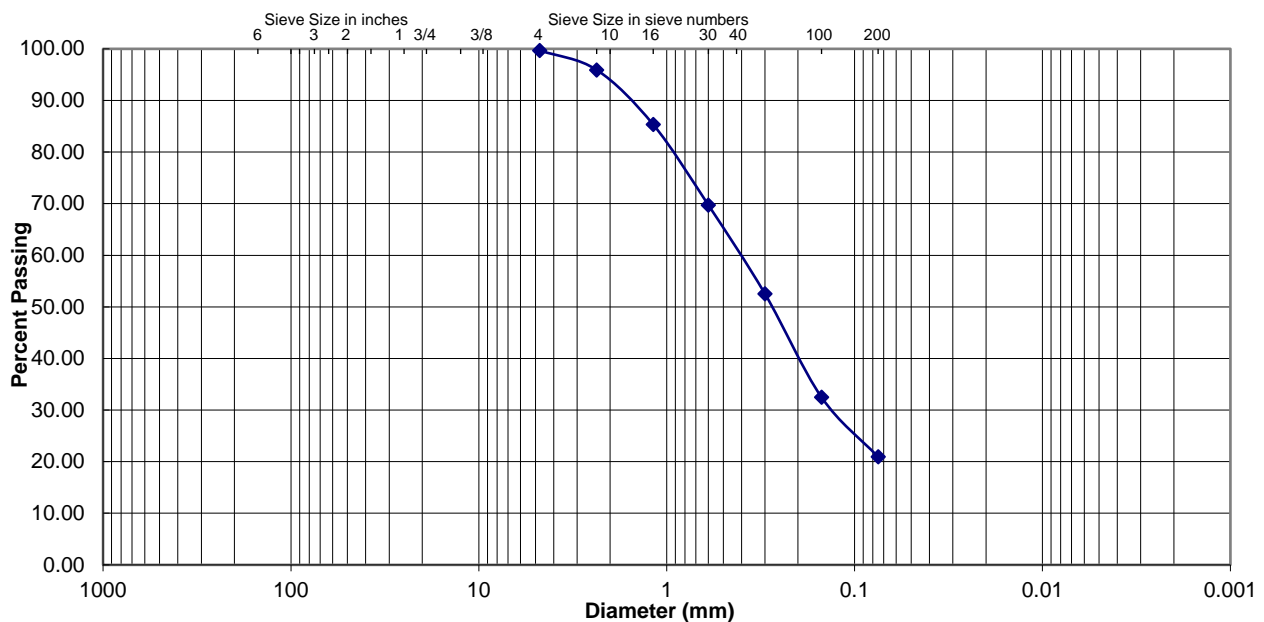
 Cu N/A

 Cc N/A

Classification

Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.

Particle Size Distribution


Comments _____

 Reviewed By JF

Project Name FAX Facility Improvement Project
 Source Grab

 Project Number 2270445501
 Lab ID B3-2'

 Preparation Method ASTM D 1140 Method A

 Date Received 09-28-2018

Particle Shape _____

 Preparation Date 09-28-2018

Particle Hardness _____

 Test Date 09-29-2018

 Sample Dry Mass (g) 314.10

Analysis based on total sample.

 Moisture Content (%) 4.1

| Sieve Size | Grams Retained | % Retained | % Passing |
|------------|----------------|------------|-----------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| No. 4 | 0.90 | 0.3 | 99.7 |
| No. 8 | 9.40 | 3.0 | 96.7 |
| No. 16 | 31.20 | 9.9 | 86.8 |
| No. 30 | 45.10 | 14.4 | 72.4 |
| No. 50 | 56.70 | 18.1 | 54.4 |
| No. 100 | 71.30 | 22.7 | 31.7 |
| No. 200 | 37.60 | 12.0 | 19.7 |
| Pan | 61.90 | 19.7 | --- |

 % Gravel 0.3
 % Sand 80.0
 % Fines 19.7
 Fines Classification ML

 D₁₀ (mm) N/A

 D₃₀ (mm) N/A

 D₆₀ (mm) N/A

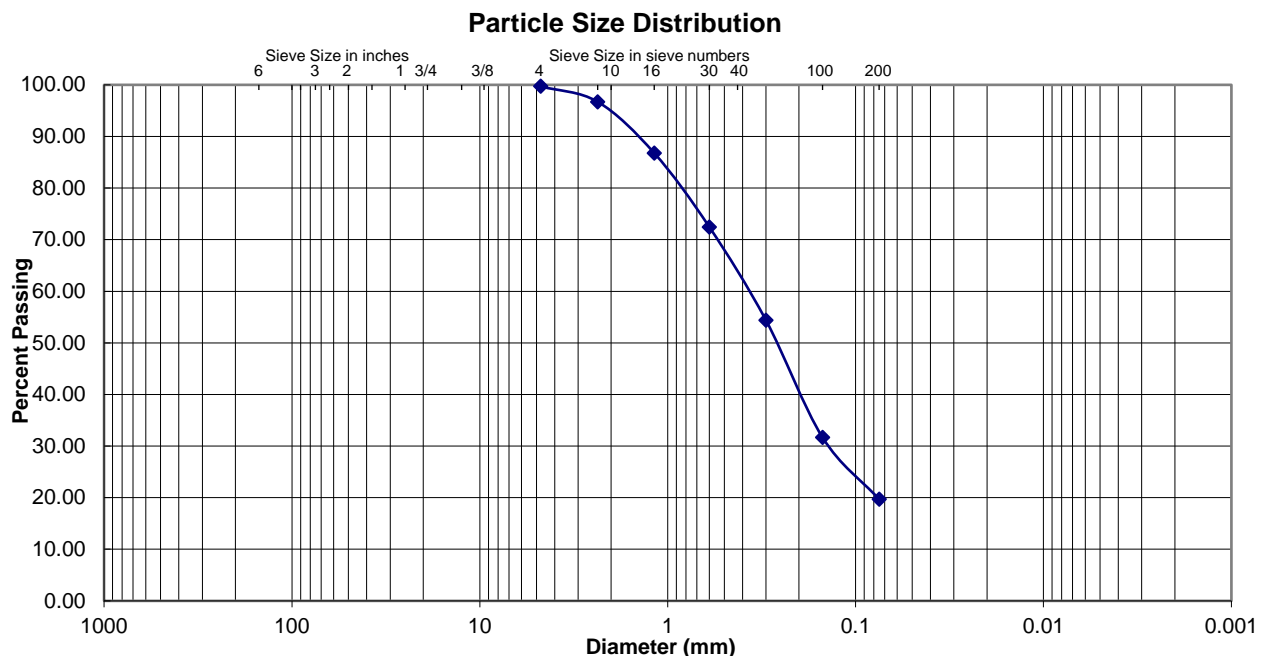
 Cu N/A

 Cc N/A

Classification

Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.



Comments _____

 Reviewed By JF

Gradation Analysis

ASTM D 422

Project Name FAX Facility Improvement Project
Source Grab

Project Number 2270445501

Lab ID B4-2'

Date Received 09-28-2018

Preparation Date 09-28-2018

Test Date 09-29-2018

Preparation Method ASTM D 1140 Method A

Particle Shape

Particle Hardness

| | |
|---------------------|--------|
| Sample Dry Mass (g) | 317.40 |
|---------------------|--------|

| | |
|----------------------|-----|
| Moisture Content (%) | 3.1 |
|----------------------|-----|

Analysis based on total sample.

| Sieve Size | Grams Retained | % Retained | % Passing |
|------------|----------------|------------|-----------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| 3/8" | 5.50 | 1.7 | 98.3 |
| No. 4 | 2.10 | 0.7 | 97.6 |
| No. 8 | 8.10 | 2.6 | 95.1 |
| No. 16 | 24.50 | 7.7 | 87.3 |
| No. 30 | 38.40 | 12.1 | 75.2 |
| No. 50 | 58.50 | 18.4 | 56.8 |
| No. 100 | 75.80 | 23.9 | 32.9 |
| No. 200 | 40.50 | 12.8 | 20.2 |
| Pan | 64.00 | 20.2 | --- |

| | |
|----------|-----|
| % Gravel | 2.4 |
|----------|-----|

| | |
|--------|-------------|
| % Sand | <u>77.4</u> |
|--------|-------------|

| | |
|---------|------|
| % Fines | 20.2 |
|---------|------|

| | |
|----------------------|----|
| Fines Classification | ML |
|----------------------|----|

| | |
|----------------------|-----|
| D ₁₀ (mm) | N/A |
|----------------------|-----|

| | |
|----------------------|-----|
| D ₃₀ (mm) | N/A |
|----------------------|-----|

| | |
|----------------------|-----|
| D ₆₀ (mm) | N/A |
|----------------------|-----|

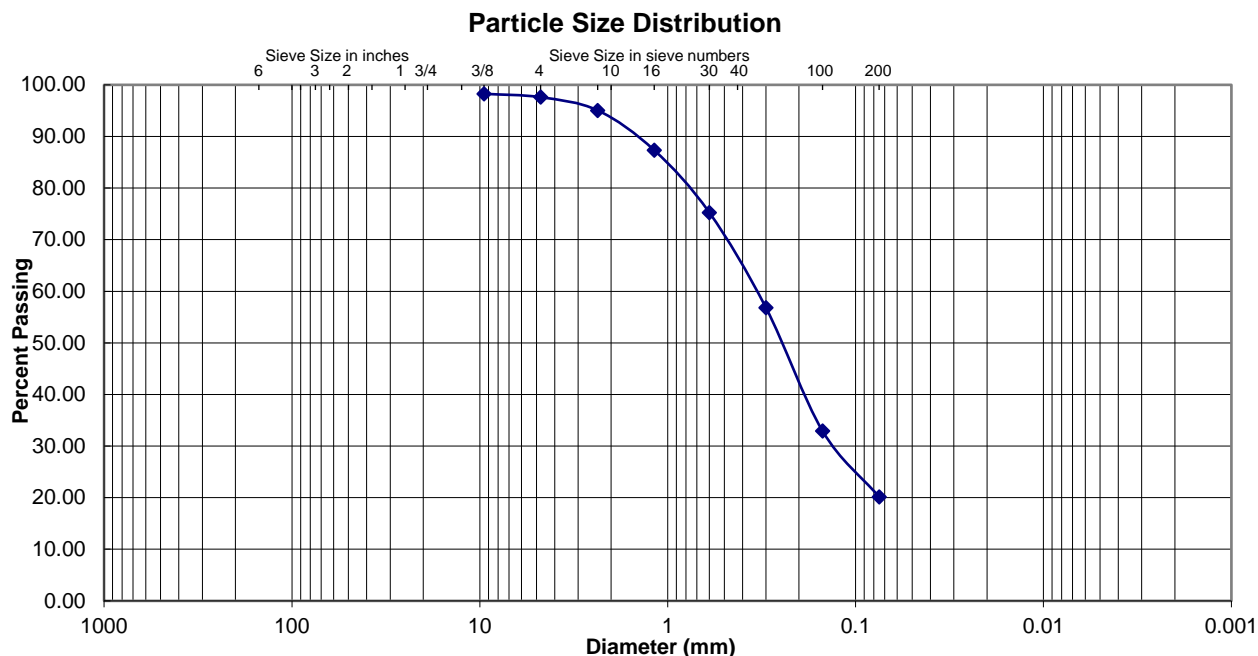
Cu N/A

Cc N/A

Classification

Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.



Comments

Reviewed By JF



Gradation Analysis

ASTM D 422

Project Name FAX Facility Improvement Project
Source Grab

Project Number 2270445501
Lab ID B5-2'
Date Received 09-28-2018
Preparation Date 09-28-2018
Test Date 09-29-2018

Preparation Method ASTM D 1140 Method A
Particle Shape _____
Particle Hardness _____
Sample Dry Mass (g) 297.20
Moisture Content (%) 4.8

Analysis based on total sample.

| Sieve Size | Grams Retained | % Retained | % Passing |
|------------|----------------|------------|-----------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| No. 4 | 8.00 | 2.7 | 97.3 |
| No. 8 | 8.40 | 2.8 | 94.5 |
| No. 16 | 17.70 | 6.0 | 88.5 |
| No. 30 | 34.70 | 11.7 | 76.9 |
| No. 50 | 58.40 | 19.7 | 57.2 |
| No. 100 | 64.30 | 21.6 | 35.6 |
| No. 200 | 36.90 | 12.4 | 23.1 |
| Pan | 68.80 | 23.1 | --- |

% Gravel 2.7
% Sand 74.2
% Fines 23.1
Fines Classification ML

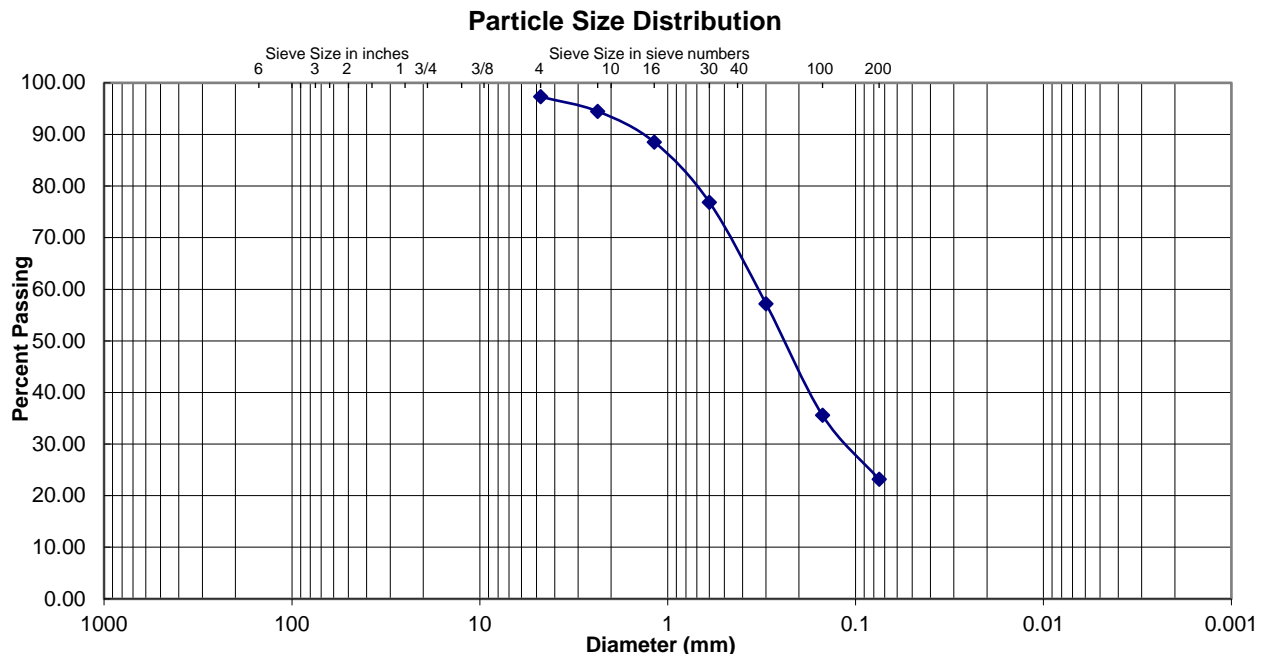
D₁₀ (mm) N/A
D₃₀ (mm) N/A
D₆₀ (mm) N/A

Cu N/A
Cc N/A

Classification

Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.



Comments _____

Reviewed By JF



Gradation Analysis

ASTM D 422

Project Name FAX Facility Improvement Project
Source SPT

Project Number 2270445501

Lab ID B5-7'

Date Received 09-28-2018

Preparation Date 09-28-2018

Test Date 09-29-2018

Preparation Method ASTM D 1140 Method A

Particle Shape _____

Particle Hardness _____

Sample Dry Mass (g) 318.80

Moisture Content (%) 4.1

Analysis based on total sample.

| Sieve Size | Grams Retained | % Retained | % Passing |
|------------|----------------|------------|-----------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| 3/8" | 5.40 | 1.7 | 98.3 |
| No. 4 | 7.10 | 2.2 | 96.1 |
| No. 8 | 9.40 | 2.9 | 93.1 |
| No. 16 | 19.60 | 6.1 | 87.0 |
| No. 30 | 29.40 | 9.2 | 77.8 |
| No. 50 | 59.00 | 18.5 | 59.3 |
| No. 100 | 90.00 | 28.2 | 31.0 |
| No. 200 | 51.40 | 16.1 | 14.9 |
| Pan | 47.50 | 14.9 | --- |

% Gravel 3.9

% Sand 81.2

% Fines 14.9

Fines Classification ML

D₁₀ (mm) N/A

D₃₀ (mm) N/A

D₆₀ (mm) N/A

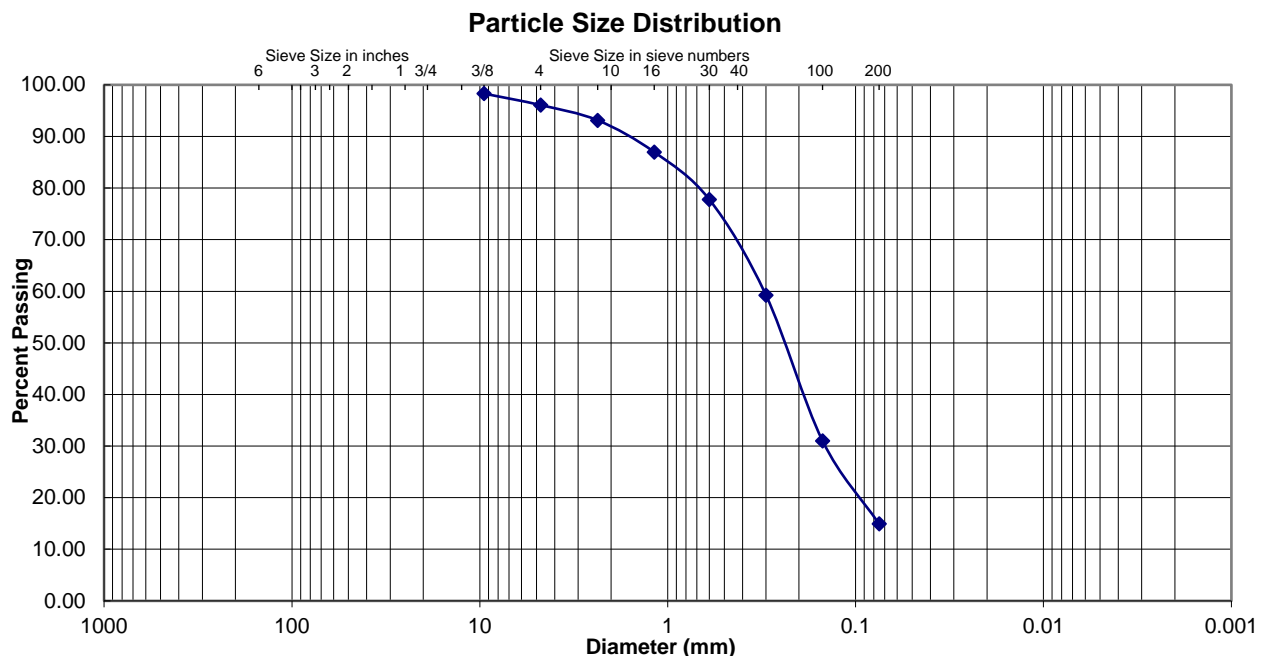
Cu N/A

Cc N/A

Classification

Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.



Comments _____

Reviewed By JF

Materials Finer Than 75µm (No. 200) Sieve

ASTM D 1140

Project Name FAX Facility Improvement Project
Source Mod Cal
Preparation Method ASTM D 1140 Method A

Project Number 2270445501
Lab ID B6-15'
Date Received 09-28-2018
Test Date 09-28-2018

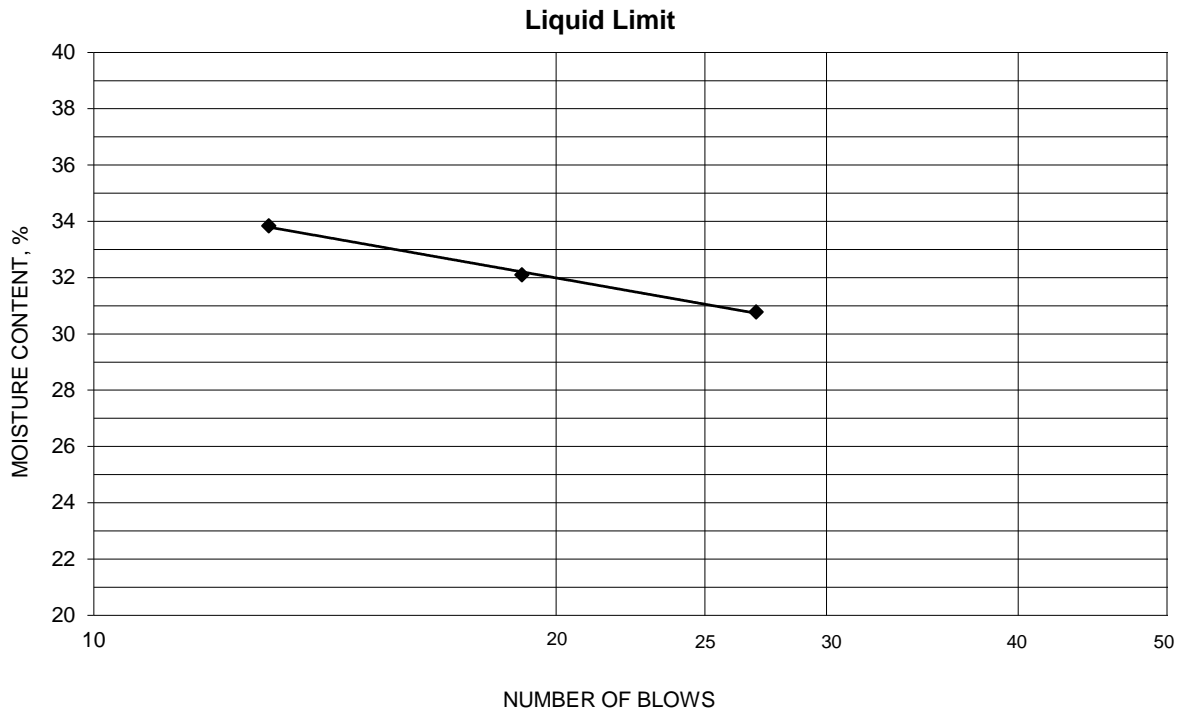
| | | | |
|---|---------------|----------------------|-------------|
| Initial Sample Wet Mass (g) | <u>321.70</u> | Moisture Content (%) | <u>18.7</u> |
| Initial Oven Dry Sample Mass (g) | <u>271.10</u> | | |
| Final Oven Dry Sample Mass (g) | <u>120.70</u> | | |
| Materials Finer Than 75µm (No. 200) Sieve (g) | <u>150.40</u> | | |
| Percent Finer Than 75µm (No. 200) Sieve (%) | <u>55.5</u> | | |

Comments

Reviewed By JF

| | | | |
|-----------|----------------------------------|---------------|-------------|
| Project | FAX Facility Improvement Project | Project No. | 2270445501 |
| Source | CM | Lab ID | B6-15' |
| Tested By | M.P. | Test Method | ASTM D 4318 |
| Test Date | 10-01-2018 | Prepared | Dry |
| | | Date Received | 09-28-2018 |

| Wet Soil and Tare Mass (g) | Dry Soil and Tare Mass (g) | Tare Mass (g) | Number of Blows | Water Content (%) | Liquid Limit |
|----------------------------|----------------------------|---------------|-----------------|-------------------|--------------|
| 19.94 | 18.45 | 13.61 | 27 | 30.8 | 31 |
| 21.21 | 19.38 | 13.68 | 19 | 32.1 | |
| 23.48 | 21.05 | 13.87 | 13 | 33.8 | |
| | | | | | |



PLASTIC LIMIT AND PLASTICITY INDEX

| Wet Soil and Tare Mass (g) | Dry Soil and Tare Mass (g) | Tare Mass (g) | Water Content (%) | Plastic Limit | Plasticity Index |
|----------------------------|----------------------------|---------------|-------------------|---------------|------------------|
| 22.91 | 21.33 | 13.47 | 20.1 | 20 | 11 |
| | | | | | |

Remarks: USCS = CL

Reviewed By JF

Gradation Analysis

ASTM D 422

Project Name FAX Facility Improvement Project
Source Grab

Project Number 2270445501

Lab ID B7-2'

Date Received 09-28-2018

| | |
|------------------|------------|
| Preparation Date | 09-28-2018 |
|------------------|------------|

Test Date 09-29-2018

Preparation Method ASTM D 1140 Method A

Particle Shape

Particle Hardness

| | |
|---------------------|--------|
| Sample Dry Mass (g) | 314.90 |
|---------------------|--------|

| | |
|----------------------|-----|
| Moisture Content (%) | 8.7 |
|----------------------|-----|

Analysis based on total sample.

| Sieve Size | Grams Retained | % Retained | % Passing |
|------------|----------------|------------|-----------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| 3/8" | 5.40 | 1.7 | 98.3 |
| No. 4 | 7.10 | 2.3 | 96.0 |
| No. 8 | 9.40 | 3.0 | 93.0 |
| No. 16 | 19.60 | 6.2 | 86.8 |
| No. 30 | 29.40 | 9.3 | 77.5 |
| No. 50 | 59.00 | 18.7 | 58.7 |
| No. 100 | 90.00 | 28.6 | 30.2 |
| No. 200 | 51.40 | 16.3 | 13.8 |
| Pan | 43.60 | 13.8 | --- |

| | |
|----------|-----|
| % Gravel | 4.0 |
|----------|-----|

| | |
|--------|------|
| % Sand | 82.2 |
|--------|------|

| | |
|---------|------|
| % Sand | 62.2 |
| % Fines | 13.8 |

| Fines Classification | ML |
|----------------------|----|
|----------------------|----|

| | |
|----------------------|-----|
| D ₁₀ (mm) | N/A |
|----------------------|-----|

| | |
|----------------------|-----|
| D ₃₀ (mm) | N/A |
|----------------------|-----|

| | |
|---------------|-----|
| D_{30} (mm) | N/A |
| D_{60} (mm) | N/A |

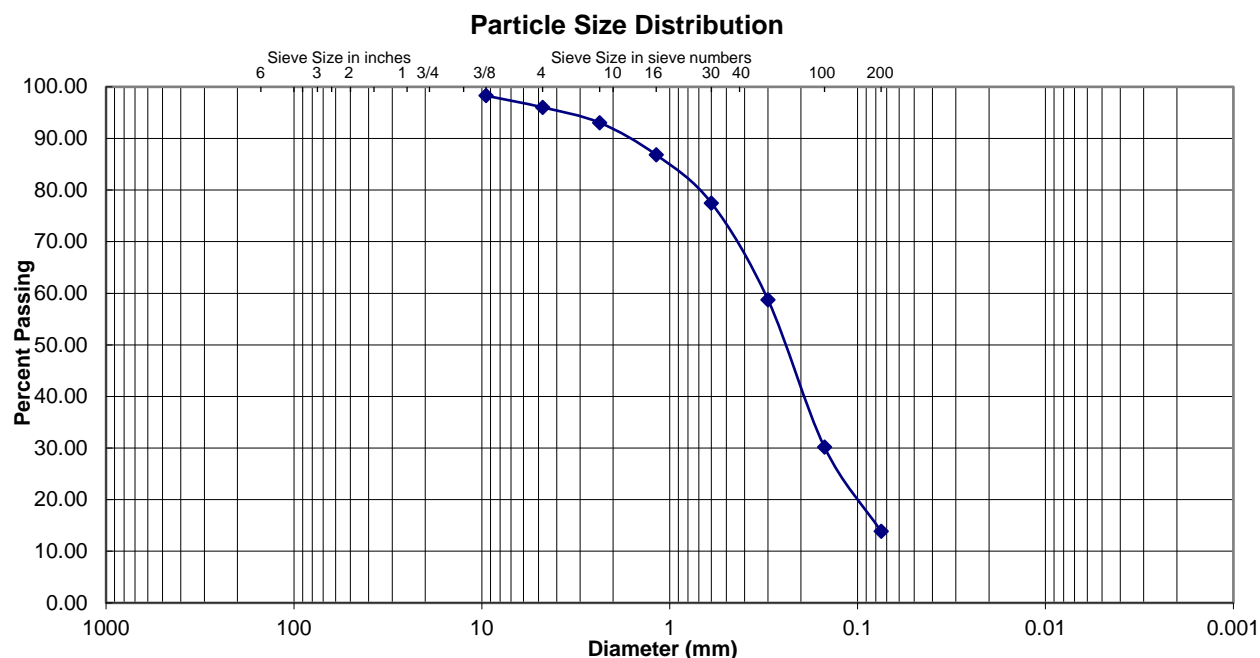
Cu N/A

Cc N/A

Classification

Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.



Comments

Reviewed By JF

Gradation Analysis

ASTM D 422

Project Name FAX Facility Improvement Project
Source Grab

Project Number 2270445501

Lab ID B8-2'

Date Received 09-28-2018

| | |
|------------------|------------|
| Preparation Date | 09-28-2018 |
|------------------|------------|

Test Date 09-29-2018

Preparation Method ASTM D 1140 Method A

Particle Shape Angular

| | |
|-------------------|------------------|
| Particle Hardness | Hard and Durable |
|-------------------|------------------|

| | |
|---------------------|--------|
| Sample Dry Mass (g) | 325.00 |
|---------------------|--------|

| | |
|----------------------|-----|
| Moisture Content (%) | 3.5 |
|----------------------|-----|

Analysis based on total sample.

| Sieve Size | Grams Retained | % Retained | % Passing |
|------------|----------------|------------|-----------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| No. 16 | 2.20 | 0.7 | 99.3 |
| No. 30 | 48.70 | 15.0 | 84.3 |
| No. 50 | 111.50 | 34.3 | 50.0 |
| No. 100 | 86.90 | 26.7 | 23.3 |
| No. 200 | 31.30 | 9.6 | 13.7 |
| Pan | 44.40 | 13.7 | --- |

| | |
|----------|-----|
| % Gravel | 0.0 |
|----------|-----|

| | |
|--------|-------------|
| % Sand | <u>86.3</u> |
|--------|-------------|

| | |
|---------|-------------|
| % Fines | <u>13.7</u> |
|---------|-------------|

| | |
|----------------------|----|
| Fines Classification | ML |
|----------------------|----|

| | |
|----------------------|-----|
| D ₁₀ (mm) | N/A |
|----------------------|-----|

| | |
|----------------------|-----|
| D ₃₀ (mm) | N/A |
|----------------------|-----|

| | |
|----------------------|-----|
| D ₆₀ (mm) | N/A |
|----------------------|-----|

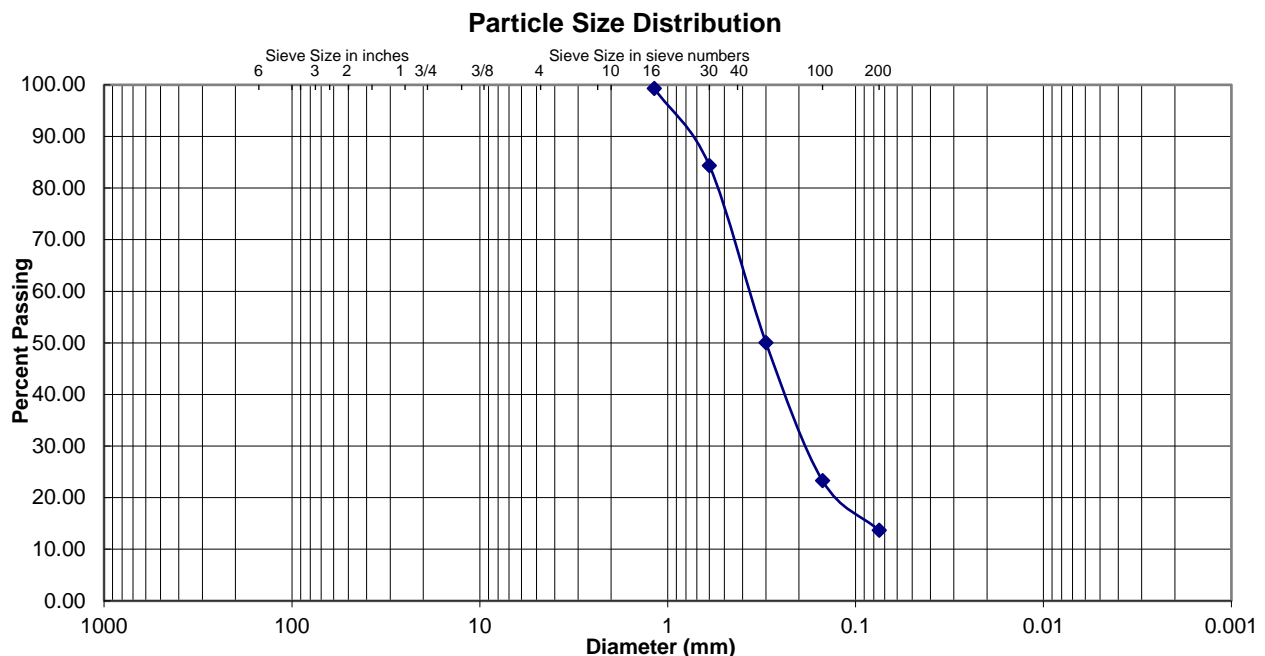
Cu N/A

Cc N/A

Classification

Silty Sand (SM)

Classification determined by ASTM D 2487. -200
material classification determined by visual assessment,
ASTM D 2488.



Comments _____

Reviewed By IF

Gradation Analysis

ASTM D 422

Project Name FAX Facility Improvement Project
Source SPT

Project Number 2270445501

Lab ID B8-5'

Date Received 09-28-2018

| | |
|------------------|------------|
| Preparation Date | 09-28-2018 |
|------------------|------------|

Test Date 09-29-2018

Preparation Method ASTM D 1140 Method A

Particle Shape

Particle Hardness

| | |
|---------------------|--------|
| Sample Dry Mass (g) | 261.90 |
|---------------------|--------|

| | |
|----------------------|-----|
| Moisture Content (%) | 3.3 |
|----------------------|-----|

Analysis based on total sample.

| Sieve Size | Grams Retained | % Retained | % Passing |
|------------|----------------|------------|-----------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| No. 16 | 1.90 | 0.7 | 99.3 |
| No. 30 | 40.10 | 15.3 | 84.0 |
| No. 50 | 92.90 | 35.5 | 48.5 |
| No. 100 | 74.90 | 28.6 | 19.9 |
| No. 200 | 27.00 | 10.3 | 9.6 |
| Pan | 25.10 | 9.6 | --- |

| | |
|----------|-----|
| % Gravel | 0.0 |
|----------|-----|

| | |
|--------|------|
| % Sand | 90.4 |
|--------|------|

| | |
|---------|-----|
| % Fines | 9.6 |
|---------|-----|

| | |
|----------------------|----|
| Fines Classification | ML |
|----------------------|----|

| | |
|----------------------|--------|
| D ₁₀ (mm) | 0.0771 |
|----------------------|--------|

| | |
|----------------------|--------|
| D ₃₀ (mm) | 0.1916 |
|----------------------|--------|

| | |
|----------------------|--------|
| D ₆₀ (mm) | 0.3757 |
|----------------------|--------|

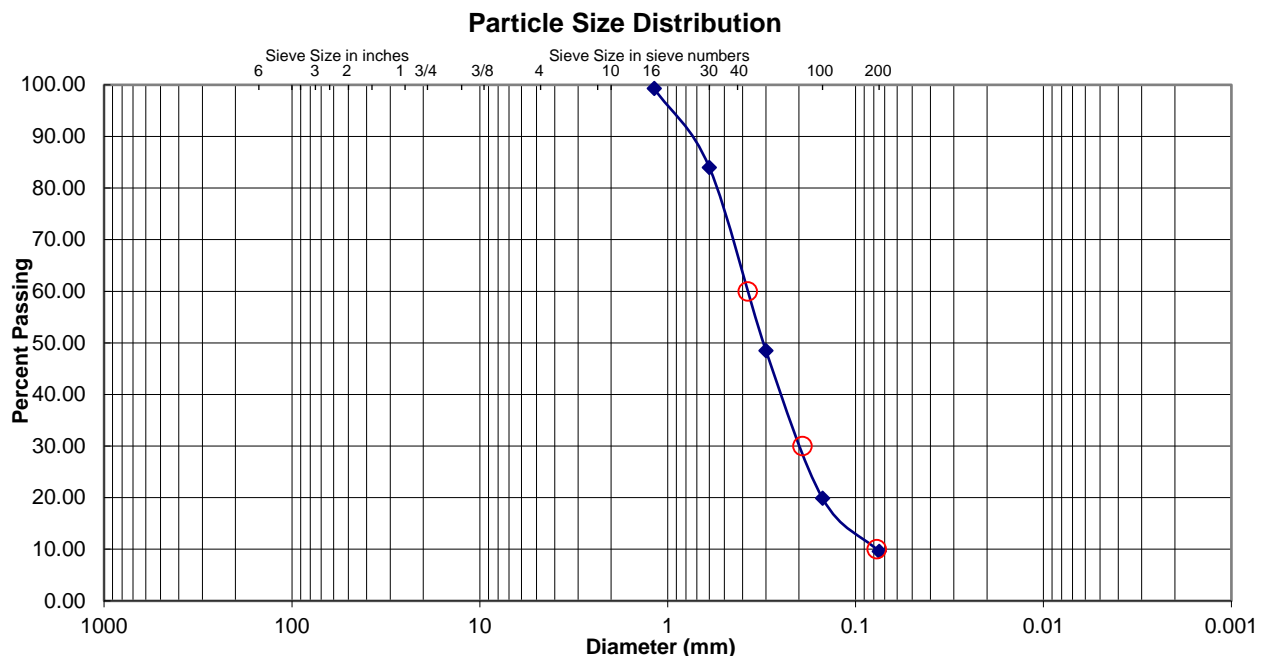
Cu 4.87

| | |
|----|------|
| Cc | 1.27 |
|----|------|

Classification

Poorly Graded Sand (SP-SM) with Silt

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.



Comments _____

Reviewed By JF

Project Name FAX Facility Improvement Project
 Source Grab

 Project Number 2270445501
 Lab ID B9-2'

 Preparation Method ASTM D 1140 Method A

 Date Received 09-28-2018

Particle Shape _____

 Preparation Date 09-28-2018

Particle Hardness _____

 Test Date 09-29-2018

 Sample Dry Mass (g) 419.80

Analysis based on total sample.

 Moisture Content (%) 3.8

| Sieve Size | Grams Retained | % Retained | % Passing |
|------------|----------------|------------|-----------|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| No. 4 | 1.70 | 0.4 | 99.6 |
| No. 8 | 0.50 | 0.1 | 99.5 |
| No. 16 | 2.00 | 0.5 | 99.0 |
| No. 30 | 49.80 | 11.9 | 87.1 |
| No. 50 | 141.50 | 33.7 | 53.4 |
| No. 100 | 113.90 | 27.1 | 26.3 |
| No. 200 | 40.60 | 9.7 | 16.6 |
| Pan | 69.80 | 16.6 | --- |

 % Gravel 0.4
 % Sand 83.0
 % Fines 16.6
 Fines Classification ML

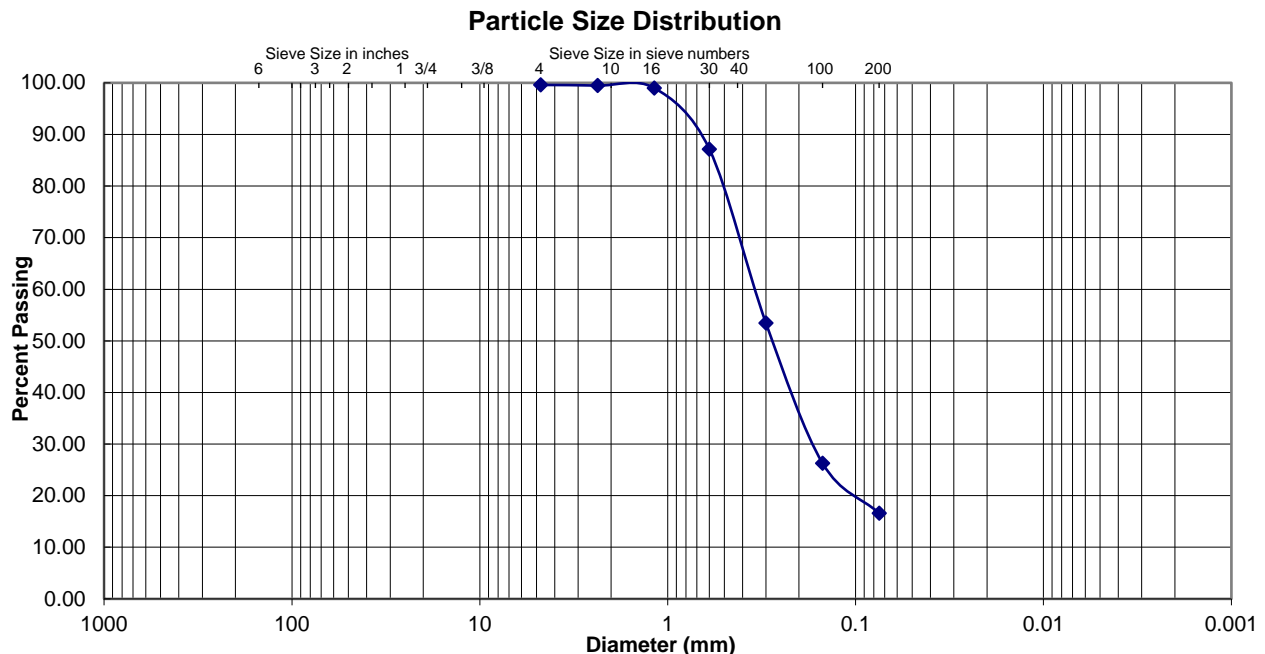
 D₁₀ (mm) N/A
 D₃₀ (mm) N/A
 D₆₀ (mm) N/A

 Cu N/A
 Cc N/A

Classification

Silty Sand (SM)

Classification determined by ASTM D 2487. -200 material classification determined by visual assessment, ASTM D 2488.



Comments _____

 Reviewed By JF



Compaction Characteristics of Soil
Using Modified Effort
ASTM D 1557 - Method B

Project FAX Maintenance facility
Source B2-Bulk (0-5')
Description Silty-Sand F-C SM Dark Brown
Visual Notes _____

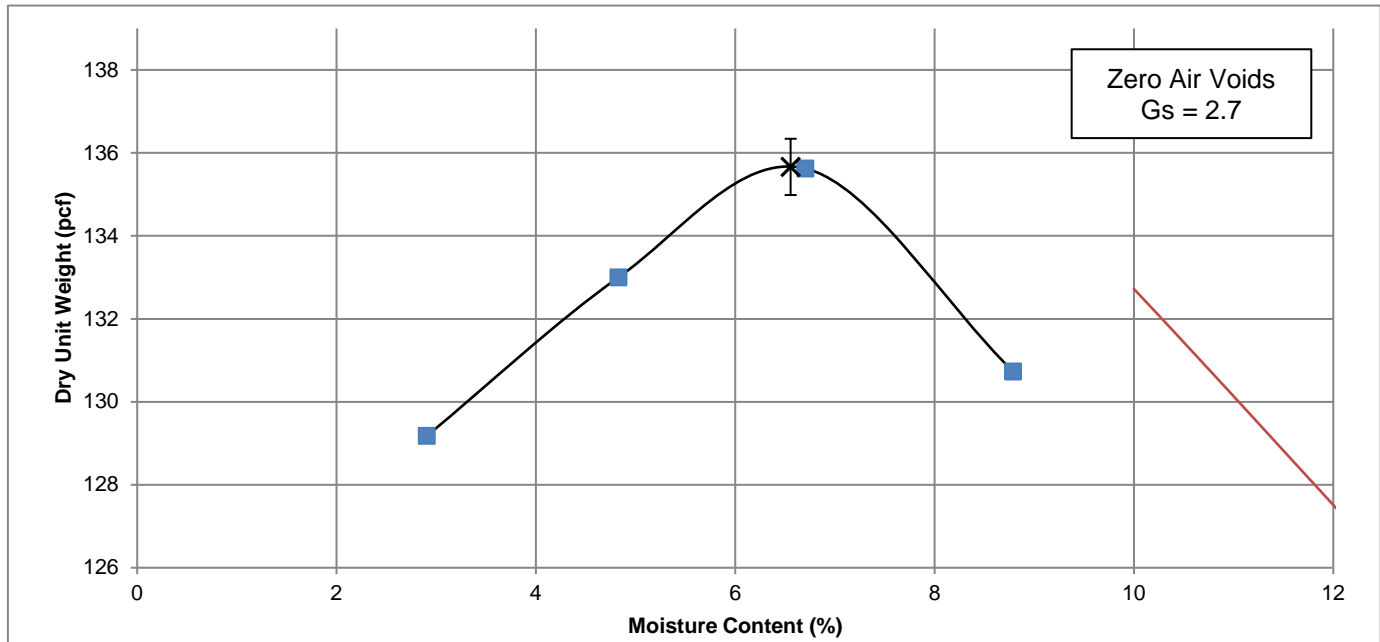
Project No. 2270445501
Sample ID B2-Bulk
Date Received 09/28/2018
Date Tested 09/30/2018

Test Fraction (%) 0.0
Gs of Test Fraction 2.7 Estimated
Oversized Fraction Sieve 3/4"

Oversized Fraction (%) 0.0
Gs of Oversized Fraction 0.0 ASTM C 127
MC of Oversized Fraction (%) 0.0

Mold Weight (g) 4254.8 Preparation Method Moist Rammer Type Manual

| Wet Soil & Mold Weight (g) | Wet Soil Weight (g) | Moisture Content Determination | | | | Dry Unit Weight (pcf) |
|----------------------------------|------------------------|--------------------------------|------------------------|----------|----------------------|-----------------------------|
| | | Wet Soil & Tare (g) | Dry Soil & Tare (g) | Tare (g) | Water Content (%) | |
| 6269 | 2014 | 506.40 | 492.10 | 0.00 | 2.9 | 129.2 |
| 6367 | 2112 | 414.70 | 395.60 | 0.00 | 4.8 | 133.0 |
| 6447 | 2192 | 501.50 | 470.00 | 0.00 | 6.7 | 135.6 |
| 6409 | 2155 | 516.20 | 474.50 | 0.00 | 8.8 | 130.7 |
| | | | | | | |
| | | | | | | |
| | | | | | | |



Maximum Dry Unit Weight (pcf) 135.7
Optimum Moisture Content (%) 6.6

Corrected Maximum Dry Unit Weight (pcf) N/A
Corrected Optimum Moisture Content (%) N/A

Comments _____
Reviewed By: JF

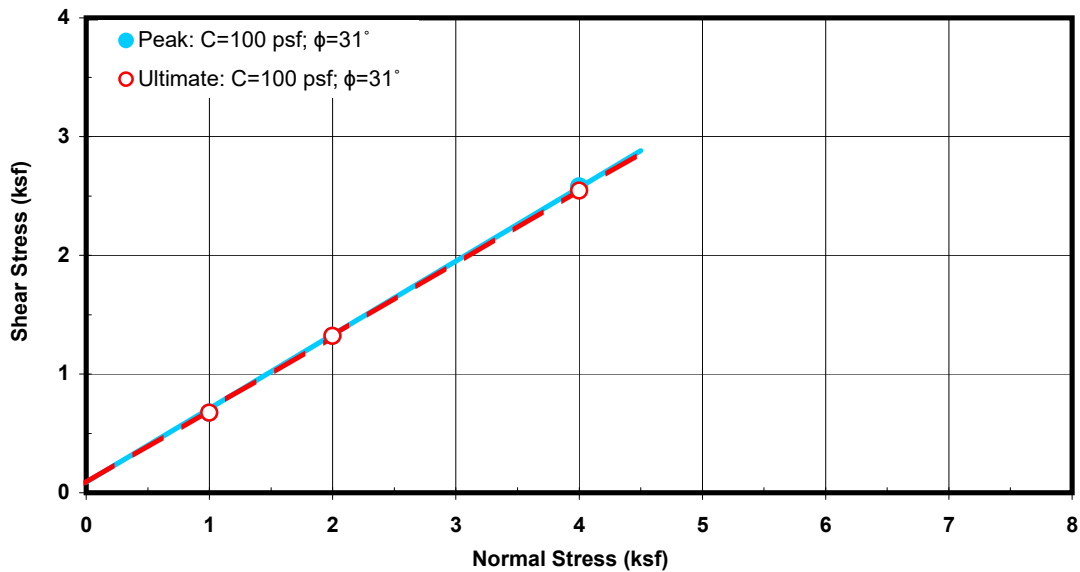
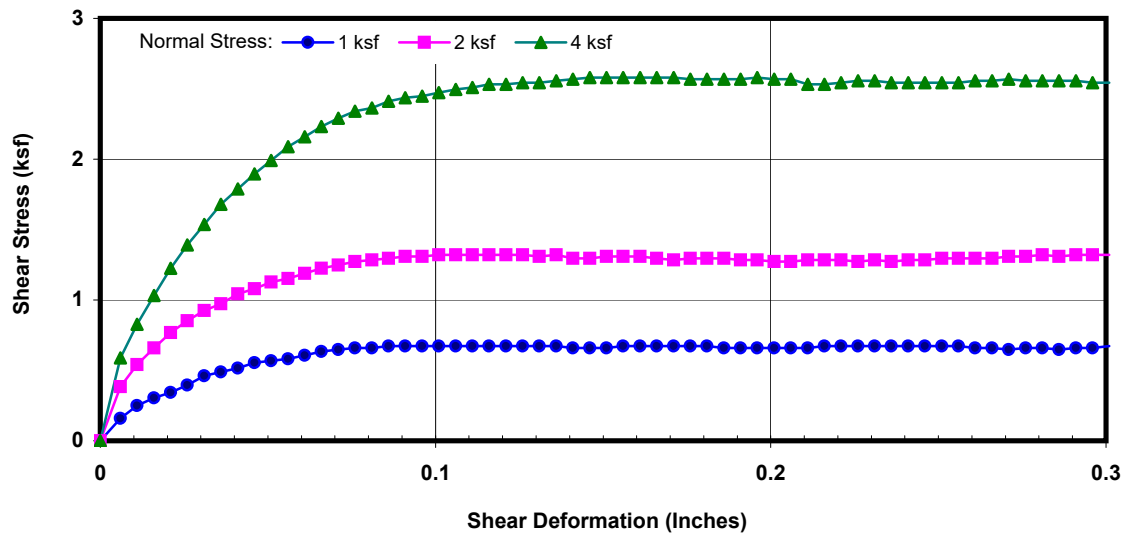


DIRECT SHEAR TEST RESULTS ASTM D 3080

Project Name: FAX Maintenance Facility
Project No.: 2270445501
Boring No.: B2
Sample No.: - Depth (ft): 5
Sample Type: Mod. Cal.
Soil Description: Silty Sand
Test Condition: Inundated Shear Type: Regular

Tested By: NG Date: 10/03/18
Computed By: JP Date: 10/06/18
Checked by: AP Date: 10/06/18

| Wet Unit Weight (pcf) | Dry Unit Weight (pcf) | Initial Moisture Content (%) | Final Moisture Content (%) | Initial Degree Saturation (%) | Final Degree Saturation (%) | Normal Stress (ksf) | Peak Shear Stress (ksf) | Ultimate Shear Stress (ksf) |
|-----------------------------|-----------------------------|------------------------------------|----------------------------------|-------------------------------------|-----------------------------------|---------------------------|-------------------------------|-----------------------------------|
| 119.0 | 113.9 | 4.5 | 16.1 | 25 | 91 | 1 | 0.673 | 0.673 |
| | | | | | | 2 | 1.320 | 1.320 |
| | | | | | | 4 | 2.580 | 2.544 |



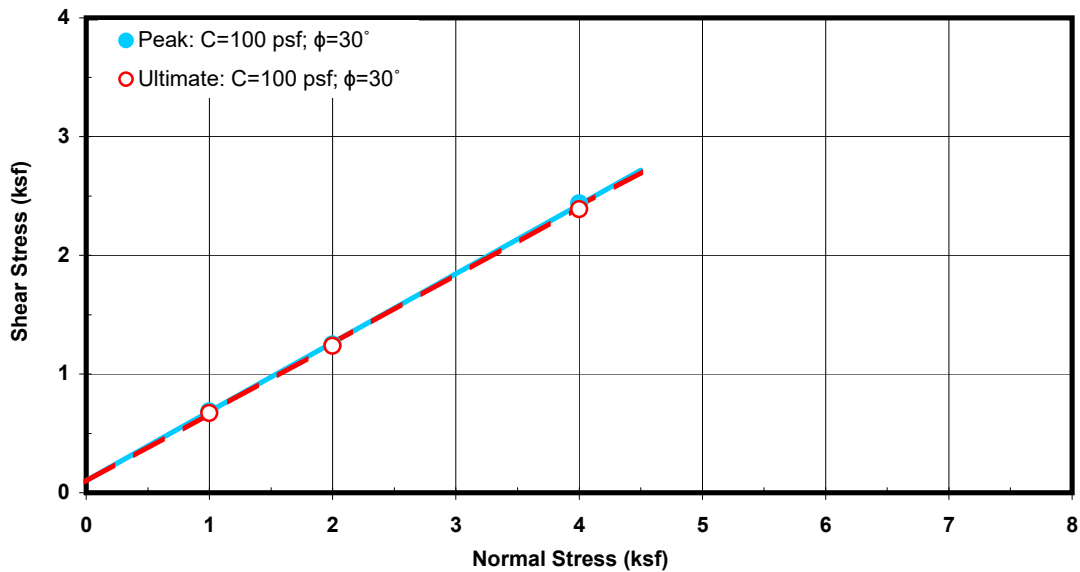
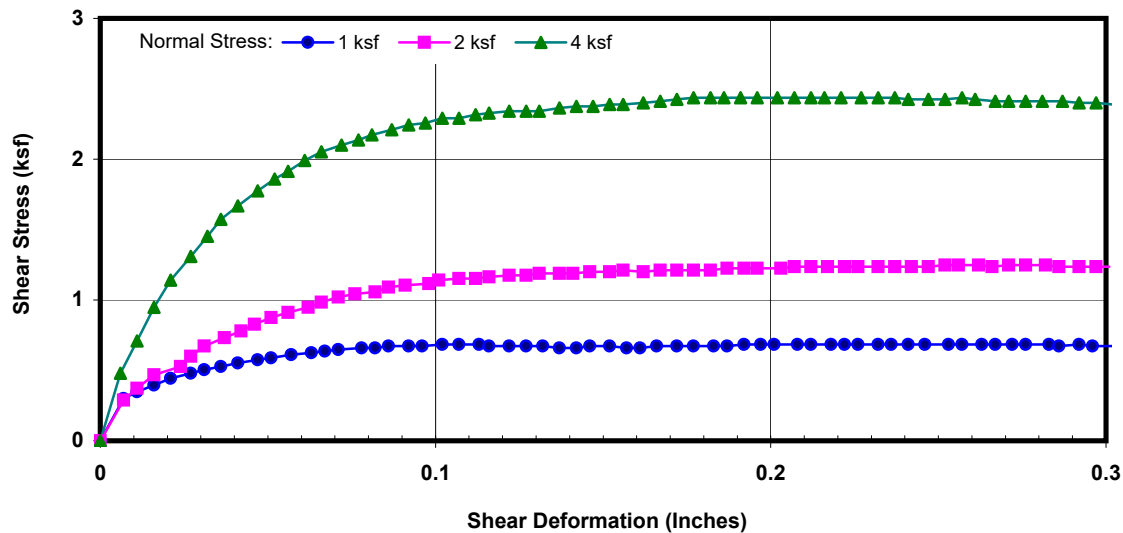


DIRECT SHEAR TEST RESULTS ASTM D 3080

Project Name: FAX Maintenance Facility
Project No.: 2270445501
Boring No.: B3
Sample No.: - Depth (ft): 5
Sample Type: Mod. Cal.
Soil Description: Silty Sand w/traces of clay
Test Condition: Inundated Shear Type: Regular

Tested By: NG Date: 10/04/18
Computed By: JP Date: 10/06/18
Checked by: AP Date: 10/06/18

| Wet Unit Weight (pcf) | Dry Unit Weight (pcf) | Initial Moisture Content (%) | Final Moisture Content (%) | Initial Degree Saturation (%) | Final Degree Saturation (%) | Normal Stress (ksf) | Peak Shear Stress (ksf) | Ultimate Shear Stress (ksf) |
|-----------------------|-----------------------|------------------------------|----------------------------|-------------------------------|-----------------------------|---------------------|-------------------------|-----------------------------|
| 126.2 | 116.5 | 8.4 | 14.8 | 50 | 90 | 1 | 0.684 | 0.672 |
| | | | | | | 2 | 1.248 | 1.236 |
| | | | | | | 4 | 2.436 | 2.388 |



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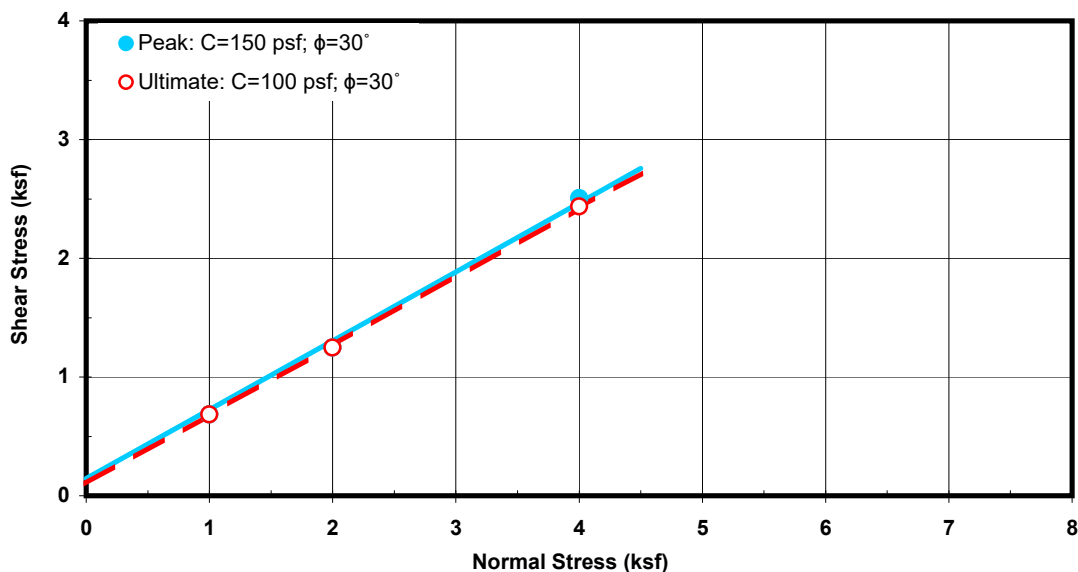
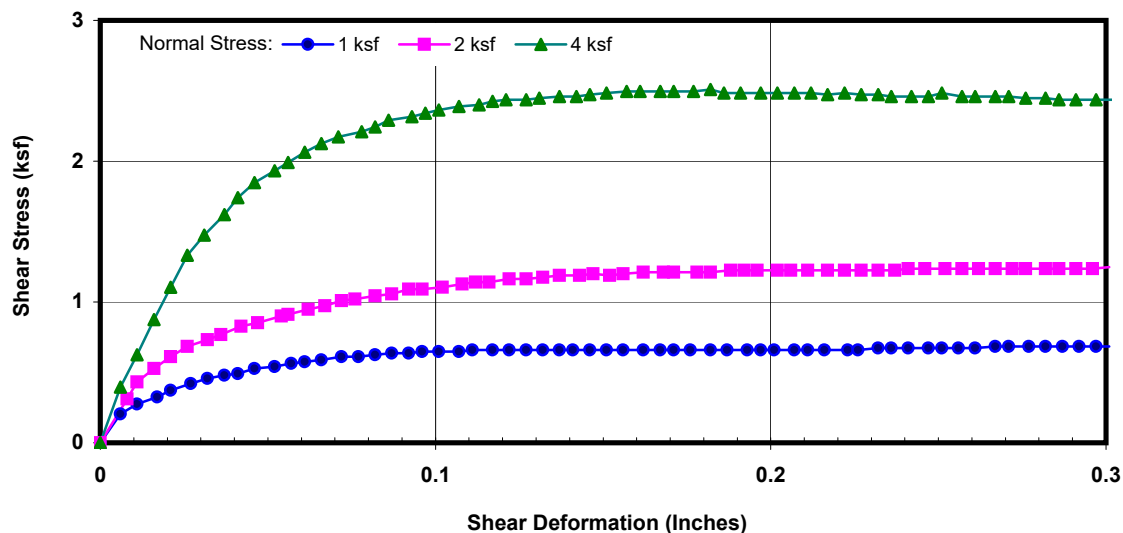
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Project Name: FAX Maintenance Facility
Project No.: 2270445501
Boring No.: B5
Sample No.: - Depth (ft): 5
Sample Type: Mod. Cal.
Soil Description: Silty Sand, fine-grained
Test Condition: Inundated Shear Type: Regular

Tested By: NG Date: 10/03/18
Computed By: JP Date: 10/06/18
Checked by: AP Date: 10/06/18

| Wet Unit Weight (pcf) | Dry Unit Weight (pcf) | Initial Moisture Content (%) | Final Moisture Content (%) | Initial Degree Saturation (%) | Final Degree Saturation (%) | Normal Stress (ksf) | Peak Shear Stress (ksf) | Ultimate Shear Stress (ksf) |
|-----------------------|-----------------------|------------------------------|----------------------------|-------------------------------|-----------------------------|---------------------|-------------------------|-----------------------------|
| 114.3 | 110.1 | 3.8 | 17.9 | 19 | 91 | 1 | 0.684 | 0.684 |
| | | | | | | 2 | 1.248 | 1.248 |
| | | | | | | 4 | 2.508 | 2.436 |



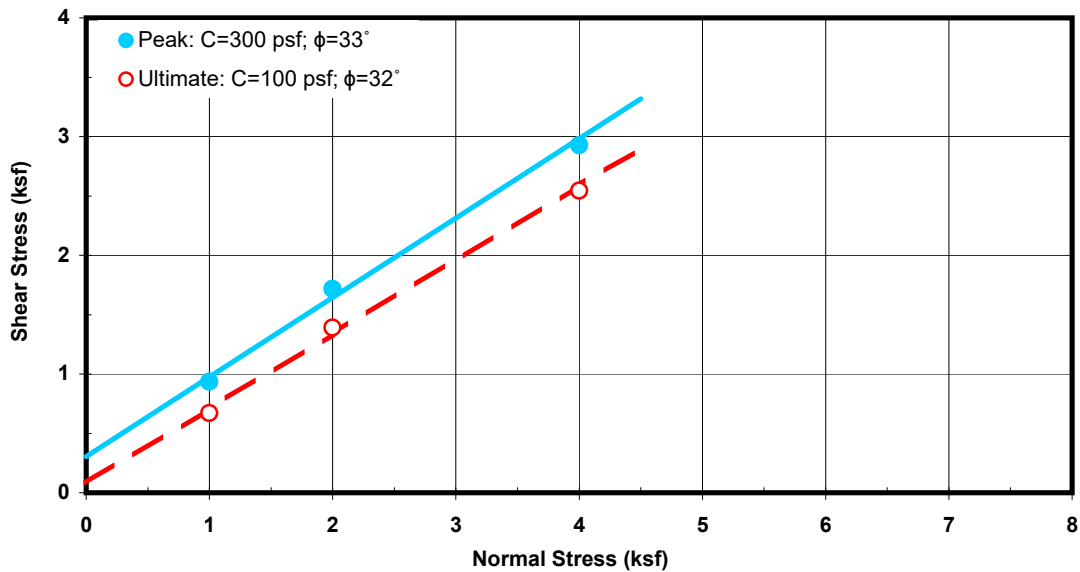
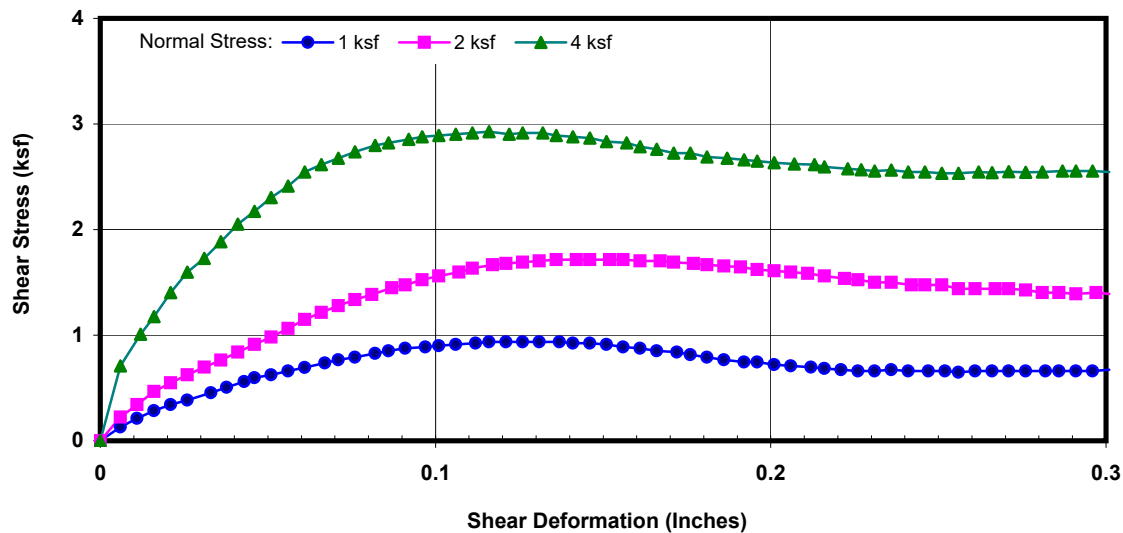


DIRECT SHEAR TEST RESULTS ASTM D 3080

Project Name: FAX Maintenance Facility
Project No.: 2270445501
Boring No.: B6
Sample No.: - Depth (ft): 7
Sample Type: Mod. Cal.
Soil Description: Silty Sand, fine-grained
Test Condition: Inundated Shear Type: Regular

Tested By: NG Date: 10/03/18
Computed By: JP Date: 10/06/18
Checked by: AP Date: 10/06/18

| Wet Unit Weight (pcf) | Dry Unit Weight (pcf) | Initial Moisture Content (%) | Final Moisture Content (%) | Initial Degree Saturation (%) | Final Degree Saturation (%) | Normal Stress (ksf) | Peak Shear Stress (ksf) | Ultimate Shear Stress (ksf) |
|-----------------------|-----------------------|------------------------------|----------------------------|-------------------------------|-----------------------------|---------------------|-------------------------|-----------------------------|
| 117.4 | 112.5 | 4.3 | 16.7 | 23 | 90 | 1 | 0.936 | 0.672 |
| | | | | | | 2 | 1.716 | 1.392 |
| | | | | | | 4 | 2.928 | 2.544 |



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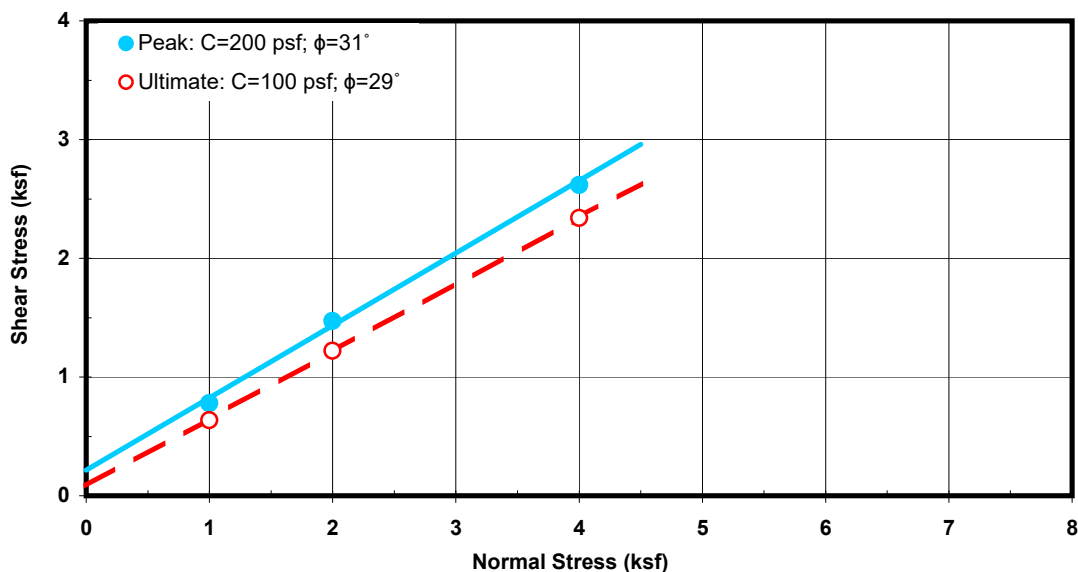
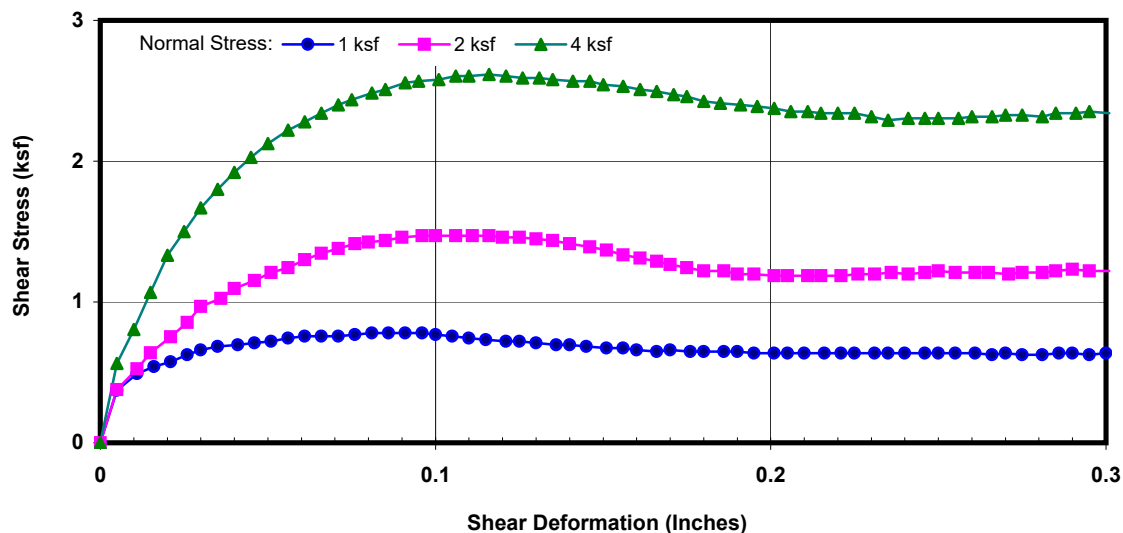
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Project Name: FAX Maintenance Facility
Project No.: 2270445501
Boring No.: B9
Sample No.: - Depth (ft): 5
Sample Type: Mod. Cal.
Soil Description: Silty Sand, fine-grained
Test Condition: Inundated Shear Type: Regular

Tested By: NG Date: 10/03/18
Computed By: JP Date: 10/06/18
Checked by: AP Date: 10/06/18

| Wet Unit Weight (pcf) | Dry Unit Weight (pcf) | Initial Moisture Content (%) | Final Moisture Content (%) | Initial Degree Saturation (%) | Final Degree Saturation (%) | Normal Stress (ksf) | Peak Shear Stress (ksf) | Ultimate Shear Stress (ksf) |
|-----------------------|-----------------------|------------------------------|----------------------------|-------------------------------|-----------------------------|---------------------|-------------------------|-----------------------------|
| 110.3 | 107.8 | 2.3 | 18.8 | 11 | 90 | 1 | 0.780 | 0.636 |
| | | | | | | 2 | 1.471 | 1.220 |
| | | | | | | 4 | 2.616 | 2.340 |



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| Boring No. | Sample Type | Depth (feet) | Soil Type | Minimum Resistivity (ohm-cm) | pH | Sulfate Content (ppm) | Chloride Content (ppm) |
|------------|-------------|--------------|-----------|------------------------------|-----|-----------------------|------------------------|
| | | | | | | | |
| B2 | Bulk | - | SM | 5246 | 8.9 | 57 | 40 |
| B5 | Bulk | - | SM | 6804 | 8.7 | 45 | 34 |
| B9 | Bulk | - | SM | 7228 | 7.3 | 45 | 41 |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

NOTES: Resistivity Test and pH: California Test Method 643
Sulfate Content : California Test Method 417
Chloride Content : California Test Method 422
ND = Not Detectable
NA = Not Sufficient Sample
NR = Not Requested

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ASTM D2844

Project Name: FAX Maintenance FacilityProject Number: 2270445501Boring No.: B5Sample Type: Bulk Depth (ft.): -Location: N/ASoil Description: Silty Sand, fine-grainedTested By: ST Date: 10/02/18Computed By: KM Date: 10/05/18Checked By: AP Date: 10/06/18

| | | | | | | | |
|------------------------------------|-------|-------|-------|--|---------|---|------|
| Mold Number | G | H | I | | R-VALUE | By Exudation: | 79 |
| Water Added, g | 41 | 36 | 31 | | | By Expansion: | *N/A |
| Compact Moisture(%) | 8.9 | 8.4 | 7.8 | | | At Equilibrium: | 79 |
| Compaction Gage Pressure, psi | 200 | 250 | 250 | | | (by Exudation) | |
| Exudation Pressure, psi | 126 | 304 | 550 | | Remarks | Gf = 1.34, and 0.6 % Retained on the 3/4" *Not Applicable | |
| Sample Height, Inches | 2.4 | 2.4 | 2.4 | | | | |
| Gross Weight Mold, g | 2913 | 2918 | 2895 | | | | |
| Tare Weight Mold, g | 1827 | 1836 | 1818 | | | | |
| Net Sample Weight, g | 1086 | 1082 | 1077 | | | | |
| Expansion, inchesx10 ⁻⁴ | 0 | 1 | 1 | | | | |
| Stability 2,000 (160 psi) | 13/20 | 12/19 | 12/18 | | | | |
| Turns Displacement | 4.53 | 4.55 | 4.54 | | | | |
| R-Value Uncorrected | 79 | 80 | 81 | | | | |
| R-Value Corrected | 78 | 79 | 80 | | | | |
| Dry Density, pcf | 126.0 | 126.0 | 126.1 | | | | |
| Traffic Index | 8.0 | 8.0 | 8.0 | | | | |
| G.E. by Stability | 0.42 | 0.40 | 0.38 | | | | |
| G.E. by Expansion | 0.00 | 0.00 | 0.00 | | | | |

