Geotechnical Engineering Report

Redlands Mall Redevelopment (Proposed State Street Village)
Redlands, San Bernardino County, California
September 30, 2021
Terracon Project No. CB215095

Prepared for:
Village Partners Ventures, LLC
Newport Beach, California

Prepared by:
Terracon Consultants, Inc.
Colton, California

September 30, 2021

Village Partners Ventures, LLC
4340 Von Karman Avenue, Suite 110
Newport Beach, California 92660

Attn: Mr. Michael Morris
P: (949) 478-1450
E: michael@villagepartners.com

Re: Geotechnical Engineering Report
Redlands Mall Redevelopment (Proposed State Street Village)
Northwest Corner of Citrus Avenue and Orange Street
Redlands, San Bernardino County, California
Terracon Project No. CB215095

Dear Mr. Morris:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PCB215095 dated April 23, 2021. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, floor slabs 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 Consultants, Inc.

Ali Tabatabaei, Ph.D., G.E.
Geotechnical Project Engineer

REGISTERED PROFESSIONAL ENGINEER
SEYEDALI TABATABAEI
No. 3159
GEOTECHNICAL
STATE OF CALIFORNIA

John S. McKeown, E.G. 2396
Senior Geologist

PROFESSIONAL GEOLOGIST
JOHN S. McKEOWN
No. EG2396
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Reviewed by: Keith P. Askew
Department Manager

REPORT TOPICS

Note: This report was originally delivered in a web-based format. Orange 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 *GeoReport* logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

Note: Refer to each individual Attachment for a listing of contents.

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INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed Redlands Mall Redevelopment to be located at Northwest Corner of Citrus Avenue and Orange Street in Redlands, San Bernardino County, California. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions and historic high groundwater
- 2019 California Building Code (CBC) seismic design parameters
- Subgrade preparation/earthwork recommendations
- Recommendations for foundation design and concrete slabs-on-grade
- Recommendations for preliminary pavement section design

The geotechnical engineering Scope of Services for this project included the advancement of 16 test borings drilled to depths ranging from approximately 10 to 51½ feet below existing site grades, laboratory testing, and preparation of this report.

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

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 site is located at Northwest Corner of Citrus Avenue and Orange Street in Redlands, San Bernardino County, California. The approximate coordinates of the site are: 34.0562°N/117.1843°W See **Site Location**

Item	Description
Existing Improvements	The site is situated just north of W Citrus Avenue and west of Orange Street within the Redlands Mall center. Currently the parcel consists of retail shopping buildings that appear to be both active and inactive, asphalt concrete (AC) drive/parking areas and appurtenant improvements. A drainage culvert is located in the northwest corner of the site.
Current Ground Cover	The site is developed with retail shopping buildings, AC pavement drive/parking areas, and landscaping.
Existing Topography	The project site is relatively flat.

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
Proposed Development	Based on our review of the site plans provided to us, the existing buildings and utilities will be demolished and removed from the site, and a mixed-use development of 3 and 4 story structures (street front retail/commercial with residential above) and appurtenant infrastructure will be constructed, including paved roadway/parking, and drainage infiltration/retention basins. The proposed construction also include independent parking structure up to six-levels; anew subterranean parking structure, 1 level, with 2-podium buildings of 3 and 4 story on top are planned for southeast quadrant. The resulting excavation from the demolition of the existing subterranean garage will be utilized for the new subterranean garage with 3 and 4 story podium buildings above.
Proposed Structures	We anticipate the proposed buildings will be supported on conventional strip footings and isolated column pads along with slab-on-grade floors. We anticipate proposed parking structure will be supported on cast-in-place drilled shaft
Structural Loads (assumed)	Structural loads were not provided at the time of this report. For preliminary geotechnical recommendaitons, we assume that the proposed structures will have the following loads, these loads should be confirmed by the project structural engineer: ■ Columns: 100 to 200 kips ■ Walls: 1 to 4 kips per linear foot (klf) ■ Slabs: 100 to 150 pounds per square foot (psf)
Finished Floor Elevation	Anticipated to be within 5 feet of existing grade

Item	Description
Grading Requirements	Design grades are anticipated to be similar to the existing grades; however, remedial grading is anticipated and backfilling of voids resulting from demolition activities of existing structures (foundations, underground utilities) will be required. The existing conditions include a subterranean parking structure; proposed grades or infilling in this area are unknown.
Below Grade Structures	A subterranean parking structure is planned; however the configuration, dimensions, and loads are not known.
Free-Standing Retaining Walls	Not anticipated
Pavements	Paved driveway and parking will be constructed on site. We assume both rigid (concrete) and flexible (asphalt) pavement sections should be considered. Please confirm this assumption. Anticipated traffic indices (TIs) are as follows for asphalt pavement: ■ Auto Parking Areas: TI=4.5 ■ Drive Lanes TI=5.5 ■ Truck Delivery Areas: TI=6.0 ■ The pavement design period is 20 years. Anticipated average daily truck traffic (ADTT) is as follows for concrete pavement: ■ Light Duty: ADTT=1 (Category A) ■ Medium Duty: ADTT=25 (Category B) ■ Dumpster Pad: ADTT=700 (Category C)
Stormwater Infiltration Systems	Preliminary infiltration testing was performed at the site to aid in the design of the infiltration system at the previously proposed location

GEOTECHNICAL CHARACTERIZATION

Site Geology

The site is located in the San Bernardino Valley, in the northern portion of the Peninsular Ranges Geomorphic Province. The site is located between the major drainages of the Santa Ana River and San Timoteo Creek. Localized drainage occurs in the Zanja Channel, which is conveyed in a storm drain beneath the northwest portion of the site and along Redlands Boulevard. Open channel portions of the the Zanja are located as close as 1,600 feet east of the site at 9th Street, and as close as 400 feet west of the site along West State Street.

The surficial native materials at the site are mapped primarily as younger alluvium consisting of unconsolidated grayish sandy to pebbly alluvium (Morton, 1978). It appears that all of the alluvial materials encountered in our exploratory borings consists of younger alluvium.

Morton (1978) shows the southerly portion of the site as underlain by clay-bearing older alluvium of Pleistocene age. The older alluvium was apparently not found in our exploratory borings. The

older alluvium is typically reddish-brown in color. It is exposed extensively south of the site and the red color is incorporated into the name of the City.

Subsurface Profile

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.In general, the site is underlan with fill soil to depths varying from 3 to 9½ feet bgs. The fill encountered was comprised of loose to medium dense, silty sand, clayey sand, and silty sand with gravel. Fill was not encountered in borings B7, B10, and P3.

Alluvial soils were encountered beneath AC (and base materials if present) in borings B7 and B10, and beneath the fill encounetered in borings B1 through B4, B6, B8, B9, P1, P2, P4, P5, and P6 to the depths of the borings. The alluvium encountered was generally loose to dense, and comprised of silty sand with varying amounts of gravel, poorly graded sand with varying amounts of silt and gravel, clayey sand, and sandy lean clay.

Boring P3 encountered refusal on gravel at a depth of approximately 1½ feet bgs; as such, percolation testing was not performed in this boring. Boring B5 encountered refusal at a depth of approximately 7½ feet bgs while still drilling within fill soils; the refusal appeared to be upon a buried structure constructed of clay brick.

The geotechnical characterization forms the basis of our geotechnical calculations and evaluation of site preparation, foundation options and pavement options. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Conditions encountered at each boring location are indicated on the individual boring logs shown in the **Exploration Results** section and are attached to this report. Stratification boundaries on the boring logs represent the approximate location of changes in native soil types; in situ, the transition between materials may be gradual.

Groundwater Conditions

The borings were advanced using continuous flight auger drilling techniques that allow short-term groundwater observations to be made while drilling. Groundwater was not observed within the maximum depths of exploration during or at the completion of drilling.

Our review of historical information regarding groundwater levels from the California Department of Water Resources (State Well No. 01S03W28J001S) indicates that groundwater . is expected to be at least 200 feet deep at the site. We do not anticipate groundwater will affect construction

at this project site. Groundwater level fluctuations may occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed.

Hydroconsolidation

To evaluate the potential deformation that may be caused by the addition of water to subsurface soils, hydroconsolidation testing was performed on a selected, representative relatively undisturbed sample (B-3 at 7½ feet). The result is shown in Exploration Results section. The test result indicate collapse potential of 0.2% for the sample tested when saturated under a surcharge pressure of 2,000 psf.

SEISMIC CONSIDERATIONS

Based on the soil properties encountered at the site and as described on the exploration logs and results, it is our opinion that the Seismic Site Classification is D. The 2019 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 2019 CBC. The 2019 CBC requires that a site-specific ground motion study be performed in accordance with Section 21.2 of ASCE 7-16 for Site Class D sites with a mapped S_1 value greater than or equal 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 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. However, the structural engineer should verify the applicability of this exception.

Based on this exception, the spectral response accelerations presented below were determined using the site coefficients (F_a and F_v) from Tables 1613.2.3(1) and 1613.2.3(2) presented in Section 16.4.4 of the 2019 CBC.

Description	Value
Site Classification (CBC) [1]	D [2]
Site Latitude (°N)	34.0562
Site Longitude (°W)	117.1843
S_s Spectral Acceleration for a 0.2-Second Period	1.746
S_1 Spectral Acceleration for a 1-Second Period	0.7
F_a Site Coefficient for a 0.2-Second Period	1.0

Description	Value
F_v Site Coefficient for a 1-Second Period	1.7
Site Modified Peak Ground Acceleration	0.821g
De-aggregated Mean Magnitude [3]	7.3

1. Seismic site classification in general accordance with the *2019 California Building Code*.
2. The 2019 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 required 100-foot soil profile determination. Our borings were extended to a maximum depth of 51½ feet. 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.
3. These values were obtained using on-line Unified Hazard Tool by the USGS (https://earthquake.usgs.gov/hazards/interactive/) for return period of 2% in 50 years accessed

A site-specific ground motion study may reduce design values and consequently 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.

Estimated Ground Motions

The site is located in the seismically active southern California 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 calculated using the USGS Unified Hazard Tool, the San Andreas (San Bernardino S segment) Fault, which is considered to have the most significant effect at the site from a design standpoint, has a maximum earthquake magnitude of 7.54 and is located approximately 8.2 kilometers from the site.

Based on the USGS Design Maps Summary Report, using the American Society of Civil Engineers (ASCE 7-16) standard, the peak ground acceleration (PGA_M) at the project site is expected to be 0.821 g. Based on the USGS Unified Hazard Tool, the project site has a de-aggregated mode magnitude of 8.1. The site is not located within an Alquist-Priolo Earthquake Fault Zone based on our review of the State Fault Hazard Maps.

LIQUEFACTION AND SEISMIC SETTLEMENT

Liquefaction Potential

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, and is typically a hazard where loose sandy soils exist below groundwater. The County of San Bernardino 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 subsurface materials generally consist of interbeded layers of silty clayey sand, silty sand and poorly graded sand extending to the maximum depth of the borings approximately 51½ feet bgs. Groundwater was not observed within the maximum depths of exploration during or at the completion of drilling, and has historically been deeper than 100 feet bgs.

According to the County of San Bernardino Geologic Hazard Overlay maps, the site is not located within an area having liquefaction potential. Based on the County mapping and the subsurface conditions encountered including depth to groundwater, it is our opinion that the liquefaction potential for the site is low to non-existent.

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.

Geotechnical engineering recommendations for foundation systems and other earth connected phases of the project are outlined below. The recommendations contained in this report are based upon the results of field and laboratory testing, engineering analyses, and our current understanding of the proposed project.

The subsurface materials generally consist of fill soils and alluvial soils comprised of interbeded layers of silty sand with varying amounts of gravel, poorly graded sand with varying amounts of silt and gravel, clayey sand, and sandy lean clay extending to the maximum depth of the borings. All fill soils should be removed during grading operations. Refusal at a depth of approximately 7½ feet bgs within fill soils while drilling boring B5; the refusal appeared to be upon a buried structure constructed of clay brick and additional investigation should be performed to determine the type and extent of the structure.

Based on the conditions encountered and our assumptions regarding finish grades, the proposed buildings can be supported on shallow foundations, such as conventional spread footings. The drainage culvert located within the northwest portion of the site should be accurately located, including the bottom and top elevations and horizontal extent. The design and depth of foundations for the proposed buildings and subterranean parking structure should be design such that additional stresses from loading will not impact the culvert.

Due to accessibility within the existing buildings, we were not able to drill deep borings within the proposed footprint of the new structures, We recommend that additional borings be conducted within the footprint of the proposed structures; this would ideally be performed, when existing structures are demolished and the debris cleared. The borings should be performed to confirm the findings and recommendations provided herein, and possibly supplement or modify as needed. .
No groundwater was encountered in the borings to the depths drilled at the time of drilling. Groundwater is not expected to affect shallow foundation construction on this site.

The **General Comments** section provides an understanding of the report limitations.

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.

Support of pavements on or above existing fill materials is discussed in this report. However, even with the recommended construction testing services, there is an inherent risk for the owner that compressible fill or unsuitable material within or buried by the fill will not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill, but can be reduced by performing additional testing and evaluation.

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.

Site Preparation

Strip and remove existing vegetation, debris, pavements and other deleterious materials from proposed buildings 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.

Demolition of the existing buildings should include complete removal of all foundation systems and remaining underground utilities within the proposed construction area. This should include removal of any loose backfill found adjacent to existing foundations. All materials derived from the demolition of existing structures and pavements should be removed from the site and not be

allowed for use as on-site fill, unless processed in accordance with the fill requirements included in this report.

Our explorations indicate the site has approximately 3 to 9½ feet of fill material across the majority of the site. The fill soils generally consisted of loose to medium dense, silty sand, clayey sand, and silty sand with gravel. We recommend that all fill soils within the footprint of building pads and settlement sensitive structures be removed and the excavation thoroughly cleaned prior to backfill placement and/or construction. Although no evidence of underground facilities such as septic tanks, cesspools, and 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

We recommend that the proposed buildings be supported by a shallow foundation bearing on engineered fill extending to a minimum depth of 2 feet below the bottom of foundations, or 5 feet below the existing grades, whichever is greater. Engineered fill placed beneath the entire footprint of the buildings should extend horizontally a minimum distance of 3 feet beyond the outside edge of perimeter footings.

Subgrade soils beneath exterior slabs and pavements should be removed to a depth of 1 foot below exting grade or bottom of proposed pavement section, and replaced as engineered fil to the proposed grades. The bottom of excavation should then be scarified, moisture conditioned, and compacted to a minimum depth of 10 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 as necessary, and compacted per the compaction requirements in this report. Compacted fill soils should then be placed to the design grades, and the moisture content and compaction of soils should be maintained until slab, pavement, or proposed improvements are constructed.

Based upon the subsurface conditions determined from the geotechnical exploration, the on site soils are suitable for the proposed fill soils provided they are free from any organics and debris. The on site soils are anticipated to be relatively workable; however, the workability of the soils may be affected by precipitation, repetitive construction traffic or other factors. If unworkable conditions develop, workability may be improved by scarifying and drying.

Excavation

We anticipate that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. 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. Excavations adjacent to the existing culvert within the northwest portion of the site, and other existing utilities or improvements to be left in place, should be performed to prevent undermining and distress to the improvement.

Fill Material Types

All fill materials should be inorganic soils free of vegetation, debris, and fragments larger than three 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 backfill
■ foundation areas	■ pavement areas
■ interior floor slab areas	■ exterior slab areas

Imported soils that are used as fill materials to raise grades should conform to low volume change materials and should conform to the following requirements:

Gradation	**Percent Finer by Weight (ASTM C 136)**
3”	100
No. 4 Sieve	50 - 100
No. 200 Sieve	20 - 50

- Liquid Limit ..... 30 (max)
- Plasticity Index ..... 15 (max)
- Maximum Expansive 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 S0)

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.

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/or low volume change imported fill:			
Beneath foundations:	95	0%	+3%
Beneath interior slabs:	95	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:	95	0%	+3%
Aggregate base (beneath pavements):	95	0%	+3%

* Upper 12 inches should be compacted to 95% within pavement and structural areas.

Utility Trenches

We anticipate that the on-site soils will provide suitable support for underground utilities and piping that may be installed. Any soft and/or unsuitable material encountered at the bottom of excavations should be removed and be replaced with an adequate bedding material. A non-expansive granular material with a sand equivalent greater than 30 is recommended for bedding and shading of utilities, unless otherwise allowed by the utility manufacturer.

On-site materials are considered suitable for backfill of utility and pipe trenches from one 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.

Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction. Planters and other surface features which could retain water in areas adjacent to the building or pavements should be sealed or eliminated. In areas where sidewalks or paving do not immediately adjoin the structure, we recommend that protective slopes be provided with a minimum grade of approximately 5 percent for at least 10 feet from perimeter walls. Backfill against footings, exterior walls, and in utility and sprinkler line trenches should be well compacted and free of all construction debris to reduce the possibility of moisture infiltration.

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. A new subterranean garage and other structures are planned; therefore, the horizontal setback distance of any stormwater storage device should consider the impacts of seepage to below ground basement walls and footings, and the final design configuration should be reviewed and approved by the geotechnical engineer. Where the appropriate setbacks cannot be accommodated, other drainage devices such as storage chambers (or holding chambers) designed to release storm water to appropriate outlets should be considered.

Roof drainage should discharge into splash blocks or extensions when the ground surface beneath such features is not protected by exterior slabs or paving. Sprinkler systems and landscaped irrigation should not be installed within 5 feet of foundation walls.

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.

Construction Considerations

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of floor slabs and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to floor slab and pavement construction.

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.

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 geotechnical engineer should be retained during the construction phase of the project to observe earthwork and to perform necessary tests and observations during subgrade preparation, proof-rolling, placement and compaction of controlled compacted fills, backfilling of excavations to the completed subgrade.

The exposed subgrade and each lift of compacted fill should be tested, evaluated, and reworked as necessary until approved 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. One density and water content test for every 50 linear feet of compacted utility trench backfill.

In areas of foundation excavations, the bearing subgrade should be evaluated under the direction of the Geotechnical Engineer. In the event that unanticipated conditions are encountered, 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.

Item	Description
Foundation Support	Engineered fill extending 2 feet below the bottom of foundations, or 5 feet below existing grades, whichever is greater.
Net Allowable Bearing pressure [1, 2] **(On-site soils or structural fill)**	2,000 psf
Minimum Foundation Dimensions	Columns: 24 inches Continuous: 18 inches
Minimum Footing Depth	24" below finish grade
Increments of Net Allowable Bearing Pressure	400 psf for each additional foot of width 800 psf for each additional foot of depth
Maximum Net Allowable Bearing Pressure	3,500 psf
Ultimate Passive Resistance [4]	350 pcf
Ultimate Coefficient of Sliding Friction [5]	0.36
Estimated Total Static Settlement from Structural Loads [2]	about 1 inch
Estimated Differential Settlement [2, 6]	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. An appropriate factor of safety has been applied.
2. Values provided are for maximum loads noted in **Project Description**. The foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of compacted fill, and the quality of the earthwork operations. Allowable bearing pressure and estimated settlement are based on the fact that building construction will commence after at least 90% of the fill and underlying native soil compression occurred.
3. Unsuitable or soft soils should be over-excavated and replaced per the recommendations presented in the **Earthwork**.
4. 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.
5. 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.
6. Differential settlements are as measured over a span of 40 feet.

Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the direction 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.

To ensure foundations have adequate support, special care should be taken when footings are located adjacent to trenches. The bottom of such footings should be at least 1 foot below an imaginary plane with an inclination of 1.5 horizontal to 1.0 vertical extending upward from the nearest edge of adjacent trenches.

DEEP FOUNDATIONS

Drilled pier recommendations are provided for the proposed parking structure and the three and four story structures that are interconnected. We recommend drilled piers be designed and constructed as presented below.

Drilled Pier Foundation – Design Parameters

Axial Loading: Axial compressive loads may be supported on straight-sided drilled piers. Compressive axial loads on pier foundations are resisted by both side friction along the pier and by end bearing at the base of the pier if above groundwater, while uplift loads are resisted solely by side friction along the pier and by the weight of the pier.

It may be beneficial to install a monitoring well to determine the actual depth to groundwater for both design and construction purposes. Drilled piers extending below groundwater should not be designed for end bearing since it is very difficult if not impossible to adequately clean the bottom of the excavation in sandy soils to ensure end bearing can be relied upon.

Allowable compressive side friction and axial capacity for the parking structure are provided for pile diameters of 24-inches to 48-inches in the attachments of this report. The allowable uplift capacities should only be based on two-thirds of the allowable side friction of the shaft; however, the weight of the foundation should be added to these values to obtain the actual allowable uplift capacities for drilled shafts. The allowable end bearing capacities and skin friction values are based on factors of safety of 3 and 2, respectively.

Lateral Loading: The proposed parking structure may be subjected to lateral loading. The lateral resistance of a drilled pier can be estimated using L-PILE Analysis. The lateral load design L-Pile input parameters are provided in the table below.

L-Pile Design Input Parameters					
Layer	Bottom Depth of Layer (feet)	L-PILE Soil Types*	Effective Unit Weight (pcf)	Friction Angle (degrees)	Undrained Shear Strength (psf)
1	5	4	115	29	---
2	10	4	115	30	---
3	15	4	115	35	---
4	20	4	110	34	---
5	25	4	115	35	---
6	30	4	115	36	---
7	35	4	120	33	---
8	40	4	120	33	---
9	50	4	120	34	---

1. Design depth to subsurface water is deeper than 50 feet.
2. If groundwater is present, end bearing below the encountered depth should not be used for design. If groundwater is not present, end bearing may be used.

* L-PILE Soil Type: 4 – sand (Reese)

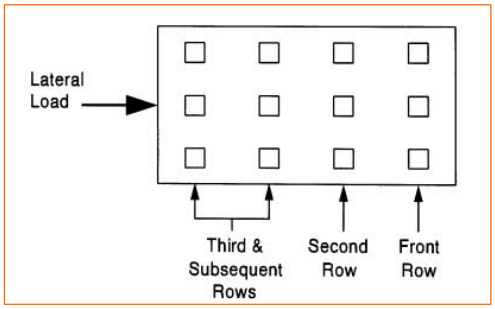
Tensile reinforcement should extend to the bottom of piers subjected to uplift loading, while maintaining appropriate concrete coverage.

Drilled piers should have a minimum (center-to-center) spacing of three diameters. Closer spacing may require a reduction in axial load capacity. Axial capacity reduction can be determined by comparing the allowable axial capacity determined from the sum of individual piers in a group versus the capacity calculated using the perimeter and base of the pier group acting as a unit. The lesser of the two capacities should be used in design.

The loaded capacities provided herein are based on the stress induced in the supporting soils. The structural capacity of the shafts should be checked to assure that they can safely accommodate the combined stresses induced by axial and lateral forces. Furthermore, the response of the drilled shaft foundations to lateral loads is dependent upon the soil/structure interaction as well as the shaft actual diameter, length, stiffness and fixity (fixed or free-head conditions.

Post-construction settlements of drilled piers designed and constructed as described in this report are estimated to range from about ¾ to 1 inch. Differential settlement between individual piers is expected to be ½ to ⅔ of the total settlement.

When piers are used in groups, the lateral capacities of the piers in the second, third, and subsequent rows of the group should be reduced as compared to the capacity of a single, independent pier. Guidance for applying p-multiplier factors to the p values in the p-y curves for each row of pier foundations within a pier group are as follows:



1. Front row: $P_m = 0.8$;
2. Second row: $P_m = 0.4$
3. Third and subsequent row: $P_m = 0.3$.

For the case of a single row of piers supporting a laterally loaded grade beam, group action for lateral resistance of piers would need to be considered when spacing is less than three pier diameters (measured center-to-center). However, spacing closer than 3D (where D is the diameter of the pier) is not recommended due to the potential for the installation of a new pier disturbing an adjacent installed pier, likely resulting in axial capacity reduction.

A structural engineer licensed in the State of California should be retained to design the drilled pier foundation. Deep foundation construction should be monitored by the Geotechnical Engineer to observe that recommendations are correctly interpreted and implemented.

Drilled Pier Construction Recommendations

The Geotechnical Engineer should observe the installation of drilled piers to verify the soil conditions and the diameter and depth of piers. Drilled piers should be constructed true and plumb.

Because of the granular nature of the soils encountered, the possible presence of shallow groundwater, and the anticipated diameter of the drilled holes, it is anticipated that caving could occur during the drilling and construction of piers within the on-site soils. Appropriate precautions should therefore be taken during the construction of piers to reduce caving and raveling.

Temporary steel casing may be required to properly drill and clean drilled piers prior to concrete placement. A water and polymer displacement method may also be considered as a means of maintaining pier integrity during construction. Foundation concrete should be placed immediately

after completion of drilling and cleaning. If foundation concrete cannot be placed in dry conditions, a tremie should be used for concrete placement. Due to potential sloughing and raveling, foundation concrete quantities may exceed calculated geometric volumes.

If casing is used for foundation construction, it should be withdrawn in a slow continuous manner, maintaining a sufficient head of concrete to prevent caving or the creation of voids in pier concrete. Foundation concrete should have a relatively high fluidity when placed in cased pier holes or through a tremie. Foundation concrete with slump in the range of 6 to 8 inches is recommended when temporary casing is utilized.

Free-fall concrete placement in drilled piers will only be acceptable if provisions are taken to avoid striking the concrete on the sides of the hole or reinforcing steel. The use of a bottom-dump hopper, or an “elephant's trunk” discharging near the bottom of the hole where concrete segregation will be minimized, is recommended.

Drilled pier end bearing surfaces must be thoroughly cleaned prior to concrete placement. A representative of the Geotechnical Engineer should inspect the bearing surface and foundation pier configuration. If the subsurface soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

The contractor should check for gas and/or oxygen deficiency before any workers enter the excavation for observation and manual cleanup. All necessary monitoring and safety precautions as required by OSHA, State or local codes should be strictly enforced.

The drilling speed should be reduced as necessary to minimize vibration and caving of the silty sand materials. Based on the data developed during our investigation, drilling for the piers may need casing. as caving soils may be encountered; the contractor should be prepared to use casing or other approved means to prevent caving. The contractor should review the boring logs to make sure he is familiar with the anticipated subsurface conditions prior to beginning construction of the deep foundations.

The installation of drilled straight-shafts may likely require the use of the slurry displacement method and/or temporary steel casing with water pumps, if groundwater encountered. If drilled straight-shaft installation is attempted without utilizing slurry displacement method or temporary casing, zones of sloughing soils and/or groundwater inflow may occur during construction. Therefore, we recommend that provisions be incorporated into the plans and specifications to utilize slurry or casing to control sloughing and/or groundwater seepage during shaft construction.

The need for casing or slurry will depend on the depth of the drilled shaft and the groundwater conditions at the time of construction. If casing is used and seepage persists, the water accumulating in the foundation excavation should be pumped out. The condition of the bearing

surface should be evaluated immediately prior to placing concrete, if casing is used in lieu of slurry. If groundwater inflow is too severe to be controlled by the use of casing and pumping or significant sloughing of the sidewalls occurs, the slurry method of construction should be utilized to complete the foundation installation.

Closely spaced piers should be drilled and filled alternately, allowing the concrete to set at least eight hours before drilling the adjacent pier. All excavations should be filled with concrete as soon after drilling as possible. In no event should pier holes be left open overnight. To prevent concrete from striking the walls of the pier and causing caving, the concrete should be placed with appropriate equipment so that the concrete is not allowed to fall freely more than 5 feet. All loose materials should be thoroughly cleaned from the bottom of the pier excavation. This is especially important because end bearing has been considered in determining the provided pier capacities. If casing is necessary and is utilized, then the casing should be withdrawn concurrently with the concrete placement.

FLOOR SLABS

DESCRIPTION	RECOMMENDATION
Interior floor system	Slab-on-grade concrete
Floor slab support	Engineered fill extending 2 feet below the bottom of associated foundations, or 5 feet below existing grades, whichever is greater.
Subbase	Minimum 4-inches of Aggregate Base
Modulus of subgrade reaction	150 pounds per square inch per inch (psi/in) (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, 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 control joints should be placed in the slab to help control the location and extent of cracking. For additional recommendations refer to the ACI Design Manual. Joints or cracks should be sealed with a water-proof, 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.

RETAINING WALLS

Design Parameters

The lateral earth pressure recommendations herein are applicable to the design of rigid retaining walls subject to slight rotation, such as cantilever or gravity type concrete walls. These lateral earth pressure recommendations are also applicable for the design of lateral loading against foundation walls.

For on-site soils or import materials above any free water surface, recommended equivalent fluid pressures for unrestrained walls are:

ITEM[1,2]	EFFECTIVE FLUID PRESSURE[5] (UNSATURATED) [6]
Active (K_a) (flat)	40 psf/ft
Seismic Active (K_{ae}) (flat)	80 psf/ft
Passive (K_p) (flat)	360 psf/ft
At-Rest (K_0) (flat)	60 psf/ft
Surcharge Loads[3,4]	0.33 x (S) psf
Coefficient of Friction**	0.35
Wall Foundation Support	Engineered fill extending 1-foot below the bottom of wall foundation
Net Allowable Bearing Pressure[7]	2,000 psf

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure conditions, wall movement in a range of 0.005H to 0.01H (H is the height of the wall) is required to fully mobilize passive earth pressures. If this scale of wall movement is not expected, a reduction factor of 50% may be used for passive earth pressure condition design.
2. Backfill, compacted to at least 90 percent of the ASTM D1557 maximum dry density, rendering a maximum unit weight of 120 pcf.
3. Uniform surcharge, where S is surcharge pressure. The project structural engineer should consider surcharge loadings, such as: adjacent streets and buildings.
4. Construction loading from heavy compaction equipment is not included.
5. No safety factor is included in these values.
6. To achieve "Unsaturated" conditions, follow guidelines in Retaining Wall Drainage below. Terracon should be contacted if drainage systems will not be installed behind retaining walls or if the walls will be located below groundwater.
7. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. An appropriate factor of safety has been applied.

The lateral earth pressures herein do not include any factor of safety and are not applicable for submerged soils/hydrostatic loading. Additional recommendations may be necessary if such conditions are to be included in the design.

The design of retaining structures should consider surcharge loads imposed on the foundations. In addition, the design should take into consideration new and existing footing loads and anticipated vehicular loads in the vicinity of the proposed walls. In general, surcharge loads should be considered where they are located within a horizontal distance behind the wall equal to the height of the wall.

Surcharge loads acting at the top of the wall should be applied to the wall over the backfill as a uniform pressure over the entire wall height and should be added to the static earth pressures. Surcharge stresses due to point loads, line loads, and those of limited extent, such as compaction equipment, should be evaluated using elastic theory.

Adequate drainage should be provided behind the retaining walls to collect water from irrigation, landscaping, surface runoff, or other sources, to achieve a free-draining backfill condition. The wall back drain should consist of Class 2 permeable materials that are placed behind the entire wall height to within 18 inches of ground surface at the top of the wall. As a minimum, the width of Class 2 permeable materials behind the wall should be two feet. As an alternative, drainage panels/mats may be used in lieu of the Class 2 permeable materials. Water collected by the back drain should be directed to an appropriate outlet, such as weep drain or perforated pipes discharging beyond the retained area, for disposal. In the event that weep hole or perforated pipe is not installed behind

the wall to provide fee-draining condition, hydro-static water pressure should be considered for the design of wall and Terracon should be contacted for readjusting design parameters.

Fill against foundation and retaining walls should be compacted to densities specified in Earthwork section of this report. Compaction of each lift adjacent to walls should be accomplished with hand-operated tampers or other lightweight compactors. Over-compaction may cause excessive lateral earth pressures which could result in wall movement.

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 outlined in the Caltrans "Highway Design Manual for Safety Roadside Rest Areas" (Caltrans, 2016). Design of Portland cement concrete (PCC) pavements are based upon American Concrete Institute (ACI) 330R-08; "Guide for Design and Construction of Concrete Parking Lots."

During the field investigation at the site, one sample of the near surface soil taken from our borings was tested in our laboratory to determine the Hveem Stabilometer Value (R-value). The test produced an R-value of 67 and an R-value of 50 was used to calculate the AC pavement thickness sections (per Caltrans recommendations). A modulus of subgrade reaction of 120 pci and a modulus of rupture of 600 psi were used for the PCC pavement designs.

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.

The pavement designs were based upon the results of preliminary sampling and testing and should be verified by additional sampling and testing (specifically R-value testing) during construction when the actual subgrade soils are exposed. Additionally, the preliminary sections provided are minimums based on procedures previously referenced. The project civil engineer should confirm minimum Traffic Indieces and sections required by local agencies or jurisdictions if applicable.

Pavement Section Thicknesses

The following table provides options for AC and PCC Sections:

Asphalt Concrete Design		
Usage	**Assumed Traffic Index**	**Recommended Structural Section**
Auto Parking Areas	4.5	3" HMA[1]/4" Class 2 AB[2]
Drive lanes	5.5	3" HMA[1]/4" Class 2 AB[2]
Truck Delivery Areas	6.0	3" HMA[1]/5" Class 2 AB[2]

1. HMA = hot mix asphalt
2. AB = aggregate base

Portland Cement Concrete Design			
Layer	**Thickness (inches)**		
	Light Duty[1]	**Medium Duty[2]**	**Dumpster Pad[3]**
PCC	5.0	6.0	7.5
Aggregate Base [4]	--	--	--

1. Car Parking and Access Lanes, Average Daily Truck Traffic (ADTT) = 1 (Category A).
2. Truck Parking Areas, Multiple Units, ADTT = 25 (Category B)
3. 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).
4. Aggregate base is not required. Compacted on-site material is considered competent.

Recommended structural sections were calculated based on assumed TIs and our preliminary sampling and testing.

Terracon does not practice traffic engineering. We recommend that the project civil engineer or traffic engineer verify that the TIs and ADTT traffic indices used are appropriate for this project.

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 maintenance should be anticipated. Therefore, 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. Maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the priority when implementing a pavement maintenance program. Additional engineering observation 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 percent.
- Subgrade and pavement surfaces should have a minimum 2 percent slope to promote proper surface drainage.
- Install below 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.

STORM WATER MANAGEMENT

Five in-situ infiltration tests (falling head borehole permeability) were performed (P1, P2, P4, P5, and P6) at approximate depths of 10 and 15 feet bgs within boreholes drilled with an 8-inch diameter auger. Boring P3 encountered refusal on gravel at a depth of approximately 1½ feet bgs; as such, percolation testing was not performed in this boring. The objective of the testing is to provide infiltration rates for designing an infiltration.

A 2-inch thick, 3/4-inch gravel layer was placed in the bottom of each boring after the borings were drilled to investigate the soil profile. Three-inch diameter perforated pipes were installed on top of the gravel layer and 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.

At the beginning of each test, the pipes were refilled with water and readings were taken at periodic time intervals as the water level dropped. The soil at the percolation test locations was classified in the field using a visual/manual procedure. 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	Boring Depth (ft.) [1]	Test Depth Range (ft.) [1]	Soil Type	Water Head (ft)	Percolation Rate Average (in./hr.)	Infiltration Rate Average (in./hr.) [2]
P-1	15	10 to 15	SP	5	235.4	11.7
P-2	15	10 to 15	SM	5	54.96	2.0
P-4	10	5 to 10	SM/SP	5	316.8	22.3
P-5	15	10 to 15	SM/SP	5	328.8	19.0
P-6	10	5 to 10	SM/SP	5	150.2	6.2

1. Below existing ground surface.
2. If proposed infiltration system will mainly rely on vertical downward seepage, the correlated infiltration rates should be used.
3. Refusal was encountered in P-3 at depth of 1 ½ feet and we did not run percolation test at this location.

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 at least 10 feet from any existing or proposed foundation system.

CORROSIVITY

The following table lists the laboratory electrical resistivity (standard and as-received), chlorides, soluble sulfates, and pH testing results. These 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. These results are preliminary and additional corrosivity testing should be performed within finished pads once grading is complete, and the corrosion recommendations updated accordingly.

Boring	Depth (feet)	Soluble Sulfate (mg/kg)	Soluble Chloride (mg/kg)	Total Salts (mg/kg)	pH	Resistivity (as-received) (Ohm-cm)	Resistivity (saturated) (Ohm-cm)
B-6	0 to 5	50	37	417	8.46	12,125	6,790

Results of soluble sulfate testing indicate samples of the on-site soils tested possess negligible sulfate concentrations when classified in accordance with Table 4.3.1 of the ACI Design Manual. Concrete should be designed in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4.

Consideration should be given to the use of non-metalic pipes where permitted by local building codes. For protection against corrosion to buried metals, Terracon recommends that an experienced corrosion engineer be retained to design a suitable corrosion protection system for underground metal structures or components.

If corrosion of buried metal is critical, it should be protected using a non-corrosive backfill, wrapping, coating, sacrificial anodes, or a combination of these methods, as designed by a qualified corrosion engineer.

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. Natural 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 or collaboration through this system 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. 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 impact 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. 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.

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ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Terracon conducted sixteen (16) soil-testing borings. These borings were drilled at the locations and to depths indicated in the table below.

Number of Borings	Boring Depth (feet) [1,2]	Planned Location
1 (B-1)	21 ½	Residential building area
1 (B-2)	51 ½	Residential building area
1 (B-3)	31 ½	Residential building area
1 (B-4)	51 ½	Parking structure
1 (B-5)	11 ½	Parking structure
2 (B-6 and B-7)	21 ½	Residential building area
2 (B-8 and B-9)	21 ½	Residential and retail building area
B-10	21 ½	South of Citrus Avenue
P-1 to P-6[3]	10 to 15	Infiltration system

1. Below ground surface.
2. P-3 located within existing subterranean parking and is not accessible with track rig. We cored concrete slab and used hand auger to advance boring for percolation testing. Boring encountered hand auger refusal at depth of 1 ½ feet.

Boring Layout and Elevations: Unless otherwise noted, Terracon personnel provided the boring layout. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet) and approximate elevations were obtained by interpolation from the Google Earth. If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advance the borings with a truck-mounted drill rig using hollow-stem augers. Both a standard penetration test (SPT) sampler (2-inch outer diameter and 1-3/8-inch inner diameter) and a modified California ring-lined sampler (3-inch outer diameter and 2-3/8-inch inner diameter) are utilized in our investigation. The penetration resistance is recorded on the boring logs as the number of hammer blows used to advance the sampler in 6-inch increments (or less if noted). The samplers are driven with an automatic hammer that drops a 140-pound weight 30 inches for each blow. After the required seating, samplers are advanced up to 18 inches, providing up to three sets of blowcounts at each sampling interval. The sampling depths, penetration distances, and other sampling information are recorded on the field boring logs. The recorded blows are raw numbers without any corrections for hammer type (automatic vs. manual cathead) or sampler size (ring sampler vs. SPT sampler). Relatively undisturbed and bulk samples of the soils

encountered are placed in sealed containers and returned to the laboratory for testing and evaluation.

We observe and record groundwater levels during drilling and sampling. For safety purposes, all borings are backfilled with auger cuttings after their completion.

Our exploration team prepares field boring logs as part of the drilling operations. These field logs include visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs are 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 to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- Water (Moisture) Content of Soil by Mass
- Laboratory Determination of Density (Unit Weight) of Soil Specimens
- Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis
- Modified Proctor test
- R-value test
- Consolidation test
- Corrosivity suite test

The laboratory testing program often included examination of soil samples by an engineer. Based on the material’s texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION AND EXPLORATION PLANS

SITE LOCATION

Redlands Mall Redevelopment (Proposed State Street Village) ■ Redlands, San Bernardino Coun
September 30, 2021 ■ Terracon Project No. CB215095

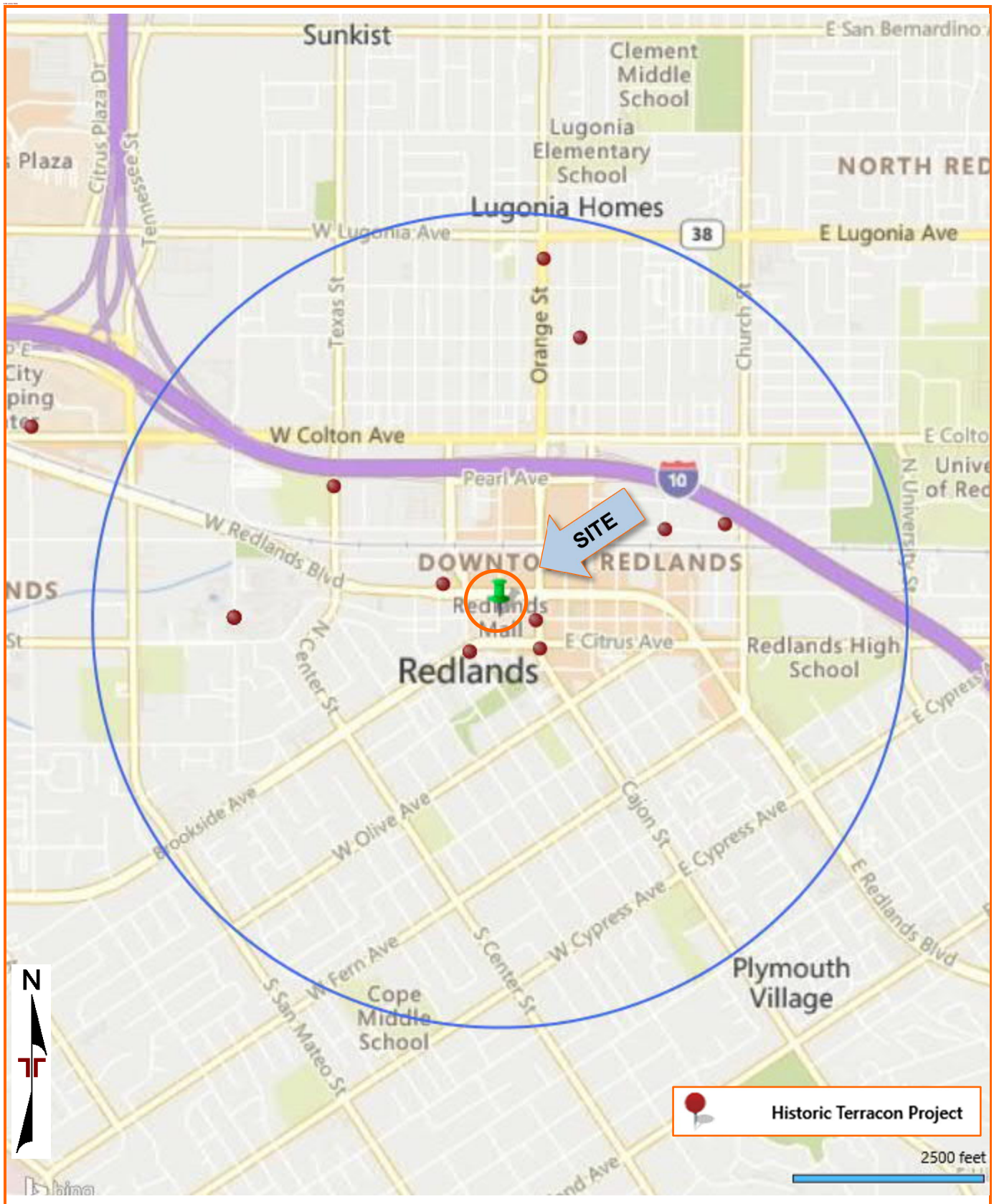


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

Redlands Mall Redevelopment (Proposed State Street Village) ■ Redlands, San Bernardino County, California

September 30, 2021 ■ Terracon Project No. CB215095

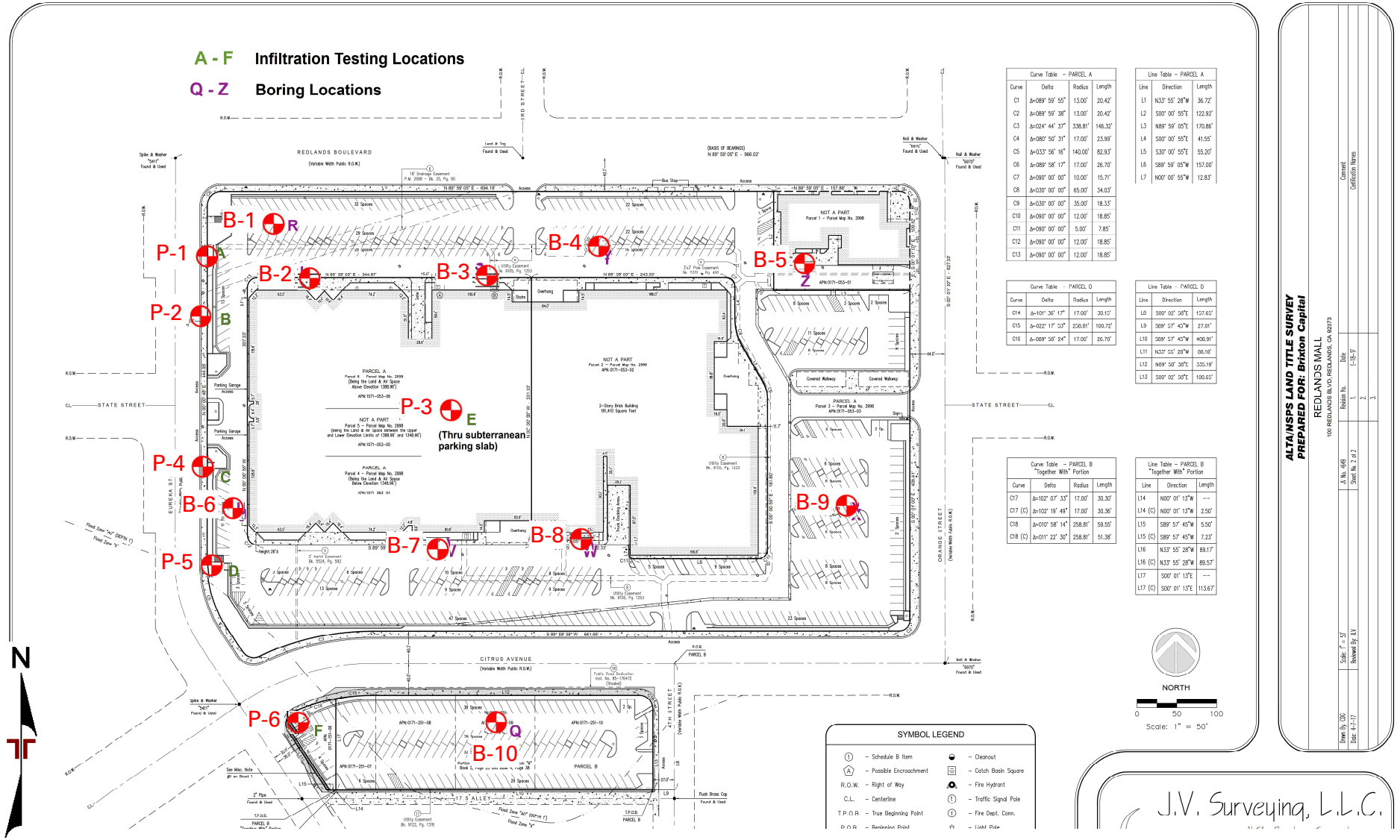


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

BORING LOG NO. B-1

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0571° Longitude: -117.1853°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3		**ASPHALT**, 3"							
		FILL - SILTY SAND (SM), fine to coarse grained, brown, medium dense							23
						11-19-21	5	123	
			5			16-21-18	5	123	
7.0									
		FILL - CLAYEY SAND WITH GRAVEL (SC), dark brown, medium dense, with concrete fragments				13-16-16	6	114	
10.0			10						
		SILTY SAND (SM), light brown, dense				20-30-44	1		
		grayish brown, medium dense	15			27-18-13			
			20			29-27-12			
21.5		***Boring Terminated at 21.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-25-2021 | Boring Completed: 08-25-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. B-2

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0569° Longitude: -117.1853°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3		**ASPHALT**, 3"							
		FILL - SILTY SAND (SM), trace gravel up to 1 1/2", fine to coarse grained, olive, medium dense							
						7-22-30	8	134	36
			5						
						14-19-33	5	126	12
7.0		**SILTY SAND (SM)**, trace gravel up to 1/2", fine to coarse grained, brown, loose, with root traces							
						5-8-8	5	130	23
9.5		**POORLY GRADED SAND (SP)**, trace gravel up to 1 1/2", fine to coarse grained, olive to gray, very dense	10						
						10-50/6"	4	105	10
13.0		**POORLY GRADED SAND WITH GRAVEL (SP)**, gravel up to 1", fine to coarse grained, brown, dense							
			15			8-14-16 N=30			5
		3 sandy silt lens							
18.0		**SILTY SAND WITH GRAVEL (SM)**, gravel up to 1", fine to coarse grained, brown, dense							
			20			12-15-21 N=36			15
23.0		**SILTY SAND (SM)**, fine to coarse grained, brown, medium dense							
			25			11-11-12 N=23			8
		4" clean sand lens							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-27-2021 | Boring Completed: 08-27-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. B-2

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0569° Longitude: -117.1853°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
		SILTY SAND (SM), fine to coarse grained, brown, medium dense *(continued)*							
		3" sandy silt lens	30			5-10-14 N=24			10
33.0									
		POORLY GRADED SAND (SP), fine to coarse grained, grayish brown, dense	35			12-17-22 N=39			4
38.0									
		POORLY GRADED SAND WITH GRAVEL (SP), gravel up to 1 1/2", fine to coarse grained, gray, very dense							
		4" silty sand lens	40			12-50/6"			8
			45			50/6"			9
		sandy clay lens							
48.0									
		SANDY LEAN CLAY (CL), brown, very stiff	50			5-12-15 N=27			61
51.5									
		Boring Terminated at 51.5 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-27-2021 | Boring Completed: 08-27-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. B-3

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0569° Longitude: -117.1845°

DEPTH	GRAPHIC LOG	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3		**ASPHALT**, 3"							
		FILL - SILTY SAND (SM), trace gravel up to 2", fine to coarse grained, brown, medium dense							18
						10-15-18	5	126	
		brick debris	5			12-16-28	9	133	
7.0		**SILTY SAND (SM)**, trace gravel up to 1/2", fine to coarse grained, reddish brown, loose				4-4-3	5	122	
11.3		**POORLY GRADED SAND (SP)**, fine to coarse grained, gray, medium dense	10			9-16-29	3	111	
13.0		**POORLY GRADED SAND WITH GRAVEL (SP)**, gravel up to 1 1/2", fine to coarse grained, grayish brown, dense	15			11-16-18 N=34			
16.5		**SILTY SAND (SM)**, fine to medium grained, reddish brown, medium dense	20			9-10-12 N=22			
		4" clean sand lens	25			10-11-12 N=23			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-27-2021 | Boring Completed: 08-27-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. B-3

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

GRAPHIC LOG	LOCATION See Exploration Plan Latitude: 34.0569° Longitude: -117.1845° DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	SILTY SAND (SM), fine to medium grained, reddish brown, medium dense *(continued)*							
	occasional sandy silt lenses	30			6-7-13 N=20			
	31.5 ***Boring Terminated at 31.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-27-2021 | Boring Completed: 08-27-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. B-4

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.057° Longitude: -117.184°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
		FILL - SILTY SAND (SM), trace gravel up to 1", fine to coarse grained, brown, medium dense, with brick debris							
						10-12-12	5	119	28
4.5		**SILTY SAND (SM)**, fine to coarse grained, brown, loose							
		root traces	5			2-3-4	4	120	26
7.0		**CLAYEY SAND (SC)**, trace gravel up to 1.5", fine to medium grained, reddish brown, loose							
						4-7-9	6	113	50
		very dense	10						
						10-18-50/5"	4	138	34
13.0		**POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM)**, gravel greater than 1.5", fine to coarse grained, reddish brown, dense							
			15			15-16-23 N=39			10
18.0		**POORLY GRADED SAND WITH SILT (SP-SM)**, trace gravel up to 1/2", fine to coarse grained, reddish brown, medium dense							
			20			7-11-14 N=25			7
23.0		**POORLY GRADED SAND (SP)**, fine to coarse grained, brown, dense							
		2" gravel lens	25			7-14-17 N=31			6

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-27-2021 | Boring Completed: 08-27-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. B-4

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.057° Longitude: -117.184°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
		POORLY GRADED SAND (SP), fine to coarse grained, brown, dense *(continued)*							
		trace gravel up to 1"	30		X	18-18-14 N=32			9
35.0		**SILTY SAND (SM)**, fine to coarse grained, olive, medium dense	35		X	8-9-12 N=21			24
38.0		**POORLY GRADED SAND (SP)**, fine to medium grained, olive, medium dense							
		occasional silt lenses	40		X	7-10-12 N=22			14
		fine to coarse grained, dense	45		X	9-13-19 N=32			9
48.0		**SILTY SAND (SM)**, trace gravel up to 1", fine to medium grained, olive, medium dense	50		X	8-11-15 N=26			32
51.5		3" sandy silt lens							
		Boring Terminated at 51.5 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-27-2021 | Boring Completed: 08-27-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. B-5

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0569° Longitude: -117.1832°

DEPTH		GRAPHIC LOG	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3	**ASPHALT**, 4"							
0.7	**AGGREGATE BASE COURSE**, 4"							
	FILL - SILTY SAND (SM), trace gravel up to 1.5", fine to coarse grained, olive brown, medium dense							
3.0	**FILL - CLAYEY SAND (SC)**, trace gravel up to 1/4", fine to medium grained, brown, medium dense, with red brick and concrete debris				10-8-15	9	124	
5					8-20-15	12	108	
	concrete debris							
7.5	**BURIED STRUCTURE**, large, textured brick pieces				5-8-5	12		
10								
	Auger contacting with plastic structure, with deteriorated fiber cloth mesh on end of drillstring. No recovery with ring sampler. Void at bottom of hole, no discernable noise when dropping rock down hole.				1-2-3			
11.5	***Auger Refusal at 11.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-26-2021 | Boring Completed: 08-26-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. B-6

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0561° Longitude: -117.1855°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3		**ASPHALT**, 3"							
0.7		**AGGREGATE BASE COURSE**, 5"							
		FILL - SILTY SAND WITH GRAVEL (SM), fine to coarse grained, brown, medium dense				12-24-32	3	119	16
5.0		**SILTY SAND (SM)**, fine to coarse grained, brown, medium dense	5			18-20-16	2	114	19
		loose				5-7-10	2	111	14
		medium dense, with gravel and cobbles	10			8-10-12	1		3
		coarse grained	15			7-8-9 N=17			50
			20			7-13-13 N=26			41
21.5		***Boring Terminated at 21.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-25-2021 | Boring Completed: 08-25-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. B-7

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.056° Longitude: -117.1846°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3		**ASPHALT**, 3"							
0.6		**AGGREGATE BASE COURSE**, 4"							
		FILL - CLAYEY SAND (SC), dark brown, loose				5-8-10	10	111	40
5.0		**SILTY SAND (SM)**, dark brown, medium dense	5			8-13-17	4	114	13
		grayish brown				6-12-11	2	113	3
		medium dense	10			6-7-10	4	110	5
		gray, medium dense	15			9-12-13 N=25			6
		brown	20			6-8-7 N=15			12
21.5		***Boring Terminated at 21.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-25-2021 | Boring Completed: 08-25-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. B-8

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.056° Longitude: -117.1841°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3		**ASPHALT**, 3"							
0.5		**AGGREGATE BASE COURSE**, 3"							
		FILL - SILTY SAND (SM), trace gravel up to 3/4", fine to coarse grained, brown, medium dense, with brick debris				11-17-17	5	122	
4.5		**SILTY SAND (SM)**, trace gravel up to 3/8", fine to coarse grained, brown, loose	5			4-7-7	3	104	
7.0		**POORLY GRADED SAND (SP)**, trace gravel up to 1/2", medium to coarse grained, gray, medium dense				6-10-14	2	107	
			10			10-16-22	2	122	
12.0		**CLAYEY SAND (SC)**, fine to coarse grained, reddish brown, medium dense	15			4-6-7 N=13			
18.0		**LEAN CLAY WITH SAND (CL)**, reddish brown, soft	20			2-2-2 N=4			
21.5		***Boring Terminated at 21.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-25-2021 | Boring Completed: 08-25-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. B-9

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0561° Longitude: -117.183°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3		**ASPHALT**, 4"							
		FILL - SILTY SAND (SM), trace gravel up to 2", fine to coarse grained, olive, medium dense							
		red brick and concrete debris				10-16-14	21	87	7
		no gravel	5			7-16-24	2	89	11
		reddish brown to olive, with 3" gravel				6-13-45	5	132	16
9.5		**SILTY SAND (SM)**, fine to medium grained, reddish brown to brown, medium dense	10			7-10-15	4	112	13
		fine to coarse grained	15			5-7-8 N=15			10
18.0		**POORLY GRADED SAND (SP)**, fine to coarse grained, brown, dense	20			8-12-21 N=33			5
21.5		***Boring Terminated at 21.5 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-27-2021 | Boring Completed: 08-27-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. B-10

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0554° Longitude: -117.1844°

DEPTH	GRAPHIC LOG		WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3		**ASPHALT**, 3"						
		FILL - SILTY SAND (SM), trace gravel up to 1", fine to medium grained, reddish brown, loose						
					4-5-6	5	113	19
4.5		**POORLY GRADED SAND (SP)**, fine to coarse grained, brown to gray, medium dense						
5					5-7-10	1	109	5
					5-7-14	1		4
10					8-8-13	1	108	10
13.0		**SILTY SAND (SM)**, trace gravel up to 1", fine to coarse grained, reddish brown, medium dense						
15					7-9-10 N=19			6
		dense						
20					11-16-16 N=32			12
21.5		***Boring Terminated at 21.5 Feet***						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
6" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-26-2021 | Boring Completed: 08-26-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. P-1

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.057° Longitude: -117.1856°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3		**ASPHALT**, 3"							
		FILL - SILTY SAND WITH GRAVEL (SM), gravel up to 3/8", fine to coarse grained, brown, medium dense	5			11-10-8 N=18			
8.0		**POORLY GRADED SAND WITH SILT (SP-SM)**, fine to coarse grained, brown, dense							
		2" reddish brown silty sand lens	10			5-13-30 N=43			
12.5		**POORLY GRADED SAND WITH GRAVEL (SP)**, gravel up to 1.5", fine to coarse grained, gray, medium dense							17
14.5						8-6-12 N=18			
15.2		**LEAN CLAY (CL)**, reddish brown, very stiff	15						
		Boring Terminated at 15.2 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-25-2021 | Boring Completed: 08-25-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. P-2

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0568° Longitude: -117.1856°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3		**ASPHALT**, 3"							
		FILL - SILTY SAND (SM), trace gravel up to 1.5", fine to coarse grained, brown, medium dense	5			6-7-6 N=13			
8.0		**POORLY GRADED SAND (SP)**, fine to coarse grained, gray, medium dense	10			4-5-7 N=12			
11.0		**SILTY SAND (SM)**, fine to coarse grained, reddish brown, medium dense							24
		trace gravel up to 1.5", dense	15			10-13-24 N=37			
15.2		***Boring Terminated at 15.2 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-25-2021 | Boring Completed: 08-25-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. P-3

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0564° Longitude: -117.1845°

GRAPHIC LOG	DEPTH		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
	0.3	**CONCRETE**, 4"							
	1.5	**FILL - SILTY SAND WITH GRAVEL (SM)**, brown							
		Auger Refusal at 1.5 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Advancement Method:
6" Hand Auger

Abandonment Method:
Boring backfilled with bentonite
Surface capped with concrete

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-27-2021 | Boring Completed: 08-27-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. P-4

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0562° Longitude: -117.1856°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.5		**ASPHALT**, 6"							
		FILL - SILTY SAND (SM), trace gravel up to 1.5", fine to coarse grained, brown, loose							
6.0		**SILTY SAND (SM)**, fine to medium grained, reddish brown, loose	5			3-3-5 N=8			
7.5		**POORLY GRADED SAND (SP)**, trace gravel up to 3/4", fine to coarse grained, gray, medium dense				5-9-13 N=22			13
10.2		***Boring Terminated at 10.2 Feet***	10						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-25-2021 | Boring Completed: 08-25-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. P-5

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0559° Longitude: -117.1855°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3		**ASPHALT**, 4"							
		FILL - SILTY SAND (SM), trace gravel, fine to coarse grained, brown, medium dense, with brick debris	5			6-7-11 N=18			
8.0		**SILTY SAND (SM)**, trace gravel up to 1.5", fine to coarse grained, brown, medium dense	10			3-3-6 N=9			
12.0		**POORLY GRADED SAND (SP)**, trace gravel up to 3/4", fine to coarse grained, brownish gray, medium dense							13
15.2		***Boring Terminated at 15.2 Feet***	15			5-5-7 N=12			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

Boring Started: 08-25-2021 | Boring Completed: 08-25-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

BORING LOG NO. P-6

PROJECT: State Street Village

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

LOCATION See Exploration Plan

Latitude: 34.0554° Longitude: -117.1852°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	PERCENT FINES
0.3		**ASPHALT**, 3"							
		FILL - SILTY SAND (SM), trace gravel up to 1.5", fine to coarse grained, brown							
3.0		**SILTY SAND (SM)**, trace gravel up to 1", fine to coarse grained, brown, medium dense	5			7-11-8 N=19			
7.0		**POORLY GRADED SAND WITH GRAVEL (SP)**, gravel up to 1.5", fine to coarse grained, gray, medium dense				5-5-12 N=17			19
10.2		***Boring Terminated at 10.2 Feet***	10						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
8" Hollow Stem Auger

Abandonment Method:
Boring backfilled with Auger Cuttings
Surface capped with asphalt

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

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

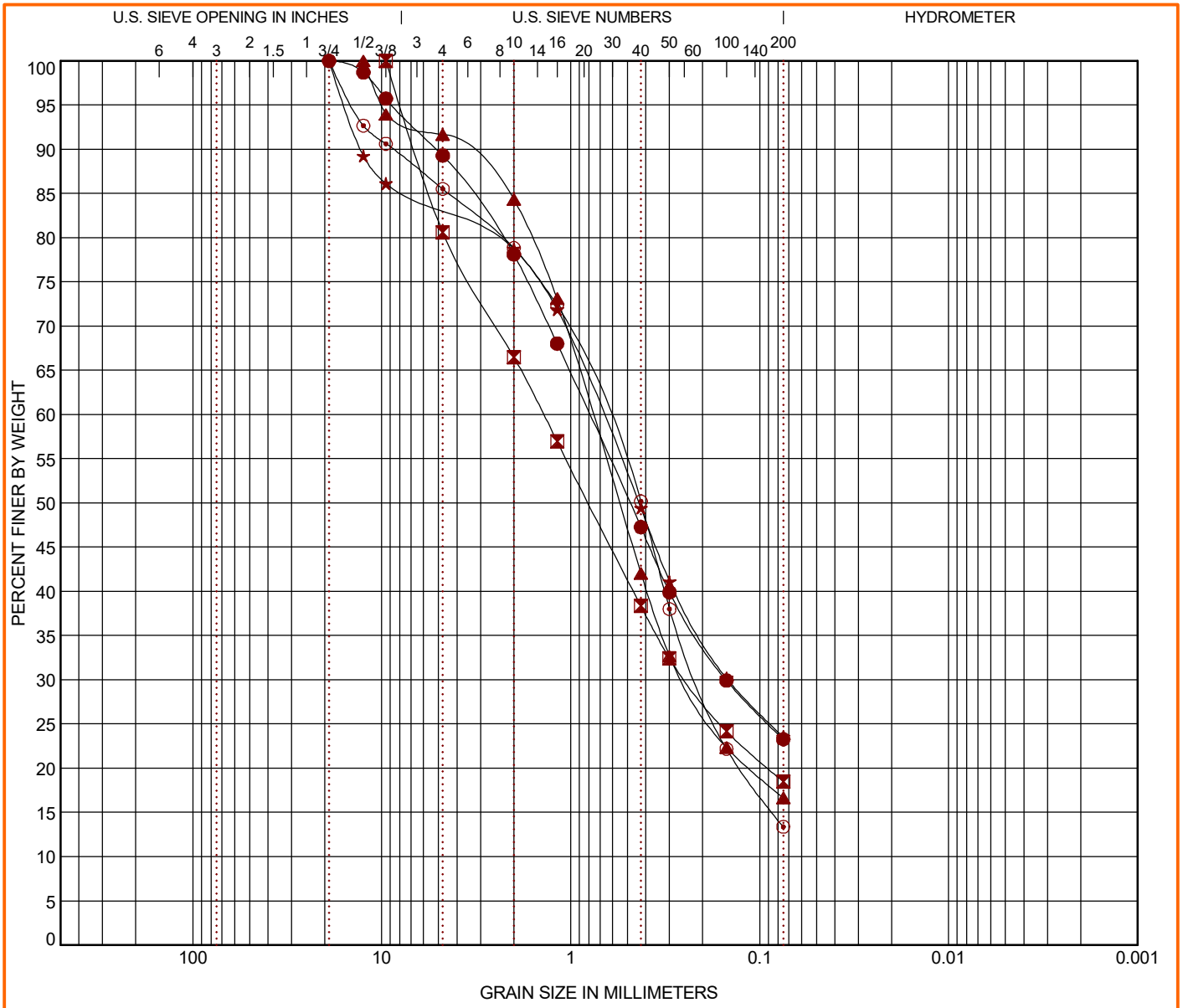
Boring Started: 08-26-2021 | Boring Completed: 08-26-2021

Drill Rig: B-61 | Driller: California Pacific Drilling

Project No.: CB215095

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	B-1	0 - 5	Silty Sand (SM)						
⊠	B-3	0 - 5	Silty Sand (SM)						
▲	P-1	10.1 - 15	Poorly Graded Sand with Gravel (SP)						
★	P-2	10.1 - 15	Silty Sand (SM)						
⊙	P-4	5.1 - 10	Silty Sand (SM)						

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	B-1	0 - 5	19	0.795	0.151		0.0	10.7	66.0		23.3	
⊠	B-3	0 - 5	9.5	1.396	0.245		0.0	19.4	62.1		18.5	
▲	P-1	10.1 - 15	12.5	0.767	0.251		0.0	8.3	75.0		16.7	
★	P-2	10.1 - 15	19	0.687	0.147		0.0	17.2	59.3		23.6	
⊙	P-4	5.1 - 10	19	0.668	0.211		0.0	14.5	72.1		13.4	

PROJECT: State Street Village

PROJECT NUMBER: CB215095

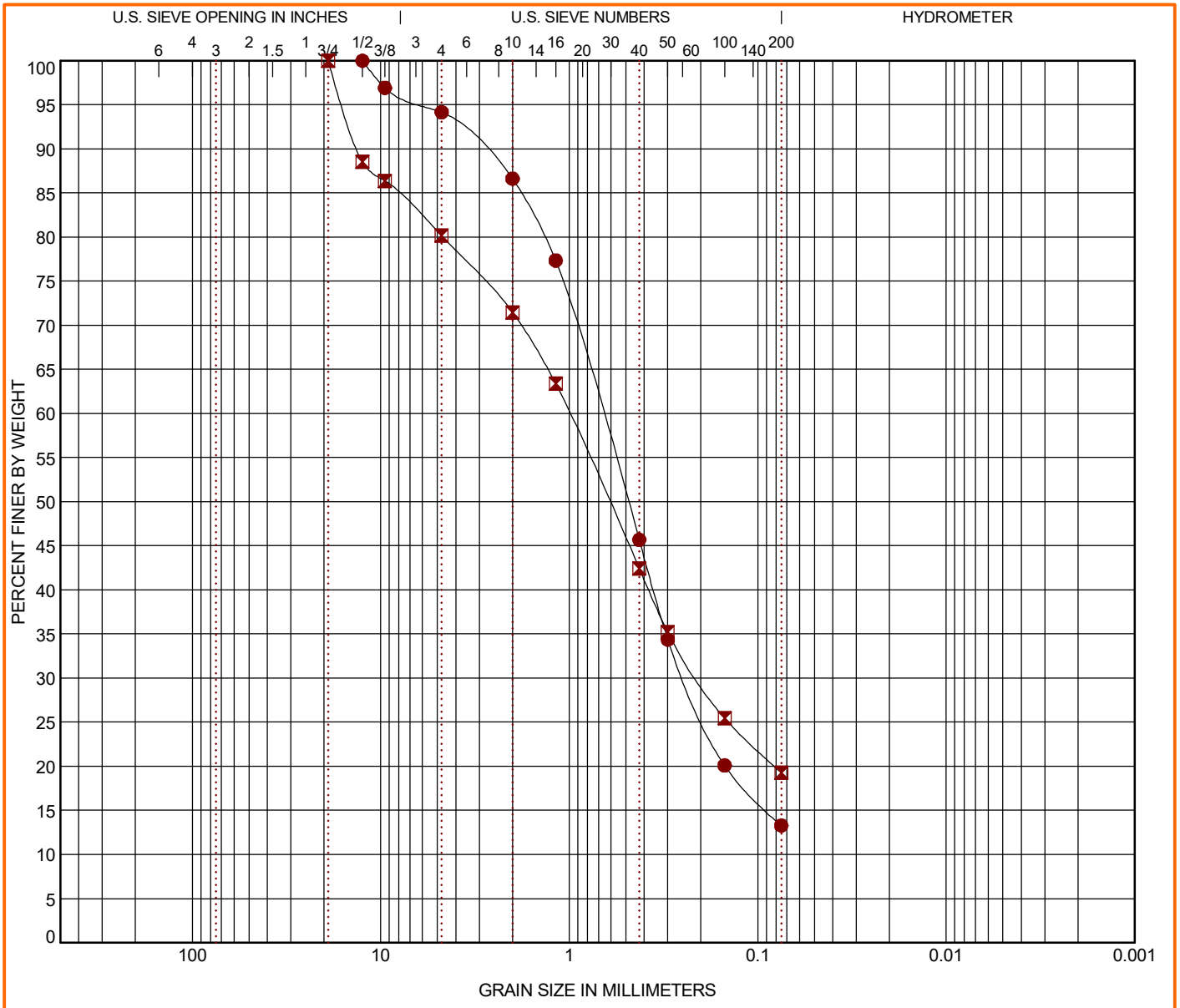
SITE: (Redevelopment of Redlands Mall)
Redlands, CA

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	P-5	10.1 - 15	Silty Sand (SM)						
⊠	P-6	5.1 - 10	Silty Sand (SM)						

Boring ID		Depth	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	P-5	10.1 - 15	12.5	0.674	0.243		0.0	5.8	80.9		13.3	
⊠	P-6	5.1 - 10	19	1.001	0.207		0.0	19.8	60.9		19.3	

PROJECT: State Street Village

PROJECT NUMBER: CB215095

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

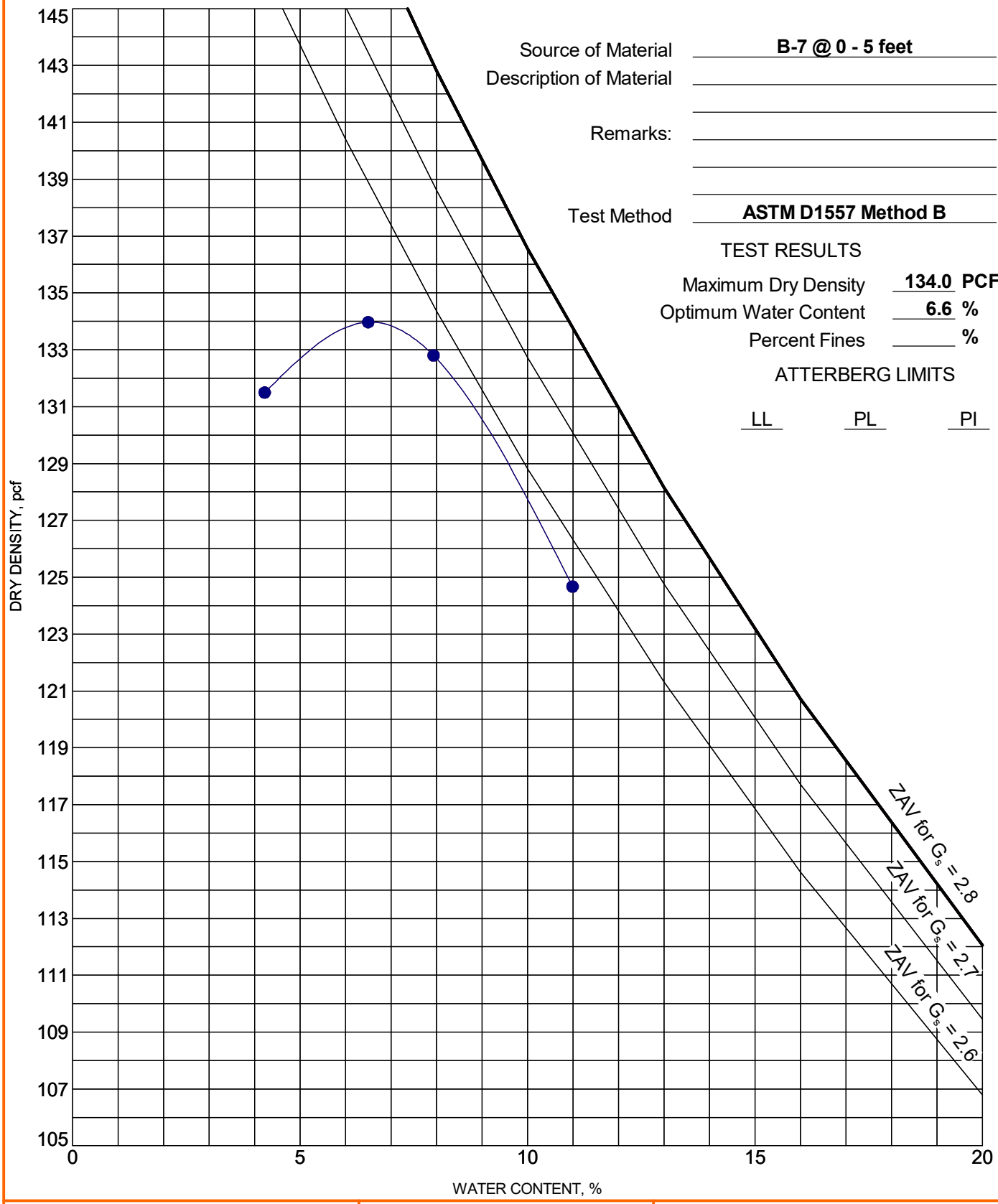
Terracon
1355 E Cooley Dr, Ste C
Colton, CA

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 CB215095 STATE STREET VILL.GPJ TERRACON_DATATEMPLATE.GDT 9/27/21

MOISTURE-DENSITY RELATIONSHIP

ASTM D698/D1557



Source of Material: **B-7 @ 0 - 5 feet**

Description of Material:

Remarks:

Test Method: **ASTM D1557 Method B**

TEST RESULTS

Maximum Dry Density	**134.0**	**PCF**
Optimum Water Content	**6.6**	**%**
Percent Fines		**%**

ATTERBERG LIMITS

LL	PL	PI

PROJECT: State Street Village

PROJECT NUMBER: CB215095

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

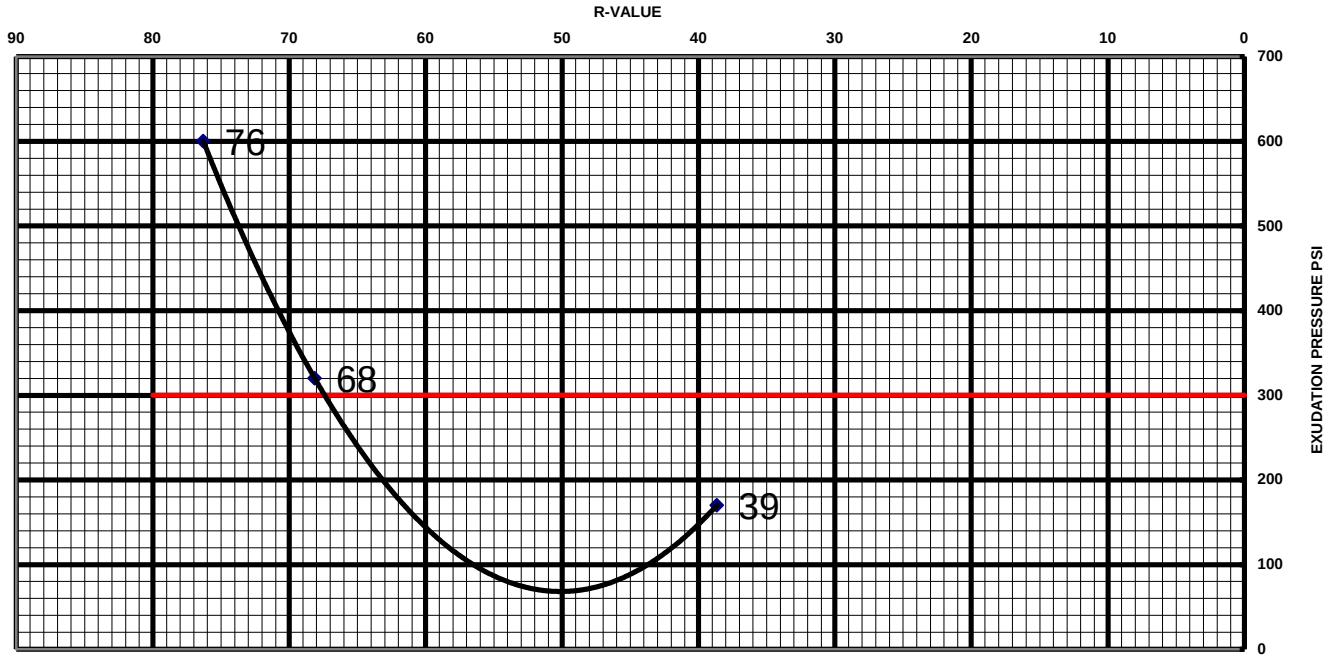
Job No. CB215095
Date. 9/9/2021

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

CLIENT: **Village Partners Ventures, LLC**
PROJECT **State Street Village**
LOCATION: **Redlands, CA**
R-VALUE # : **B-1 (0 to 5')**
T.I. :

	A	B	C	D
COMPACTOR AIR PRESSURE P.S.I.	350	350	350	
INITIAL MOISTURE %	6.0	6.0	6.0	
WATER ADDED, ML	40	30	20	
WATER ADDED %	3.5	2.7	1.8	
MOISTURE AT COMPACTION %	9.5	8.7	7.8	
HEIGHT OF BRIQUETTE	2.48	2.45	2.51	
WET WEIGHT OF BRIQUETTE	1197	1179	1200	
DENSITY LB. PER CU.FT.	133.5	134.1	134.4	
STABILOMETER PH AT 1000 LBS.	34	22	14	
2000 LBS.	70	33	24	
DISPLACEMENT	5.10	4.50	4.40	
R-VALUE	39	68	76	
EXUDATION PRESSURE	170	320	600	
THICK. INDICATED BY STAB.	0.00	0.00	0.00	
EXPANSION PRESSURE	2	8	30	
THICK. INDICATED BY E.P.	0.07	0.27	1.00	

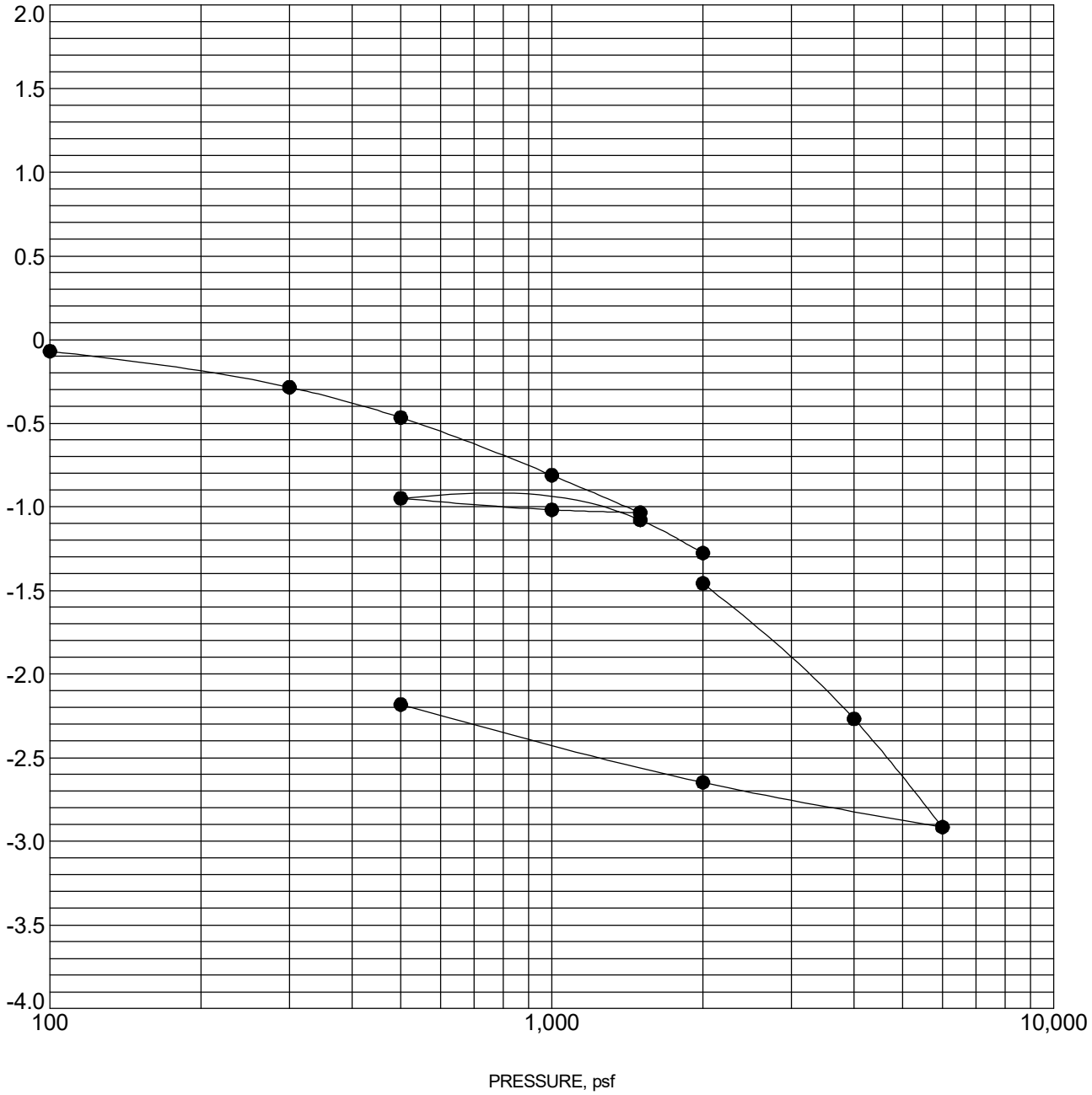
EXUDATION CHART



R-Value: **67**

SWELL CONSOLIDATION TEST

ASTM D2435



Specimen Identification			Classification	γ_d, pcf	WC, %
●	B-3	7.5 - 9 ft	Silty Sand (SM)		

NOTES: sample was saturated at surcharge pressure of 2,000 psf

PROJECT: State Street Village

SITE: (Redevelopment of Redlands Mall)
Redlands, CA

Terracon
1355 E Cooley Dr, Ste C
Colton, CA

PROJECT NUMBER: CB215095

CLIENT: Village Partners Ventures LLC
Newport Beach, CA

750 Pilot Road, Suite F
Las Vegas, Nevada 89119
(702) 597-9393

Client
Village Partners Ventures LLC
Newport Beach, CA

Project
State Street Village

Sample Submitted By: Terracon (CB) **Date Received:** 9/9/2021 **Lab No.: 21-0685**

Results of Corrosion Analysis

Sample Number	6-A
Sample Location	B-6
Sample Depth (ft.)	0.0-5.0
pH Analysis, ASTM G 51	8.46
Water Soluble Sulfate (SO4), ASTM C 1580 (mg/kg)	50
Chlorides, ASTM D 512, (mg/kg)	37
Total Salts, AWWA 2540, (mg/kg)	417
As-Received Resistivity, ASTM G 57, (ohm-cm)	12125
Saturated Minimum Resistivity, ASTM G 57, (ohm-cm)	6790

Analyzed By: Trisha Campo
Chemist

CB215095

PERCOLATION TEST DATA

BORING NUMBER: P-1
LOT No: N/A
TRACT No: N/A

CLIENT: Redlands Mall Redevelopment
PROJECT: Village Partners Ventures LLC

DATE OF DRILLING: August 25, 2021
DATE OF TESTING: August 26, 2021
DRILLED BY: SP
TESTED BY: GA

DEPTH BEFORE (ft.): 14.8
DEPTH AFTER (ft.): 14.8
PVC PIPE DIA. (in.): 3.0
PERC HOLE DIA. (in.): 8.0

Time Interval (min.)	Total Elapsed Time (min.)	Initial Water Level (ft.)	Final Water Level (ft.)	Change in Water Level (ft.)	Initial Hole Depth (ft.)	Final Hole Depth (ft.)	Percolation Rate (in/hr)	Infiltration rate (Porchet Method) (in/hr)
30	30	10	14.80	4.80	14.8	14.8	115.20	7.48
30	60	10	14.80	4.80	14.8	14.8	115.20	7.48
10	70	10	13.19	3.19	14.8	14.8	229.68	11.35
10	80	10	12.87	2.87	14.8	14.8	206.64	9.75
10	90	10	13.08	3.08	14.8	14.8	221.76	10.79
10	100	10	13.21	3.21	14.8	14.8	231.12	11.46
10	110	10	13.31	3.31	14.8	14.8	238.32	11.99
10	120	10	13.29	3.29	14.8	14.8	236.88	11.89
				Average of last 3 readings:			235.44	11.78

CB215095

PERCOLATION TEST DATA

BORING NUMBER: P-2
LOT No: N/A
TRACT No: N/A

CLIENT: Redlands Mall Redevelopment
PROJECT: Village Partners Ventures LLC

DATE OF DRILLING: August 25, 2021
DATE OF TESTING: August 26, 2021
DRILLED BY: SP
TESTED BY: GA

DEPTH BEFORE (ft.): 14.8
DEPTH AFTER (ft.): 14.8
PVC PIPE DIA. (in.): 3.0
PERC HOLE DIA. (in.): 8.0

Time Interval (min.)	Total Elapsed Time (min.)	Initial Water Level (ft.)	Final Water Level (ft.)	Change in Water Level (ft.)	Initial Hole Depth (ft.)	Final Hole Depth (ft.)	Percolation Rate (in/hr)	Infiltration rate (Porchet Method) (in/hr)
30	30	10	13.29	3.29	14.8	14.8	78.96	3.96
30	60	10	13.23	3.23	14.8	14.8	77.52	3.85
10	70	10	10.79	0.79	14.8	14.8	56.88	2.07
10	80	10	10.81	0.81	14.8	14.8	58.32	2.13
10	90	10	10.75	0.75	14.8	14.8	54.00	1.96
10	100	10	10.77	0.77	14.8	14.8	55.44	2.02
10	110	10	10.75	0.75	14.8	14.8	54.00	1.96
10	120	10	10.77	0.77	14.8	14.8	55.44	2.02
				Average of last 3 readings:			54.96	2.00

CB215095

PERCOLATION TEST DATA

BORING NUMBER: P-4
LOT No: N/A
TRACT No: N/A

CLIENT: Redlands Mall Redevelopment
PROJECT: Village Partners Ventures LLC

DATE OF DRILLING: August 25, 2021
DATE OF TESTING: August 26, 2021
DRILLED BY: SP
TESTED BY: GA

DEPTH BEFORE (ft.): 9.4
DEPTH AFTER (ft.): 9.4
PVC PIPE DIA. (in.): 3.0
PERC HOLE DIA. (in.): 8.0

Time Interval (min.)	Total Elapsed Time (min.)	Initial Water Level (ft.)	Final Water Level (ft.)	Change in Water Level (ft.)	Initial Hole Depth (ft.)	Final Hole Depth (ft.)	Percolation Rate (in/hr)	Infiltration rate (Porchet Method) (in/hr)
30	30	5	9.4	4.40	9.4	9.4	105.60	7.44
30	60	5	9.4	4.40	9.4	9.4	105.60	7.44
10	70	5	9.4	4.40	9.4	9.4	316.80	22.31
10	80	5	9.4	4.40	9.4	9.4	316.80	22.31
10	90	5	9.4	4.40	9.4	9.4	316.80	22.31
10	100	5	9.4	4.40	9.4	9.4	316.80	22.31
10	110	5	9.4	4.40	9.4	9.4	316.80	22.31
10	120	5	9.4	4.40	9.4	9.4	316.80	22.31
				Average of last 3 readings:			316.80	22.31

CB215095

PERCOLATION TEST DATA

BORING NUMBER: P-5
LOT No: N/A
TRACT No: N/A

CLIENT: Redlands Mall Redevelopment
PROJECT: Village Partners Ventures LLC

DATE OF DRILLING: August 25, 2021
DATE OF TESTING: August 26, 2021
DRILLED BY: SP
TESTED BY: GA

DEPTH BEFORE (ft.): 15.0
DEPTH AFTER (ft.): 15.0
PVC PIPE DIA. (in.): 3.0
PERC HOLE DIA. (in.): 8.0

Time Interval (min.)	Total Elapsed Time (min.)	Initial Water Level (ft.)	Final Water Level (ft.)	Change in Water Level (ft.)	Initial Hole Depth (ft.)	Final Hole Depth (ft.)	Percolation Rate (in/hr)	Infiltration rate (Porchet Method) (in/hr)
30	30	10	15.00	5.00	15.0	15.0	120.00	7.50
30	60	10	15.00	5.00	15.0	15.0	120.00	7.50
10	70	10	14.79	4.79	15.0	15.0	344.88	20.74
10	80	10	14.73	4.73	15.0	15.0	340.56	20.26
10	90	10	14.68	4.68	15.0	15.0	336.96	19.87
10	100	10	14.62	4.62	15.0	15.0	332.64	19.41
10	110	10	14.56	4.56	15.0	15.0	328.32	18.96
10	120	10	14.52	4.52	15.0	15.0	325.44	18.66
				Average of last 3 readings:			328.80	19.01

CB215095

PERCOLATION TEST DATA

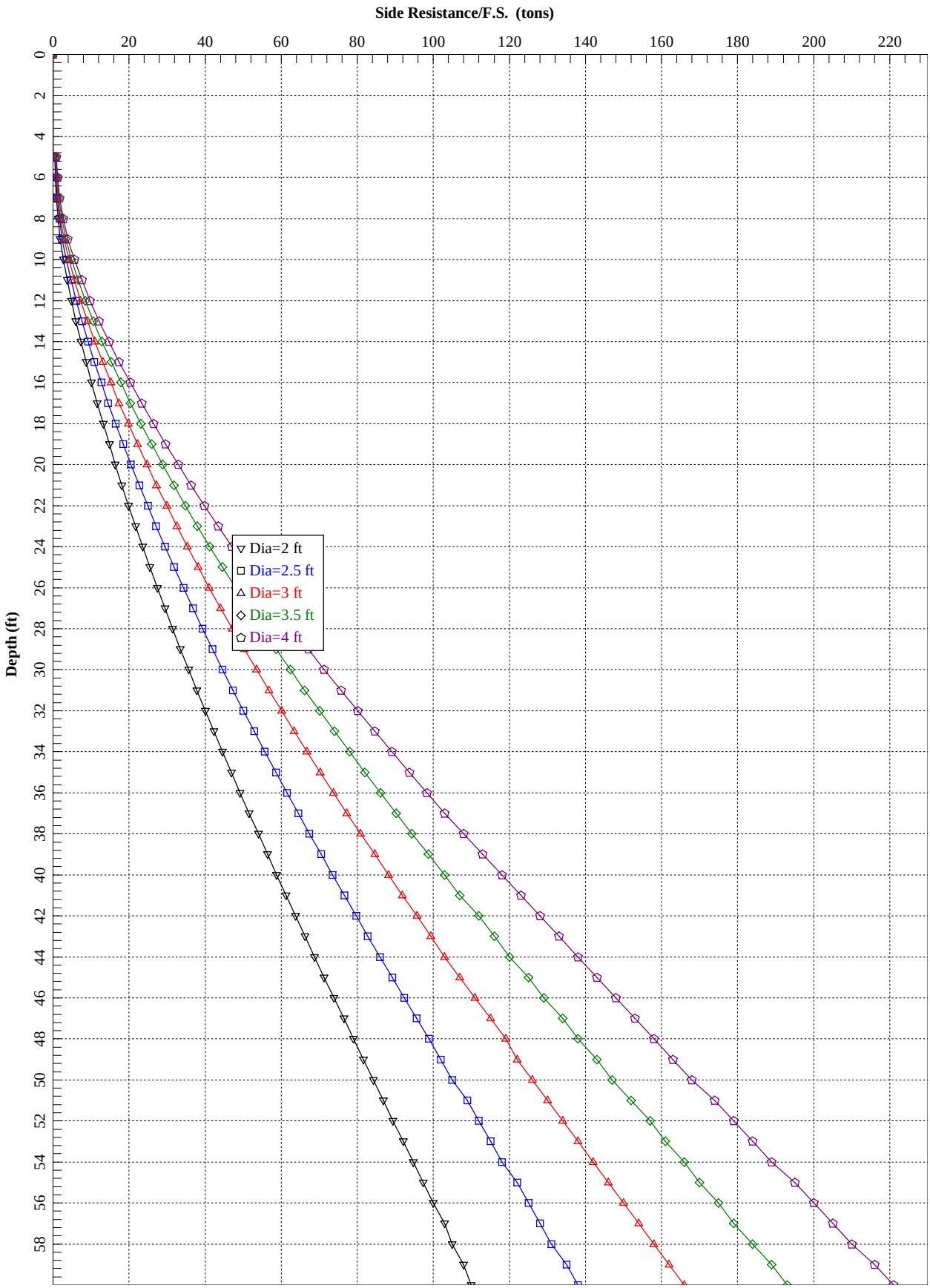
BORING NUMBER: P-6
LOT No: N/A
TRACT No: N/A

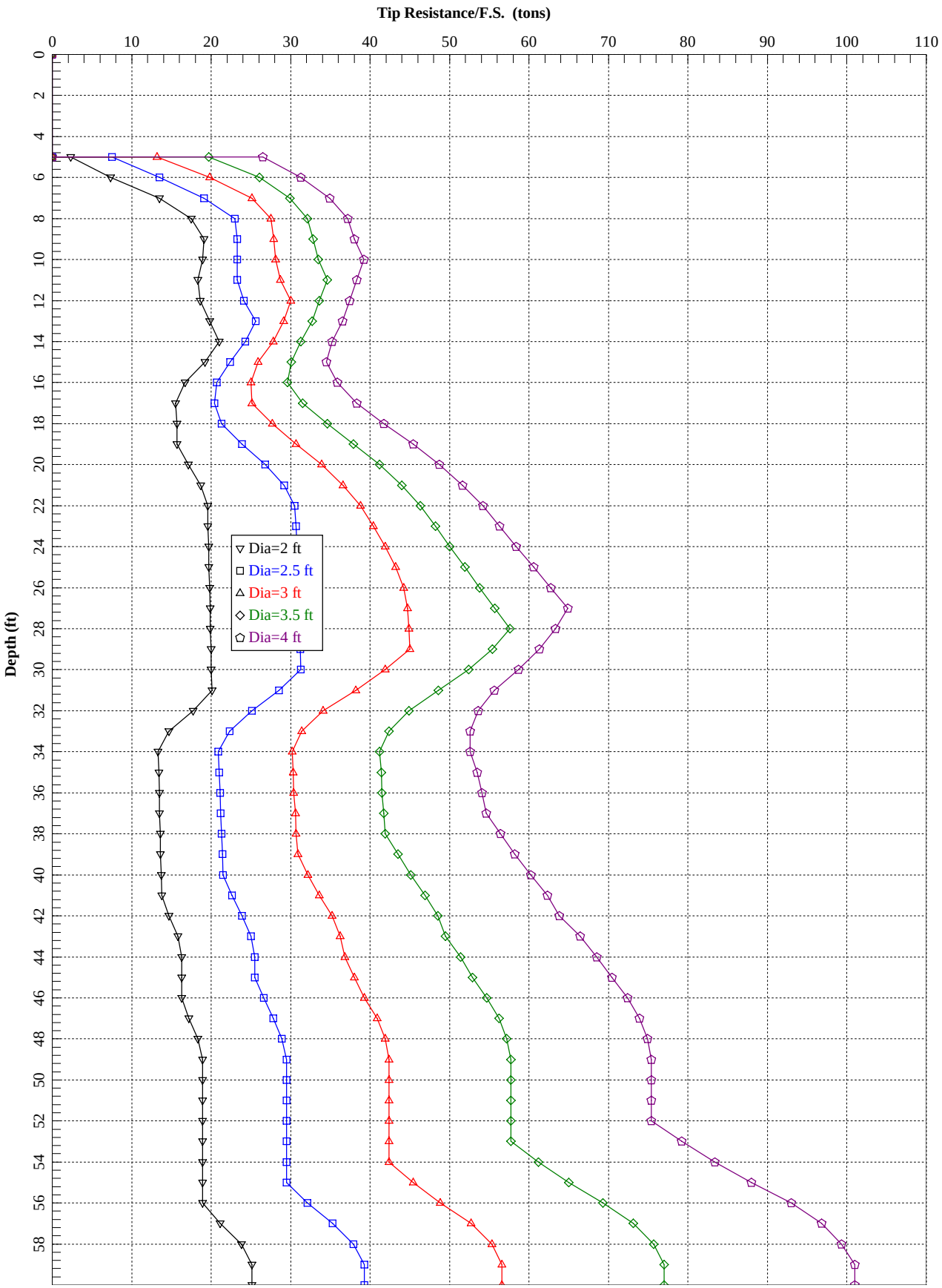
CLIENT: Redlands Mall Redevelopment
PROJECT: Village Partners Ventures LLC

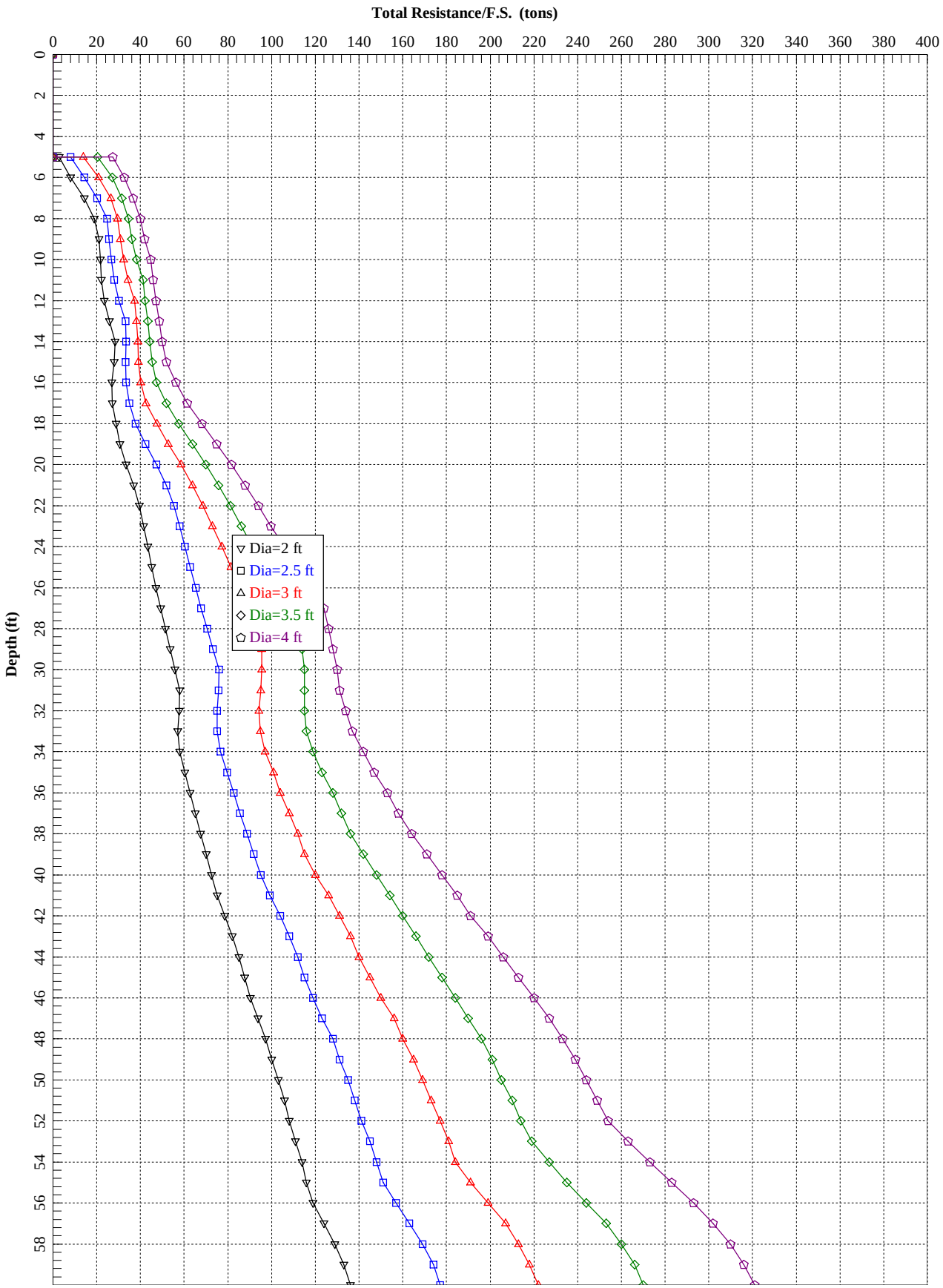
DATE OF DRILLING: August 26, 2021
DATE OF TESTING: August 27, 2021
DRILLED BY: SP
TESTED BY: GA

DEPTH BEFORE (ft.): 10.0
DEPTH AFTER (ft.): 9.9
PVC PIPE DIA. (in.): 3.0
PERC HOLE DIA. (in.): 8.0
% VOID (Rock Backfill): 0.50
GRAVEL PACKING 0.57

Time Interval (min.)	Total Elapsed Time (min.)	Initial Water Level (ft.)	Final Water Level (ft.)	Change in Water Level (ft.)	Initial Hole Depth (ft.)	Final Hole Depth (ft.)	Percolation Rate (in/hr)	Infiltration rate (Porchet Method) (in/hr)
30	30	5	9.90	4.90	10.0	9.9	117.60	7.21
30	60	5	9.54	4.54	9.9	9.9	108.96	6.49
10	70	5	7.33	2.33	9.9	9.9	167.76	7.17
10	80	5	7.21	2.21	9.9	9.9	159.12	6.69
10	90	5	7.15	2.15	9.9	9.9	154.80	6.46
10	100	5	7.12	2.12	9.9	9.9	152.64	6.35
10	110	5	7.04	2.04	9.9	9.9	146.88	6.05
10	120	5	7.10	2.10	9.9	9.9	151.20	6.27
				Average of last 3 readings:			150.24	6.22


Side Resistance/F.S. (tons)
0
20
40
60
80
100
120
140
160
180
200
220
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
Dia=2 ft
Dia=2.5 ft
Dia=3 ft
Dia=3.5 ft
Dia=4 ft


Tip Resistance/F.S. (tons)
0
10
20
30
40
50
60
70
80
90
100
110
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
Dia=2 ft
Dia=2.5 ft
Dia=3 ft
Dia=3.5 ft
Dia=4 ft


Total Resistance/F.S. (tons)
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
Depth (ft)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
Dia=2 ft
Dia=2.5 ft
Dia=3 ft
Dia=3.5 ft
Dia=4 ft

SUPPORTING INFORMATION

Contents:

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS
State Street Village ■ Redlands, CA
Terracon Project No. CB215095

Terracon GeoReport

SAMPLING

- Auger Cuttings
- Modified California Ring Sampler
- Standard Penetration Test

WATER LEVEL

- **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 variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

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			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (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 SOIL BORING LOG

The soil boring logs contained within this document are intended for application to the project as described in this document. Use of these soil boring logs for any other purpose may not be appropriate.

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]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [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]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [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 on or above "A"		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - 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:	Liquid limit - oven dried / Liquid limit - 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] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[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.