GEOTECHNICAL INVESTIGATION
INFILTRATION REPORT

Prepared For
SPower, Sustainable Power Group

Proposed
Estrella Solar
Southeast Corner of Avenue A and 95th Street West
Lancaster, Los Angeles County, California

BRUIN GEOTECHNICAL SERVICES, INC.
44732 Yucca Avenue
Lancaster, California 93534

Job No: 20-26
February 11, 2021

SOIL AND MATERIAL
TESTING AND INSPECTIONS

February 11, 2021 Job No.: 20-26

Ms. Ashlee Auger P.E.
SPower, Sustainable Power Group
2180 South 1300 East, Suite 600
Salt Lake City, UT 84106

Subject: **Geotechnical Investigation Infiltration Report for Estrella Solar Photovoltaic Array at the Southwest Corner of Avenue A and 90th Street West, Lancaster, Los Angeles County, California**
APN 3262-006-002, 003

Dear Ms. Auger:

Presented herewith is the report of our Geotechnical Investigation Infiltration Report for the subject project. Our work was performed in accordance with the scope of work outlined in our original proposal dated October 1, 2020.

This report presents the results of our field investigation, laboratory testing, and our engineering judgment, opinions, conclusions and recommendations pertaining to the proposed development.

It has been a pleasure to be of service to you on this project. Should you have any questions regarding the contents of this report, or should you require additional information, please contact the undersigned at (661) 273-9078.

Respectfully submitted,

BRUIN GEOTECHNICAL SERVICES, INC.

Ryan D. Duke, P.E.

RDD/mes

REGISTERED PROFESSIONAL ENGINEER
RYAN DUKE
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STATE OF CALIFORNIA

GEOTECHNICAL INVESTIGATION INFILTRATION REPORT

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ESTRELLA SOLAR
SOUTHEAST CORNER OF AVENUE A AND 95TH STREET WEST
LANCASTER, LOS ANGELES COUNTY, CALIFORNIA

1.0 INTRODUCTION

This report presents the results of our geotechnical investigation specifically for storm-water infiltration performed by Bruin Geotechnical Services, Inc. for the proposed storm water basins at the subject site based on discussions, site plans and hydrology information provided by the project civil engineer, Kimley-Horn, and the client. This report is specific to the proposed development.

The purpose of this investigation was to evaluate the on-site infiltration rate of the subsurface soil conditions, as well as evaluate the geotechnical engineering characteristics relative to the low impact development storm water basins and the proposed solar development at the subject Site. The report has been prepared in general accordance with Los Angeles County guidelines GS200.2.

The scope of the authorized geotechnical investigation included the following tasks:

- Perform a site reconnaissance
- Conduct a field subsurface exploration through soil trenches, exploratory borings, and soil sampling
- Perform laboratory testing program of selected soil samples
- Perform the infiltration testing of on-site soils
- Perform engineering analyses and calculations of the data
- Prepare this Geotechnical Investigation Infiltration Report

This study also includes a review of published and unpublished literature and geotechnical maps with respect to groundwater located in proximity to the site which may have impact on the proposed improvements.

2.0 SITE LOCATION AND DESCRIPTION

The irregular-shaped site, herein after referred to as Site, is located at the northeast corner of West Avenue A and 90th Street West in the city of Lancaster, Los Angeles County, California, and consists of two (2) parcels totaling approximately 148.98 acres. The subject parcels include:

- APN: 3262-006-002 (79.77 acres)
- APN: 3262-006-003 (69.21 acres)

At the time of Bruin GSI's field investigation, the site was vacant, undeveloped land. The site is surrounded by agricultural parcels to the east, south, and west and residential parcels to the north and southeast. The site contained scattered capped pipes approximately two (2) feet in height and an existing well in the southeast portion of the site. The remainder of the Site is vacant and relatively flat, with dense covering of annual weeds and shrubs with few scattered trees. The intention of the site description is to be illustrative and specifically not intended for use as a legal description of the Site.

The Site topography is relatively flat and level with a gentle slope down to the northeast, with drainage by sheet flow at approximately 1%. The approximate elevation at the site is 2,450 feet above mean sea level.

The general location of the subject Site is shown on Figure 1.

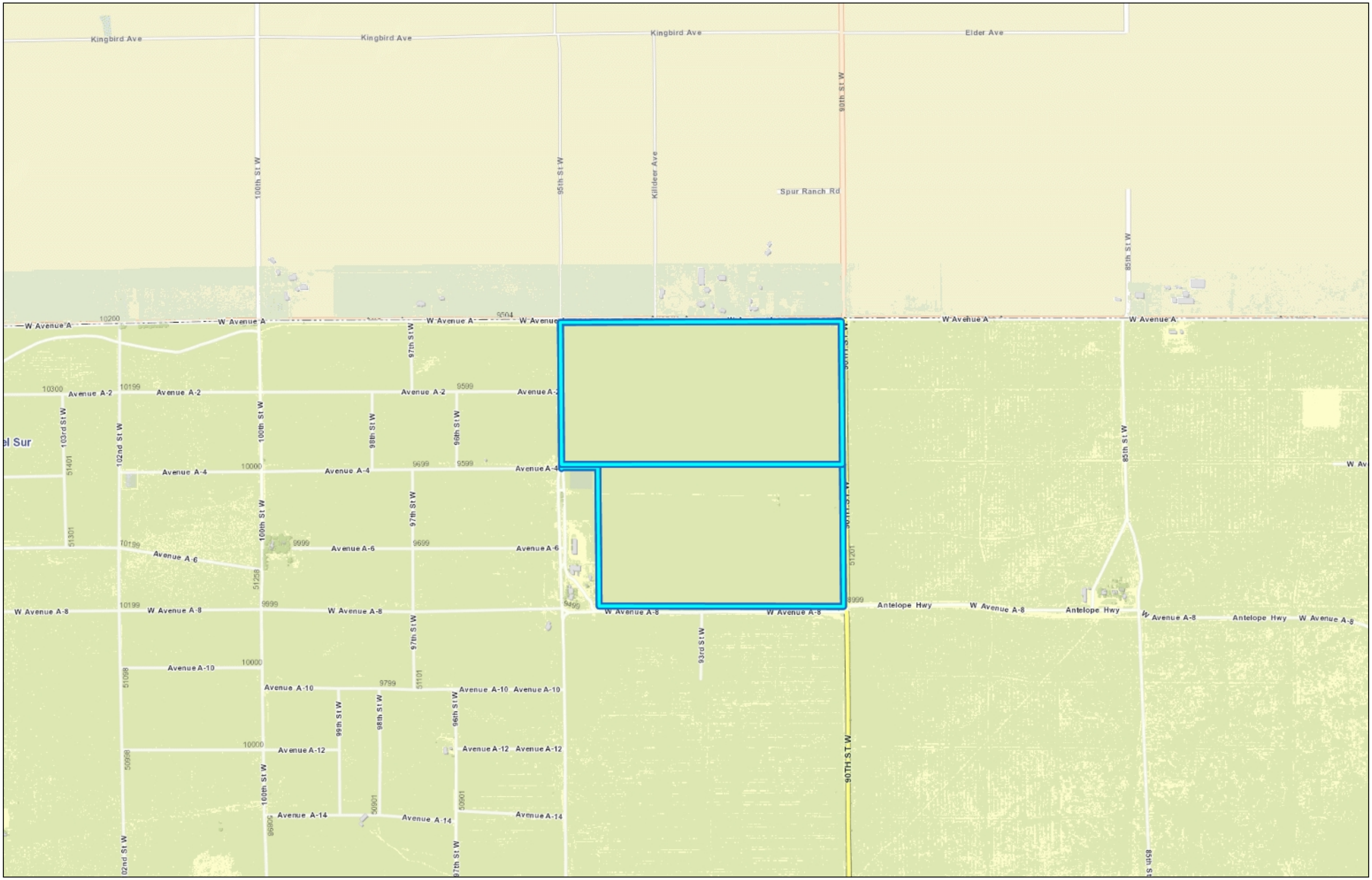
3.0 PROPOSED GRADING AND CONSTRUCTION

Based on our review of the preliminary site plan, and information obtained from discussions with the project civil engineer and the client, Bruin GSI understands the proposed improvements on the Site include photovoltaic solar array facility with driven steel H piles, access roads and inverter equipment pads. Anticipated depths of the driven H-piles are approximately eight (8) feet below ground surface (bgs). Equipment pads may be supported on driven H-piles or concrete pads. No equipment pads are anticipated within the proposed infiltration basins. The infiltration basins proposed invert elevation is approximately eighteen (18) inches below the ground surface. Additionally, the basins will vary in size and shape, depending on the pre-determined minimum retention volumes per sub-area provided by the hydrology study prepared by project civil engineer, Kimley-Horn.

Due to the relatively flat topography, it appears the proposed earthwork at the Site will be minimal, generally consisting of clearing or mowing vegetation, creating "at grade" access roads and minor excavation of the proposed infiltration basins. It is our understanding that it is intended that the site development will have minimal impact on existing sheet-flow drainage conditions with the exception of creating the localized infiltration basins which will be graded as local depressions, allowing driven steel H-piles to be placed within.

4.0 PROPOSED INFILTRATION SYSTEM

Based on our review of the plans prepared by Kimley-Horn, a total of six (6) infiltration basins are proposed throughout the Site for the purpose of percolating the sheet-flow storm-drain water. The smallest retention volume determined is 74,166 cf. (554,800 gal) and the



0 752 1,505 Feet

Figure 1 Vicinity Map

Created in GIS-NET Public

Printed: 2/10/21

maximum retention volume is 74,166 cf. (554,800 gal.) of storm-drain water. Due to the flat topography of the Site, it is anticipated the stormwater drain by sheet-flow will follow the natural grade to the location of the proposed basins. The basins vary in size and shape and will have an invert elevation approximately eighteen (18) inches below the ground surface. It is our understanding that each infiltration basin has been designed by Kimley-Horn according to the expected retention volume determined by a hydrology study.

5.0 GEOTECHNICAL INVESTIGATION

The geotechnical investigation included a field subsurface exploration program through drilling and trenching, obtaining bulk, grab and undisturbed soil samples, laboratory testing on soil samples collected and infiltration testing program. These programs were performed in accordance with our proposal for Geotechnical Investigation Infiltration Report dated November 17, 2020. The scope of work did not include environmental assessment or investigation for the presence or absence of hazardous substances or toxic materials in structures, soil, and surface water, air, below or around the site. The field subsurface exploration, laboratory testing programs and Infiltration testing protocol are described below, as required by Los Angeles County requirements (GS200.2).

5.1 Field Exploration Program

A site reconnaissance was made by our representative prior to instigating the field exploration and testing program. The Site was observed, and boundaries roughly located for purposes of underground utility locating. As required by law, Bruin GSI contacted Underground Service Alert (one-call notification service) to attain underground utility marking and clearance, a minimum of 72 hours prior to performing the field subsurface investigation.

The field exploration program was conducted from November 18, 2020, through December 22, 2020, under the technical supervision of our engineer, and consisted of exploratory borings, exploratory excavations, and infiltration testing.

A total of fifteen (15) exploratory borings were drilled using a CME 75 rig with 8” hollow stem auger in accordance with generally accepted geotechnical exploration procedures (ASTM D 1452). These borings were performed for the geotechnical investigation report to address site development including foundation design parameters and grading that will be completed under a separate cover. However, the lab results and boring logs deemed pertinent to this study were evaluated and used to aid in completion of this report. The boring logs and laboratory test results from the aforementioned geotechnical investigation report are presented in Appendix A.

Soil samples were obtained at various depth intervals, consisting of relatively undisturbed brass rings samples (Modified California Split-Spoon sampler) and Standard Penetration Test (STP) samples driven by a 140-pound hammer falling 30 inches. After seating of the sampler, the number of blows required to drive the sampler one foot was recorded in 6-inch increments, in general accordance with procedures presented in ASTM D 1586. Bulk samples collected at various depths from auger cuttings during drilling represent a mixture of soils within the noted depths. The soil samples were returned to the laboratory for analysis and testing.

Subsequent to infiltration testing, a total of four (4) exploratory trenches at each infiltration test hole location were excavated to maximum depths of six (6) feet below ground surface (bgs), using a tractor-mounted backhoe equipped with a thirty-six inch-bucket. Grab samples obtained at various depths were returned to the laboratory for analysis and testing.

The approximate locations of the borings, infiltration test holes, and exploratory trenches within the area of the proposed construction were determined by sighting and pacing from existing site improvements, such as streets, and the use of a hand-held GPS unit and should be only considered accurate to the degree implied by the method used. Boring and exploratory trench locations are shown on Figure 2.

Final boring and exploratory trench logs are presented in Appendix B are Bruin GSI's interpretation of the field logs prepared by our representative during excavation and drilling, as well as laboratory test results. The stratification lines represent approximate boundaries between soil types. The actual soil transitions may be gradual.

5.2 Laboratory Testing

The field excavation logs, boring logs, and soil samples were reviewed to assess which samples would be analyzed further. The selected soil samples collected during trenching and boring activities at the Site were then tested in the laboratory to assist in evaluating engineering properties of subsurface materials deemed within structural influence and to provide data required for conclusions related to the infiltration characteristics.

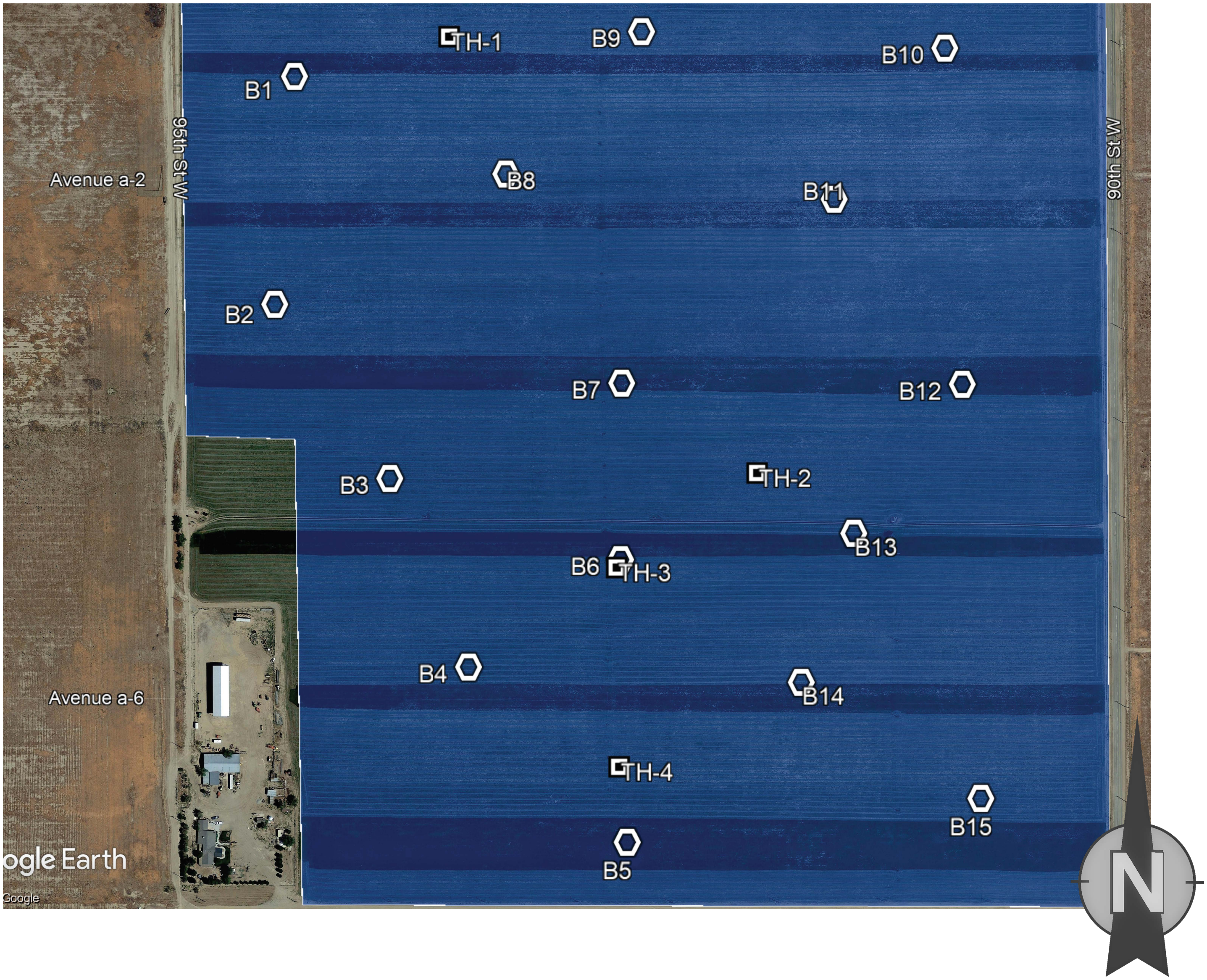
The soil samples were classified in accordance with the Unified Soils Classification System and a testing program was established. The samples were tested to determine the following:

- In-situ moisture and dry unit weight determinations were determined in accordance with ASTM D 2937.

Figure 2

Boring Location Map

N.T.S.



Project:

Estrella Solar
Northeast Corner of Avenue B and 110th Street West
Lancaster, Los Angeles County, California

Job Number:	**Date:**
20-26	02/11/21

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- Relative strength characteristics were estimated from results of direct shear tests (ASTM D 3080) performed on bulk soil samples remolded to approximately 90 percent of the maximum dry density as determined by ASTM D 1557 test method.
- Consolidation potential was determined on select soil samples in accordance with ASTM D 2435. The samples were saturated at 1.6 KSF to check hydro-consolidation potential. The maximum load applied was 6.4 KSF. The soil samples were unloaded to 1.2 KSF to check rebound.

The following additional tests were performed:

- Identification of soils ASTM D 2488
- Expansion Index ASTM D 4829
- Maximum density – Optimum moisture ASTM D 1557
- Material Finer than the No. 200 Sieve ASTM D 1140
- Sand Equivalent Value ASTM D 2419
- Grain-size Analysis (Hydrometer method) ASTM D 422

Pertinent tabular and graphic test results are presented in Appendix C.

5.3 Infiltration Testing Protocol

The Los Angeles County Geotechnical and Materials Engineering Division's Low Impact Development Storm-water Infiltration guide (GS200.2, dated June 30, 2017) was used to determine the protocol required for infiltration testing procedures for this project. Based on the Large-Scale Testing Procedures defined on the GS200.2, the Site was determined as Extra-Large Regional Project, since the approximate storm-water quality retention volume (SWQDv) is expected to be 74,166 cf. (554,800 gal). For Extra-Large Regional Projects, the infiltration basin percolation test with constant head required one hundred (100) square feet of horizontal surface area of testing. It was determined to excavate four (4) representative locations, all within the limits of designated locations of the selected basins spread across the Site. To meet the required horizontal surface area of infiltration testing, all excavations were rectangular in shape, with dimensions approximately five (5) ft. long by five (5) ft. wide and excavated at the proposed invert elevation of eighteen (18) in. below ground surface (bgs).

Based on the review and discussions with the engineer, it is our understanding that the infiltration basins were designed to capture approximately eighteen (18) inches of water above the proposed invert elevation. The water level for testing purposes was maintained at twelve (12) inches above the proposed invert elevation and did not exceed the maximum depth of water anticipated in the proposed facility.

A vertical measuring rod marked in one (1) inch increments was installed inside each test pit. A hose with a splash plate was used on the bottom of the pit to convey the water, preventing erosion and disturbance of the pond's bottom. The excavation was filled with water up to one (1) foot above the proposed invert elevation. A calibrated water flowmeter connecting the hose to the water tank provided readings of instantaneous gallons per minute of clean tap water being added to the test pit.

During presoaking time, the readings of the volume of water, instantaneous flow rate and water surface elevation were checked every thirty (30) minutes. Once the instantaneous flow rate stabilized (i.e., the highest and lowest readings were within ten (10) percent of each other, for three (3) consecutive readings), we proceeded to record the water drop on the measuring rod until the pit was empty (falling phase of the test). The total combined time that included pre-soak, test duration and an additional hour after flow-rate stabilization exceeded the six (6) hour minimum required by the GS200.2 guidelines.

At the conclusion of the testing, the test pits were excavated by use of a tractor-mounted backhoe to observe and determine the path of water migration and if mounding had occurred. Profiles of the water migration are presented in Appendix D.

5.3.1 Design Criteria

To determine the design infiltration rate for design purposes, GS200.2 guidelines require to graph the cumulative volume vs. time of each test pit to find the slope of the straight line (raw measurement of the infiltration rate noted at the Site [ft/hr]); and then calculate to determine the rate in [in/hr]. This allows comparison to the minimum infiltration rate suggested by the guidelines.

The GS200.2 requires the application of reduction factors to the raw measurements established at the Site in order to determine the site-specific long-term infiltration rate to be used for design. Under section "Reduction Factors" of the GS200.2, a table is provided as a guidance for the range of values that may be used for each factor. The reduction factors involved in the calculation of the design infiltration rate include the following:

- Test-specific reduction factor, (RF_T) Infiltration Basin Percolation Test
- Site variability, # tests performed, thoroughness of subsurface investigation (RF_V)
- Long-term siltation, plugging and maintenance (RF_S)

The Total Reduction Factor (RF) is calculated using the individual reduction factors related to this project; and applied to the raw infiltration rate in order to determine the design infiltration rate that will represent the long-term performance of the proposed infiltration BMPs.

6.0 FINDINGS

The following findings for the site are based on the results of the field exploration, infiltration and laboratory testing programs and represent professional opinions.

6.1 Regional Geology

The project site is located in the central portion of the Antelope Valley Basin, which makes up part of the western Mojave Desert Geomorphic province. The Antelope Valley is characterized as a 4,000 km^2 sediment filled, closed basin that lies between the San Andreas and Garlock fault zones and forms the westernmost "wedge" of the Mojave desert geomorphic province (Dibblee, 1967). The Mojave Desert geomorphic province is characterized by broad expanses of desert plains and isolated mountain ranges with elevations ranging from 2,300 to 3,500 feet above mean sea level. Annual rainfall generally ranges between five to ten (5-10) inches and drains into interior playas (Department of Water Resources, 2003).

Sediments in the central portion of the Antelope Valley are derived from the Transverse Ranges to the south and from the Tehachapi Mountains to the north. The project site contains a thick deposit of alluvium. Similar alluvial deposits are present near or at the ground surface throughout the central Antelope Valley. Modern streams that head in the western Transverse Ranges and the Tehachapi Mountains flow toward a closed basin at Rosamond Lake, northeast of the project site area. The southern and northern margins of the Antelope Valley contain common thrust faults and folds that expose some of the oldest sediment within the basin. The thrust faults and folds are related to activity on the San Andreas and Garlock Fault Zones, which form the southern and northern boundaries of the Mojave Desert geomorphic province in this area.

6.2 Site Geology

The site is located on the Little Buttes, CA United States Geological Survey (USGS) 7.5-minute topographic quadrangle. Elevation at the site is approximately 2,350 feet above mean sea level.

The Site sits on alluvium that emanates from a Portal Ridge that is associated with the base of the northern flank of the San Gabriel Mountains. The Site contains natural alluvial fan, and bar and swale topography. The project site is located along axial valley deposits that are comprised of coalescing alluvial fans. Rock outcrops are not visible on the project site. Dibblee (1967 and 2002) maps alluvium across the project site area as distal alluvial fan deposits. These are young surficial alluvial deposits in this area and are described as valley and terrace deposits of alluvial sand and gravel. At depth, the entire tract is underlain by the Late Pleistocene aged lacustrine deposits.

No springs or areas indicative of shallow ground water were observed on the project site. Surface drainage of the property would be primarily by sheet-flow across the property area, where it would flow northeast toward numerous unnamed northeast flowing tributary drainages.

6.3 Seismic Hazards Assessment

The types of geologic and seismic hazards assessed include ground-surface fault rupture and liquefaction. Our scope of services did not include a 50-foot test boring or detailed analysis of liquefaction, however, due to relatively deep (greater that 50' bgs) groundwater, we performed a limited research of publish liquefaction study within the area.

The purpose of the Alquist-Priolo Geologic Hazards Zone Act, as summarized in CDMG Special Publication 2 (SP 42), is to "prohibit the location of most structures for human occupancy across the traces of active faults and to mitigate thereby the hazard of fault-rupture." As indicated by SP 42, "the State Geologist is required to delineate "earthquake fault zones" (EFZs) along known active faults in California. Cities and counties affected by the zones must regulate certain development 'projects' within the zones. They must withhold development permits for sites within the zones until geologic investigations demonstrate that the sites are not threatened by surface displacement from future faulting.

Zones of Required Investigation referred to as "Seismic Hazard Zones" in CCR Section 3722, are areas shown on Seismic Hazard Zone Maps where Site investigations are required to determine the need for mitigation of potential liquefaction and/or earthquake-induced landslide ground displacements.
The Site is not located in a Landslide and Liquefaction Seismic Hazard Zone as specified by the State of California. No other published liquefaction studies were reviewed.

6.4 Liquefaction

Earthquake-induced ground shaking can be the cause of several significant phenomena, including liquefaction of saturated fine sands and silty sands. Loose soils can transform from a solid to a liquid state as a result of increased pore pressure during seismic loading. Liquefaction results in a complete loss of strength and can cause structures to settle or even overturn if it occurs in the bearing zone. If liquefaction occurs beneath sloping ground, a phenomena known as lateral spreading can occur. Due to the materials encountered at the site and that are anticipated to underlie the Site, and the absence of a shallow groundwater table, the potential for liquefaction is low. The project site has a low susceptibility to liquefaction.

6.5 Hydrogeology

The Antelope Valley Groundwater Basin is a closed alluvial drainage basin that is bounded to the northwest by the Garlock fault zone at the base of the Tehachapi Mountains, to the southwest by the San Andreas fault zone at the base of the San Gabriel Mountains, and to the north and east by several fault systems and low-lying bedrock hills (California Department of Water Resources, 2003). The primary water-bearing materials are Pleistocene and Holocene age unconsolidated alluvial and lacustrine deposits that consist of compact gravels, sand, silt, and clay. These deposits are coarse and rich in gravel near mountains and hills but become finer grained and better sorted toward the central parts of the valley (Duell 1987).

Coarse alluvial deposits form the two main aquifers of the basin: a lower aquifer and an upper aquifer. Most of the clays were deposited in large perennial lakes during periods of heavy precipitation. These clays are interbedded with lenses of coarser water- bearing material as thick as 20 feet; in contrast, the clay beds are as thick as 400 feet. The lake deposits form a zone of low permeability between the permeable alluvium of the upper aquifer and that of the lower aquifer. The upper aquifer, which is the primary source of groundwater for the valley, is generally unconfined whereas the lower aquifer is generally confined.

6.6 Groundwater

The nearest well data for the project site area show that groundwater levels are located approximately 270 feet below the ground surface in the vicinity of the subject site. Well data was gathered from USGS well site name 08N14W01N001S, site number 348053N1183221W001. The seasonal high groundwater elevation is greater than 150 feet below the proposed invert of the infiltration basins.

Historically, groundwater in the Antelope Valley Groundwater Basin flows north from the San Gabriel Mountains and south and east from the Tehachapi Mountains toward Rosamond Lake and Rogers Lake. Because of recent groundwater pumping, groundwater levels and flow have been altered in urban areas such as Lancaster and Edwards Air Force Base. Groundwater pumping has caused subsidence of the ground surface, and by 1992, 292 square miles of Antelope Valley had subsided more than one foot (Sneed and others, 2000). From 1942 through 2004, Over this period of time the groundwater level in the project site vicinity decreased or was lowered by approximately 54 feet.

6.7 Site and Subsurface Conditions

Native alluvial materials were encountered within all of our exploratory trenches, borings and test pits. The native materials were noted to be dry to moist and medium dense to very dense for coarse grain soils, and soft to firm for fine grain soils. Localized strata consisting of layers of silty sand underlain by layers of sandy silts (ML) and silty sands (SM), and occasional poorly graded sands (SP). After infiltration testing, materials encountered during exploration were noted very moist to saturated for fine grain soils in the upper six (6) feet below existing ground. Localized strata layers were found to be similar to those encountered in the borings and it is our professional opinion that infiltration rate results correlated with soil types encountered.

Hydrometer testing results for selected soil sample show generally sandy silts (ML) with traces of clay binder (< 12%).

Sieve analysis testing results for selected soil samples show interbedded layers of sandy silt (ML) and silty sandS (SM), with occasional poorly graded sands (SP) and dual classification of silty sand and sandy silt (SM/ML).

Laboratory test results from sand equivalent, hydrometer, moisture content and sieve analysis confirm the uniformity of the soil strata, providing general data of the infiltration potential of the soils located across the project Site. For more detailed descriptions of the subsurface materials refer to the excavation and boring logs in Appendixes A and B.

6.8 Soil Engineering Properties

Physical tests were performed on the bulk and relatively undisturbed samples to characterize the engineering properties of the native soils.

Moisture content and dry unit weight determinations were performed on samples to evaluate the in-situ unit weights of the different materials. In-place moisture contents varied and were generally one to nine (1-9) percent. In-place dry densities ranged generally from 99 pounds per cubic foot (pcf) to 122 pcf. Moisture contents on excavations through test pits after infiltration testing ranged between thirteen to twenty-one (13-21) percent. Moisture content and dry unit weight results are shown on the boring and excavation logs in Appendixes A and B.

The expansion index tests (ASTM D 4829) indicate that the surficial soils are within the "very low" category.

Consolidation test results reveal that soil samples tested have a negligible potential to hydro-consolidate.

6.9 Coefficient of permeability

Data acquired during the infiltration test included surface area of percolation (square foot), and stabilized flow rate (raw infiltration rate). Each basin had an approximately 5 ft. x 5 ft. x 1 ft. minimum surface area of percolation of 45 sq ft (bottom area and wetted sidewall area of each test pit). The stabilized flowrate for all basins ranged from 2.3 to 3.9 [cu-ft./hr.], the raw infiltration rates ranged from 0.05 to 0.09 [ft./hr.]. The calculations indicate that all test pits met the minimum required infiltration rate of 0.3 [in/hr.].

Reduction factors must be applied to the measured percolation rates per requirements of GS200.2, to determine the design values that will represent the long-term performance of the proposed infiltration BMPs. The calculations are presented below.

6.9.1 Infiltration Design Calculations

Based on our review of GS200.2, under section called "Reduction Factors" a table is provided as a guidance to the range of values that may be used for each factor applicable to the project for the calculation of the reduction factor. The raw infiltration rates were reduced depending on the factors selected from the "Reduction Factors" table from GS200.2, based on our overall understanding of the project, and applied as shown below:

- Test-specific reduction factor (Infiltration Basin Percolation Test), RF_T= 2
- Site variability, number of tests performed, thoroughness of subsurface investigation, RF_V = 1
- Long-term siltation, plugging and maintenance RF_S = 1
- Total Reduction Factor, RF = RF_T * RF_V * RF_S = 2 * 1 * 1 = 2

The calculated reduction factor (RF) was applied to the stabilized infiltration rates obtaining the design infiltration rate per basin. Furthermore, these are compared to the minimum infiltration rate suggested by GS200.2 guidelines to show their compliance, as indicated on Appendix D.

For basins 1 and 2, the design infiltration rates are calculated to be 0.48 and 0.34 inches per hour. For basins 3, and 4 the design infiltration rates are calculated to be 0.52 and 0.30 inches per hour, respectively.

6.10 Exploratory Trenching through Test Pits

After successful completion of the infiltration testing, the test pits were excavated to a maximum depth of seven (7) feet below ground surface to determine the water migration pattern. The visual results of trenching the infiltration test pits 1 and 3 show the water drained mostly vertical, with lateral leaching of about 2’-6” – 5’ outside of the test pits. Visual inspection indicated silty to very silty and saturated soils and confirmed the results of the infiltration rate at the falling stage of the infiltration testing.

For test pits 2 and 4, the visual observation during excavation of the test pits indicated granular soils with fines (as verified with laboratory testing) with vertical drainage and lateral leaching of about 1’-3” – 2’-8” beyond outside the test pits excavation sidewalls. Refer to Appendix E for illustrations of the water migration observed through each pit excavation after testing. Mounding was not observed in any of the test pit excavations.

6.11 Soil settlement

Differential soil settlement occurs when supporting soils are not uniform in density or classification and seismic shaking causes one type of soil to settle more than the other. When unaccounted for in design, such settlement can result in damage to structures, pavement and subsurface utilities. Soils with potential for hydro-consolidation can also cause differential settlement under loading conditions and the induction of moisture.

The Site proposed improvements involve shallow drainage storm-water basins and construction of drive H piles to support the proposed solar racking systems through the basin depressions. No equipment pads will be constructed with the basins. Soil samples obtained within the proposed basin areas were tested for potential hydro-consolidation. The soil samples were loaded to 6.4 [k/sf] under saturated conditions, the results indicated negligible to slight potential in the upper eight (8) feet below ground surface.

7.0 SECTION 111 STATEMENT

Additional subsurface investigation and analysis will be conducted to determine specific foundation design criteria for the proposed solar facility. However, based on the data obtained, previous reports prepared by our firm for similar solar sites in the immediate vicinity to the subject Site, and understanding of the proposed development, subsequent to compliance with the recommendations provided in this report and based on the site reconnaissance, subsurface exploration, and laboratory analysis, it is our opinion the proposed structures will be safe from hazards associated with faulting, landslides, slippage, and settlement. The proposed development will not adversely impact the existing geologic stability of adjacent sites.

8.0 EFFECT OF PROPOSED GRADING ON ADJACENT PROPERTIES

It is our opinion that the proposed grading and construction will not adversely affect the stability of adjoining properties provided that grading and construction are performed in compliance with the recommendations presented herein.

9.0 OPINIONS AND CONCLUSIONS

Based upon the results of our investigation, the proposed development is considered feasible from a geotechnical standpoint provided the recommendations presented herein are incorporated into the design and construction. If changes in the design of the structures are made or variations of changed conditions are encountered during construction, Bruin GSI should be contacted to evaluate their effects on these recommendations.

The soils explored and tested at the Site were found to be relatively uniform in classification, infiltration rates and strength. Based on the laboratory testing and subsurface data obtained, it is Bruin GSI's opinion that the upper Site soils will be suitable for infiltration purposes and meet or exceed the minimum required rate by GS200.2, including the reduction factors applied.

Based on our experience, knowledge, and review of reports prepared on property immediately adjacent to the site, it is anticipated that the embedment of the driven galvanized steel piles will be approximately eight (8) feet below ground surface (bgs). Foundation piles for solar facilities are typically designed as displacement piles, and are tested for uplift to withstand a peak axial uplift loading of approximately 3,000 Lb. At this embedment depth, results have shown these foundation piles meet the maximum allowed deflection tolerance of one (1) inch for design purposes. These proposed piles are designed with skin friction capacity based on direct shear data as means of transferring the load to the ground, as opposed to end bearing capacity.

It is our professional opinion that, based on the direct shear results on samples showing cohesive strengths ranging from 143 pounds per cubic foot to 294 pounds per cubic foot (pcf) under saturated conditions, and anticipated steel H-Piles embedment of eight (8) feet, piles located within the proposed basins, the driven galvanized H-piles will not be adversely affected by settlement due to hydro-consolidation. As such, settlement due to hydro-consolidation would be minimal, and within our understanding of acceptable tolerances.

Based on our calculations of the design infiltration rates, verified with the laboratory test results on soil samples obtained on each infiltration basin locations, it is our professional opinion the proposed infiltration basins are feasible from a geotechnical perspective.

10.0 GEOTECHNICAL RECOMMENDATIONS

The following geotechnical engineering recommendations are relative to the proposed infiltration basins, based on observations from the field investigation program, the laboratory test results and our experience with sites of similar conditions.

10.1 Earthwork

Prior to any grading, the Site should be cleared and grubbed of all vegetation (mowing is also an option). All pavements, vegetation, trash, debris and abandoned underground utilities shall be removed from the area to be graded and properly disposed of.

It is our professional opinion that conventional earth-moving equipment can achieve the proposed grading at the project Site.

10.2 Fill Slope Construction and Stability

Permanent cut slopes at infiltration basin locations may be constructed at a slope ratio not exceeding 5:1 (horizontal: vertical) or flatter. Cut slopes constructed as recommended are expected to be both surficial and grossly stable and anticipated to remain so under normal conditions.

The slopes should be planted with native vegetation as soon as possible to minimize erosion and maintenance.

If slopes are planned steeper than 2:1, the Geotechnical Consultant shall be notified for slope stability determinations.

Although GS200.2 requires no grading or construction to disturb soils at or below the proposed invert depth of infiltration (eighteen (18) inches below ground surface), it is our understanding that the project development includes driven H-piles within the basins. With the installation of H-piles as foundation systems for this type of facilities and our experience in nearby projects, it is our professional opinion that the driving of these galvanized steel piles will not represent an impact as to disturbing the soils for purposes of infiltration of sheet-flow quantities of storm-water as indicated by the design provided by the Engineer (Kimley-Horn).

In the event where quantities of storm-drain water changes, Bruin GSI should be contacted to further evaluate the impact on grading/construction on the project site.

10.3 Basin Maintenance

Based on our observations, test results on representative samples of soil and in consideration of the minimum required retention volume provided by Kimley-Horn, it is our professional opinion that siltation, plugging and maintenance of the infiltration basins will be minimal, provided the earthwork recommendations are followed.

Based on our understanding of the civil engineering design, the natural drainage of the project Site will remain as is, with minimal drainage alteration. The following maintenance recommendations for infiltration basins are recommended:

- Trash and debris should be removed as needed, but at least annually prior to the beginning of the wet season.
- Slope areas that have become bare should be revegetated and eroded areas should be regraded prior to being revegetated.
- After a large storm event any sediments exceeding three (3) inches thick accumulated should be removed.
- Repair and re-seed erosion on slopes if necessary.
- Periodically observe function under wet weather conditions.
- Planting of native vegetation as soon as possible after earthwork completion.

Due to the soil uniformity and infiltration rates obtained, provided the construction of the Site proceeds as planned (with minimal drainage alteration), it is our opinion that sheet-flow storm-water collected within the proposed infiltration basins will percolate into the site surface soils during storm events. In addition, percolation of sheet-flow water is expected to occur at the surface as it travels across the site, before intercepted by the basins as well as after exiting the basins, in the case of a larger than designed storm event. Once any disturbed or removed native vegetation has returned to the site, the vegetation will aid in reducing the velocity of sheet-flow and allowing for additional percolation in to the ground prior to interception by the proposed infiltration basins.

In the event of a larger storm than designed, the storm-drain water will continue out of the basins in a sheet-flow manner, minimizing any erosion. Return of the natural vegetation will also contribute to preventing the minimal erosion that may occur.

11.0 POST-GRADING AND DESIGN CONSIDERATIONS

11.1 Drainage

The surface drainage system consists of sheet flow across the Site and into the proposed infiltration basins shall be maintained in current condition and not be altered by grading. This natural drainage system will collect storm-water into the subgrade soils, allowing its percolation into the ground.

Bruin GSI anticipates occasional maintenance of the infiltration basins may be necessary during for the lifetime of the project. It is expected the earthwork will minimally alter the topsoil strata. The re-vegetation after earthwork will help minimize any erosion that may occur.

The owner is advised that all drainage devices should be properly maintained throughout the lifetime of the development. Natural vegetation should be re-established and allow to grow after construction of infiltration basins, allowing the percolation of storm-drain sheet-flow across the Site and at the proposed basins.

12.0 ADDITIONAL SERVICES

A comprehensive Geotechnical Investigation Report specifically directed at the structural aspects of the proposed solar array is in process. The report will incorporate data from this report, as well as the data obtained from the future investigation, laboratory testing results and plans prepared for submittal.

Final project plans and specifications should be reviewed prior to construction to confirm that the full intent of the recommendations presented herein have been applied to design and construction. This report is based on the assumption that an adequate testing and inspection program along with client consultation will be performed during final design and construction phases to verify compliance with the recommendations of this report.

Retaining Bruin GSI as the geotechnical consultant to provide additional services from preliminary design through project completion will assure continuity of services.

Additional services include:

- Geotechnical Investigation Report.
- Consultation during design stages of the project.
- Review, stamp and signature of the grading and building plans.
- Observation and testing during rough grading, fine grading and trench backfill as well as placement of engineered fill.
- Consultation as required during construction.

Cost estimates can be prepared if requested. Please contact our office.

13.0 LIMITATIONS AND UNIFORMITY OF CONDITIONS

This report is based on the development plans provided to our office. If structure design changes or structure locations changes occur, the conclusion and recommendations in this report may not be considered valid unless the changes are reviewed and the conclusions of this report are modified or approved by the Geotechnical Consultant.

The subsurface conditions and characteristics described herein have been projected from individual borings or test pits placed across the subject property. Actual variations in the subsurface conditions and characteristics may occur.

If conditions encountered during construction differ from those described in this report, this office should be notified so as to consider the necessity for modifications. No responsibility for construction compliance with the design concepts, specifications, or recommendations is assumed unless on-site construction review is performed during the course of construction, which pertains to the specific recommendations contained herein.

It is recommended that Bruin GSI be provided the opportunity for a general review of final design and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design specifications. If Bruin GSI is not accorded the privilege of making this recommended review, Bruin GSI can assume no responsibility for misinterpretation of the recommendations contained in this report.

This report has been prepared in accordance with generally accepted practice and standards in this community at this time. No warranties, either expressed or implied, are made as to the professional advice provided under the terms of the agreement and included in this report. This report has been prepared for the exclusive use of SPower, Sustainable Power Group and their authorized agents. Unauthorized reproduction of any portion of this report without expressed written permission is prohibited.

If parties other than Bruin GSI are engaged to provide construction geotechnical services, they must be notified that they will be required to assume complete responsibility for the geotechnical phase of the project by concurring with the findings and recommendations in this report or providing alternate recommendations.

14.0 CLOSURE

The conclusions, recommendations, and opinions presented herein are: (1) based upon our evaluation and interpretations of the limited data obtained from our field and laboratory programs; (2) based upon an interpolation of soil conditions between and beyond the borings and trenches; (3) are subject to confirmation of the actual conditions encountered during construction; and, (4) are based upon the assumption that sufficient observation and testing will be provided during the grading, infrastructure installation and building phases of site development.

References

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Sneed, Michelle, and D. L. Galloway. 2000. Aquifer-System Compaction and Land Subsidence: Measurements, Analyses, and Simulations-the Holly Site, Edwards Air Force Base, Antelope Valley, California. U.S. Geological Survey Water Resources Investigations Report 00-4015. 65 p.

APPENDIX A

Boring Logs and Classification Key

LOG OF BORING 5

Date(s) drilled	11-18-2020
Drilling Contractor	GP Drilling
Drilling Method	Hollow Stem Auger
Drill Rig Type	CME 75
Drill Bit Size/Type	8"
Sampling Method(s)	CSS/Bulk
Groundwater	None Encountered
Borehole Backfill	Native/ Cuttings
Hammer Data	140#, 30" drop
Logged By:	DM
Checked By:	MS
Total Depth of Borehole	10' bgs
Boring Location:	See Figure 2
Notes:	
Client:	SPower
Project Number:	20-26
Project Location:	Lancaster, CA

Depth	Sample	USCS	Graphic Log	Material Description	Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
	■	SM		Greyish brown very silty fine to medium sand w/ occ coarse sand Medium dense	11-18	DIST	2.5
5'	■	SM		Greyish brown very silty fine to medium sand w/ caliche (slightly cemented) Medium dense, slightly moist	19-32	108.0	4.2
10'	■	SM/ML		Greyish brown very silty fine to medium sand w/ caliche (slightly cemented) Medium dense, slightly moist	13-26	103.1	5.0
				Boring terminated @ 10' bgs No groundwater No caving			
15'							
20'							
25'							
30'							

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Date(s) drilled	11-18-2020	**LOG OF BORING 6**	
Drilling Contractor	GP Drilling		
Drilling Method	Hollow Stem Auger		
Drill Rig Type	CME 75	Logged By:	DM
Drill Bit Size/Type	8"	Checked By:	MS
Sampling Method(s)	CSS	Total Depth of Borehole	15' bgs
Client: SPower			
Groundwater	None Encountered	Boring Location:	See Figure 2
Project Number: 20-26			
Borehole Backfill	Native/ Cuttings	Notes:	
Project Location: Lancaster, CA			
Hammer Data	140#, 30" drop		

Depth	Sample	USCS	Graphic Log	Material Description	Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
5'	■	SM		Moderate brown silty fine to coarse sand w/ #4 gravel & occ 1/2" gravel Dense, moist	19-26	121.8	1.7
	■	SP		Moderate brown fine to medium sand w/ coarse sand & occ 3/8" gravel Medium dense, slightly moist	7-11	103.1	1.1
10'							
15'	■	SM		Moderate brown silty fine to coarse sand w/ #4 gravel Medium dense, moist	10-13	109.1	2.3
20'				Boring terminated @ 15' bgs No groundwater No caving			
25'							
30'							

LOG OF BORING 7

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Date(s) drilled	11-18-2020
Drilling Contractor	GP Drilling
Drilling Method	Hollow Stem Auger
Drill Rig Type	CME 75
Drill Bit Size/Type	8"
Sampling Method(s)	CSS
Groundwater	None Encountered
Borehole Backfill	Native/ Cuttings
Hammer Data	140#, 30" drop
Logged By:	DM
Checked By:	MS
Total Depth of Borehole	9' bgs
Boring Location:	See Figure 2
Notes:	
Client:	SPower
Project Number:	20-26
Project Location:	Lancaster, CA

Depth	Sample	USCS	Graphic Log	Material Description	Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
	■	SM		Moderate brown silty fine to medium sand w/ occ #4-3/8" gravel Dense, moist	30-36	118.9	5.0
5'	■	SM/SP		Brown fine to medium sand w/ coarse sand Medium dense, slightly moist	8-12	114.6	3.1
	■	SP		Brown fine to medium sand w/ coarse sand Medium dense, moist	11-12	113.6	4.7
10'							
				Boring terminated @ 9' bgs No groundwater No caving			
15'							
20'							
25'							
30'							

LOG OF BORING 9

Date(s) drilled	11-18-2020		
Drilling Contractor	GP Drilling		
Drilling Method	Hollow Stem Auger		
Drill Rig Type	CME 75	Logged By:	DM
Drill Bit Size/Type	8"	Checked By:	MS
Sampling Method(s)	CSS	Total Depth of Borehole	10' bgs
Client: SPower			
Groundwater	None Encountered	Boring Location:	See Figure 2
Project Number: 20-26			
Borehole Backfill	Native/ Cuttings	Notes:	
Project Location: Lancaster, CA			
Hammer Data	140#, 30" drop		

Depth	Sample	USCS	Graphic Log	Material Description	Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
5'		SM		Greyish brown silty fine sand w/ medium to coarse sand & occ #4 gravel Medium dense, moist	14-18	113.4	2.4
		SM/ML		Moderate brown very silty fine to medium sand w/ coarse sand & slight caliche Medium dense, slightly moist	8-13	112.9	7.4
10'							
				Boring terminated @ 10' bgs No groundwater No caving			
15'							
20'							
25'							
30'							

Date(s) drilled	11-18-2020	**LOG OF BORING 13** **Page 1 of 1**
Drilling Contractor	GP Drilling	
Drilling Method	Hollow Stem Auger	
Drill Rig Type	CME 75	Logged By: DM
Drill Bit Size/Type	8"	Checked By: MS
Sampling Method(s)	CSS	Total Depth of Borehole: 15' bgs

Client: SPower	Groundwater: None Encountered	Boring Location: See Figure 2
Project Number: 20-26	Borehole Backfill: Native/ Cuttings	Notes:
Project Location: Lancaster, CA	Hammer Data: 140#, 30" drop	

Depth	Sample	USCS	Graphic Log	Material Description	Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
	■	ML/CL		Pale brown fine sandy silt w/ clay binder (cemented) Very firm, moist	25-50/6"	118.8	3.7
5'							
	■	SM		Moderate brown slightly silty fine to medium sand w/ occ coarse sand Medium dense, slightly moist	9-16	Dist.	1.3
	■	SM/SP		Moderate brown slightly silty fine to medium sand w/ occ coarse sand Medium dense, slightly moist	10-14	105.8	2.6
10'							
15'	■	SM		Moderate brown silty fine to coarse sand Medium dense, slightly moist	12-19	108.3	3.2
				Boring terminated @ 15' bgs No groundwater No caving			
20'							
25'							
30'							

BRUIN GEOTECHNICAL SERVICES, INC.

GEOTECHNICAL REPORTS | MATERIAL TESTING | CONSTRUCTION INSPECTION

SOIL CLASSIFICATION KEY

MAJOR DIVISIONS			SYMBOL	TYPICAL NAMES
Coarse Grained Soils 50% or more larger than #200 sieve	**Gravels** More than half coarse-fraction is larger than No. 4 sieve size	Clean gravels with little or no fines	GW	Well graded gravels, gravel-sand mixtures
			GP	Poorly graded gravels, gravel-sand mixtures
		Gravel with over 12% fines	GM	Silty gravels, poorly graded gravel-sand-silt mixtures
			GC	Clayey gravels, poorly graded gravel-sand-clay mixtures
	Sands More than half coarse-fraction is smaller than No. 4 sieve size	Clean sands with little or no fines	SW	Well graded sands, gravelly sands
			SP	Poorly graded sands, gravelly sands
		Sands with over 12% fines	SM	Silty sands, poorly graded sand-silt mixtures
			SC	Clayey sands, poorly graded sand-clay mixtures
Fine Grained Soils 50% or more smaller than #200 sieve	**Silts and Clays** Liquid limit less than 50		ML	Inorganic silts, rock flour, clayey silts
			CL	Inorganic clays of low to medium plasticity, sandy clays, silty clays
			OL	Organic clays and organic silty clays of low plasticity
	Silts and Clays Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy/silty soils, elastic silts
			CH	Inorganic clays with high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
Highly Organic Soils			Pt	Peat and other highly organic soils

CLASSIFICATION SYSTEM BASED ON THE UNIFIED SOIL CLASSIFICATION SYSTEM

44732 Yucca Avenue
Tel (661) 273-9078

Lancaster, California 93534
www.bruingsi.net

Boring Log Key

Depth	Sample	USCS	Graphic Log	Material Description	Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
1	2	3	4	5	6	7	8

COLUMN DESCRIPTIONS

1	Depth in feet below the ground surface	5	Description of the material encountered. May include consistency, moisture, color, and other descriptors
2	Sampling Method see "symbols" below	6	Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval
3	USCS symbol	7	Dry weight per unit volume of soil sample measured in laboratory units in pounds per cubic foot
4	Graphic depiction of the subsurface material	8	Water content of the sample expressed as a percentage of the dry weight of the sample

ABBREVIATIONS

DIST = Disturbed Sample
N/R = No Recovery
CHEM = Chemical Test
N/A = Not Analyzed

SAMPLING METHOD SYMBOLS

California Split Spoon (CSS)

Standard Penetration Test (SPT)

Bulk Sample

Grab Sample

GENERAL NOTES

1. Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.

2. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

APPENDIX B

Excavation Logs and Classification Key

Client:	S-Power Estrella
Project Location:	Lancaster, CA
Date(s) trenched	12/22/2020
Total Depth of Trench	6' bgs
Trenching Equipment	Backhoe
Sampling Method(s)	Hand-Sampler
Trench Backfill	Native Cuttings
Ground-water	None Encountered

TEST HOLE 1

Logged By	LW
Checked By:	MS
Notes:	Lat: 34.819371°
	Lon: -118.296718°

Project number: 20-26

Depth	Sample	USCS	Graphic Log	Material Description	Dry Unit Weight pcf	Water Content %
		SM		Brown silty fine to medium sand w/occ coarse sand - # 4 gravel & clay binder Dense, saturated		15.5
		ML		Brown very silty fines w/occ medium to coarse sand w/trace of caliche & organics Firm, very moist		21.5
5'		ML				18.7
				Boring terminated at 6' bgs No groundwater No caving		
10'						
15'						
20'						
25'						
30'						

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Client:	S-Power Estrella	TEST HOLE 2	
Project Location:	Lancaster, CA	Page 1 of 1	
Date(s) trenched	12/22/2020		
Total Depth of Trench	5' bgs		
Trenching Equipment	Backhoe	Logged By	LW
Sampling Method(s)	Hand-Sampler	Checked By:	MS
Trench Backfill	Native Cuttings	Notes:	Lat: 34.815998°
Ground-water	None Encountered		Lon: -118.293815°

Project number: 20-28

Depth	Sample	USCS	Graphic Log	Material Description	Dry Unit Weight pcf	Water Content %
	■	ML		Pale brown fine sandy silt w/caliche (clay binder)		19.9
				Very firm, saturated		
5'	■					13.7
				Moderately firm, very moist		
				Boring terminated at 5' bgs		
				No groundwater		
10'				No caving		
15'						
20'						
25'						
30'						

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Client:	S-Power Estrella	**TEST HOLE 3**	
Project Location:	Lancaster, CA		
Date(s) trenched	12/22/2020		
Total Depth of Trench	5 ft. bgs		
Trenching Equipment	Backhoe	Logged By	LW
Sampling Method(s)	Hand-Sampler	Checked By:	MS
Trench Backfill	Native Cuttings	Notes:	Lat: 34.815268°
Ground-water	None Encountered		Lon: -118.295137°

Project number: 20-26

Depth	Sample	USCS	Graphic Log	Material Description	Dry Unit Weight pcf	Water Content %
5'	■	SM	▦	Moderate brown silty fine to coarse sand w/# 4 gravel w/occ 1/2" gravel		15.6
				Dense, saturated		
				Boring terminated at 6' bgs		
				No groundwater		
10'				No caving		
15'						
20'						
25'						
30'						

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Client:	S-Power Estrella	**TEST HOLE 4**	
Project Location:	Lancaster, CA	Page 1 of 1	
Date(s) trenched	12/22/2020		
Total Depth of Trench	4' bgs		
Trenching Equipment	Backhoe	Logged By	LW
Sampling Method(s)	Hand-Sampler	Checked By:	MS
Trench Backfill	Native Cuttings	Notes:	Lat: 34.813728°
Ground-water	None Encountered		Lon: -118.295114°

Project number: 20-26

Depth	Sample	USCS	Graphic Log	Material Description	Dry Unit Weight pcf	Water Content %
	■	ML		Brown silty fine to medium sand w/coarse sand w/occ # 4 gravel & trace of organics		18.7
				Moderate firm, saturated		
	■	ML		Brown very silty fine to medium sand w/occ coarse sand & # 4 - 3/8" gravel		14.8
5'				Very dense, very moist		
				Boring terminated at 4' bgs		
				No groundwater		
				No caving		
10'						
15'						
20'						
25'						
30'						

BRUIN GEOTECHNICAL SERVICES, INC.

GEOTECHNICAL REPORTS | MATERIAL TESTING | CONSTRUCTION INSPECTION

SOIL CLASSIFICATION KEY

MAJOR DIVISIONS			SYMBOL	TYPICAL NAMES
Coarse Grained Soils 50% or more larger than #200 sieve	**Gravels** More than half coarse-fraction is larger than No. 4 sieve size	Clean gravels with little or no fines	GW	Well graded gravels, gravel-sand mixtures
			GP	Poorly graded gravels, gravel-sand mixtures
		Gravel with over 12% fines	GM	Silty gravels, poorly graded gravel-sand-silt mixtures
			GC	Clayey gravels, poorly graded gravel-sand-clay mixtures
	Sands More than half coarse-fraction is smaller than No. 4 sieve size	Clean sands with little or no fines	SW	Well graded sands, gravelly sands
			SP	Poorly graded sands, gravelly sands
		Sands with over 12% fines	SM	Silty sands, poorly graded sand-silt mixtures
			SC	Clayey sands, poorly graded sand-clay mixtures
Fine Grained Soils 50% or more smaller than #200 sieve	**Silts and Clays** Liquid limit less than 50		ML	Inorganic silts, rock flour, clayey silts
			CL	Inorganic clays of low to medium plasticity, sandy clays, silty clays
			OL	Organic clays and organic silty clays of low plasticity
	Silts and Clays Liquid limit greater than 50		MH	Inorganic silts, micaceous or diatomaceous fine sandy/silty soils, elastic silts
			CH	Inorganic clays with high plasticity, fat clays
			OH	Organic clays of medium to high plasticity, organic silts
Highly Organic Soils			Pt	Peat and other highly organic soils

CLASSIFICATION SYSTEM BASED ON THE UNIFIED SOIL CLASSIFICATION SYSTEM

Excavation Log Key

Depth	Sample	USCS	Graphic Log	Material Description	Penetration Resistance (Blows/6")	Dry Unit Weight pcf	Water Content %
1	2	3	4	5	6	7	8

COLUMN DESCRIPTIONS

1	Depth in feet below the ground surface	5	Description of the material encountered. May include consistency, moisture, color, and other descriptors
2	Sampling Method see "symbols" below	6	Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval
3	USCS symbol	7	Dry weight per unit volume of soil sample measured in laboratory units in pounds per cubic foot
4	Graphic depiction of the subsurface material	8	Water content of the sample expressed as a percentage of the dry weight of the sample

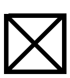
ABBREVIATIONS

DIST	=	Disturbed Sample	N/A	=	Not Analyzed
N/R	=	No Recovery			
CHEM	=	Chemical Test			

SAMPLING METHOD SYMBOLS


Hand Sample


Bulk Sample


Grab Sample

GENERAL NOTES

1. Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.

2. Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

APPENDIX C
Laboratory Test Results

SUMMARY OF LABORATORY TEST RESULTS

SIEVE ANALYSIS

Percent passing individual sieves

Sample I.D.	1/2"	3/8"	#4	#10	#40	#100	#200
TH-1@2’	100	100	99	97	57	37	30
TH-2@ 2’	100	100	96	90	71	56	42
TH-1@4’	100	100	100	98	89	80	73
B7@6’	100	100	95	87	57	27	15
B13@7’	100	100	98	89	44	15	8
B6@8’	100	99	98	91	38	5	3

SUMMARY OF LABORATORY TEST RESULTS

SAND EQUIVALENT

Sample I.D.	Sand Equivalent
TH-2@4’	12
TH-1@6’	8
B6@8’	27
B13@9’	17

EXPANSION INDEX

Sample	Expansion Index	Classification
B5@0-5’	0	Non-Expansive

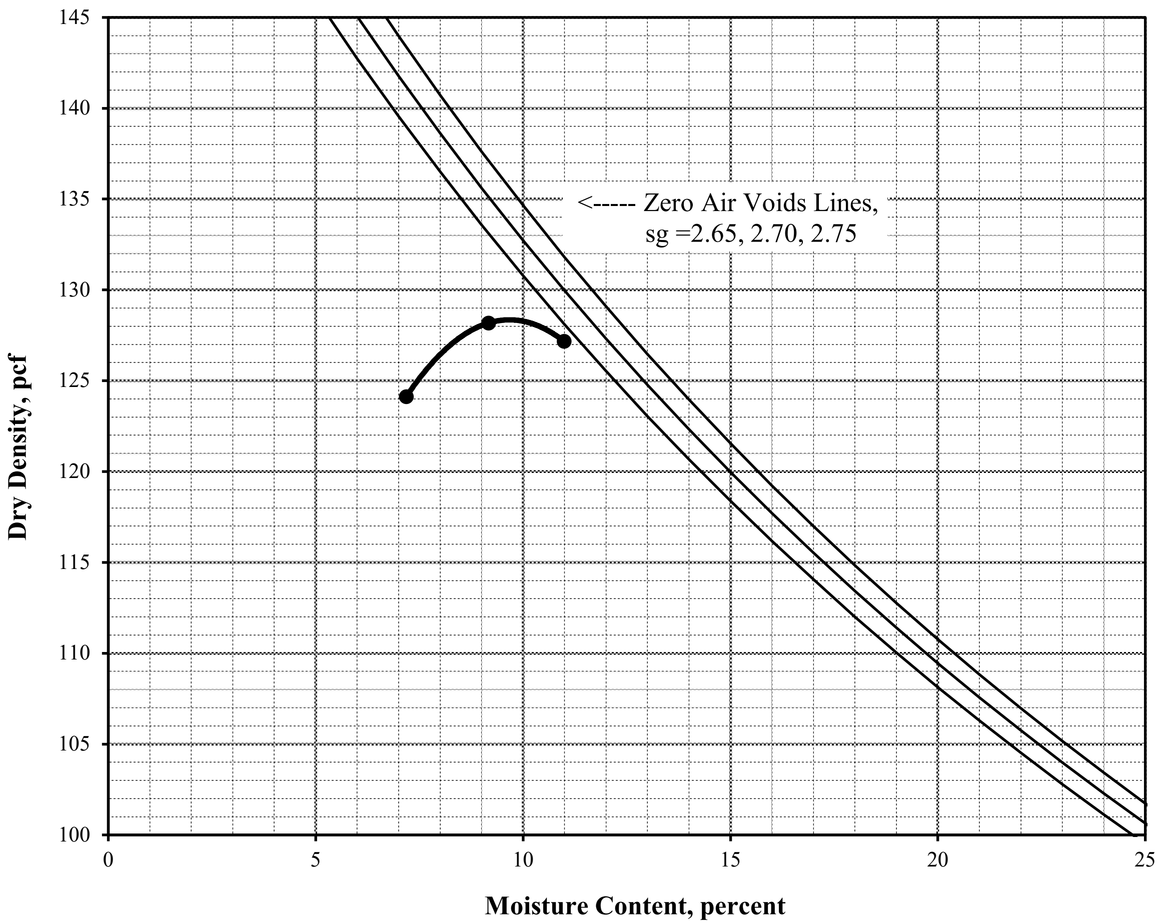
Bruin Geotechnical Services Inc.

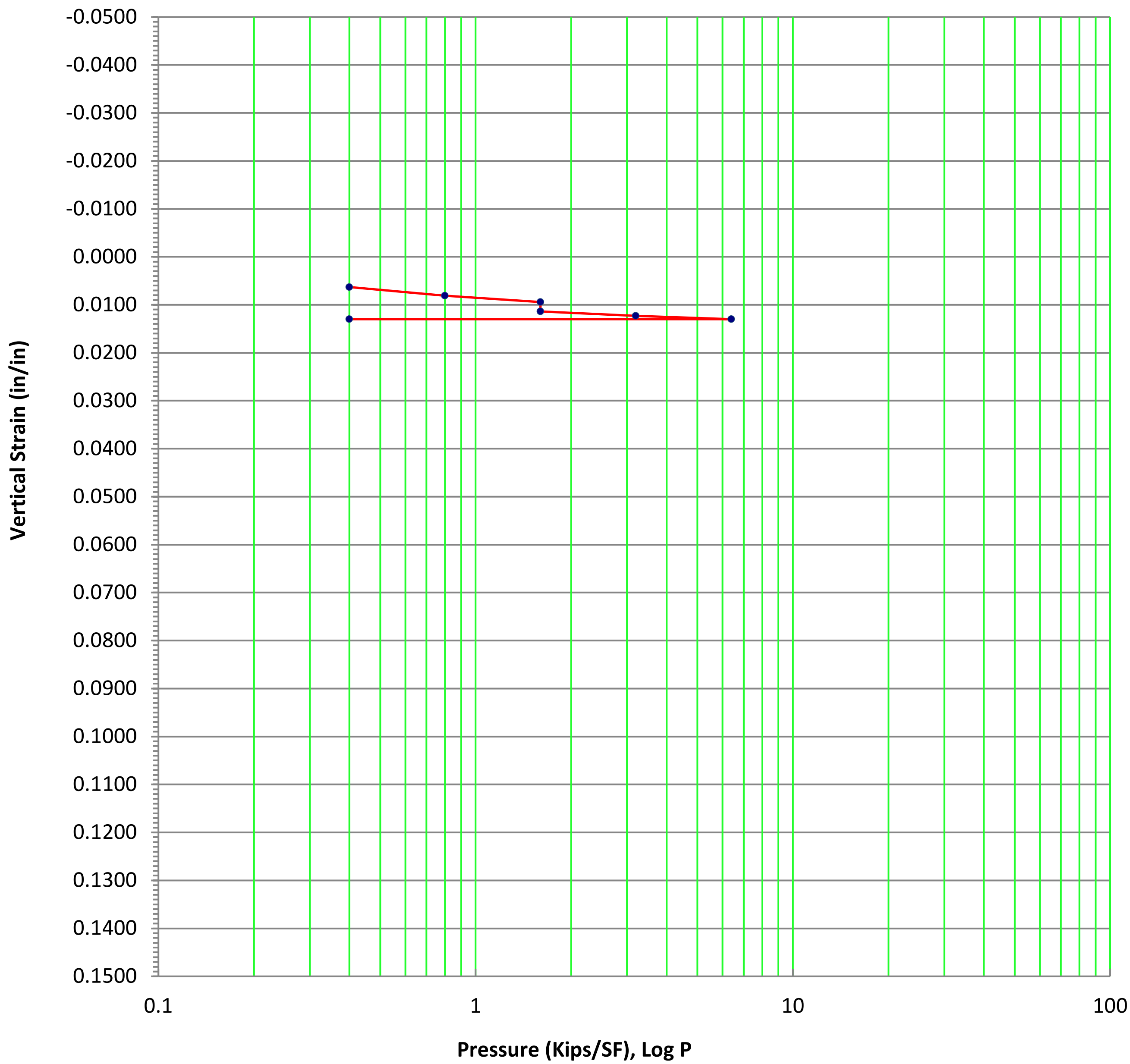
44732 Yucca Avenue
Lancaster, CA 93534
661-273-9078

Maximum Density/Optimum Moisture Proctor ASTM D698/D1557

Project Number:	20-26	December 30, 2020
Project Name:	Spower/Estrella	ASTM D-1557 C
Lab ID Number:	B5 bulk	Rammer Type: 10#
Sample Location:	B5 0'-5'	
Description:	Light yellowish brown very silty fine to coarse sand w/occ # 4 - 3/8" grvl.	

		Sieve Size	% Retained
Maximum Density:	**128.5 pcf**	3/4"	
Optimum Moisture:	**9.5%**	3/8"	
		#4	





Sample location: B13@9'
Material: SM/SP
Initial Dry Density: 105.8 PCF
Moisture Content: 2.6 %
% Hydroconsolidation: 0.2 %

* Test Method: ASTM D-2435

Consolidation Test

Spower - Estrella

Lancaster, CA

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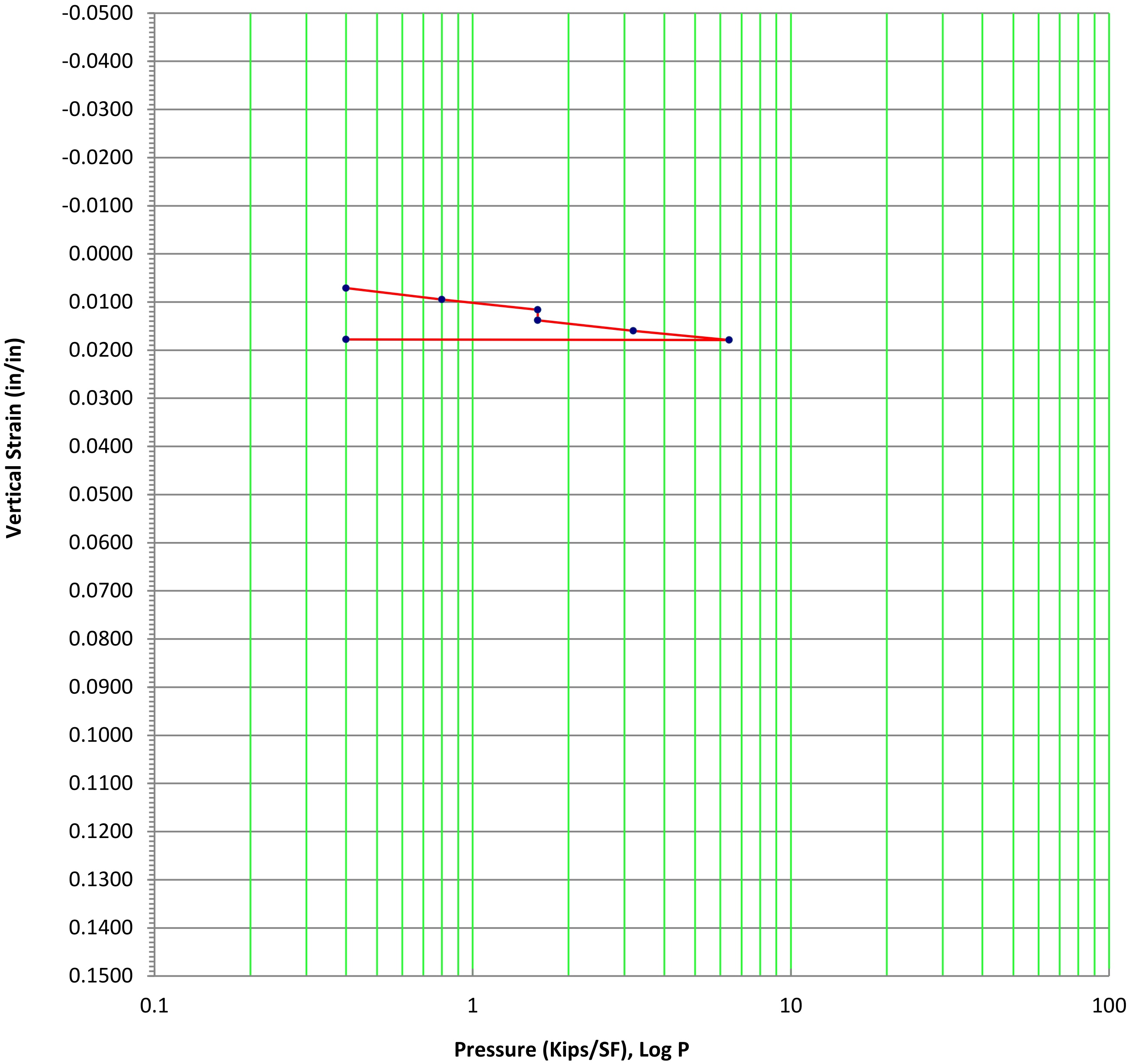
1/10/2021	**20-26**



Sample location:	B5@5'
Material:	SM
Initial Dry Density:	108.0 PCF
Moisture Content:	4.2 %
% Hydroconsolidation:	0.2 %

* Test Method: ASTM D-2435

Consolidation Test

Spower - Estrella

Lancaster, CA

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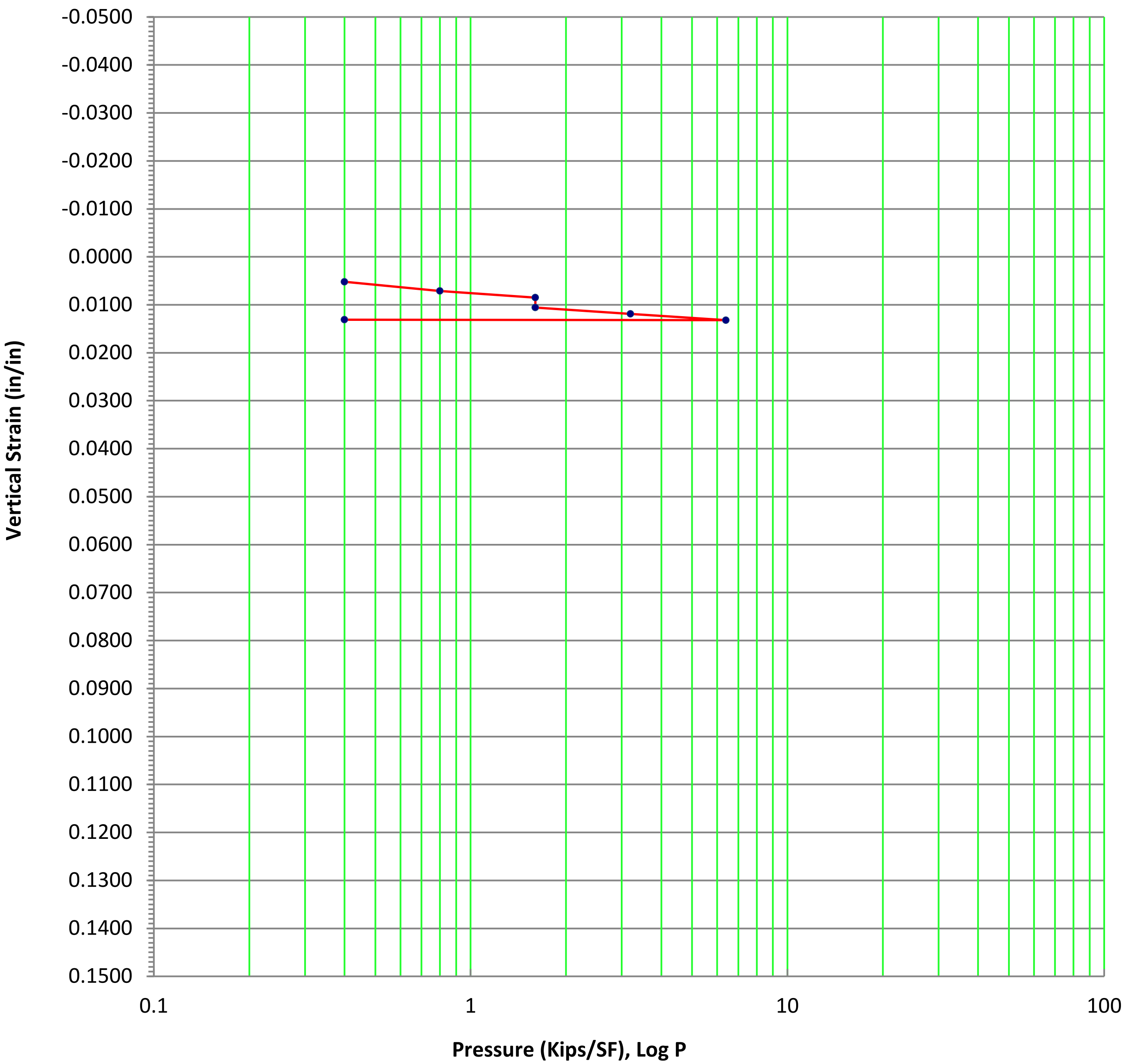
est. 2004

1/10/2021 **20-26**



Sample location: B6@8'
Material: SP
Initial Dry Density: 103.1 PCF
Moisture Content: 1.1 %
% Hydroconsolidation: 0.2 %

* Test Method: ASTM D-2435

Consolidation Test

Spower - Estrella

Lancaster, CA

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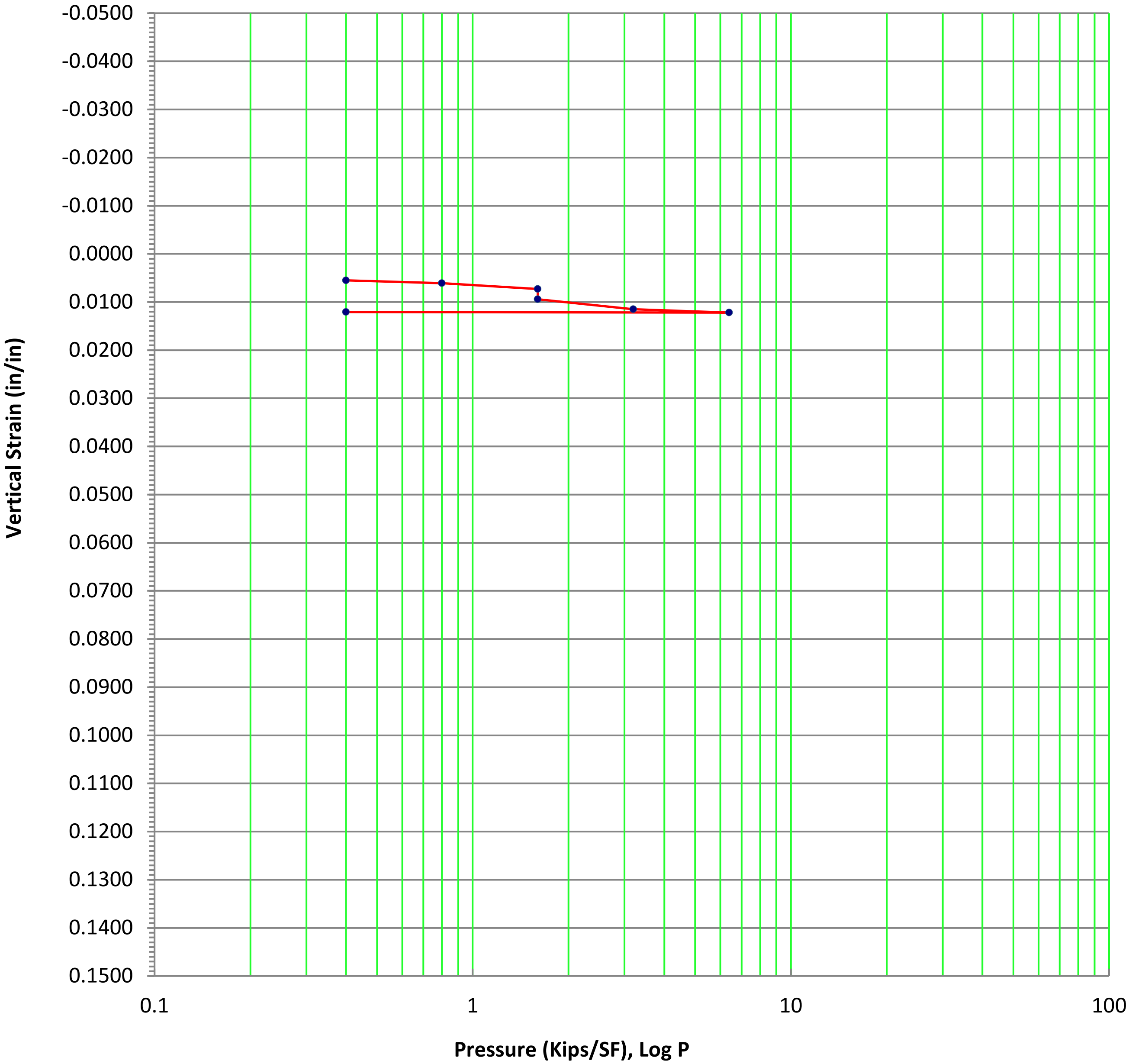
est. 2004

1/10/2021	**20-26**



Sample location:	B9@5'	
Material:	SM	
Initial Dry Density:	113.4	PCF
Moisture Content:	2.4	%
% Hydroconsolidation:	0.2	%

* Test Method: ASTM D-2435

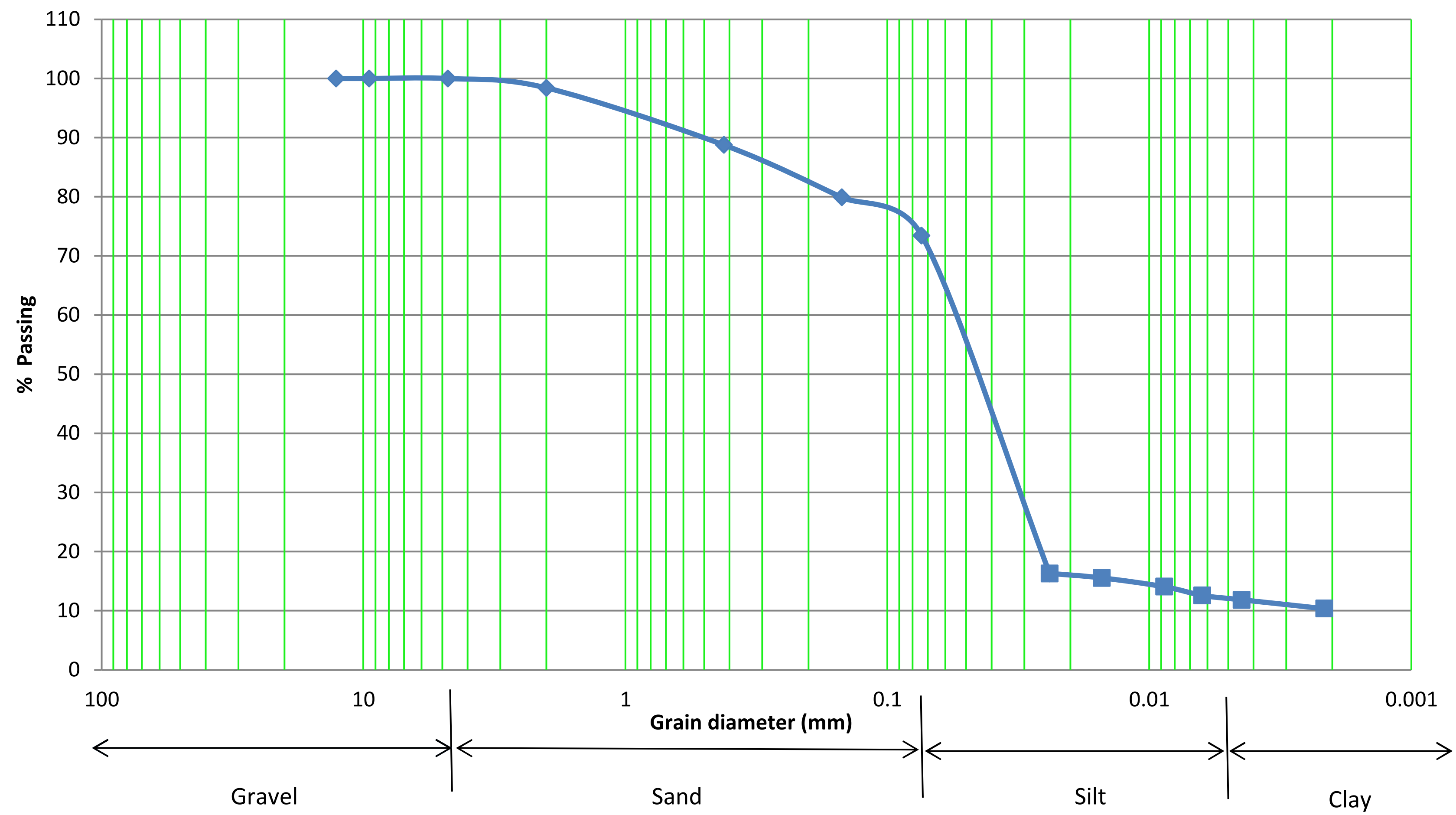
Consolidation Test

Spower - Estrella

Lancaster, CA

BRUIN GEOTECHNICAL SERVICES INC. est. 2004

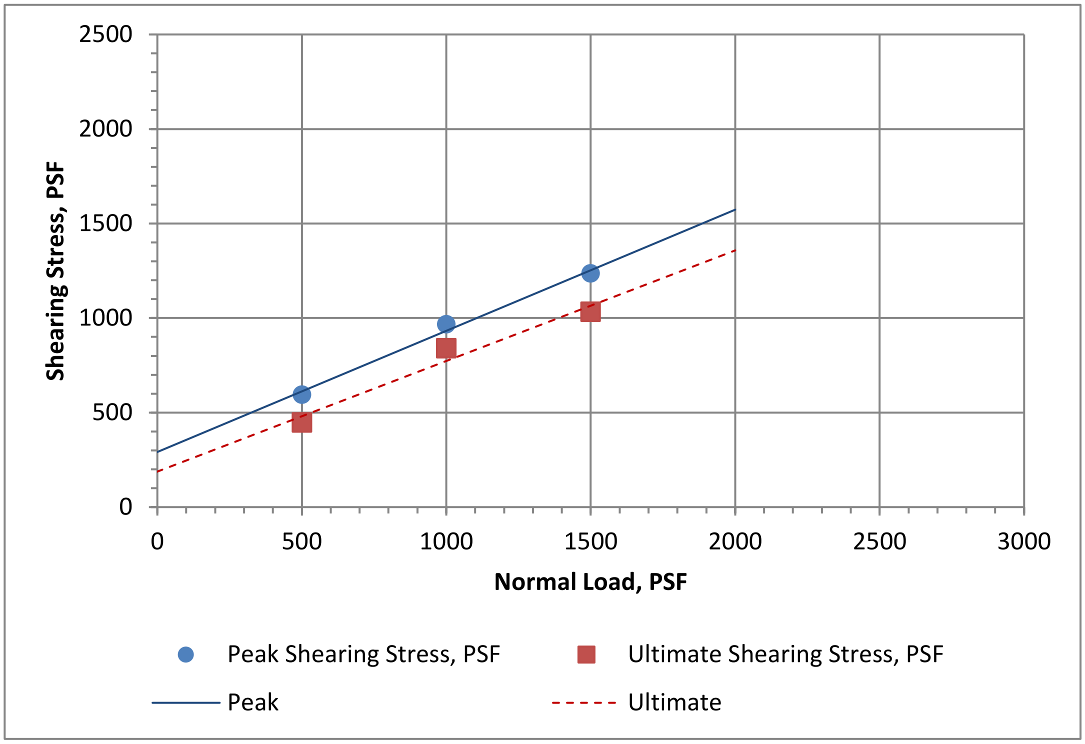
1/10/2021	**20-26**

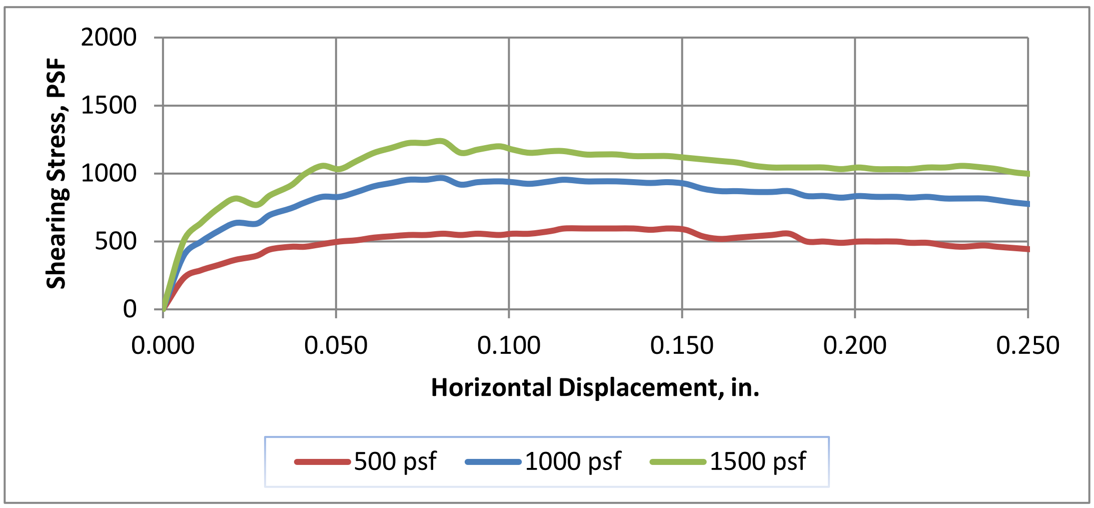


Grain Size Distribution Curve (ASTM D422)

Job Number:	20-26	Coefficient of Uniformity, Cu:	25
Client Name:	Spower / Estrella	Particle range, mm:	13
Sample I.D.:	TH1@4'		
Date:	2/8/2021	USCS:	ML

BRUIN
GEOTECHNICAL SERVICES INC.
est. 2004





Sample Description: Light brown very silty fien to medium sand w/occ coarse sand

DIRECT SHEAR DATA (Per ASTM D-3080)

Sample ID	Symbol	Depth, feet	Dry Density, PCF	Average deg. of saturation
B5	●	5	108	99
			Peak	Ultimate
Angle of friction, (degrees)			33	30
Cohesive Strength (PSF)			292	188

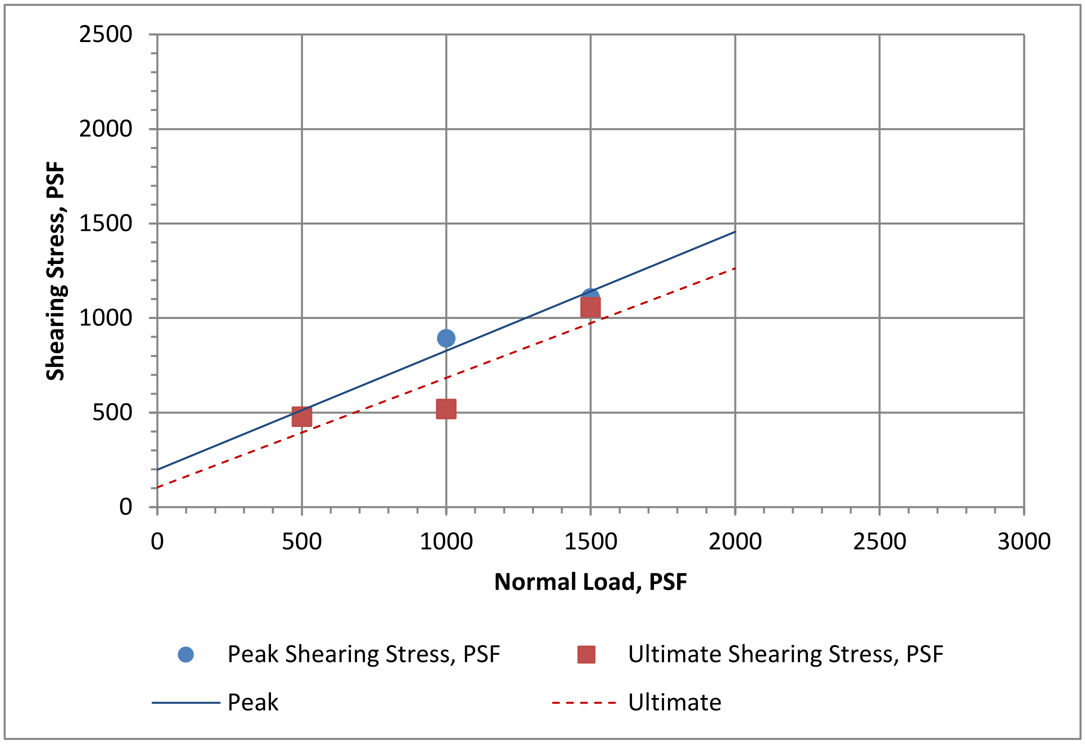
Direct Shear Test

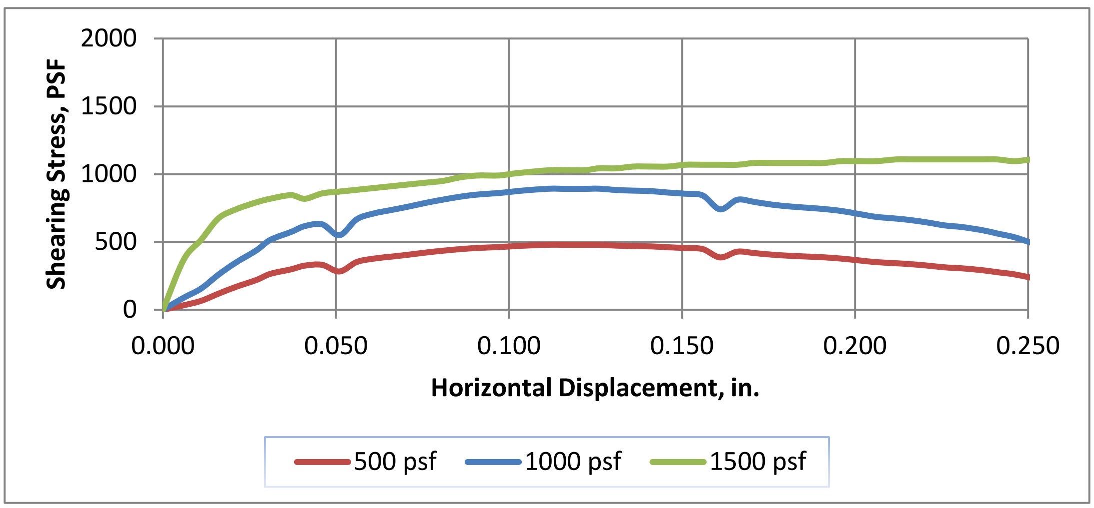
SPower - Estrella

Lancaster, CA

BRUIN GEOTECHNICAL SERVICES INC. est. 2004

1/12/2021	20-26





Sample Description: Brown silty fine to medium sand w/ coarse sand

DIRECT SHEAR DATA (Per ASTM D-3080)

Sample ID	Symbol	Depth, feet	Dry Density, PCF	Average deg. of saturation
B7	●	6	113	97
			Peak	Ultimate
Angle of friction, (degrees)			32	30
Cohesive Strength (PSF)			490	104

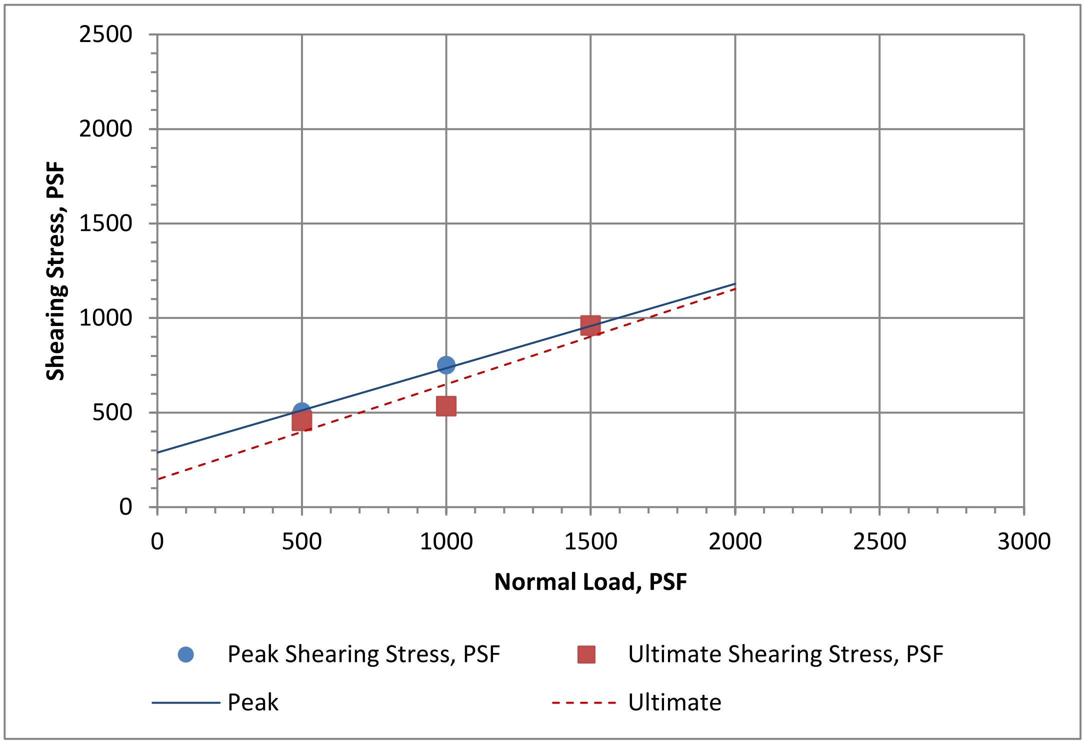
Direct Shear Test

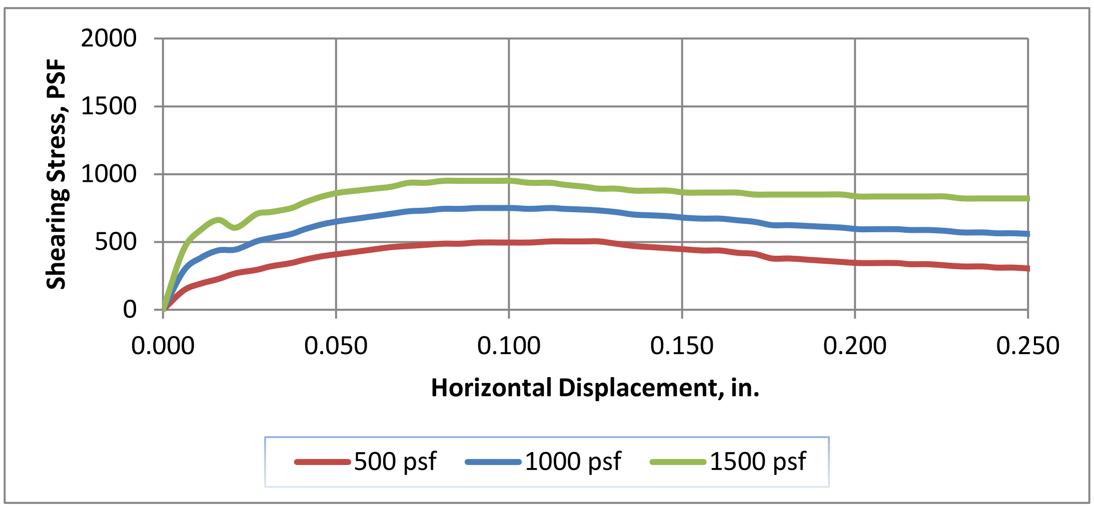
SPower - Estrella

Lancaster, CA

BRUIN GEOTECHNICAL SERVICES INC. est. 2004

1/12/2021	**20-26**





Sample Description: Greyish brown very silty fine sand w/occ medium to coarse sand 3/8" gravel

DIRECT SHEAR DATA (Per ASTM D-3080)

Sample ID	Symbol	Depth, feet	Dry Density, PCF	Average deg. of saturation
B9	●	8	113	99
			Peak	Ultimate
Angle of friction, (degrees)			24	27
Cohesive Strength (PSF)			342	146

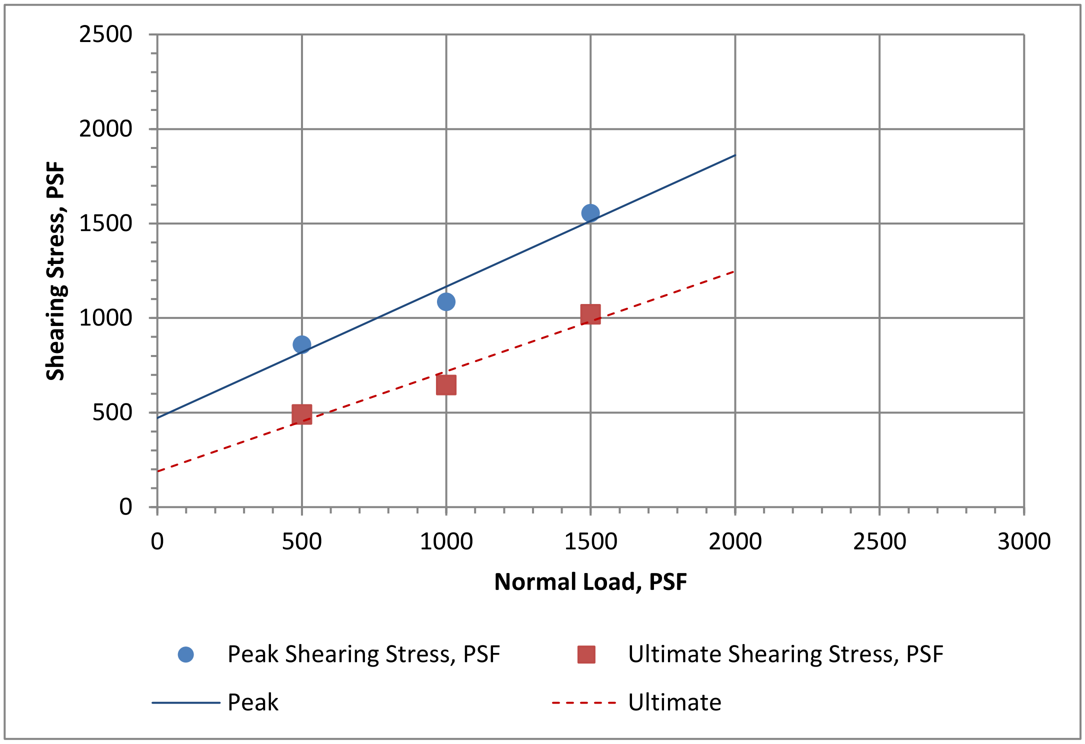
Direct Shear Test

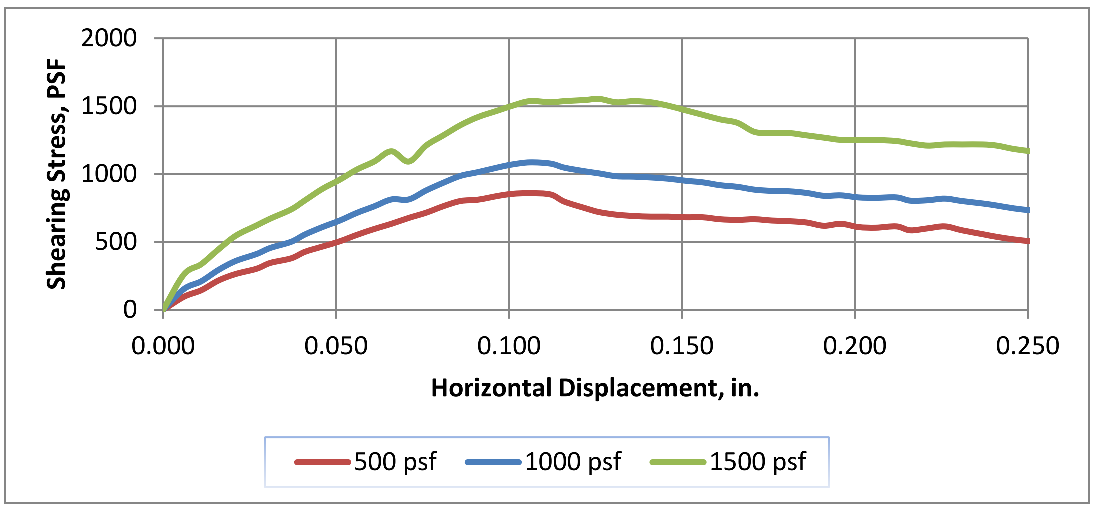
SPower - Estrella

Lancaster, CA

BRUIN
GEOTECHNICAL SERVICES INC.
est. 2004

1/15/2021	**20-26**





Sample Description: Light greyish brown very silty fine to medium sand w/ coarse sand

DIRECT SHEAR DATA (Per ASTM D-3080)

Sample ID	Symbol	Depth, feet	Dry Density, PCF	Average deg. of saturation
B13	●	3	119	95
			Peak	Ultimate
Angle of friction, (degrees)			35	28
Cohesive Strength (PSF)			472	188

Direct Shear Test

SPower - Estrella

Lancaster, CA

BRUIN
GEOTECHNICAL SERVICES INC.
est. 2004

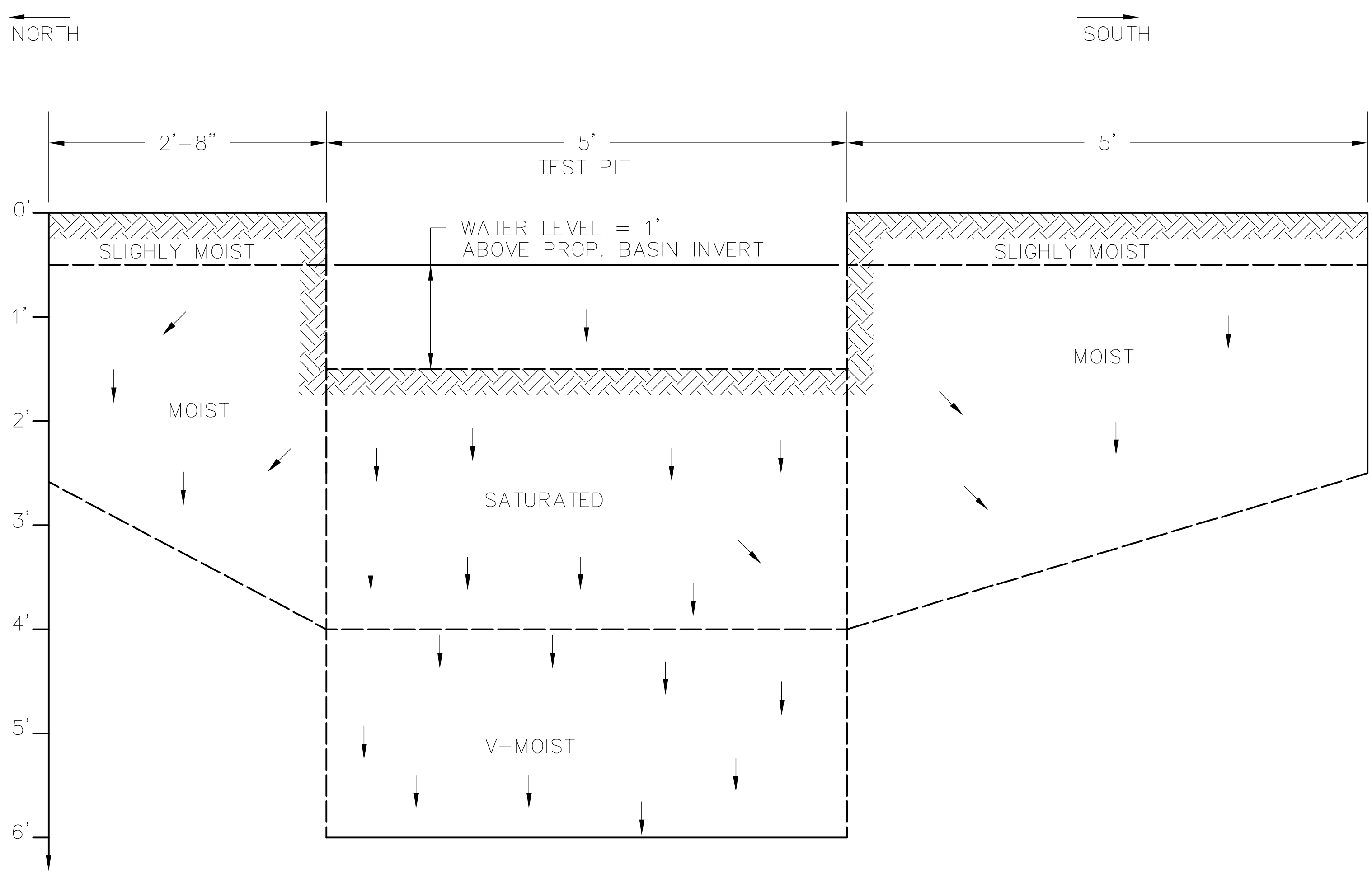
1/12/2021	**20-26**

APPENDIX D

Groundwater Investigation Map

TEST HOLE 1

OBSERVATION OF EXCAVATION AFTER TESTING

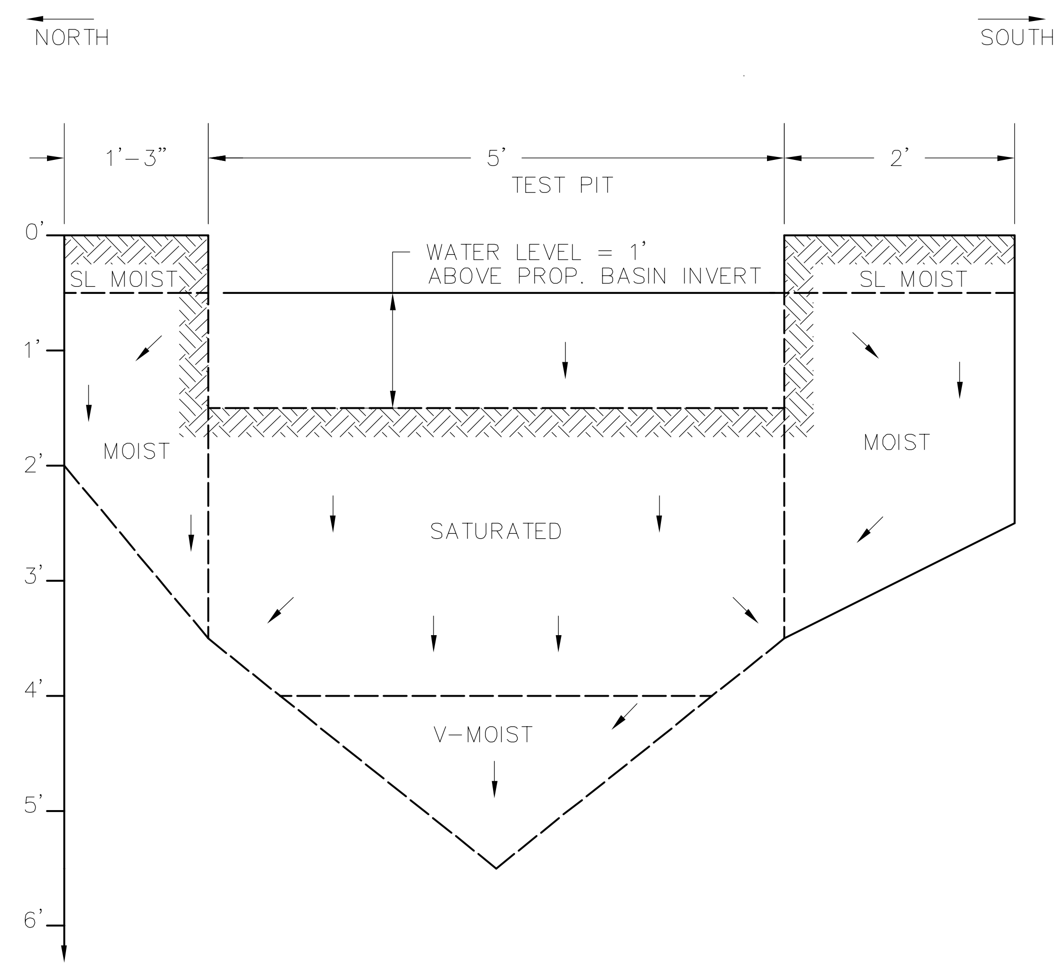


LEGEND

↓ DIRECTION OF FLOW

TEST HOLE 2

OBSERVATION OF EXCAVATION AFTER TESTING

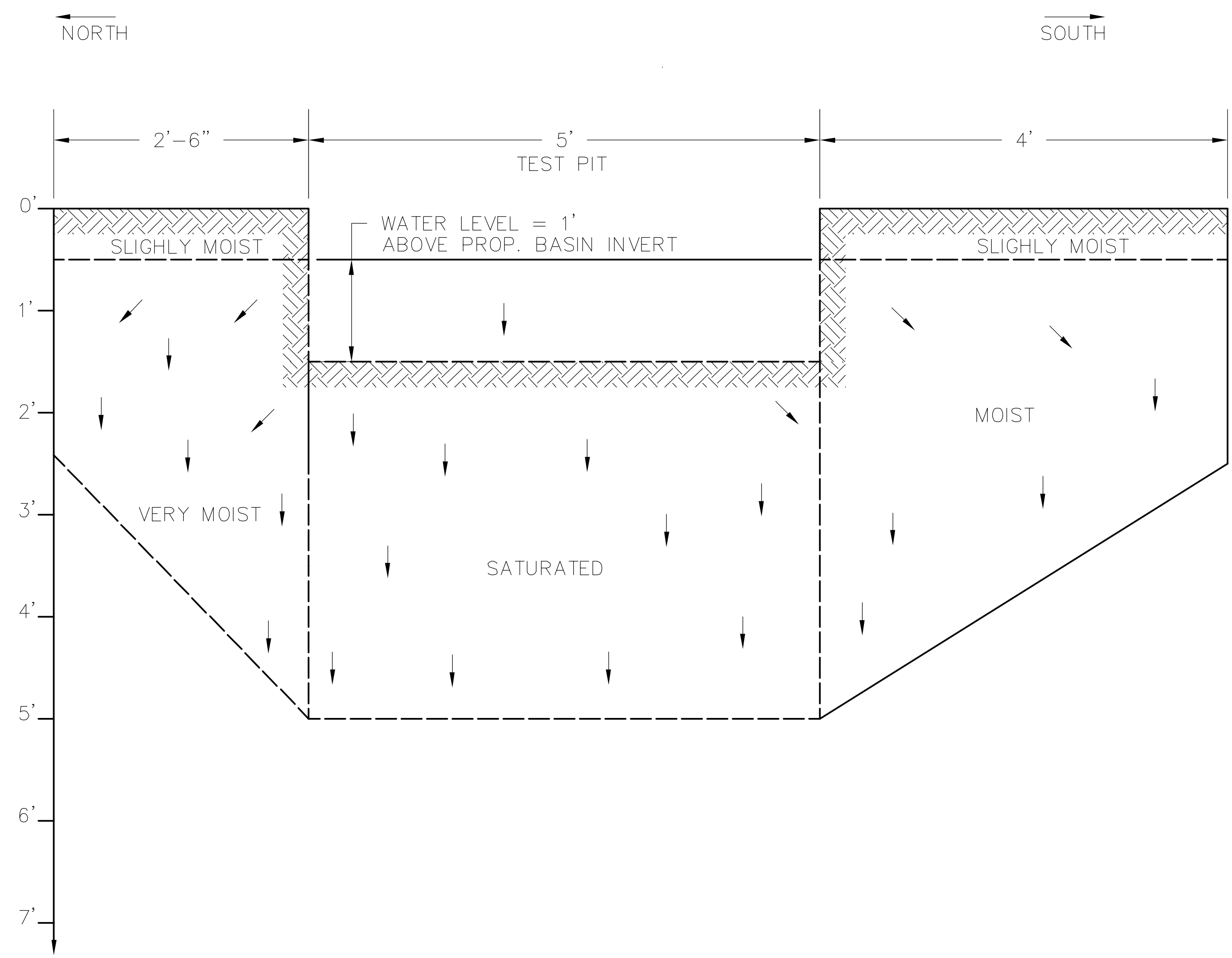


LEGEND

↓ DIRECTION OF FLOW

TEST HOLE 3

OBSERVATION OF EXCAVATION AFTER TESTING

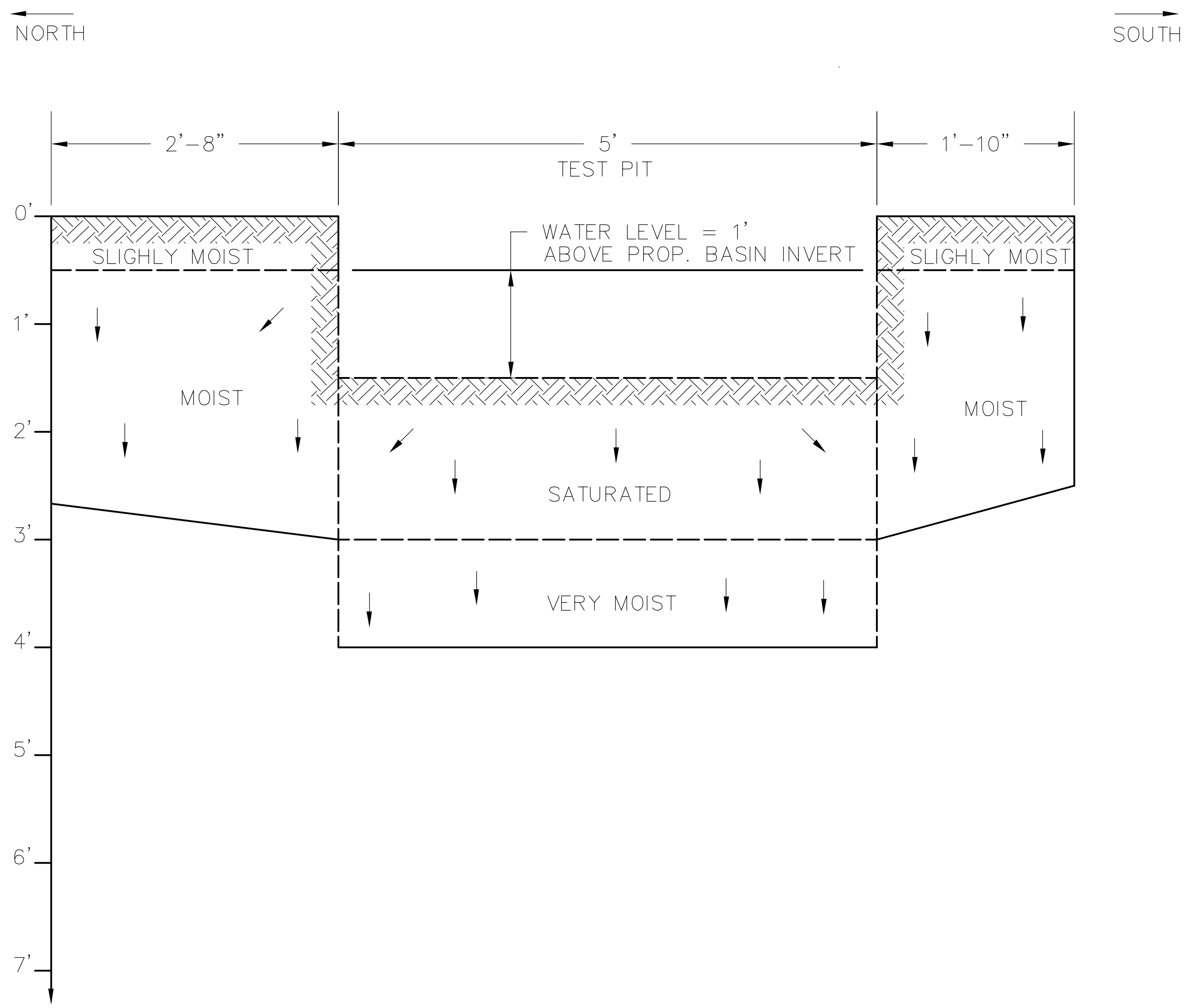


LEGEND

DIRECTION OF FLOW

TEST HOLE 4

OBSERVATION OF EXCAVATION AFTER TESTING



LEGEND

↓ DIRECTION OF FLOW

APPENDIX E

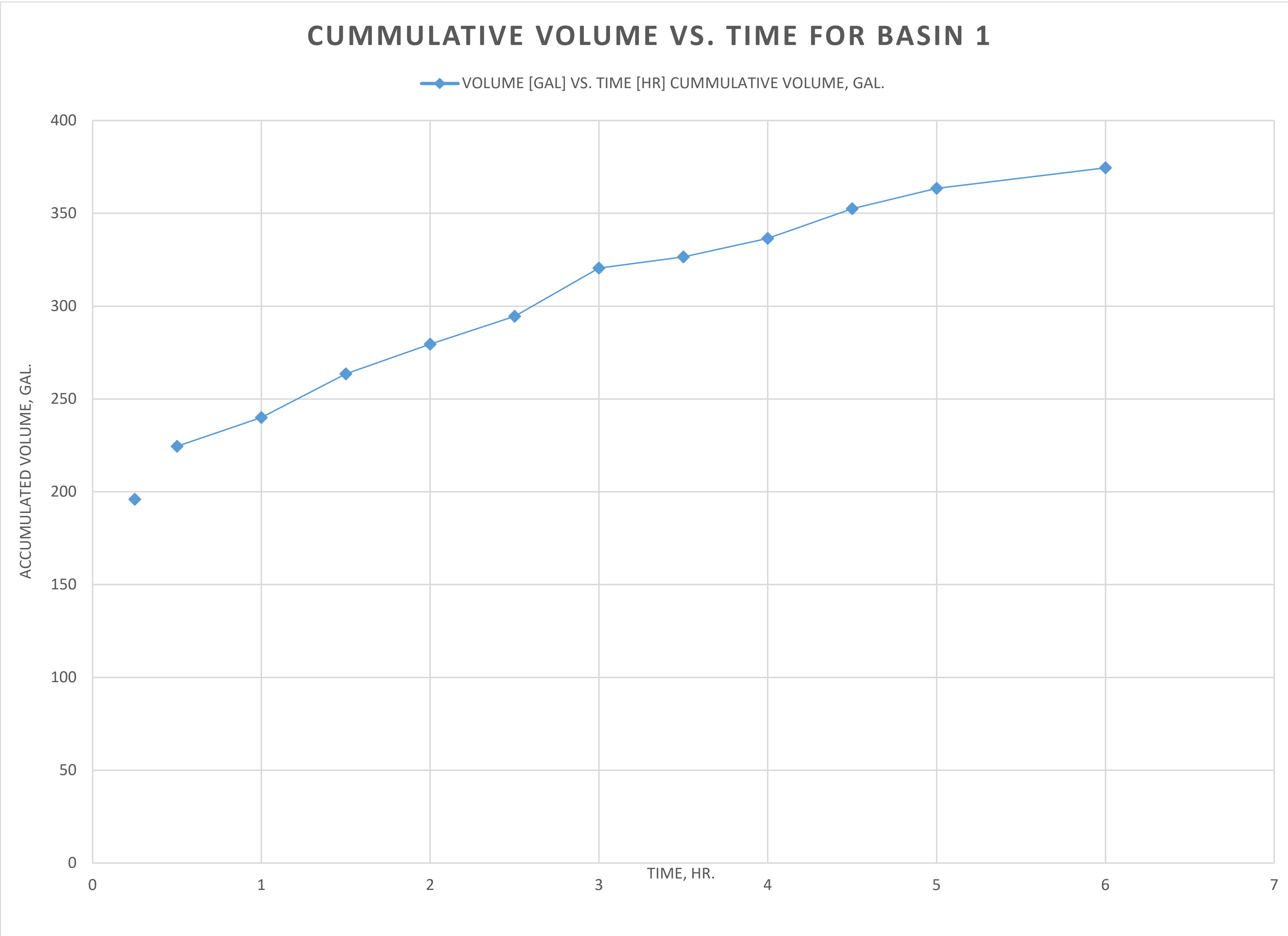
Infiltration Results and Cumulative Volume vs. Time Graphs

EXCAVATION PERCOLATION FIELD LOG

PROJECT LOCATION: SOUTH EAST CORNER OF AVE. A & 95TH ST. WEST, LANCASTER, CA
SOIL DESCRIPTION: BROWN VERY SILTY FINE TO MEDIUM SAND W/OCC COARSE SAND & CLAY BINDER
TESTED BY: AM/MF
LIQUID DESCRIPTION: CLEAR CLEAN TAP WATER
MEASUREMENT METHOD: MARKED ROD
DATE: 12/16/2020
TIME INTERVAL STANDARD
START TIME FOR PRE-SOAK: 8:45 AM
START TIME FOR STANDARD: 9:19 AM

TEST LOCATION/NO.: BASIN 1
WIDTH OF EXCAVATION, FT: 5 LENGTH OF EXCAVATION, FT: 5
DEPTH OF EXCAVATION, IN: 18
DEPTH OF INVERT OF BMP, IN: 18
DEPTH OF WATER TABLE: UNKNOWN
DEPTH TO INITIAL WATER DEPTH: 12 INCHES
WATER REMAINING IN EXCAVATION? (Y/N) YES
STD. TIME BETWEEN READINGS: 30 MINUTES

READING NO.	TIME START/END (HH:MM)	ELAPSED TIME (MIN)	VOLUME (START/END) V, [GAL]	ΔV, [GAL]	INFILTRATION FLOW RATE, Q [GPM]	STABILIZED FLOW RATE %	WATER SURFACE ELEVATION (IN)	WATER SURFACE ELEVATION DROP, Δ (IN)	VOLUME [GAL] VS. TIME [HR]: CUMMULATIVE TIME, HR.	CUMMULATIVE VOLUME, GAL.	SOIL DESCRIPTION/NOTES/COMMENTS
Presoak	8:45 9:00	15	30618 30814	196	13.07	0.0	12 10.5	1.5	0.25	196	
Presoak	9:02 9:17	15	30814 30842.5	28.5	1.90	14.5	12 10	2	0.5	224.5	
1	9:19 9:49	30	30842.5 30858	15.5	0.52	27.2	12 10	2	1	240	
2	9:51 10:21	30	30858 30881.5	23.5	0.78	66.0	12 10	2	1.5	263.5	
3	10:23 10:53	30	30881.5 30897.5	16	0.53	68.1	12 10	2	2	279.5	
4	10:55 11:25	30	30897.5 30912.5	15	0.50	93.8	12 10	2	2.5	294.5	
5	11:27 11:57	30	30912.5 30938.5	26	0.87	57.7	12 10	2	3	320.5	
6	11:59 12:29	30	30938.5 30944.5	6	0.20	23.1	12 10	2	3.5	326.5	
7	12:31 13:01	30	30944.5 30954.5	10	0.33	60.0	12 11	1	4	336.5	STABILIZED FLOW RATE
8	13:03 13:33	30	30954.5 30970.5	16	0.53	62.5	12 11	1	4.5	352.5	
9	13:35 14:05	30	30970.5 30981.5	11	0.37	68.8	12 11	1	5	363.5	
10	14:07 15:07	60	30981.5 30992.5	11	-	-	12 11	1	6	374.5	


CUMMULATIVE VOLUME VS. TIME FOR BASIN 1
VOLUME [GAL] VS. TIME [HR] CUMMULATIVE VOLUME, GAL.
ACCUMULATED VOLUME, GAL.
TIME, HR.
0
50
100
150
200
250
300
350
400
0
1
2
3
4
5
6
7

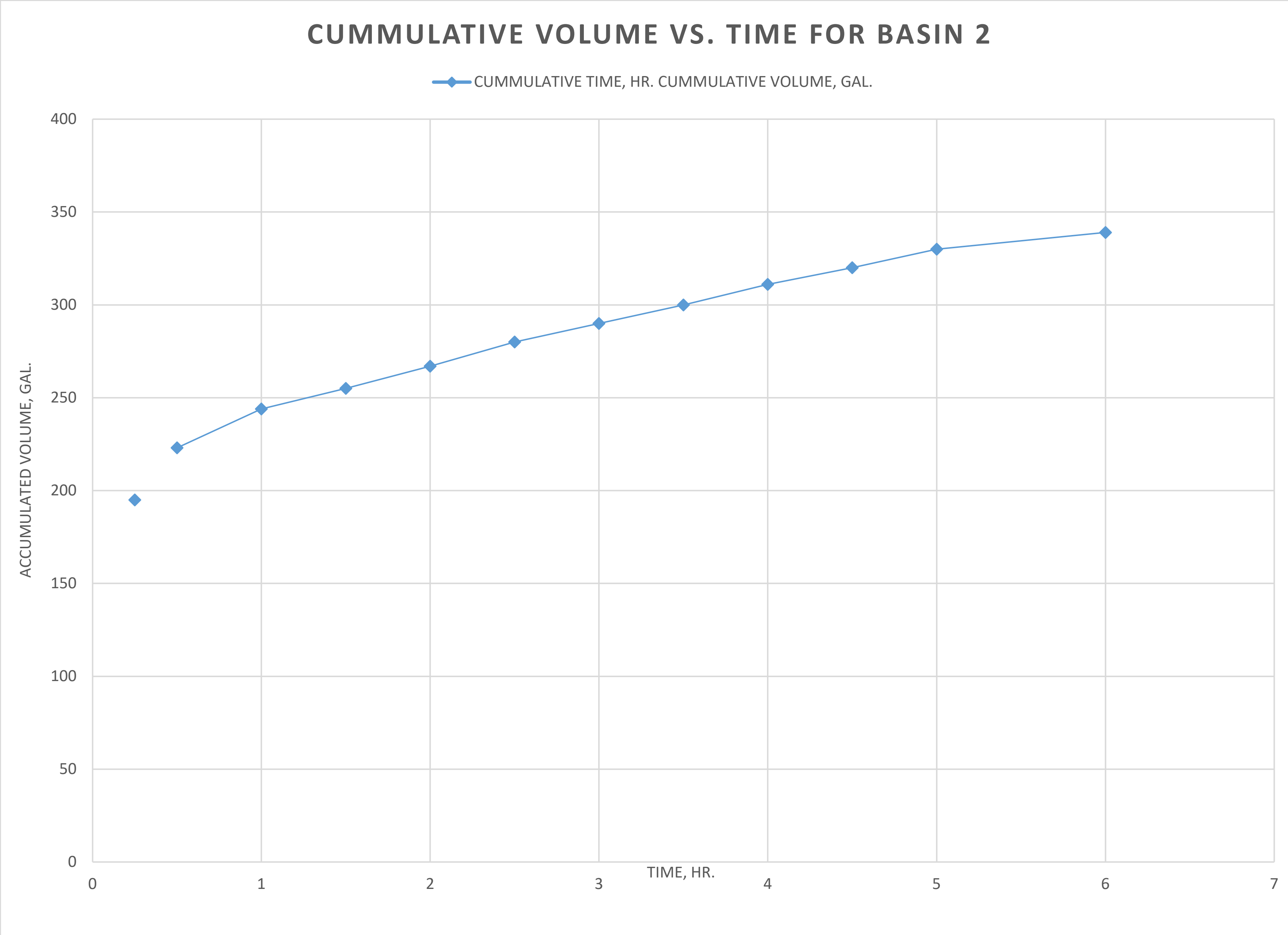
EXCAVATION PERCOLATION FIELD LOG

PROJECT LOCATION: SOUTH EAST CORNER OF AVE. A & 95TH ST. WEST, LANCASTER, CA
SOIL DESCRIPTION: PALE BROWN FINE SANDY SILT W/CALICHE (CLAY BINDER)
TESTED BY: AM/MF
LIQUID DESCRIPTION: CLEAR CLEAN TAP WATER
MEASUREMENT METHOD: MARKED ROD
DATE: 12/17/2020
TIME INTERVAL STANDARD
START TIME FOR PRE-SOAK: 8:50 AM
START TIME FOR STANDARD: 9:24 AM

TEST LOCATION/NO.: BASIN 2
WIDTH OF EXCAVATION, FT: 5 LENGTH OF EXCAVATION, FT: 5
DEPTH OF EXCAVATION, IN: 18
DEPTH OF INVERT OF BMP, IN: 18
DEPTH OF WATER TABLE: UNKNOWN
DEPTH TO INITIAL WATER DEPTH: 12 INCHES

WATER REMAINING IN EXCAVATION? (Y/N) YES
STD. TIME BETWEEN READINGS: 30 MINUTES

									VOLUME [GAL] VS. TIME [HR]		
READING NO.	TIME START/END (HH:MM)	ELAPSED TIME (MIN)	VOLUME (START/END) V, [GAL]	ΔV, [GAL]	INFILTRATION FLOW RATE, Q [GPM]	STABILIZED FLOW RATE %	WATER SURFACE ELEVATION (IN)	WATER SURFACE ELEVATION DROP, Δ (IN)	CUMMULATIVE TIME, HR.	CUMMULATIVE VOLUME, GAL.	SOIL DESCRIPTION/NOTES/COMMENTS
Presoak	8:50 9:05	15	30994 31189	195	13.00	0.0	12 10.5	1.5	0.25	195	
Presoak	9:07 9:22	15	31189 31217	28	1.87	14.4	12 11.5	0.5	0.5	223	
1	9:24 9:54	30	31217 31238	21	0.70	37.5	12 11	1	1	244	
2	9:56 10:26	30	31238 31249	11	0.37	52.4	12 11	1	1.5	255	
3	10:28 10:58	30	31249 31261	12	0.40	91.7	12 11.5	0.5	2	267	
4	11:00 11:30	30	31261 31274	13	0.43	92.3	12 11	1	2.5	280	
5	11:32 12:02	30	31274 31284	10	0.33	76.9	12 11.5	0.5	3	290	
6	12:04 12:34	30	31284 31294	10	0.33	100.0	12 11.5	0.5	3.5	300	
7	12:36 13:06	30	31294 31305	11	0.37	90.9	12 11.5	0.5	4	311	STABILIZED FLOW RATE
8	13:08 13:38	30	31305 31314	9	0.30	81.8	12 11.5	0.5	4.5	320	
9	13:40 14:10	30	31314 31324	10	0.33	90.0	12 11.5	0.5	5	330	
10	14:12 15:12	60	31324 31333	9	-	-	12 11.5	0.5	6	339	

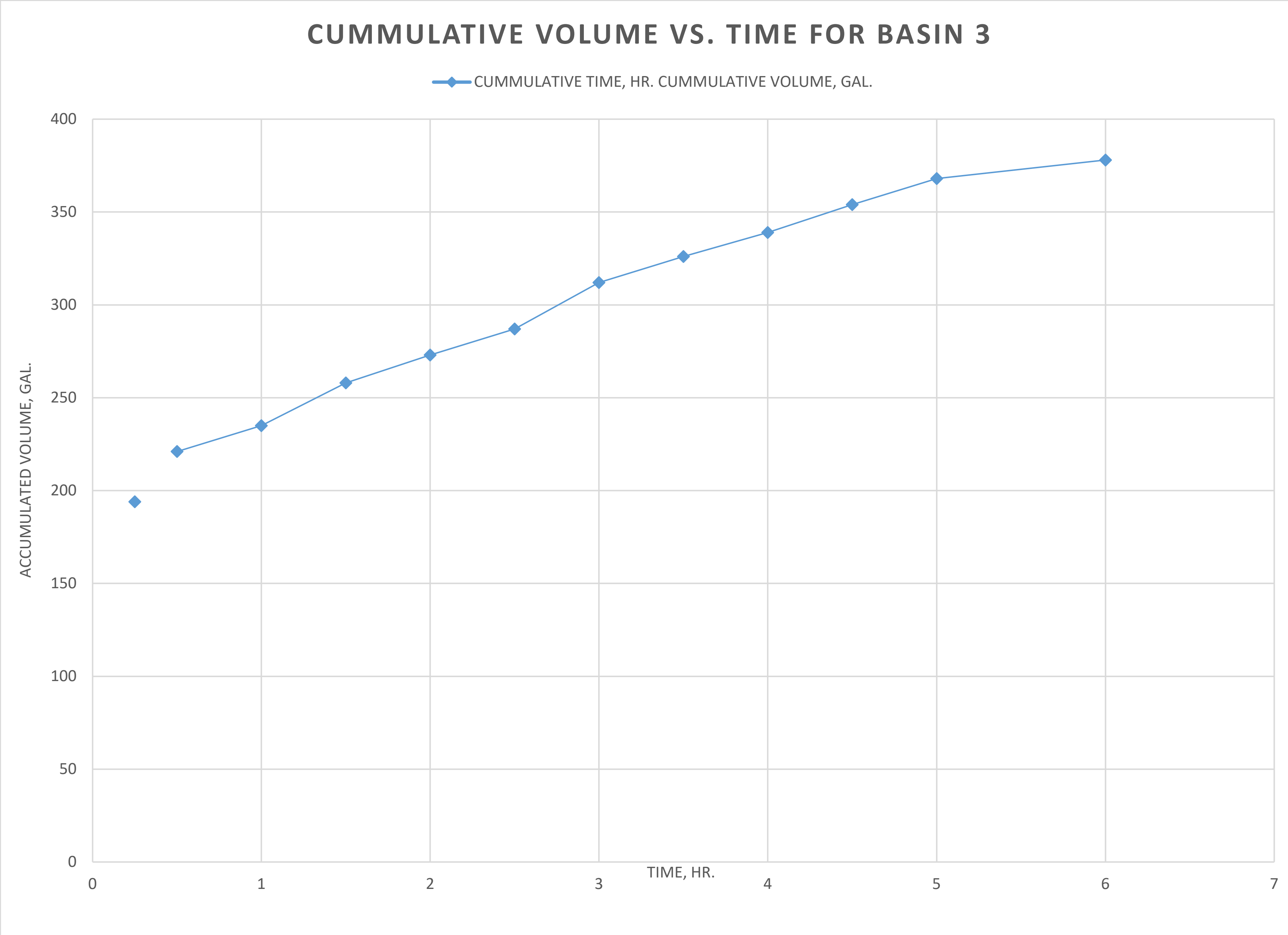

CUMMULATIVE VOLUME VS. TIME FOR BASIN 2
CUMMULATIVE TIME, HR. CUMMULATIVE VOLUME, GAL.
ACCUMULATED VOLUME, GAL.
TIME, HR.
400
350
300
250
200
150
100
50
0
0
1
2
3
4
5
6
7

EXCAVATION PERCOLATION FIELD LOG

PROJECT LOCATION: SOUTH EAST CORNER OF AVE. A & 95TH ST. WEST, LANCASTER, CA
SOIL DESCRIPTION: MODERATE BROWN SILTY FINE TO COARSE SAND W/# 4 GRAVEL W/OCC 1/2" GRAVEL
TESTED BY: AM/MF
LIQUID DESCRIPTION: CLEAR CLEAN TAP WATER
MEASUREMENT METHOD: MARKED ROD
DATE: 12/18/2020
TIME INTERVAL STANDARD
START TIME FOR PRE-SOAK: 8:32 AM
START TIME FOR STANDARD: 9:06 AM

TEST LOCATION/NO.: BASIN 3
WIDTH OF EXCAVATION, FT: 5 LENGTH OF EXCAVATION, FT: 5
DEPTH OF EXCAVATION, IN: 18
DEPTH OF INVERT OF BMP, IN: 18
DEPTH OF WATER TABLE: UNKNOWN
DEPTH TO INITIAL WATER DEPTH: 12 INCHES
WATER REMAINING IN EXCAVATION? (Y/N) YES
STD. TIME BETWEEN READINGS: 30 MINUTES

									VOLUME [GAL] VS. TIME [HR]		
READING NO.	TIME START/END (HH:MM)	ELAPSED TIME (MIN)	VOLUME (START/END) V, [GAL]	ΔV, [GAL]	INFILTRATION FLOW RATE, Q [GPM]	STABILIZED FLOW RATE %	WATER SURFACE ELEVATION (IN)	WATER SURFACE ELEVATION DROP, Δ (IN)	CUMMULATIVE TIME, HR.	CUMMULATIVE VOLUME, GAL.	SOIL DESCRIPTION/NOTES/COMMENTS
Presoak	8:32 8:47	15	31335 31529	194	12.93	0.0	12 10.5	1.5	0.25	194	
Presoak	8:49 9:04	15	31529 31556	27	1.80	13.9	12 11.25	0.75	0.5	221	
1	9:06 9:36	30	31556 31570	14	0.47	25.9	12 11	1	1	235	
2	9:38 10:08	30	31570 31593	23	0.77	60.9	12 11	1	1.5	258	
3	10:10 10:40	30	31593 31608	15	0.50	65.2	12 11	1	2	273	
4	10:42 11:12	30	31608 31622	14	0.47	93.3	12 11.5	0.5	2.5	287	
5	11:14 11:44	30	31622 31647	25	0.83	56.0	12 11	1	3	312	
6	11:46 12:16	30	31647 31661	14	0.47	56.0	12 11	1	3.5	326	
7	12:18 12:48	30	31661 31674	13	0.43	92.9	12 11.5	0.5	4	339	STABILIZED FLOW RATE
8	12:50 13:20	30	31674 31689	15	0.50	86.7	12 11.5	0.5	4.5	354	
9	13:22 13:52	30	31689 31703	14	0.47	93.3	12 11.5	0.5	5	368	
10	13:54 14:54	60	31703 31713	10	-	-	12 3	9	6	378	


CUMMULATIVE VOLUME VS. TIME FOR BASIN 3
CUMMULATIVE TIME, HR. CUMMULATIVE VOLUME, GAL.
ACCUMULATED VOLUME, GAL.
400
350
300
250
200
150
100
50
0
0
1
2
3
4
5
6
7
TIME, HR.

EXCAVATION PERCOLATION FIELD LOG

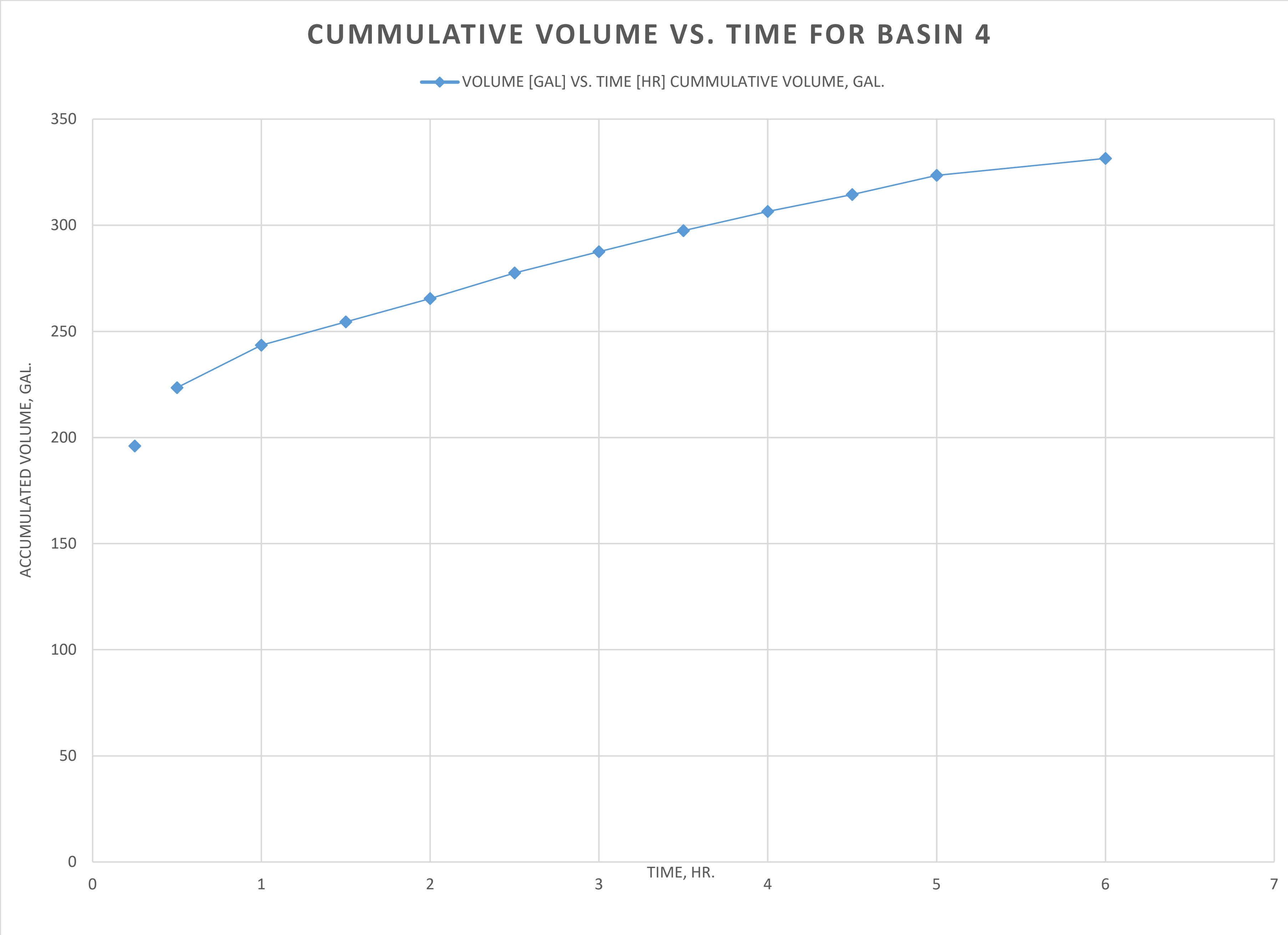
PROJECT LOCATION: SOUTH EAST CORNER OF AVE. A & 95TH ST. WEST, LANCASTER, CA
SOIL DESCRIPTION: GREYISH BROWN VERY SILTY FINE TO MEDIUM SAND W/CALICHE (SLIGHTLY CEMENTED)
TESTED BY: AM/MF
LIQUID DESCRIPTION: CLEAR CLEAN TAP WATER
MEASUREMENT METHOD: MARKED ROD
DATE: 12/21/2020

TIME INTERVAL STANDARD

START TIME FOR PRE-SOAK: 8:35 AM
START TIME FOR STANDARD: 9:09 AM

TEST LOCATION/NO.: BASIN 4
WIDTH OF EXCAVATION, FT: 5 LENGTH OF EXCAVATION, FT: 5
DEPTH OF EXCAVATION, IN: 18
DEPTH OF INVERT OF BMP, IN: 18
DEPTH OF WATER TABLE: UNKNOWN
DEPTH TO INITIAL WATER DEPTH: 12 INCHES
WATER REMAINING IN EXCAVATION? (Y/N) YES
STD. TIME BETWEEN READINGS: 30 MINUTES

READING NO.	TIME START/END (HH:MM)	ELAPSED TIME (MIN)	VOLUME (START/END) V, [GAL]	ΔV, [GAL]	INFILTRATION FLOW RATE, Q [GPM]	STABILIZED FLOW RATE %	WATER SURFACE ELEVATION (IN)	WATER SURFACE ELEVATION DROP, Δ (IN)	VOLUME [GAL] VS. TIME [HR]: CUMMULATIVE TIME, HR.	CUMMULATIVE VOLUME, GAL.	SOIL DESCRIPTION/NOTES/COMMENTS
Presoak	8:35 / 8:50	15	31715 / 31911	196	13.07	0.0	12 / 10.5	1.5	0.25	196	
Presoak	8:52 / 9:07	15	31911 / 31938.5	27.5	1.83	14.0	12 / 11.5	0.5	0.5	223.5	
1	9:09 / 9:39	30	31938.5 / 31958.5	20	0.67	36.4	12 / 11	1	1	243.5	
2	9:41 / 10:11	30	31958.5 / 31969.5	11	0.37	55.0	12 / 11	1	1.5	254.5	
3	10:13 / 10:43	30	31969.5 / 31980.5	11	0.37	100.0	12 / 11.5	0.5	2	265.5	
4	10:45 / 11:15	30	31980.5 / 31992.5	12	0.40	91.7	12 / 11	1	2.5	277.5	
5	11:17 / 11:47	30	31992.5 / 32002.5	10	0.33	83.3	12 / 11.5	0.5	3	287.5	
6	11:49 / 12:19	30	32002.5 / 32012.5	10	0.33	100.0	12 / 11.5	0.5	3.5	297.5	
7	12:21 / 12:51	30	32012.5 / 32021.5	9	0.30	90.0	12 / 11.5	0.5	4	306.5	STABILIZED FLOW RATE
8	12:53 / 13:23	30	32021.5 / 32029.5	8	0.27	88.9	12 / 11.5	0.5	4.5	314.5	
9	13:25 / 13:55	30	32029.5 / 32038.5	9	0.30	88.9	12 / 11.5	0.5	5	323.5	
10	13:57 / 14:57	60	32038.5 / 32046.5	8	-	-	12 / 11.5	0.5	6	331.5	


CUMMULATIVE VOLUME VS. TIME FOR BASIN 4
VOLUME [GAL] VS. TIME [HR] CUMMULATIVE VOLUME, GAL.
ACCUMULATED VOLUME, GAL.
TIME, HR.
0
50
100
150
200
250
300
350
0
1
2
3
4
5
6
7

INFILTRATION BASIN PERCOLATION TEST - CONSTANT HEAD

DATA CALCULATIONS:

BASIN No.	STABILIZED FLOWRATE		SURFACE AREA OF PERCOLATION				RAW INFILTRATION RATE [FT/HR]
	[GAL/HR]	[CF/HR]	LENGTH, [FT]	WIDTH, [FT]	HEIGHT, [FT]	S.A., [SF]	
1	27.0	3.6	5	5	1	45	0.08
2	19.0	2.5	5	5	1	45	0.06
3	29.0	3.9	5	5	1	45	0.09
4	17.0	2.3	5	5	1	45	0.05

REDUCTION FACTORS			RF
RF_t	RF_v	RF_s	
2	1	1	2
2	1	1	2
2	1	1	2
2	1	1	2

EXTRA-LARGE REGIONAL PROJECTS MEETING CRITERIA:

BASIN No.	HORIZONTAL TEST PIT DIMENSIONS AND AREA PER BASIN			TOTAL HRZNTL AREA TESTED	REQ. TOTAL HRZNTL AREA OF TEST	CRITERIA MET?
	LENGTH, [FT]	WIDTH, [FT]	AREA, [SF]	[SF]	[SF]	
1	5	5	25	100	100	YES
2	5	5	25			
3	5	5	25			
4	5	5	25			

BASIN No.	CALCULATED DESIGN INFILTRATION RATE		GS200.2 MIN. DESIGN INFILT. RATE	CRITERIA MET?
	[FT/HR]	[IN/HR]	[IN/HR]	
1	0.040	0.48	0.3	YES
2	0.028	0.34	0.3	YES
3	0.043	0.52	0.3	YES
4	0.025	0.30	0.3	YES