Tuscaloosa DHR

TUSCALOOSA, ALABAMA

August 23, 2024

REPORT OF GEOTECHNICAL EXPLORATION

Prepared By

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GMC PROJECT NUMBER: GBHM240037

GMC

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August 23, 2024

Ms. Jacquelyn Hart, AIA
GMC
2400 5th Avenue S
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Birmingham, AL 35233

RE: **REPORT OF GEOTECHNICAL EXPLORATION**
TUSCALOOSA DHR
TUSCALOOSA, ALABAMA
GMC PROJECT NO. GBHM240037

Dear Ms. Hart:

Goodwyn Mills Cawood, LLC (Geotechnical & Construction Services Division) is pleased to provide this report of geotechnical exploration performed for the above referenced project. This report includes the results of field exploration, testing, and general recommendations for foundation design and site recommendations.

We appreciate the opportunity to perform this study during this phase of the project for you and look forward to continued participation during the construction phase of this project. If you have any questions pertaining to this report, or if we may be of further service, please do not hesitate to call.

Sincerely,
GOODWYN MILLS CAWOOD, LLC

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1.0 EXECUTIVE SUMMARY

This report presents the results of our geotechnical investigation performed for the proposed DHR office located on US-43 between Virginia Circle and 29th Street in Tuscaloosa, Alabama. Project development will consist of a new building and associated parking and drive lanes. Our geotechnical scope of work for this project included conducting geotechnical fieldwork, associated engineering analysis, and this geotechnical engineering report. At the time of this report structural loading information had not been provided.

This report provides recommendations for foundation options, site preparation, and other geotechnical related conditions that might affect the proposed construction. The following geotechnical considerations were identified during our investigation:

- The site was explored by performing seventeen (17) Standard Penetration Test (SPT) borings advanced to a depth of approximately 10 to 20 feet below existing grade.
- The borings encountered 1 to 5 inches of organic laden material at the ground surface. Below the organic laden material, very soft to stiff silts and clays or loose clayey sands were present to about 4 feet. The next stratum consisted of medium stiff to very stiff clay and silt or medium dense clayey sand to the termination depth of the borings.
- Due to the loose and soft soils that are present in the upper 4 feet of the site, we recommend that an allowance be set up for undercutting and replacing these soils in the building/structure areas and 10 feet beyond the building perimeter.
- For parking and drives, an allowance should include up to 2 feet of this material below the planned roadway subgrade elevation and 2 feet beyond the edge of pavement. In paved areas, the soils may also be stabilized by undercutting 18 inches below the subgrade elevation, placing a woven geotextile stabilization fabric, and 18 inches of compacted granular material.
- Fill material placed in the building area and 10 feet beyond the building perimeter should be compacted to at least 95 percent of the standard Proctor maximum dry density and 98% in the upper 12 inches below subgrade.
- The seismic site class based on the ASCE 7-16 for this site is “D”.
- Conventional shallow foundations bearing in the existing suitable natural soils or newly placed compacted fill should be sized for a net allowable bearing capacity of 2,500 pounds per square foot (psf). Static settlement for conventional shallow foundations is expected to be less than 1-inch if the site is prepared as recommended.

The following sections provide additional detailed recommendations. The recommendations presented herein have been developed on the basis of the subsurface conditions encountered during field investigation and our understanding of the proposed construction. Should changes in the project criteria occur, a review must be carried out by GMC to determine if modifications to our recommendations will be required.

2.0 PROJECT INFORMATION AND SCOPE OF WORK

2.1 Project Information

A geotechnical exploration was conducted for the proposed DHR office building to be located on US-43 between Virginia Circle and 29th Street in Tuscaloosa, Alabama. The proposed structure is a single-story masonry building with associated parking and drives. We have not been provided loads at the time of this report. We have assumed that maximum column and wall loads will be 150 kips and 4 kips/ft, respectively. Current site elevations range from about 157 ft to 160 ft MSL and the proposed FFE of the building is approximately 160 ft MSL. Based on this FFE, up to 4 feet of fill will be required to reach planned grades.

2.2 Scope of Work

The purpose of this exploration was to perform a general evaluation of the subsurface soil conditions at the site and to provide general sitework recommendations, pavement recommendations, and foundation recommendations. The scope of the exploration and evaluation included performing seventeen Standard Penetration Test (SPT) borings advanced to a depth of approximately 10 to 20 feet below existing grade. The scope also included performing an engineering evaluation of the materials encountered in the borings.

The scope of services for the geotechnical study did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring records regarding odors, colors, or unusual or suspicious items or conditions are strictly for the information of the client.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 Field Exploration

The boring locations and depths were selected by GMC. Field-testing employed by GMC was performed in general accordance with ASTM standards or generally accepted methods. The borings were located in the field by GMC geotechnical personnel and drilled by subcontracted personnel.

The borings were performed in accordance with ASTM D1586 using a Geoprobe 7822 rig equipped with a rotary head and hollow stem augers (HSA). Soils were sampled using a two-inch OD split barrel sampler in accordance with ASTM D1586 driven with an automatic hammer.

3.2 Laboratory Analyses

The soil samples collected were visually classified by a geotechnical engineer. Selected representative samples were tested in our laboratory for soil classification purposes. These tests consisted of natural moisture contents, Atterberg limits, and grain size distributions. The results are shown on the Boring Records and the laboratory data sheets included in the Appendix. The laboratory-testing program was conducted in general accordance with applicable ASTM standards and methods.

4.0 SITE AND SUBSURFACE CONDITIONS

4.1 General

The proposed site is on the east side of US-43 between Virginia Circle and 29th Street in Tuscaloosa, Alabama. At the time of this study, the area was mostly wooded with some grassed areas. Site grades ranged from 157 to 160 feet MSL. The photo below shows the general site conditions at the time of the investigation.

4.2 Site Geology

Published geologic information indicates the site is underlain by alluvial, coastal and low terrace deposits. The alluvial, coastal and low terrace deposits consists of varicolored fine to coarse quartz sand containing clay lenses and gravel in places.

4.3 Subsurface Conditions

The site was explored by drilling seventeen (17) soil test borings. Auger refusal was not encountered in any of the borings.

The following summarizes the subsurface conditions encountered:

Organic Laden Material
Approximately 1 to 5 inches of organic laden material (OLM) was noted at the boring locations.

Residual Soils
Below the OLM, the borings encountered residual soils consisting of silt (ML), lean and sandy lean clay (CL), silty clay (CL-ML), and clayey sand (SC). Standard Penetration Test (SPT) N-values in these soils ranged from 0 to 27 blows per foot (bpf). The N-values were generally low (N<6 bpf) in the upper 3 to 4 feet, especially in the proposed building pad.

The subsurface descriptions contained herein are of a generalized nature to highlight the major soil stratification features and soil characteristics. The boring records included in the Appendix should be reviewed for specific information as to individual boring locations. The stratification shown on the boring records represents conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials, and the transition may be gradual.

4.4 Groundwater Information

Groundwater was not encountered in the borings at the time of our exploration. Groundwater levels may vary due to seasonal conditions, proximity to bodies of water, and recent rainfall. It is common for water to be "perched" or "trapped" within zones of loose and soft soils overlying a less permeable material.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Sitework Recommendations

Stripping
Sitework should begin with clearing and grubbing (stripping) of the site and should include the removal of any organic laden materials (OLM).

Loose / Soft Soils
Loose silts and clay soils were present in the upper 3 to 4 feet of the site. **We recommend that an allowance be set up for undercutting and replacing these soils in the building/structure areas and 10 feet beyond the structure perimeter. For parking and drives, an allowance should include up to 2 feet of this material below the planned roadway subgrade elevation and 2 feet beyond the edge of pavement.** In the paved areas, the soils may also be stabilized by undercutting 18 inches below the subgrade elevation, placing a woven geotextile stabilization fabric (such as a Mirafi HP270), and 18 inches of compacted granular material.

Proofrolling/Evaluation
Once the site is at grade and/or prior to the placement of any new fill, the site should be thoroughly proofrolled with repeated passes of a loaded tandem axle dump truck or otherwise evaluated. Soft soils that are observed during evaluation should be undercut and replaced with properly compacted fill. The proofrolling, undercutting,

and filling activities should be witnessed by a qualified representative of the geotechnical engineer and should be performed during a period of dry weather.

Attempts can first be made to compact the problem soils. If suitable weather conditions exist prior to and at the time of construction, re-compaction and densification may prove successful. The soils should be scarified and the soil moisture should be adjusted to within 3 percent of optimum moisture for low plasticity soils. Once proofrolling has been accomplished, then re-compaction of the soils may be attempted.

5.2 Time of Year Site Preparation Considerations

The time of the year that the sitework begins can affect the project considerably. There are many considerations that need to be addressed prior to bidding a project that could affect the budget based on the time of year a project starts earthwork activities. The time of the year that the geotechnical borings were performed can provide a false sense of actual near surface conditions depending on the time of year and weather conditions. Below are considerations that should be addressed based on the time of the year earthwork is started.

“Wet” Season

During the “wet” season, the amount of undercutting may be greater, therefore resulting in greater excavation costs. The soils are typically proofrolled to determine their suitability for the placement of new fill or subgrade support. During the wet season, the surface soils have a higher moisture content and will tend to pump, therefore, hindering the placement of new fill. In addition, the drying time, time period between rain events, and temperature is not conducive to scarify soils, allow to dry, and recompact. At this time, the decision should be made by the owner to try either scarify/dry/compact the in-place soils, which could take time, or undercut and replace with suitable material, which could increase the sitework costs. Based on our experience, the amount of undercut could be an additional 1 to 2 feet (or greater in localized areas), whereas in drier weather, lesser amounts of undercutting may be necessary, if recompaction or stabilization of soils left in place can be achieved.

Some undercut soils are not always “unsuitable” soil and can be moisture conditioned and reused as fill in the deep areas if drying conditions are favorable. We expect the majority of undercut material will not be suitable for reuse as engineered fill.

“Dry” Season

During the “dry” season, the surface soils have a lower moisture content and will tend to “bridge” or “crust” softer underlying soils. They will generally allow the placement of new fill, but the crust can break down if repeated passes with heavily loaded equipment is persistent. In addition, new fill from cuts or other sources may need to be moisture conditioned prior to compaction. The soils can dry significantly, requiring the addition of water for proper compaction. Water trucks should be used, as necessary, by the contractor to condition the soils within the required specifications.

Contractor Responsibility

The grading contractors have the option of performing their own evaluation of the site conditions to assess the excavation considerations based on the time of year a project is bid. We strongly suggest that the grading contractors conduct their own evaluation of the site conditions and material management requirements to cost effectively develop the site.

5.3 Fill Placement

All fill materials should be placed in loose lifts not exceeding 8-inches in thickness for larger compacting equipment and in 4-inch loose lifts for hand operated equipment with a maximum particle size of 3 inches.

The following table summarizes the compacted fill requirements:

Location	Test Method	Compaction Required (minimum)	Moisture Content
Structural and Pavement Areas and 10' beyond building perimeters and 2' beyond back of curb line	ASTM D698 (Standard Proctor)	95%	-/+3 percentage points of optimum moisture
Upper 12 inches of subgrade in Building and Pavement Areas and 10' beyond building perimeters and 2' beyond back of curb line	ASTM D698 (Standard Proctor)	98%	-/+3 percentage points of optimum moisture

Select fill materials should meet the following characteristics:

Property	Requirement
Organic Material	≤ 5%
Liquid Limit	‹ 50%
Plasticity Index	≤ 25%
Maximum Dry Density	≥ 100 lb/ft^3
Maximum Particle Size	3 inches or less

One bulk sample was collected during the geotechnical investigation for Proctor testing and the results are included in the Appendix. The on-site material should be suitable for use as structural fill; however, samples of the proposed fill materials, either from on-site or borrow, should be provided at the beginning of construction to the geotechnical engineer for Proctor testing and evaluation prior to placement. These soils will likely require moisture conditioning during reuse. Density tests should be performed to document compaction and moisture content of any earthwork involving soils and other applicable materials. Density tests should be performed frequently, with a recommended minimum of one test per 5,000 square feet per lift of fill in building areas and one test per 10,000 square feet per lift in other areas. Fill material must meet the specified density and moisture requirements to be considered acceptable.

5.4 Backfilling of Utility Trenches

Backfilling of storm drain and utility trenches must be performed in a controlled manner to reduce settlement of the fill and cracking of overlying floor slabs and pavements. We recommend that utility trenches be backfilled with acceptable borrow or on-site excavated soils in 6-inch loose lifts compacted with mechanical piston tampers to the project requirements. Should seepage occur in utility trenches, it may be necessary to "floor" the trench with dense-graded gravel to provide a working surface. If crushed stone is used to backfill utility trenches, we recommend that dense graded aggregate (DGA, compacted in lifts) be used. Open-graded crushed stone, such as ALDOT No. 57, can serve as a channel for seepage toward structures and therefore is not recommended for use as utility trench backfill within 10 feet of any structure perimeter.

5.5 Subgrade Restoration

Typically, due to the movement of heavy equipment and weather conditions, the subgrade soil becomes disturbed during construction. As a result, soils have a tendency to lose shear strength and support capability. Therefore, additional effort on the contractor's part will be required to reduce traffic and limit disturbance of soils. It is essential that the subgrade be restored to a properly compacted condition based on optimum moisture and density.

6.0 FOUNDATIONS

6.1 Shallow Foundations

If the site is prepared as discussed previously, shallow foundations can be used for support of the structures. The foundations may be sized using a net allowable bearing pressure of 2,500 pounds per square foot (psf) bearing in suitable natural soils or compacted structural fill material as recommended in Section 5.3. Total settlements of foundations are expected to be about 1-inch, with differential settlements of approximately ½ the total settlement value if the site is prepared in this manner.

Footings should bear at a minimum depth of 18 inches below subgrade elevation. Even though computed footing dimensions may be less, column footings and continuous footings should have minimum width dimensions of 24 inches and 18 inches, respectively. This allows for hand cleaning of materials disturbed during the excavation process and reduces the potential for punching shear failure. The minimum bearing depth of foundations should be 18 inches below exterior grade.

All foundation excavations should be observed by the geotechnical engineer or his representative. The engineer can provide geotechnical guidance to the owner's design team should any unforeseen foundation problems develop during construction. If areas of foundation surfaces prove to be unsuitable, the foundation may need to be over-excavated. The over-excavated area can be backfilled with "lean" concrete up to the planned foundation bearing depth.

Foundation concrete should be placed the same day as footings are excavated so that the foundation bearing soils can remain near the existing moisture content. Foundation bearing surfaces should not be disturbed or left exposed during inclement weather. Saturation of the on-site soils can cause a loss of strength and increased compressibility. If bearing soils dry excessively, the can later well and heave foundations. Excavations for footings should be hand cleaned to remove loose soil or mud and the bearing surface should be thoroughly compacted. If concrete placement is not possible immediately after excavation, we recommend that a thin layer (approximately 2 inches) of lean concrete be placed on the bearing surface for protection after we have observed and evaluated the exposed bearing surfaces.

6.2 Lateral Resistance

Lateral loads may be resisted by the passive pressure of the soil acting against the side of the footing and/or the friction developed between the base of the footing and the underlying soil. For foundations cast against the residual soils or properly compacted fill, the passive pressure can be taken as an equivalent to the pressure exerted by a fluid weighing 240 pcf (Ø = 20°, moist unit weight of soil = 120 pcf). A coefficient of friction of 0.35 may be used for calculating the frictional resistance at the base of the shallow footings.

The resistance values discussed are based on assumption that the foundations can withstand horizontal movements of up to ¼-inch. In addition, the excavation of the footing walls should be near vertical and the concrete placed directly against the soil. The passive pressure will be reduced if the loaded side is benched or sloped. Lateral resistance determined in accordance with these recommendations should be considered the total available resistance. The design should include a minimum factor of safety of 1.5.

6.3 Grade/Floor Slabs

It is our opinion that grade/floor slabs can be built on-grade achieving support from properly compacted fills. For select fill or subgrade soils compacted to at least 98 percent of the materials standard Proctor maximum dry density, we recommend a modulus of subgrade reaction of 125 psi/in (pci). Ground supported slabs should be founded on a minimum of 4 inches of compacted, granular materials with less than 10% passing the #200 sieve. This layer should provide uniform and immediate support of the slab and act as a capillary break. A vapor retarder should be used on top of the granular layer, as required by the building use.

On most projects, there is some time lag between initial grading and the time when the contractor is ready to place concrete for the slab-on-grade. Inclement weather just prior to placement of concrete for the slab-on-grade can result in trapped water in the granular layer.

6.4 Seismic Site Class

Subsurface information (SPT and soil classification) from the borings, published geologic information, and our experience was used to estimate the seismic site classification. Based upon this information, we recommend a Seismic Class of D (Stiff Soil) for this site. Based on our understanding of the project, we have assumed a Risk Category of III. If the Risk Category is different, the values below may need to be revised. According to the ASCE 7/SEI 7-16 hazard standard information, the site has mapped 0.2 second spectral response acceleration (S_S) of approximately 0.292g and a mapped 1.0 second spectral response acceleration (S_1) of approximately 0.102g.

Using this information, Site Class D and Risk Category III, the site coefficients F_a and F_v have been determined to be 1.566 and 2.396, respectively. The design spectral response accelerations S_{DS} and S_{D1} were 0.305g and 0.163g, respectively.

7.0 PAVEMENTS

7.1 General

No traffic information has been provided however, we assume that typical traffic will include automobiles and occasional delivery and garbage trucks. If this traffic information changes, it should be provided to us so that we can review the pavement recommendations and make any necessary changes to the pavement sections. Based on the existing site conditions and planned use, we recommend that a flexible pavement be utilized in the parking and drive lanes and a rigid pavement in the area of the dumpster pad and any loading areas.

Due to the movement of heavy equipment and weather conditions, the subgrade soil becomes disturbed during construction. As a result, soils have a tendency to lose shear strength and support capability. The subgrade for pavement should be restored to its optimum moisture content and proofrolled prior the base course placement. **Undercut of soft materials and replacement with select fill or geotextile and stone should be budgeted for pavement areas.**

7.2 Rigid Pavement

All Portland cement concrete pavements should contain 4 to 6 percent entrained air assuming the mix will contain ¾ -inch to 1-inch nominal maximum size aggregate. Concrete slump should be no more than 2 inches when placed by slip forming and no more than 4 inches for non-slip formed concrete. Minimum 28-day concrete compressive strength should be 4,000 psi and minimum flexural strength 550 psi. All rigid pavements shall be underlain by 6-inches of ALDOT Section 825 Type B Crushed Aggregate Base.

RIGID PAVEMENT MINIMUM THICKNESS	
Pavement Materials	**Thickness (inches)**
Portland Cement Concrete	8
ALDOT Section 825 Type B, Crushed Aggregate Base (98% Standard)	6

Pavement joints, reinforcing, and details should be designed in accordance with the applicable American Concrete Institute (ACI) standards. Portland cement concrete pavement should meet the requirements of ALDOT Section 450.

7.3 Flexible Pavement

The typical minimum flexible pavement sections should include the following:

Pavement Area	Minimum Section Thickness	Pavement Materials
Standard-Duty Pavements (Auto Parking)	1.0 inch	ALDOT Section 424A Superpave Bituminous Wearing Surface
	2.0 inches	ALDOT Section 424B Superpave Bituminous Binder Layer
	6.0 inches(1)	ALDOT Section 825 Type B, Dense Graded Aggregate Base (98% Modified)
Heavy Duty Pavements, Roadway Section	1.5 inches	Asphaltic Concrete 424A Superpave Bituminous Wearing Surface
	3.0 inches	Asphaltic Concrete 424B Superpave Bituminous Binder Layer
	8.0 inches(1)	ALDOT Section 825 Type B, Dense Graded Aggregate Base (98% Modified)

(1) In lieu of crushed aggregate base course (ALDOT 825 Type B), soil aggregate base course (ALDOT 823 Type B or C) can be utilized with a thickness of 9 inches for Standard-Duty and 12 inches for Heavy-Duty pavement sections.

A tack coat (ALDOT Section 405) should be placed between bituminous pavement layers if a delay should occur between the placements of the layers. The pavement sections represent the minimum recommended thickness for a pavement section designed for a 15-year life. However, periodic maintenance should be anticipated over the pavement design life. All pavement materials and construction procedures should conform to the *State of Alabama Department of Transportation Standard Specifications for Highway Construction, Latest Edition*. The hot-mix asphalt should conform to Section 424.

8.0 REPORT LIMITATIONS

The recommendations submitted are based on the available soil information obtained by GMC and design details furnished by GMC for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, we should be notified immediately to determine if changes in the foundation, or other, recommendations are required. If GMC is not retained to perform these functions, GMC cannot be responsible for the impact of those conditions on the performance of the project.

The findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the geotechnical engineer should be provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations.

We emphasize that this report was prepared for design and informational purposes only and may not be sufficient to prepare an accurate construction budget. Contractors reviewing this report should acknowledge that the recommendations contained herein are for design and informational purposes only. In no case should this report be utilized as a substitute for development of specific earthwork specifications.

The information contained in this report is not intended, nor is sufficient, to aid in the design of segmental or mechanically stabilized earth (MSE) retaining walls. Segmental or MSE wall designers and builders should not rely on this report and should perform independent analysis to determine all necessary soil characteristics for use in their wall design, including but not limited to, soil shear strengths, bearing capacities, global stability, etc.

APPENDIX

Figure 1 – Site Location Plan

Figure 2 – Boring Location Plan

Figure 3 – USGS Site Map

USCS Classification

Subsurface Diagrams

Boring Records

Summary of Laboratoy Results

Field and Laboratory Procedures

Google Earth Imagery dated 2/12/2024

REF. SHEET:

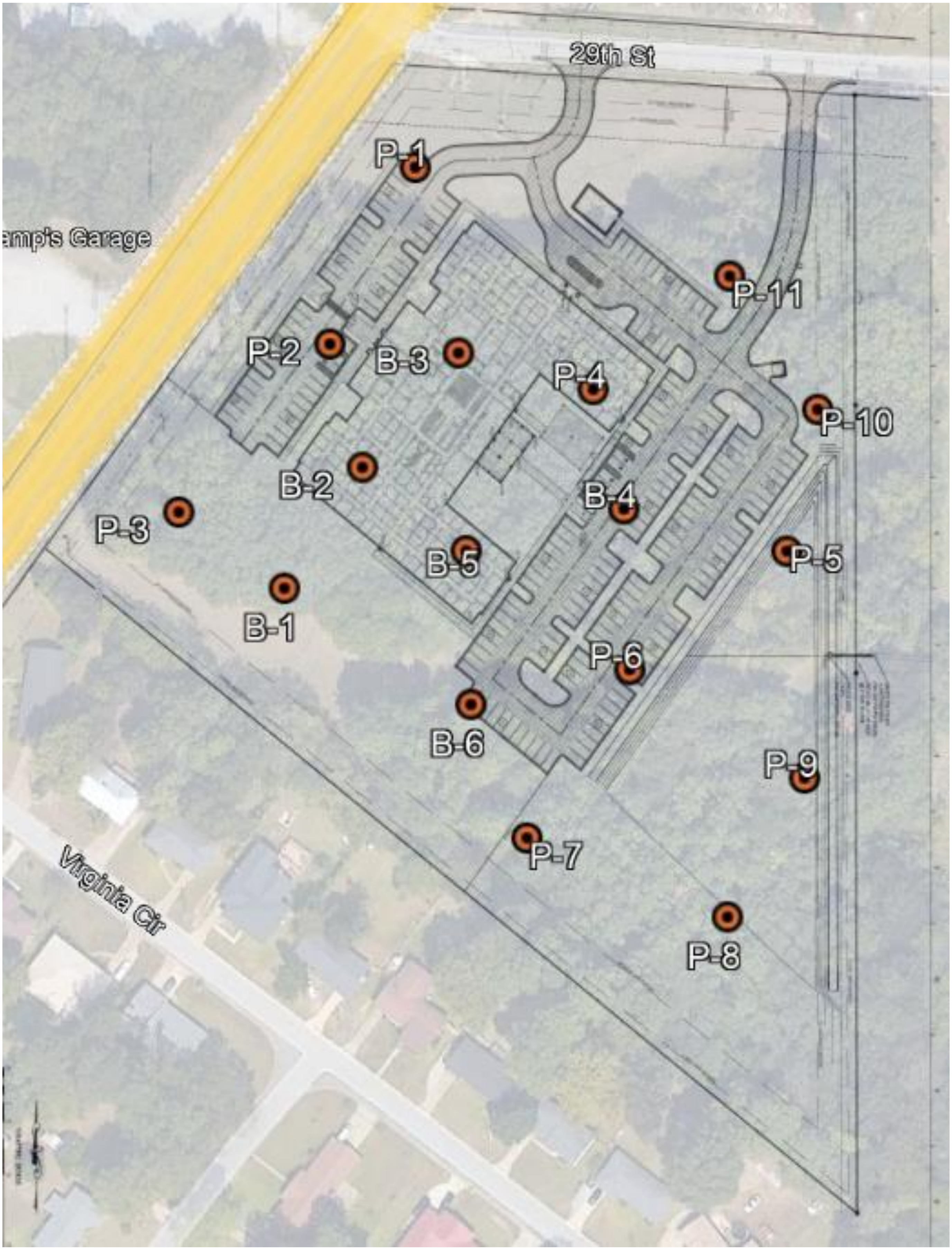
DESCRIPTION:

SITE LOCATION PLAN
Tuscaloosa DHR
Tuscaloosa, AL

FIGURE 1

GMC # GBHM240037
DATE: 8-23-2024
DRAWN BY:

GMC



REF. SHEET:

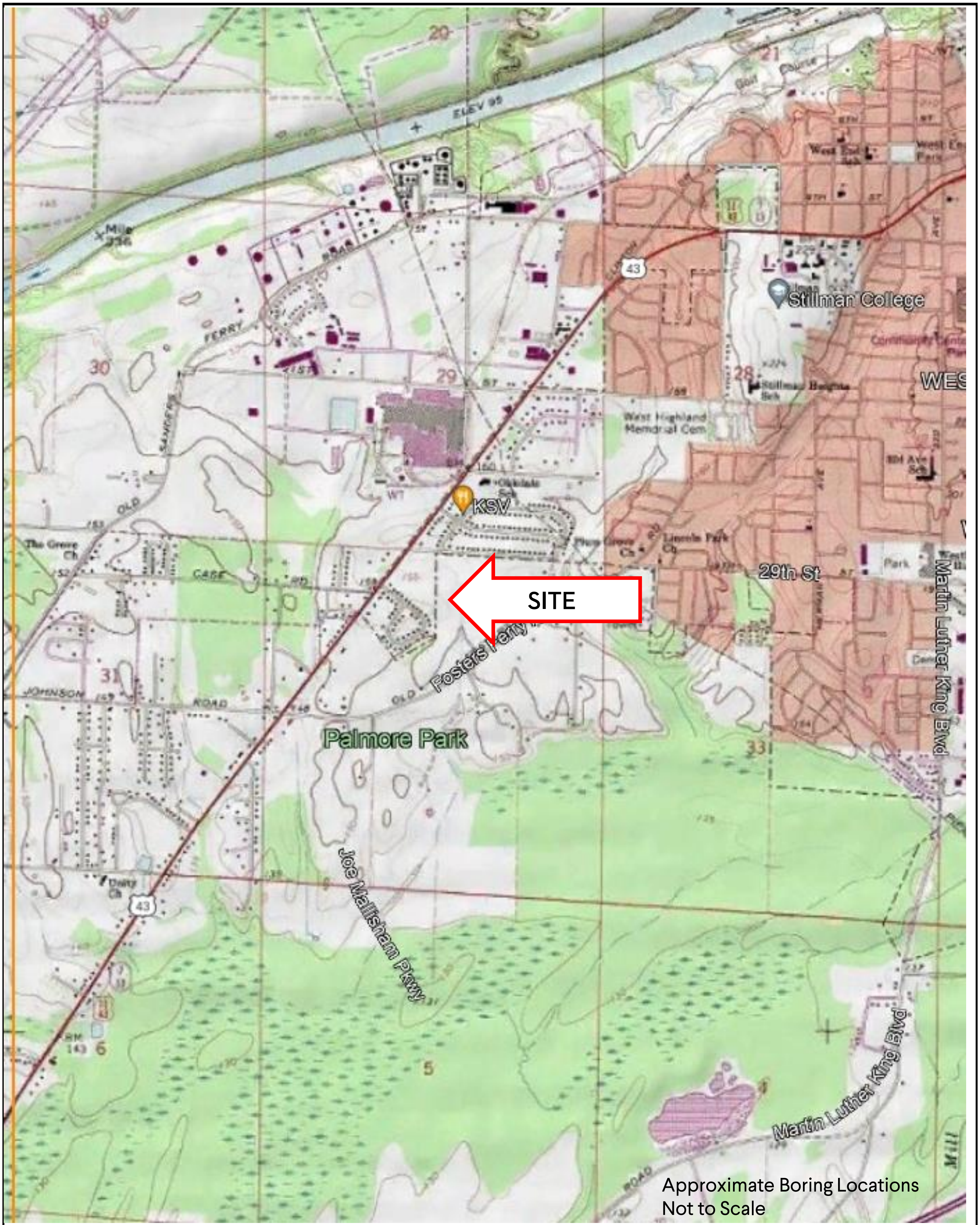
DESCRIPTION:

BORING LOCATION PLAN
Tuscaloosa DHR
Tuscaloosa, AL

FIGURE 2

GMC # GBHM240037
DATE: 8-23-2024
DRAWN BY:

GMC



Approximate Boring Locations
Not to Scale

REF. SHEET:

DESCRIPTION:

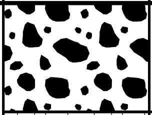
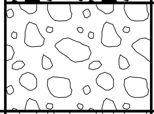
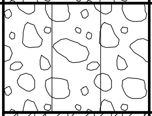
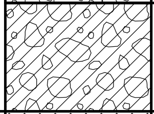
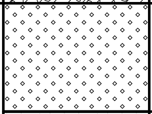
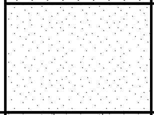
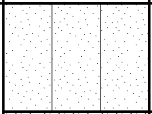
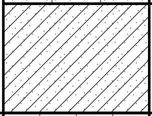
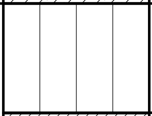
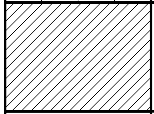
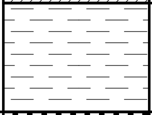
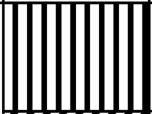
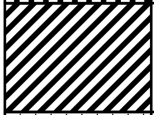
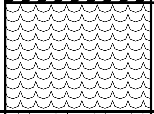
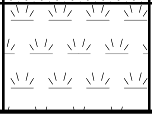
USGS SITE PLAN
Tuscaloosa DHR
Tuscaloosa, AL

FIGURE 3

GMC # GBHM240037
DATE: 8-23-2024
DRAWN BY:

GMC

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

GMC

SUBSURFACE DIAGRAM
Building Profile

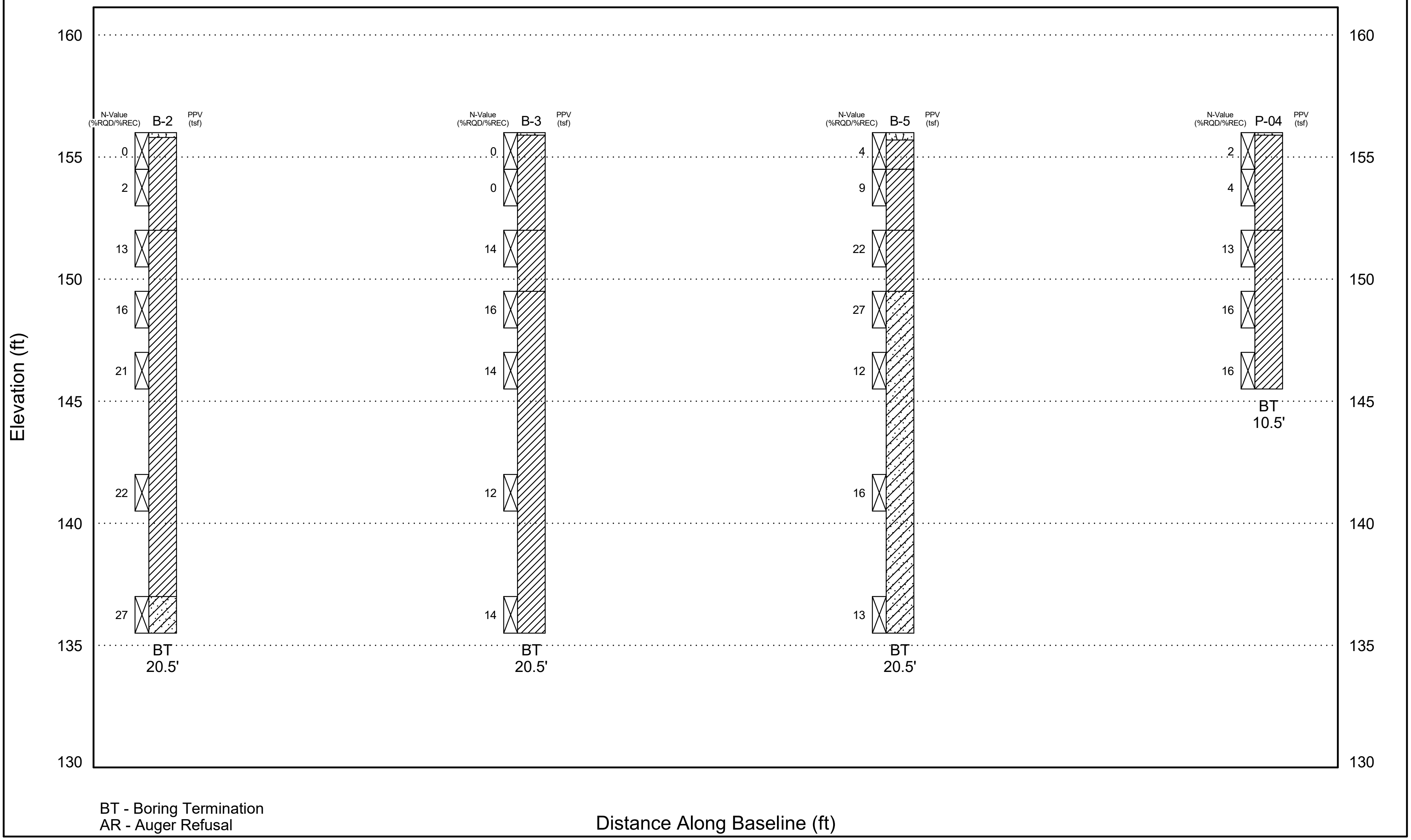
▨ TOPSOIL ▨ CL ▨ SC

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL



BT - Boring Termination
AR - Auger Refusal

BT-AR DEPTH LOG GBHM240037 DHR TUSCALOOSA.GPJ GMC DATA TEMPLATE.GDT 8/24/24

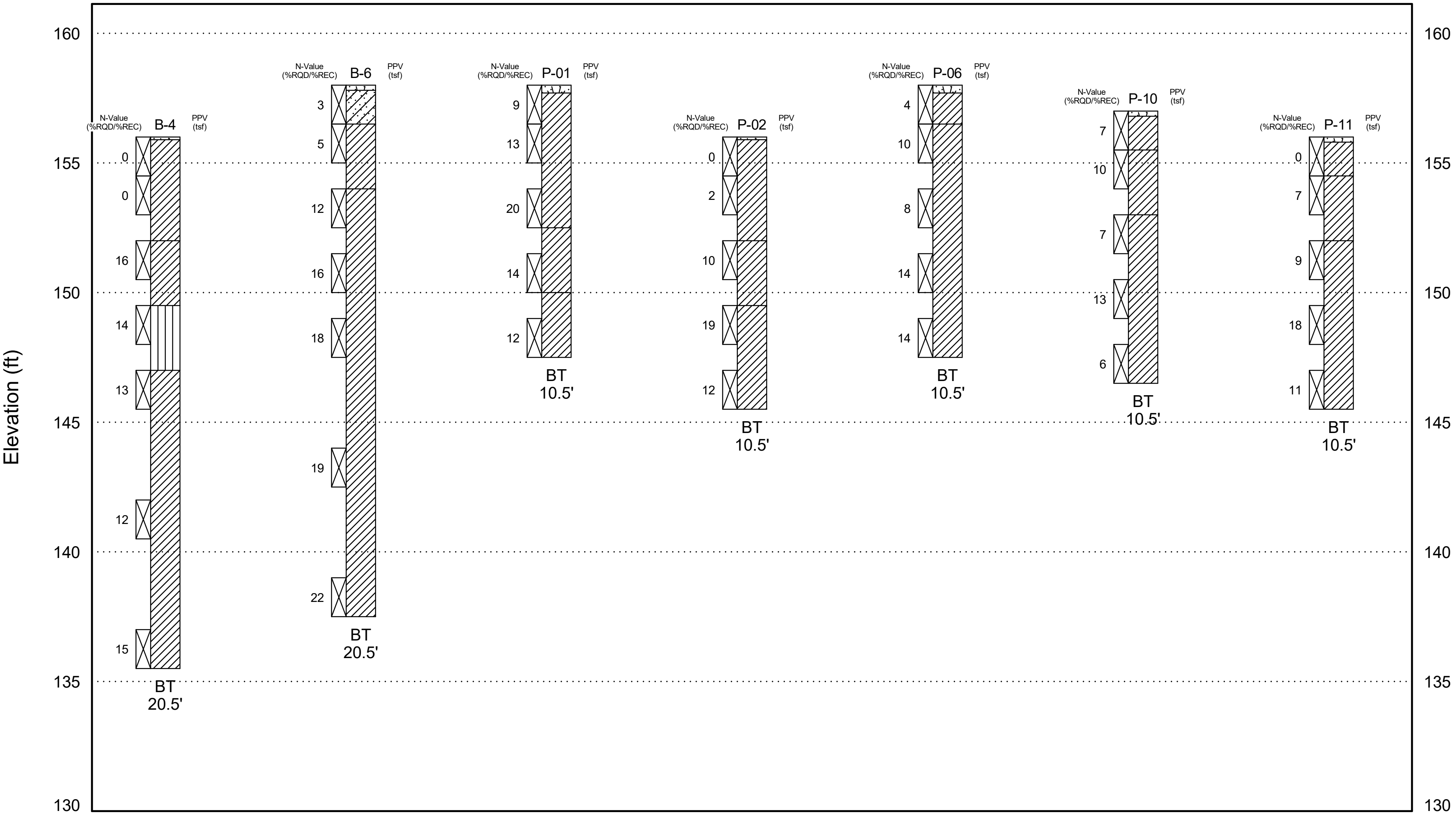
GMC

SUBSURFACE DIAGRAM
Parking Profile

TOPSOIL ▨ CL ▥ ML ▨ SC

CLIENT Alabama Department of Human Resourses **PROJECT NAME** DHR Tuscaloosa

PROJECT NUMBER GBHM240037 **PROJECT LOCATION** Tuscaloosa, AL

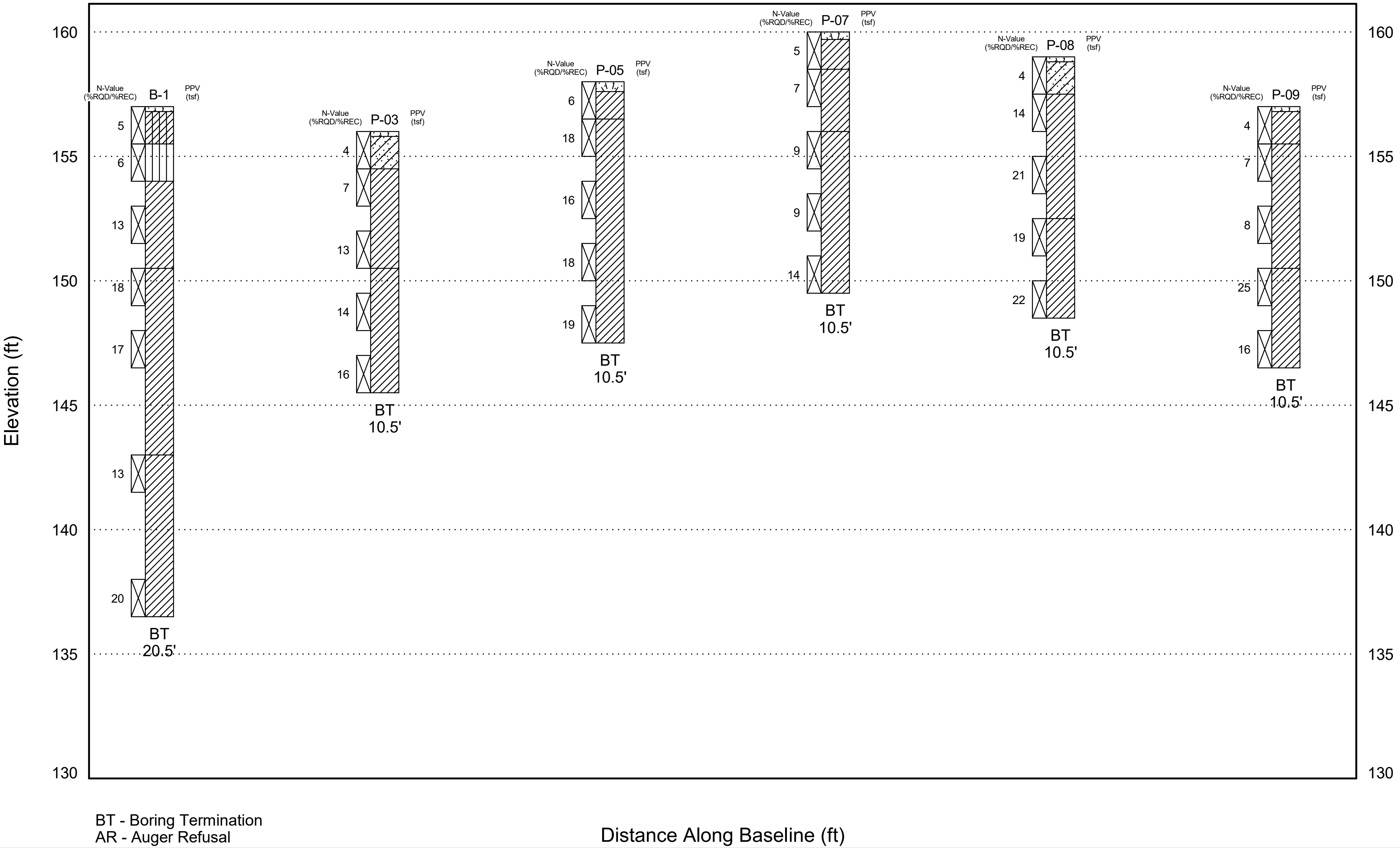


BT - Boring Termination
AR - Auger Refusal

SUBSURFACE DIAGRAM
Boring Profile

▨ TOPSOIL
▨ ML-CL
▥ ML
▨ CL
▨ SC

CLIENT Alabama Department of Human Resourses
PROJECT NAME DHR Tuscaloosa
PROJECT NUMBER GBHM240037
PROJECT LOCATION Tuscaloosa, AL



BT - Boring Termination
AR - Auger Refusal

BT-AR DEPTH LOG GBHM240037 DHR TUSCALOOSA.GPJ GMC DATA TEMPLATE.GDT 8/24/24

BORING NUMBER B-1

PAGE 1 OF 1

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL

DATE STARTED 8/6/24 **COMPLETED** 8/6/24

GROUND ELEVATION 157 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR Earth Core, LLC

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY S. Wheeler **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM), 2" SILTY CLAY with SAND (CL-ML), light brown, medium stiff - with organics	☒ SS		4-3-2 (5)			12	26	19	7	79
155			SILT (ML), light brown, medium stiff	☒ SS		3-3-3 (6)			10				
			LEAN CLAY (CL), light brown to gray, stiff										
	5			☒ SS		5-5-8 (13)			17				
150			LEAN CLAY (CL), reddish brown to gray, very stiff	☒ SS		5-7-11 (18)							
	10			☒ SS		7-8-9 (17)							
145													
	15		SANDY LEAN CLAY (CL), reddish brown, stiff to very stiff	☒ SS		5-6-7 (13)							
140													
	20			☒ SS		7-9-11 (20)							
			Boring was terminated at 20.5 feet.										
135													
	25												
130													
	30												
125													
	35												

BORING NUMBER B-2

PAGE 1 OF 1

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL

DATE STARTED 8/6/24 **COMPLETED** 8/6/24

GROUND ELEVATION 156 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR Earth Core, LLC

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY S. Wheeler **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
	0												
155			Organic Laden Material (OLM), 2" LEAN CLAY (CL), gray, very soft - with organics	SS		0-0-0 (0)			22				
				SS		0-1-1 (2)			24				
	5		LEAN CLAY with SAND (CL), reddish brown to gray, stiff to very stiff	SS		4-6-7 (13)			18				
150													
				SS		5-7-9 (16)							
	10			SS		7-9-12 (21)							
145													
	15			SS		10-11-11 (22)							
140													
	20		CLAYEY SAND (SC), red, brown, medium dense	SS		8-12-15 (27)							
135			Boring was terminated at 20.5 feet.										
	25												
130													
	30												
125													
	35												

BORING NUMBER B-3

PAGE 1 OF 1

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL

DATE STARTED 8/6/24 **COMPLETED** 8/6/24

GROUND ELEVATION 156 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR Earth Core, LLC

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY S. Wheeler **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	FINES CONTENT (%)
155	0		Organic Laden Material (OLM), 1" LEAN CLAY (CL), gray, very soft - with organics	☒ SS		0-0-0 (0)			23				
				☒ SS		0-0-0 (0)			23				
150	5		LEAN CLAY (CL), gray, stiff - with trace organics	☒ SS		5-7-7 (14)			14				
			LEAN CLAY (CL), reddish brown to gray, stiff to very stiff	☒ SS		5-7-9 (16)							
145	10			☒ SS		5-7-7 (14)							
140	15			☒ SS		4-5-7 (12)							
135	20			☒ SS		6-7-7 (14)							
			Boring was terminated at 20.5 feet.										
130	25												
125	30												
	35												

GMC

BORING NUMBER B-4

PAGE 1 OF 1

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL

DATE STARTED 8/6/24 **COMPLETED** 8/6/24

GROUND ELEVATION 156 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR Earth Core, LLC

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY S. Wheeler **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
155	0	▨	Organic Laden Material (OLM), 1" LEAN CLAY (CL), gray, very soft - with trace organics	☒ SS		0-0-0 (0)			25				
		▨		☒ SS		0-0-0 (0)			21				
150	5	▨	LEAN CLAY (CL), reddish brown to gray, very stiff	☒ SS		4-6-10 (16)			20				
			SILT (ML), light gray, stiff	☒ SS		6-6-8 (14)							
145	10	▨	LEAN CLAY (CL), reddish brown to gray, stiff	☒ SS		4-6-7 (13)							
140	15	▨		☒ SS		4-6-6 (12)							
135	20	▨		☒ SS		5-7-8 (15)							
			Boring was terminated at 20.5 feet.										
130	25												
125	30												
	35												

BORING NUMBER B-5

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL

DATE STARTED 8/6/24 **COMPLETED** 8/6/24

GROUND ELEVATION 156 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR Earth Core, LLC

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY S. Wheeler **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
	0												
155		▨	Organic Laden Material (OLM), 3" LEAN CLAY (CL), gray, stiff - with organics	SS		1-2-2 (4)			14				
		▨	LEAN CLAY with SAND (CL), gray to reddish brown, stiff	SS		3-4-5 (9)			15	33	15	18	82
150	5	▨	LEAN CLAY with SAND (CL), reddish brown to gray, very stiff	SS		6-9-13 (22)			21				
		▨	CLAYEY SAND (SC), red, light brown, medium dense	SS		10-15-12 (27)							
145	10	▨		SS		5-6-6 (12)							
140	15	▨		SS		5-7-9 (16)							
135	20	▨		SS		6-6-7 (13)							
			Boring was terminated at 20.5 feet.										
130	25												
125	30												
	35												

BORING NUMBER B-6

PAGE 1 OF 1

GMC

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL

DATE STARTED 8/6/24 **COMPLETED** 8/6/24

GROUND ELEVATION 158 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR Earth Core, LLC

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY S. Wheeler **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
	0	▨	Organic Laden Material (OLM), 2" CLAYEY SAND (SC), reddish-brown, loose	☒ SS		1-1-2 (3)			18				
155		▨	SANDY LEAN CLAY (CL), reddish-brown to gray, medium stiff	☒ SS		2-2-3 (5)			15				
	5	▨	SANDY LEAN CLAY (CL), reddish-brown to gray, stiff to very stiff	☒ SS		5-6-6 (12)			17				
150		▨		☒ SS		7-8-8 (16)							
	10	▨		☒ SS		6-9-9 (18)							
145		▨											
	15	▨		☒ SS		7-8-11 (19)							
140		▨											
	20	▨		☒ SS		9-10-12 (22)							
			Boring was terminated at 20.5 feet.										
135													
	25												
130													
	30												
125													
	35												

GMC

BORING NUMBER P-01

PAGE 1 OF 1

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL

DATE STARTED 8/5/24 **COMPLETED** 8/5/24

GROUND ELEVATION 158 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR Earth Core, LLC

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY S. Wheeler **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	FINES CONTENT (%)
	0	▨	Organic Laden Material (OLM), 3" LEAN CLAY with SAND (CL), reddish-brown, stiff	SS		5-7-2 (9)			13	29	17	12	74
155		▨		SS		4-6-7 (13)			20				
	5	▨		SS		7-10-10 (20)							
150		▨	LEAN CLAY with SAND (CL), reddish-brown to gray, stiff	SS		4-5-9 (14)							
	10	▨	SANDY LEAN CLAY (CL), reddish-brown, stiff	SS		4-5-7 (12)							
145			Boring was terminated at 10.5 feet.										
	15												
140													
	20												
135													
	25												
130													
	30												
125													
	35												

BORING NUMBER P-02

PAGE 1 OF 1

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL

DATE STARTED 8/6/24 **COMPLETED** 8/6/24

GROUND ELEVATION 156 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR Earth Core, LLC

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY S. Wheeler **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	FINES CONTENT (%)
	0												
155		▨	Organic Laden Material (OLM), 1" LEAN CLAY (CL), very soft - with organics	SS		0-0-0 (0)			20				
		▨		SS		1-1-1 (2)			23	40	16	24	87
	5	▨	LEAN CLAY (CL), reddish-brown, stiff	SS		4-5-5 (10)							
150		▨	LEAN CLAY (CL), reddish-brown to gray, stiff to very stiff	SS		6-8-11 (19)							
	10	▨		SS		4-5-7 (12)							
145			Boring was terminated at 10.5 feet.										
	15												
140													
	20												
135													
	25												
130													
	30												
125													
	35												

GMC

BORING NUMBER P-03

PAGE 1 OF 1

CLIENT Alabama Department of Human Resourses
PROJECT NAME DHR Tuscaloosa
PROJECT NUMBER GBHM240037
PROJECT LOCATION Tuscaloosa, AL
DATE STARTED 8/6/24 **COMPLETED** 8/6/24
GROUND ELEVATION 156 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY S. Wheeler **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	FINES CONTENT (%)
155	0		Organic Laden Material (OLM), 2" CLAYEY SAND (SC), brown, loose - with organics	☒ SS		3-2-2 (4)			13				
			SANDY LEAN CLAY (CL), reddish-brown to gray, medium stiff	☒ SS		2-3-4 (7)			14				
	5			☒ SS		5-6-7 (13)							
150			LEAN CLAY (CL), reddish-brown to gray, stiff to very stiff	☒ SS		5-7-7 (14)							
145	10			☒ SS		6-7-9 (16)							
			Boring was terminated at 10.5 feet.										
140	15												
135	20												
130	25												
125	30												
	35												

GMC

BORING NUMBER P-04

PAGE 1 OF 1

CLIENT Alabama Department of Human Resourses
PROJECT NAME DHR Tuscaloosa
PROJECT NUMBER GBHM240037
PROJECT LOCATION Tuscaloosa, AL
DATE STARTED 8/6/24 **COMPLETED** 8/6/24
GROUND ELEVATION 156 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY S. Wheeler **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
	0												
155		▨	Organic Laden Material (OLM), 1" LEAN CLAY with SAND (CL), gray, soft	SS		1-1-1 (2)			21	28	15	13	77
		▨		SS		1-2-2 (4)			29				
	5	▨	LEAN CLAY (CL), reddish-brown to gray, stiff to very stiff	SS		5-6-7 (13)							
150		▨		SS		5-7-9 (16)							
	10	▨		SS		5-7-9 (16)							
145			Boring was terminated at 10.5 feet.										
	15												
140													
	20												
135													
	25												
130													
	30												
125													
	35												

BORING NUMBER P-05

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL

DATE STARTED 8/5/24 **COMPLETED** 8/5/24

GROUND ELEVATION 158 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR Earth Core, LLC

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY S. Wheeler **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
	0		Organic Laden Material (OLM), 5"										
		▨	SANDY LEAN CLAY (CL), reddish-brown, medium stiff	SS		3-3-3 (6)			15				
		▨	SANDY LEAN CLAY (CL), reddish-brown to gray, very stiff	SS		5-11-7 (18)			12				
155		▨											
	5	▨		SS		4-7-9 (16)							
150		▨		SS		6-9-9 (18)							
	10	▨		SS		9-8-11 (19)							
			Boring was terminated at 10.5 feet.										
145													
	15												
140													
	20												
135													
	25												
130													
	30												
125													
	35												

BORING NUMBER P-06

PAGE 1 OF 1

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL

DATE STARTED 8/5/24 **COMPLETED** 8/5/24

GROUND ELEVATION 158 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR Earth Core, LLC

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY S. Wheeler **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	FINES CONTENT (%)
	0		Organic Laden Material (OLM), 3" LEAN CLAY with SAND (CL), reddish-brown, soft - with organics	SS		1-2-2 (4)			15	28	16	12	72
155			LEAN CLAY (CL), reddish-brown to brown, stiff	SS		4-5-5 (10)			16				
	5			SS		4-3-5 (8)							
150				SS		4-8-6 (14)							
	10			SS		7-10-4 (14)							
			Boring was terminated at 10.5 feet.										
145													
	15												
140													
	20												
135													
	25												
130													
	30												
125													
	35												

BORING NUMBER P-07

PAGE 1 OF 1

GMC

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL

DATE STARTED 8/5/24 **COMPLETED** 8/5/24

GROUND ELEVATION 160 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR Earth Core, LLC

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY S. Wheeler **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
160	0		Organic Laden Material (OLM), 3" LEAN CLAY with SAND (CL), reddish-brown, medium stiff - with organics	SS		2-2-3 (5)			13	27	16	11	71
			SANDY LEAN CLAY (CL), reddish-brown, medium stiff	SS		3-3-4 (7)			12				
155	5		SANDY LEAN CLAY (CL), reddish-brown to light brown, stiff	SS		3-4-5 (9)							
				SS		6-7-2 (9)							
150	10			SS		4-6-8 (14)							
			Boring was terminated at 10.5 feet.										
145	15												
140	20												
135	25												
130	30												
125	35												

BORING NUMBER P-08

PAGE 1 OF 1

CLIENT Alabama Department of Human Resourses
PROJECT NAME DHR Tuscaloosa
PROJECT NUMBER GBHM240037
PROJECT LOCATION Tuscaloosa, AL
DATE STARTED 8/5/24 **COMPLETED** 8/5/24
GROUND ELEVATION 159 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY S. Wheeler **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS LIQUID LIMIT	ATTERBERG LIMITS PLASTIC LIMIT	ATTERBERG LIMITS PLASTICITY INDEX	FINES CONTENT (%)
	0	▨	Organic Laden Material (OLM), 2" CLAYEY SAND (SC), brown, loose - with organics	☒ SS		2-2-2 (4)			12				
		▨	SANDY LEAN CLAY (CL), brown to gray, stiff to very stiff	☒ SS		3-6-8 (14)			10				
155	5	▨		☒ SS		10-7-14 (21)							
		▨	LEAN CLAY (CL), reddish-brown to brown, very stiff	☒ SS		6-7-12 (19)							
150	10	▨		☒ SS		8-11-11 (22)							
			Boring was terminated at 10.5 feet.										
145	15												
140	20												
135	25												
130	30												
125	35												

GMC

BORING NUMBER P-09

PAGE 1 OF 1

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL

DATE STARTED 8/5/24 **COMPLETED** 8/5/24

GROUND ELEVATION 157 ft **HOLE SIZE** 4"

DRILLING CONTRACTOR Earth Core, LLC

GROUND WATER LEVELS:

DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT

AT TIME OF DRILLING None Encountered

LOGGED BY S. Wheeler **CHECKED BY**

AT END OF DRILLING ---

NOTES

AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
	0	▨	Organic Laden Material (OLM), 2" SANDY LEAN CLAY (CL), brown, soft - with organics	☒ SS		2-2-2 (4)			14				
155		▨	SANDY LEAN CLAY (CL), light brown, medium stiff to stiff	☒ SS		2-3-4 (7)			10				
	5	▨		☒ SS		3-3-5 (8)							
150		▨	LEAN CLAY (CL), reddish-brown to light brown, very stiff	☒ SS		10-10-15 (25)							
	10	▨		☒ SS		3-6-10 (16)							
145			Boring was terminated at 10.5 feet.										
	15												
140													
	20												
135													
	25												
130													
	30												
125													
	35												

BORING NUMBER P-10

CLIENT Alabama Department of Human Resourses
PROJECT NAME DHR Tuscaloosa
PROJECT NUMBER GBHM240037
PROJECT LOCATION Tuscaloosa, AL
DATE STARTED 8/5/24 **COMPLETED** 8/5/24
GROUND ELEVATION 157 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY S. Wheeler **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
	0		Organic Laden Material (OLM), 2"	SS		1-2-5 (7)			13				
			SANDY LEAN CLAY (CL), gray, medium stiff - with trace organics	SS		2-3-7 (10)			9				
155			SANDY LEAN CLAY (CL), gray, stiff										
	5		SANDY LEAN CLAY (CL), reddish-brown to light brown, medium stiff to stiff	SS		4-2-5 (7)							
150				SS		4-6-7 (13)							
	10			SS		4-3-3 (6)							
			Boring was terminated at 10.5 feet.										
145													
	15												
140													
	20												
135													
	25												
130													
	30												
125													
	35												

BORING NUMBER P-11

PAGE 1 OF 1

CLIENT Alabama Department of Human Resourses
PROJECT NAME DHR Tuscaloosa
PROJECT NUMBER GBHM240037
PROJECT LOCATION Tuscaloosa, AL
DATE STARTED 8/5/24 **COMPLETED** 8/5/24
GROUND ELEVATION 156 ft **HOLE SIZE** 4"
DRILLING CONTRACTOR Earth Core, LLC
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe 7822DT, Auto-Hammer, HSA w/ SPT
AT TIME OF DRILLING None Encountered
LOGGED BY S. Wheeler **CHECKED BY**
AT END OF DRILLING ---
NOTES
AFTER DRILLING ---

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	DRY UNIT WT. (pcf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			FINES CONTENT (%)
										LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	
	0		Organic Laden Material (OLM), 2"										
155		▨	SANDY LEAN CLAY (CL), gray, very soft - with organics	SS		0-0-0 (0)			21				
		▨	SANDY LEAN CLAY (CL), gray, medium stiff	SS		1-2-5 (7)			24				
	5	▨	LEAN CLAY (CL), reddish-brown to light brown, stiff to very stiff	SS		3-3-6 (9)							
150		▨		SS		4-7-11 (18)							
	10	▨		SS		4-6-5 (11)							
145			Boring was terminated at 10.5 feet.										
	15												
140													
	20												
135													
	25												
130													
	30												
125													
	35												

SUMMARY OF LABORATORY RESULTS

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Max. Sieve Size Tested (mm)	%<#200 Sieve	Natural Moisture (%)	Class-ification	Opt. Moisture Content (%)	Max Dry Density (pcf)	Specific Gravity
B-1	0-1.5	26	19	7	2	79	11.7	CL-ML			
B-1	1.5-3						10.2				
B-1	4-5.5						16.7				
B-2	0-1.5						21.9				
B-2	1.5-3						24.3				
B-2	4-5.5						18.1				
B-3	0-1.5						23.0				
B-3	1.5-3						23.1				
B-3	4-5.5						13.6				
B-4	0-1.5						25.3				
B-4	1.5-3						21.5				
B-4	4-5.5						20.2				
B-5	0-1.5						14.0				
B-5	1.5-3	33	15	18	1.18	82	15.5	CL			
B-5	4-5.5						21.1				
B-6	0-1.5						18.1				
B-6	1.5-3						15.0				
B-6	4-5.5						17.1				
P-01	0-1.5	29	17	12	2	74	12.7	CL			
P-01	1.5-3						20.3				
P-02	0-1.5						20.2				
P-02	1.5-3	40	16	24	2	87	22.8	CL			
P-03	0-1.5						13.4				
P-03	1.5-3						13.5				
P-04	0-1.5	28	15	13	2	77	20.6	CL			
P-04	1.5-3						28.9				
P-05	0-1.5						15.3				
P-05	1.5-3						12.3				
P-06	0-1.5	28	16	12	1.18	72	15.5	CL			
P-06	1.5-3						15.7				
P-07	0-1.5	27	16	11	4.75	71	12.6	CL			
P-07	1.5-3						12.4				
P-08	0-1.5						11.6				
P-08	1.5-3						9.8				
P-09	0-1.5						14.1				
P-09	1.5-3						10.1				
P-10	0-1.5						13.3				
P-10	1.5-3						9.2				
P-11	0-1.5						20.7				
P-11	1.5-3						24.0				

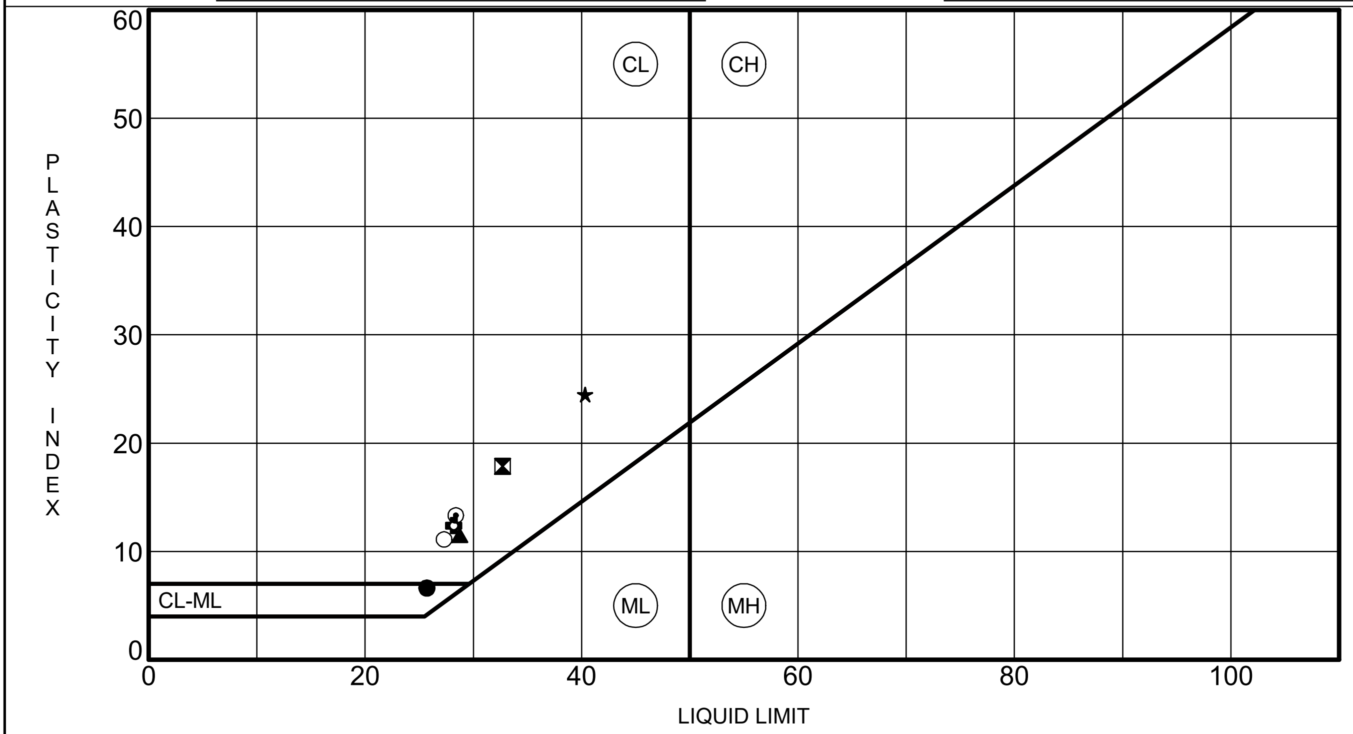
ATTERBERG LIMITS' RESULTS

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL



	Specimen Identification	LL	PL	PI	Fines	Classification
●	**B-1 0.0-1.5**	**26**	**19**	**7**	**79**	**SILTY CLAY with SAND(CL-ML)**
⧗	**B-5 1.5-3.0**	**33**	**15**	**18**	**82**	**LEAN CLAY with SAND(CL)**
▲	**P-01 0.0-1.5**	**29**	**17**	**12**	**74**	**LEAN CLAY with SAND(CL)**
★	**P-02 1.5-3.0**	**40**	**16**	**24**	**87**	**LEAN CLAY(CL)**
⦿	**P-04 0.0-1.5**	**28**	**15**	**13**	**77**	**LEAN CLAY with SAND(CL)**
✿	**P-06 0.0-1.5**	**28**	**16**	**12**	**72**	**LEAN CLAY with SAND(CL)**
○	**P-07 0.0-1.5**	**27**	**16**	**11**	**71**	**LEAN CLAY with SAND(CL)**

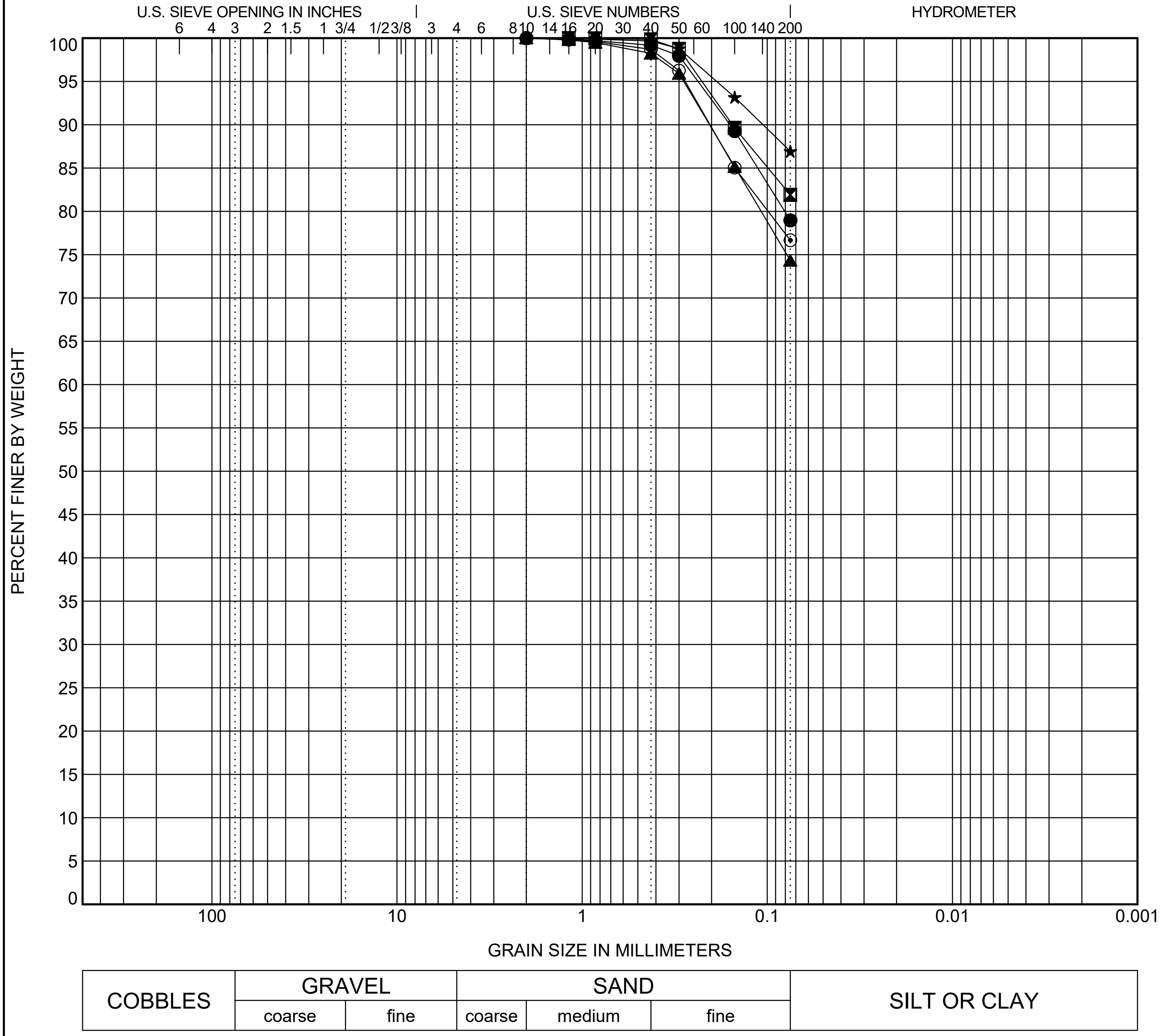
GRAIN SIZE DISTRIBUTION

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL



	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-1**	**0.0-1.5**	**SILTY CLAY with SAND(CL-ML)**	**26**	**19**	**7**		
⧗	**B-5**	**1.5-3.0**	**LEAN CLAY with SAND(CL)**	**33**	**15**	**18**		
▲	**P-01**	**0.0-1.5**	**LEAN CLAY with SAND(CL)**	**29**	**17**	**12**		
★	**P-02**	**1.5-3.0**	**LEAN CLAY(CL)**	**40**	**16**	**24**		
⊙	**P-04**	**0.0-1.5**	**LEAN CLAY with SAND(CL)**	**28**	**15**	**13**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-1**	**0.0-1.5**	**2**				**0.0**	**21.0**	**79.0**	
⧗	**B-5**	**1.5-3.0**	**1.18**				**0.0**	**18.1**	**81.9**	
▲	**P-01**	**0.0-1.5**	**2**				**0.0**	**25.7**	**74.3**	
★	**P-02**	**1.5-3.0**	**2**				**0.0**	**13.1**	**86.9**	
⊙	**P-04**	**0.0-1.5**	**2**				**0.0**	**23.3**	**76.7**	

GMC

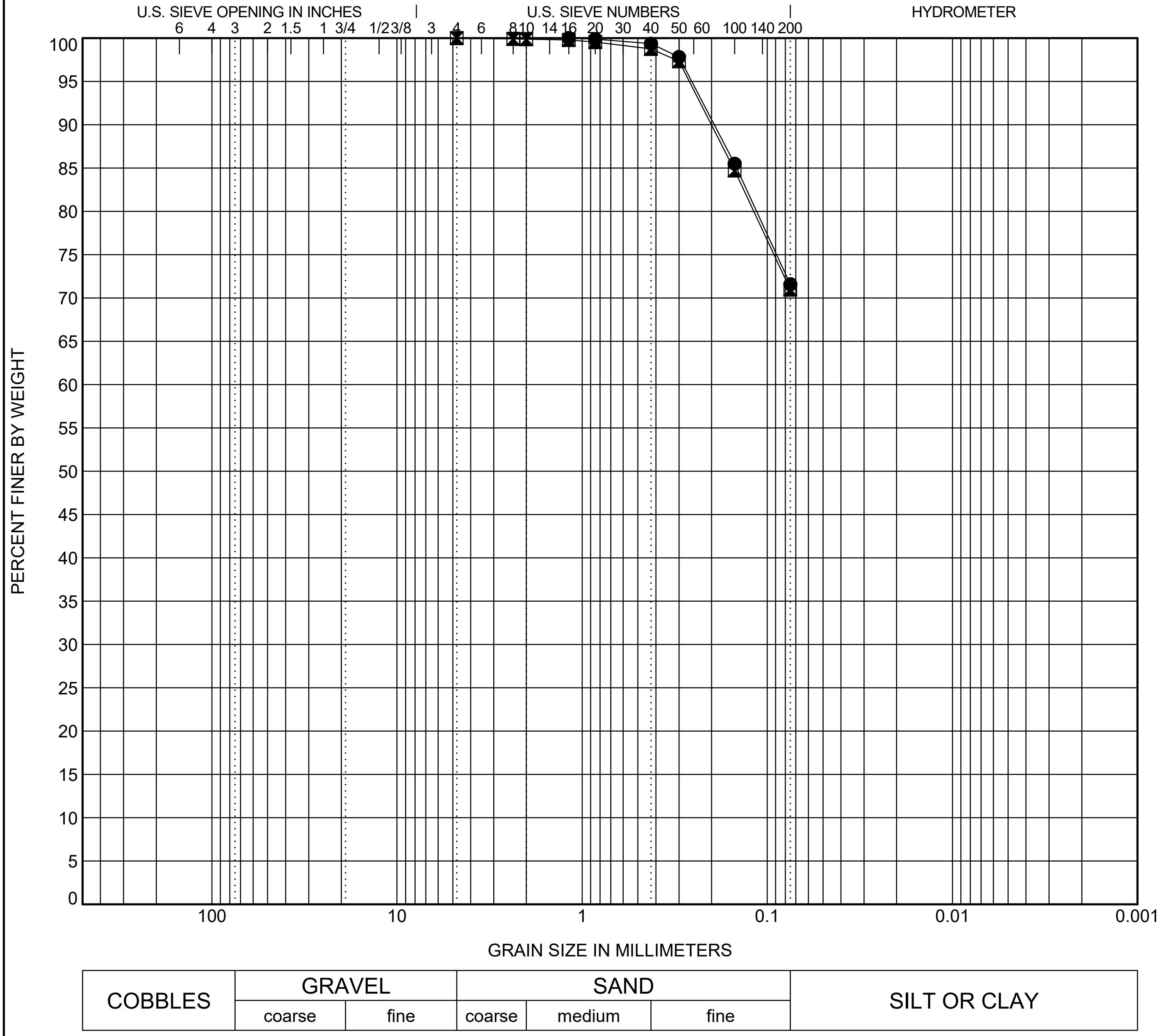
GRAIN SIZE DISTRIBUTION

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL



	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**P-06**	**0.0-1.5**	**LEAN CLAY with SAND(CL)**	**28**	**16**	**12**		
☒	**P-07**	**0.0-1.5**	**LEAN CLAY with SAND(CL)**	**27**	**16**	**11**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**P-06**	**0.0-1.5**	**1.18**				**0.0**	**28.4**	**71.6**	
☒	**P-07**	**0.0-1.5**	**4.75**				**0.0**	**29.0**	**71.0**	

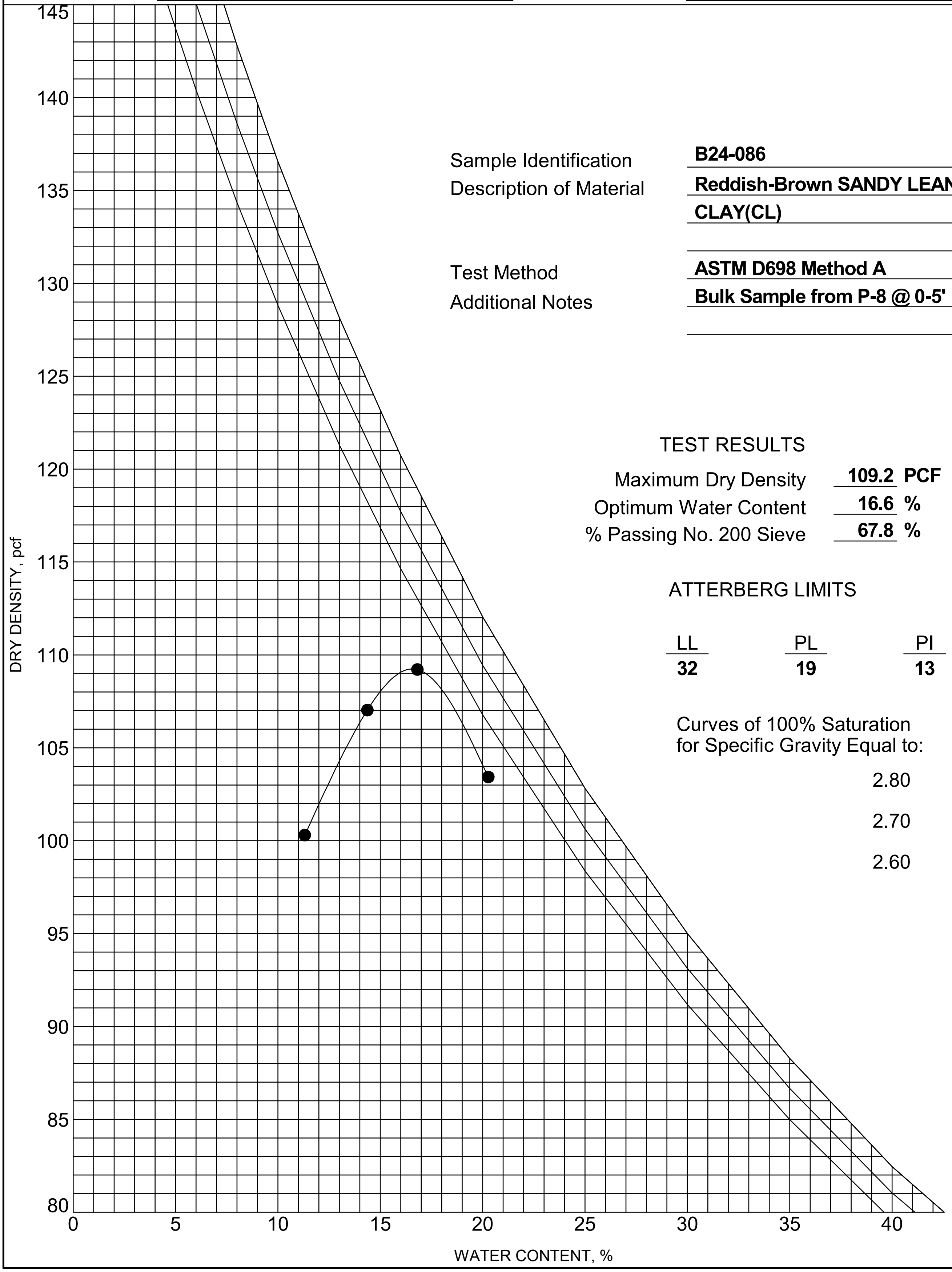
MOISTURE-DENSITY RELATIONSHIP

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL



Sample Identification **B24-086**

Description of Material **Reddish-Brown SANDY LEAN CLAY(CL)**

Test Method **ASTM D698 Method A**

Additional Notes **Bulk Sample from P-8 @ 0-5'**

TEST RESULTS

Maximum Dry Density **109.2 PCF**

Optimum Water Content **16.6 %**

% Passing No. 200 Sieve **67.8 %**

ATTERBERG LIMITS

LL	PL	PI
32	**19**	**13**

Curves of 100% Saturation
for Specific Gravity Equal to:

2.80

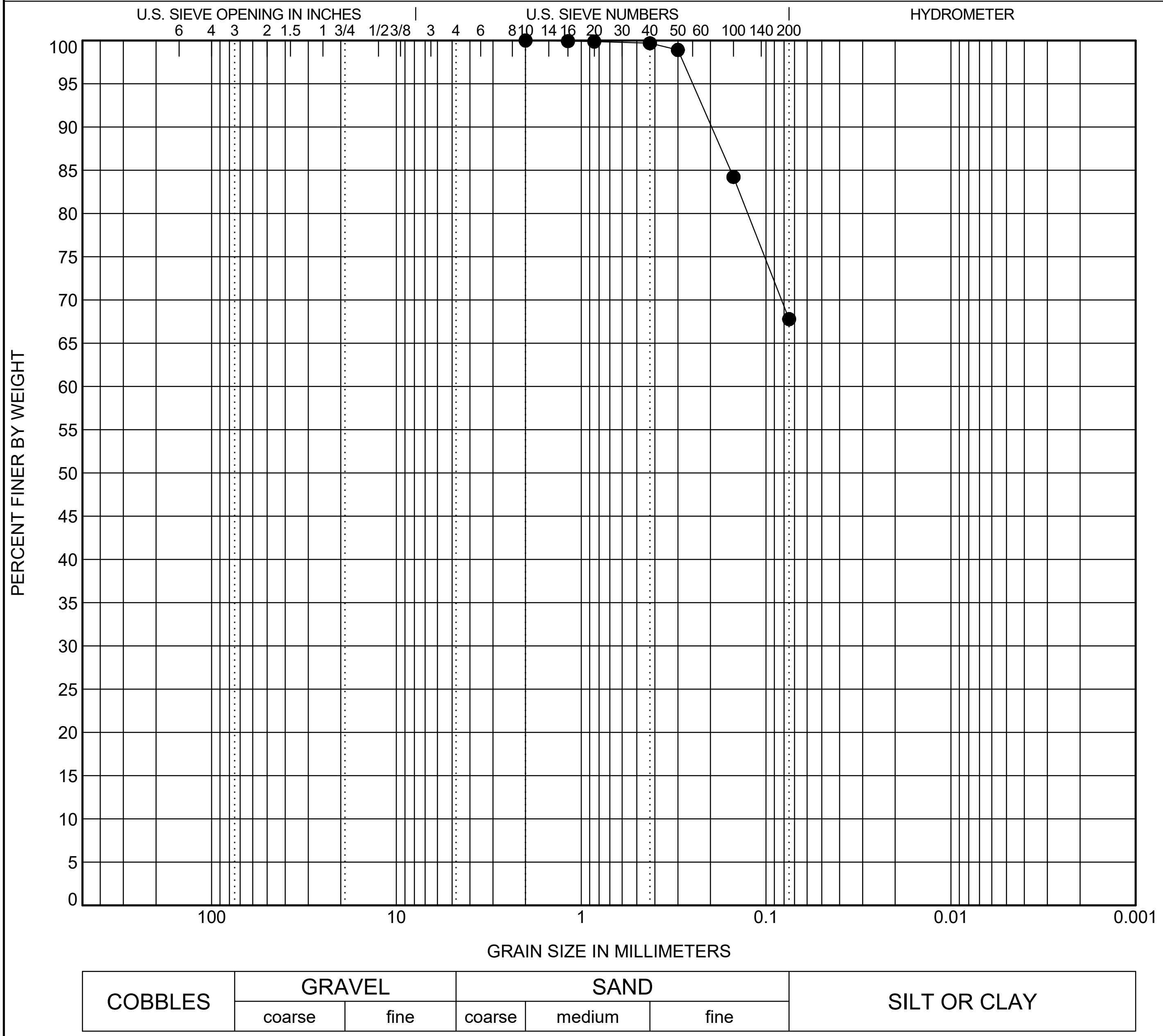
2.70

2.60

3.STD PROCTOR TEST GBHM240037 DHR TUSCALOOSA.GPJ GMC DATA TEMPLATE.GDT 8/19/24

GRAIN SIZE DISTRIBUTION

CLIENT	Alabama Department of Human Resourses	**PROJECT NAME**	DHR Tuscaloosa
PROJECT NUMBER	GBHM240037	**PROJECT LOCATION**	Tuscaloosa, AL



	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B24-086**	**0.0-5.0**	**SANDY LEAN CLAY(CL)**	**32**	**19**	**13**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B24-086**	**0.0-5.0**	**2**				**0.0**	**32.2**	**67.8**	

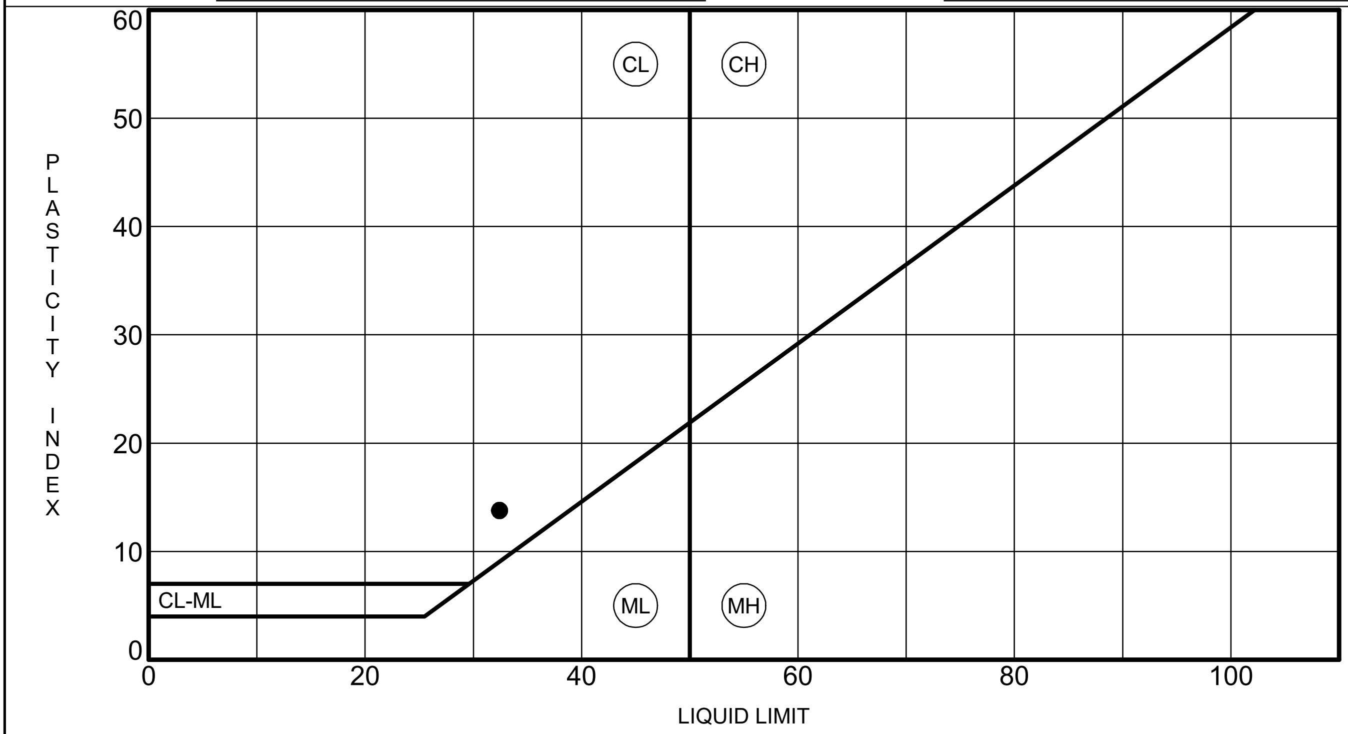
ATTERBERG LIMITS' RESULTS

CLIENT Alabama Department of Human Resourses

PROJECT NAME DHR Tuscaloosa

PROJECT NUMBER GBHM240037

PROJECT LOCATION Tuscaloosa, AL



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B24-086**	**0.0-5.0**	**32**	**19**	**13**	**68**	**SANDY LEAN CLAY(CL)**

FIELD TEST PROCEDURES

General

The general field procedures employed by Goodwyn Mills Cawood, LLC (GMC), are summarized in the American Society for Testing and Materials (ASTM) Standard D420 which is entitled "Investigating and Sampling Soil and Rock". This recommended practice lists recognized methods for determining soil and rock distribution and groundwater conditions. These methods include geophysical and in-situ methods as well as borings.

The detailed collection methods used during this exploration are presented in the following paragraphs.

Standard Drilling Techniques

General: To obtain subsurface samples, borings are drilled using one of several alternate techniques depending upon the subsurface conditions. These techniques are as follows:

In Soils:
a) Continuous hollow stem augers.
b) Rotary borings using roller cone bits or drag bits, and water or drilling mud to flush the hole.
c) "Hand" augers.

In Rock:
a) Core drilling with diamond-faced, double or triple tube core barrels.
b) Core boring with roller cone bits.

Hollow Stem Auger: A hollow stem augers consists of a hollow steel tube with a continuous exterior spiral flange termed a flight. The auger is turned into the ground, returning the cuttings along the flights. The hollow center permits a variety of sampling and testing tools to be used without removing the auger.

Rotary Borings: Rotary drilling involves the use of roller cone or drag type drill bits attached to the end of drill rods. A flushing medium, normally water or bentonite slurry, is pumped through the rods to clear the cuttings from the bit face and flush them to the surface. Casing is sometimes set behind the advancing bit to prevent the hole from collapsing and to restrict the penetration of the drilling fluid into the surrounding soils. Cuttings returned to the surface by the drilling fluid are typically collected in a settling tank, to allow the fluid to be recirculated.

Hand Auger Boring: Hand auger borings are advanced by manually twisting a 4" diameter steel bucket auger into the ground and withdrawing it when filled to observe the sample collected. Posthole diggers are sometimes used in lieu of augers to obtain shallow soil samples. Occasionally these hand auger borings are used for driving 3-inch diameter steel tubes to obtain intact soil samples.

Core Drilling: Soil drilling methods are not normally capable of penetrating through hard cemeted soil, weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound, continuous rock. Material that cannot be penetrated by auger or rotary soil-drilling methods at a reasonable rate is designated as "refusal material". Core drilling procedures are required to penetrate and sample refusal materials.

Prior to coring, casing may be set in the drilled hole through the overburden soils, to keep the hole from caving and to prevent excessive water loss. The refusal materials are then cored according to ASTM D2113 using a diamond studded bit fastened to the end of a hollow, double or triple tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovery is measured, and the core is placed, in sequence, in boxes for storage and transported to our laboratory.

Sampling and Testing in Boreholes

General: Several techniques are used to obtain samples and data in soils; however, the most common methods in this area are:

a) Standard Penetrating Testing
b) Water Level Readings

These procedures are presented below. Any additional testing techniques employed during this exploration are contained in other sections of the Appendix.

Standard Penetration Testing: At regular intervals, the drilling tools are removed and soil samples obtained with a standard 2-inch diameter split tube sampler connected to an A or N-size rod. The sampler is first seated 6 inches to penetrate any loose cuttings, and then driven an additional 12 inches with blows of a 140-pound safety hammer falling 30 inches. Generally, the number of hammer blows required to drive the sampler the final 12 inches is designated the "penetration resistance" or "N" value, in blows per foot (bpf). The split barrel sampler is designed to retain the soil penetrated, so that it may be returned to the surface for observation. Representative portions of the soil samples obtained from each split barrel sample are placed in jars, sealed and transported to our laboratory.

The standard penetration test, when properly evaluated, provides an indication of the soil strength and compressibility. The tests are conducted according to ASTM Standard D1586. The depths and N-values of standard penetration tests are shown on the Boring Records. Split barrel samples are suitable for visual observation and classification tests but are not sufficiently intact for quantitative laboratory testing.

Water Level Readings: Water table readings are normally taken in the borings and are recorded on the Boring Records. In sandy soils, these readings indicate the approximate location of the hydrostatic water table at the time of our field exploration. In clayey soils, the rate of water seepage into the borings is low and it is generally not possible to establish the location of the hydrostatic water table through short-term water level readings. Also, fluctuation in the water table should be expected with variations in precipitation, surface run-off, evaporation, and other factors. For long-term monitoring of water levels, it is necessary to install piezometers.

The water levels reported on the Boring Records are determined by field crews immediately after the drilling tools are removed, and several hours after the borings are completed, if possible. The time lag is intended to permit stabilization of the groundwater table, which may have been disrupted by the drilling operation.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the cave-in zone. The cave-in depth is measured and recorded on the Boring Records.

Boring Records

The subsurface conditions encountered during drilling are reported on a field boring record prepared by the Driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of coarse gravel, cobbles, etc., and observations of ground water. It also contains the driller's interpretation of the soil conditions between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are kept on file in our office.

After the drilling is completed, a geotechnical professional classifies the soil samples and prepares the final Boring Records, which are the basis for all evaluations and recommendations. The following terms are taken from ASTM D2487 or Deere's Technical Description of Rock Cores for Engineering Purposes, Rock Mechanical Engineering Geology 1, pp. 18-22.

Relative Density of Cohesionless Soils From Standard Penetration Test

Very Loose	≤ 4 bpf
Loose	5 - 10 bpf
Medium	11 – 30 bpf
Dense	31 - 50 bpf
Very Dense	› 50 bpf

(bpf = blows per foot, ASTM D 1586)

Consistency of Cohesive Soils

Very Soft	≤ 2 bpf
Soft	3 - 4 bpf
Medium	5 - 8 bpf
Stiff	9 - 15 bpf
Very Stiff	16 - 30 bpf
Hard	› 30 bpf

Relative Hardness of Rock

Very Soft Rock disintegrates or easily compresses to touch; can be hard to very hard soil.

Soft Rock may be broken with fingers.

Moderately Soft Rock may be scratched with a nail, corners and edges may be broken with fingers.

Moderately Hard Rock a light blow of hammer is required to break samples.

Hard Rock a hard blow of hammer is required to break sample.

Particle Size Identification

Boulders	Larger than 12"
Cobbles	3" - 12"
Gravel	
Coarse	3/4" - 3"
Fine	4.76mm - 3/4"
Sand	
Coarse	2.0 - 4.76 mm
Medium	0.42 - 2.00 mm
Fine	0.42 - 0.074 mm
Fines (Silt or Clay)	Smaller than 0.074 mm

Rock Continuity

$$\textbf{RECOVERY} = \frac{\text{Total Length of Core}}{\text{Length of Core Run}} \text{ x } 100\ \%$$

Description	Core Recovery %
Incompetent	Less than 40
Competent	40 - 70
Fairly Continuous	71 - 90
Continuous	91 - 100

Relative Quality of Rocks

$$\textbf{RQD} = \frac{\text{Total core, counting only pieces › 4" long}}{\text{Length of Core Run}} \text{ x } 100\ \%$$

Description	RQD %
Very Poor	0 - 25 %
Poor	25 - 50 %
Fair	50 - 75 %
Good	75 - 90 %
Excellent	90 - 100 %

LABORATORY TESTING

GENERAL

The laboratory testing procedures employed by Goodwyn Mills Cawood, LLC (GMC) are in general accordance with ASTM standard methods and other applicable specifications.

Several test methods, described together with others in this Appendix, were used during the course of this exploration. The Laboratory Data Summary sheet indicates the specific tests performed.

SOIL CLASSIFICATION

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Boring Records".

The classification system discussed above is primarily qualitative and for detailed soil classification, two laboratory tests are commonly performed: grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

POCKET PENETROMETER TEST

A pocket penetrometer test is performed by pressing the tip of a small, spring-loaded penetrometer with even pressure to a prescribed depth into a soil sample. This test yields a value for unconfined compressive strength, which may be correlated with unconfined compressive strengths obtained by other laboratory methods.

MOISTURE CONTENT

Moisture contents are determined from representative portions of the specimen. The soil is dried to a constant weight in an oven at 100° C and the loss of moisture during the drying process is measured. From this data, the moisture content is computed.

ATTERBERG LIMITS

Liquid Limit (LL), Plastic Limit (PL) and Shrinkage Limit (SL) tests are performed to aid in the classification of soils and to determine the plasticity and volume change characteristics of the materials. The Liquid Limit is the minimum moisture content at which a soil will flow as a heavy viscous fluid. The Plastic Limit is the minimum moisture content at which the soil behaves as a plastic material. The Shrinkage Limit is the moisture content below which no further volume change will take place with continued drying. The Plasticity Index (PI) is the numeric difference of Liquid Limit and Plastic Limit and indicates the range of moisture content over which a soil remains plastic. These tests are performed in accordance with ASTM D4318, D4943 and D427.

PARTICLE SIZE DISTRIBUTION

The distribution of soils coarser than the No. 200 (75-mm) sieve is determined by passing a representative specimen through a standard set of nested sieves. The weight of material retained on each sieve is determined and the percentage retained (or passing) is calculated.

A specimen may be washed through only the No. 200 sieve, if the full range of particle sizes is not required. The percentage of material passing the No. 200 sieve is reported.

The distribution of materials finer than the No. 200 sieve is determined by use of a hydrometer. The particle sizes and distribution are computed from the time rate of settlement of the different size particles while suspended in water. These tests are performed in accordance with ASTM D421, D422 and D1140.

COMPACTION TESTS (Moisture-Density Relationships)

Compaction tests are performed on representative soil samples to determine the maximum dry density and optimum moisture content. The results of the tests are used in conjunction with other tests to determine the desired engineering properties relating to settlement, bearing capacity, shear strength, and permeability. The results may also be used as a standard to determine the percent compaction of soil fills.

The two most commonly used compaction tests are the standard proctor test and the modified proctor test. They are performed in accordance with ASTM Specifications D698 and D1557, respectively. Generally, the standard proctor compaction test is run on samples from building areas and areas where moderate building loads are anticipated. The modified compaction test is generally used for analyses of highways and other areas where large building loads are expected. Both tests have three alternative methods.

Test	Method	Hammer		Mold Diameter	Run on Material Finer Than	No. Layers	No. of Blows/ Layer
		Wt.	Fall				
Standard D698	A	5.5 lb.	12”	4”	No. 4 sieve	3	25
	B	5.5 lb.	12”	4”	3/8” sieve	3	25
	C	5.5 lb.	12”	6”	3/4” sieve	3	56
Modified D1557	A	10 lb.	18”	4”	No. 4 sieve	5	25
	B	10 lb.	18”	4”	3/8” sieve	5	25
	C	10 lb.	18”	6”	3/4” sieve	5	56

Test results are presented in the form of a dry unit weight versus moisture content curve. The compaction method used and any deviations from the recommended procedures are noted in this report.