SCCCSHD Long Term Care Facility

Geotechnical Engineering Report

March 31, 2023 | Terracon Project No. 66235001

SEC of 8th Street and Eastern Avenue (Highway 31), Springer, New Mexico

Prepared for:

SCCCSHD c/o Dekker Perich Sabatini
7601 Jefferson NE, Suite 100
Albuquerque, NM 87109

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March 31, 2023

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Attn: Mr. Brian Barnes
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Re: Geotechnical Engineering Report
SCCCSHD Long Term Care Facility
SEC of 8th Street and Eastern Avenue (Highway 31)
Springer, NM
Terracon Project No. 66235001

Dear Mr. Barnes:

We have completed the scope of Geotechnical Engineering services for the above referenced project in general accordance with Terracon Proposal No. P66235001 dated January 1, 2017. 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

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3/31/2023

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

Refer to each individual Attachment for a listing of contents.

Report Summary

Topic [1]	Overview Statement [2]
Project Description	The proposed structures will consist of the following: ■ 33,000 sq ft single-story building ■ Retaining walls ■ Single-story maintenance building ■ Bus parking canopy ■ Trash enclosures The project will consist of the construction of asphalt concrete and/or Portland cement concrete paved parking areas and drives. The NAPA traffic classification for asphalt concrete pavements is assumed to consist of: ■ Class I: Parking stalls for autos and/or pickup trucks ■ Class II: Traffic consisting of home delivery trucks, trash pickup, buses The anticipated ACI traffic categories and daily truck traffic is assumed to consist of: ■ Category A: Car parking areas and access lanes including delivery trucks ■ Category A-1: Trash trucks, shuttle buses, deliver/semi-tractor trailer trucks, or fire truck lanes 20 Year Design Life
Geotechnical Characterization	Stiff to very stiff fine grained clay soils to an approximate depth of 10 feet below ground surface underlain by firm to very hard sedimentary shale with interbedded sandstone bedrock Groundwater not observed during our exploration
Earthwork	Shallow excavations for the proposed structures are anticipated to be accomplished with conventional construction equipment. Excavations extending into the hard to very hard shale bedrock encountered at approximately 5 to 10 feet below ground surface may require extra effort and/or heavy-duty excavation equipment. Existing on-site clay soils can be used for structural/engineered fill but may require extra processing to achieve a uniform structural/engineered fill. Shale bedrock, if encountered, is not considered suitable as structural fill within the building, walls, or pavement areas.

	Soils are sensitive to moisture variation
Shallow Foundations	Shallow foundations are recommended for building and structure support Allowable bearing pressure = 1,500 psf to 2,500 psf Expected settlements: < 1-inch total, < 3/4-inch differential
Deep Foundations	Deep foundations are not considered necessary for this site
Free-Standing Retaining Walls	Wall heights of up to 6 feet are anticipated to achieve final grade. Retaining walls can be designed using the bearing pressure values in the Shallow Foundation section of the report. Earth pressures acting on the retaining walls are provided in the Lateral Earth Pressure section.
Below-Grade Structures	Loading docks can be designed using the bearing pressure values in the Shallow Foundation section of the report. Earth pressures acting on the loading dock walls are provided in the Lateral Earth Pressure section.
Pavements	With subgrade prepared as noted in **Earthwork**. Parking areas for passenger vehicles: 4” Asphalt Concrete (AC) over 6” Base Course (BC) 6” Portland cement concrete (PCC) Drives, trash truck access, shuttle buses, delivery/semi-tractor trailer, and/or emergency/fire truck access 6” AC over 6” BC 6.5” PCC Dumpster Pad areas 7.0” PCC
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed SCCCSHD to be located near the SEC of 8th Street and Eastern Avenue (Highway 31) in Springer, NM. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil and rock conditions
- Groundwater conditions
- Seismic site classification per IBC
- Site preparation and earthwork
- Foundation design and construction
- Floor slab design and construction
- Lateral earth pressures
- Pavement design and construction
- Metal and corrosion potential considerations

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

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
Information Provided	Project information was provided by Mark Baczek of DPS in an email on 1/3/2023 that included "Geotech Investigation RFP – SCCCSHD Long Term Care Facility.pdf".
Project Description	The project will include the construction of a long-term care facility, pavements, and utilities on a vacant lot.

Item	Description
Proposed Structure	The proposed structures will consist of the following structures: ■ 33,000 sq ft single-story building ■ Retaining walls ■ Single-story maintenance building ■ Bus parking canopy Trash enclosures
Building Construction	Construction will consist of wood frame or cold formed steel frame with prefabricated roof trusses or joists Central spine with raised roof with heavy steel or timber trusses supported on columns Slab-on-grade floor system Interior structural walls will be supported on reinforced thickened slabs placed integral with slab-on-grade Heavily loaded columns will be supported on reinforced concrete footings isolated from slabs
Finished Floor Elevation	Finished floor elevation is anticipated to be within 4 to 6 feet of existing site grade
Maximum Loads	From "Geotech Investigation RFP – SCCCSHD Long Term Care Facility.pdf": ■ Columns: 10 to 50 kips ■ Walls: 2.0 to 2.5 kips per lineal feet Slabs: 150 pounds per square foot (psf)
Grading/Slopes	Up to about 6 to 8 feet of cut and fill may be required to bring the site to construction grade
Below-Grade Structures	Truck loading dock
Free-Standing Retaining Walls	Wall heights of up to about 6 feet are expected

Item	Description
Pavements	The project will consist of the construction of asphalt concrete and/or portland cement concrete paved parking areas and drives. The NAPA traffic classification for asphalt concrete pavements is assumed to consist of: ▪ Class I: Parking stalls for autos and/or pickup trucks ▪ Class II: Traffic consisting of home delivery trucks, trash pickup, buses The anticipated ACI traffic categories and daily truck traffic is assumed to consist of: ▪ Category A: Car parking areas and access lanes including delivery trucks ▪ Category A-1: Trash trucks, deliver/semi-tractor trailer trucks, shuttle buses, or fire truck lanes 20 Year Design Life The pavement design period is 20 years.
Building Code	2021 IBC

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

Site Conditions

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

Item	Description
Parcel Information	The project is located at the SEC of 8th Street and Eastern Avenue (Highway 31) in Springer, NM. See **Site Location**
Existing Improvements	The site is undeveloped.
Current Ground Cover	Soil and vegetation
Existing Topography	Sloping down to the south

Geotechnical Characterization

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.

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	**Stiff to Very Stiff Fined Grained Soils**	Stiff to very stiff clay with varying amounts of sand and gravel
2	**Firm to Very Hard Sedimentary Bedrock**	Sedimentary bedrock consisting of sandy shale with interbedded sandstone

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

Seismic Site Class

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil/bedrock properties observed at the site and as described on the exploration logs and results, our professional opinion is for that a **Seismic Site Classification of C** be considered for the project. Subsurface explorations at this site were extended to a maximum depth of 26.5 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area. Additional deeper borings or geophysical testing may be performed to confirm the conditions below the current boring depth.

Corrosivity

The table below lists the results of laboratory soluble sulfate, electrical resistivity, and pH testing. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Boring	Sample Depth (feet)	Soil Description	Soluble Sulfate (mg/kg)	Electrical Resistivity (Ω-cm)	pH
B-03	2.6	Lean Clay (CL)	110	1,300	8.03

Criteria published by the Cast Iron Pipe Research Institute indicates that the near surface subgrade soils generally have a moderate corrosive potential to cause corrosion to buried ferrous materials. Review of data published by the National Association of Corrosion Engineers indicates that the resistivity value concentration places the soil in the moderately corrosive category. If there is concern regarding pipe corrosion, the use of PVC or poly-wrap should be considered.

Results of soluble sulfate testing indicate that ASTM Type I or I/II Portland cement should be suitable for all concrete on and below grade. Foundation concrete should be designed for negligible sulfate exposure in accordance with the provisions of the ACI Design Manual, Section 318, Chapter 4. The following should be considered:

- Use of Type I or I/II modified cement for sulfate resistance
- Cement should have a tricalcium aluminate content of not more than 8%.
- Provide air-entrainment of 4% to 7% by volume.
- Lower the water to cement ratio to 0.4 to 0.45.

Geotechnical Overview

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

The site could be characterized generally by stiff to very stiff clay soils with variable amounts of sand and gravel to an approximate depth of 5 to 10 feet below ground surface, underlain by firm to very hard shale bedrock with interbedded sandstone. Near surface soils which show a low to high tendency for consolidation/collapse when elevated in moisture content will require particular attention in the design and construction.

Based on the geotechnical subsurface exploration, the laboratory test results, and our engineering analyses, the proposed buildings, bus parking canopy, retaining walls, and loading docks/trash enclosure walls can be supported on a spread and continuous footing foundation system or monolithic slab with turned down edges foundation system bearing on a zone of structural fill/recompacted existing soils. In addition, a slab-on-grade floor system supported on a zone of structural fill/recompacted existing soils can be used, provided some movement can be tolerated.

On-site soils clay soils are suitable for use as structural/engineered fill beneath foundations, floor slabs, walls, and pavements, provided they are processed and compacted as outlined in this report. Shale bedrock, if encountered, should not be used as structural fill within the building area or beneath walls, dumpster pads, and pavements. Extra effort and processing of the clays will likely be required to provide a uniform structural fill material. As an alternative, imported soils could be used as structural fill or blended with the on-site clays to facilitate construction.

Any engineered fill required to raise the site to construction grade can be included in the recommended structural/engineered fill zone. Foundation excavations within the clay soils are expected to be achieved with conventional earth moving equipment. Excavations that extend to the hard to very hard shale bedrock may require extra effort and/or heavy-duty excavation equipment. Loose or caving soils will likely be encountered in shallow excavations such as foundation footings. Additional site preparation recommendations, including subgrade improvement and fill placement, are provided in the **Earthwork** section. Groundwater was not encountered within the maximum depths of exploration during or at the completion of drilling.

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

Earthwork

Earthwork is anticipated to include clearing and grubbing, excavations, and fill placement. The following sections provide recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

Site Preparation

Prior to placing fill (if necessary), topsoil, organic soils, and any loose, soft, or otherwise unsuitable materials should be removed from proposed construction areas. Removal depths will likely vary across the site and should be adjusted based on conditions encountered during site preparation. Organic soils removed during site preparation should not be used as fill beneath the prosed new building, retaining wall, and pavement areas. Complete stripping of the topsoil/root mats should be performed in the proposed building and parking/driveway areas.

Subgrade Preparation

We recommend that the soils within the footprint of the proposed building structures (long term care and maintenance building) be removed and recompacted to a minimum depth of 3 feet below the bottom of shallow foundations. We recommend that the soils within the footprint of the proposedbus parking canopy, loading dock walls, and retaining walls be removed and recompacted to a minimum depth of 2 foot below the bottom of shallow foundations. We recommend that the soils within the footprint of the proposed trash enclosure walls be removed and recompacted to a minimum depth of 1 foot below the bottom of shallow foundations. We recommend that a minimum 3 feet of structural fill/recompacted native soils be removed and replaced with structural fill below floor slabs. Structural fill placed beneath the entire footprint of the building should extend horizontally a minimum distance of 2 feet beyond the outside edge of footings. On-site clay soils are considered suitable to be used as structural fill/recompacted existing soils. Extra effort and processing of the clays will likely be required to provide a uniform structural fill material. As an alternative, imported soils could be used as structural fill or blended with the on-site clays to facilitate construction.

Subgrade soils beneath proposed exterior slabs and pavements should be removed and recompacted to a depth of 12-inches beneath proposed slab or pavement section.

The subgrade should be proofrolled with an adequately loaded vehicle such as a fully-loaded tandem-axle dump truck. The proofrolling should be performed under the observation of the Geotechnical Engineer or representative. Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. Such areas should either be removed or modified by treating/applying/mixing with aggregate or rock. Excessively wet or dry material should either be removed or moisture conditioned and recompacted.

All 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 structural fill soils should then be placed to the proposed design grade and the moisture content and compaction of subgrade soils should be maintained until foundation or pavement construction.

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

Excavation

We anticipate that shallow excavations for the proposed construction can be accomplished with conventional earthmoving equipment. Excavations extending into the hard to very hard shale bedrock may require extra effort and/or heavy-duty excavation equipment. The bottom of excavations should be thoroughly cleaned of loose soils and disturbed materials prior to backfill placement and/or construction.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill and general fill. Structural fill is material used below, or within 10 feet of the structure to include the floor slab, exterior flatwork, sidewalks, pavements, and other movement sensitive elements of the project. General fill is material used to achieve grade outside of these areas.

Reuse of On-Site Soil: Excavated on-site soil may be selectively reused as fill below structures, walls, slabs, pavement, and landscaping areas. If encountered, shale bedrock should not be reused as fill.

Material property requirements for on-site soil for use as general fill and structural fill are noted in the table below:

Property	General Fill	Structural Fill [1,2]
Composition	Free of deleterious material	Free of deleterious material
Maximum particle size	3 inches (or 2/3 of the lift thickness)	2 inches
Fines content	Not limited	Not limited
Plasticity	Not limited	Maximum plasticity index of 25
GeoModel Layer Expected to be Suitable[3]	1 and 2	1

1. Extra effort and processing of the clays will likely be required to provide a uniform structural fill material. As an alternative, imported soils could be used as structural fill or blended with the on-site clays to facilitate construction.
2. Shale bedrock not suitable for use as structural fill
3. Based on subsurface exploration. Actual material suitability should be determined in the field at time of construction.

Imported Fill Materials: Imported fill materials should meet the following material property requirements. Regardless of its source, compacted fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade.

Soil Type [1]	USCS Classification	Acceptable Parameters (for Structural Fill)
Low Plasticity Cohesive	CL	Liquid Limit less than 30 Plasticity index less than 15
Granular	GW, GP, GM, GC, SW, SP, SM, SC	Less than 50% passing No. 200 sieve

1. Structural and general fill should consist of approved materials free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation prior to use on this site. Additional geotechnical consultation should be provided prior to use of uniformly graded gravel on the site.

Fill Placement and Compaction Requirements

Structural and general fill should meet the following compaction requirements.

Item	Structural Fill	General Fill
Maximum Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used. Thicker loose lift thickness can be used provided that the minimum compaction requirements are met throughout the entire lift. 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used	Same as structural fill
Minimum Compaction Requirements [1,2]	95% of max. below foundations and within 1 foot of finished pavement subgrade 95% of max. above foundations, below floor slabs, and more than 1 foot below finished pavement subgrade	90% of max.
Water Content Range [1]	Low plasticity cohesive: -2% to +2% of optimum Granular: -3% to +3% of optimum	As required to achieve min. compaction requirements

Item	Structural Fill	General Fill

1. Maximum density and optimum water content as determined by the Modified Proctor test (ASTM D 1557).
2. If the granular material is a coarse sand or gravel, or of a uniform size, or has a low fines content, compaction comparison to relative density may be more appropriate. In this case, granular materials should be compacted to at least 70% relative density (ASTM D 4253 and D 4254). Materials not amenable to density testing should be placed and compacted to a stable condition observed by the Geotechnical Engineer or representative.

Utility Trench Backfill

Any soft or unsuitable materials encountered at the bottom of utility trench excavations should be removed and replaced with structural fill or bedding material in accordance with public works specifications for the utility be supported. This recommendation is particularly applicable to utility work requiring grade control and/or in areas where subsequent grade raising could cause settlement in the subgrade supporting the utility. Trench excavation should not be conducted below a downward 1:1 projection from existing foundations without engineering review of shoring requirements and geotechnical observation during construction.

On-site sand materials are considered suitable for foundation, embedment, and backfill of utility and pipe trenches from 1 foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances. Utility installation should be performed in accordance with the applicable Local or State jurisdiction.

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 plasticity index requirements of structural/engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

Utility trenches are a common source of water infiltration and migration. Utility trenches penetrating beneath the structures should be effectively sealed to restrict water intrusion and flow through the trenches, which could migrate below the structures. The trench backfill should be placed and compacted to comply with the water content and compaction recommendations for structural fill stated previously in this report.

Grading and Drainage

All grades must provide effective drainage away from the buildings and structures during and after construction and should be maintained throughout the life of the structures.

Water retained next to the building and structures can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should incorporate gutters/drains with downspouts that discharge onto splash blocks at a distance of at least five (5) feet from the building.

Exposed ground should be sloped and maintained at a minimum 3% away from the buildings and structures for at least 5 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structures should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Earthwork Construction Considerations

Shallow excavations for the proposed structure are anticipated to be accomplished with conventional construction equipment. Excavations extending to shale bedrock may require extra effort and/or heavy-duty excavation equipment. Upon completion of filling and grading, care should be taken to maintain the subgrade water content prior to construction of grade-supported improvements such as floor slabs and pavements. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade freezes, desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to floor slab construction.

Water was not encountered in majority of the borings, and excessive seepage is generally not anticipated in excavations for this project (e.g., for footing construction and utility installation). If seepage is encountered, the contractor is responsible for employing appropriate dewatering methods to control seepage and facilitate construction. In our experience, dewatering of excavations in clay soils can typically be accomplished using sump pits and pumps. If sand seams or layers are encountered, a more extensive dewatering system may be required.

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

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

Excavations or other activities resulting in ground disturbance have the potential to affect adjoining properties and structures. Our scope of services does not include review of available final grading information or consider potential temporary grading performed by the contractor for potential effects such as ground movement beyond the project limits. A preconstruction/ precondition survey should be conducted to document nearby property/infrastructure prior to any site development activity. Excavation or ground disturbance activities adjacent or near property lines should be monitored or instrumented for potential ground movements that could negatively affect adjoining property and/or structures.

Construction Observation and Testing

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

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, as recommended by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas. Where not specified by local ordinance, one density and water content test should be performed for every 100 linear feet of compacted utility trench backfill and a minimum of one test performed for every 12 vertical inches of compacted backfill.

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

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

Shallow Foundations

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

Design Parameters – Compressive Loads

Item	Description
Maximum Net Allowable Bearing Pressure [1, 2]	▪ LTC and Maintenance Buildings: 2,500 psf ▪ Retaining Walls: 2,000 psf ▪ Bus Parking Canopy: 2,000 psf ▪ Trash Dumpster Enclosure Walls: 1,500 psf
Required Bearing Stratum [3]	▪ LTC and Maintenance Buildings: Minimum of three (3) feet of structural fill/recompacted native soils ▪ Retaining Walls: Minimum of two (2) feet of structural fill/recompacted native soils ▪ Bus Parking Canopy: Minimum of two (2) feet of structural fill/recompacted native soils ▪ Trash Dumpster Enclosure Walls: Minimum of one (1) foot of structural fill/recompacted native soils
Minimum Foundation Dimensions	Wall Foundations – 18 inches Column Foundations – 24 inches
Ultimate Passive Resistance[4] (equivalent fluid pressures)	290 pcf (on-site clay soils) 390 pcf (granular backfill)
Sliding Resistance [5]	0.35 allowable coefficient of friction - granular material
Minimum Embedment below Finished Grade [6]	Exterior footings in unheated areas: 24 inches Interior footings in heated areas: 12 inches
Estimated Total Settlement from Structural Loads [2]	Less than about 1 inch
Estimated Differential Settlement [2, 7]	About 3/4 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. Values assume that exterior grades are no steeper than 20% within 10 feet of structure. Light column loads can be supported on properly reinforced thickened slabs integral with the main floor

Item	Description

slab. Moderate to heavy column loads should be supported on individual footings isolated from the floor slab.

2. Values provided are for maximum loads noted in **Project Description**. Additional geotechnical consultation will be necessary if higher loads are anticipated.
3. Unsuitable, loose or soft soils should be overexcavated and replaced per the recommendations presented in **Earthwork**.
4. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face. Assumes no hydrostatic pressure.
5. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Frictional resistance for granular materials is dependent on the bearing pressure which may vary due to load combinations. For fine-grained materials, lateral resistance using cohesion should not exceed ½ the dead load.
6. Embedment necessary to minimize the effects of frost and/or seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
7. Differential settlements are noted for equivalent-loaded foundations and bearing elevation as measured over a span of 50 feet.

Design Parameters – Overturning and Uplift Loads

Shallow foundations subjected to overturning loads (i.e. – bus parking canopy) should be proportioned such that the resultant eccentricity is maintained in the center-third of the foundation (e.g., e < b/6, where b is the foundation width). This requirement is intended to keep the entire foundation area in compression during the extreme lateral/overturning load event. Foundation oversizing may be required to satisfy this condition.

Uplift resistance of spread footings can be developed from the effective weight of the footing and the overlying soils with consideration to the IBC basic load combinations.

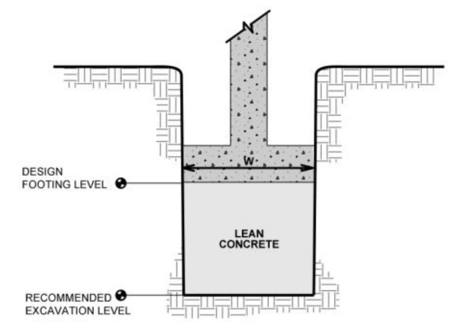
Item	Description
Soil Moist Unit Weight	115 pcf
Soil weight included in uplift resistance	Soil included within the prism extending up from the top perimeter of the footing at an angle of 20 degrees from vertical to ground surface

Foundation Construction Considerations

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

Loose or soft soils exposed at the surface of footing excavations may require surficial compaction with hand-held dynamic compaction equipment prior to placing structural fill, steel, and/or concrete. Should surficial compaction not be adequate, construction of a working surface consisting of either crushed stone or a lean concrete mud mat may be required prior to the placement of reinforcing steel and construction of foundations.

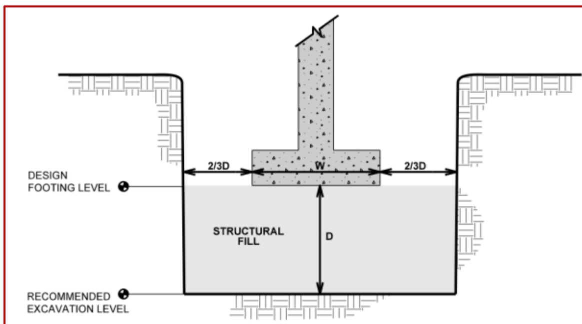
If unsuitable bearing soils are observed at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. The lean concrete replacement zone is illustrated on the sketch below.



LEAN CONCRETE BACKFILL

NOTE: EXCAVATIONS ARE SHOWN VERTICAL; HOWEVER, THE SIDEWALLS SHOULD BE SLOPED AS NECESSARY FOR SAFETY

Overexcavation for structural fill placement below footings should be conducted as shown below. The overexcavation should be backfilled up to the footing base elevation, with structural fill placed, as recommended in the **Earthwork** section.



OVER-EXCAVATION / BACKFILL ZONE

NOTE: EXCAVATIONS ARE SHOWN VERTICAL; HOWEVER, THE SIDEWALLS SHOULD BE SLOPED AS NECESSARY FOR SAFETY

Floor Slabs

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

Floor Slab Design Parameters

Item	Description
Floor Slab Support[1]	Minimum 3 feet of structural fill/recompacted native soils Minimum of 4 inches of base course [2]
Estimated Modulus of Subgrade Reaction [3]	150 pounds per square inch per inch (psi/in) for a soil subgrade prepared as recommended in this report Note: A value of 200 pci can be used at the top of the compacted base course[2]

1. Unless adequately reinforced for differential movement, floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.
2. In areas of moderate to heavy floor slab loading conditions
3. Modulus of subgrade reaction is an estimated value based upon our experience with the subgrade condition, the requirements noted in **Earthwork**, and the floor slab support as noted in this table. It is provided for point loads. For large area loads the modulus of subgrade reaction would be lower.

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

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

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

Floor Slab Construction Considerations

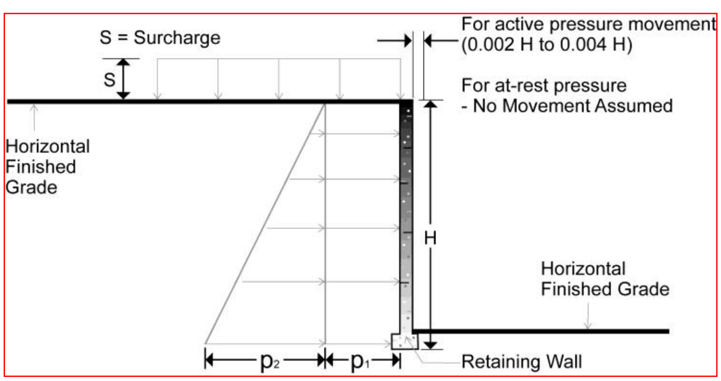
Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor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

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

Lateral Earth Pressures

Design Parameters

Structures with unbalanced backfill levels on opposite sides, such as loading dock walls and retaining walls, should be designed for earth pressures at least equal to values indicated in the following table. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction, and/or compaction and the strength of the materials being restrained. Two wall restraint conditions are shown in the diagram below. Active earth pressure is commonly used for design of free-standing cantilever loading dock and retaining walls and assumes wall movement. The "at-rest" condition assumes no wall movement and is commonly used for basement walls, loading dock walls, or other walls restrained at the top. The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls (unless stated).



Lateral Earth Pressure Design Parameters

Earth Pressure Condition [1]	Coefficient for Backfill Type [2]	Surcharge Pressure [3] p_1 (psf)	Equivalent Fluid Pressures (psf) [2,4] Unsaturated [5]
Active (Ka)	Granular - 0.29 Cohesive – 0.42	(0.29)S (0.42)S	(35)H (50)H
At-Rest (Ko)	Granular - 0.46 Cohesive – 0.58	(0.46)S (0.58)S	(50)H (70)H
Passive (Kp)	Granular – 3.25 Cohesive – 2.40	N/A N/A	(390)H (290)H

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, wall must move horizontally to mobilize resistance. Fat clay or other expansive soils should not be used as backfill behind the wall.
2. Uniform, horizontal backfill, with a maximum unit weight of 120 pcf for granular soils.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. To achieve "Unsaturated" conditions, follow guidelines in **Subsurface Drainage for Below-Grade Walls** below.

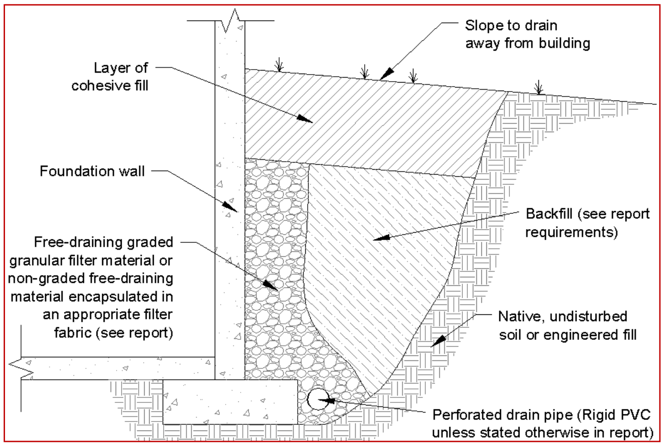
Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 degrees from vertical for the active case.

Footings, floor slabs or other loads bearing on backfill behind walls may have a significant influence on the lateral earth pressure. Placing footings within wall backfill and in the zone of active soil influence on the wall should be avoided unless structural analyses indicate the wall can safely withstand the increased pressure.

The lateral earth pressure recommendations given in this section are applicable to the design of rigid retaining walls subject to slight rotation, such as cantilever, or gravity type concrete walls. These recommendations are not applicable to the design of modular block - geogrid reinforced backfill walls (also termed MSE walls). Recommendations covering these types of wall systems are beyond the scope of services for this assignment. However, we would be pleased to develop a proposal for evaluation and design of such wall systems upon request.

Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls with heights greater than about 3 feet and extend below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5% passing the No. 200 sieve. The free-draining aggregate should be encapsulated in a filter fabric.



As an alternative to free-draining granular fill, a prefabricated drainage structure may be used. A prefabricated drainage structure is a plastic drainage core or mesh which is covered with filter fabric to prevent soil intrusion and is fastened to the wall prior to placing backfill.

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.

Clay soils, such as those encountered at this site, generally provide relatively poor pavement support and are susceptible to rutting and pumping under repeated heavy vehicle traffic. Pavement subgrades should be prepared in accordance with the recommendations presented in the **Site Preparation** and **Fill Placement and Compaction Requirements** sections of this report. As a minimum, the upper 1 foot of subgrade soils below pavements should consist of low-plasticity, controlled engineered fill (liquid limit of 45 or less and a plasticity index of 30 or less). A greater thickness of controlled engineered fill or additional subgrade stabilization may be required to provide adequate support of heavy equipment during construction. All subgrade soils should be compacted in accordance with the density and moisture content ranges described in the **Fill Placement and Compaction Requirements** section of this report

Pavement Design Parameters

Design of Asphaltic Concrete (AC) pavements is based on the procedures outlined in the National Asphalt Pavement Association (NAPA) Information Series 109 (IS-109). Design of Portland Cement Concrete (PCC) pavements is based upon American Concrete Institute (ACI) 330R-01; Guide for Design and Construction of Concrete Parking Lots.

The design of pavement thickness was based on the following:

Design of Asphaltic Concrete (AC) pavements is based on the procedures outlined in the National Asphalt Pavement Association (NAPA) Information Series 109 (IS-109). Design of Portland Cement Concrete (PCC) pavements is based upon American Concrete Institute (ACI) 330R-01; Guide for Design and Construction of Concrete Parking Lots.

The pavements should be supported on a minimum of 12-inches of compacted subgrade as recommended in the **Earthwork** section.

The design of pavement thickness was based on the following:

The NAPA traffic classification for asphalt concrete pavements is assumed to consist of:

- Class I: Parking stalls for autos and/or pickup trucks – 200 to 300 vehicles per day
- Class II: Traffic consisting of delivery trucks, trash pickup, and fire trucks - 7 delivery vehicles per week, 1 trash collection vehicle per week, daily shuttle buses, and periodic fire truck

The anticipated ACI traffic categories and daily truck traffic is assumed to consist of:

- Category A: Car parking areas and access lanes, including trucks – 200 to 300 car vehicles per day and 7 delivery trucks per week
- Category A-1: trash truck or fire truck lanes – 1 trash truck per week, daily shuttle buses, and periodic fire truck

The following soil subgrade parameters were used in the pavement design:

- Soil characterization of Medium per NAPA
- Modulus of subgrade reaction of 150 pci

Pavement Section Thicknesses

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

Asphaltic Concrete Design

Layer	Thickness (inches)	
	Traffic Class I [1]	Traffic Class II [1]
AC [2, 3]	4	6
Base Course (BC)	6	6

1. See **Project Description** for more specifics regarding traffic assumptions.
2. All materials should meet the current New Mexico Department of Transportation (NMDOT) Standard Specifications for Highway and Bridge Construction.
   - Asphaltic Surface - NMDOT Type SP-III or IV Hot Mix Asphalt (HMA): Section 423 or COA Section 116
   - Base Course - NMDOT Type I Base Course: Section 303
3. A minimum 1.5-inch surface course should be used on ACC pavements.

The following table provides our estimated minimum thickness of PCC pavements.

Portland Cement Concrete Design

Layer	Thickness (inches)		
	Traffic Category A [1]	Traffic Category A-1 [1]	Dumpster Pads [1]
PCC [2]	6	6.5	7

1. See **Project Description** for more specifics regarding traffic classifications.
2. All materials should meet the current NMDOT Standard Specifications for Highway and Bridge Construction.
   - Concrete Pavement - NMDOT Portland Cement Concrete Class AA: Section 451

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

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

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

Pavement Drainage

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

Based on the possibility of shallow and/or perched groundwater, we recommend installing a pavement subdrain system to control groundwater, improve stability, and improve long-term pavement performance.

Pavement Maintenance

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

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

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.
- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage.

- Install pavement drainage systems surrounding areas anticipated for frequent wetting.
- Install joint sealant and seal cracks immediately.
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

General Comments

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

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

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

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

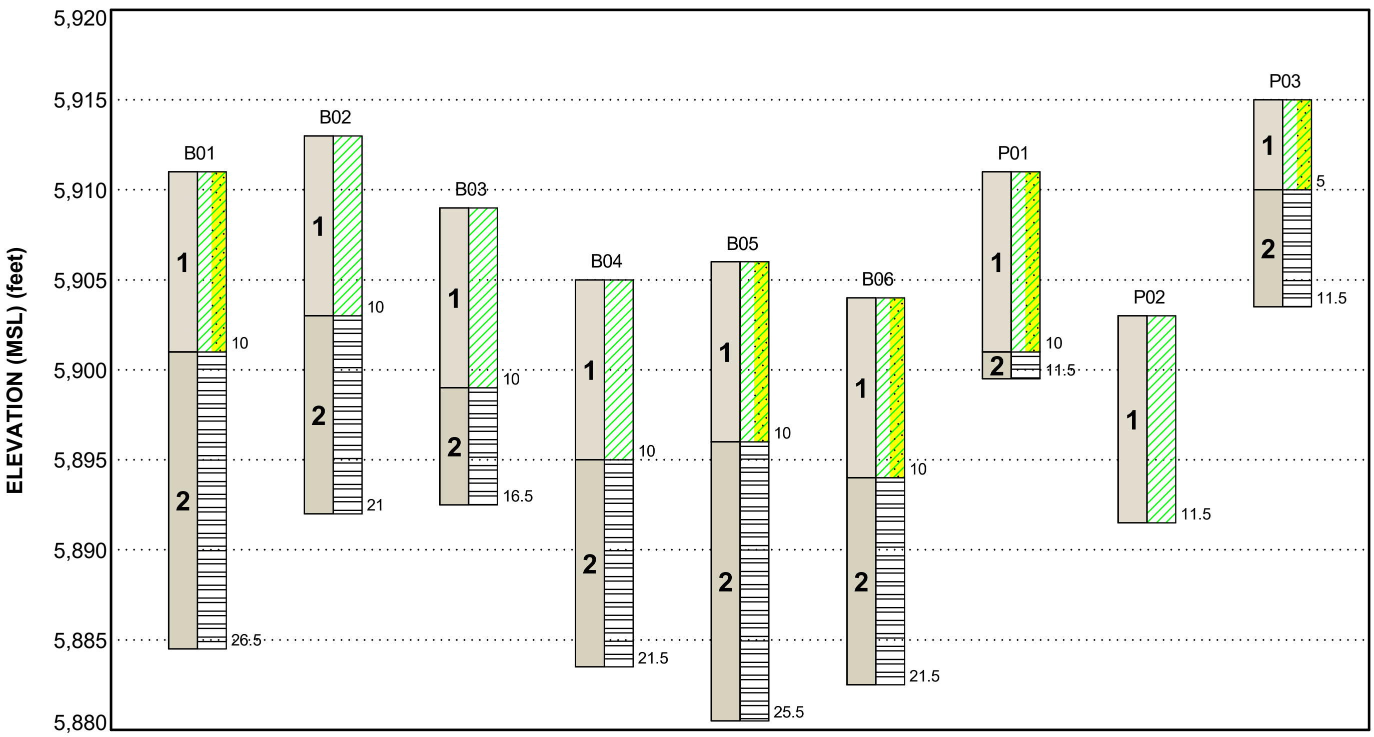
Figures

Contents:

GeoModel

GEOMODEL

SCCCSHD Long Term Care Facility ■ Springer, NM
Terracon Project No. 66235001



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	Firm to Very Stiff Fine Grained Soils	Clay soils with variable amounts of sand and gravel
2	Hard to Very Hard Sedimentary Bedrock	Bedrock consisting of a sandy shale with sanstone interbedded

LEGEND

- Lean Clay with Sand
- Shale
- Lean 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.

Attachments

Exploration and Testing Procedures

Field Exploration

Number of Borings	Approximate Boring Depth (feet)	Location
5	16.5 to 26.5	Building Area
1	21.5	Maintenance Building and Bus Parking Canopy
1	11.5	Trash Enclosure Area
2	11.5	Pavement/Retaining Wall Areas

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

Subsurface Exploration Procedures: We advanced the borings with a truck-mounted, rotary drill rig using continuous flight augers hollow stem augers. Three (3) 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 10 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.

We also observed the boreholes while drilling and at the completion of drilling for the presence of groundwater. Groundwater levels (if applicable) are shown on the attached boring logs.

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 and Rock by Mass
- 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
- EPA Method 300 Water soluble sulfates
- ASTM G187 Standard Test Method for Soil Resistivity Using 2-Electrode Soil Box
- ASTM G51 Standard Test Method for pH

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

Note: All attachments are one page unless noted above.

SITE LOCATION

SCCCSHD Long Term Care Facility ■ Springer, NM

March 31, 2023 ■ Terracon Project No. 66235001

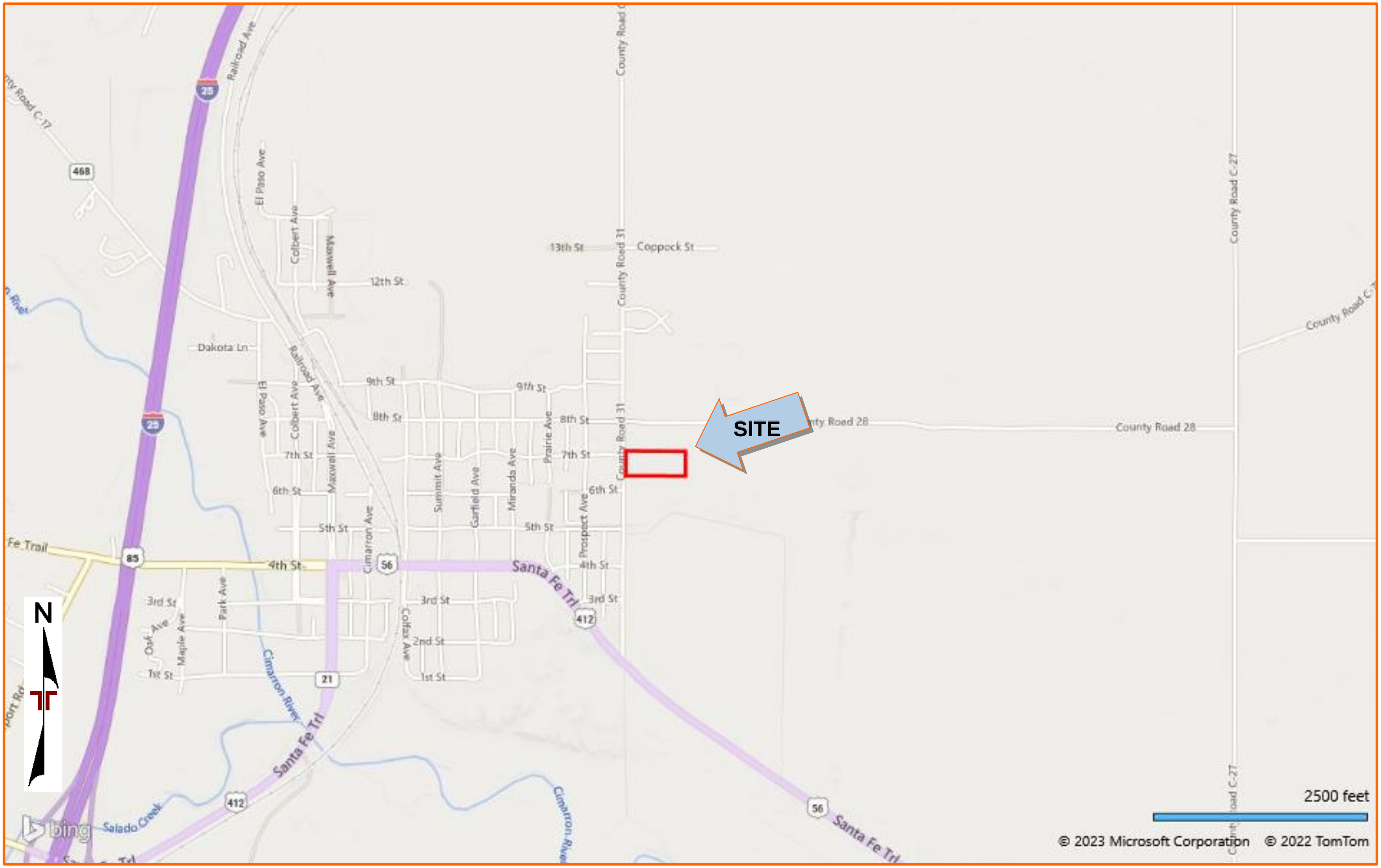


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

STREET MAPS PROVIDED BY MICROSOFT BING MAPS

EXPLORATION PLAN

SCCCSHD Long Term Care Facility ■ Springer, NM

March 31, 2023 ■ Terracon Project No. 66235001

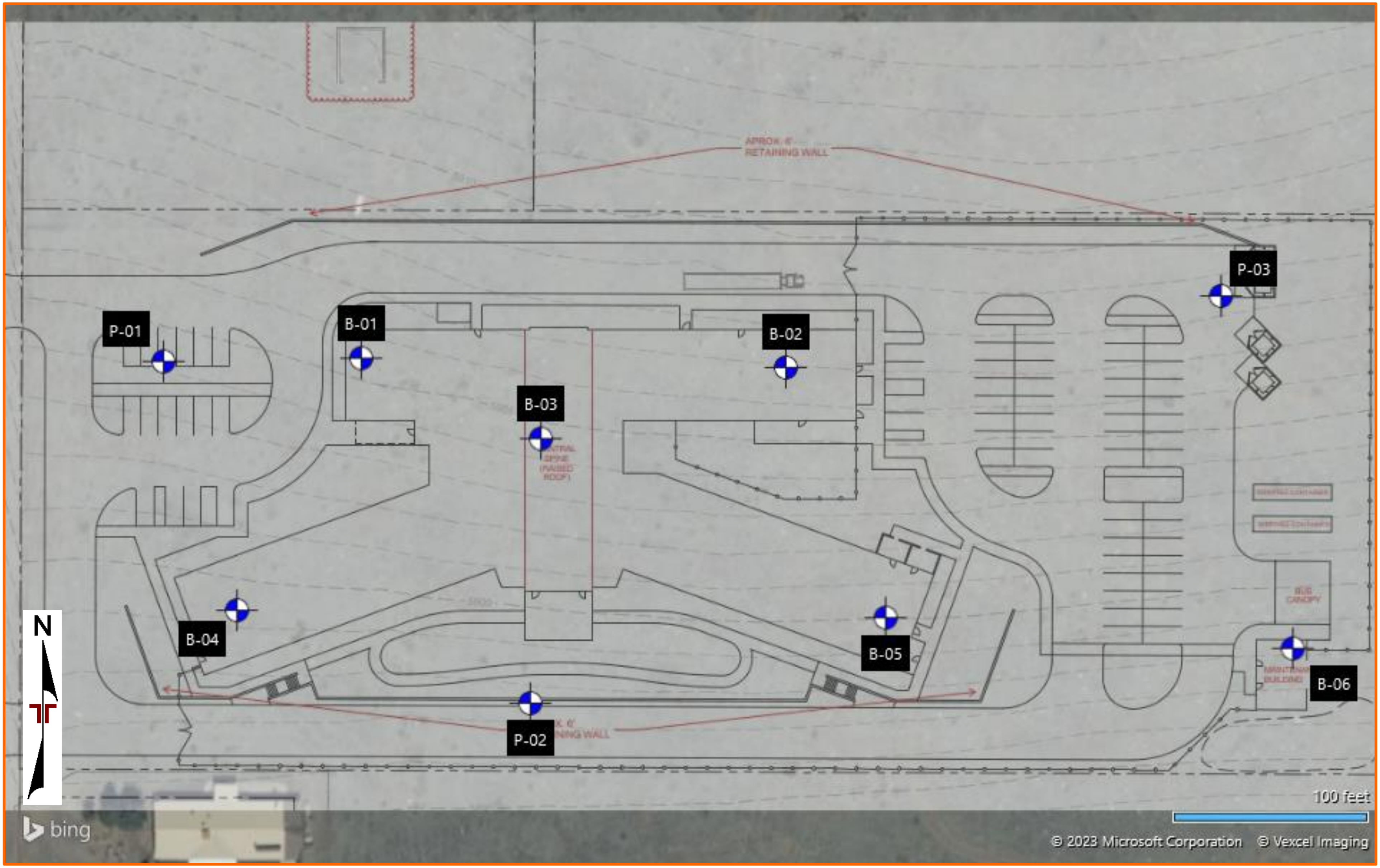


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Boring Logs (B-01 through B-06 and P-01 through P-03)
Atterberg Limits Results
Grain Size Distribution (2)
Swell Consolidation Test (4)
Corrosivity/Corrosion Potential
Summary of Laboratory Results (2)

Note: All attachments are one page unless noted above.

BORING LOG NO. B01

PROJECT: SCCCSHD Long Term Care Facility

**CLIENT: S. Central Colfax County Special Hospital District
Springer, NM**

**SITE: SEC of 8th St and Eastern Ave (HWY 31)
Springer, NM**

LOCATION See Exploration Plan

Latitude: 36.3645° Longitude: -104.5837°

Surface Elev.: 5911 (Ft.)

MODEL LAYER	DEPTH	DESCRIPTION	ELEVATION (Ft.)
1		**LEAN CLAY WITH SAND (CL)**, trace gravel, light brown and brown, stiff to very stiff	
	10.0		5901
2		**SANDY SHALE**, brown, hard to very hard, with sandstone interbedded	
	26.5		5884.5
		Boring Terminated at 26.5 Feet	

FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
5-9	-0.76 @ 500psf	7.0	81		
6-8-10 N=18		8.9		41-14-27	83
15-44-50/1"		7.1			
34-25-50/1"		5.8			
35-23-50/1"		7.5			
29-29-50/1"		8.0			

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 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 were provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

Boring Started: 02-16-2023 | Boring Completed: 02-16-2023

Drill Rig: CME 45 | Driller: Envirodrill

Project No.: 66235001

BORING LOG NO. B02

PROJECT: SCCCSHD Long Term Care Facility

CLIENT: S. Central Colfax County Special Hospital District Springer, NM

SITE: SEC of 8th St and Eastern Ave (HWY 31) Springer, NM

LOCATION See Exploration Plan

Latitude: 36.3645° Longitude: -104.5829°

Surface Elev.: 5913 (Ft.)

MODEL LAYER	DEPTH	DESCRIPTION	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		**LEAN CLAY (CL)**, trace sand, trace gravel, light brown to brown, stiff to very stiff										
							3-5-5 N=10		6.5		32-15-17	85
				5			10-15		6.5	89		
	10.0		5903	10								
2		**SANDY SHALE**, brown, hard to very hard, with sandstone interbedded					20-44-50 N=94		7.0			
				15			30-24-50/1"		6.6			
				20			32-21-50/1"		5.6			
	21.0		5892									
		Boring Terminated at 21 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 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 were provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

Boring Started: 02-16-2023	Boring Completed: 02-16-2023
Drill Rig: CME 45	Driller: Envirodrill
Project No.: 66235001	

BORING LOG NO. B03

PROJECT: SCCCSHD Long Term Care Facility

CLIENT: S. Central Colfax County Special Hospital District Springer, NM

SITE: SEC of 8th St and Eastern Ave (HWY 31) Springer, NM

LOCATION See Exploration Plan

Latitude: 36.3644° Longitude: -104.5833°

Surface Elev.: 5909 (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		**LEAN CLAY (CL)**, light brown to brown, medium stiff to very stiff									
						5-10	-0.56 @ 500psf	7.8	82		
								7.6			
			5			8-8-8 N=16		8.2		36-13-23	86
		10.0 / 5899	10								
2		**SANDY SHALE**, hard to very hard				18-20-30 N=50		5.7			
			15			30-40-27 N=67		5.5			
		16.5 / 5892.5									

Boring Terminated at 16.5 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 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 were provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

Boring Started: 02-16-2023	Boring Completed: 02-16-2023
Drill Rig: CME 45	Driller: Envirodrill
Project No.: 66235001	

BORING LOG NO. B04

PROJECT: SCCCSHD Long Term Care Facility

CLIENT: S. Central Colfax County Special Hospital District Springer, NM

SITE: SEC of 8th St and Eastern Ave (HWY 31) Springer, NM

LOCATION See Exploration Plan

Latitude: 36.3641° Longitude: -104.5839°

Surface Elev.: 5905 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH / DESCRIPTION / 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		**LEAN CLAY (CL)**, trace sand, brown, stiff to very stiff									
			2.5–4		X	5-6-6 N=12		6.9		36-19-17	95
			5–6			10-14	+0.03 @ 500psf	7.5	78		
		10.0 — 5895	10								
2		**SANDY SHALE**, brown, firm to very hard, with sandstone interbedded									
			10–11.5		X	7-10-14 N=24		4.3			
			15–16.5		X	22-50/5"		10.4			
			20–21.5		X	21-50/4"		10.6			
		21.5 — 5883.5									
		Boring Terminated at 21.5 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 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 were provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

Boring Started: 02-16-2023	Boring Completed: 02-16-2023
Drill Rig: CME 45	Driller: Envirodrill
Project No.: 66235001	

BORING LOG NO. B05

PROJECT: SCCCSHD Long Term Care Facility

CLIENT: S. Central Colfax County Special Hospital District
Springer, NM

SITE: SEC of 8th St and Eastern Ave (HWY 31)
Springer, NM

LOCATION See Exploration Plan

Latitude: 36.3641° Longitude: -104.5827°

Surface Elev.: 5906 (Ft.)

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1	10.0	5896	**LEAN CLAY WITH SAND (CL)**, brown, stiff to very stiff
2	25.5	5880.5	**SANDY SHALE**, brown, firm to very hard, with sandstone interbedded

Boring Terminated at 25.5 Feet

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SWELL (%)	WATER CONTENT (%)	DRY UNIT WEIGHT (pcf)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2.5–3.5			11-17		9.2	79	39-17-22	82
5–6.5			7-8-6 N=14		6.7			
10–11.5			13-14-15 N=29		6.6			
15–16.5			26-50/4"		6.0			
20–21.5			50/6"		7.5			
25–25.5			50/6"		6.6			

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 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 were provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

Boring Started: 02-16-2023

Boring Completed: 02-16-2023

Drill Rig: CME 45

Driller: Envirodrill

Project No.: 66235001

BORING LOG NO. B06

PROJECT: SCCCSHD Long Term Care Facility

CLIENT: S. Central Colfax County Special Hospital District Springer, NM

SITE: SEC of 8th St and Eastern Ave (HWY 31) Springer, NM

LOCATION See Exploration Plan

Latitude: 36.3641° Longitude: -104.5820°

Surface Elev.: 5904 (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		**LEAN CLAY WITH SAND (CL)**, light brown and brown, stiff to very stiff									
						5-7-9 N=16		6.9			
			5			10-15	-0.47 @ 500psf	7.2	92	29-14-15	79
		10.0 / 5894	10								
2		**SANDY SHALE**, brown, hard to very hard, with sandstone interbedded				15-26-24 N=50		5.1			
			15			35-8-50/1"		7.0			
			20			50/5"		5.3			
		21.5 / 5882.5									

Boring Terminated at 21.5 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 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 were provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

Boring Started: 02-16-2023	Boring Completed: 02-16-2023
Drill Rig: CME 45	Driller: Envirodrill
Project No.: 66235001	

BORING LOG NO. P01

PROJECT: **SCCCSHD Long Term Care Facility**

CLIENT: **S. Central Colfax County Special Hospital District**
Springer, NM

SITE: **SEC of 8th St and Eastern Ave (HWY 31)**
Springer, NM

LOCATION See Exploration Plan

Latitude: 36.3645° Longitude: -104.5840°

Surface Elev.: 5911 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH / DESCRIPTION / 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		**LEAN CLAY WITH SAND (CL)**, brown to light brown, stiff to very stiff									
						7-13		8.3	80	38-16-22	81
			5			6-8-9 N=17		7.8			
		10.0 — 5901	10								
2		**SANDY SHALE**, brown, medium hard				17-16-15 N=31		7.2			
		11.5 — 5899.5									
		Boring Terminated at 11.5 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 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 were provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

Boring Started: 02-16-2023	Boring Completed: 02-16-2023
Drill Rig: CME 45	Driller: Envirodrill
Project No.: 66235001	

BORING LOG NO. P02

PROJECT: SCCCSHD Long Term Care Facility

CLIENT: S. Central Colfax County Special Hospital District Springer, NM

SITE: SEC of 8th St and Eastern Ave (HWY 31) Springer, NM

LOCATION See Exploration Plan

Latitude: 36.3640° Longitude: -104.5834°

Surface Elev.: 5903 (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		**LEAN CLAY (CL)**, trace sand, brown, stiff to very stiff									
						11-9		6.8	86	37-17-20	90
			5			4-5-7 N=12		7.2			
		11.5 / 5891.5	10			5-5-9 N=14		5.9			
		Boring Terminated at 11.5 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 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 were provided by others.

Notes:

WATER LEVEL OBSERVATIONS

Not encountered

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

Boring Started: 02-16-2023	Boring Completed: 02-16-2023
Drill Rig: CME 45	Driller: Envirodrill
Project No.: 66235001	

BORING LOG NO. P03

PROJECT: SCCCSHD Long Term Care Facility

CLIENT: S. Central Colfax County Special Hospital District Springer, NM

SITE: SEC of 8th St and Eastern Ave (HWY 31) Springer, NM

LOCATION See Exploration Plan

Latitude: 36.3646° Longitude: -104.5822°

Surface Elev.: 5915 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH / DESCRIPTION / 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		**LEAN CLAY WITH SAND (CL)**, trace gravel, light brown and brown, stiff to very stiff				10-15		27.5	72	29-15-14	78
		5.0 — 5910	5								
2		**SANDY SHALE**, brown, hard to very hard, with sandstone interbedded				21-30-31 N=61		3.9			
			10			15-38-50 N=88		7.2			
		11.5 — 5903.5									
		Boring Terminated at 11.5 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 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 were provided by others.

Notes:

WATER LEVEL OBSERVATIONS

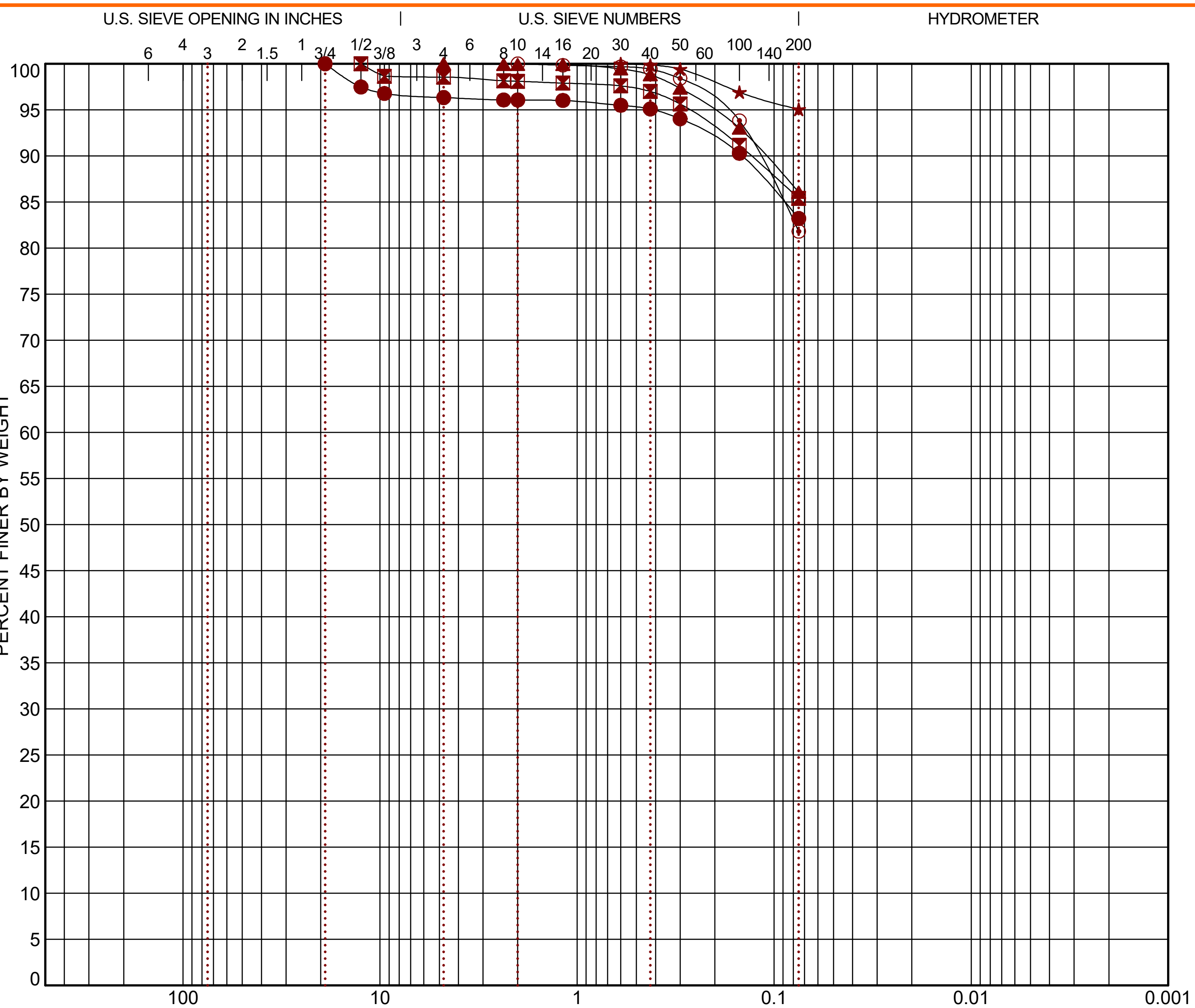
Not encountered

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

Boring Started: 02-16-2023	Boring Completed: 02-16-2023
Drill Rig: CME 45	Driller: Envirodrill
Project No.: 66235001	

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
●	B01	5 - 6.5	LEAN CLAY with SAND (CL)	8.9	41	14	27		
⧗	B02	2.5 - 4	LEAN CLAY (CL)	6.5	32	15	17		
▲	B03	5 - 6.5	LEAN CLAY (CL)	8.2	36	13	23		
★	B04	2.5 - 4	LEAN CLAY (CL)	6.9	36	19	17		
⊙	B05	2.5 - 3.5	LEAN CLAY with SAND (CL)	9.2	39	17	22		

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	B01	5 - 6.5	19				0.0	3.7	13.1		83.2	
⧗	B02	2.5 - 4	12.5				0.0	1.5	13.2		85.4	
▲	B03	5 - 6.5	4.75				0.0	0.0	13.9		86.1	
★	B04	2.5 - 4	0.6				0.0	0.0	4.9		95.1	
⊙	B05	2.5 - 3.5	2				0.0	0.0	18.2		81.8	

PROJECT: SCCCSHD Long Term Care Facility

SITE: SEC of 8th St and Eastern AVe (HWY 31) Springer, NM

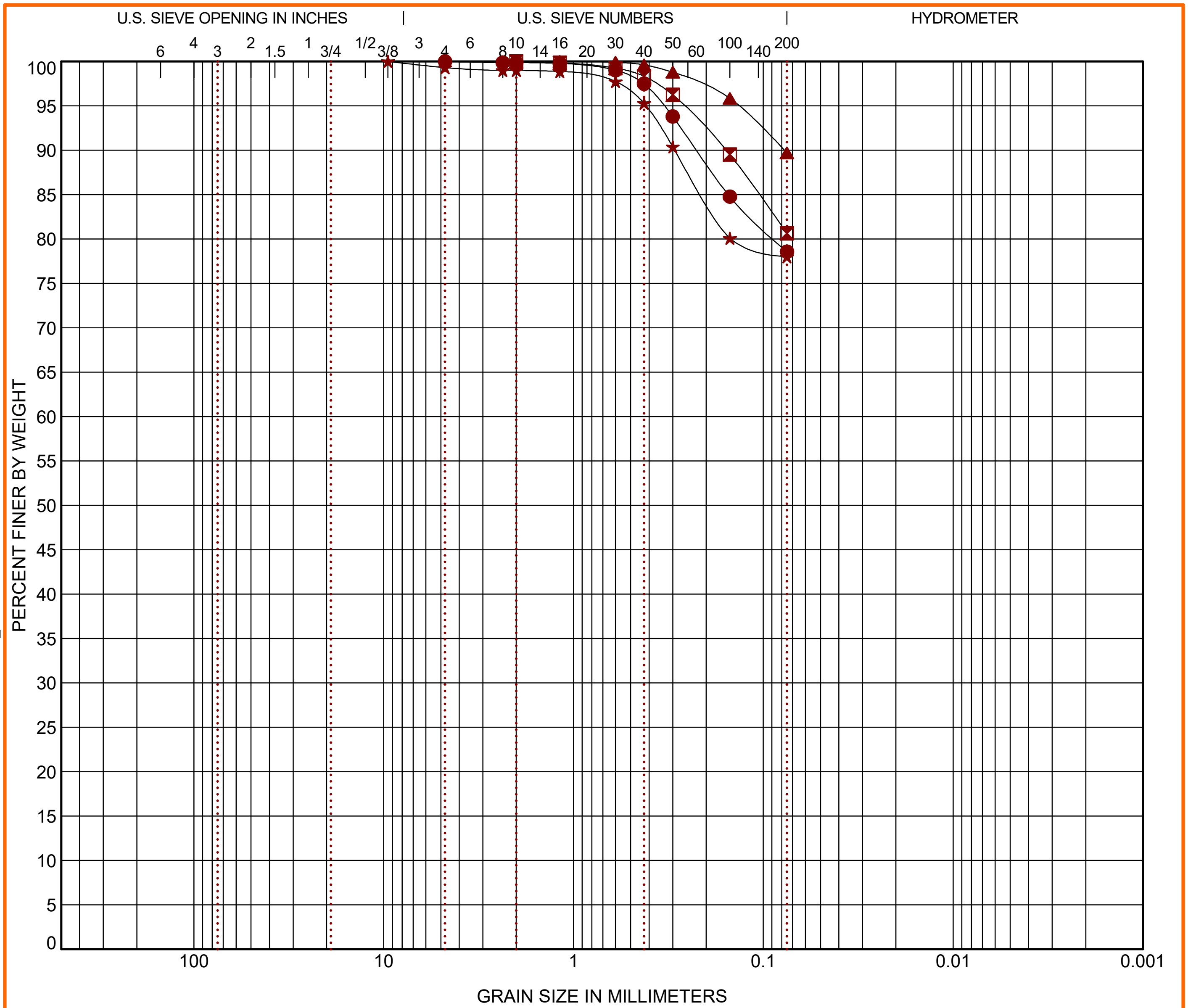
Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

PROJECT NUMBER: 66235001

CLIENT: South Central Colfax County Special Hospital District Springer, NM

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
●	B06	5 - 6	LEAN CLAY with SAND (CL)	7.2	29	14	15		
⊠	P01	2.5 - 3.5	LEAN CLAY with SAND (CL)	8.3	38	16	22		
▲	P02	2.5 - 3.5	LEAN CLAY (CL)	6.8	37	17	20		
★	P03	2.5 - 3.5	LEAN CLAY with SAND (CL)	27.5	29	15	14		

	Boring ID	Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Silt	%Fines	%Clay
●	B06	5 - 6	4.75				0.0	0.0	21.4		78.6	
⊠	P01	2.5 - 3.5	2				0.0	0.0	19.4		80.6	
▲	P02	2.5 - 3.5	1.18				0.0	0.0	10.3		89.7	
★	P03	2.5 - 3.5	9.5				0.0	0.7	21.3		78.0	

PROJECT: SCCCSHD Long Term Care Facility

PROJECT NUMBER: 66235001

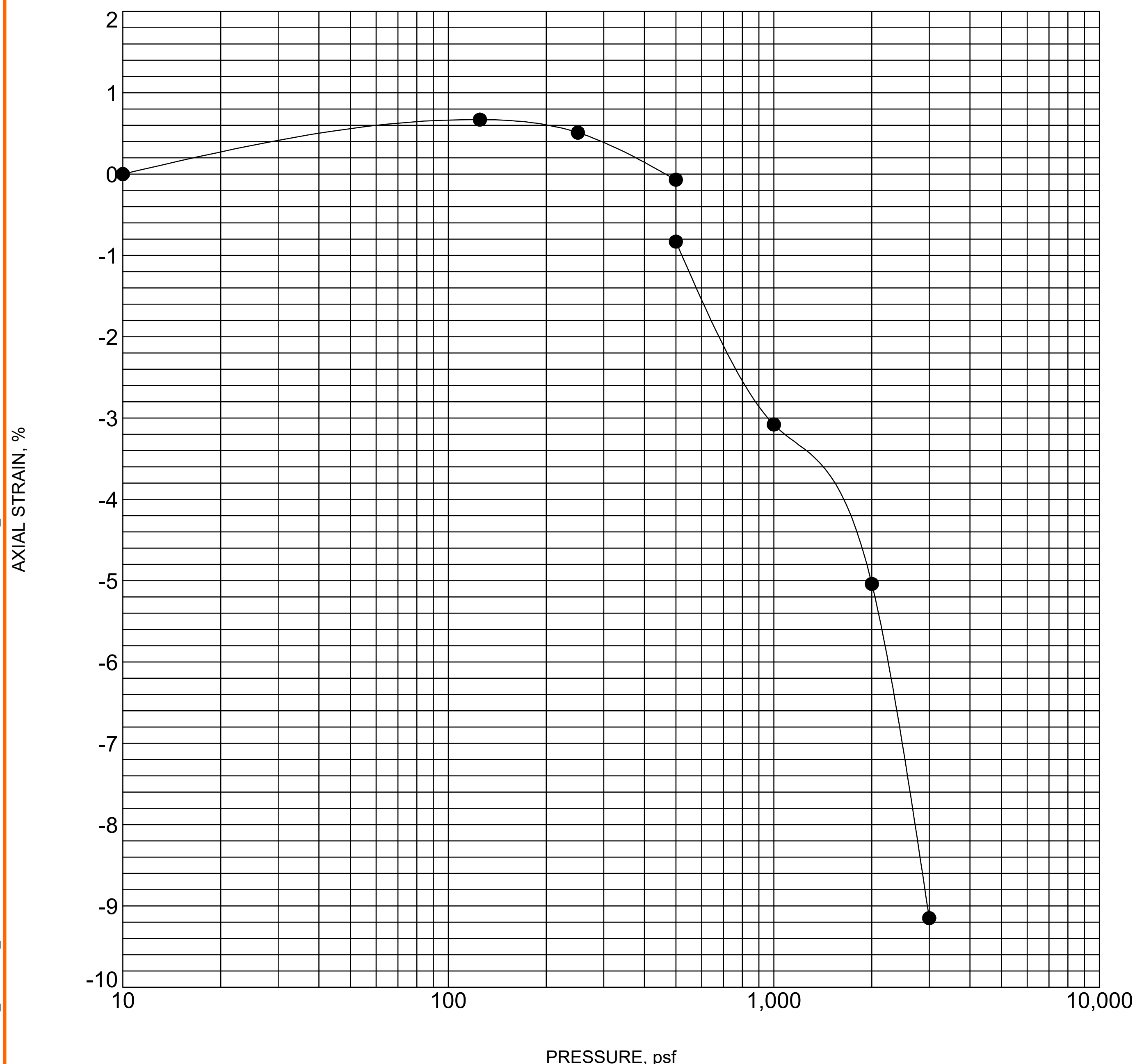
SITE: SEC of 8th St and Eastern AVe (HWY 31)
Springer, NM

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

CLIENT: South Central Colfax County Special Hospital District
Springer, NM

SWELL CONSOLIDATION TEST

ASTM D4546



Specimen Identification		Classification	γ_d, pcf	WC, %
● B01	2.5 - 5 ft	LEAN CLAY WITH SAND(CL)	81	7.0

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

PROJECT: SCCCSHD Long Term Care Facility

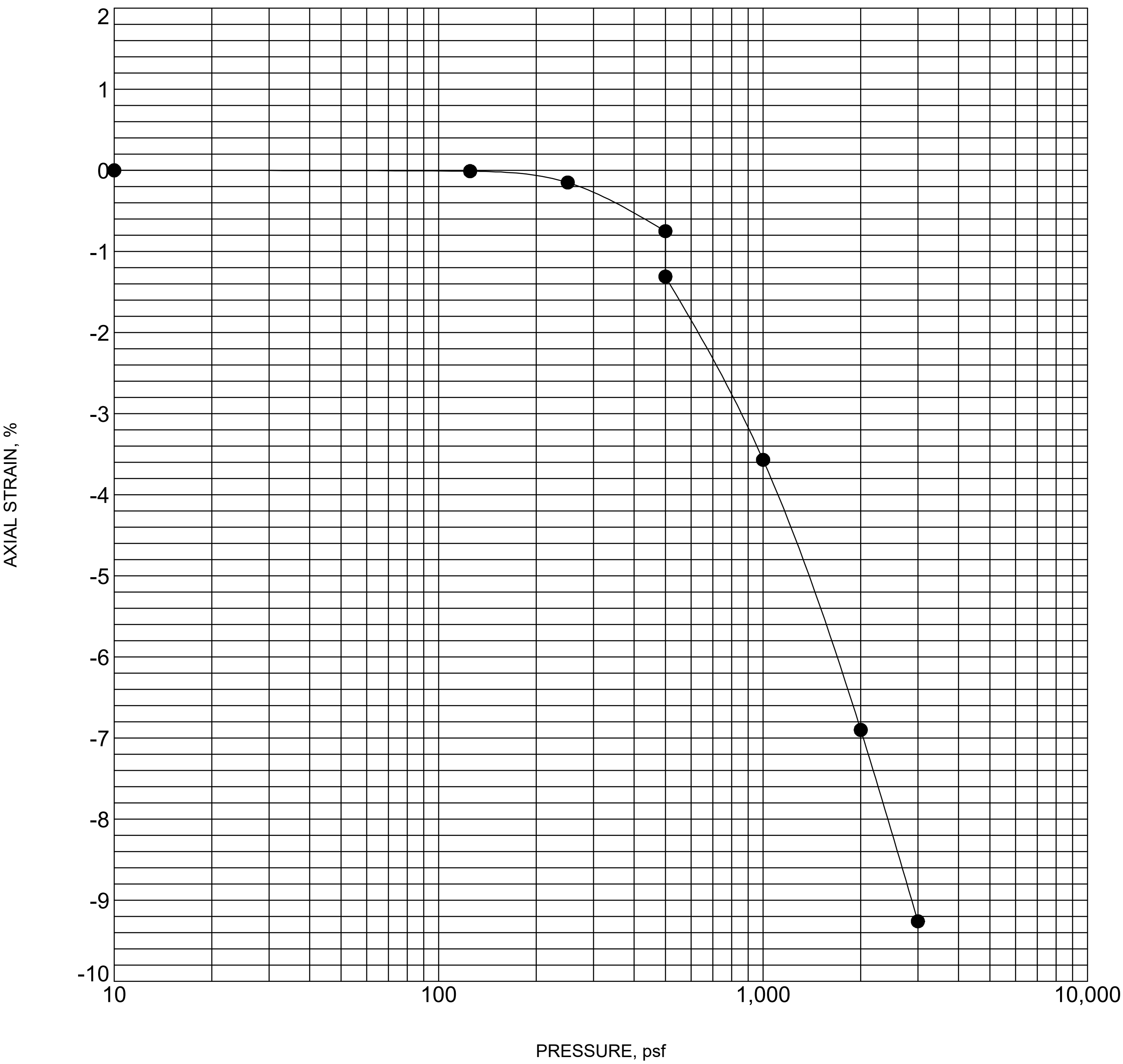
SITE: SEC of 8th St and Eastern AVe (HWY 31)
Springer, NM

Terracon
6805 Academy Pkwy West NE
Albuquerque, NM

PROJECT NUMBER: 66235001

CLIENT: South Central Colfax County Special Hospital District
Springer, NM

SWELL CONSOLIDATION TEST
ASTM D4546

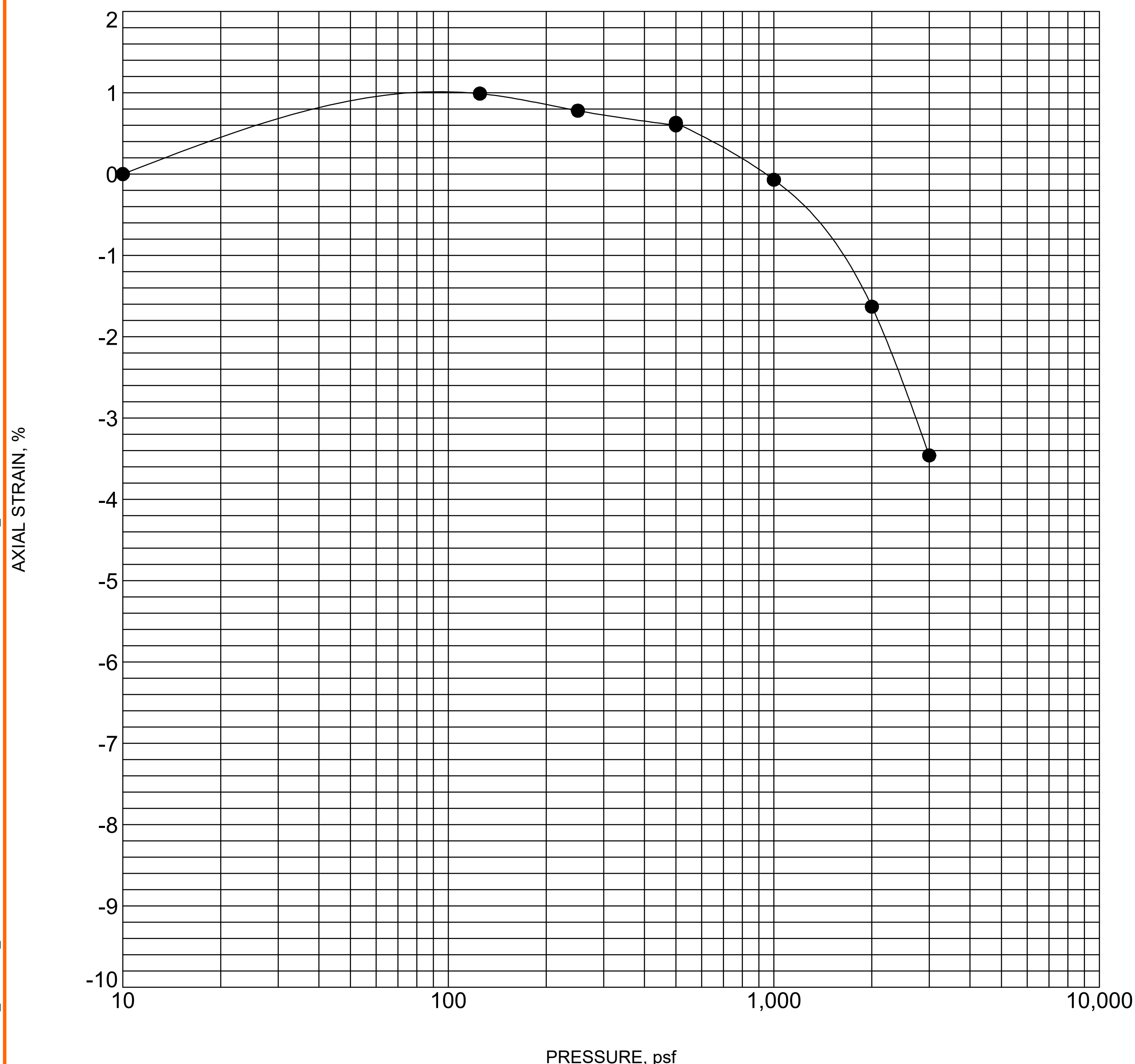


Specimen Identification		Classification	γ_d, pcf	WC, %
●	B03 2.5 - 5 ft	LEAN CLAY(CL)	82	7.8

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

PROJECT: SCCCSHD Long Term Care Facility	Terracon 6805 Academy Pkwy West NE Albuquerque, NM	PROJECT NUMBER: 66235001
SITE: SEC of 8th St and Eastern AVe (HWY 31) Springer, NM		CLIENT: South Central Colfax County Special Hospital District Springer, NM

SWELL CONSOLIDATION TEST
ASTM D4546

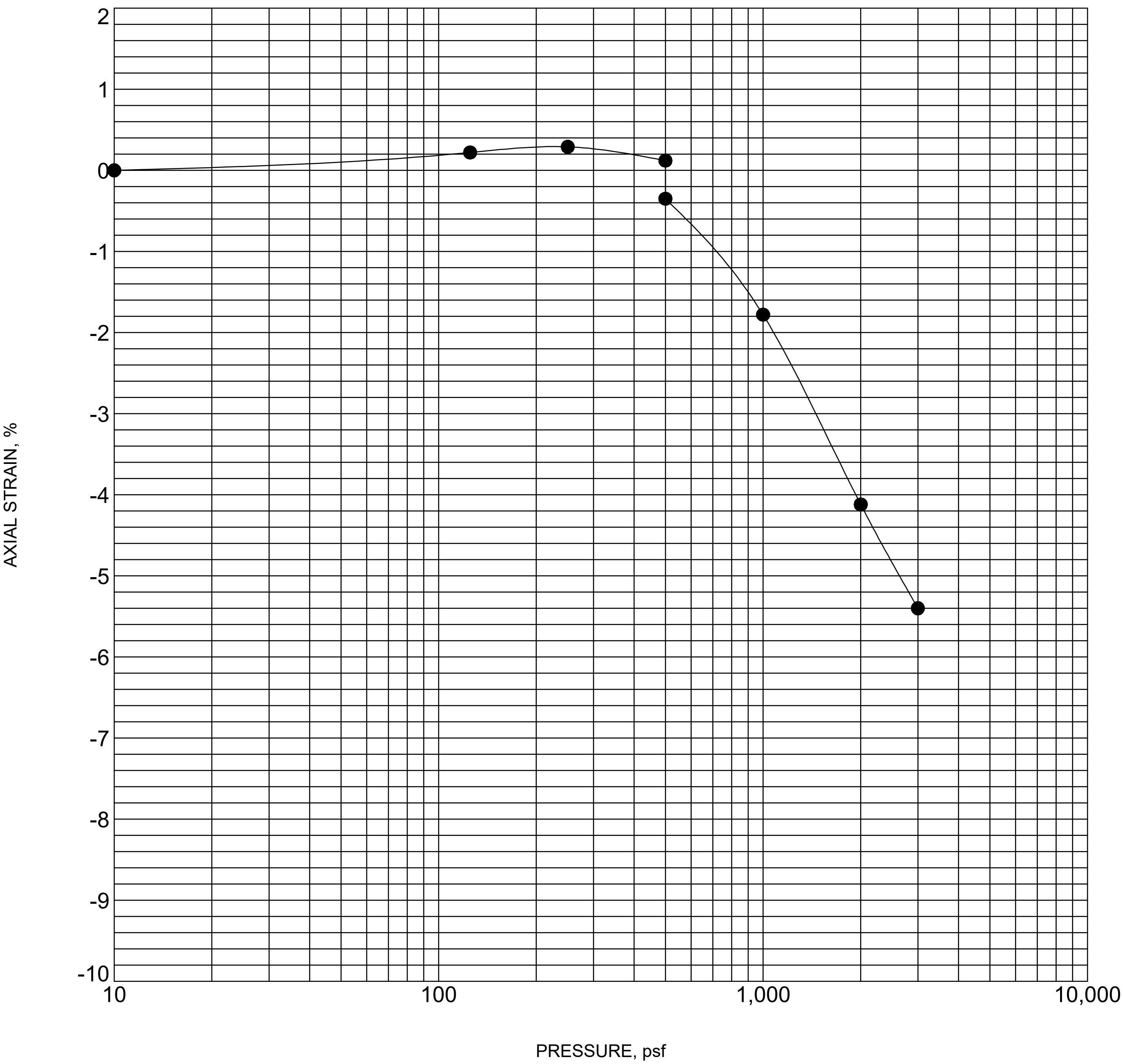


Specimen Identification		Classification	γ_d, pcf	WC, %
● B04	5 - 10 ft	LEAN CLAY(CL)	78	7.5

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

PROJECT: SCCCSHD Long Term Care Facility	Terracon 6805 Academy Pkwy West NE Albuquerque, NM	PROJECT NUMBER: 66235001
SITE: SEC of 8th St and Eastern AVe (HWY 31) Springer, NM		CLIENT: South Central Colfax County Special Hospital District Springer, NM

SWELL CONSOLIDATION TEST
ASTM D4546



Specimen Identification		Classification	γ_d, pcf	WC, %
●	B06 5 - 10 ft	LEAN CLAY with SAND(CL)	92	7.2

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

PROJECT: SCCCSHD Long Term Care Facility	Terracon 6805 Academy Pkwy West NE Albuquerque, NM	PROJECT NUMBER: 66235001
SITE: SEC of 8th St and Eastern AVe (HWY 31) Springer, NM		CLIENT: South Central Colfax County Special Hospital District Springer, NM

Analytical Report
Lab Order **2302A14**
Date Reported:

Hall Environmental Analysis Laboratory, Inc.

CLIENT: Terracon
Project: SCCCSHD Long Term Care Facility
Lab ID: 2302A14-001 **Matrix:** SOIL

Client Sample ID: B-03@2.6'
Collection Date: 2/22/2023
Received Date: 2/22/2023 4:23:00 PM

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed	Batch
EPA METHOD 300.0: ANIONS							Analyst: **JMT**
Sulfate	110	7.5		mg/Kg	5	2/27/2023 1:39:00 PM	73395
RESISTIVITY AND EC SOIL							Analyst: **JMT**
Resistivity	1300	100		Ohms * c	1	2/24/2023 4:29:00 PM	73361
SM4500H+B/EPA 9040C							Analyst: **SNS**
pH	8.03			pH Units	1	2/27/2023 4:27:00 AM	R94909

Refer to the QC Summary report and sample login checklist for flagged QC data and preservation information.

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank
D	Sample Diluted Due to Matrix	E	Above Quantitation Range/Estimated Value
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits
ND	Not Detected at the Reporting Limit	P	Sample pH Not In Range
PQL	Practical Quanitative Limit	RL	Reporting Limit
S	% Recovery outside of standard limits. If undiluted results may be estimated.		

Supporting Information

Contents:

General Notes
Unified Soil Classification System

Note: All attachments are one page unless noted above.

GENERAL NOTES

Terracon

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING			
	Auger	Shelby Tube	Split Spoon
	Rock Core	Macro Core	Modified California Ring Sampler
	Grab Sample	No Recovery	Modified Dames & Moore Ring Sampler

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	$\geq$ 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

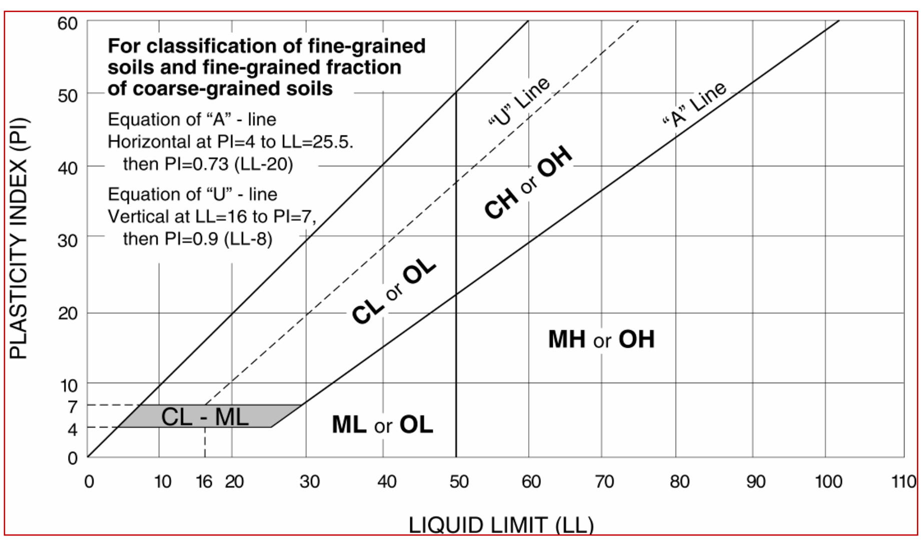
PLASTICITY DESCRIPTION

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. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu\geq4$ and $1\leq Cc\leq3$ [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]	$Cu\geq6$ and $1\leq Cc\leq3$ [E]	SW	Well-graded sand [I]
			$Cu<6$ and/or $[Cc<1$ or $Cc>3.0]$ [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

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



Rock Classification Notes

WEATHERING	
Term	**Description**
Fresh	Mineral crystals appear bright; show no discoloration. Features show little or now staining on surfaces. Discoloration does not extend into intact rock.
Slightly weathered	Rock 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 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 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 to 2 feet	**Thin**	2 inches – 1 foot
Slightly fractured	2 to 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.