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Terracon.com

Santa Fe Greenway Project: San Ysidro Crossing to Siler Road

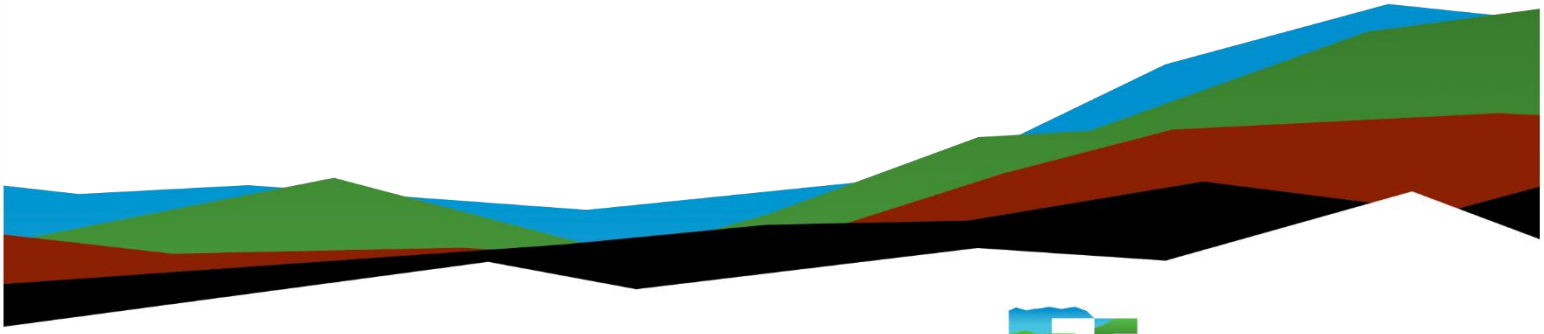
Geotechnical Engineering Services

Final Foundation Report

May 4, 2023 | Terracon Project No. 66215115

Prepared for:

AECOM
6501 Americas Parkway NE, Suite 900
Albuquerque, New Mexico 87110



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May 4, 2023

AECOM
6501 Americas Parkway NE, Suite 900
Albuquerque, New Mexico 87110

Attn: Mr. Richard Rotto, PE
P: (505) 470-4951
E: Richard.Rotto@aecom.com

Re: Geotechnical Engineering Services
Final Foundation Report
Santa Fe Greenway Project: San Ysidro Crossing to Siler Road
Santa Fe, New Mexico
Terracon Project No. 66215115

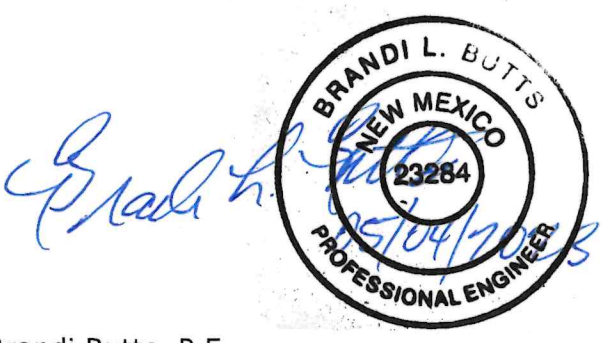
Dear Mr. Rotto:

We have completed the scope of the Geotechnical Engineering services for the above-referenced project in general accordance with Terracon Proposal No. P66215115 dated June 7, 2021. This geotechnical engineering report presents the results of the field exploration, laboratory testing and provides final geotechnical recommendations concerning the design and construction of the proposed bridge.

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



Stenson Lee
Staff Engineer

Brandi Butts, P.E.
Senior Engineer

Table of Contents

Appendices

Executive Summary

A geotechnical investigation has been performed for the Santa Fe Greenway Project in Santa Fe, New Mexico. Terracon completed two borings a depth of approximately 61.5 feet below the existing ground surface at the approximate locations of Abutments 1 and 2.

Based on the information obtained from our subsurface exploration, the site can be developed for the proposed project. The following geotechnical considerations were identified:

- The subsurface conditions encountered at the bridge abutments consisted of the following:
  - Sands with varying amounts gravel, silt, and clay (loose to very dense)
  - Clay soils with variable amounts sand (stiff to hard)
  - Groundwater was not encountered at the time of drilling
- Hard and very dense soils were encountered in Borings B-01 and B-02 at an approximate depth of 20 feet below ground surface and extend to the total explored depth of 61.5 feet. These soils may require additional effort or heavy-duty excavation equipment.
- Bridge structure may be supported on drilled shaft foundations extending into dense to very dense sand soils at the minimum lengths presented in this report.
- Depending upon the depth of construction and current flow conditions within the Santa Fe River, casing, drilling slurry and/or dewatering may be required during construction. A qualified contractor with experience in drilled shaft construction in "wet" or caving soil conditions should review the information contained herein and determine what installation methods will be required.
- Shallow excavations into the on-site soils are expected to be accomplished with conventional earthwork equipment.
- For structural designs based upon AASHTO 2020 LRFD Bridge Design Specifications, a Site Class C and Zone 1 should be used for the project site. Per 2020 AASHTO LRFD Bridge Design Specifications, seismic analysis is not required for single-span bridges, regardless of the seismic zone.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **General Comments** should be read for an understanding of the report's limitations.

Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the Greenway Project in Santa Fe, New Mexico. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface conditions
- Groundwater conditions
- Seismic Site Class per AASHTO
- Site preparation and earthwork
- Deep foundation design and construction

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

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

Project Description

Item	Description
Structures	Pedestrian bridge crossing at San Ysidro Crossing
No. of bridge spans	One (1)
Bridge construction	Prefabricated steel truss bridge, supporting a 6-inch-thick concrete deck with a single span, approximately 163 feet in length (back-to-back of backwall), supported on two abutments located outside of the Santa Fe River channel. Abutments will be supported on a single row of 42-inch drilled shafts spaced at about 12 feet (center-to-center). Each abutment will consist of a two-shaft configuration.
Final Maximum loads[1] (per shaft)	▪ Service I: 248 kips ▪ Strength I: 294 kips
Scour depths (ft) (500-Year Event)	▪ Abutments: 6 feet
Foundation maximum allowable settlement	Less than ½ inch (assumed)
Lateral Loads and Analysis	To be provided and performed by AECOM
Grading	At or near existing roadway alignment
Cut and fill slopes	Not applicable
Free-standing retaining walls	Not Applicable
Below-grade areas	None

1. Factored loads provided by AECOM

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

Site Conditions

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

Item	Description
Location	Santa Fe River between San Ysidro Crossing and Siler Road in Santa Fe, New Mexico.
Existing improvements	Undeveloped parcels located along proposed project alignment and improvements
Current ground cover	Soil, trees, and vegetation
Existing topography	Flat to gently sloping down to the west and southwest

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** and the GeoModel can be found in the **Figures** attachment of this report.

Geotechnical Characterization

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	**Loose to Very Dense Coarse Grained Soils**	Sand soils with variable amounts of gravel, silt, and clay.
2	**Stiff to Hard Fine Grained Soils**	Clay soils with variable amounts of sand.

The borings were advanced in the dry using an air rotary drilling technique that allow short term groundwater observations to be made while drilling. Groundwater seepage was not encountered within the maximum drilling depth at the time of our field exploration.

Groundwater conditions may be different at the time of construction. It should be recognized that fluctuations of the groundwater conditions will occur due to seasonal and

longer-term variations associated with flows of the Santa Fe River, amount of precipitation and runoff, future construction, and other factors not evident at the time the borings were drilled. Long-term groundwater monitoring was outside the scope of services for this project. These observations represent groundwater conditions at the time of the field exploration and may not be indicative of other times or other locations.

Geotechnical Considerations

Based on the results of our exploration, it is our opinion that the site is suitable for the proposed construction, provided the recommendations presented in this report are followed. The proposed bridge structure may be supported on drilled shaft foundations. Drilled shafts will need to extend into dense to very dense sand soils to develop resistance to resist foundation loads.

Hard and very dense soils were encountered in Borings B-01 and B-02 at an approximate depth of 20 feet below ground surface and extend to the total explored depth of 61.5 feet. These soils may require additional effort or heavy-duty excavation equipment. Shallow excavations into the on-site soils are expected to be accomplished with conventional earthwork equipment.

Depending upon the depth of construction and current flow conditions within the Santa Fe River, casing, drilling slurry, and/or dewatering may be required during construction. A qualified contractor with experience in drilled shaft construction in wet/caving soil conditions should review the information contained herein and determine what installation methods will be required.

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 (which are presented in Appendices A and B), engineering analyses, and our current understanding of the proposed project. The **General Comments** section provides an understanding of the report's limitations.

Earthwork

The following presents recommendations for site preparation, excavation, subgrade preparation and placement of structural backfill on the project. The recommendations presented for design and construction of earth supported elements are contingent upon following the recommendations outlined in this section. The earthwork should be performed in accordance with the 2019 New Mexico Department of Transportation

(NMDOT) Standard Specifications for Highway and Bridge Construction, referred here after as the Specifications.

Site Preparation

Clearing and grubbing should be in accordance with Section 201 of the Specifications.

Subgrade

Subgrade preparation should be in accordance with Section 207 of the Specifications.

Excavation, Borrow, and Embankment

Excavation, borrow, and embankment (if required) should be in accordance with Section 203 of the Specifications. Compaction criteria specified in Section 203 of the Specifications should be implemented during construction.

Grading and Drainage

Positive drainage should be provided during construction and maintained throughout the life of the proposed project. Infiltration of water into the subgrade soils and utility excavations (if applicable) must be prevented during construction, and drainage must be maintained throughout the life of the proposed project. Backfill in utility trenches should be well compacted to reduce the possibility of moisture infiltration.

Earthwork Construction Considerations

Shallow excavations into the on-site soils are expected to be accomplished with conventional earthwork equipment. Depending upon the depth of construction and current flow conditions within the Santa Fe River, casing, drilling slurry, and/or dewatering may be required during construction. A qualified contractor with experience in drilled shaft construction under wet/caving soil conditions should review the information contained herein and determine what installation methods will be required.

The individual contractor(s) should be responsible for designing and constructing stable, temporary excavations as required to maintain the stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local and federal regulations, including current OSHA excavation and trench safety standards. As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, "Excavations" and its appendices and in accordance with any applicable local and/or state regulations.

As a safety measure, it is recommended that all vehicles and soil piles be kept to a minimum lateral distance from the crest of the slope equal to no less than the slope height. The exposed slope face should be protected against the elements.

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

Drilled Shaft Foundations

Drilled shaft foundations have been analyzed for support of the proposed bridge structure based upon the borings at the site.

Drilled Shaft Design Parameters

Drilled shaft axial analysis was performed by Terracon based on procedures outlined in FHWA Drilled Shafts: Construction Procedures and LRFD Design Methods, Publication No. NHI-10-016, and AASHTO LRFD 2020 and considering skin friction only.

Calculations for axial resistance for the Strength Limit State considered the 500-year scour design depth of six feet at the abutments.

AASHTO LRFD resistance factors used in design are summarized in the following table.

Soil	Resistance Factors					
	Strength Limit[1]			Extreme Limit[2]		Service Limit
	Tip	Shaft	Uplift	Compression	Uplift	
Granular	N/A	0.55	0.45	1.0	0.8	1.0
Fine-Grained	N/A	0.45	0.35			

1. AASHTO LRFD 2020, Table 10.5.5.2.4-1.
2. AASHTO LRFD 2020, Section 10.5.5.3.3.

Shafts should be terminated at or below elevations corresponding to the estimated tip embedment indicated below. The following table summarizes drilled shafts resistances excluding base/tip resistance:

Loc./ Diam., (inches)	Quantity	Top of Shaft Elevation,[1] (feet)	Est. Tip Elev.,[1] (feet)	Est. Shaft Length,[1] (feet)	Factored Load/Shaft (Strength 1) (kips)	Factored Resistance/ Shaft (kips)
Abut. 1/42″	2	6635.65	6,590.65	45	294	316
Abut. 2 /42″	2	6,631.30	6,586.30	45	294	316

1. Based upon top of shaft elevations of 6,635.65 and 6,631.30 feet for Abutments 1 and 2, respectively.
2. The contribution of soil resistance within the upper 6 feet should be neglected in computations of vertical and lateral resistance to account for scour depth. A nominal unit weight of 100 pcf may be assigned to the soils in the top 6 feet of each profile for the purposes of the foundation design.

Drilled Shaft Group Effects — Axial Resistance

Shaft groups may experience a reduction in compressive axial resistance, depending upon configuration of the group. Axial reduction factors are summarized below for a single row of shafts with the given center-to-center spacing.

Shaft Group Configuration	Shaft Center-to-Center Spacing	Reduction Factor for Group Effects, η
Single Row	2*D*	0.90
	3*D* or more	1.0

1. Shaft group cap not present or not in contact with ground.
2. *D*: Diameter of the shaft.

For intermediate spacings, the value of η may be determined by linear interpolation. Spacing closer than 2*D* is not recommended without additional geotechnical consultation due to the potential for the installation of a new shaft to disturb an adjacent installed shaft, likely resulting in axial capacity reduction.

The nominal uplift resistance of shaft groups shall be taken as the minimum of the sum of individual shaft resistances or the uplift resistance of the shaft group considered as a block. The shaft group blocks should be determined as per AASHTO LRFD Section 10.7.3.11 and considering the soils as cohesive. Uplift resistance factors should be applied as presented in **Drilled Shaft Design Parameters**.

Drilled Shaft Lateral Resistance

Lateral resistance analyses was performed by AECOM and was completed considering the effects of scour (Strength Limit State) and extending the shaft to the minimum tip elevation length to verify fixity. Recommended lateral analysis design parameters for the bridge are provided below.

Recommended LPILE Parameters for Abutment 1

Stratigraphy[1]		L-Pile Soil Model	S_u (psf)[3]	ϕ[3]	γ' (pcf)[3]	ε_{50}[3]	k (pci) Static
Depth[1]	Material						
0-6[2]	IGNORE	---	---	---	---	---	---
6-14	Sand	Sand (Reese)	---	34°	115	---	90
14-23	Sand	Sand (Reese)	---	36°	125	---	225
23-33	Sand	Sand (Reese)	---	36°	125	---	225
33-43	Sand	Sand (Reese)	---	36°	125	---	225
43-61.5	Sand	Sand (Reece)	---	36°	125	---	225

1. Based upon top of shaft elevation of 6,635.65 feet
2. The contribution of soil resistance within the upper 6 feet should be neglected in computations of vertical and lateral resistance to account for scour depth. A nominal unit weight of 100 pcf may be assigned to the soils in the top 6 feet of each profile for the purposes of the foundation design.
3. Definition of Terms:
   S_u: Undrained shear strength
   ϕ: Internal friction angle
   γ': Effective unit weight
   ε50: Default L-Pile strain
   K: Default L-Pile Horizontal modulus of subgrade reaction (Static Condition)
4. Assumed compressive strength of concrete (AASHTO LRFD Section 10.8.3.5.4b).

Recommended LPILE Parameters for Abutment 2

Stratigraphy[1]		L-Pile Soil Model	S_u (psf)[3]	ϕ[3]	γ' (pcf)[3]	ε_{50}[3]	k (pci) Static
Depth[1]	Material						
0-6[2]	IGNORE	---	---	---	---	---	---
6-15	Sand	Sand (Reese)	---	29°	105	---	25
15-23	Sand	Sand (Reese)	---	36°	125	---	225

Stratigraphy[1]		L-Pile Soil Model	S_u (psf)[3]	ϕ[3]	γ' (pcf)[3]	ε_{50}[3]	k (pci) Static
Depth[1]	Material						
23-33	Sand	Sand (Reese)	---	36°	125	---	225
33-48	Sand	Sand (Reese)	---	36°	125	---	225
48-61.5	Sand	Sand (Reece)	---	36°	125	---	225

1. Based upon top of shaft elevation of 6,631.30 feet
2. The contribution of soil resistance within the upper 6 feet should be neglected in computations of vertical and lateral resistance to account for scour depth. A nominal unit weight of 100 pcf may be assigned to the soils in the top 6 feet of each profile for the purposes of the foundation design.
3. Definition of Terms:
   S_u: Undrained shear strength
   ϕ: Internal friction angle
   γ': Effective unit weight
   ε50: Default L-Pile strain
   K: Default L-Pile Horizontal modulus of subgrade reaction (Static Condition)
4. Assumed compressive strength of concrete (AASHTO LRFD Section 10.8.3.5.4b).

Drilled Shaft Group Effects — Lateral Resistance

Shaft lateral resistance should be reduced for group effects using appropriate *P*-multipliers. The *P*-multipliers provided in the following table should be used in the LPILE analysis to model reduction in group lateral resistance for proximity to adjacent piles, where *B* is the width or outside diameter of the shaft and the shaft spacing is center-to-center.

Shaft Center-to-Center Spacing	*P*-Multiplier		
	Row 1	Row 2	Row 3 and higher
3*B*	0.8	0.4	0.3
5*B*	1.0	0.85	0.7

1. In direction of loading
2. *B*: Diameter of drilled shaft

For intermediate spacings, the value of η may be determined by linear interpolation.

Shaft Settlement

Shaft settlement was calculated based on FHWA-NHI-10-016. Based on our analysis, the provided service limit resistance does not exceed 1 inch of settlement for the specified service limit loads, shaft group configurations, and estimated tip elevations.

Drilled Shaft Foundation Construction Considerations

Drilled shafts should be constructed in accordance with NMDOT Standard Specifications Section 502. Drilled shaft integrity testing consisting of cross-hole sonic logging (CSL) and/or low strain integrity (LSI) testing is recommended to be performed in accordance with Section 505, *Pile Integrity Testing*, of the NMDOT Specifications. Cross-hole sonic logging is recommended to be performed on each shaft. The LSI testing is recommended to be performed at locations where CSL logging indicates a potential anomaly.

Hard and very dense soils were encountered in Borings B-01 and B-02 at an approximate depth of 20 feet below ground surface and extend to the total explored depth of 61.5 feet. These soils may require additional effort or heavy-duty excavation equipment. Depending upon the depth of construction and current flow conditions within the Santa Fe River, casing, drilling slurry and/or dewatering may be required during construction to properly drill and clean shafts prior to concrete placement. The type of drilling slurry (polymer or mineral) will need to consider any environmental impacts or restrictions; however, mineral slurry should not be used due to potential "crusting" of the sidewalls.

If casing is used for shaft construction, it should be withdrawn in a slow continuous manner maintaining a sufficient head of concrete to prevent the creation of voids in shaft concrete. Drilled shaft concrete should have a relatively high fluidity when placed in cased holes. Concrete with slump in the range of 6 to 8 inches is recommended.

The bottom of the shaft excavation should be free of loose material before concrete placement. If water is encountered in shaft excavations at the time of concrete placement, it should be removed so concrete can be placed in a dry shaft, or concrete should be placed using a tremie pipe in accordance with Section 502 of the Specifications.

A qualified contractor with experience in drilled shaft construction in wet/caving soil conditions should review the information contained herein and determine what installation methods will be required.

Seismic Considerations

For structural designs based upon AASHTO 2020 LRFD Bridge Design Specifications, a Site Class C and Zone 1 should be used for the project site. Per 2020 AASHTO LRFD Bridge Design Specifications, seismic analysis is not required for single-span bridges, regardless of the seismic zone.

Integrity Testing and Specifications

Integrity testing of the drilled shafts after placement of concrete is recommended to be specified to verify the structural integrity of the shafts. The contractor shall furnish and install four 2-inch inner diameter PVC conduits for cross-hole sonic logging (CSL) and Thermal Integrity Profiling. The inspection tubes shall be uniformly distributed along the outside diameter to the full depth of the drilled shafts. CSL testing shall be required for each drilled shaft. The following payment items are recommended be shown on the Plans:

Item No.	Item	Unit	Quantity
505000	CSL Consultant Testing	Each	4
505011	LSI Consultant Testing	Each	2

Other Requirements

The following additional payment item is recommended to be shown on the plans. Obstruction Removal is a contingent payment for any unanticipated obstructions encountered during drilling which requires special removal equipment.

Item No.	Item	Unit	Quantity
502600	Obstruction Removal	Lineal Feet	4

Specifications

The acceptable methods of construction are provided in the 2019 NMDOT Standard Specifications for Highway and Bridge Construction.

General Comments

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction, and other earth-related construction phases of the project.

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

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

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. 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 affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others.

Construction and site development have the potential to affect adjacent properties. Such impacts can include damage due to vibration, modification of groundwater/surface water

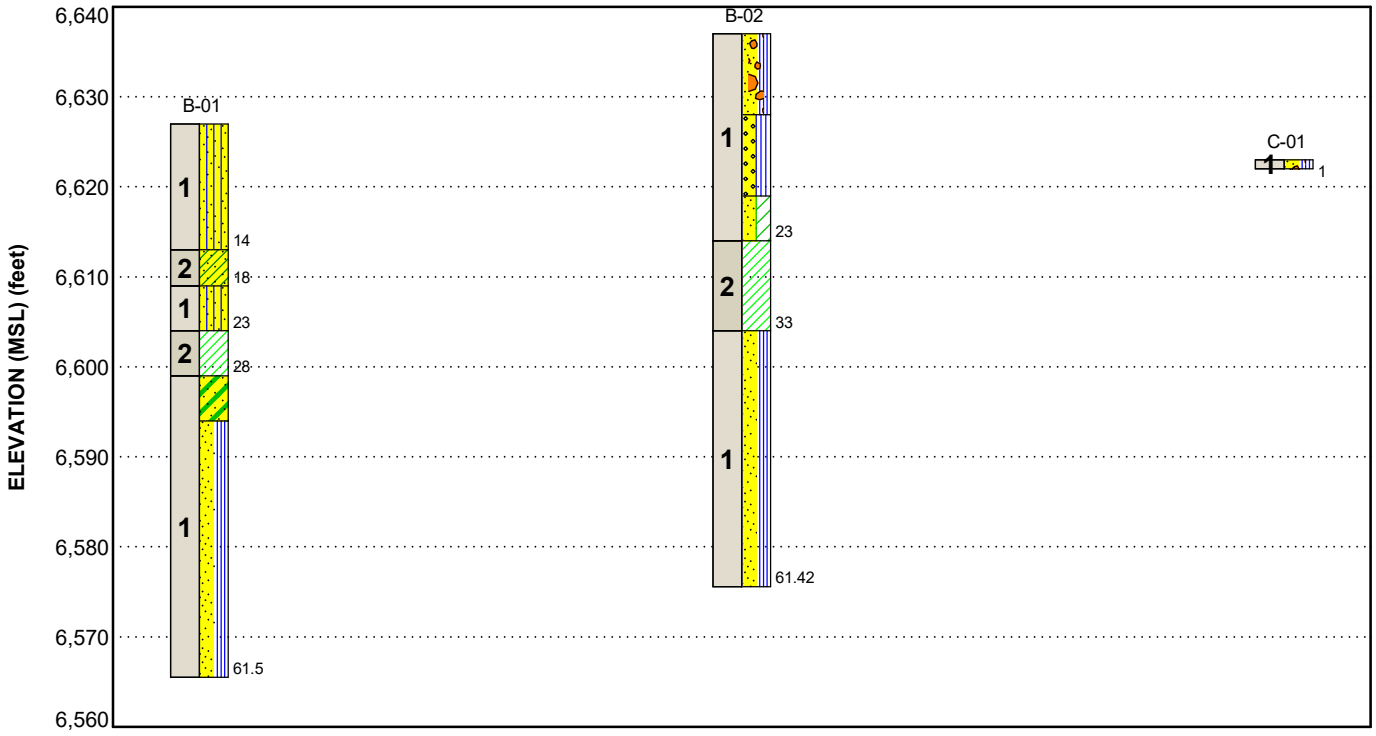
flow during construction, foundation movement due to undermining or subsidence from excavation, and noise or air quality concerns. Evaluation of these items on nearby properties is commonly associated with contractor means and methods and is not addressed in this report. If changes in the nature, design, 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.

Figures

Contents:

GEOMODEL

Santa Fe River Greenway Project ■ Santa Fe, NM
Terracon Project No. 66215115



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	**Loose to Very Dense Coarse Grained Soils**	Coarse grained sand soils with variable amounts of gravel, silt, and clay.
2	**Stiff to Hard Fine Grained Soils**	Fine grained clay soils with variable amounts of sand.

LEGEND

- Silty Sand
- Sandy Lean Clay
- Lean Clay
- Clayey Sand
- Poorly-graded Sand with Silt
- Poorly-graded Sand with Silt and Gravel
- Well-graded Sand with Silt
- Poorly-graded Sand with Clay

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project. Numbers adjacent to soil column indicate depth below ground surface.

Exploration and Testing Procedures

Field Exploration

The field exploration program was performed using borings and geophysical surveys

A summary of the boring locations and depths are summarized below.

Number of Borings	Boring Designation	Approximate Boring/ Exploration Depth (feet)	Location
2	B-01 and B-02	61.5	Bridge Abutments
1	C-01	1 (grab sample)	Channel Bed

Boring Layout and Elevations: The proposed boring locations were located in the field by measuring from the Project Plan and Profile sheets and existing site features shown on various drawings and aerial photos provided by the client, using a handheld GPS and survey measurements. The accuracy of boring locations should only be assumed to the level implied by the methods used. Approximate ground surface elevations were by GPS and survey.

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted, rotary drill rig using continuous flight augers hollow stem augers. Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. A 3-inch O.D. split-barrel sampling spoon with 2.5-inch I.D. ring lined sampler was also used for sampling in the upper 5 feet. Ring-lined, split-barrel sampling procedures are similar to standard split spoon sampling procedure; however, blow counts are typically recorded for 6-inch intervals for a total of 12 inches of penetration. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion.

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

interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Laboratory Testing

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

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D422 Standard Test Method for Particle-Size Analysis of Soils
- ASTM D2435 Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading

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

Site Location and Exploration Plans

Contents:

Site Location Plan
Exploration Plan- Soil Borings

Note: All attachments are one page unless noted above.

SITE LOCATION

Santa Fe River Greenway Project ■ Santa Fe, NM
May 4, 2023 ■ Terracon Project No. 66215115

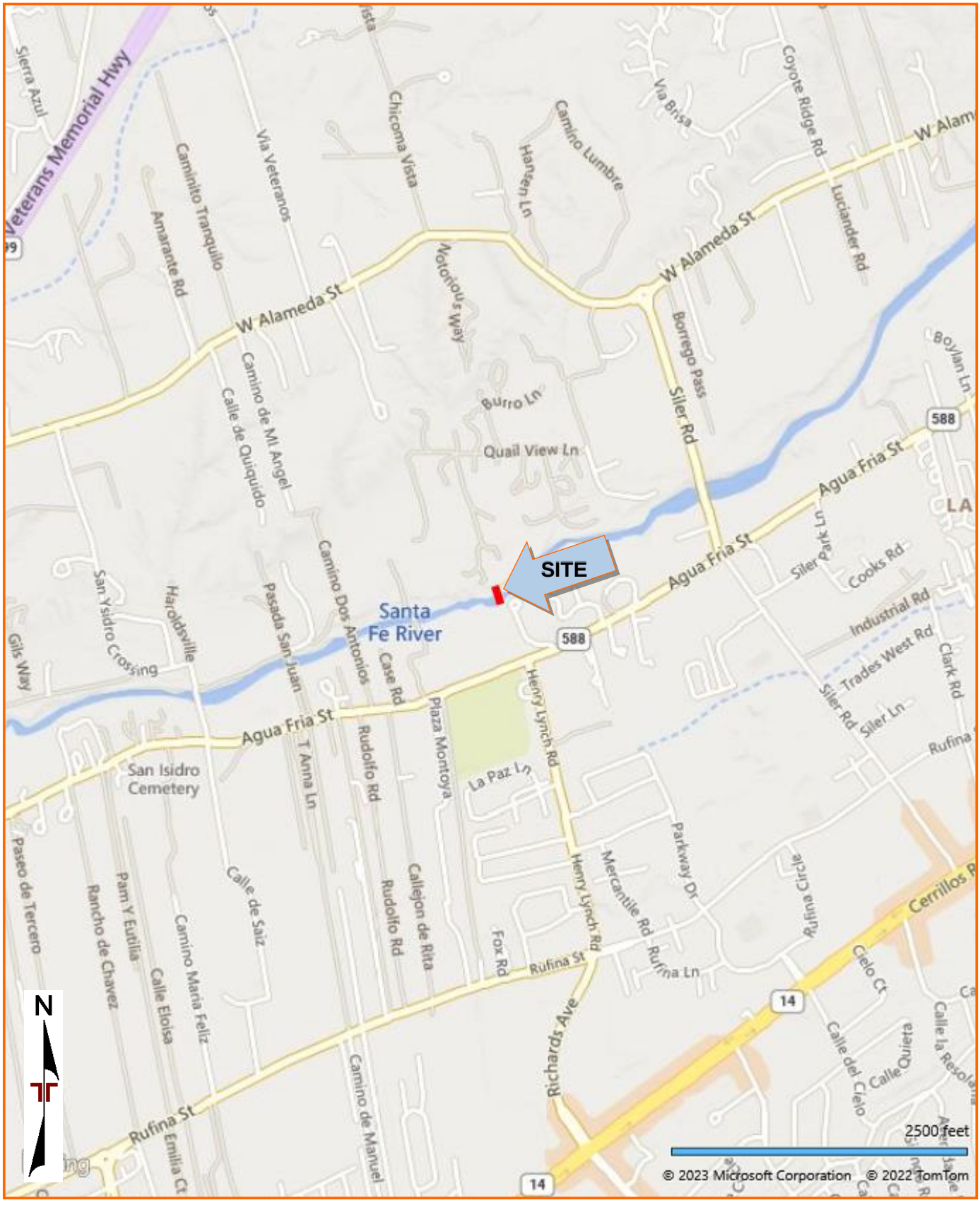


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

ROAD MAP PROVIDED BY MICROSOFT BING MAPS

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

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Note: All attachments are one page unless noted above.

BORING LOG NO. B-01

PROJECT: Santa Fe River Greenway Project

CLIENT: AECOM Technical Services Inc
Phoenix, AZ

SITE: San Ysidro
Santa Fe, NM

LOCATION See Exploration Plan

Latitude: 35.6625° Longitude: -106.0037°

Surface Elev.: 6627 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1												
							13-10-9 N=19		4.0		NP	18
							12-19	-0.09 @ 500 psf	6.1	106		
							5-7-10 N=17		6.8			
				10			5-10-11 N=21		10.2			
		14.0	6613									
2							5-15-23 N=38				48-19-29	67
		18.0	6609									
1				20			9-28-35 N=63		6.4			
		23.0	6604									
2							7-13-26 N=39				44-18-26	98
		28.0	6599									
		33.0	6594	30			10-42-50/4"		9.9			
1							11-39-50/3"		4.4			
				40			48-50/1"		4.4			
							11-15-15 N=30		6.5			
				50			19-24-21 N=45		5.5			
							12-16-14 N=30		6.1			
		61.5	6565.5	60			15-21-24 N=45		8.6			

SILTY SAND (SM), red brown to black, medium dense

SANDY LEAN CLAY (CL), trace gravel, brown, hard

SILTY SAND (SM), light brown, very dense

LEAN CLAY (CL), brown, hard

CLAYEY SAND (SC), red brown, very dense

POORLY GRADED SAND (SP-SM), trace gravel, red brown, dense to very dense

Boring Terminated at 61.5 Feet

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

Hammer Type: Automatic

Advancement Method:
7" hollow stem augers

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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.

Elevations measured in the field

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

Boring Started: 02-03-2023 | Boring Completed: 02-03-2023

Drill Rig: CME-55 | Driller: Terracon

Project No.: 66215115

BORING LOG NO. B-02

PROJECT: Santa Fe River Greenway Project

CLIENT: AECOM Technical Services Inc
Phoenix, AZ

SITE: San Ysidro
Santa Fe, NM

LOCATION See Exploration Plan

Latitude: 35.6621° Longitude: -106.0035°

Surface Elev.: 6637 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		0.0	6637									
							4-4-6 N=10		5.0		NP	11
							3-5	-0.1 @ 500 psf	6.9	107		
							1-2-2 N=4		5.0			
				10			2-2-3 N=5				NP	10
							10-12-16 N=28		8.2			
				20			12-28-24 N=52		7.0			
2							5-9-13 N=22				47-19-28	97
				30			10-18-23 N=41		17.1			
1							13-35-50/5"		4.9			
				40			21-50/3"		4.2			
							19-37-50/1"		4.6			
				50			38-50/2"		5.4			
							50/0"		3.7			
		61.4	6575.6	60			31-42-50/5"		24.6			

POORLY GRADED SAND WITH SILT AND GRAVEL (SP-SM), red brown, loose to medium dense

9.0 6628

WELL GRADED SAND WITH SILT (SW-SM), trace gravel, red brown

18.0 6619

POORLY GRADED SAND WITH CLAY (SP-SC), trace gravel, red brown, very dense

23.0 6614

LEAN CLAY (CL), dark brown, stiff to hard

33.0 6604

POORLY GRADED SAND WITH SILT (SP-SM), trace gravel, red brown, very dense

Boring Terminated at 61.42 Feet

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

Hammer Type: Automatic

Advancement Method:
7" hollow stem augers

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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.

Elevations measured in the field

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

Boring Started: 03-03-2023 | Boring Completed: 03-03-2023

Drill Rig: CME-55 | Driller: Terracon

Project No.: 66215115

BORING LOG NO. C-01

PROJECT: Santa Fe River Greenway Project

CLIENT: AECOM Technical Services Inc
Phoenix, AZ

SITE: San Ysidro
Santa Fe, NM

LOCATION See Exploration Plan

Latitude: 35.6622° Longitude: -106.0036°

Surface Elev.: 6623 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		1.0	6622								NP	

POORLY GRADED SAND (SP), light brown, trace gravel

Boring Terminated at 1 Foot

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

Hammer Type: Automatic

Advancement Method:
7" hollow stem augers

Abandonment Method:
Boring backfilled with auger cuttings upon completion.

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.

Elevations measured in the field

Notes:

WATER LEVEL OBSERVATIONS

Groundwater not encountered

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

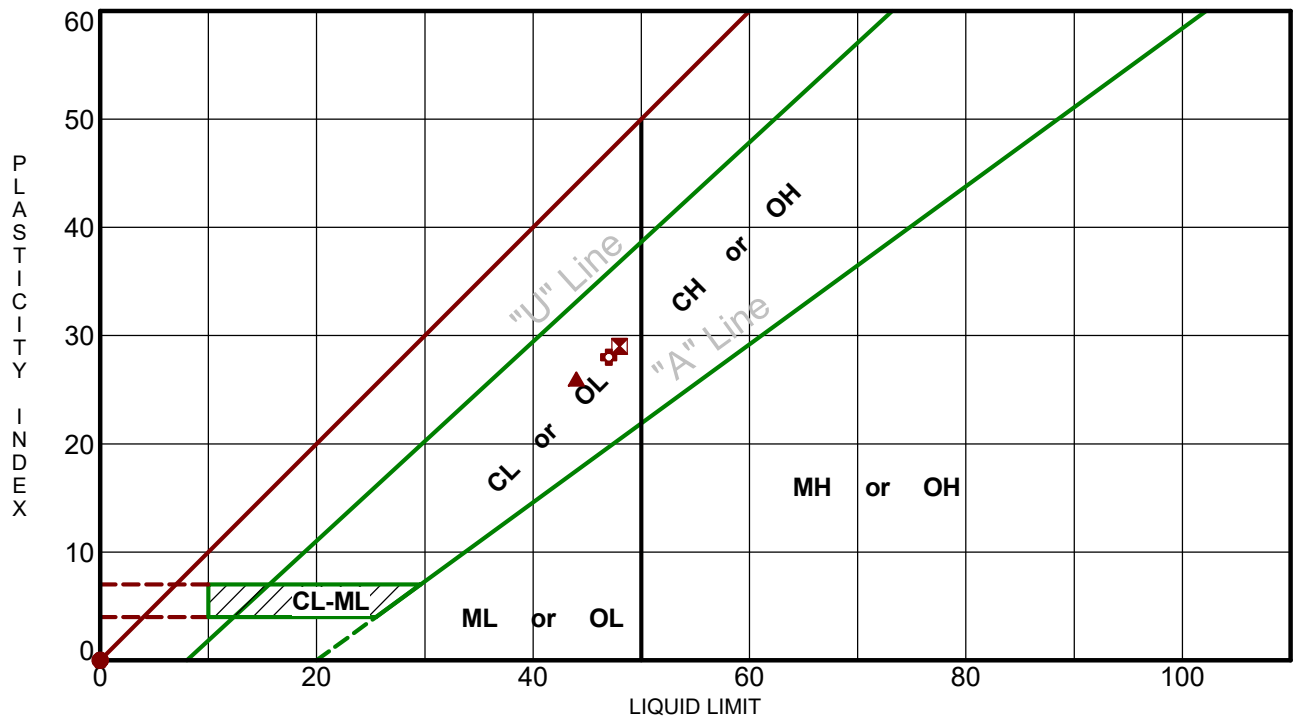
Boring Started: 02-03-2023 | Boring Completed: 02-03-2023

Drill Rig: CME-55 | Driller: Terracon

Project No.: 66215115

ATTERBERG LIMITS RESULTS

ASTM D4318



Boring ID		Depth (Ft)	LL	PL	PI	Fines	USCS	Description
●	B-01	2.5 - 4	NP	NP	NP	18.5	SM	SILTY SAND
⊠	B-01	15 - 16.5	48	19	29	66.7	CL	SANDY LEAN CLAY
▲	B-01	25 - 26.5	44	18	26	98.0	CL	LEAN CLAY
★	B-02	2.5 - 4	NP	NP	NP	11.3	SP-SM	POORLY GRADED SAND with SILT(SP-SM)
⊙	B-02	10 - 11.5	NP	NP	NP	10.1	SW-SM	WELL-GRADED SAND with SILT
✿	B-02	25 - 26.5	47	19	28	96.7	CL	LEAN CLAY
○	C-01	0 - 1	NP	NP	NP	0.4	SP	POORLY GRADED SAND

PROJECT: Santa Fe River Greenway Project

PROJECT NUMBER: 66215115

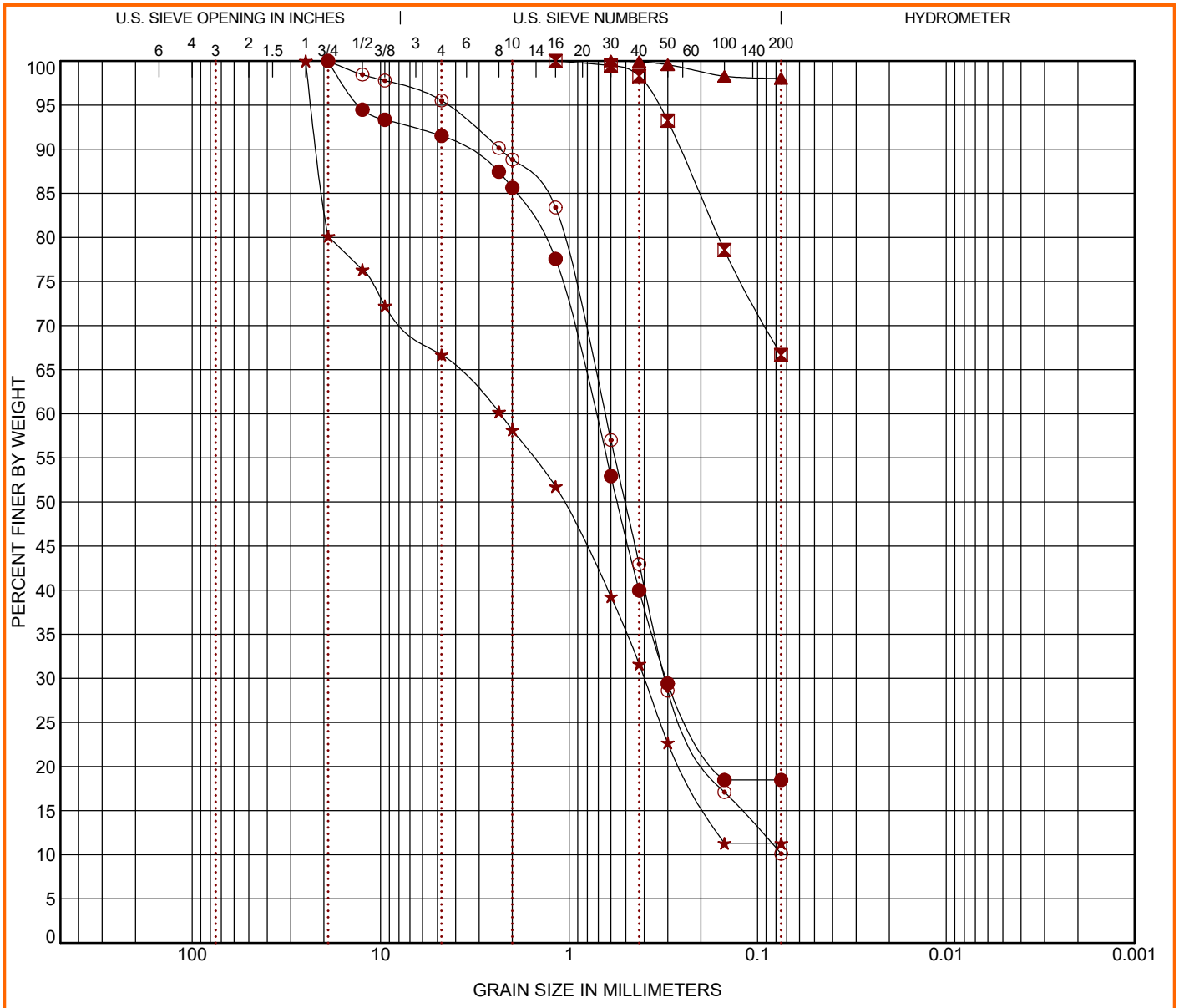
SITE: San Ysidro
Santa Fe, NM

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

CLIENT: AECOM Technical Services Inc
Phoenix, AZ

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	B-01	2.5 - 4	SILTY SAND (SM)	4.0	NP	NP	NP		
⊠	B-01	15 - 16.5	SANDY LEAN CLAY (CL)		48	19	29		
▲	B-01	25 - 26.5	LEAN CLAY (CL)		44	18	26		
★	B-02	2.5 - 4	POORLY GRADED SAND with SILT(SP-SM)	5.0	NP	NP	NP		
⊙	B-02	10 - 11.5	WELL-GRADED SAND with SILT (SW-SM)		NP	NP	NP	2.01	8.74

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	B-01	2.5 - 4	19	0.728	0.306		0.0	8.5	73.0		18.5	
⊠	B-01	15 - 16.5	1.18				0.0	0.0	33.3		66.7	
▲	B-01	25 - 26.5	0.6				0.0	0.0	2.0		98.0	
★	B-02	2.5 - 4	25	2.32	0.399		0.0	33.3	55.4		11.3	
⊙	B-02	10 - 11.5	19	0.648	0.31		0.0	4.5	85.4		10.1	

PROJECT: Santa Fe River Greenway Project

PROJECT NUMBER: 66215115

SITE: San Ysidro
Santa Fe, NM

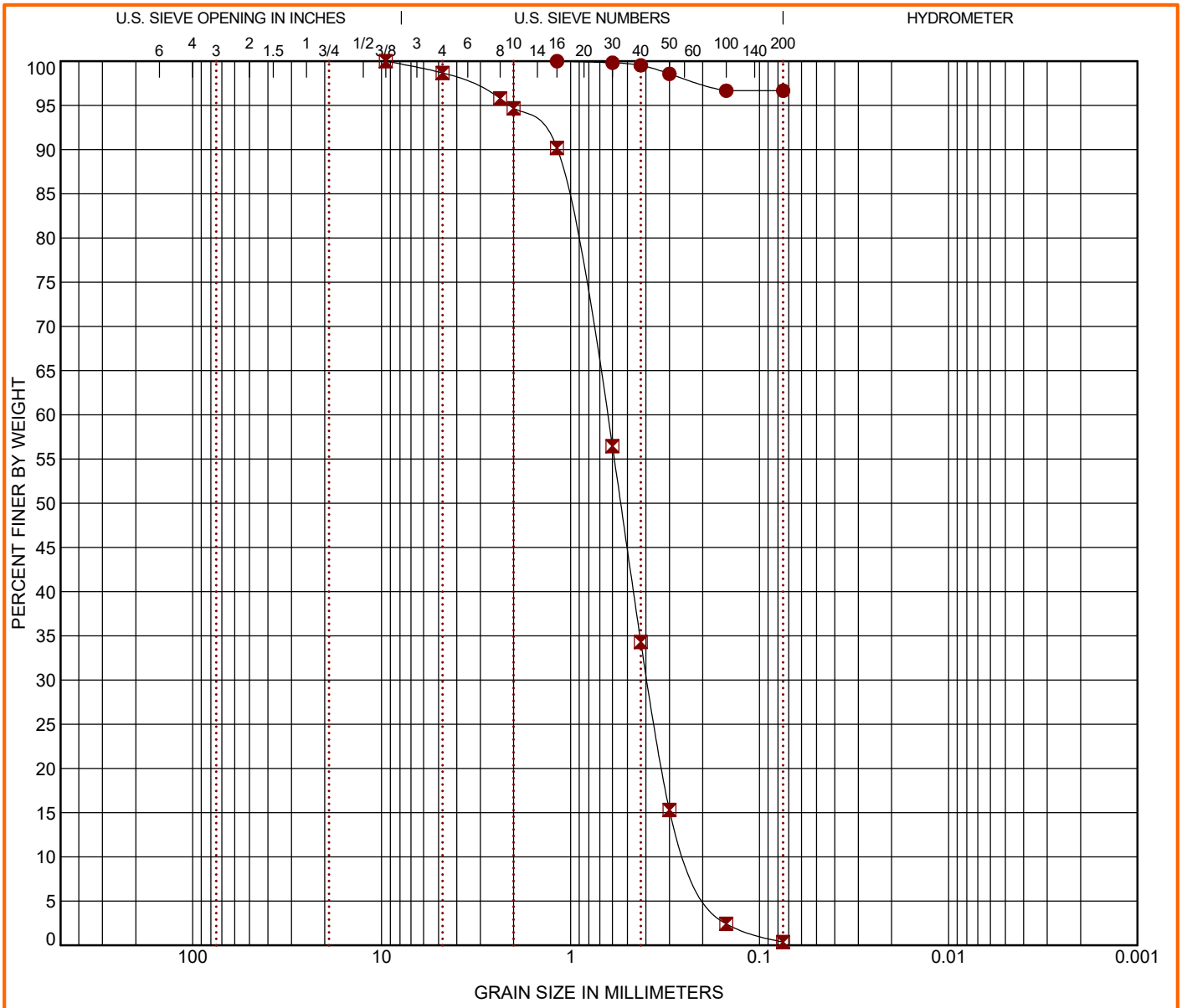
Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

CLIENT: AECOM Technical Services Inc
Phoenix, AZ

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 66215115 SANTA FE RIVER GR.GPJ TERRACON_DATATEMPLATE.GDT 5/2/23

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	USCS Classification	WC (%)	LL	PL	PI	Cc	Cu
●	B-02	25 - 26.5	LEAN CLAY (CL)		47	19	28		
⊠	C-01	0 - 1	POORLY GRADED SAND (SP)		NP	NP	NP	1.06	2.86

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	B-02	25 - 26.5	1.18				0.0	0.0	3.3		96.7	
⊠	C-01	0 - 1	9.5	0.644	0.393	0.226	0.0	1.3	98.3		0.4	

PROJECT: Santa Fe River Greenway Project

PROJECT NUMBER: 66215115

SITE: San Ysidro
Santa Fe, NM

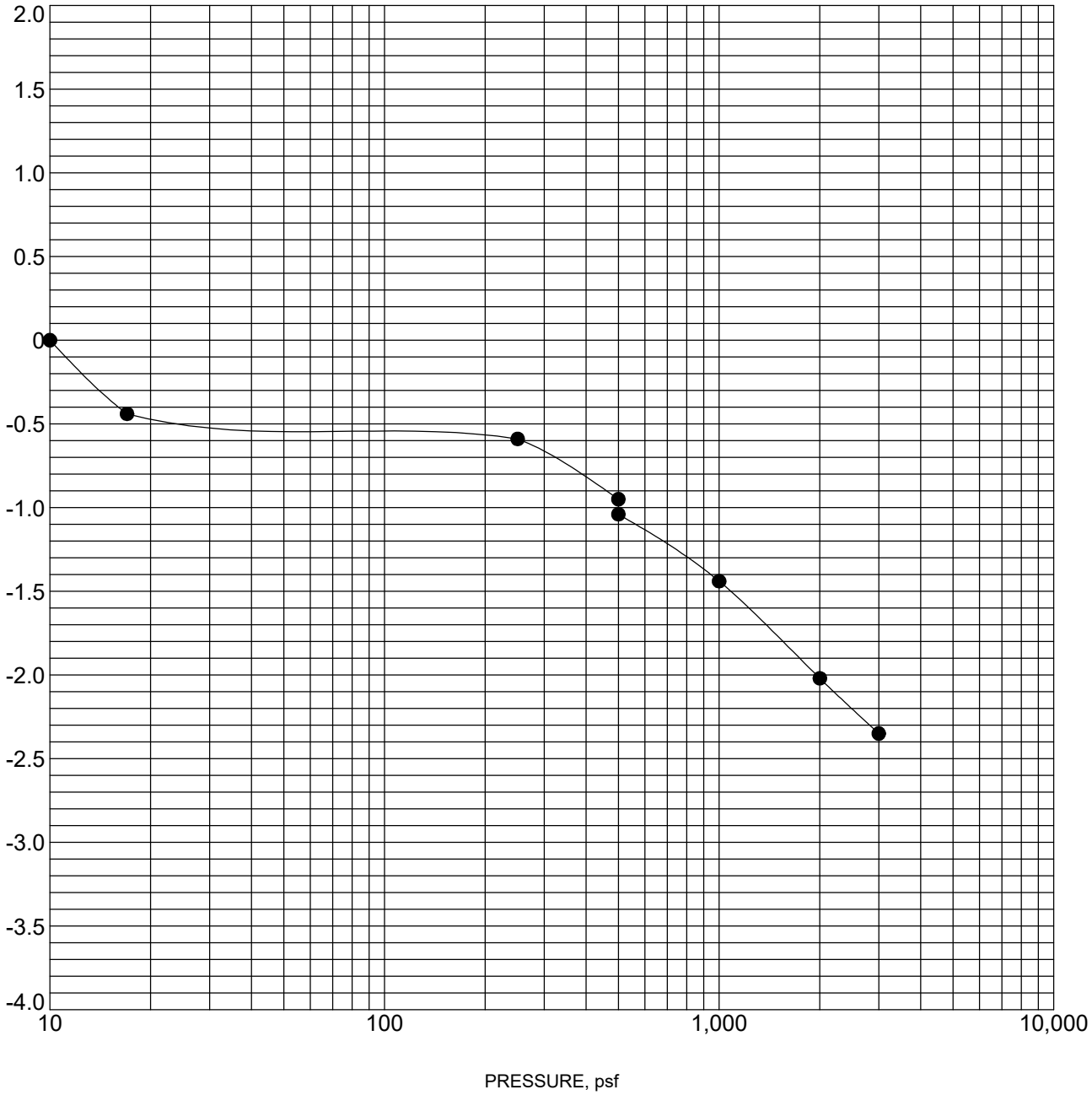
Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

CLIENT: AECOM Technical Services Inc
Phoenix, AZ

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS-2 66215115 SANTA FE RIVER GR.GPJ TERRACON_DATATEMPLATE.GDT 5/2/23

SWELL CONSOLIDATION TEST

ASTM D4546



Specimen Identification			Classification	γ_d, pcf	WC, %
●	B-01	5 - 6 ft	SILTY SAND	106	6.1

NOTES: Sample inundated with water at 500 pounds per square foot (psf).

PROJECT: Santa Fe River Greenway Project

PROJECT NUMBER: 66215115

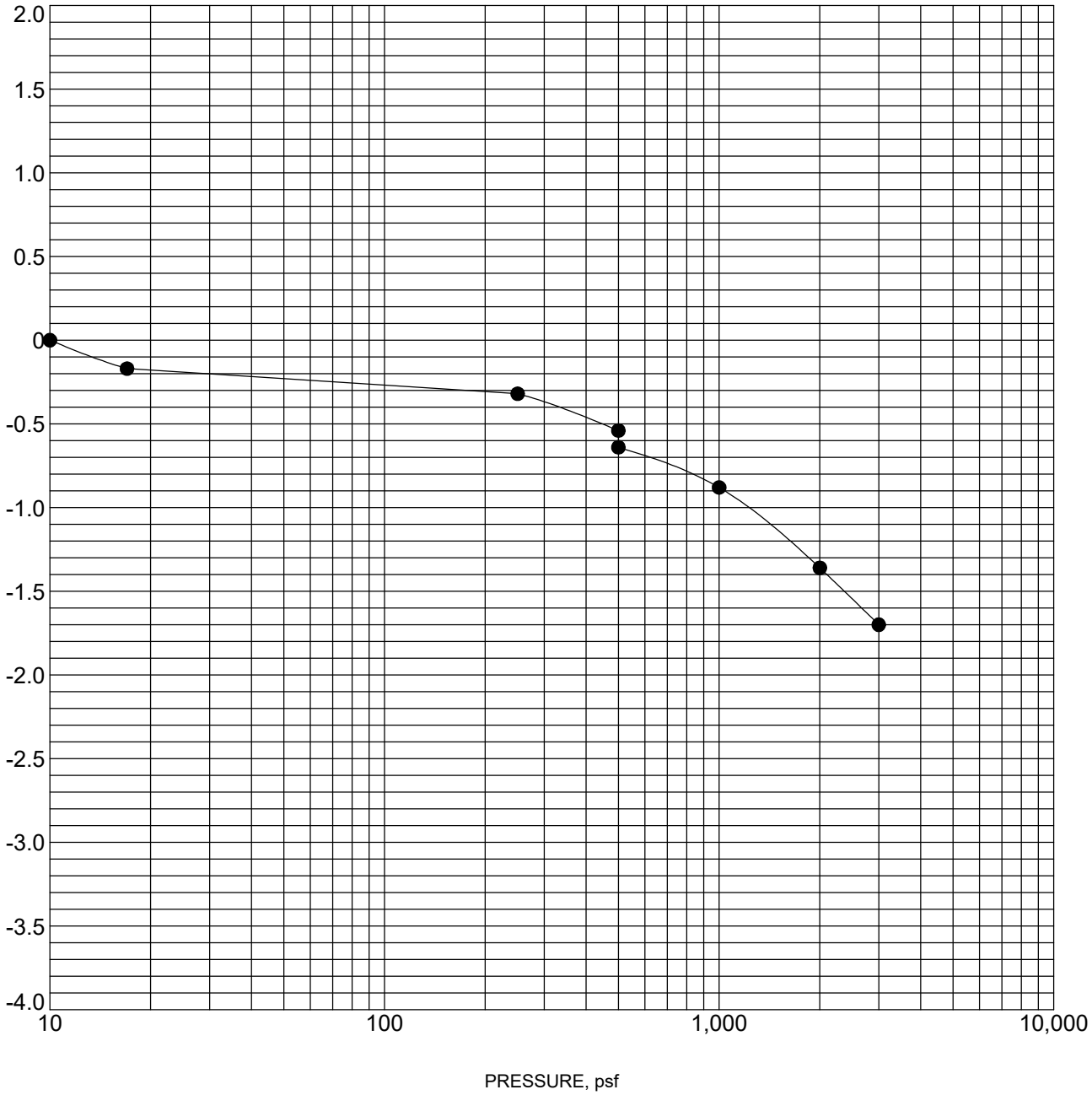
SITE: San Ysidro
Santa Fe, NM

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

CLIENT: AECOM Technical Services Inc
Phoenix, AZ

SWELL CONSOLIDATION TEST

ASTM D4546



Specimen Identification			Classification	γ_d, pcf	WC, %
●	B-02	5 - 6 ft	POORLY GRADED SAND with SILT(SP-SM)	107	6.9

NOTES: Sample inundated with water at 500 pounds per square foot (psf).

PROJECT: Santa Fe River Greenway Project

PROJECT NUMBER: 66215115

SITE: San Ysidro
Santa Fe, NM

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

CLIENT: AECOM Technical Services Inc
Phoenix, AZ

SUMMARY OF LABORATORY RESULTS

Borehole No.	Depth (ft.)	USCS Soil Class.	In-Situ Properties		Classification				Expansion Testing		Corrosivity				Remarks
			Dry Density (pcf)	Water Content (%)	Passing #200 Sieve (%)	Atterberg Limits			Swell (%)	Consolidation (%)	pH	Resistivity (ohm-cm)	Sulfates (ppm)	Chlorides (ppm)	
						LL	PL	PI							
B-01	2.5 - 4.0	SM		4	18	NP	NP	NP							
B-01	5.0 - 6.0	SM	106	6						0.09 @ 500 psf					1, 2
B-01	7.5 - 9.0	SM		7											2
B-01	10.0 - 11.5	SM		10											2
B-01	15.0 - 16.5	CL			67	48	19	29							
B-01	20.0 - 21.5	SM		6											2
B-01	25.0 - 26.5	CL			98	44	18	26							
B-01	30.0 - 31.3	SP-SM		10											2
B-01	35.0 - 36.3	SP-SM		4											2
B-01	40.0 - 40.6	SP-SM		4											2
B-01	45.0 - 46.5	SP-SM		7											2
B-01	50.0 - 51.5	SP-SM		6											2
B-01	55.0 - 56.5	SP-SM		6											2
B-01	60.0 - 61.5	SP-SM		9											2
B-02	2.5 - 4.0	SP-SM		5	11	NP	NP	NP							
B-02	5.0 - 6.0	SP-SM	107	7						0.1 @ 500 psf					1, 2
B-02	7.5 - 9.0	SP-SM		5											2
B-02	10.0 - 11.5	SW-SM			10	NP	NP	NP							
B-02	15.0 - 16.5	SW-SM		8											2
B-02	20.0 - 21.5	SW-SM		7											2
B-02	25.0 - 26.5	CL			97	47	19	28							
B-02	30.0 - 31.5	CL		17											2
B-02	35.0 - 36.4	SP-SM		5											2
B-02	40.0 - 40.8	SP-SM		4											2
B-02	45.0 - 46.1	SP-SM		5											2

REMARKS

1. Dry Density and/or moisture determined from one or more rings of a multi-ring sample.
2. Visual Classification.
3. Submerged to approximate saturation.
4. Expansion Index in accordance with ASTM D4829-95.
5. Air-Dried Sample

PROJECT: Santa Fe River Greenway Project

SITE: San Ysidro
Santa Fe, NM

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM
PH. 505-797-4287 FAX. 505-797-4288

PROJECT NUMBER: 66215115

CLIENT: AECOM Technical Services Inc
Phoenix, AZ

EXHIBIT: B-1

SUMMARY OF LABORATORY RESULTS

Borehole No.	Depth (ft.)	USCS Soil Class.	In-Situ Properties		Classification				Expansion Testing		Corrosivity				Remarks
			Dry Density (pcf)	Water Content (%)	Passing #200 Sieve (%)	Atterberg Limits			Swell (%)	Consolidation (%)	pH	Resistivity (ohm-cm)	Sulfates (ppm)	Chlorides (ppm)	
						LL	PL	PI							
B-02	50.0 - 50.7	SP-SM		5											2
B-02	55.0 - 55.0	SP-SM		4											2
B-02	60.0 - 61.4	SP-SM		25											2
C-01	0.0 - 1.0	SP			0	NP	NP	NP							

REMARKS

1. Dry Density and/or moisture determined from one or more rings of a multi-ring sample.
2. Visual Classification.
3. Submerged to approximate saturation.
4. Expansion Index in accordance with ASTM D4829-95.
5. Air-Dried Sample

PROJECT: Santa Fe River Greenway Project

SITE: San Ysidro
Santa Fe, NM

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM
PH. 505-797-4287 FAX. 505-797-4288

PROJECT NUMBER: 66215115

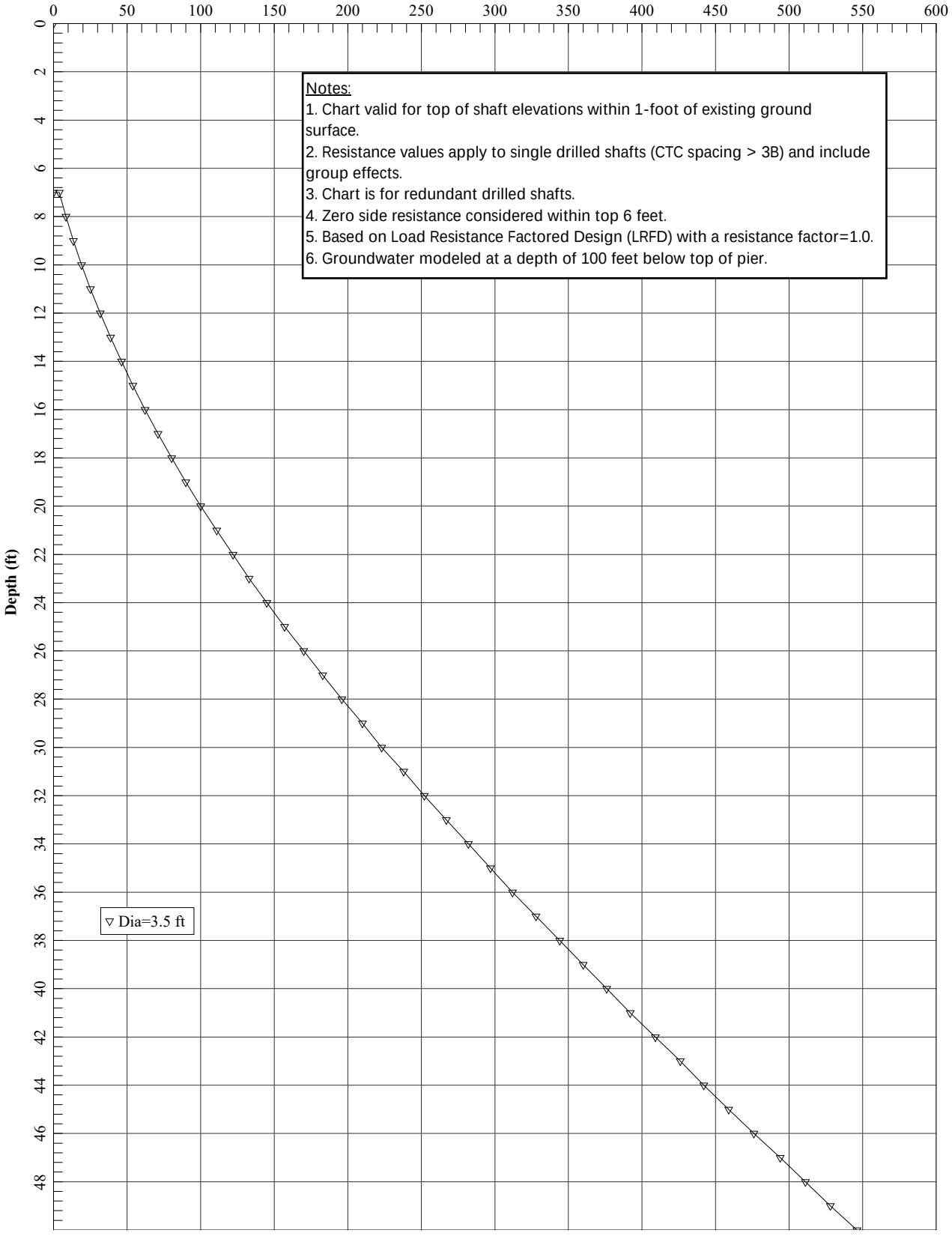
CLIENT: AECOM Technical Services Inc
Phoenix, AZ

EXHIBIT: B-2

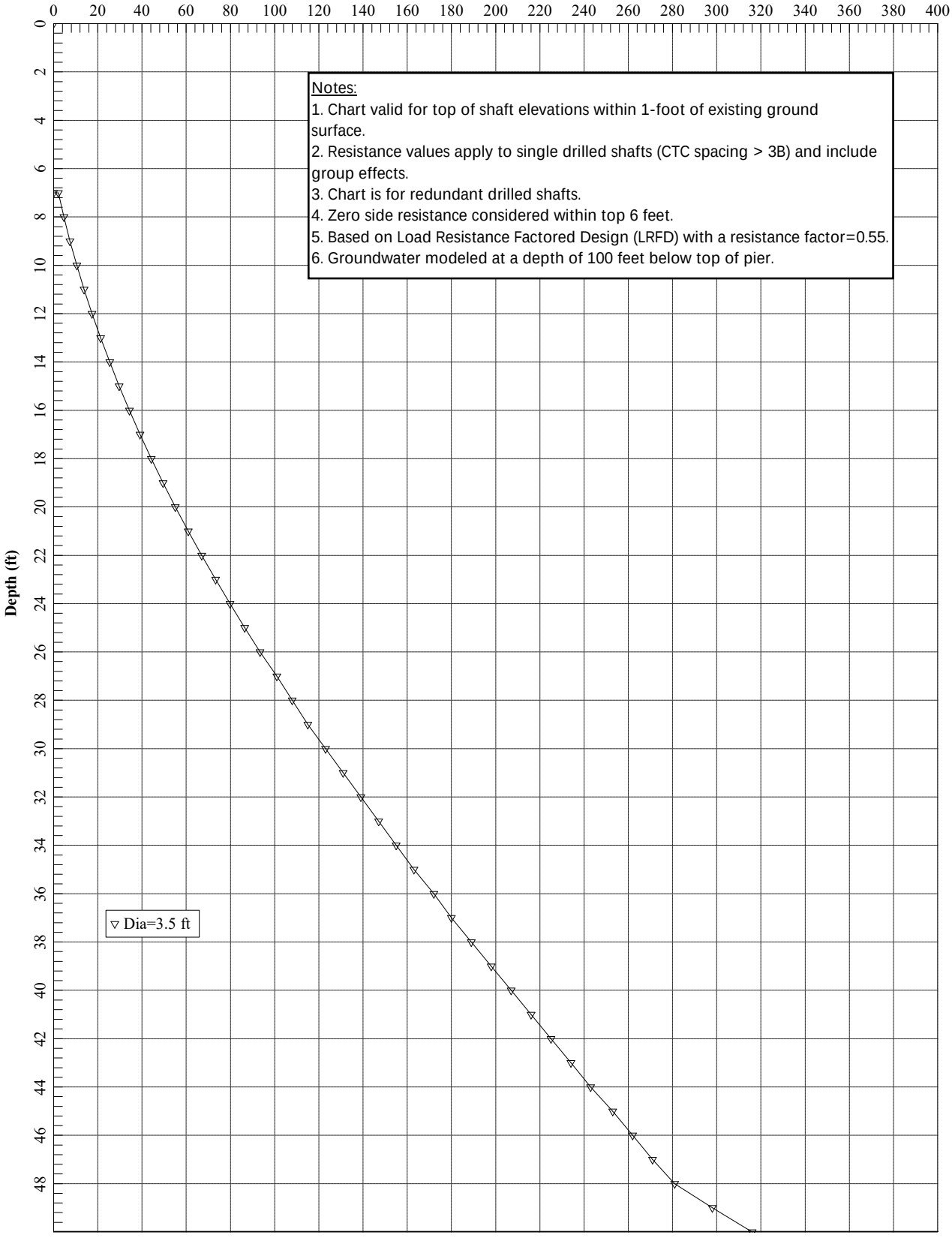
Drilled Shaft Axial Capacity Charts

Contents:

Santa Fe Greenway Project Pedestrian Bridge: Abutments 1 & 2
Nominal Skin Resistance (tons)



Santa Fe Greenway Project Pedestrian Bridge: Abutments 1 & 2
LRFD Factored Skin Resistance (tons)



Supporting Information

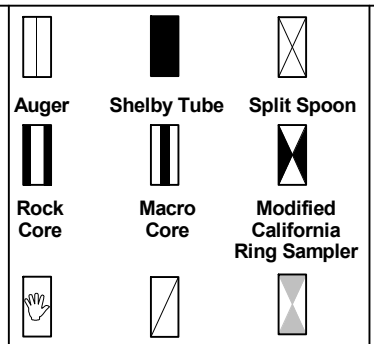
Contents:

Note: All attachments are one page unless noted above.

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING



WATER LEVEL

- Water Initially Encountered
- Water Level After a Specified Period of Time
- Water Level After a Specified Period of Time

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

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
N	N value
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. 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 Includes gravels, sands and silts.			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, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

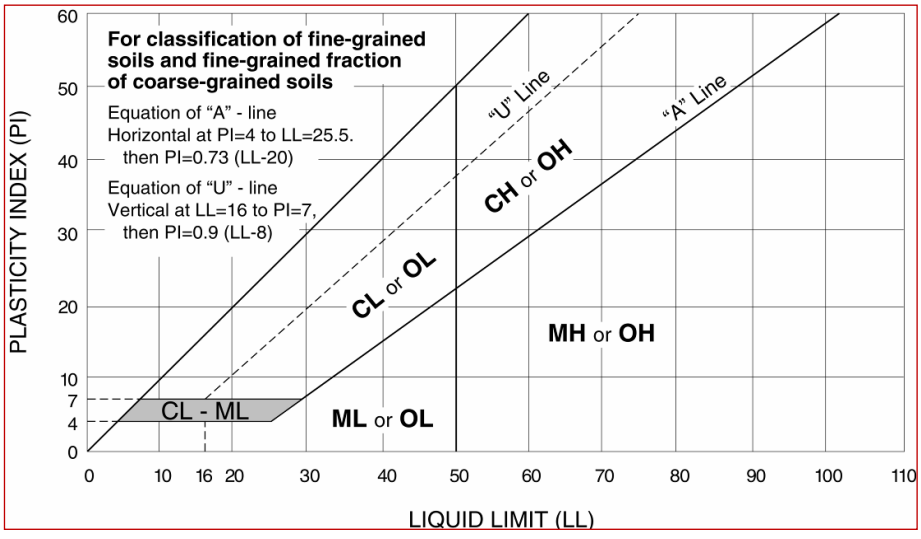
PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

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

[A] Based on the material passing the 3-inch (75-mm) sieve.
[B] If the field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to the 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] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to the 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 the group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to the 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 the group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to the 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.



Rock Classification Notes

WEATHERING	
Term	**Description**
Fresh	Mineral crystals appear bright; show no discoloration. Features show little or no staining on surfaces. Discoloration does not extend into intact rock.
Slightly weathered	Rock is generally fresh except along fractures. Some fractures stained and discoloration may extend <0.5 inches into rock.
Moderately weathered	Significant portions of rock are dull and discolored. Rock may be significantly weaker than in fresh state near fractures. Soil zones of limited extent may occur along some fractures.
Highly weathered	Rock is dull and discolored throughout. Majority of rock mass is significantly weaker and has decomposed and/or disintegrated; isolated zones of stronger rock and/or soil may occur throughout.
Completely weathered	All rock material is decomposed and/or disintegrated to soil. The rock mass or fabric is still evident and largely intact. Isolated zones of stronger rock may occur locally.

STRENGTH OR HARDNESS		
Description	**Field Identification**	**Uniaxial Compressive Strength, psi**
Extremely strong	Can only be chipped with geological hammer. Rock rings on hammer blows. Cannot be scratched with a sharp pick. Hand specimens require several hard hammer blows to break.	>36,000
Very strong	Several blows of a geological hammer to fracture. Cannot be scratched with a 20d common steel nail. Can be scratched with a geologist's pick only with difficulty.	15,000–36,000
Strong	More than one blow of a geological hammer needed to fracture. Can be scratched with a 20d nail or geologist's pick. Gouges or grooves to ¼ inch deep can be excavated by a hard blow of a geologist's pick. Hand specimens can be detached by a moderate blow.	7,500–15,000
Medium strong	One blow of geological hammer needed to fracture. Can be distinctly scratched with 20d nail. Can be grooved or gouged 1/16 in. deep by firm pressure with a geologist's pick point. Can be fractured with a single firm blow of geological hammer. Can be excavated in small chips (about 1 in. maximum size) by hard blows of the point of a geologist's pick.	3,500–7,500
Weak	Shallow indent by firm blow with geological hammer point. Can be gouged or grooved readily with geologist's pick point. Can be excavated in pieces several inches in size by moderate blows of a pick point. Small thin pieces can be broken by finger pressure.	700–3,500
Very weak	Crumbles under firm blow with geological hammer point. Can be excavated readily with the point of a geologist's pick. Pieces 1 in. or more in thickness can be broken with finger pressure. Can be scratched readily by fingernail.	150–700

DISCONTINUITY DESCRIPTION			
Fracture Spacing (Joints, Faults, Other Fractures)		**Bedding Spacing (May Include Foliation or Banding)**	
Description	**Spacing**	**Description**	**Spacing**
Intensely fractured	< 2.5 inches	**Laminated**	< ½ inch
Highly fractured	2.5–8 inches	**Very thin**	½–2 inches
Moderately fractured	8 inches–2 feet	**Thin**	2 inches–1 foot
Slightly fractured	2–6.5 feet	**Medium**	1–3 feet
Very slightly fractured	> 6.5 feet	**Thick**	3–10 feet
		Massive	> 10 feet

ROCK QUALITY DESIGNATION (RQD) [1]	
Description	**RQD Value (%)**
Very Poor	0–25
Poor	25–50
Fair	50–75
Good	75–90
Excellent	90–100

1. The combined length of all sound and intact core segments equal to or greater than 4 inches in length, expressed as a percentage of the total core run length.