Department of Behavioral Health's Comprehensive Treatment Campus

Geotechnical Engineering Report

Victorville, California

Prepared for:

San Bernardino County
385 N Arrowhead Ave, 3rd Floor
San Bernardino, CA

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November 8, 2024

San Bernardino County
385 N Arrowhead Ave, 3rd Floor
San Bernardino, CA

Attn: Mr. Bill Guerth
P: (909)-387-5000
E: William.Guerth@pfm.sbcounty.gov

Re: Geotechnical Engineering Report
Department of Behavioral Health's Comprehensive Treatment Campus
13333 Palmdale Road
Victorville, California
Terracon Project No. CB245134

Dear Mr. Guerth:

We have completed the scope of Geotechnical Engineering services for the above referenced project in general accordance with Terracon Proposal No. PCB245134 dated September 26, 2024. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs, infiltration systems, and pavements for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon

Eduardo Dominguez-Beltran, E.I.T.
Senior Staff Engineer

Fred F. Buhamdan, P.E.
Regional Manager

Table of Contents

Attachments

Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the Terracon logo will bring you back to this page. For more interactive features, please view your project online at **client.terracon.com.**

Refer to each individual Attachment for a listing of contents.

Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the Department of Behavioral Health (DBH) Comprehensive Treatment Campus to be located at 13333 Palmdale Road in Victorville, California. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Seismic Site Class per 2022 California Building Code (CBC)
- Site preparation and earthwork
- Foundation design and construction
- Floor slab design and construction
- Stormwater infiltration considerations
- Pavement design and construction

The geotechnical engineering Scope of Services for this project included the advancement of test borings, infiltration testing, laboratory testing, engineering analysis, and preparation of this report.

Drawings showing the site and boring locations are shown on the **Site Location** and **Exploration Plan,** respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs and/or as separate graphs in the **Exploration Results** section.

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Project Description	San Bernardino County is reshaping the St. John of God Health Care Services Center into the San Bernardino County Behavioral Health Comprehensive Treatment Campus. The County intends to develop this site with new treatment facilities and transitional housing extending North, East and West from the existing

Item	Description
	structure. Based on the architects plan, there is a Parcel "A" and "B". The project will include construction of several single-story buildings consisting of: Parcel "A" ■ Four (4) Building 'A' Residential Treatment - 1,740 sf ■ Four (4) Building 'B' Residential Treatment - 2,894 sf ■ One (1) Building 'C' Community Building - 6,840 sf ■ Two (2) Building 'G' Withdrawal Management - 4,566 sf Parcel "B" ■ Two (2) Building 'F' Treatment Facility - 10,944 sf ■ One (1) Building 'H' Recreation/Activity Building - 13,662 sf Additionally parking lots, sidewalks, fencing and landscaping are planned for the surrounding area.
Building Construction	We anticipate the new building to be wood or metal construction supported on shallow foundations with concrete slabs on grade.
Finished Floor Elevation	We assume the proposed grade elevations will follow site elevations with minimum grading required.
Maximum Loads (Assumed)	We assume that the proposed structural improvements will have the following loads: ■ Columns: 40 to 80 kips ■ Walls: 1 to 2 kips per linear foot (klf) ■ Slabs: 150 pounds per square foot (psf)
Grading/Slopes	We assume the proposed grade elevations will follow the existing site elevations with minimum grading required. Slopes are not planned.
Below-Grade Structures	None anticipated
Free-Standing Retaining Walls	None anticipated

Item	Description
Pavements	Paved driveway and parking will be constructed on site. We assume flexible (asphalt) and rigid (concrete) pavement sections should be considered in areas where traffic is on subgrade. Anticipated traffic indices (Tis) are as follows for asphalt pavements: ■ Auto Parking Areas: TI=4.5 ■ Driving Lanes and Driveways: TI=6.0 ■ The pavement design period: 20 years
Infiltration Systems	New infiltration systems are being considered for this project. It is our understanding that the depth of the proposed systems will range from 0 to 5 feet.
Building Code	2022 California Building Code, ASCE 7-16

Terracon should be notified if any of the above information is inconsistent with the planned construction, especially the grading limits, as modifications to our recommendations may be necessary.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at 13333 Palmdale Road in Victorville, California. The approximate size of the project area is 29.47 acres. Latitude/Longitude (approximate) 34.50358° N, 117.371244° W (See **Site Location)**
Existing Improvements	The project site currently is partially occupied by the St. John of God Health Care Services facility and a parking lot and driveway. The rest of the site is undeveloped.
Current Ground Cover	The project site is covered with soil, asphalt pavement and landscaping.

Geotechnical Characterization

We have developed a general characterization of the subsurface soil and groundwater conditions based upon our review of the data and our understanding of the geologic setting and planned construction. The following table provides our geotechnical characterization. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration and Laboratory Results.** The subsurface materials encountered generally consist of silty sand, sand, and silt with varying amounts of silt, sand, and gravel interbedded with layers of clay with varying amounts of sand and silt. Granular materials varied from loose to very dense and fine-grained materials from stiff to hard.

Groundwater

The borings were advanced using a hollow-stem auger drilling technique that allow short-term groundwater observations to be made while drilling. Groundwater was not encountered to a depth of 31.5 feet below ground surface (bgs) at the time of our field exploration.

According to data collected from the Department of Water Resources Water Data Library for the State of California from well number 345022N1173724W001, located on the southwestern part of the site, the highest groundwater level recorded between 2004 and 2014 was 368 feet bgs.[1]

Groundwater conditions may be different at the time of construction. Groundwater conditions may change because of seasonal variations in rainfall, runoff, and other conditions not apparent at the time of drilling. Long-term groundwater monitoring was outside the scope of services for this project.

Laboratory Results

Laboratory tests were conducted on selected soil samples and the test results are presented in the **Exploration Results** section and on the boring logs.

[1] Groundwater elevation was obtained from the Water Data Library for the State of California Well Name 05N05W23K001S

Atterberg limit test results indicate that the near-surface soils generally have low plasticity. Expansion Index testing conducted on bulk soil samples indicated the near-surface soils have very low expansion potential. A Modified Proctor test conducted on on-site near surface soils indicated a maximum dry density of 128.5 and 133.6 pounds per cubic foot (pcf) and corresponding optimum moisture content of 9.3 and 8.0 percent. Collapse/swell testing indicated approximately 2.5% collapse potential for the sample collected from boring B-II at 7.5 feet bgs and confined with a typical footing pressure of 2,000 psf. Direct shear testing indicated onsite soils within the upper 5 feet have friction angles ranging between 27.5 and 29.7 with corresponding cohesion ranging between 48 and 186 psf. R-values tests on two bulk soil samples indicated soils had a value of 26 and 65.

Seismic Characterization

Seismic Site Class

The 2022 California Building Code (CBC) Seismic Design Parameters have been generated using the SEAOC/OSHPD Seismic Design Maps Tool. This web-based software application calculates seismic design parameters in accordance with ASCE 7-16, and 2022 CBC. The 2022 CBC requires that a site-specific ground motion study be performed in accordance with Section 11.4.8 of ASCE 7-16 for Site Class D sites with a mapped S_s value greater than or equal to 0.2.

However, Section 11.4.8 of ASCE 7-16 includes an exception from such analysis for specific structures on Site Class D sites. The commentary for Section 11 of ASCE 7-16 (Page 534 of Section CII of ASCE 7-16) states that "In general, this exception effectively limits the requirements for site-specific hazard analysis to very tall and or flexible structures at Site Class D sites." Based on our understanding of the proposed structures, it is our assumption that the exception in Section 11.4.8 applies to the proposed structure. According to the structural engineer, this exception increases the S_Mi value by 50% per ASCE 7-16 Supplement 3.

Based on this exception, the spectral response accelerations presented below were determined using the site coefficients (Fa and Fv) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2022 CBC.

Description	Value
2022 California Building Code Site Classification (CBC) [1]	D[2]
Site Latitude (°N)	34.50358
Site Longitude (°W)	117.371244
S_S Spectral Acceleration for a 0.2-Second Period	1.236

Description	Value
Si Spectral Acceleration for a 1-Second Period	0.48
F_a Site Coefficient for a 0.2-Second Period	1.006
F_v Site Coefficient for a 1-Second Period	1.820

1. Seismic site classification in general accordance with the *2022 California Building Code.*
2. The 2022 California Building Code (CBC) requires a site soil profile determination extending to a depth of 100 feet for seismic site classification. The current scope does not include the 100-foot soil profile determination. Borings were extended to a maximum depth of 31½ feet, and this seismic site class definition considers that similar or denser soils continue below the maximum depth of the subsurface exploration. Additional exploration to deeper depths would be required to confirm the conditions below the current depth of exploration.

A site-specific ground motion study may generate less conservative coefficients and acceleration values which may reduce construction costs. We recommend consulting with a structural engineer to evaluate the need for such study and its potential impact on construction costs. Terracon should be contacted if a site-specific ground motion study is desired.

Faulting and Estimated Ground Motions

The site is located in southern California, which is a seismically active area. The type and magnitude of seismic hazards affecting the site are dependent on the distance to causative faults, the intensity, and the magnitude of the seismic event. As determined using the USGS Unified Hazard Tool, the San Andreas fault is the closest fault seismic source to the site with a magnitude of 7.99 at a distance of approximately 26kilometers from the site.

Based on the USGS Design Maps Summary Report, using the American Society of Civil Engineers (ASCE 7-16) standard, the design peak ground acceleration (PGA_M) for the project site is 0.55g. Based on the USGS Unified Hazard Tool, the project site seismicity for the 2% chance of exceedance hazard in 50 years is defined by a mean magnitude of 7.1.

The site is not located within an Alquist-Priolo Earthquake Fault Zone for fault rupture hazard based on our review of the State Fault Hazard Maps.[2]

[2] California Geological Survey, https://maps.conservation.ca.gov/cgs/informationwarehouse.

Liquefaction

Liquefaction is a mode of ground failure that results from the generation of high pore water pressures during earthquake ground shaking, causing loss of shear strength. Liquefaction is typically a hazard where loose sandy soils exist below groundwater. The California Geological Survey (CGS) has designated certain areas as potential liquefaction hazard zones. These are areas considered at a risk of liquefaction-related ground failure during a seismic event, based upon mapped surficial deposits and the presence of a relatively shallow water table. The County of San Bernardino Geologic Hazard Overlays does not include the site in a zone of potential liquefaction.

The subsurface materials encountered generally consist of silty sand, sand, and silt with varying amounts of silt, sand, and gravel interbedded with layers of clay with varying amounts of sand and silt. Historical shallow groundwater (less than 50 feet deep) is not documented in the vicinity of the site. Therefore, due to the anticipated subsurface soil characteristics, the potential for liquefaction to occur at the site is considered low.

Seismically induced settlement can occur in dry/unsaturated, unconsolidated sandy soils during seismic ground shaking. The analysis results show less than 1 inch of dry seismic settlement is expected. Differential seismic settlement is estimated to be on the order of one-half of the total seismic settlement over a horizontal distance of 40 feet.

Stormwater Management

Four in-situ infiltration tests (falling head borehole permeability) were performed within the 0 to 5 feet deep boreholes, drilled with an 8-inch diameter augur. The objective of the testing was to provide infiltration rates for designing a parking lot infiltration system. A 2-inch thick layer of gravel was placed in the bottom of each boring after the borings were drilled to investigate the soil profile. A 3-inch diameter perforated pipe was installed on top of the gravel layer in each boring. Gravel was used to backfill between the perforated pipes and the boring sidewall. The borings were then filled with water for a pre-soak period of 1 hour. Testing began after a pre-soak period. At the beginning of the test, the pipes were refilled with water and readings were taken at standardized time intervals. The infiltration velocity is presented as the infiltration rate and is summarized in the following table. The infiltration rates provided do not include safety factors.

Test Location	Test Depth Range (ft.) [1]	Soil Type	Percolation Rate Average (in./hr.)	Infiltration Rate Average (in./hr.) [2]
B-20	0 to 5	Silty Sand (SM)	220	17.6
B-21	0 to 5	Sandy Silt (ML) / Silty Clay with Sand (CL-ML) / Silty Sand (SM)	72	3.1
B-22	0 to 5	Silty Sand (SM)	60	2.3
B-27	0 to 5	Silty Sand (SM)	216	11.9

1. Below existing ground surface.
2. If proposed infiltration system will mainly rely on vertical downward seepage, the correlated infiltration rates should be used. Correlation was based on the Porchet method.

Infiltration onsite within the areas of B-20, B-21, B-22 and B-27 is considered feasible at the tested depths from a geotechnical standpoint. The field test results are not intended to be design rates. They represent the result of our tests, at the depths and locations indicated, as described above. The design rate should be determined by the designer by applying an appropriate factor of safety.

The above infiltration rates determined by the percolation test method are based on field test results utilizing clear water. Infiltration rates can be affected by silt buildup, debris, degree of soil saturation, site variability and other factors. The rate obtained at specific location and depth is representative of the location and depth tested and may not be representative of the entire site. Application of an appropriate safety factor is prudent to account for subsoil inconsistencies, possible compaction related to site grading, and potential silting of the percolating soils, depending on the application.

The design engineer should also check with the local agency for the limitation of the infiltration rate allowed in the design. If the maximum allowable design infiltration rate is lower than the above recommended rate, the maximum allowable design infiltration rate should be used. The designer of the basins should also consider other possible site variability in the design.

The percolation tests were performed with clear water, whereas the storm water will likely not be clear, but may contain organics, fines, and grease/oil. The presence of these deleterious materials will tend to decrease the rate that water percolates from the infiltration systems. Design of the storm water infiltration systems should account for the presence of these materials and should incorporate structures/devices to remove these deleterious materials.

Based on the soils encountered in our borings, we expect the percolation rates of the soils could be different than measured in the field due to variations in fines and gravel content.

The design elevation and size of the proposed infiltration system should account for this expected variability in infiltration rates.

Infiltration testing should be performed after construction of the infiltration system to verify the design infiltration rates. It should be noted that siltation and vegetation growth along with other factors may affect the infiltration rates of the infiltration areas. The actual infiltration rate may vary from the values reported here. Infiltration systems should be located a minimum of 10 feet from any existing or proposed foundation system.

Corrosivity

The results of laboratory sulfides, soluble sulfate, chlorides, electrical resistivity, redox potential, total salts, and pH testing are presented in our appendix within the **Exploration Results** section. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Results of soluble sulfate testing indicate samples of the on-site soils tested possess moderate sulfate concentrations when classified in accordance with Table 19.3.1.1 of the ACI Design Manual. Concrete should be designed in accordance with the exposure class SI provisions of the ACI Design Manual, Section 318, Chapter 19.

Geotechnical Overview

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project.

The recommendations contained in this report are based upon the results of field and laboratory testing (presented in the **Exploration Results),** engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the report limitations.

Our recommended pavement section design has been developed based on our understanding of the intended use, assumed traffic, and subgrade preparation recommended herein using methodology contained in Caltrans "Highway Design Manual" (Caltrans, 2020) and American Concrete Institute (ACI) 330R-08 "Guide for Design and Construction of Concrete Parking Lots." The **Pavements** section includes minimum pavement component thickness.

Earthwork

The following recommendations include site preparation, excavation, subgrade preparation and placement of engineered fills on the project. The recommendations presented for design and construction of earth supported elements including foundations, slabs, and pavements are contingent upon following the recommendations outlined in this section.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

An on-site, pre-job meeting with the owner, the contractor and the Geotechnical Engineer should occur prior to all grading-related operations. Observation, testing, documentation, and reporting of the grading operation should be performed by the Geotechnical Engineer of Record. A final compaction report should be issued by the Geotechnical Engineer of Record at the completion of the grading operation. Interim reports may be issued according to project requirements. Operations undertaken at the site without the Geotechnical Engineer present may result in exclusions of affected areas from compaction reports for the project.

Grading of the subject site should be performed, at a minimum, in accordance with these recommendations and with applicable portions of the current version of CBC. The following recommendations are presented for your assistance in establishing proper grading criteria.

Site Preparation

Strip and remove existing vegetation, debris, pavements, and other deleterious materials from new building and pavement areas. Exposed surfaces should be free of mounds and depressions which could prevent uniform compaction. The site should be initially graded to create a relatively level surface to receive fill and provide for a relatively uniform thickness of fill beneath proposed building structures.

Evidence of utilities such as utility markings were observed onsite. Although no evidence underground facilities such as septic tanks, cesspools, or basements was observed during the site reconnaissance, such features could be encountered during construction. If unexpected fills, utilities, or underground facilities are encountered, such features should be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Subgrade Preparation

Foundations and floor slabs should bear on engineered fill extending to a minimum depth of 2 feet below the bottom of foundations, or 4 feet below existing grades, whichever is greater. Grading for the proposed structure should incorporate the limits of the building plus a lateral distance of 2 feet beyond the outside edge of perimeter footings.

Subgrade soils beneath exterior slabs and pavements should be scarified, moisture conditioned, and compacted to a minimum depth of 12 inches. The moisture content and compaction of subgrade soils should be maintained until slab or pavement construction.

Exposed areas which will receive fill, once properly cleared and benched where necessary, should be scarified to a minimum depth of 10 inches, moisture conditioned, and compacted per the compaction requirements in this report.

Based upon the subsurface conditions determined from the geotechnical exploration, subgrade soils exposed during construction are anticipated to be relatively workable. However, the workability of the subgrade may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying.

Excavation

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. Excavation penetrating very dense granular soils may require the use of specialized heavy-duty equipment to facilitate break-up and removal. Consideration should be given to obtaining a unit price for difficult excavation in the contract documents for the project. Onsite soils consist of cohesionless sandy soils. Such soils have the tendency to cave and slough during excavations. Therefore, formwork may be needed for foundation excavations.

The bottom of excavations should be thoroughly cleaned of loose soils and disturbed materials prior to backfill placement and/or construction.

Individual contractors are responsible for designing and constructing stable, temporary excavations. Excavations should be sloped or shored in the interest of safety following local, and federal regulations, including current OSHA excavation and trench safety standards.

Fill Material Types

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than 6 inches in size. Pea gravel or other similar non-cementitious, poorly-graded materials should not be used as fill or backfill without the prior approval of the geotechnical engineer.

Clean on-site soils or approved imported materials may be used as fill material for the following:

- general site grading
- foundation areas
- interior floor slab areas
- foundation backfill
- pavement areas
- exterior slab areas

Imported soils for use as fill material within proposed building and structure areas should conform to low volume change materials as indicated in the following specifications:

Gradation	**Percent Finer by Weight (ASTM C 136)**
3"	100
No. 4 Sieve	50-100
No. 200 Sieve	10-40

- Liquid Limit .... 30 (max)
- Plasticity Index .... 15 (max)
- Maximum expansion index* .... 20 (max)

*ASTM D 4829

The contractor shall notify the Geotechnical Engineer of import sources sufficiently ahead of their use so that the sources can be observed and approved as to the physical characteristic of the import material. For all import material, the contractor shall also submit current verified reports from a recognized analytical laboratory indicating that the import has a "not applicable" (Class SO) potential for sulfate attack based upon current ACI criteria and is "mildly corrosive" to ferrous metal and copper. The reports shall be accompanied by a written statement from the contractor that the laboratory test results are representative of all import material that will be brought to the job.

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift. Fill lifts should not exceed 10 inches loose thickness.

Fill Placement and Compaction Requirements

Structural and general fill should meet the following compaction requirements:

Material Type and Location	Per the Modified Proctor Test (ASTM D 1557)		
	Minimum Compaction Requirement	Range of Moisture Contents for Compaction Above Optimum	
		Minimum	Maximum
On-site soils and low volume change imported fill:			
Beneath foundations:	90	0%	+3%
Beneath interior slabs:	90	0%	+3%
Fill greater than 5 feet in depth	95	0%	+3%
Miscellaneous backfill:	90	0%	+3%
Beneath pavements:	95	0%	+3%
Utility Trenches*:	90	0%	+3%
Bottom of excavation receiving fill:	90	0%	+3%
Aggregate base beneath pavements:	95	0%	+3%

* Upper 12 inches should be compacted to 95% within pavement and structural areas. Low-volume change imported soils should be used in structural areas.

Utility Trench Backfill

Any soft or unsuitable materials encountered at the bottom of utility trench excavations should be removed and replaced with structural fill or bedding material in accordance with public works specifications for the utility be supported. This recommendation is particularly applicable to utility work requiring grade control and/or in areas where subsequent grade raising could cause settlement in the subgrade supporting the utility.

On-site silty sand materials are considered suitable for backfill of utility and pipe trenches from 1 foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the gradation and expansion index requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

Exterior Slab Design and Construction

Exterior slabs-on-grade, exterior architectural features, and utilities founded on, or in backfill may experience some movement due to the volume change of the backfill. To reduce the potential for damage caused by movement, we recommend:

- minimizing moisture increases in the backfill;
- controlling moisture-density during placement of backfill;
- using designs which allow vertical movement between the exterior features and adjoining structural elements;
- placing effective control joints on relatively close centers.

Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

Exposed ground should be sloped and maintained at a minimum 5% away from the building for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. Consideration should be given to extending low volume change soils to the limits of flatwork surrounding the building to reduce the potential for differential movements of the flatwork and to maintain adequate drainage after building construction. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Trees or other vegetation whose root systems have the ability to remove excessive moisture from the subgrade and foundation soils should not be planted next to the structure. Trees and shrubbery should be kept away from the exterior of the structure a distance at least equal to their expected mature height.

We recommend a minimum horizontal setback distance of 10 feet from the perimeter of any building and the high-water elevation of the nearest storm-water retention basin.

We recommend construction activities minimize soil compaction at the bottom of infiltration systems. Soil compaction damages soil structure, reduces infiltration rates, limits root growth and plant survivability, and destroys soil organisms. For these reasons site planning, design, and execution, where appropriate, should restrict compaction to infiltration areas.

Earthwork Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of grade-supported improvements such as floor slabs and pavements. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices, and in accordance with any applicable local and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied nor inferred.

On-site silt soils may pump and unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. The use of light construction equipment would aid in reducing subgrade disturbance. The use of remotely operated equipment, such as a backhoe, would be beneficial to perform cuts and reduce subgrade disturbance.

Should unstable subgrade conditions develop stabilization measures will need to be employed. Stabilization measures may include placement of aggregate base and multi-axial geogrid. Use of lime, fly ash, kiln dust or cement could also be considered as a stabilization technique. Laboratory evaluation is recommended to determine the effect of chemical stabilization on subgrade soils prior to construction.

We recommend that the earthwork portion of this project be completed during extended periods of dry weather if possible. If earthwork is completed during the wet season (typically November through April) it may be necessary to take extra precautionary measures to protect subgrade soils. Wet season earthwork operations may require additional mitigative measures beyond that which would be expected during the drier summer and fall months. This could include diversion of surface runoff around exposed soils and draining of ponded water on the site. Once subgrades are established, it may be necessary to protect the exposed subgrade soils from construction traffic.

Construction Observation and Testing

The earthwork efforts should be observed by the Geotechnical Engineer (or others under their direction). Observation should include documentation of adequate removal of surficial materials (vegetation, topsoil, and pavements), evaluation and remediation of existing fill materials, as well as proofrolling and mitigation of unsuitable areas delineated by the proofroll.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, as recommended by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. Where not specified by local ordinance, one density and water content test should be performed for every 50 linear feet of compacted utility trench backfill and a minimum of one test performed for every 12 vertical inches of compacted backfill. This testing frequency criteria may be adjusted during construction as specified by the geotechnical engineer of record.

In areas of foundation excavations, the bearing subgrade should be evaluated by the Geotechnical Engineer. If unanticipated conditions are observed, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

Shallow Foundations

If the site has been prepared in accordance with the requirements noted in **Earthwork,** the following design parameters are applicable for shallow foundations.

Design Parameters

Item	Description
Foundation Type	Conventional Shallow Spread Footing
Maximum Net Allowable Bearing Pressure [1f] [2]	3,000 psf for 2 to 6 feet wide footings 2,200 psf for 6 to 10 feet wide footings

Item	Description
Required Bearing Stratum [3]	Low-volume change engineered fill extending to a minimum depth of 2 feet below the bottom of foundations, or 4 feet below existing grades, whichever is greater.
Minimum Foundation Dimensions	Walls: 18 inches wide Columns: 24 inches wide
Minimum Embedment below Finished Grade [4]	18 inches
Ultimate Passive Resistance [5]	400 psf/ft
Ultimate Coefficient of Sliding Friction [6]	0.40
Estimated Total Static Settlement from Structural Loads [2]	Less than 1 inch
Estimated Static Differential Settlement [2, 7]	About 1/2 of total settlement

1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation.
2. Values provided are for maximum loads noted in **Project Description.** Additional geotechnical consultation will be necessary if higher loads are anticipated.
3. Unsuitable or soft soils should be overexcavated and replaced per the recommendations presented in **Earthwork.**
4. Embedment necessary to minimize the effects of seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
5. Use of passive earth pressures requires the footing forms be removed and compacted structural fill be placed against the vertical footing face. A factor of safety of 2.0 is recommended.
6. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Should be neglected for foundations subject to net uplift conditions. A factor of safety of 1.5 is recommended.
7. Differential settlements are noted for equivalent-loaded foundations and bearing elevation as measured over a span of 40 feet.

Foundation Construction Considerations

As noted in **Earthwork,** the footing excavations should be evaluated under the observation of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Care should be taken to prevent wetting or drying of the bearing materials during construction. Excessively wet or dry material or any loose/disturbed material in the bottom of the footing excavations should be removed/reconditioned before foundation concrete is placed.

Floor Slabs

Design parameters for floor slabs assume the requirements for **Earthwork** have been followed. Specific attention should be given to positive drainage away from the structure and positive drainage of the aggregate base beneath the floor slab.

Floor Slab Design Parameters

Item	Description
Floor Slab Support	Low-volume change engineered fill extending to a minimum depth of 2 feet below the bottom of foundations, depth of undocumented fill or 4 feet below existing grades, whichever is greater.
Subbase	Minimum 4 inches of Aggregate Base
Estimated Modulus of Subgrade Reaction	200 pounds per square inch per inch (psi/in) for point loads. (The modulus was obtained based on estimates obtained from NAVFAC 7.1 design charts). This value is for a small loaded area (1 Sq. ft or less) such as for forklift wheel loads or point loads and should be adjusted for larger loaded areas.

The use of a vapor retarder should be considered beneath concrete slabs on grade covered with wood, tile, carpet, or other moisture sensitive or impervious coverings, when the project includes humidity-controlled areas, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder, the slab designer should refer to ACI 302 and/or ACI 360 for procedures and cautions regarding the use and placement of a vapor retarder.

Saw-cut contraction joints should be placed in the slab to help control the location and extent ofcracking. For additional recommendations, refer to the ACI Design Manual. Joints or cracks should be sealed with a waterproof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

Where floor slabs are tied to perimeter walls or turn-down slabs to meet structural or other construction objectives, our experience indicates differential movement between the walls and slabs will likely be observed in adjacent slab expansion joints or floor slab cracks beyond the length of the structural dowels. The Structural Engineer should account for potential differential settlement through use of sufficient control joints, appropriate reinforcing or other means.

Floor Slab Construction Considerations

Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor slabs, the affected material should be removed, and structural fill should be added to replace the resulting excavation. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

The Geotechnical Engineer should observe the condition of the floor slab subgrades immediately prior to placement of the floor slab support course, reinforcing steel, and concrete. Attention should be paid to high traffic areas that were rutted and disturbed earlier, and to areas where backfilled trenches are located.

Pavements

General Pavement Comments

Pavement designs are provided for the traffic conditions and pavement life conditions as noted in **Project Description** and in the following sections of this report. A critical aspect of pavement performance is site preparation. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the **Earthwork** section.

Pavement Design Parameters

Design of asphalt concrete (AC) pavements is based on the procedures outline in the Caltrans "Highway Design Manual" (Caltrans, 2020). Design of Portland cement concrete (PCC) pavements is based upon American Concrete Institute (ACI) 330R-08 "Guide for Design and Construction of Concrete Parking Lots."

A design R-value of 25 and 50 were used for Parcel "A" and Parcel "B", respectively to calculate the minimum AC and PCC pavement design section thicknesses. R-value or CBR testing should be completed prior to pavement construction to verify the design values used. A modulus of rupture of 600 psi was used in design for the PCC pavement designs. A modulus of subgrade reaction of 100 pci and 200 pci for the west half and east half, respectively.

The structural sections are predicated upon proper compaction of the utility trench backfills and the subgrade soils as prescribed by in **Earthwork,** with the upper 12 inches of subgrade soils and all aggregate base material brought to a minimum relative compaction of 95 percent in accordance with ASTM D 1557 prior to paving. The aggregate base should meet Caltrans requirements for Class 2 base.

Assuming the pavement subgrades will be prepared as recommended within this report, the following pavement sections should be considered minimums for this project for the traffic indices assumed in the table below. As more specific traffic information becomes available, we should be contacted to reevaluate the pavement design calculations.

Pavement Section Thicknesses

The following tables provides our opinion of minimum thickness for AC pavement sections:

Parcel "A" Pavement Recommendation

Layer	Minimum AC Pavement Thickness (inches)	
	TI = 4.5 [2] Auto Parking	TI = 6 Driveways and Drive Lanes
AC [1, 3]	3	3
Aggregate Base [1]	4	10

1. All materials should meet the Caltrans Standard Specifications for Highway Construction.
2. Traffic Index = TI
3. Flexible pavement structural sections were calculated utilizing the Gravel Equivalent Method in accordance with Caltrans Highway Design Manual Ch. 630

Parcel "B" Pavement Recommendation

Layer	Minimum AC Pavement Thickness (inches)	
	TI = 4.5 [2] Auto Parking	TI = 6 Driveways and Drive Lanes
AC [1, 3]	3	3
Aggregate Base [1]	4	5

1. All materials should meet the Caltrans Standard Specifications for Highway Construction.
2. Traffic Index = TI
3. Flexible pavement structural sections were calculated utilizing the Gravel Equivalent Method in accordance with Caltrans Highway Design Manual Ch. 630

The following tables provides our estimated minimum thickness of PCC pavements sections.

Parcel "A" Pavement Recommendation

Layer	Minimum PCC Pavement Thickness (inches)	
	Parking[1]	Driveways and Drive Lanes[2]
PCC	5.0	7.0
Aggregate Base [4]	4	4

1. Car Parking and Access Lanes, Average Daily Truck Traffic (ADTT) = 1 (Category A)
2. In areas of anticipated heavy traffic, fire trucks, delivery trucks, or concentrated loads (e.g., dumpster pads), and areas with repeated turning or maneuvering of heavy vehicles, ADTT = 700 (Category C)
3. All materials should meet the Caltrans Standard Specifications for Highway Construction.

Parcel "B" Pavement Recommendation

Layer	Minimum PCC Pavement Thickness (inches)	
	Parking[1]	Driveways and Drive Lanes[2]
PCC	5.0	6.5
Aggregate Base [4]	4	4

1. Car Parking and Access Lanes, Average Daily Truck Traffic (ADTT) = 1 (Category A)
2. In areas of anticipated heavy traffic, fire trucks, delivery trucks, or concentrated loads (e.g., dumpster pads), and areas with repeated turning or maneuvering of heavy vehicles, ADTT = 700 (Category C)
3. All materials should meet the Caltrans Standard Specifications for Highway Construction.

Areas for parking of heavy vehicles, concentrated turn areas, and start/stop maneuvers could require thicker pavement sections. Edge restraints (i.e. concrete curbs or aggregate shoulders) should be planned along curves and areas of maneuvering vehicles.

Although not required for structural support, a minimum 4-inch thick base course layer is recommended to help reduce potential for slab curl, shrinkage cracking, and subgrade pumping through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. Joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer. PCC pavement details for joint spacing, joint reinforcement, and joint sealing should be prepared in accordance with ACI 330 and ACI 325.

Where practical, we recommend early-entry cutting of crack-control joints in PCC pavements. Cutting of the concrete in its "green" state typically reduces the potential for micro-cracking of the pavements prior to the crack control joints being formed, compared to cutting the joints after the concrete has fully set. Micro-cracking of pavements may lead to crack formation in locations other than the sawed joints, and/or reduction of fatigue life of the pavement.

Openings in pavements, such as decorative landscaped areas, are sources for water infiltration into surrounding pavement systems. Water can collect in the islands and migrate into the surrounding subgrade soils thereby degrading support of the pavement. Islands with raised concrete curbs, irrigated foliage, and low permeability near-surface soils are particular areas of concern. The civil design for the pavements with these conditions should include features to restrict or collect and discharge excess water from the islands. Examples of features are edge drains connected to the stormwater collection system, longitudinal subdrains, or other suitable outlets and impermeable barriers preventing lateral migration of water such as a cutoff wall installed to a depth below the pavement structure.

Pavement Drainage

Pavements should be sloped to provide rapid drainage of surface water. Water allowed to pond on or adjacent to the pavements could saturate the subgrade and contribute to premature pavement deterioration. In addition, the pavement subgrade should be graded to provide positive drainage within the granular base section. Appropriate sub-drainage or connection to a suitable daylight outlet should be provided to remove water from the granular subbase.

Pavement Maintenance

The pavement sections represent minimum recommended thicknesses and, as such, periodic upkeep should be anticipated. Preventive maintenance should be planned and provided for through an on-going pavement management program. Maintenance activities are intended to slow the rate of pavement deterioration and to preserve the pavement investment. Pavement care consists of both localized (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Additional engineering consultation is recommended to determine the type and extent of a cost-effective program. Even with periodic maintenance, some movements and related cracking may still occur, and repairs may be required.

Pavement performance is affected by its surroundings. In addition to providing preventive maintenance, the civil engineer should consider the following recommendations in the design and layout of pavements:

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.
- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage.
- Install pavement drainage systems surrounding areas anticipated for frequent wetting.
- Install joint sealant and seal cracks immediately.
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.

Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. The findings and recommendations presented in this report were prepared in a manner consistent with the standards of care and skill ordinarily exercised by members of its profession completing similar studies and practicing under similar conditions in the geographic vicinity and at the time these services have been performed. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly effect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

Attachments

Exploration and Testing Procedures

Field Exploration

Boring Designation	Approximate Boring Depth or Refusal (feet)	Location
B-1 through B-19	21½ to 31½	Building area
B-20 through B-27	5 to 21½	Pavement

Boring Layout and Elevations: Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±10 feet) and referencing existing site features. If elevations and a more precise boring layout are desired, we recommend borings be surveyed.

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted drill rig using continuous flight hollow stem augers. Four samples were generally obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. A 3-inch O.D. split-barrel sampling spoon with 2.5-inch I.D. ring lined sampler was also used for sampling soils at the project site. Ring-lined, split-barrel sampling procedures are similar to standard split spoon sampling procedure. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests. The laboratory testing program included the following types of tests:

- Moisture Content
- Dry Unit Weight
- Atterberg Limits
- Fines Content (Percent Passing #200 Sieve)
- One-dimensional Consolidation
- Direct Shear
- Expansion Index
- Modified Proctor (ASTM D 1557)
- R-Value
- Corrosion Suite

The laboratory testing program often included examination of soil samples by an engineer. Based on the results of our field and laboratory programs, we described and classified the soil samples in accordance with the Unified Soil Classification System.

Site Location and Exploration Plans

Contents:

Note: All attachments are one page unless noted above.

Site Location

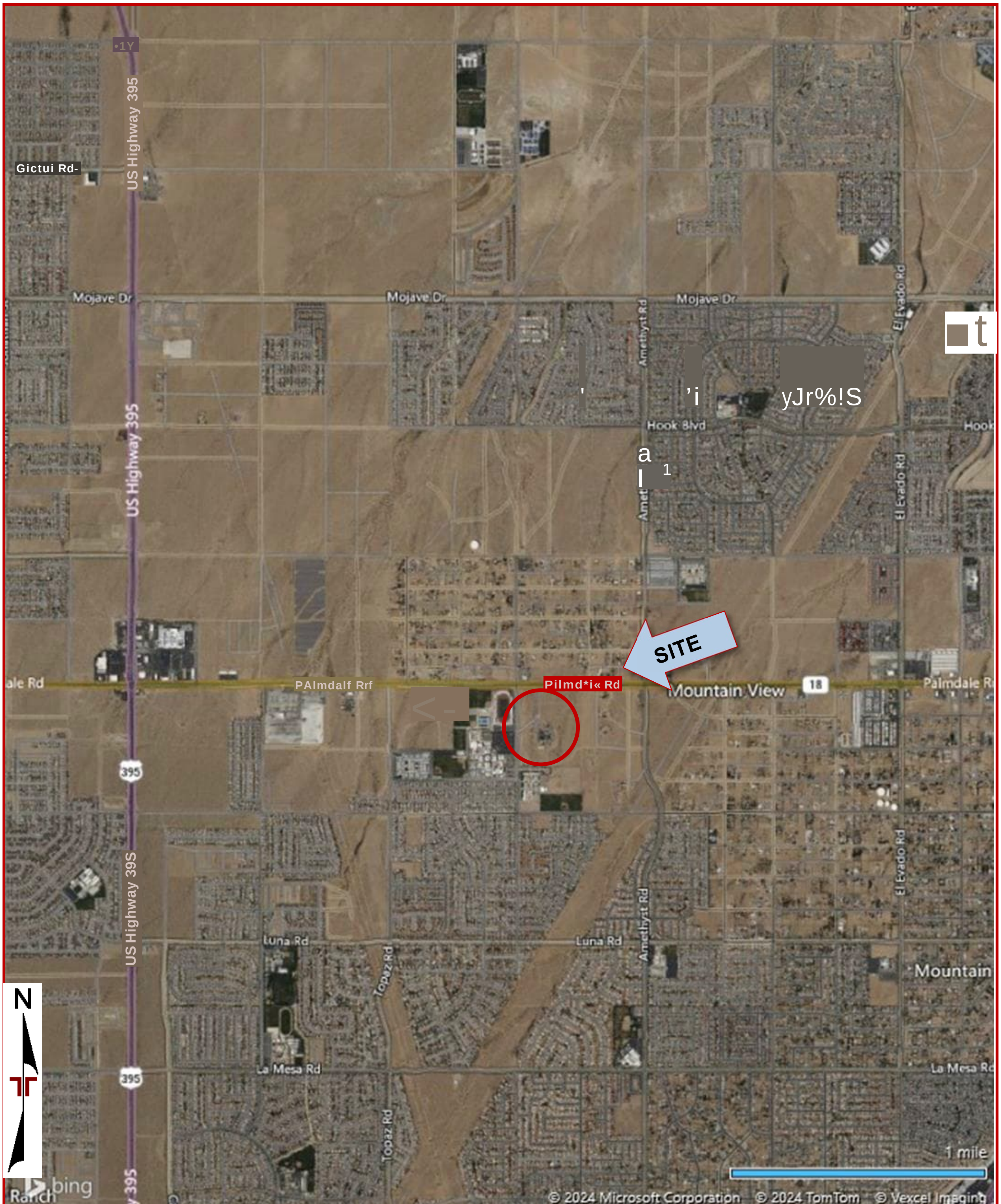
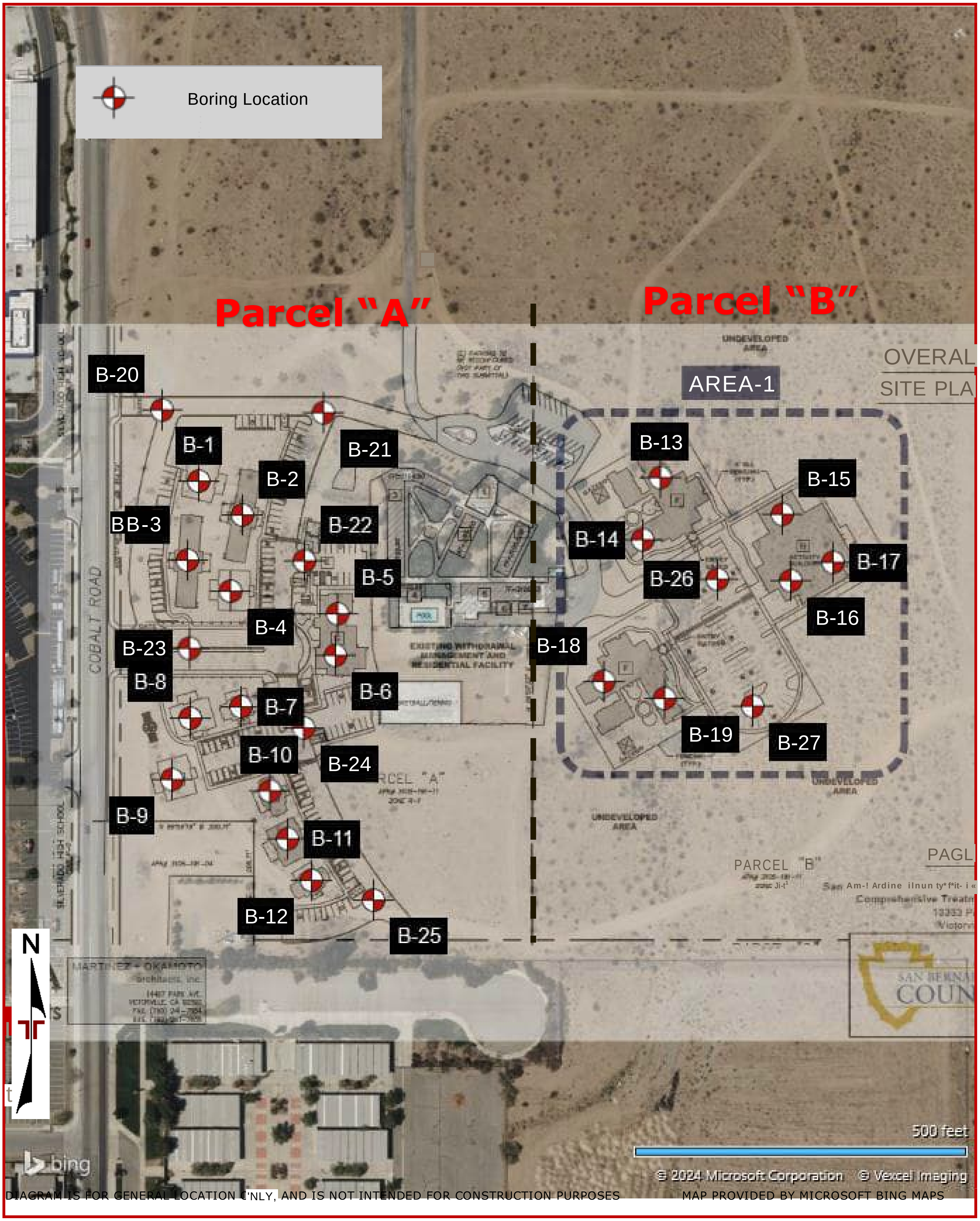


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan



Exploration and Laboratory Results

Contents:

Note: All attachments are one page unless noted above.

Boring Log No. B-I

Location: See Exploration Plan

Latitude: 34.5041° Longitude: -117.3725°

Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	POORLY GRADED SAND WITH SILT (SP-SM), trace clay, brown												
	medium dense				9-11-12					1.8	111		9
	loose	5			4-4-5 N=9								
7.5	**SANDY SILT (ML),** trace clay, brown, hard				24-29-34					3.0	112		
10.0	**SILTY SAND (SM),** trace clay, brown, medium dense	10			6-8-9 N=17								
		15			5-8-13 N=21								
20.0	**SANDY SILT (ML),** trace clay, brown, very stiff	20			9-11-13 N=24								
21.5	***Boring Terminated at 21.5 Feet***												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-09-2024

Boring Completed
10-09-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-2

Location: See Exploration Plan

Latitude: 34.5039° Longitude: -117.3723°

Graphic Log Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SILTY SAND (SM), trace clay, brown												
	medium dense				7-9-9 N=18								31
	dense	5			13-28-40					5.6	104		
7.5	**SANDY SILT (ML),** brown, very stiff				7-12-16 N=28								
10.0	**SILTY CLAY (CL-ML),** brown, hard	10			15-22-30					3.7	114	26-20-6	
	with sand, very stiff	15			10-14-15 N=29								
20.0	**SILTY SAND (SM),** with clay, brown, dense	20			17-14-17 N=31								
21.5	***Boring Terminated at 21.5 Feet***												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-09-2024

Boring Completed
10-09-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-3

Location: See Exploration Plan

Latitude: 34.5037° Longitude: -117.3726°

Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Test Type	Compressive Strength (tsf)	Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	POORLY GRADED SAND WITH SILT (SP-SM), trace clay, brown												
	medium dense				12-22-30					2.0	115		
		5			6-12-16 N=28								7
					8-17-23					1.2	110		
10.0	**SANDY SILT (ML),** trace clay, brown, very stiff	10			5-9-10 N=19								
15.0	**SILTY SAND (SM),** trace clay, brown, medium dense	15			7-12-15 N=27								
20.0	**SANDY SILT (ML),** trace clay, brown, very stiff	20			10-13-15 N=28								
21.5	***Boring Terminated at 21.5 Feet***												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-09-2024

Boring Completed
10-09-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-4

Location: See Exploration Plan

Latitude: 34.5036° Longitude: -117.3724°

Depth (Ft.) / Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
SILTY SAND (SM), trace clay, brown												
dense				14-20-17 N=37								
5.0 SILTY CLAY (CL-ML), trace sand, brown, hard	5			28-50/5"					6.6	115		
7.5 SANDY SILT (ML), trace clay, brown, very stiff				7-10-12 N=22							26-22-4	
hard	10			11-20-26					4.3	107		
15.0 SILTY SAND (SM), trace clay, brown, dense	15			15-17-19 N=36								
20.0 SILT (ML), with clay, brown, hard	20			14-18-18 N=36								
21.5												

Boring Terminated at 21.5 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Logged by
CR

Boring Started
10-09-2024

Boring Completed
10-09-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-5

Location: See Exploration Plan

Latitude: 34.5035° Longitude: -117.3718°

Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SILTY SAND (SM), trace clay, brown												
	very dense				31-50					3.7	134		19
	medium dense	5			10-11-12 N=23								21
	dense				18-22-46					2.1	112		
	medium dense	10			8-10-13 N=23								
15.0	**SANDY SILT (ML),** trace clay, brown, stiff	15			6-7-8 N=15							20-17-3	
		20			7-7-7 N=14								
21.5	***Boring Terminated at 21.5 Feet***												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-09-2024

Boring Completed
10-09-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-6

Location: See Exploration Plan

Latitude: 34.5033° Longitude: -117.3719°

Depth (Ft.)	Material Description	Sample Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SILTY SAND (SM), trace clay, brown												
	medium dense			X	9-10-18 N=28								
	very dense	5			50								
7.5	**SANDY SILT (ML),** trace clay, brown, very stiff			X	8-9-8 N=17								
10.0	**SILTY SAND WITH GRAVEL (SM),** brown, medium dense	10			14-25-31					3.1	116		
15.0	**SANDY SILT (ML),** trace clay, brown, very stiff	15		X	6-8-9 N=17								
	with clay	20			8-10-11 N=21								
21.5	***Boring Terminated at 21.5 Feet***												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Logged by
CR

Boring Started
10-10-2024

Boring Completed
10-10-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-7

Location: See Exploration Plan

Latitude: 34.5031° Longitude: -117.3723°

Graphic Log Depth (Ft.)	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SILTY SAND (SM), brown												
	very dense				34-50/5"					4.4	113		
		5			30-50/6"								30
7.5	**SANDY SILTY CLAY (CL-ML),** brown, hard				10-17-26					2.1	116	23-18-5	
10.0	**SILTY SAND (SM),** brown, medium dense	10			8-9-12 N=21								
15.0	**SANDY SILT (ML),** brown, very stiff	15			10-10-13 N=23								
20.0	LEAN CLAY WITH SILT fcLr brown, very stiff	20			10-14-14 N=28							23-15-8	
		25											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-08-2024

Boring Completed
10-08-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-7

Location: See Exploration Plan

Latitude: 34.5031° Longitude: -117.3723°

Graphic Log	Depth (Ft.) / Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SANDY SILT (ML), trace clay, brown, very stiff				11-15-15 N=30								
	30.0 **SILTY SAND (SM),** brown, dense	30			15-19-18 N=37								
	31.5												
	Boring Terminated at 31.5 Feet												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Logged by
CR

Boring Started
10-08-2024

Boring Completed
10-08-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-8

Location: See Exploration Plan

Latitude: 34.5031° Longitude: -117.3726°

Depth (Ft.)	Material Description	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Qy Uc ,,t? jht S	Atterberg Limits LL-PL-PI	Percent Fines
0.0–5.0	**SANDY SILT (ML),** trace clay, brown; stiff			8-5-5								
5.0–7.5	**SILTY SAND (SM),** trace clay, brown, dense			7-13-21 N=34					1.6	117		
7.5–10.0	**SANDY SILT (ML),** trace clay, brown, very stiff			9-13-13								
10.0–15.0	**WELL GRADED SAND (SW),** dense			8-15-23 N=38					1.5	110		
15.0–20.0	**SILTY SAND (SM),** trace clay, brown, dense			8-15-17 N=32								
20.0–21.5	**SANDY SILT (ML),** trace clay, brown, hard			12-17-17 N=34								

Boring Terminated at 21.5 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-10-2024

Boring Completed
10-10-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-9

Location: See Exploration Plan

Latitude: 34.5028° Longitude: -117.3727°

Graphic Log / Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SANDY SILT (ML), with clay, brown												
	very stiff				22-22-19					4.1	109		
5.0	**SILTY SAND (SM),** brown, medium dense	5			4-5-10 N=15								
7.5	**SANDY SILT (ML),** with clay, brown, hard				16-28-34								
	very stiff	10			10-12-12 N=24								
		15			15-14-15 N=29								
21.5	hard	20			18-21-24 N=45								

Boring Terminated at 21.5 Feet

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Logged by
CR

Boring Started
10-10-2024

Boring Completed
10-10-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-10

Location: See Exploration Plan

Latitude: 34.5028° Longitude: -117.3722°

Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SILTY SAND (SM), trace clay, brown												
	dense				21-22-22 N=44								
	very dense	5			30-50					8.0	115		
7.5	**SANDY SILT (ML),** trace clay, brown, hard				12-23-31 N=54								
10.0	**SILTY SAND (SM),** brown, very dense	10			18-33-50					1.8	100		
15.0	**SANDY SILT (ML),** trace clay, brown, very stiff	15			11-13-13 N=26								
	hard	20			16-16-21 N=37								
21.5	***Boring Terminated at 21.5 Feet***												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Logged by
CR

Boring Started
10-10-2024

Boring Completed
10-10-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-11

Location: See Exploration Plan

Latitude: 34.5026° Longitude: -117.3721°

Graphic Log Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Test Type	Compressive Strength (tsf)	Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SILTY SAND (SM), trace clay, brown												
	loose				8-7-7					1.6	110		
	medium dense	5			6-16-12 N=28								
7.5	**SANDY SILT (ML),** trace clay, brown, hard				13-19-26					4.5	106		
	stiff	10			6-6-8 N=14								
	very stiff	15			7-8-9 N=17								
20.0	**SILTY SAND (SM),** trace clay, brown, medium dense	20			6-8-9 N=17								
21.5	***Boring Terminated at 21.5 Feet***												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-10-2024

Boring Completed
10-10-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-12

Location: See Exploration Plan

Latitude: 34.5024° Longitude: -117.3720°

Graphic Log	Depth (Ft.) / Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SILTY SAND (SM), brown												
	medium dense				12-13-15 N=28								
	very dense	5			27-50/5"					3.1	113		
	medium dense				7-8-15 N=23								
	dense	10			13-25-30					3.7	117		
	15.0 **SANDY ORGANIC SILT WITH GRAVEL (ML),** tra tel clay, brown, very stiff	5			11-11-13 N=24								
		20			9-11-12 N=23								
	21.5 ***Boring Terminated at 21.5 Feet***												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Logged by
CR

Boring Started
10-10-2024

Boring Completed
10-10-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-13

Location: See Exploration Plan

Latitude: 34.5041° Longitude: -117.3702°

Graphic Log	Depth (Ft.) / Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SILTY SAND WITH GRAVEL (SM), brown												
	medium dense				7-11-18					2.7	113		
		5			7-8-9 N=17								
					23-25-20					1.2	154		
		10			5-6-10 N=16								
	dense	15			14-17-21 N=38								
	20.0 **SANDY SILT (ML),** very stiff	20			10-10-10 N=20								
	21.5 ***Boring Terminated at 21.5 Feet***												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-11-2024

Boring Completed
10-11-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-14

Location: See Exploration Plan

Latitude: 34.5038° Longitude: -117.3703°

Depth (Ft.)	Material Description	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
0.0	**SILTY SAND WITH GRAVEL (SM),** brown										
2.5–4.0	medium dense	Split spoon	10-10-10 N=20								
5.0–6.5		Ring sampler	12-18-21					3.2	119		
7.5–9.0		Split spoon	6-7-7 N=14								
10.0–11.5		Ring sampler	9-12-16					3.5	117		
15.0–16.5	dense	Split spoon	9-15-16 N=31								
20.0	**SANDY SILT (ML),** brown, very stiff										
20.0–21.5		Split spoon	8-9-11 N=20								
21.5	***Boring Terminated at 21.5 Feet***										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information forexplanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-11-2024

Boring Completed
10-11-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-15

Location: See Exploration Plan

Latitude: 34.5039° Longitude: -117.3696°

Depth (Ft.)	Description	Field Test Results	Water Content (%)	Dry Unit Weight (pcf)
	SILTY SAND WITH GRAVEL (SM), brown			
	very dense, NO RECOVERY	33-50/5"		
	medium dense, NO RECOVERY	7-11-12 N=23		
	dense	20-22-28	2.8	119
	medium dense	6-7-8 N=15		
15.0	**SANDY SILT (ML),** hard	14-16-17 N=33		
		10-12-16 N=28		
21.5	***Boring Terminated at 21.5 Feet***			

Other columns (blank for this boring): Water Level Observations, Sample Type, Expansion Index, Strength Test (Test Type, Compressive Strength (tsf), Strain (%)), Atterberg Limits (LL-PL-PI), Percent Fines.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-11-2024

Boring Completed
10-11-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-16

Location: See Exploration Plan

Latitude: 34.5036° Longitude: -117.3696°

Depth (Ft.)	Material Description	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
0.0	**SILTY SAND WITH GRAVEL (SM),** trace clay, brown										
2.5–4.0	medium dense		15-15-14 N=29								13
5.0–6.5			13-20-22					1.4	101		
7.5–9.0	dense		8-15-19 N=34								
10.0–11.5	very dense		18-30-50/6"					1.9	112		
15.0	**POORLY GRADED SAND (SP),** brown, medium dense		7-11-14 N=25							NP	
20.0–21.5	dense		11-15-19 N=34								
21.5	***Boring Terminated at 21.5 Feet***										

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
CR

Boring Started
10-08-2024

Boring Completed
10-08-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-17

Location: See Exploration Plan

Latitude: 34.5037° Longitude: -117.3694°

Depth (Ft.)	Description	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	,,t? Qy Uc S jht	Atterberg Limits LL-PL-PI	Percent Fines
0	**SILTY SAND (SM),** brown											
2.5	very dense			31-50/5"					3.5	113		
5	dense			12-19-16 N=35								
7.5	very dense			20-35-50/6"					2.1	128		
10	dense			15-14-17 N=31								
15	medium dense			8-11-13 N=24								
20				7-9-13 N=22								
21.5	***Boring Terminated at 21.5 Feet***											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-11-2024

Boring Completed
10-11-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-18

Location: See Exploration Plan

Latitude: 34.5032° Longitude: -117.3705°

Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SILTY SAND (SML brown												
	medium dense				16-16-11 N=27	4							
		5			13-17-23					2.5	117		
					8-5-10 N=15								
		10			19-15-12								
	dense	15			6-13-20 N=33								
20.0	**SANDY SILT (ML),** very stiff	20			8-14-14 N=28								
21.5	***Boring Terminated at 21.5 Feet***												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Logged by
CR

Boring Started
10-11-2024

Boring Completed
10-11-2024

Boring Log No. B-19

Location: See Exploration Plan

Latitude: 34.5032° Longitude: -117.3702°

Depth (Ft.)	Material Description	Sample Type	Field Test Results	Expansion Index	Test Type	Compressive Strength (tsf)	Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
0	**SILTY SAND (SM),** trace clay, brown										
	very dense		30-50/5"					5.5	124		23
5	medium dense		13-17-19 N=36								
7.5	**POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM),** brown, very dense		30-50/6"					2.2	118		
10			14-24-28 N=52								10
15	**SANDY SILT (ML),** trace clay, brown, very stiff		13-17-18 N=35								52
20			7-12-13 N=25								
25											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-08-2024

Boring Completed
10-08-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-19

Location: See Exploration Plan

Latitude: 34.5032° Longitude: -117.3702°

Graphic Log	Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
		SANDY SILT (ML), trace clay, brown, very stiff *(continued)*		X	9-14-15 N=29								
		30		X	12-8-8 N=16								
	31.5	***Boring Terminated at 31.5 Feet***											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-08-2024

Boring Completed
10-08-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-20

Location: See Exploration Plan

Latitude: 34.5044° Longitude: -117.3727°

Depth (Ft.)	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SILTY SAND (SM), brown												
	loose			X	4-4-3 N=7								
	medium dense			X	4-4-16 N=20								
5.0	***Boring Terminated at 5 Feet***	5											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
CR

Boring Started
10-08-2024

Boring Completed
10-08-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-21

Location: See Exploration Plan

Latitude: 34.5043° Longitude: -117.3719°

Graphic Log	Depth (Ft.) / Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	[illegible]	Atterberg Limits LL-PL-PI	Percent Fines
	SANDY SILT (ML), trace clay, brown												
	2.0 **SILTY CLAYEY SAND (SC-SM),** brown, medium dense				7-7-6 N=13								42
	3.5 **SILTY SAND (SM),** trace clay, brown, medium dense				6-7-9 N=16								
	5.0 ***Boring Terminated at 5 Feet***	5											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

Boring Started
10-08-2024

Boring Completed
10-08-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-22

Graphic Log	Location: See Exploration Plan Latitude: 34.5037° Longitude: -117.3720° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SILTY SAND (SM), trace clay, brown												
	dense				9-11-19 N=30								
	medium dense				12-11-12 N=23								
	5.0	5											
	Boring Terminated at 5 Feet												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
CR

Boring Started
10-08-2024

Boring Completed
10-08-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-23

Location: See Exploration Plan

Latitude: 34.5034° Longitude: -117.3726°

Graphic Log	Depth (Ft.) / Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SANDY SILT (ML), trace clay, brown												
	very stiff			SPT	13-13-10 N=23								
	hard	5		Ring	14-19-23					4.3	108		
	stiff			SPT	4-3-7 N=10								
	10.0 SILTY SAND (SM), trace clay, brown, medium dense	10		Ring	11-19-28					1.7	116		24
	with clay	15		SPT	10-12-13 N=25								
	20.0 SANDY SILT (ML), with clay, brown, very stiff	20		SPT	10-9-13 N=22								
	21.5 **Boring Terminated at 21.5 Feet**												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Logged by
CR

Boring Started
10-09-2024

Boring Completed
10-09-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-24

Graphic Log	Location: See Exploration Plan Latitude: 34.5030° Longitude: -117.3720° Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SANDY SILT (ML), with clay, brown												
	stiff			X	4-4-6 N=10								
	very stiff	5		X	8-8-8 N=16								
	6.5												
	Boring Terminated at 6.5 Feet												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Logged by
CR

Boring Started
10-10-2024

Boring Completed
10-10-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-25

Location: See Exploration Plan

Latitude: 34.5023° Longitude: -117.3717°

Graphic Log	Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
		SILTY SAND (SM), brown											
		dense			15-16-18 N=34								
	5.0	**SANDY SILT (ML),** brown, stiff to very stiff	5		14-9-6 N=15								
	6.5	***Boring Terminated at 6.5 Feet***											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with bentonite grout upon completion

Logged by
CR

Boring Started
10-11-2024

Boring Completed
10-11-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-26

Location: See Exploration Plan

Latitude: 34.5037° Longitude: -117.3699°

Graphic Log	Depth (Ft.) / Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
	SILTY SAND (SM), trace clay												
	medium dense			X	4-6-12 N=18								19
		5		X	11-11-13 N=24								
	6.5												
	Boring Terminated at 6.5 Feet												

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).
See Supporting Information forexplanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Notes

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
CR

Boring Started
10-08-2024

Boring Completed
10-08-2024

Terracon
1355 E Cooley Dr
Colton, CA

Boring Log No. B-27

Location: See Exploration Plan

Latitude: 34.5031° Longitude: -117.3698°

Graphic Log	Depth (Ft.)	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Expansion Index	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
		SILTY SAND (SM), trace clay, brown											
		medium dense			6-9-6 N=15								
					6-5-6 N=11								
	5.0		5										
		Boring Terminated at 5 Feet											

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information forexplanation of symbols and abbreviations.

Notes

Water Level Observations
Groundwater not encountered

Advancement Method
8" Hollow Stem Auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Drill Rig
GT-1675

Hammer Type
Automatic

Driller
2R Drilling

Logged by
CR

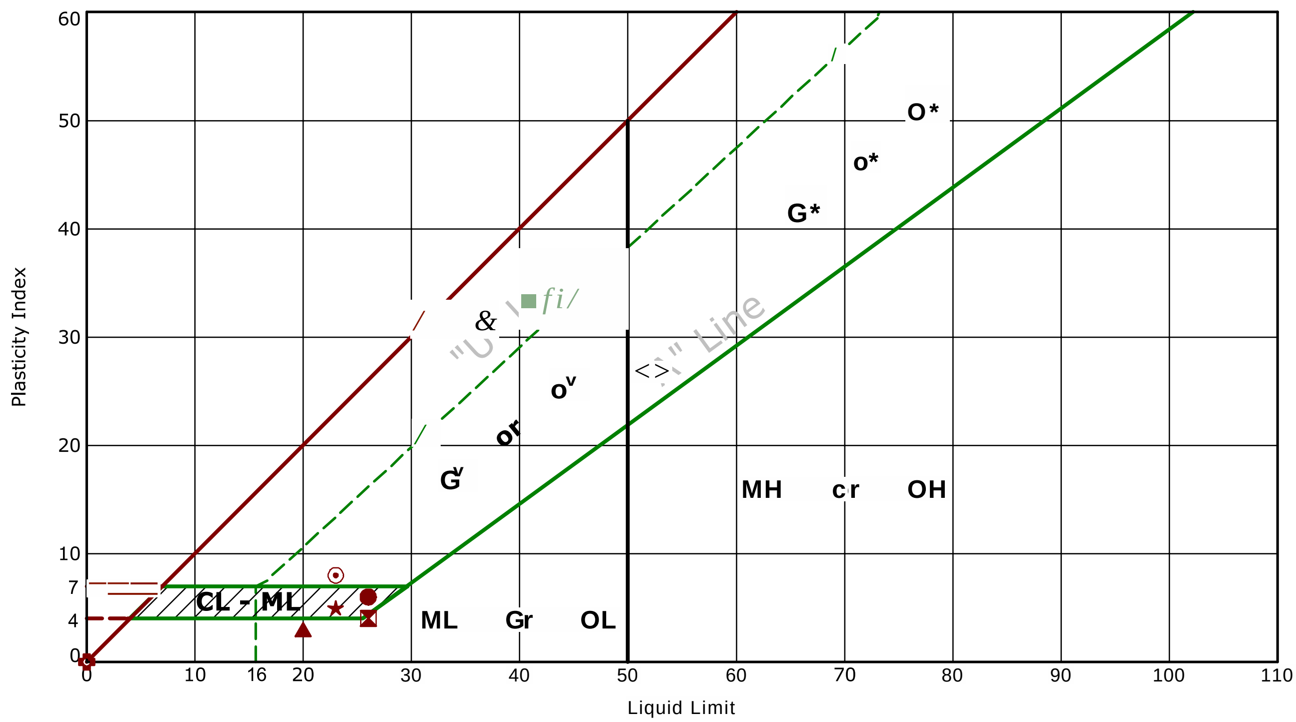
Boring Started
10-08-2024

Boring Completed
10-08-2024

Terracon
1355 E Cooley Dr
Colton, CA

Atterberg Limit Results

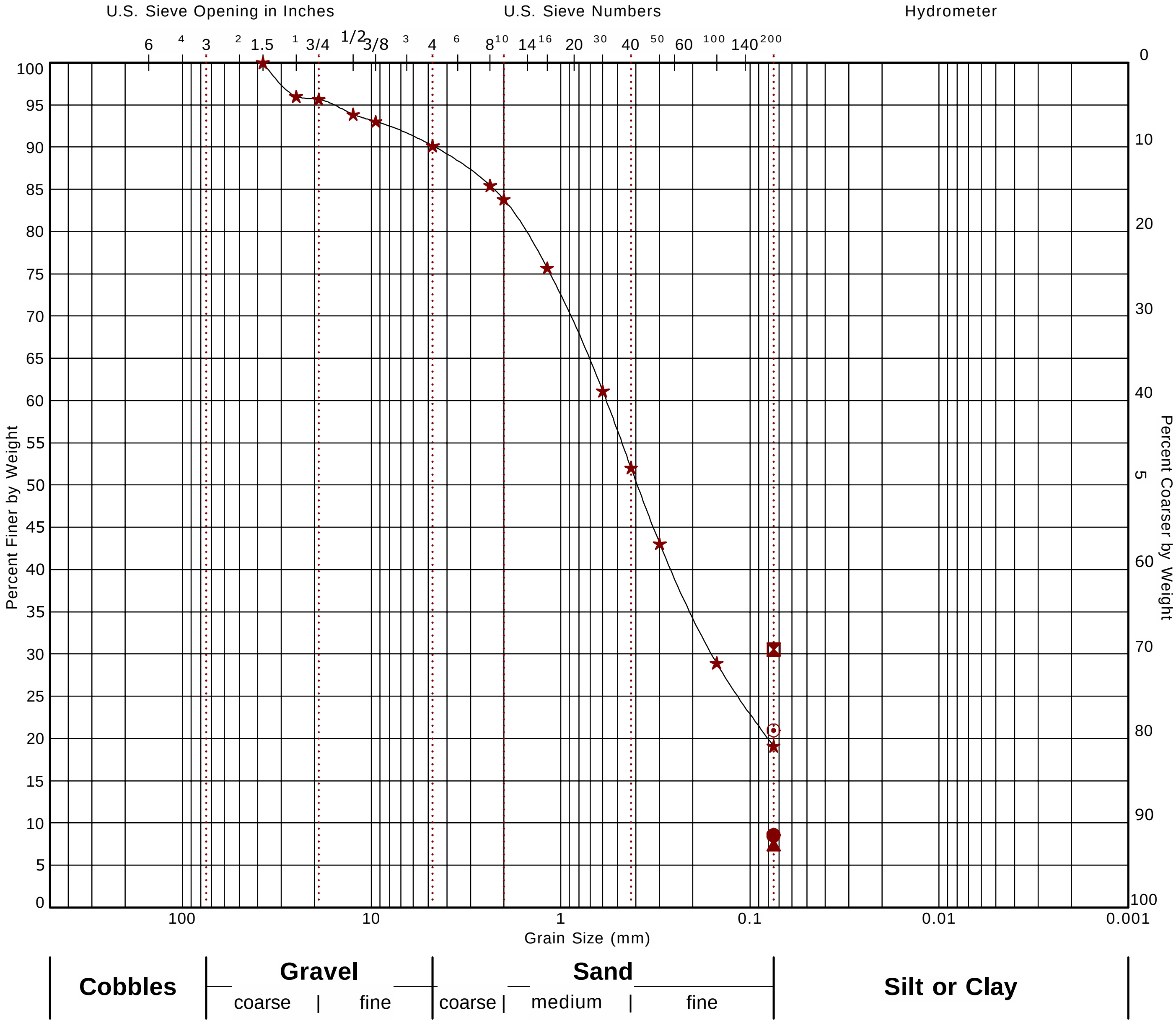
ASTM D4318



	Boring ID	Depth (Ft)	LL	PL	PI	Fines	uses	Description
•	B-2	10 - 11.5	26	20	6		CL-ML	SILTY CLAY
SI	B-4	7.5 - 9	26	22	4		ML	SANDY SILT
▲	B-5	15 - 16.5	20	17	3		ML	SANDY SILT
★	B-7	7.5 - 9	23	18	5		CL-ML	SANDY SILTY CLAY
⊙	B-7	20 - 21.5	23	15	8		CL	LEAN CLAY WITH SILT
4	B-16	15 - 16.5	NP	NP	NP		SP	POORLY GRADED SAND

Grain Size Distribution

ASTM D422 / ASTM C136 / AASHTO T27



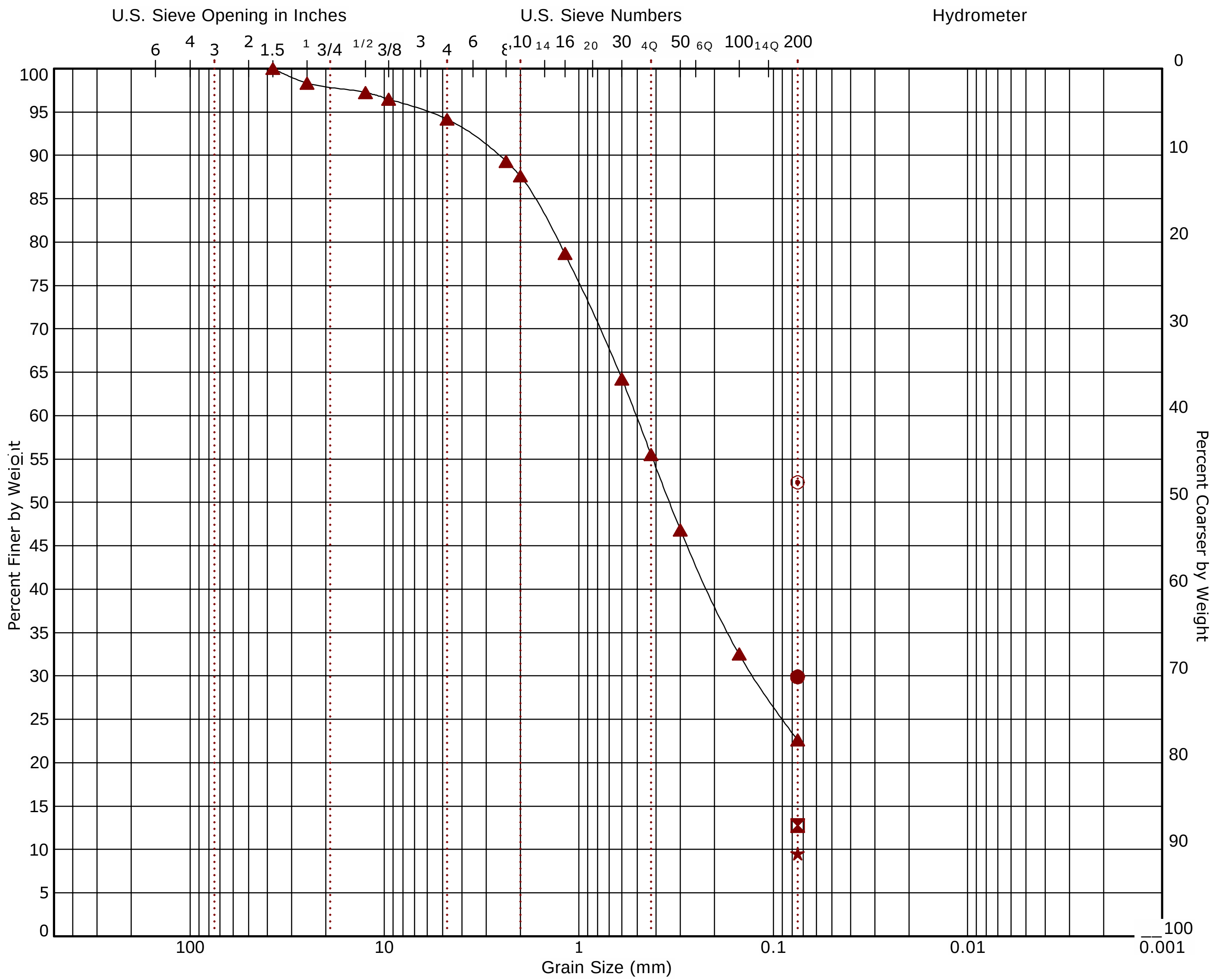
Boring ID		Depth (Ft)	Description	USCS	LL	PL	PI	Cc	Cu
•	B-1	2.5 - 4	POORLY GRADED SAND WITH SILT	SP-SM					
⧗	B-2	2.5 - 4	SILTY SAND	SM					
▲	B-3	5 - 6.5	POORLY GRADED SAND WITH SILT	SP-SM					
★	B-5	0 - 5	SILTY SAND	SM					
⊙	B-5	5 - 6.5	SILTY SAND	SM					

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
•	B-1	2.5 - 4	0.075							8.6		
⧗	B-2	2.5 - 4	0.075							30.5		
▲	B-3	5 - 6.5	0.075							7.4		
★	B-5	0 - 5	37.5	0.574	0.158		0.0	9.8	71.0	19.1		
⊙	B-5	5 - 6.5	0.075							21.0		

Terracon
1355 E Cooley Dr
Colton, CA

Grain Size Distribution

ASTM D422 / ASTM C136 / AASHTO T27



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

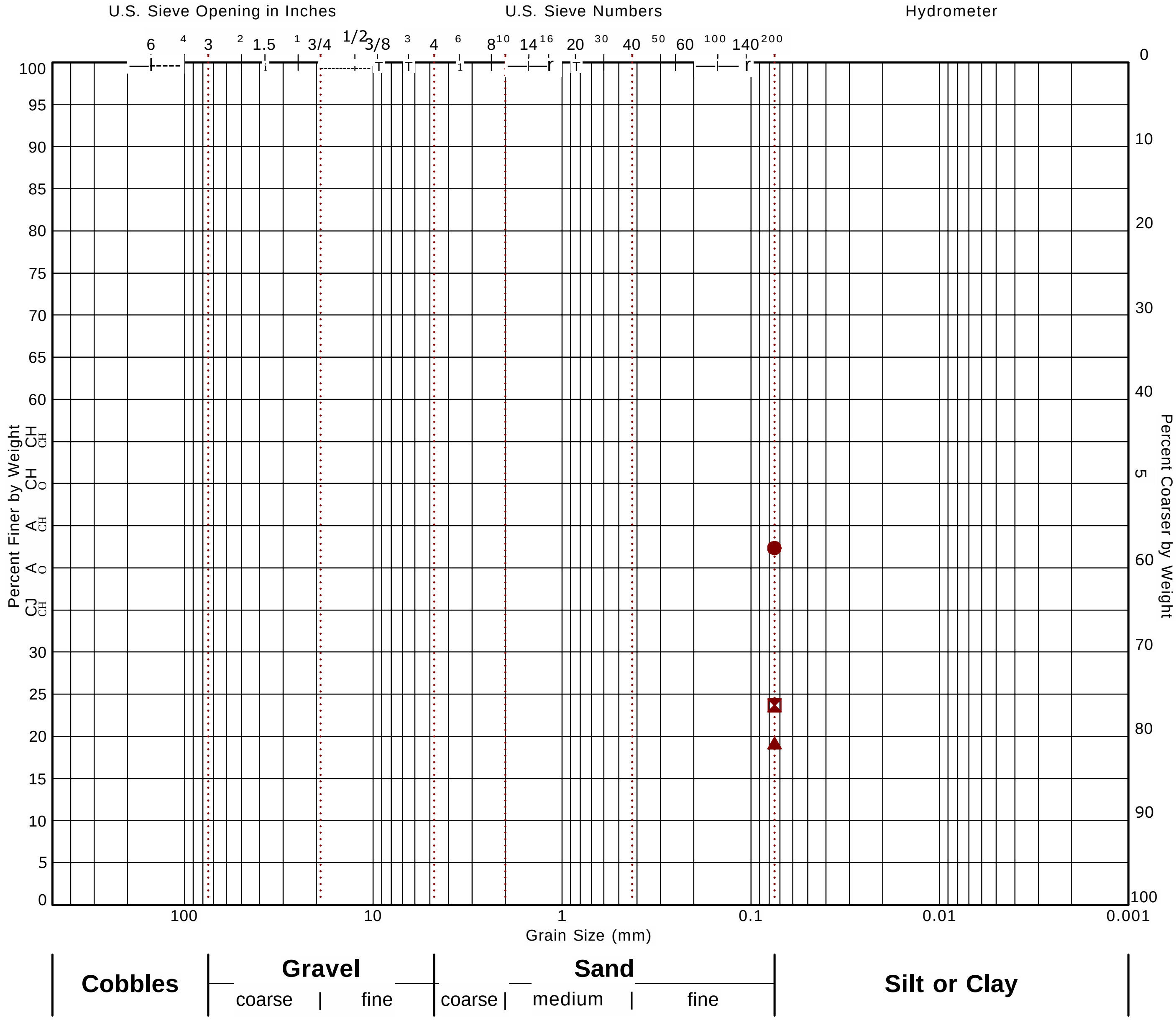
	Boring ID	Depth (Ft)	Description	uses	LL	PL	PI	Cc	Cu
●	B-7	5 - 6	SILTY SAND	SM					
⊠	B-16	2.5 - 4	SILTY SAND WITH GRAVEL	SM					
▲	B-19	0 - 5	SILTY SAND	SM					
★	B-19	10 - 11.5	POORLY GRADED SAND WITH SILT AND GRAVEL	SP-SM					
©	B-19	15 - 16.5	SANDY SILT	ML					

	Boring ID	Depth (Ft)	Dioo	D_{60}	O_{30}	D_{10}	%Cobbles	% Gravel	%Sand	%Fines	o/oSilt	%Clay
●	B-7	5 - 6	0.075							29.9		
⊠	B-16	2.5 - 4	0.075							12.8		
▲	B-19	0 - 5	37.5	0.507	0.126		0.0	5.8	71.5	22.6		
★	B-19	10 - 11.5	0.075							9.5		
⦿	B-19	15 - 16.5	0.075							52.3		

Terracon
1355 E Cooley Dr
Colton, CA

Grain Size Distribution

ASTM D422 / ASTM C136 / AASHTO T27



	Boring ID	Depth (Ft)	Description	uses	LL	PL	PI	Cc	Cu
●	B-21	2 - 3.5	SILTY CLAYEY SAND	SC-SM					
⊠	B-23	10-11.5	SILTY SAND	SM					
▲	B-26	2.5 - 4	SILTY SAND	SM					

	Boring ID	Depth (Ft)	Dioo	D_{60}	O_{30}	D_{10}	%Cobbles	% Gravel	%Sand	%Fines	o/oSilt	%Clay
•	B-21	2 - 3.5	0.075							42.4		
in	B-23	10 - 11.5	0.075							23.7		
▲	B-26	2.5 - 4	0.075							19.2		

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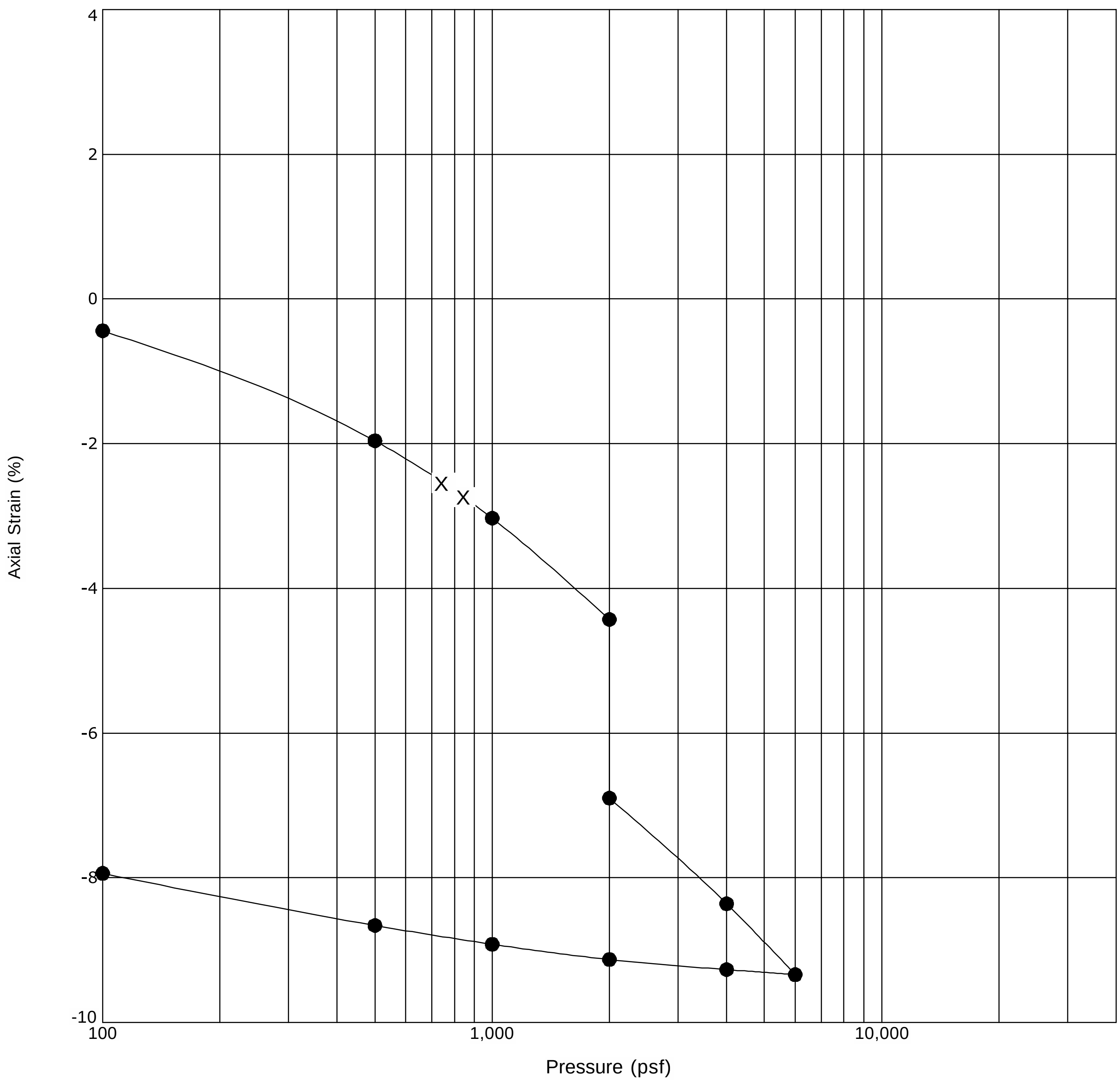
Colton, CA

One-Dimensional Swell or Collapse

ASTM D4546



Boring ID		Depth (Ft)	Description	uses	X|(PCf)	WC (%)
•	B-II	7.5 - 9	SANDY SILT	ML		

Notes: Water added at 2,000 psf

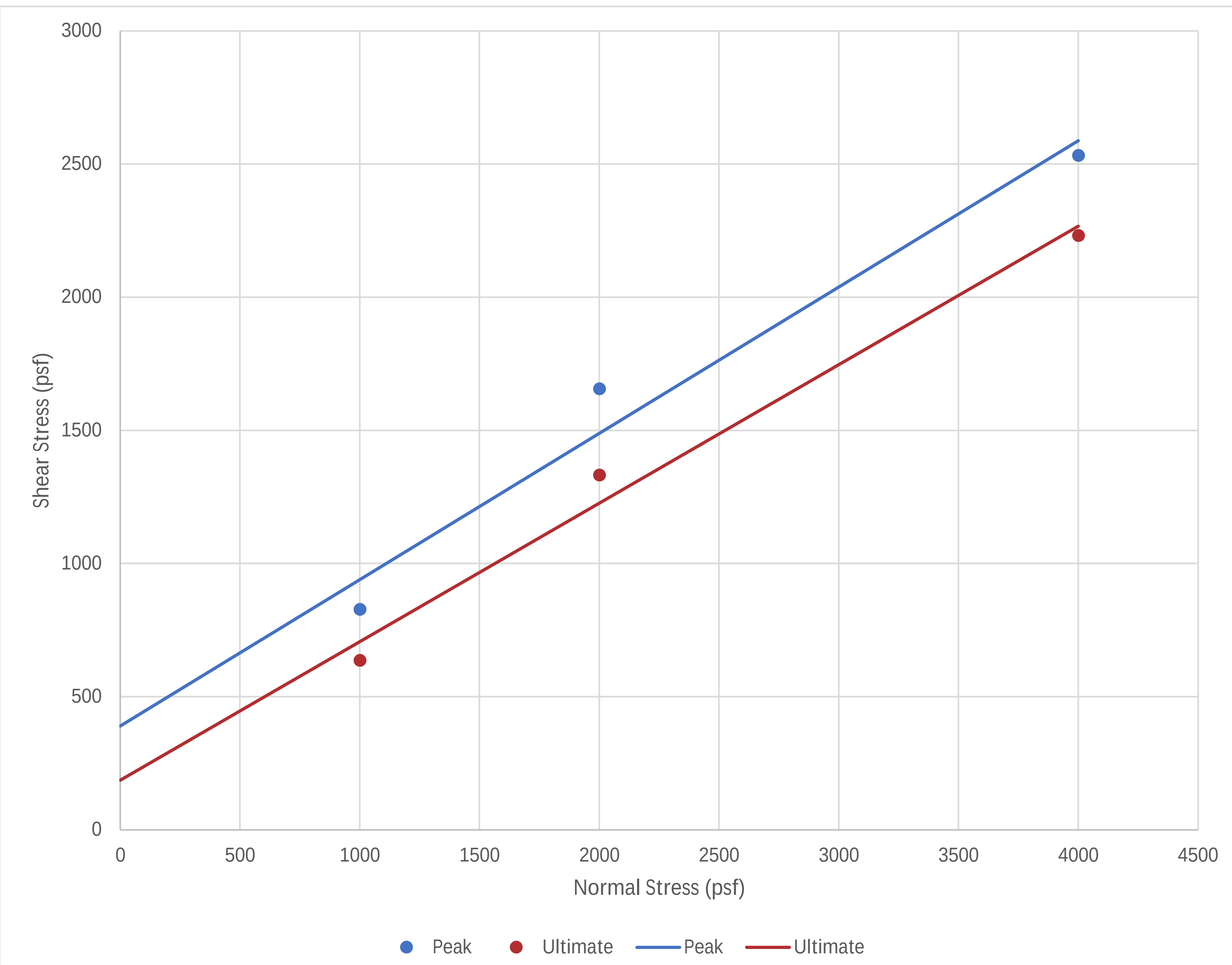
Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Direct Shear Test

ASTM D3080

Boring ID	Depth	Description	USCS	γ_d (pcf)	W(%)
B-2	5	Silty Sand	SM		

Normal Stress (psf)	Peak Shear Stress (psf)	Ultimate Shear Stress (psf)	Peak		Ultimate	
			<p	C (psf)	<p	C (psf)
1000	828	636	28.8	390	27.5	186
2000	1656	1332				
4000	2532	2232				



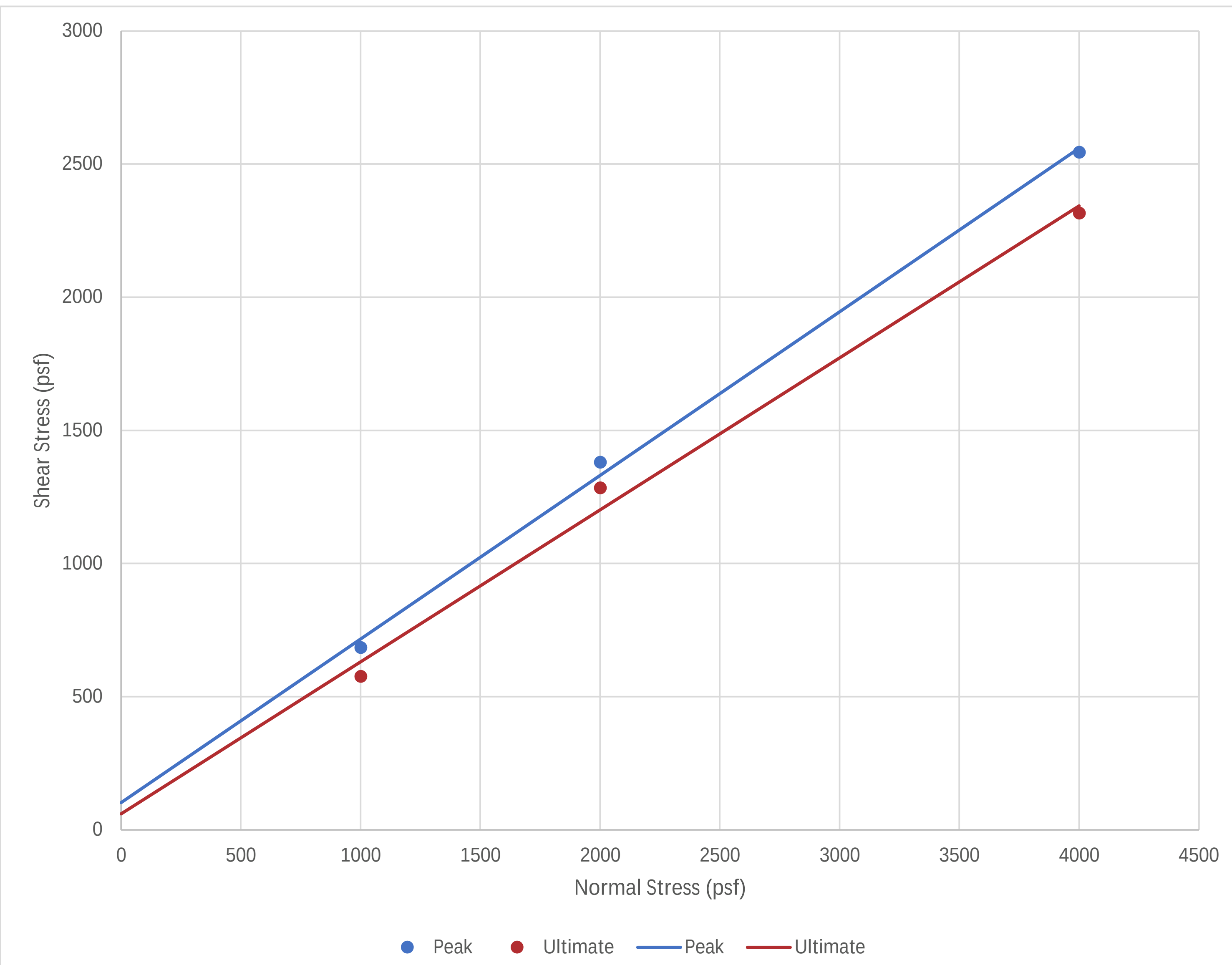
Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Direct Shear Test

ASTM D3080

Boring ID	Depth	Description	USCS	γ_d (pcf)	W (%)
B-7	2.5	Silty Sand	SM		

Normal Stress (psf)	Peak Shear Stress (psf)	Ultimate Shear Stress (psf)	Peak		Ultimate	
			<p	C (psf)	φ°	C (psf)
1000	684	576				
2000	1380	1284	31.6	102	29.7	60
4000	2544	2316				



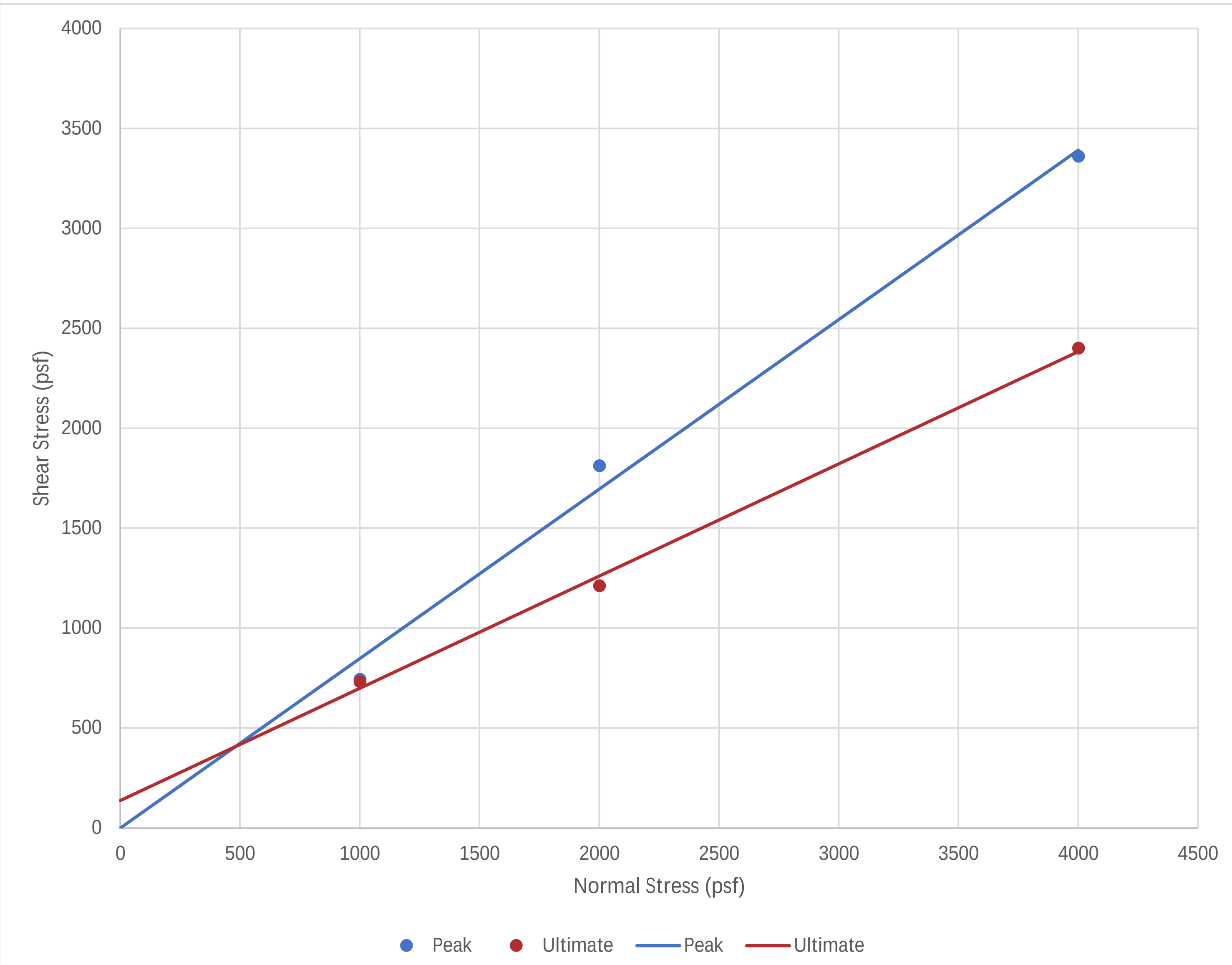
Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Direct Shear Test

ASTM D3080

Boring ID	Depth	Description	USCS	γ_d (pcf)	W (%)
B-17	7.5	Silty Sand	SM		

Normal Stress (psf)	Peak Shear Stress (psf)	Ultimate Shear Stress (psf)	Peak		Ultimate	
			<p	C (psf)	φ°	C (psf)
1000	744	732	40.6	0	29.3	138
2000	1812	1212				
4000	3360	2400				



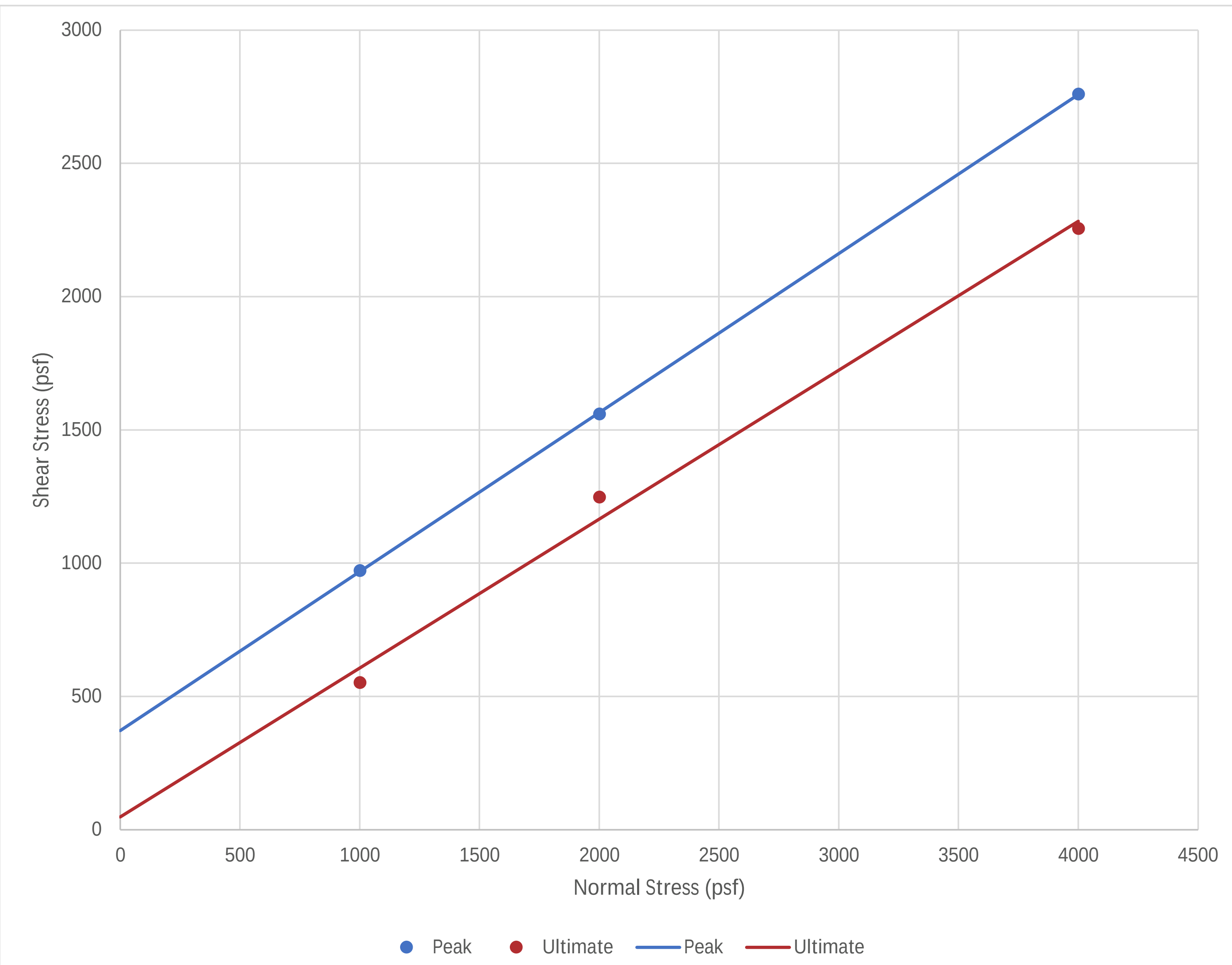
Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Direct Shear Test

ASTM D3080

Boring ID	Depth	Description	USCS	γ_d (pcf)	W(%)
B-17	7.5	Silty Sand	SM		

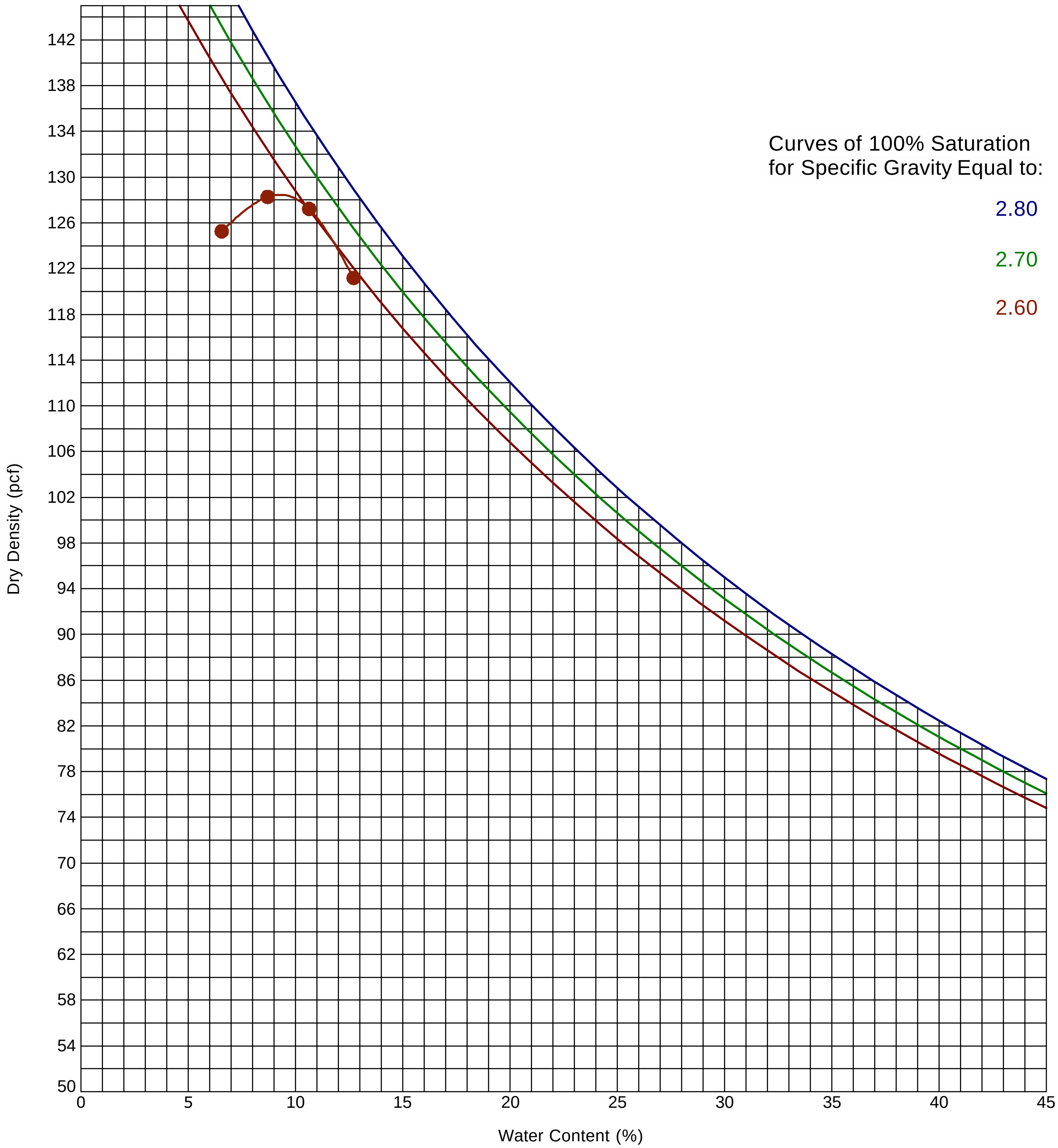
Normal Stress (psf)	Peak Shear Stress (psf)	Ultimate Shear Stress (psf)	Peak		Ultimate	
			<p	C (psf)	φ°	C (psf)
1000	972	552	30.8	372	29.2	48
2000	1560	1248				
4000	2760	2256				



Terracon
1355 E Cooley Dr
Colton, CA

Moisture-Density Relationship

ASTM D1557-Method D

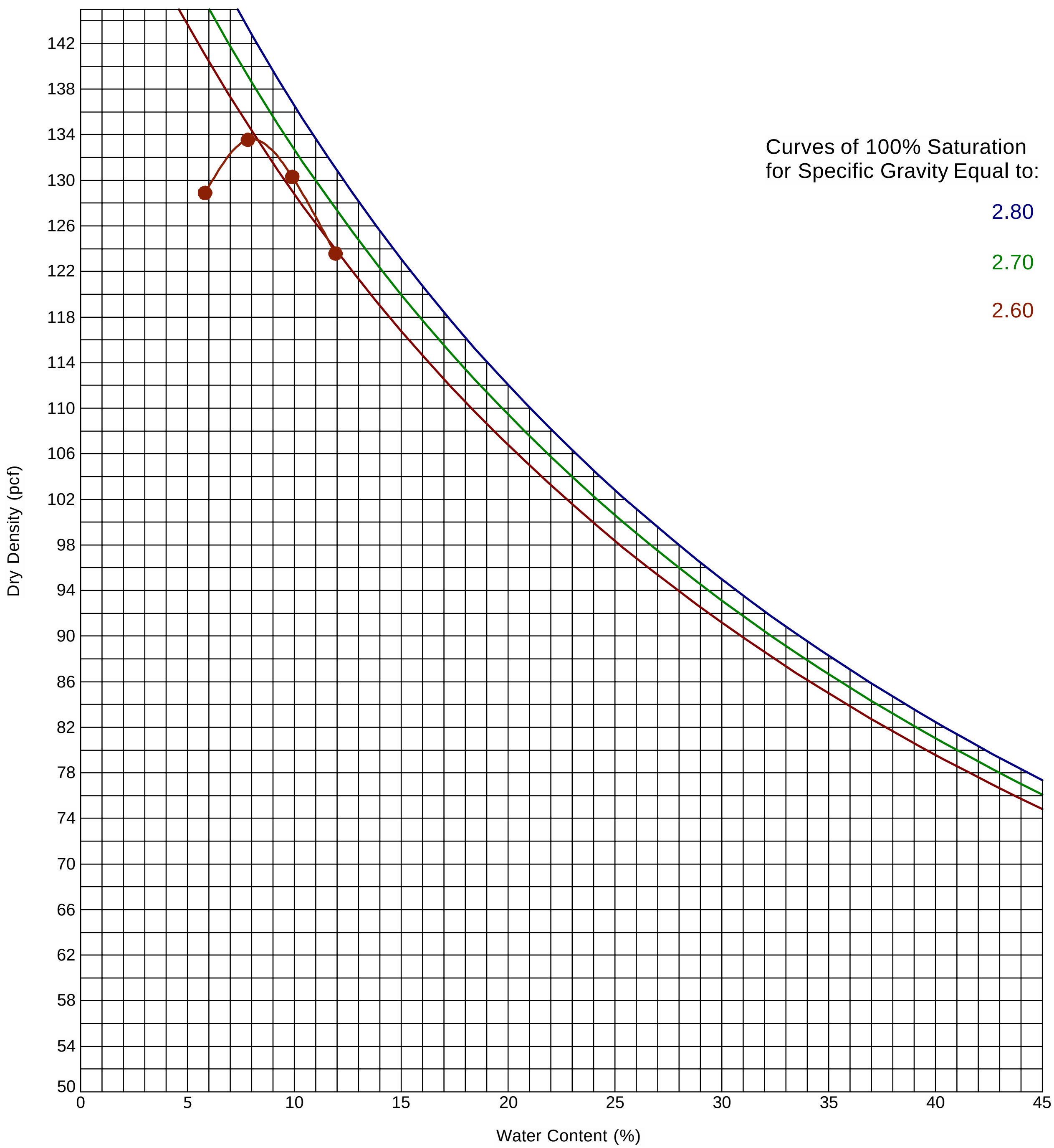


Boring ID	Depth (Ft)	Description of Materials
B-7	0 - 5	SILTY SAND

Fines (%)	Fraction > mm size	LL	PL	PI	Test Method	Maximum Dry Density (pcf)	Optimum Water Content (%)
	0.0				ASTM D1557-Method D	128.5	9.3

Moisture-Density Relationship

ASTM D1557-Method D



Boring ID	Depth (Ft)	Description of Materials
B-19	0 - 5	SILTY SAND

Fines (%)	Fraction > mm size	LL	PL	PI	Test Method	Maximum Dry Density (pcf)	Optimum Water Content (%)
23	0.0				ASTM D1557-Method D	133.6	8.0

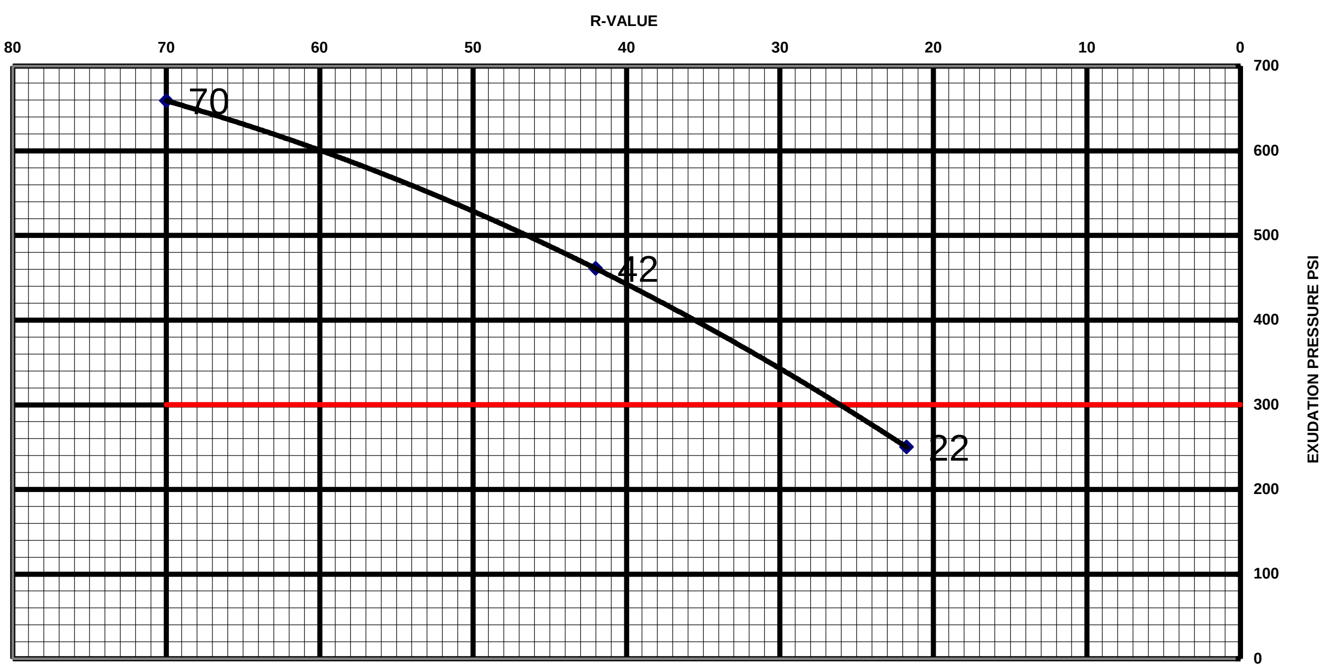
Job No. CB245134
Date. 11/6/2024

LAB0RATORY RECORD OF TESTS MADE ON
BASE, SUBBASE, AND BASEMENT SOILS

CLIENT: **San Bernardino County**
PROJECT **DBH-Comprehensive Treatment Campus**
LOCATION:
R-VALUE # : **B-21**
T.I. :

	A	B	C	D
COMPACTOR AIR PRESSURE P.S.I.	100	250	350	
INITIAL MOISTURE %	5.1	5.1	5.1	
WATER ADDED, ML	80	70	60	
WATER ADDED %	7.4	6.5	5.6	
MOISTURE AT COMPACTION %	12.5	11.6	10.7	
HEIGHT OF BRIQUETTE	2.50	2.48	2.47	
WET WEIGHT OF BRIQUETTE	1134	1135	1136	
DENSITY LB. PER CU.FT.	122.2	124.3	125.9	
STABILOMETER PH AT 1000 LBS.	43	31	19	
2000 LBS.	103	68	32	
DISPLACEMENT	4.98	4.67	4.29	
R-VALUE	22	42	70	
EXUDATION PRESSURE	250	461	659	
THICK. INDICATED BY STAB.	0.00	0.00	0.00	
EXPANSION PRESSURE	0	8	21	
THICK. INDICATED BY E.P.	0.00	0.27	0.70	

EXUDATION CHART



R-Value: **26**

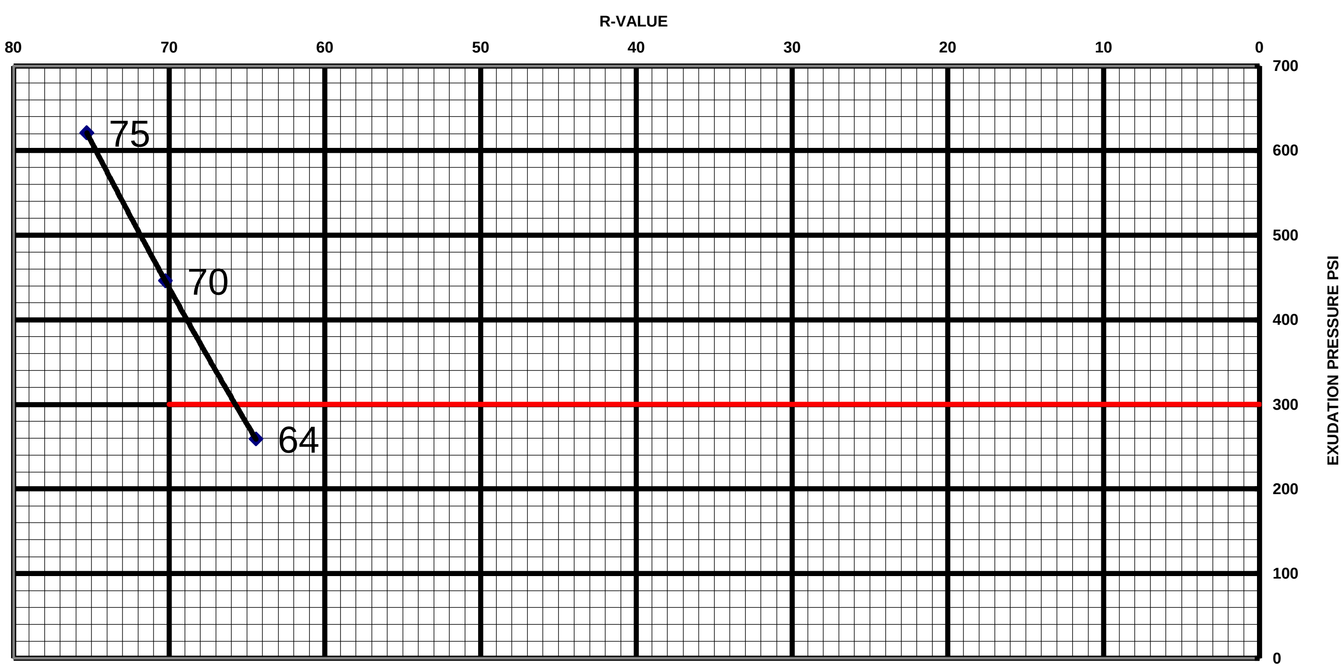
Job No. CB245134
Date. 11/6/2024

LAB0RATORY RECORD OF TESTS MADE ON
BASE, SUBBASE, AND BASEMENT SOILS

CLIENT: **San Bernardino County**
PROJECT **DBH-Comprehensive Treatment Campus**
LOCATION:
R-VALUE # : **B-27**
T.I. :

	A	B	C	D
COMPACTOR AIR PRESSURE P.S.I.	350	350	350	
INITIAL MOISTURE %	2.7	2.7	2.7	
WATER ADDED, ML	80	70	60	
WATER ADDED %	7.1	6.3	5.3	
MOISTURE AT COMPACTION %	9.8	9.0	8.0	
HEIGHT OF BRIQUETTE	2.48	2.47	2.50	
WET WEIGHT OF BRIQUETTE	1155	1149	1157	
DENSITY LB. PER CU.FT.	128.5	129.4	129.8	
STABILOMETER PH AT 1000 LBS.	20	17	14	
2000 LBS.	32	28	25	
DISPLACEMENT	5.52	4.99	4.43	
R-VALUE	64	70	75	
EXUDATION PRESSURE	259	446	621	
THICK. INDICATED BY STAB.	0.00	0.00	0.00	
EXPANSION PRESSURE	0	0	0	
THICK. INDICATED BY E.P.	0.00	0.00	0.00	

EXUDATION CHART



R-Value: **65**

9123 Chesapeake Dr
San Diego, CA 92123
(619) 821-3630

Terracon
Explore with us

Client

San Bernardino County

Project

SBC - DBH Comprehensive Treatment Campus

Sample Submitted By: E. Dominguez-Beltran **Date Tested:** 10/30/2024 **Project Number:** CB245134

Results of Corrosion Analysis

Sample Type	Grab	Grab
Sample Location	B-3	B-8
Sample Depth (ft.)	0.0' -5.0'	0.0' -5.0'
pH Analysis, ASTM G 51	8.30	8.29
Water Soluble Sulfate (SO4), ASTM D516 (%)	0.05	0.10
Sulfides, AWWA 4500-S^{2-} D, (mg/kg)	Nil	Nil
Chlorides, ASTM D512, (mg/kg)	4.5	5.1
Red-Ox, ASTM G 200, (mV)	+370	+191
Total Salts, AWWA 2520 B, (mg/kg)	285	317
Saturated Minimum Resistivity, ASTM G 57, (ohm-cm)	2,600	1,300

Reviewed By: [signature]

Tom Remmel
Laboratory Manager

Supporting Information

Contents:

Note: All attachments are one page unless noted above.

Job No.: CB245134

PERCOLATION TEST DATA

BORING NUMBER: B-20
LOT No: N/A
TRACT No: N/A

CLIENT: San Bernadino County
PROJECT: DBH Comprehensive Treatment Campus

DATE OF DRILLING:	October 8, 2024	DEPTH BEFORE (ft.):	5.0
DATE OF PRESOAK:	October 8, 2024	DEPTH AFTER (ft.):	5.0
DATE OF TEST:	October 9, 2024	PVC PIPE DIA. (in.):	3.0
TESTED BY:	AS	PERC HOLE DIA. (in.):	8.0

Time Interval (min.)	Total Elapsed Time (min.)	Initial Water Level (in.)	Final Water Level (in.)	Change in Water Level (in.)	Initial Hole Depth (in.)	Final Hole Depth (in.)	Percolation Rate (in/hr)	Infiltration rate (Porchet Method) (in/hr)
0	0	0.0	0.0	0.0	60.0	60.0	#DIV/0!	#DIV/0!
25	25	0.0	60.0	60.0	60.0	60.0	144.0	9.00
25	50	0.0	45.0	45.0	60.0	60.0	108.0	5.47
10	60	28.0	60.0	32.0	60.0	60.0	192.0	21.33
10	70	23.0	60.0	37.0	60.0	60.0	222.0	21.66
10	80	19.0	60.0	41.0	60.0	60.0	246.0	21.87
10	90	14.0	60.0	46.0	60.0	60.0	276.0	22.08
10	100	20.0	60.0	40.0	60.0	60.0	240.0	21.82
10	110	18.0	42.0	24.0	60.0	60.0	144.0	9.00
				Average of last 3 readings:			220.00	17.63

Job No.: CB245134

PERCOLATION TEST DATA

BORING NUMBER: B-21
LOT No: N/A
TRACT No: N/A

CLIENT: San Bernadino County
PROJECT: DBH Comprehensive Treatment Campus

DATE OF DRILLING:	October 8, 2024	DEPTH BEFORE (ft.):	5.0
DATE OF PRESOAK:	October 8, 2024	DEPTH AFTER (ft.):	5.0
DATE OF TEST:	October 9, 2024	PVC PIPE DIA. (in.):	3.0
TESTED BY:	AS	PERC HOLE DIA. (in.):	8.0

Time Interval (min.)	Total Elapsed Time (min.)	Initial Water Level (in.)	Final Water Level (in.)	Change in Water Level (in.)	Initial Hole Depth (in.)	Final Hole Depth (in.)	Percolation Rate (in/hr)	Infiltration rate (Porchet Method) (in/hr)
0	0	0.0	0.0	0.0	60.0	60.0	#DIV/0!	#DIV/0!
25	25	4.0	37.0	33.0	60.0	60.0	79.2	3.82
25	50	5.0	32.0	27.0	60.0	60.0	64.8	2.98
10	60	8.0	31.0	23.0	60.0	60.0	138.0	6.49
10	70	7.0	24.0	17.0	60.0	60.0	102.0	4.39
10	80	8.0	23.0	15.0	60.0	60.0	90.0	3.87
10	90	9.0	22.0	13.0	60.0	60.0	78.0	3.35
10	100	9.0	21.0	12.0	60.0	60.0	72.0	3.06
10	110	8.0	19.0	11.0	60.0	60.0	66.0	2.72
					Average of last 3 readings:		72.00	3.05

Job No.: CB245134

PERCOLATION TEST DATA

BORING NUMBER: B-22
LOT No: N/A
TRACT No: N/A

CLIENT: San Bernadino County
PROJECT: DBH Comprehensive Treatment Campus

DATE OF DRILLING:	October 8, 2024	DEPTH BEFORE (ft.):	5.0
DATE OF PRESOAK:	October 8, 2024	DEPTH AFTER (ft.):	5.0
DATE OF TEST:	October 9, 2024	PVC PIPE DIA. (in.):	3.0
TESTED BY:	AS	PERC HOLE DIA. (in.):	8.0

Time Interval (min.)	Total Elapsed Time (min.)	Initial Water Level (in.)	Final Water Level (in.)	Change in Water Level (in.)	Initial Hole Depth (in.)	Final Hole Depth (in.)	Percolation Rate (in/hr)	Infiltration rate (Porchet Method) (in/hr)
0	0	0.0	0.0	0.0	60.0	60.0	#DIV/0!	#DIV/0!
25	25	3.0	27.0	24.0	60.0	60.0	57.6	2.45
25	50	4.0	24.0	20.0	60.0	60.0	48.0	2.00
10	60	5.0	26.0	21.0	60.0	60.0	126.0	5.42
10	70	8.0	24.0	16.0	60.0	60.0	96.0	4.17
10	80	4.0	19.0	15.0	60.0	60.0	90.0	3.56
10	90	8.0	20.0	12.0	60.0	60.0	72.0	3.00
10	100	5.0	15.0	10.0	60.0	60.0	60.0	2.31
10	110	7.0	17.0	10.0	60.0	60.0	60.0	2.40
						Average of last 3 readings:	64.00	2.57

Job No.: CB245134

PERCOLATION TEST DATA

BORING NUMBER: B-22
LOT No: N/A
TRACT No: N/A

CLIENT: San Bernadino County
PROJECT: DBH Comprehensive Treatment Campus

DATE OF DRILLING:	October 8, 2024	DEPTH BEFORE (ft.):	5.0
DATE OF PRESOAK:	October 8, 2024	DEPTH AFTER (ft.):	5.0
DATE OF TEST:	October 9, 2024	PVC PIPE DIA. (in.):	3.0
TESTED BY:	AS	PERC HOLE DIA. (in.):	8.0

Time Interval (min.)	Total Elapsed Time (min.)	Initial Water Level (in.)	Final Water Level (in.)	Change in Water Level (in.)	Initial Hole Depth (in.)	Final Hole Depth (in.)	Percolation Rate (in/hr)	Infiltration rate (Porchet Method) (in/hr)
0	0	0.0	0.0	0.0	60.0	60.0	#DIV/0!	#DIV/0!
25	25	5.0	59.0	54.0	60.0	60.0	129.6	8.64
25	50	3.0	53.0	50.0	60.0	60.0	120.0	7.06
10	60	7.0	50.0	43.0	60.0	60.0	258.0	15.40
10	70	8.0	55.0	47.0	60.0	60.0	282.0	18.49
10	80	7.0	51.0	44.0	60.0	60.0	264.0	16.00
10	90	8.0	47.0	39.0	60.0	60.0	234.0	13.57
10	100	7.0	42.0	35.0	60.0	60.0	210.0	11.20
10	110	8.0	42.0	34.0	60.0	60.0	204.0	11.03
						Average of last 3 readings:	216.00	11.93

General Notes

Sampling	Water Level	Field Tests
Auger Cuttings; Modified Dames & Moore Ring Sampler; Standard Penetration Test	Water Initially Encountered Water Level After a Specified Period of Time Water Level After a Specified Period of Time Cave In Encountered Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variationswill occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.	N — Standard Penetration Test Resistance (Blows/Ft.) (HP) — Hand Penetrometer (T) — Torvane (DCP) — Dynamic Cone Penetrometer UC — Unconfined Compressive Strength (PID) — Photo-Ionization Detector (OVA) — Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance			Consistency of Fine-Grained Soils (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Relative Density	**Standard Penetration or N-Value (Blows/Ft.)**	**Ring Sampler (Blows/Ft.)**	**Consistency**	**Unconfined Compressive Strength Qu (tsf)**	**Standard Penetration or N-Value (Blows/Ft.)**	**Ring Sampler (Blows/Ft.)**
Very Loose	0 - 3	0 - 6	Very Soft	less than 0.25	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	0.25 to 0.50	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium Stiff	0.50 to 1.00	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	1.00 to 2.00	8 - 15	10 - 18
Very Dense	> 50	> 99	Very Stiff	2.00 to 4.00	15 - 30	19 - 42
			Hard	> 4.00	> 30	> 42

Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu>4 and 1<Cc<3 [E]	GW	Well-graded gravel [F]
			Cu<4 and/or [Cc<1 or Cc>3.0] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu>6 and 1<Cc<3 [E]	SW	Well-graded sand [I]
			Cu<6 and/or [Cc<1 or Cc>3.0] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains > 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains > 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains > 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains > 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI > 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.