Report of Subsurface Exploration and Geotechnical Evaluation

Auburn Islamic Center
Auburn, AL
Building & Earth Project No.: AU250152

Prepared For:
Auburn Islamic Center

September 11, 2025

BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers
The Benchmark for Professional Service Firms

95 Auburn Lakes Road
Auburn, AL 36830
Ph: (334) 821-1445
www.BuildingAndEarth.com

September 11, 2025

Auburn Islamic Center
338 Armstrong Street
Auburn, AL 36830
c/o: Seay, Seay, and Litchfield P.C.

Attention: Mr. Mustafa Kazmi

Subject: Report of Subsurface Exploration and Geotechnical Evaluation
Auburn Islamic Center
Auburn, Alabama
Building & Earth Project No: AU250152

Dear Mr. Kazmi:

Building & Earth Sciences, Inc. has completed the authorized subsurface exploration and geotechnical engineering evaluation for the Auburn Islamic Center located at 740 Mill Creek Road in Auburn, AL.

The purpose of this exploration and evaluation was to determine general subsurface conditions at the site and to address applicable geotechnical aspects of the proposed construction and site development. The recommendations in this report are based on a physical reconnaissance of the site and observation and classification of samples obtained from eight soil test borings conducted at the site. Confirmation of the anticipated subsurface conditions during construction is an essential part of geotechnical services.

We appreciate the opportunity to provide consultation services for the proposed project. If you have any questions regarding the information in this report or need any additional information, please call us.

Respectfully Submitted,
BUILDING & EARTH SCIENCES, INC.

Aaron Roy
Aaron Roy, P.E.
Branch Manager

Jeffrey C. Pepper
Jeff Pepper, P.E.
Chief Engineer/Principal

No. 30081
JEFFREY C. PEPPER

Table of Contents

1.0 PROJECT & SITE DESCRIPTION

The subject site is located at 740 Mill Creek Road, Auburn, Alabama. Information relative to the proposed site and the proposed development is listed in Table 1 below. Photographs depicting the current site condition are presented on the following page.

Development Item	Detail	Description
General Site	Size (Ac.)	±2.63 Ac.
	Existing Development	None existing; however, historical Google Earth aerial imagery depicts a structure near borings P-01 and P-02 that was demolished sometime between 1998 and 2005
	Vegetation	Tall grass and thick brush in the western portion and forested land (mature growth) in the eastern portion
	Slopes	The topography of the site slopes from the higher elevations (Elev. 486 ft.) on the northwest corner of the site to the lower elevations (Elev. 479 ft.) to the southeast
	Retaining Walls	None existing or proposed
	Drainage	Fair, the site generally drains from northwest to south east following existing topography
	Cuts & Fills	Cuts of about 1 foot with fills up to 2 feet within the building pad
Proposed Buildings	No. of Bldgs	One (1)
	Square Ft.	±8,000 SF
	Stories	One (1)
	Construction	Wood framed (assumed)
	Column Loads	Less than 30 kips (assumed)
	Wall Loads	Less than 3 klf (assumed)
	Preferred Foundation	Shallow Foundation
	Preferred Slab	Slab-on-grade
Pavements	Traffic	Not Provided
	Standard Duty	Both Rigid & Flexible options provided
	Heavy Duty	Both Rigid & Flexible options provided

Table 1: Project and Site Description

Reference: *Overall Site Layout Plan Sheet C2.0 dated August 2025 prepared by Kadre Engineering.*

Notes:

1. ***If actual loading conditions exceed our anticipated loads, Building & Earth Sciences should be allowed to review the proposed structural design and its effects on our recommendations for foundation design.***

2. ***The Overall Site Layout Plan Sheet C2.0, dated August 2025 was used in preparing this report. If the final grades or building locations are modified, then Building & Earth should be allowed to review the plan and its effects on our recommendations.***

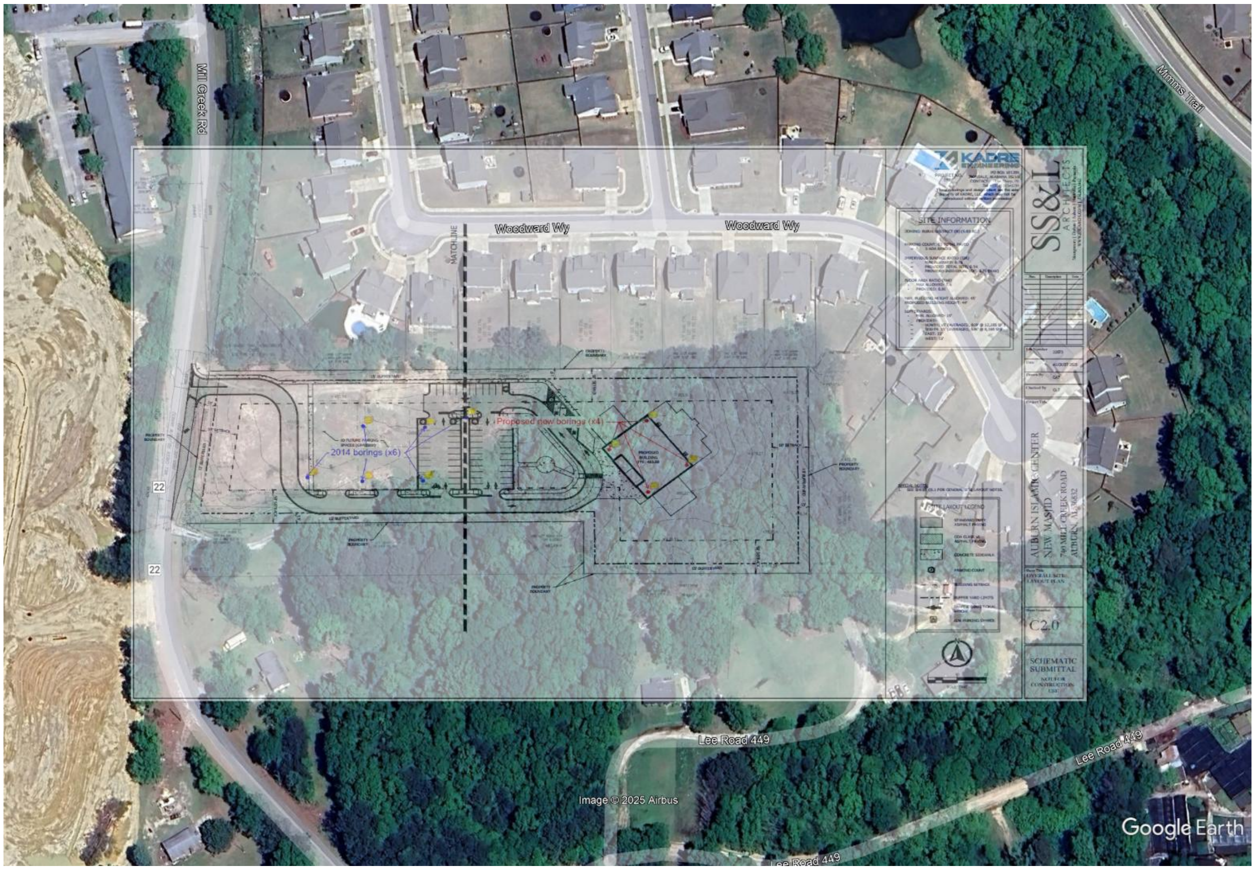


Figure 1: Google Earth Aerial Image of the Project Site

Figure 2: Facing East Towards B-01; Conditions Typical of West Side of Site

Figure 3: Site Conditions Typical of East Side of Site; Scattered Debris

Figure 4: Construction Debris Pile Northeast of P-02

Figure 5: Boulder Pile Northwest of P-03

2.0 SCOPE OF SERVICES

The authorized subsurface exploration was performed on August 26, 2025, in conformance with our proposal AU27189, dated August 13, 2025. Occasionally some modification of the scope outlined in our proposal is required to provide for proper evaluation of the encountered subsurface conditions. As such, boring P-02 encountered shallow auger refusal (AR<10 ft.) and was offset approximately 5 feet north and re-drilled where the boring continued to the proposed termination depth of 10 feet.

The purpose of the geotechnical exploration was to determine general subsurface conditions at specific boring locations and to gather data on which to base a geotechnical evaluation with respect to the proposed construction. The subsurface exploration for this project consisted of eight soil test borings. The site was drilled using a GeoProbe 3145GT equipped with an automatic hammer for performing Standard Penetration Tests (SPT) to help evaluate the relative soil strength. Refer to the Appendix for a description of the drilling and sampling procedures.

The soil boring locations were determined in the field by a representative of our staff utilizing coordinates previously gathered from Google Earth Pro. As such, the boring locations shown on the Boring Location Plan attached to this report should be considered approximate.

The soil samples recovered during our site investigation were visually classified and specific samples were selected by the project engineer for laboratory analysis. The laboratory analysis consisted of:

Test	ASTM	No. of Tests
Natural Moisture Content	D2216	18
Atterberg Limits	D4318	3
Material Finer Than No. 200 Sieve by Washing	D1140	5

Table 2: Scope of Laboratory Tests

The results of the laboratory analysis are presented on the enclosed Boring Logs and in tabular form in the Appendix of this report. Descriptions of the laboratory tests that were performed are also included in the Appendix.

The information gathered from the exploration was evaluated to determine a suitable foundation type for the proposed structure. The information was also evaluated to help determine if any special subgrade preparation procedures will be required during the earthwork phase of the project.

The results of the work presented within this report addresses:

- Site geology and its impact on site development.
- Summary of existing surface conditions.
- A description of the subsurface and groundwater conditions encountered at the soil test boring locations. Long-term water level monitoring was not included in our scope of services.
- Presentation of laboratory test results.
- Site preparation considerations including material types to be expected at the site and treatment of unsuitable soils, if encountered.
- Compaction requirements and recommended criteria to establish suitable material for structural backfill.
- Recommendations to be used for foundation design, including appropriate foundation types, bearing pressures, and depths.
- Recommendations for slab-on-grade design, including a modulus of subgrade reaction.
- Recommendations regarding pavement design and construction based on assumed CBR and traffic loading.

3.0 GEOTECHNICAL SITE CHARACTERIZATION

The following discussion is intended to create a general understanding of the site from a geotechnical engineering perspective. It is not intended to be a discussion of every potential geotechnical issue that may arise, nor to provide every possible interpretation of the conditions identified. The following conditions and subsequent recommendations assume that significant changes in subsurface conditions do not occur between boreholes. However, anomalous conditions can occur due to variations in existing fill that may be present, and the geologic conditions at the site, and it will be necessary to evaluate the assumed conditions during site grading and foundation installation. The seasonal conditions and prevalent weather prior to and during site grading can have a significant impact on the near surface site conditions.

3.1 GEOLOGY

Published data from the USGS indicate that the site is underlain by mylonitic and cataclastic rocks in the Brevard, Towaliga, and Goat Rock fault zones. Mylonite, primary rock type in this formation, is a metamorphic chert-like rock with a streaky and banded structure. Gneiss, secondary rock type, is a metamorphic rock that is foliated with alternating bands of granular and flaky minerals. Other rock types found in this formation consist of schist and quartzite. Generally, the underlying rock formation found at the site was produced by the extreme granulation and shearing of rock that have been pulverized and rolled during over thrusting or intense dynamic metamorphism.

3.2 EXISTING SURFACE CONDITIONS

At the time of our site visit, the site consisted of tall, thick grass and underbrush on the western portion with densely wooded land to the east consisting of mature trees. The topography of the site slopes from the higher elevations (about Elev. 486 ft.) on the northwest corner of the site to the lower elevations on the southeast portion of the property (about Elev. 479 ft.). Piles of construction debris and boulders up to approximately 4 feet in diameter, were observed towards the center of the site between borings P-02 and P-03.

Review of historical satellite imagery indicated that the western most borings (P-01 and P-02) were situated within what appears to have been a structure. Figure 6 below shows historic satellite imagery of the site, dated January 1998. The structure was demolished some time between 1998 and 2005.

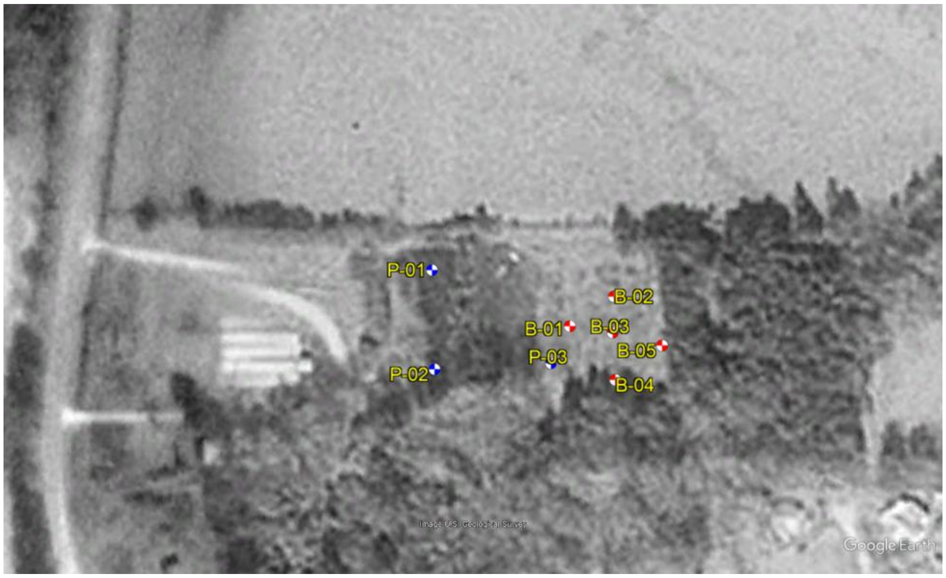


Figure 6: Historic Satellite Imagery of the Site (Google Earth dated 01/10/1998)

3.3 SUBSURFACE CONDITIONS

A generalized stratification summary has been prepared using data from the soil test borings and is presented in the table below. The stratification depicts the general soil conditions and strata types encountered during our field investigation.

Stratum No.	Description	Consistency
1	Topsoil	N/A
2	Fill Soils: Silty Sands (SM) and Clayey Sands (SC) (P-01 and P-02 Only)	Typically loose to medium dense
3	Residual Silty Sands (SM)	Medium Dense
4	Residual Sandy Silt (ML)	Typically medium stiff to stiff the upper 5 feet, underlain by stiff to hard through the termination depth
5	Weathered Rock: Sampled as Silty Sand (SM)	Very Dense, N Values >50 blows per six inches

Table 3: Stratification Summary

Subsurface soil profiles which show the thickness of the stratum referenced above have also been prepared based on the data obtained at the specific boring locations and are presented in the Appendix. For specific details on the information obtained from individual soil borings, please refer to the Boring Logs included in the Appendix. For specific details on the information obtained from individual soil borings, please refer to the Boring Logs included in the Appendix. The elevations of the borings indicated in this report were estimated based on *Overall Site Layout Plan Sheet C2.0* dated August 2025 prepared by Kadre Engineering.

3.3.1 TOPSOIL

The borings initially encountered approximately 2 to 4 inches of topsoil. Topsoil depths reported on the boring logs should only be construed as an estimate and topsoil thickness may vary in unexplored areas. For this report, topsoil is defined as the soil horizon which contains the root mat of the noted vegetation observed at the boring locations. ***The site contractor should provide their own evaluation of the site to determine the topsoil depth to utilize for bidding purposes.***

3.3.2 EXISTING FILL SOILS

Beneath the topsoil, the east most borings P-01 and P-02 encountered silty sand (SM) and clayey sand (SC) soils classified as fill material that extended to 9.5 and 6 feet below the existing ground surface, respectively.

The fill generally varied between loose to medium dense relative densities as indicated by the SPT N-values between 4 and 19 blows per foot (bpf). However, boring P-02 encountered shallow auger refusal at about 2 feet below the existing ground surface. The borings was offset approximately 5 feet north and re-drilled where the boring continued to the proposed termination depth of 10 feet. Based on the historical aerial imagery of the site, it is possible that foundations or other construction remnants were left in placed following demolition.

Laboratory analysis on select fill samples indicated soil moisture contents between approximately 12 to 16 percent with about 30 percent passing the No. 200 sieve. Atterberg limits testing on a select sample of the fill indicated non-plastic characteristics.

3.3.3 RESIDUAL SOILS

Below the topsoil of the remaining borings typically encountered sandy silt (ML) through the termination depths, with a stratum of silty sands (SM) encountered within the upper 6 feet in boring B-01. SM soils were also encountered beneath the weathered rock in P-02.

Typically, the ML soil exhibited medium stiff to stiff consistencies within the upper 5 feet as indicated by the N-values between 6 and 12 bpf. Below five feet, SPT values ranged between 11 and 47 bpf indicating stiff the hard consistencies. The SM soils generally exhibited medium dense to dense relative densities with N-values between 14 and 30 bpf.

Laboratory analysis on select samples of the residual ML soils indicated approximately 69 to 76 percent passing the No. 200 sieve. The residual ML/SM soils exhibited moisture levels between 9 and 20 percent. Atterberg limits testing performed on select samples of the ML soils indicated liquid limits (LL) of 44 and 46 with plasticity indices of 7 and 8, respectively.

3.4 BOREHOLE COLLAPSE

At the time of drilling, groundwater was not encountered in the depths explored. However, borehole collapse, which can be an indicator of groundwater levels, occurred in all five of the building borings between about 9 and 10 feet at the time of drilling. Water levels reported are accurate only for the time and date that the borings were drilled. The prevalent weather conditions prior to construction will influence the amount and depth of water at the borehole locations. Long term monitoring of the boreholes was not included as part of our subsurface exploration. Identifying the static depth to the groundwater table verses the presence of perched water was not included in our scope of services. The borings were backfilled the same day that they were drilled so the stabilized water level may be different than shown. Borehole collapse data is included in the following table.

Boring No.	Depth (ft)
B-01	8.8
B-02	8.8

Boring No.	Depth (ft)
B-03	9.6
B-04	10.2
B-05	8.8

Table 4: Approximate Borehole Collapse Depth

4.0 SITE DEVELOPMENT CONSIDERATIONS

The *Overall Site Layout Plan Sheet C2.0* dated August 2025 prepared by Kadre Engineering was provided for the preparation of this report. Based on review of the plan, we anticipate cuts of about 1 foot with fills of about 2 feet will be required to reach finished grades within the building pad.

Based on our evaluation of the subsurface soil information, and the anticipated foundation loads, it appears that construction with a shallow foundation system is feasible. The site development recommendations outlined below are intended for development of the site to support construction with a shallow foundation system.

The primary geotechnical concerns for this project are:

- The presence of moisture sensitive soils encountered across the site
- Low consistency (N≤6) cohesive ML soils soil encountered near footing depth in B-02.
- The presence of undocumented fill near borings P-01 and P-02. The existing fill generally appeared to be moderately compacted and possibly could contained construction debris. There is a likelihood of encountering old foundations, septic tanks, and construction debris on the western portion of the site.

Recommendations addressing the site conditions are presented in the following sections.

4.1 INITIAL SITE PREPARATION

All trees, roots, topsoil, construction debris and deleterious materials should be removed from the proposed construction areas. Approximately 2 to 4 inches of topsoil were observed in the borings. The topsoil thickness is accurate only at the specific boring locations but can be extrapolated between boreholes for initial cost estimating purposes. A geotechnical engineer should observe stripping and grubbing operations to evaluate that all unsuitable materials are removed from locations for proposed construction.

Review of historical satellite imagery indicated that the western most borings were situated within what appears to have been a structure. The structure appears to have been demolished sometime between 1998 and 2005. Because of past use of the site, buried structures could be encountered such as foundations, utility lines, septic tanks, old water wells, etc. If encountered, they should be removed and backfilled in accordance with requirements outlined in the Structural Fill section of this report. Please note that boring P-02 initially encountered shallow refusal at about 2 feet. This boring was offset about 5 feet north and drilled to the proposed termination depth.

We recommend test pits be performed within the vicinity of borings P-01 and P-02 to evaluate the limits of the fill soil and possible foundation/construction debris. Additional evaluations of subsoils within these areas should be performed prior to construction, which should include proofrolling of the subgrade with a loaded (20- to 25-ton) tandem-axle dump truck. Test pits and dynamic cone penetrometer (DCP) testing should be performed within the delineated areas of concern.

Materials disturbed during clearing operations should be stabilized in place or, if necessary, undercut to undisturbed materials and backfilled with properly compacted, approved structural fill.

During site preparation activities, the contractor should identify borrow source materials that will be used as structural fill and provide samples to the testing laboratory so that conformance to the Structural Fill requirements outlined below and appropriate moisture-density relationship curves can be determined.

4.2 SUBGRADE EVALUATION

We recommend that the project geotechnical engineer or a qualified representative evaluate the subgrade after the site is prepared. Some unsuitable or unstable areas may be present in unexplored areas of the site. All areas that will require fill or that will support structures should be carefully proofrolled with a heavy (40,000 # minimum), rubber-tired vehicle at the following times.

- After an area has been stripped, and undercut if required, prior to the placement of any fill.
- After grading an area to the finished subgrade elevation in a building or pavement area.
- After areas have been exposed to any precipitation, and/or have been exposed for more than 48 hours.

Some instability may exist during construction, depending on climatic and other factors immediately preceding and during construction. If any soft or otherwise unsuitable soils are identified during the proofrolling process, they must be undercut or stabilized prior to fill placement, pavement construction, or floor slab construction. All unsuitable material identified during construction shall be removed and replaced in accordance with the Structural Fill section of this report.

4.3 MOISTURE SENSITIVE SOILS

Moisture sensitive silty sands (SM) and sandy silts (ML) were encountered across most of the site during the subsurface exploration. These soils will degrade if allowed to become saturated. Therefore, not allowing water to pond by maintaining positive drainage and temporary dewatering methods (if required) is important to help avoid degradation and softening of the soils.

The contractor should anticipate some difficulty during the earthwork phase of this project if moisture levels are moderate to high during construction. Increased moisture levels will soften the subgrade, and the soils may become unstable under the influence of construction traffic. Accordingly, construction during wet weather conditions should be avoided, as this could result in soft and unstable soil conditions that would require ground modification, such as in place stabilization or undercutting.

4.4 EVALUATION OF EXISTING FILL AND OF LOW CONSISTENCY SOILS

Existing fill was encountered between 1.5 to 8.5 feet in borings P-01 and P-02. Low relative density (N≤8) fill soils were generally encountered through the fill layer, with the borings encountering medium dense and possibly debris laden fill near the surface. We do not know the quantity or origin of the fill nor whether density tests were performed during its placement. Our limited data indicate that the fill has received moderate compactive effort. However, possible buried construction material could be present within the fill soils, based on soil data and historic aerial imagery.

We recommend test pits be performed within the vicinity of borings P-01 and P-02 to evaluate the limits of the fill soil and possible foundation/construction debris. Depending on final grades within the western pavement areas, we recommend performing a partial undercut to a depth of at least 2 feet below planned subgrade elevations and replacing with structural fill. It should be acknowledged that there will be some risk of excessive settlement over time with this approach if underlying construction debris is not fully removed.

After the initial undercut is performed, the geotechnical engineer, or qualified representative, should evaluate the exposed soils. The exposed soils should be proofrolled in accordance with Section 4.2 of this report. Remediation such as undercutting and/or stabilization efforts may be necessary if unstable soils are observed during the evaluation.

Stabilization methods should be evaluated during construction. Any undercutting should extend laterally 5 feet outside of the edge of the pavement.

Some unsuitable or unstable areas may be present in unexplored areas of the site. Once the known undercut is complete, the areas planned for construction should be proofrolled in order to identify any additional soft soils requiring removal.

Undercut soils should be replaced with structural fill. Clean, non-organic, non-saturated soils taken from the undercut area can be re-used as structural fill. The placement procedure, compaction and composition of the structural fill must meet the requirements of the Structural Fill section of this report.

Any undercutting or stabilization should be conducted under the observation of the geotechnical engineer or a designated representative. *Weather conditions at the time of construction will affect the undercutting depths and quantities.* Some instability may exist during construction, depending on climatic and other factors immediately preceding and during construction.

4.5 STRUCTURAL FILL

Requirements for structural fill on this project are as follows:

Soil Type	USCS Classification	Property Requirements	Placement Location
Sand and Gravel	GW, GP, GM, SW, SP, SM, or combinations	Maximum 2" particle size	All locations and depths with proper drainage.
Lean Silt and Clay	ML, CL	$LL<50$, $PI<25$, $\gamma_d>95$ pcf	All locations and depths.
Fat Clay, Elastic Silt	CH, MH	$\gamma_d>95$ pcf	Not suitable for use as structural fill.
On-site soils	SM, SC, ML,	As listed above.	All locations and depths. Existing fill with excessive debris or organics should not be re-used as structural fill, if encountered.

Table 5: Structural Fill Requirements

Notes:

1. ***All structural fill should be free of vegetation, topsoil, and any other deleterious materials. The organic content of materials to be used for fill should be less than 4 percent.***
2. ***LL indicates the soil Liquid Limit; PI indicates the soil Plasticity Index; γ_d indicates the maximum dry density as defined by the density standard outlined in the table below.***
3. ***Laboratory testing of the soils proposed for fill must be performed in order to verify their conformance with the above recommendations.***

4. ***Any fill to be placed at the site should be reviewed by the geotechnical engineer.***

Placement requirements for structural fill are as follows:

Specification	Requirement
Lift Thickness	Maximum 8-inch loose lifts when compacted with large heavy compaction equipment. Maximum 6-inch loose lifts when compacted with lightweight compaction equipment (thinner lifts may be required in confined locations).
Density	Minimum of 98% of maximum dry density as defined by ASTM D698 at all locations and depths
Moisture	±2 percent of optimum moisture as defined by ASTM D698 for cohesive soils. For cohesionless soils with greater than 2 percent passing the US Standard No. 200 sieve, ±3 percent of optimum moisture as defined above. Moisture requirement is waived for cohesionless soil with less than 12 percent passing the No. 200 sieve.
Density Testing Frequency	**Structural and slope areas**: One test per 2,500 square feet (SF) per lift with a minimum of three tests performed per lift **Pavement areas**: One test per 5,000 square feet (SF) per lift with a minimum of three tests performed per lift **Utility trenches**: One test per 150 linear feet per lift with a minimum of two performed per lift The testing frequency can be increased or decreased by the Geotechnical Engineer of Record in the field based on uniformity of material being placed and compactive effort used.

Table 6: Structural Fill Replacement Requirements

4.6 EXCAVATION CONSIDERATIONS

All excavations performed at the site should follow OSHA guidelines for temporary excavations. Excavated soils should be stockpiled according to OSHA regulations to limit the potential cave-in of soils.

4.6.1 GROUNDWATER

Groundwater was not encountered in the depths explored. **Groundwater is not expected to be encountered during construction or grading operations.** should be noted that fluctuations in the water level could occur due to seasonal variations in rainfall. The contractor must be prepared to remove groundwater seepage from excavations if encountered during construction. Excavations extending below groundwater levels will require dewatering systems (such as well points, sump pumps or trench drains). The contractor should evaluate the most economical and practical dewatering method.

4.7 UTILITY TRENCH BACKFILL

All utility trenches must be backfilled and compacted in the manner specified above for structural fill. It may be necessary to reduce the lift thickness to 4 to 6 inches to achieve compaction using hand-operated equipment.

4.8 LANDSCAPING AND DRAINAGE CONSIDERATION

The potential for soil moisture fluctuations within building areas and pavement subgrades should be reduced to lessen the potential of subgrade movement. Site grading should include positive drainage away from buildings and pavements. Excessive irrigation of landscaping poses a risk of saturating and softening soils below shallow footings and pavements, which could result in settlement of footings and premature failure of pavements.

4.9 WET WEATHER CONSTRUCTION

Excessive movement of construction equipment across the site during wet weather may result in ruts, which will collect rainwater, prolonging the time required to dry the subgrade soils.

During rainy periods, additional effort will be required to properly prepare the site and establish/maintain an acceptable subgrade. The difficulty will increase in areas where clay or silty soils are exposed at the subgrade elevation. Grading contractors typically postpone grading operations during wet weather to wait for conditions that are more favorable. Contractors can typically disk or aerate the upper soils to promote drying during intermittent periods of favorable weather. When deadlines restrict postponement of grading operations, additional measures such as undercutting and replacing saturated soils or stabilization can be utilized to facilitate placement of additional fill material.

4.10 SUBGRADE REHABILITATION

The subgrade soils often become disturbed during the period between initial site grading and construction of surface improvements. The amount and depth of disturbance will vary with soil type, weather conditions, construction traffic, and drainage.

The engineer should evaluate the subgrade soil during final grading to verify that the subgrade is suitable to receive pavement and/or concrete slab base materials. The final evaluation may include proofrolling or density tests.

Subgrade rehabilitation can become a point of controversy when different contractors are responsible for site grading and building construction. The construction documents should specifically state which contractor will be responsible for maintaining and rehabilitating the subgrade. Rehabilitation may include moisture conditioning and recompacting soils. When deadlines or weather restrict grading operations, additional measures such as undercutting and replacing saturated soils or chemical stabilization can often be utilized.

5.0 FOUNDATION RECOMMENDATIONS

Specific structural loading conditions were not known at the time of this report; however, based on our experience with similar projects, we anticipate that the individual column loads will be less than 30 kips and wall loads will be less than 3 kips per linear foot. ***If these assumptions concerning structural loading are incorrect, our office should be contacted, such that our recommendations can be reviewed.***

5.1 SHALLOW FOUNDATIONS

Based on the conditions encountered during our field investigation and after our site preparation and grading recommendations are implemented, the proposed structure can be supported on conventional shallow foundations designed using an allowable soil bearing capacity of **2,500** psf.

Even though computed footing dimensions may be less, column footings should be at least 24 inches wide and strip footings should be at least 18 inches wide. These dimensions facilitate hand cleaning of footing subgrades disturbed by the excavation process and the placement of reinforcing steel. They also reduce the potential for localized punching shear failure. ***All exterior footings should bear at least 24 inches below the adjacent exterior grade.*** Total settlement of footings designed and constructed as recommended above should be 1 inch or less.

The following items should be considered during the preparation of construction documents and foundation installation:

- The geotechnical engineer of record should observe the exposed foundation bearing surfaces prior to concrete placement to verify that the conditions anticipated during the subsurface exploration are encountered.
- All bearing surfaces must be free of soft or loose soil prior to placing concrete.
- Concrete should be placed the same day the excavations are completed and bearing materials verified by the engineer. If the excavations are left open for an extended period, or if the bearing surfaces are disturbed after the initial observation, then the bearing surfaces should be reevaluated prior to concrete placement.
- Water should not be allowed to pond in foundation excavations prior to concrete placement or above the concrete after the foundation is completed.

- Wherever possible, the foundation concrete should be placed “neat”, using the sides of the excavations as forms. Where this is not possible, the excavations created by forming the foundations must be backfilled with suitable structural fill and properly compacted.
- The building pad should be sloped to drain away from the building foundations.
- Roof drains should be routed away from the foundation soils.

6.0 FLOOR SLABS

Site development recommendations presented in this report should be followed to provide for subgrade conditions suitable for support of grade supported slabs. Floor slabs will be supported on residual soils or newly placed structural fill.

We recommend floor slabs for the proposed structure be supported on a minimum four-inch layer of clean, densely-graded granular material commonly referred to as “crusher-run” materials or No. 57 stone. The purpose of this layer is to help provide a uniform loading condition and act as a capillary break for moisture migration through the subgrade soil. This gravel material should be consolidated in-place with vibratory equipment. a modulus of subgrade reaction of 125 pci can be used in the design of a grade-supported building floor slab.

We recommend a minimum 10-mil thick vapor retarder meeting ASTM E 1745, Class C requirements be placed directly below the slab-on-grade floors. A higher quality vapor retarder (Class A or B) may be used if desired to further inhibit the migration of moisture through the slab-on-grade and should be evaluated based on the floor covering and use. The vapor retarder should extend to the edge of the slab-on-grade floors and should be sealed at all seams and penetrations. The slab should be appropriately reinforced (if required) to support the proposed loads.

Where applicable, we recommend that the floor slab be isolated from the foundation footings so differential settlement of the structure will not induce shear stresses on the floor slab. Temperature and shrinkage reinforcements in slabs on grade maybe considered and incorporated accordingly in the slab design. ACI 360-10 provides guidance on the proper quantity of such reinforcement. The slab should also be appropriately reinforced to support the proposed loads as required. If welded-wire mesh reinforcement is utilized, the mesh reinforcement should be placed 2 inches below the slab surface or upper one-third of the slab thickness, whichever is closer to the surface. Adequate construction joints, contraction joints and isolation joints should also be provided in the slab to reduce the impacts of cracking and shrinkage, in general accordance with ACI standards and guidelines (ACI360R-10).

7.0 PAVEMENT CONSIDERATIONS

Based on the materials encountered at the boring locations and after our recommendations for site preparation are implemented, pavements at the subject site may be designed based on a California Bearing Ratio (CBR) of four (4). Note that no CBR or plate load testing was completed to develop these recommendations.

For pavement design purposes, we have assumed two levels of traffic shown on the table below, for commonly used pavement sections. Specific traffic information was not provided. If the pavement were a typical roadway, according to the "AASHTO Guide for Design of Pavement Structures, 1993", the pavement sections provided in sections 8.1 and 8.2 would be adequate for the following daily traffic volume:

Type	Automobiles (per day)	Delivery Trucks (2-Axle/4-Tire) (per day)	Delivery Trucks (2-Axle/6-Tire) (per day)	Delivery Trucks (Tractor Trailer) (per day)	ESAL
Standard Duty	1000	0	0	0	2.9E+04
Heavy Duty	1000	1	1	1	4.2E+04

Table7: Assumed Traffic Volume

The volumes shown above are just one example of possible vehicle types and daily traffic that would result in the total equivalent 18-kip single-axle load (ESAL) shown.

It has been our experience that parking lots experience a certain level of wear and stress greater than roadways designed for similar traffic volumes. Therefore, parking lots are typically designed using the AASHTO method and adjusted based on experience. If the owner would like Building & Earth to assess other likely traffic volumes, we will gladly review other options.

In addition, we have assumed the following design parameters:

Design Criteria	Value
Design life (Years)	20
Initial Serviceability	4.2
Terminal Serviceability	2.0
Reliability	85%
Standard Deviation	0.45(Flexible)
Standard Deviation	0.35(Rigid)

Table 8: Assumed Design Parameters

Note: All subgrade, base and pavement construction operations should meet minimum requirements of the Alabama Department of Transportation (ALDOT) "*Standard Specifications for Highway Construction*", latest edition. The applicable sections of the specifications are identified as follows:

Material	Specification Section
Portland Cement Concrete Pavement	450
Bituminous Asphalt Wearing Layer	424A
Bituminous Asphalt Binder Layer	424B
Mineral Aggregate Base Materials	825

Table 9: ALDOT Specification Sections

7.1 FLEXIBLE PAVEMENT

The asphalt pavement sections described herein were designed using the "AASHTO Guide for Design of Pavement Structures, 1993" by establishing the structural numbers used for the AASHTO design system and substituting materials based upon structural equivalency as follows:

Material	Structural Coefficient
Asphalt Concrete	0.44
Crushed Stone Base	0.14

Table10: Structural Equivalent Coefficient

The following flexible pavement sections are based on the design parameters presented above:

Minimum Recommended Thickness (in)		Material
Standard Duty	Heavy Duty	
1.0	1.5	Surface Course
2.0	2.0	Binder Course
6.0	6.0	Base

Table 11: Asphalt Pavement Recommendations

All pavements used for parking areas should be sloped a minimum of 1 percent to provide surface drainage. Water allowed to pond on or adjacent to the pavement could saturate the subgrade and cause premature deterioration of the pavements as a result of loss of strength and stability. Periodic maintenance of the pavement should be anticipated. This should include sealing of cracks and joints and maintaining proper surface drainage to avoid ponding water on or near the pavement areas.

The asphalt pavement sections provided are intended for final traffic and does not consider additional loading during construction. If the asphaltic pavement sections are subjected to construction traffic, especially prior to installation of the wearing surface, there is a risk that the pavement will be damaged. Construction traffic will significantly reduce the life of the asphalt pavement.

7.2 RIGID PAVEMENT

The following rigid pavement sections are based on the design parameters presented above. We assume an effective modulus of subgrade reaction (k) of 150 pci. We have assumed concrete elastic modulus (E_c) of 3.6 X 10^6 psi, and a concrete modulus of rupture (S'_c) of 650 psi.

Minimum Recommended Thickness (in)		Material
Standard Duty	Heavy Duty	
4	5	Portland Cement Concrete, f'_c=4000 psi
6	6	Base

Table12:Rigid Pavement Recommendations

The concrete should be protected against moisture loss, rapid temperature fluctuations, and construction traffic for several days after placement. All pavements should be sloped for positive drainage. We recommend the pavements be reinforced to hold any cracks that might develop tightly together and restrain their growth. We recommend that rigid pavement be considered at any areas where heavy rubber-tired traffic will routinely occur such as trash dumpsters, delivery areas, etc. It is assumed that rigid pavement will be utilized in the loading docks.

8.0 CONSTRUCTION MONITORING

Field verification of site conditions is an essential part of the services provided by the geotechnical consultant. In order to confirm our recommendations, it will be necessary for Building & Earth personnel to make periodic visits to the site during site grading. Typical construction monitoring services are listed below.

- Periodic observations and consultations by a member of our engineering staff during site grading
- Continuous monitoring during structural fill placement
- Field density tests during structural fill placement
- Observation and verification of the bearing surfaces exposed after foundation excavation

- Field concrete testing such as slump, air content, and molding concrete strength test specimens
- Structural steel inspection

9.0 CLOSING AND LIMITATIONS

This report was prepared for the Auburn Islamic Center, for specific application to the Auburn Islamic Center located in Auburn, Alabama. The information in this report is not transferable. This report should not be used for a different development on the same property without first being evaluated by the engineer.

The recommendations in this report were based on the information obtained from our field exploration and laboratory analysis. The data collected is representative of the locations tested. Variations are likely to occur at other locations throughout the site. Engineering judgment was applied in regards to conditions between borings. It will be necessary to confirm the anticipated subsurface conditions during construction.

This report has been prepared in accordance with generally accepted standards of geotechnical engineering practice. No other warranty is expressed or implied. In the event that changes are made, or anticipated to be made, to the nature, design, or location of the project as outlined in this report, Building & Earth must be informed of the changes and given the opportunity to either verify or modify the conclusions of this report in writing, or the recommendations of this report will no longer be valid.

The scope of services for this project did not include any environmental assessment of the site or identification of pollutants or hazardous materials or conditions. If the owner is concerned about environmental issues Building & Earth would be happy to provide an additional scope of services to address those concerns.

This report is intended for use during design and preparation of specifications and may not address all conditions at the site during construction. Contractors reviewing this information should acknowledge that this document is for design information only.

An article published by the Geoprofessional Business Association (GBA), titled *Important Information About Your Geotechnical Report*, has been included in the Appendix. We encourage all individuals to become familiar with the article to help manage risk.

Appendix Table of Contents

GEOTECHNICAL INVESTIGATION METHODOLOGIES

The subsurface exploration, which is the basis of the recommendations of this report, has been performed in accordance with industry standards. Detailed methodologies employed in the investigation are presented in the following sections.

DRILLING PROCEDURES – STANDARD PENETRATION TEST (ASTM D1586)

At each boring location, soil samples were obtained at standard sampling intervals with a split-spoon sampler. The borehole was first advanced to the sample depth by augering and the sampling tools were placed in the open hole. The sampler was then driven 18 inches into the ground with a 140-pound automatic hammer free-falling 30 inches. The number of blows required to drive the sampler each 6-inch increment was recorded. The initial increment is considered the "seating" blows, where the sampler penetrates loose or disturbed soil in the bottom of the borehole.

The blows required to penetrate the final two (2) increments are added together and are referred to as the Standard Penetration Test (SPT) N-value. The N-value, when properly evaluated, gives an indication of the soil's strength and ability to support structural loads. Many factors can affect the SPT N-value, so this result cannot be used exclusively to evaluate soil conditions.

The SPT testing was performed using a drill rig equipped with an automatic hammer. Automatic hammers mechanically control the height of the hammer drop, and doing so, deliver higher energy efficiency (90 to 99 % efficiency) than manual hammers (60 % efficiency) which are dropped using a manually operated rope and cathead system. Because historic data correlations were developed based on use of a manual hammer, it is necessary to adjust the N-values obtained using an automatic hammer to make these correlations valid. Therefore, an energy correction factor of 1.3 was applied to the recorded field N-values from the automatic hammer for the purpose of our evaluation. The N-values discussed or mentioned in this report and shown on the boring logs are recorded field values.

Samples retrieved from the boring locations were labeled and stored in plastic bags at the jobsite before being transported to our laboratory for analysis. The project engineer prepared Boring Logs summarizing the subsurface conditions at the boring locations.

BORING LOG DESCRIPTION

Building & Earth Sciences, Inc. used the gINT software program to prepare the attached boring logs. The gINT program provides the flexibility to custom design the boring logs to include the pertinent information from the subsurface exploration and results of our laboratory analysis. The soil and laboratory information included on our logs is summarized below:

DEPTH AND ELEVATION

The depth below the ground surface and the corresponding elevation are shown in the first two columns.

SAMPLE TYPE

The method used to collect the sample is shown. The typical sampling methods include Split Spoon Sampling, Shelby Tube Sampling, Grab Samples, and Rock Core. A key is provided at the bottom of the log showing the graphic symbol for each sample type.

SAMPLE NUMBER

Each sample collected is numbered sequentially.

BLOWS PER INCREMENT, REC%, RQD%

When Standard Split Spoon sampling is used, the blows required to drive the sampler each 6-inch increment are recorded and shown in column 5. When rock core is obtained the recovery ration (REC%) and Rock Quality Designation (RQD%) is recorded.

SOIL DATA

Column 6 is a graphic representation of four different soil parameters. Each of the parameters use the same graph, however, the values of the graph subdivisions vary with each parameter. Each parameter presented on column 6 is summarized below:

- N-value- The Standard Penetration Test N-value, obtained by adding the number of blows required to drive the sampler the final 12 inches, is recorded . The graph labels range from 0 to 50.
- Qu – Unconfined Compressive Strength estimate from the Pocket Penetrometer test in tons per square foot (tsf). The graph labels range from 0 to 5 tsf.
- Atterberg Limits – The Atterberg Limits are plotted with the plastic limit to the left, and liquid limit to the right, connected by a horizontal line. The difference in the plastic and liquid limits is referred to as the Plasticity Index. The Atterberg Limits test results are also included in the Remarks column on the far right of the boring log. The Atterberg Limits graph labels range from 0 to 100%.
- Moisture – The Natural Moisture Content of the soil sample as determined in our laboratory.

SOIL DESCRIPTION

The soil description prepared in accordance with ASTM D2488, Visual Description of Soil Samples. The Munsel Color chart is used to determine the soil color. Strata changes are indicated by a solid line, with the depth of the change indicated on the left side of the line and the elevation of the change indicated on the right side of the line. If subtle changes within a soil type occur, a broken line is used. The Boring Termination or Auger Refusal depth is shown as a solid line at the bottom of the boring.

GRAPHIC

The graphic representation of the soil type is shown. The graphic used for each soil type is related to the Unified Soil Classification chart. A chart showing the graphic associated with each soil classification is included.

REMARKS

Remarks regarding borehole observations, and additional information regarding the laboratory results and groundwater observations.

Major Divisions			*Symbols*		*Group Name & Typical Description*
			Lithology	*Group*	
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 is larger than No. 4 sieve*	***Clean Gravels*** *(Less than 5% 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 *(More than 12% 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 is smaller than No. 4 sieve*	***Clean Sands*** *(Less than 5% fines)*	⁘	***SW***	*Well-graded sands, gravelly sands, little or no fines*
			⁘	***SP***	*Poorly-graded sands, gravelly sands, little or no fines*
		Sands with Fines *(More than 12% 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*	***Inorganic***	▥	***ML***	*Inorganic silts and very find sands, rock flour, silty or clayey fine sands or clayey silt with slight plasticity*
			▨	***CL***	*Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays*
		Organic	▤	***OL***	*Organic silts and organic silty clays of low plasticity*
	Silts and Clays *Liquid Limit greater than 50*	***Inorganic***	▥	***MH***	*Inorganic silts, micaceous or diatomaceous fine sand, or silty soils*
			▨	***CH***	*Inorganic clays of high plasticity*
		Organic	≋	***OH***	*Organic clays of medium to high plasticity, organic silts*
Highly Organic Soils			⁂	***PT***	*Peat, humus, swamp soils with high organic contents*

Table 1: Soil Classification Chart (based on ASTM D2487)

SOIL CLASSIFICATION METHODOLOGY

Building & Earth Sciences classifies soil in general accordance with the Unified Soil Classification System (USCS) presented in ASTM D2487. Table 1 and Figure 1 exemplify the general guidance of the USCS. Soil consistencies and relative densities are presented in general accordance with Terzaghi, Peck, & Mesri's (1996) method, as shown on Table 2, when quantitative field and/or laboratory data is available. Table 2 includes Consistency and Relative Density correlations with N-values obtained using either a manual hammer (60 percent efficiency) or automatic hammer (90 percent efficiency). The *Blows Per Increment* and *SPT N-values* displayed on the boring logs are the unaltered values measured in the field. When field and/or laboratory data is not available, we may classify soil in general accordance with the Visual Manual Procedure presented in ASTM D2488.

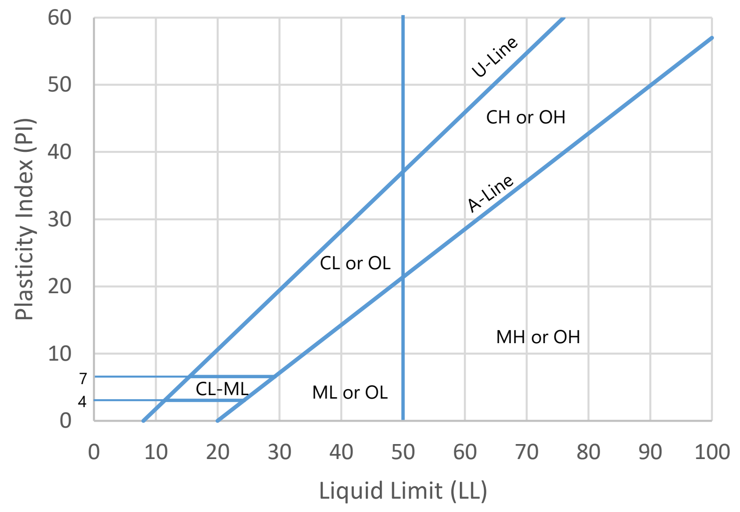


Figure 1: Plasticity Chart (based on ASTM D2487)

Non-cohesive: Coarse-Grained Soil			Cohesive: Fine-Grained Soil			
SPT Penetration (blows/foot)		Relative Density	SPT Penetration (blows/foot)		Consistency	Estimated Range of Unconfined Compressive Strength (tsf)
			Automatic Hammer*	Manual Hammer		
Automatic Hammer*	Manual Hammer		< 2	< 2	Very Soft	< 0.25
0 - 3	0 - 4	Very Loose	2 - 3	2 - 4	Soft	0.25 – 0.50
3 - 8	4 - 10	Loose	3 - 6	4 - 8	Medium Stiff	0.50 – 1.00
8 - 23	10 - 30	Medium Dense	6 - 12	8 - 15	Stiff	1.00 – 2.00
23 - 38	30 - 50	Dense	12 - 23	15 - 30	Very Stiff	2.00 – 4.00
> 38	> 50	Very Dense	> 23	> 30	Hard	> 4.00

Table 2: Soil Consistency and Relative Density (based on Terzaghi, Peck & Mesri, 1996)

* - Modified based on 80% hammer efficiency

KEY TO LOGS

☒	Standard Penetration Test ASTM D1586 or AASHTO T-206	▼	Dynamic Cone Penetrometer (Sower DCP) ASTM STP-399
■	Shelby Tube Sampler ASTM D1587	○	No Sample Recovery
▥	Rock Core Sample ASTM D2113	▽	Groundwater at Time of Drilling
■	Auger Cuttings	▼	Groundwater as Indicated

Table 1: Symbol Legend

Soil	Particle Size	U.S. Standard
Boulders	Larger than 300 mm	N.A.
Cobbles	300 mm to 75 mm	N.A.
Gravel	75 mm to 4.75 mm	3-inch to #4 sieve
Coarse	75 mm to 19 mm	3-inch to ¾-inch sieve
Fine	19 mm to 4.75 mm	¾-inch to #4 sieve
Sand	4.75 mm to 0.075 mm	#4 to #200 Sieve
Coarse	4.75 mm to 2 mm	#4 to #10 Sieve
Medium	2 mm to 0.425 mm	#10 to #40 Sieve
Fine	0.425 mm to 0.075 mm	#40 to #200 Sieve
Fines	Less than 0.075 mm	Passing #200 Sieve
Silt	0.075 mm to 2 μm	N.A.
Clay	Less than 2 μm	N.A.

Table 2: Standard Sieve Sizes

N-Value ☐	Standard Penetration Test Resistance calculated using ASTM D1586 or AASHTO T-206. Calculated as sum of original, field recorded values.	Atterberg Limits ├─┤ PL LL	A measure of a soil's plasticity characteristics in general accordance with ASTM D4318. The soil Plasticity Index (PI) is representative of this characteristic and is bracketed by the Liquid Limit (LL) and the Plastic Limit (PL).
Qu ▲	Unconfined compressive strength, typically estimated from a pocket penetrometer. Results are presented in tons per square foot (tsf).	% Moisture ●	Percent natural moisture content in general accordance with ASTM D2216.

Table 3: Soil Data

Hollow Stem Auger	Flights on the outside of the shaft advance soil cuttings to the surface. The hollow stem allows sampling through the middle of the auger flights.
Mud Rotary / Wash Bore	A cutting head advances the boring and discharges a drilling fluid to support the borehole and circulate cuttings to the surface.
Solid Flight Auger	Flights on the outside bring soil cuttings to the surface. Solid stem requires removal from borehole during sampling.
Hand Auger	Cylindrical bucket (typically 3-inch diameter and 8 inches long) attached to a metal rod and turned by human force.

Table 4: Soil Drilling Methods

Descriptor	Meaning
Trace	Likely less than 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

Table 5: Descriptors

Manual Hammer	The operator tightens and loosens the rope around a rotating drum assembly to lift and drop a sliding, 140-pound hammer falling 30 inches.
Automatic Trip Hammer	An automatic mechanism is used to lift and drop a sliding, 140-pound hammer falling 30 inches.
Dynamic Cone Penetrometer (Sower DCP) ASTM STP-399	Uses a 15-pound steel mass falling 20 inches to strike an anvil and cause penetration of a 1.5-inch diameter cone seated in the bottom of a hand augered borehole. The blows required to drive the embedded cone a depth of 1-3/4 inches have been correlated by others to N-values derived from the Standard Penetration Test (SPT).

Table 6: Sampling Methods

Non-plastic	A 1/8-inch thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be re-rolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be re-rolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

Table 7: Plasticity

Dry	Absence of moisture, dusty, dry to the touch.
Moist	Damp but no visible water.
Wet	Visible free water, usually soil is below water table.

Table 8: Moisture Condition

Stratified	Alternating layers of varying material or color with layers at least ½ inch thick.
Laminated	Alternating layers of varying material or color with layers less than ¼ inch thick.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensides	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay.
Homogeneous	Same color and appearance throughout.

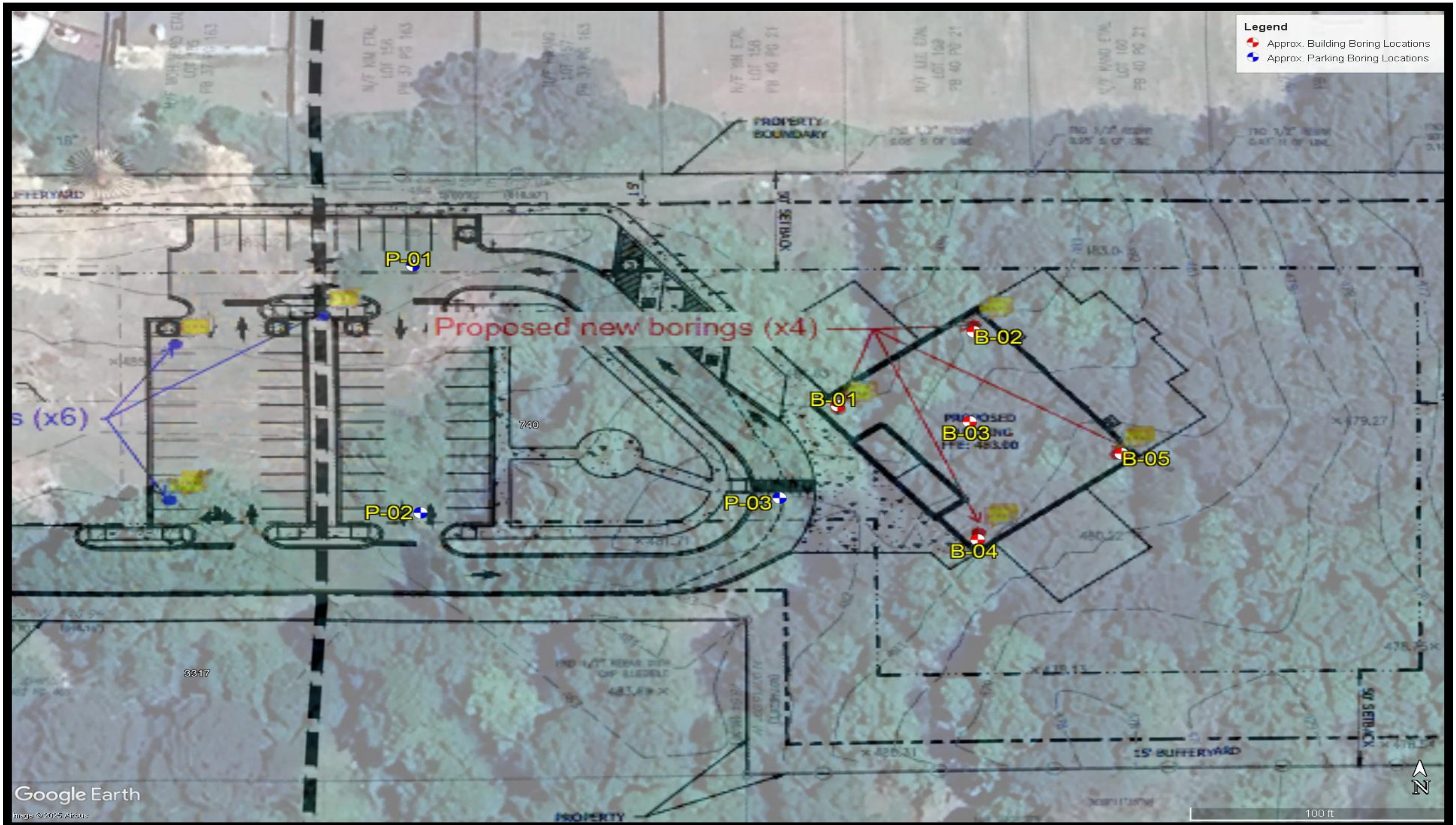
Table 9: Structure

KEY TO HATCHES

Hatch	*Description*	*Hatch*	*Description*	*Hatch*	*Description*
▨	***GW*** *- Well-graded gravels, gravel – sand mixtures, little or no fines*	■	*Asphalt*	▨	*Clay with Gravel*
▨	***GP*** *- Poorly-graded gravels, gravel – sand mixtures, little or no fines*	▨	*Aggregate Base*	▨	*Sand with Gravel*
▨	***GM*** *- Silty gravels, gravel – sand – silt mixtures*	▨	*Topsoil*	▨	*Silt with Gravel*
▨	***GC*** *- Clayey gravels, gravel – sand – clay mixtures*	▨	*Concrete*	▨	*Gravel with Sand*
▨	***SW*** *- Well-graded sands, gravelly sands, little or no fines*	▨	*Coal*	▨	*Gravel with Clay*
▨	***SP*** *- Poorly-graded sands, gravelly sands, little or no fines*	▨	***CL-ML*** *- Silty Clay*	▨	*Gravel with Silt*
▨	***SM*** *- Silty sands, sand – silt mixtures*	▨	*Sandy Clay*	▨	*Limestone*
▨	***SC*** *- Clayey sands, sand – clay mixtures*	▨	*Clayey Chert*	▨	*Chalk*
▨	***ML*** *- Inorganic silts and very find sands, rock flour, silty or clayey fine sands or clayey silt with slight plasticity*	▨	*Low and High Plasticity Clay*	▨	*Siltstone*
▨	***CL*** *- Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays*	▨	*Low Plasticity Silt and Clay*	▨	*Till*
▨	***OL*** *- Organic silts and organic silty clays of low plasticity*	▨	*High Plasticity Silt and Clay*	▨	*Sandy Clay with Cobbles and Boulders*
▨	***MH*** *- Inorganic silts, micaceous or diatomaceous fine sand, or silty soils*	▨	*Fill*	▨	*Sandstone with Shale*
▨	***CH*** *- Inorganic clays of high plasticity*	▨	*Weathered Rock*	▨	*Coral*
▨	***OH*** *- Organic clays of medium to high plasticity, organic silts*	▨	*Sandstone*	▨	*Boulders and Cobbles*
▨	***PT*** *- Peat, humus, swamp soils with high organic contents*	▨	*Shale*	▨	*Soil and Weathered Rock*

Table 1: Key to Hatches Used for Boring Logs and Soil Profiles

BORING LOCATION PLAN



Reference used to produce this drawing:

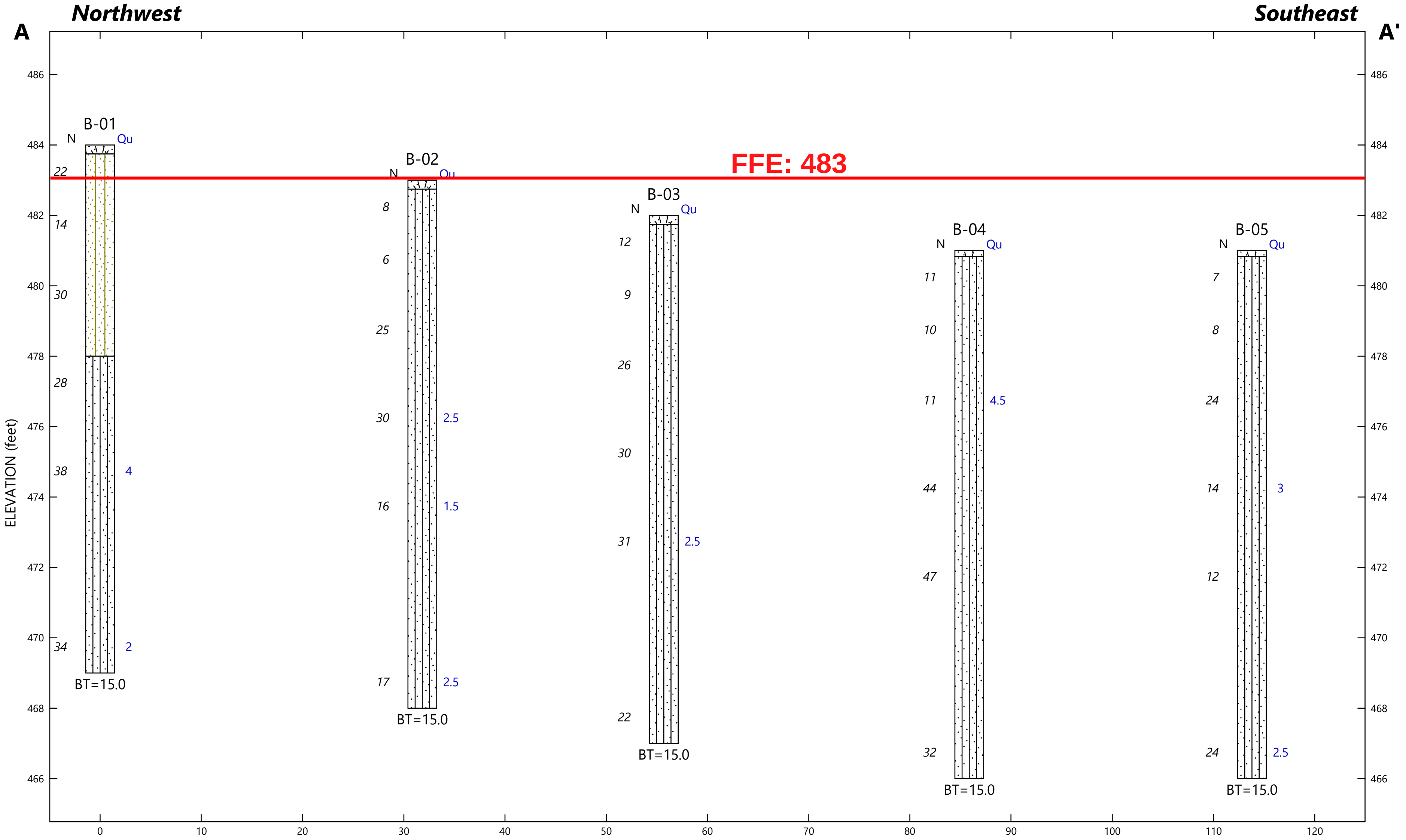
Overall Site Layout Plan Sheet C2.0 dated August 2025

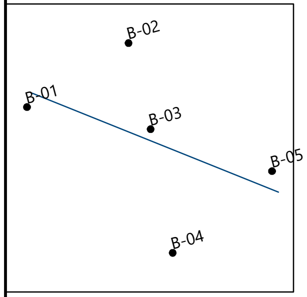
BORING LOCATION PLAN

BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

PROJECT NO.:	**PROJECT NAME / LOCATION:**	**SCALE:**	**DATE:**
AU250152	Auburn Islamic Center Auburn, AL	As shown	8/26/2025

SUBSURFACE SOIL PROFILES





Site Map Scale 1 inch equals 85 feet

Key to Hatches

- ▨ Topsoil
- ▨ USCS Silty Sand
- ▨ USCS Sandy Silt

Legend

BT=Boring Termination, TPT=Test Pit Terminated
AR=Auger Refusal, ER=Excavation Refusal
N=Standard Penetration Test N-Value
Qu=Unconfined compressive strength estimate
from pocket penetrometer test (tsf)

▽ Water Level Reading at time of drilling.
▼ Water Level Reading after drilling.

0 14

Horizontal Scale (feet)
Vertical Exaggeration: 3.5x

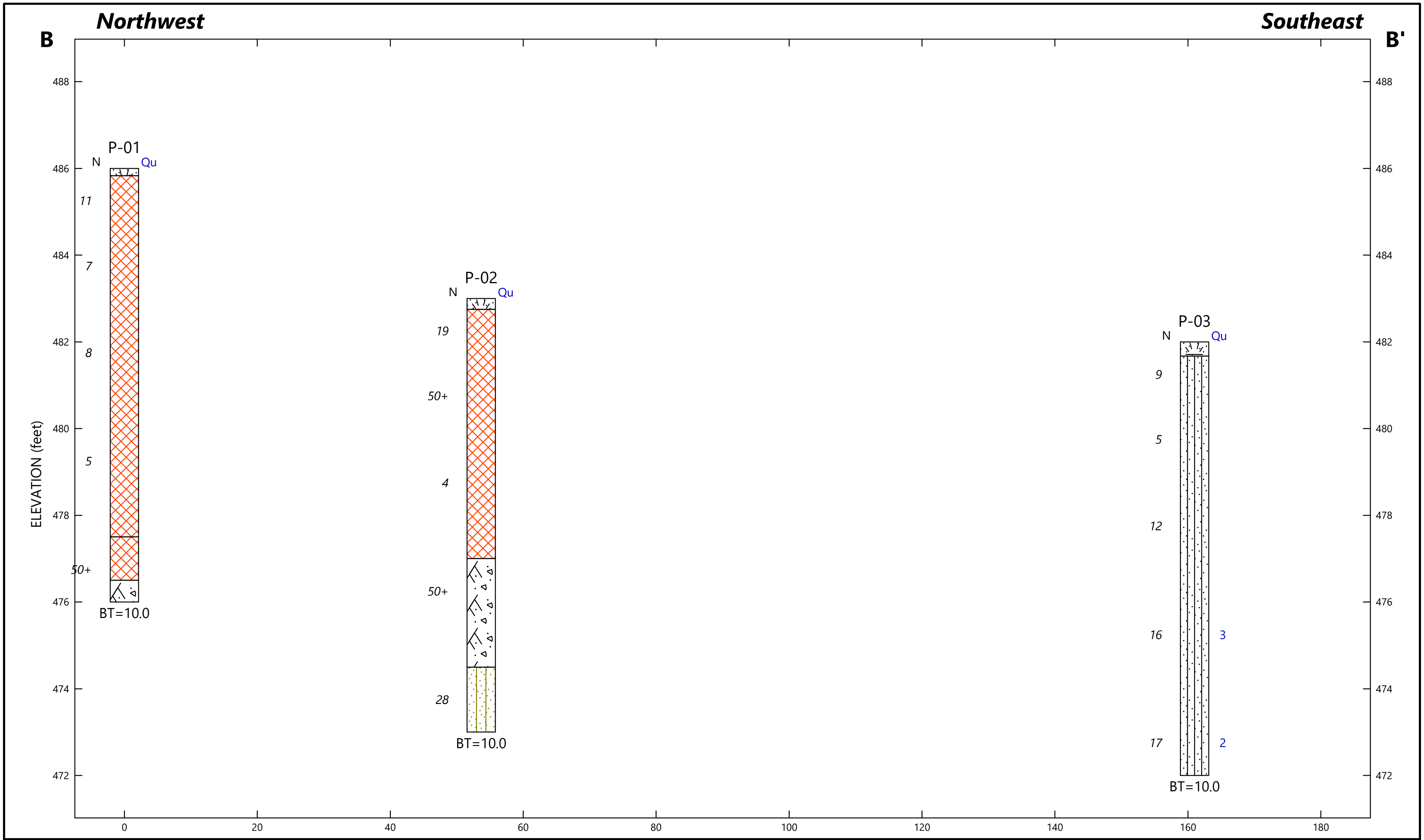
Building & Earth Sciences, Inc.
95 Lee Road 46, Suite C, Auburn, AL 36830

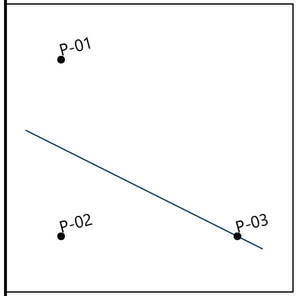
Auburn Islamic Center
Auburn, AL

Building A-A': Subsurface Profile

PROJECT NO: AU250152	PLATE NO: A-1	DATE: 9/10/25

BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers





Site Map Scale 1 inch equals 130 feet

Key to Hatches

▨ Topsoil
▨ Fill
▨ Weathered Rock
▨ USCS Silty Sand
▨ USCS Sandy Silt

Legend

BT=Boring Termination, TPT=Test Pit Terminated
AR=Auger Refusal, ER=Excavation Refusal
N=Standard Penetration Test N-Value
Qu=Unconfined compressive strength estimate from pocket penetrometer test (tsf)
▽ Water Level Reading at time of drilling.
▼ Water Level Reading after drilling.

0 21
Horizontal Scale (feet)
Vertical Exaggeration: 6.5x

Building & Earth Sciences, Inc.
95 Lee Road 46, Suite C, Auburn, AL 36830

Auburn Islamic Center
Auburn, AL

Parking Lot B-B': Subsurface Profile

PROJECT NO: AU250152 | PLATE NO: B-1 | DATE: 9/10/25

BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

BORING LOGS

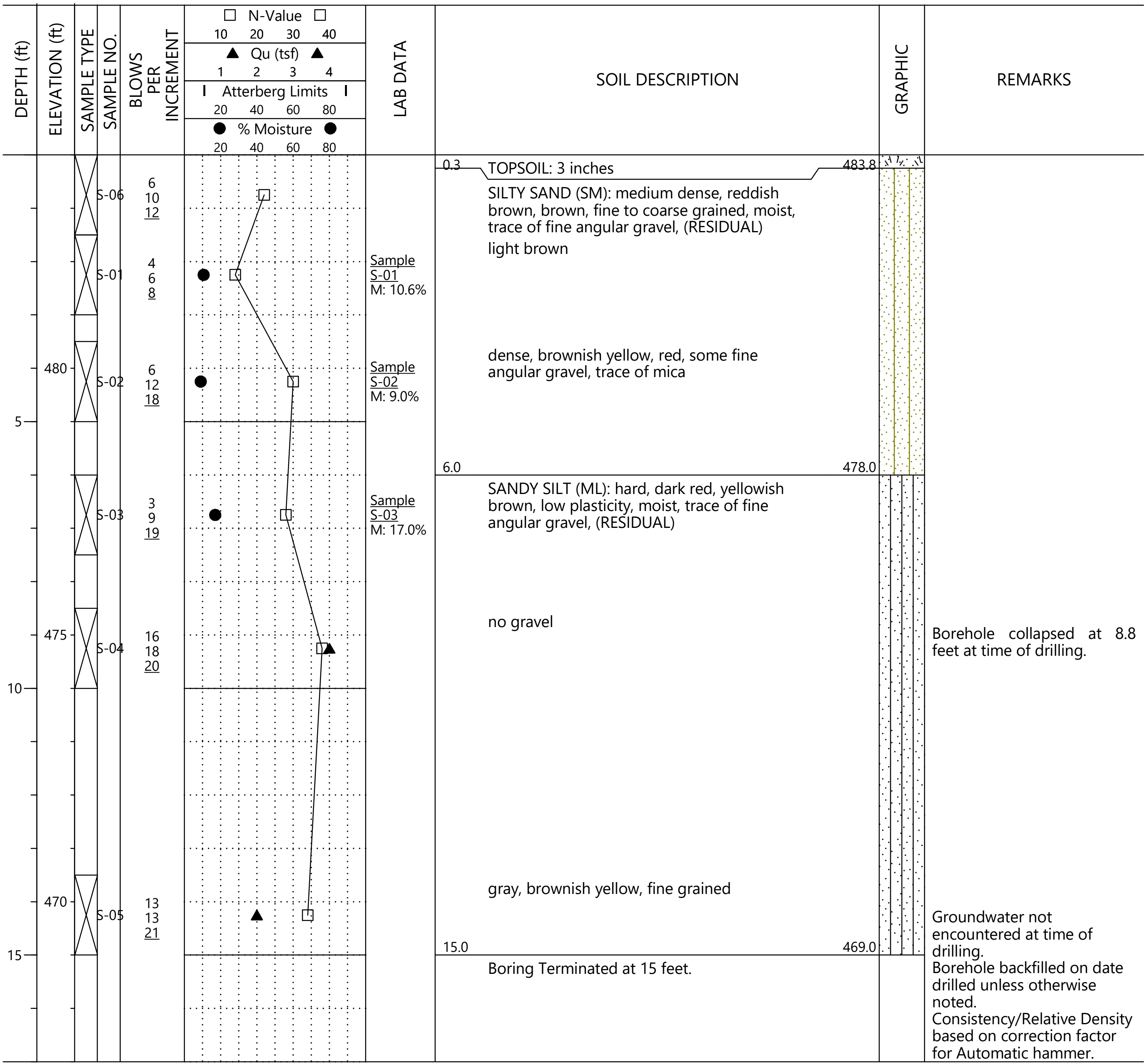
BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

LOG OF BORING
Designation: B-01
Sheet 1 of 1

95 Lee Road 46, Suite C
Auburn, AL 36830
Office: (334) 821-1445
www.BuildingAndEarth.com

PROJECT NAME: Auburn Islamic Center
PROJECT NUMBER: AU250152
DRILLING METHOD: Hollow Stem Auger
EQUIPMENT USED: Geoprobe 3126GT
HAMMER TYPE: Automatic
BORING LOCATION: Bldg Pad: West Corner: 32.547125°,-85.502029°

LOCATION: Auburn, AL
DATE DRILLED: 8/26/25
WEATHER: 80°, Sunny
ELEVATION: 484
DRILL CREW: Building & Earth
LOGGED BY: Z. Houde



Sample No.	Blows per Increment	Lab Data
S-06	6 10 12	
S-01	4 6 8	Sample S-01 M: 10.6%
S-02	6 12 18	Sample S-02 M: 9.0%
S-03	3 9 19	Sample S-03 M: 17.0%
S-04	16 18 20	
S-05	13 13 21	

Depth	Soil Description	Elevation
0.3	TOPSOIL: 3 inches	483.8
	SILTY SAND (SM): medium dense, reddish brown, brown, fine to coarse grained, moist, trace of fine angular gravel, (RESIDUAL) light brown dense, brownish yellow, red, some fine angular gravel, trace of mica	
6.0		478.0
	SANDY SILT (ML): hard, dark red, yellowish brown, low plasticity, moist, trace of fine angular gravel, (RESIDUAL) no gravel gray, brownish yellow, fine grained	
15.0		469.0
	Boring Terminated at 15 feet.	

REMARKS:

Borehole collapsed at 8.8 feet at time of drilling.

Groundwater not encountered at time of drilling.
Borehole backfilled on date drilled unless otherwise noted.
Consistency/Relative Density based on correction factor for Automatic hammer.

SAMPLE TYPE ☒ Standard Penetration Test

N-VALUE	STANDARD PENETRATION RESISTANCE (AASHTO T-206)	**REC**	RECOVERY	**LL:**	LIQUID LIMIT
% MOISTURE	PERCENT NATURAL MOISTURE CONTENT	**RQD**	ROCK QUALITY DESIGNATION	**PL:**	PLASTIC LIMIT
▽	GROUNDWATER LEVEL IN THE BOREHOLE AT TIME OF DRILLING	**UD**	UNDISTURBED	**PI:**	PLASTICITY INDEX
▼	STABILIZED GROUNDWATER LEVEL	**Qu**	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH		

M: NATURAL MOISTURE CONTENT
F: PERCENT PASSING NO. 200 SIEVE

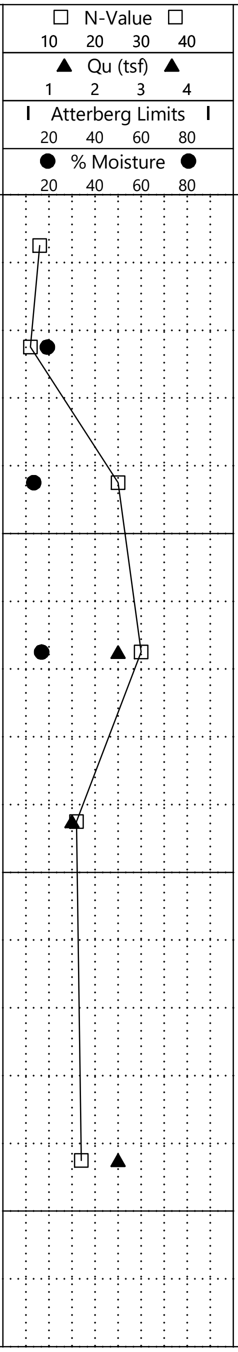
BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

LOG OF BORING
Designation: B-02
Sheet 1 of 1

95 Lee Road 46, Suite C
Auburn, AL 36830
Office: (334) 821-1445
www.BuildingAndEarth.com

PROJECT NAME: Auburn Islamic Center
PROJECT NUMBER: AU250152
DRILLING METHOD: Hollow Stem Auger
EQUIPMENT USED: Geoprobe 3126GT
HAMMER TYPE: Automatic
BORING LOCATION: Bldg Pad: North Corner: 32.547220°,-85.501861°

LOCATION: Auburn, AL
DATE DRILLED: 8/26/25
WEATHER: 80°, Sunny
ELEVATION: 483
DRILL CREW: Building & Earth
LOGGED BY: Z. Houde



DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	BLOWS PER INCREMENT	LAB DATA	SOIL DESCRIPTION	REMARKS
0.3	482.8					TOPSOIL: 3 inches	
		☒	S-06	4 4 4		SANDY SILT (ML): stiff, yellowish brown, brown, low plasticity, moist, (RESIDUAL)	
		☒	S-01	2 2 4	Sample S-01 M: 19.3%	medium stiff, yellowish brown, reddish brown, trace of mica	
	480						
		☒	S-02	4 11 14	Sample S-02 M: 13.4%	hard, brownish yellow	
5							
		☒	S-03	4 13 17	Sample S-03 M: 16.8% F: 75.1%	brownish yellow, reddish brown	
	475						
		☒	S-04	4 7 9		very stiff, brownish yellow, light gray	Borehole collapsed at 8.8 feet at time of drilling.
10							
	470						
		☒	S-05	3 6 11		dark gray, reddish brown	Groundwater not encountered at time of drilling.
15.0	468.0					Boring Terminated at 15 feet.	Borehole backfilled on date drilled unless otherwise noted. Consistency/Relative Density based on correction factor for Automatic hammer.

SAMPLE TYPE ☒ Standard Penetration Test

N-VALUE	STANDARD PENETRATION RESISTANCE (AASHTO T-206)	**REC**	RECOVERY	**LL:** LIQUID LIMIT	**M:** NATURAL MOISTURE CONTENT
% MOISTURE	PERCENT NATURAL MOISTURE CONTENT	**RQD**	ROCK QUALITY DESIGNATION	**PL:** PLASTIC LIMIT	**F:** PERCENT PASSING NO. 200 SIEVE
▽	GROUNDWATER LEVEL IN THE BOREHOLE AT TIME OF DRILLING	**UD**	UNDISTURBED	**PI:** PLASTICITY INDEX	
▼	STABILIZED GROUNDWATER LEVEL	**Qu**	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH		

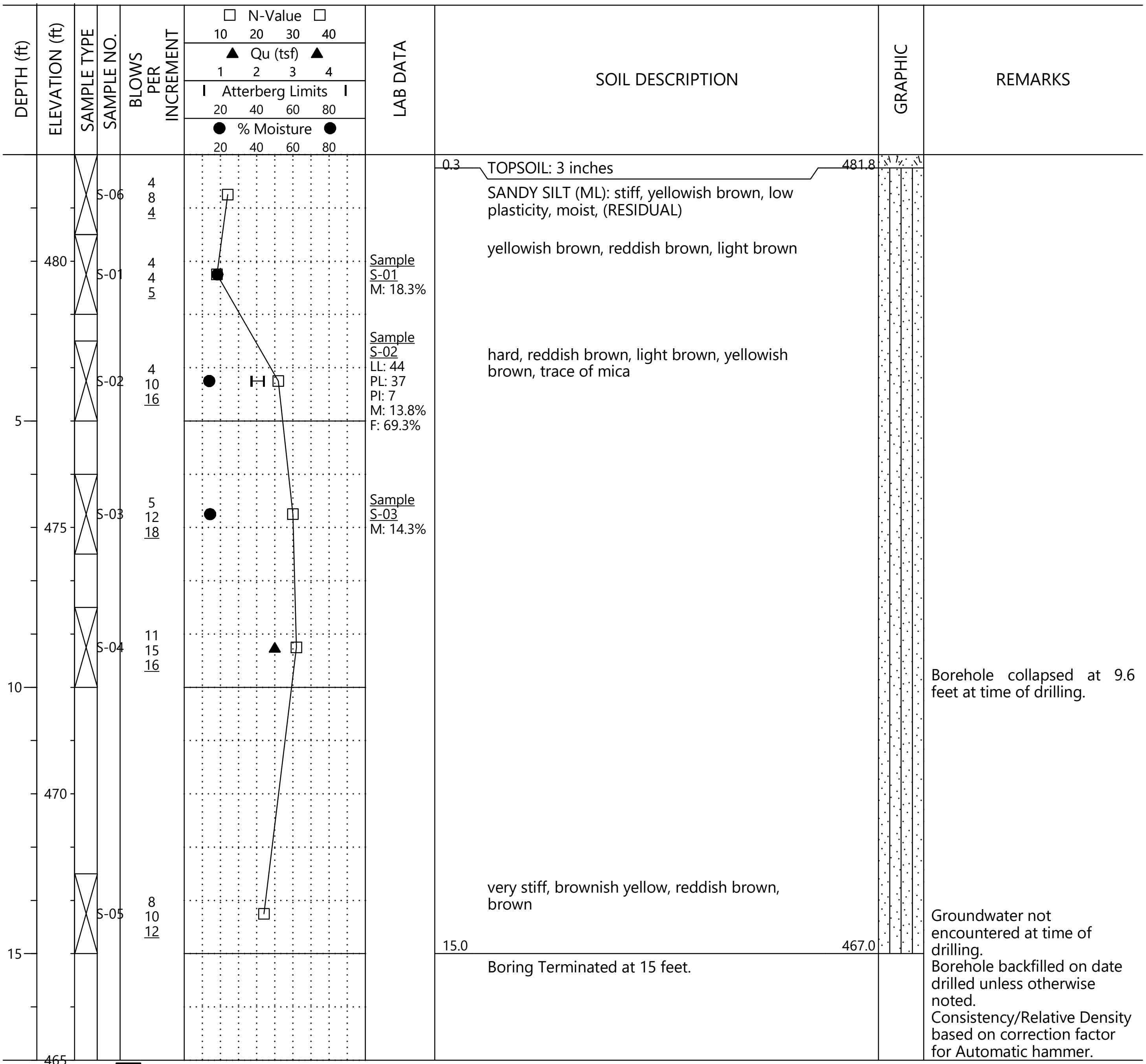
BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

95 Lee Road 46, Suite C
Auburn, AL 36830
Office: (334) 821-1445
www.BuildingAndEarth.com

LOG OF BORING
Designation: B-03
Sheet 1 of 1

PROJECT NAME: Auburn Islamic Center
PROJECT NUMBER: AU250152
DRILLING METHOD: Hollow Stem Auger
EQUIPMENT USED: Geoprobe 3126GT
HAMMER TYPE: Automatic
BORING LOCATION: Bldg Pad: Center: 32.547104°,-85.501866°

LOCATION: Auburn, AL
DATE DRILLED: 8/26/25
WEATHER: 80°, Sunny
ELEVATION: 482
DRILL CREW: Building & Earth
LOGGED BY: Z. Houde



SAMPLE NO.	BLOWS PER INCREMENT	LAB DATA
S-06	4 8 4	
S-01	4 4 5	Sample S-01 M: 18.3%
S-02	4 10 16	Sample S-02 LL: 44 PL: 37 PI: 7 M: 13.8% F: 69.3%
S-03	5 12 18	Sample S-03 M: 14.3%
S-04	11 15 16	
S-05	8 10 12	

SOIL DESCRIPTION

0.3 TOPSOIL: 3 inches 481.8

SANDY SILT (ML): stiff, yellowish brown, low plasticity, moist, (RESIDUAL)

yellowish brown, reddish brown, light brown

hard, reddish brown, light brown, yellowish brown, trace of mica

very stiff, brownish yellow, reddish brown, brown

15.0 467.0

Boring Terminated at 15 feet.

REMARKS

Borehole collapsed at 9.6 feet at time of drilling.

Groundwater not encountered at time of drilling.
Borehole backfilled on date drilled unless otherwise noted.
Consistency/Relative Density based on correction factor for Automatic hammer.

SAMPLE TYPE ☒ Standard Penetration Test

N-VALUE	STANDARD PENETRATION RESISTANCE (AASHTO T-206)	**REC**	RECOVERY	**LL:** LIQUID LIMIT	**M:** NATURAL MOISTURE CONTENT
% MOISTURE	PERCENT NATURAL MOISTURE CONTENT	**RQD**	ROCK QUALITY DESIGNATION	**PL:** PLASTIC LIMIT	**F:** PERCENT PASSING NO. 200 SIEVE
▽	GROUNDWATER LEVEL IN THE BOREHOLE AT TIME OF DRILLING	**UD**	UNDISTURBED	**PI:** PLASTICITY INDEX	
▼	STABILIZED GROUNDWATER LEVEL	**Qu**	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH		

BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

95 Lee Road 46, Suite C
Auburn, AL 36830
Office: (334) 821-1445
www.BuildingAndEarth.com

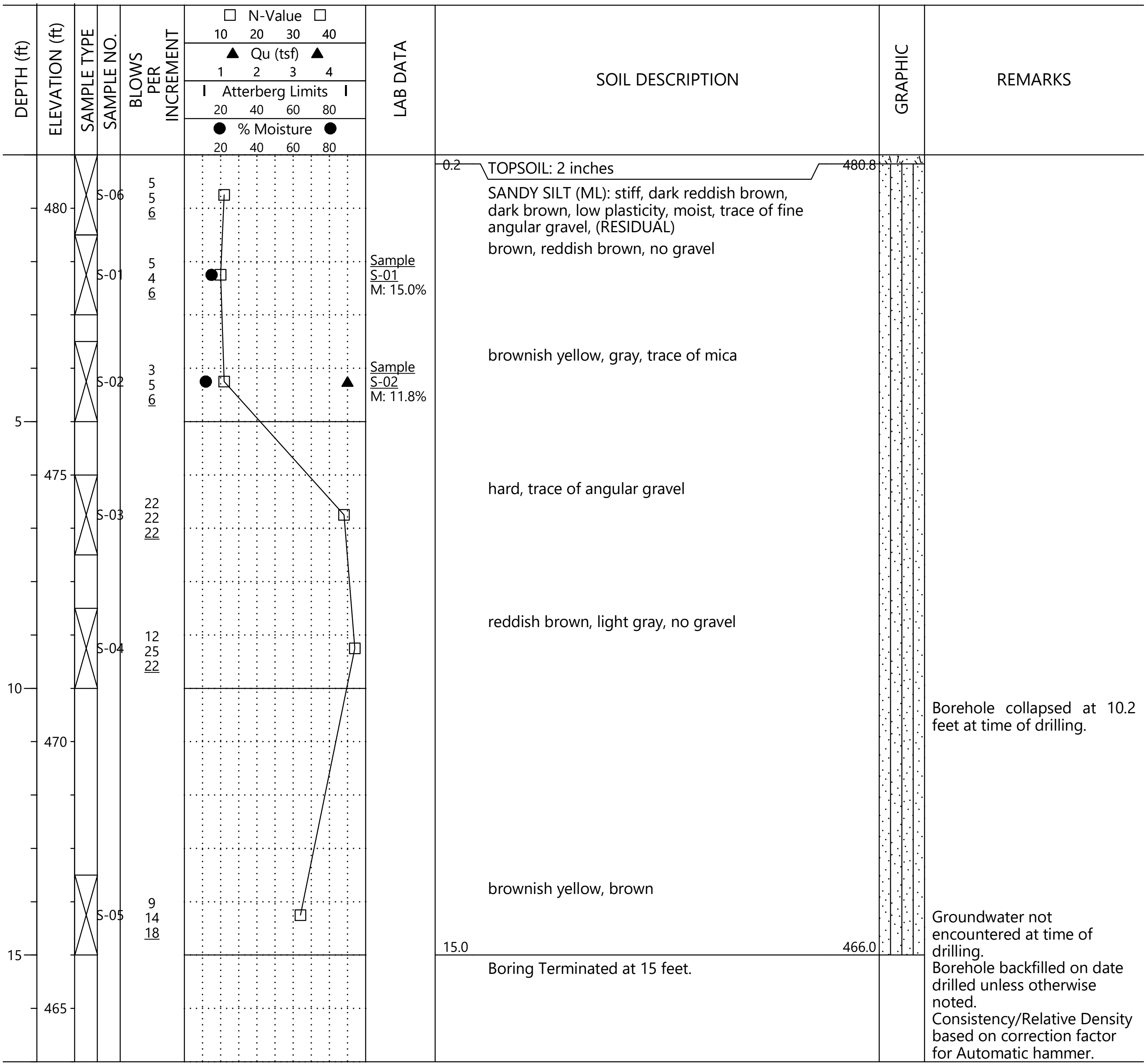
LOG OF BORING

Designation: B-04

Sheet 1 of 1

PROJECT NAME: Auburn Islamic Center
PROJECT NUMBER: AU250152
DRILLING METHOD: Hollow Stem Auger
EQUIPMENT USED: Geoprobe 3126GT
HAMMER TYPE: Automatic
BORING LOCATION: Bldg Pad: South Corner: 32.546952°,-85.501856°

LOCATION: Auburn, AL
DATE DRILLED: 8/26/25
WEATHER: 80°, Sunny
ELEVATION: 481
DRILL CREW: Building & Earth
LOGGED BY: Z. Houde



SAMPLE NO.	BLOWS PER INCREMENT	LAB DATA
S-06	5 5 6	
S-01	5 4 6	Sample S-01 M: 15.0%
S-02	3 5 6	Sample S-02 M: 11.8%
S-03	22 22 22	
S-04	12 25 22	
S-05	9 14 18	

SOIL DESCRIPTION

0.2 TOPSOIL: 2 inches 480.8

SANDY SILT (ML): stiff, dark reddish brown, dark brown, low plasticity, moist, trace of fine angular gravel, (RESIDUAL)

brown, reddish brown, no gravel

brownish yellow, gray, trace of mica

hard, trace of angular gravel

reddish brown, light gray, no gravel

brownish yellow, brown

15.0 466.0

Boring Terminated at 15 feet.

REMARKS

Borehole collapsed at 10.2 feet at time of drilling.

Groundwater not encountered at time of drilling.
Borehole backfilled on date drilled unless otherwise noted.
Consistency/Relative Density based on correction factor for Automatic hammer.

SAMPLE TYPE ☒ Standard Penetration Test

N-VALUE	STANDARD PENETRATION RESISTANCE (AASHTO T-206)	**REC**	RECOVERY	**LL:** LIQUID LIMIT	**M:** NATURAL MOISTURE CONTENT
% MOISTURE	PERCENT NATURAL MOISTURE CONTENT	**RQD**	ROCK QUALITY DESIGNATION	**PL:** PLASTIC LIMIT	**F:** PERCENT PASSING NO. 200 SIEVE
▽	GROUNDWATER LEVEL IN THE BOREHOLE AT TIME OF DRILLING	**UD**	UNDISTURBED	**PI:** PLASTICITY INDEX	
▼	STABILIZED GROUNDWATER LEVEL	**Qu**	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH		

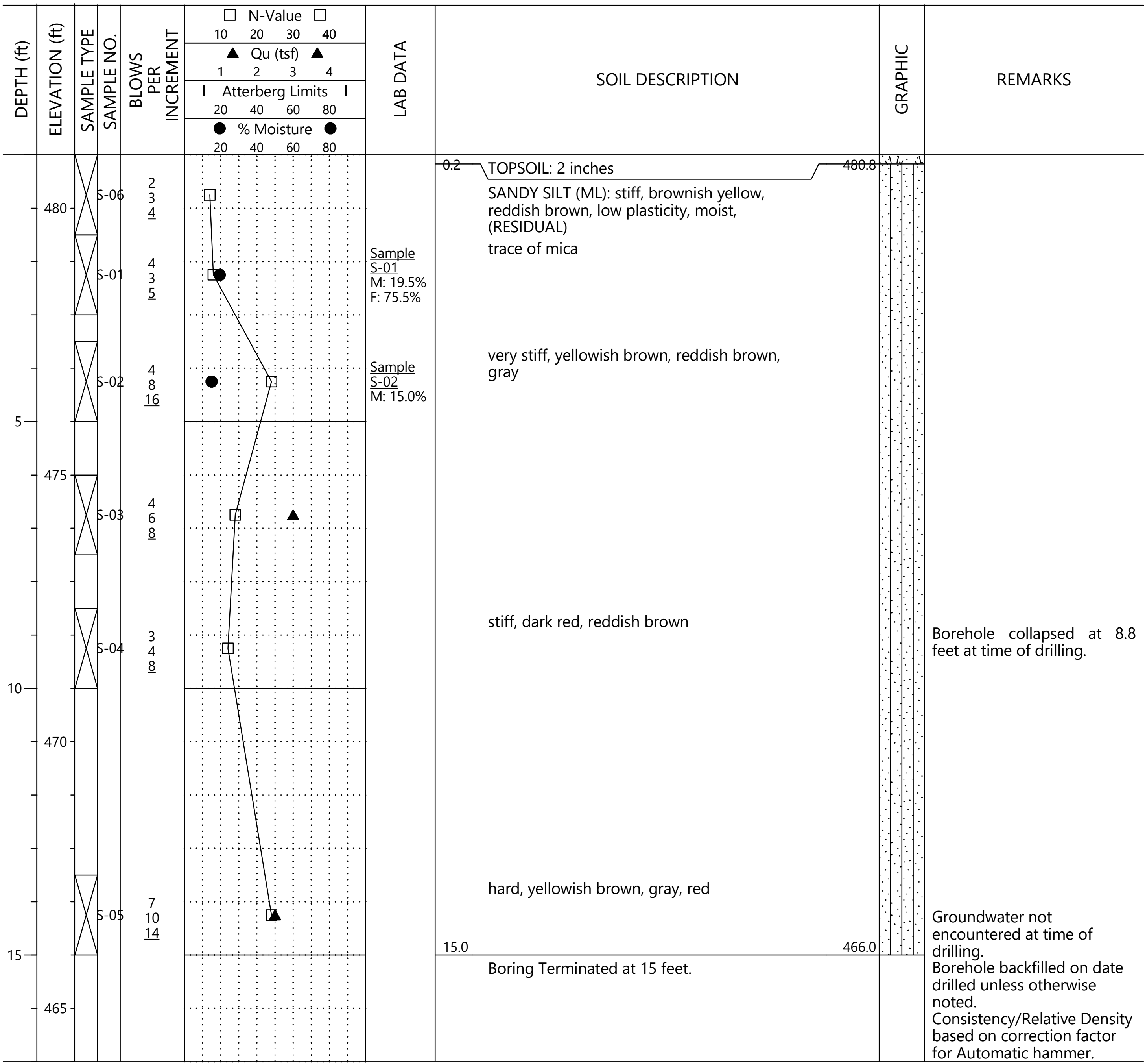
BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

LOG OF BORING
Designation: B-05
Sheet 1 of 1

95 Lee Road 46, Suite C
Auburn, AL 36830
Office: (334) 821-1445
www.BuildingAndEarth.com

PROJECT NAME: Auburn Islamic Center
PROJECT NUMBER: AU250152
DRILLING METHOD: Hollow Stem Auger
EQUIPMENT USED: Geoprobe 3126GT
HAMMER TYPE: Automatic
BORING LOCATION: Bldg Pad: East Corner: 32.547063°,-85.501677°

LOCATION: Auburn, AL
DATE DRILLED: 8/26/25
WEATHER: 80°, Sunny
ELEVATION: 481
DRILL CREW: Building & Earth
LOGGED BY: Z. Houde



DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	BLOWS PER INCREMENT	LAB DATA	SOIL DESCRIPTION	REMARKS
0.2	480.8					TOPSOIL: 2 inches	
		☒	S-06	2 3 4		SANDY SILT (ML): stiff, brownish yellow, reddish brown, low plasticity, moist, (RESIDUAL)	
		☒	S-01	4 3 5	Sample S-01 M: 19.5% F: 75.5%	trace of mica	
		☒	S-02	4 8 16	Sample S-02 M: 15.0%	very stiff, yellowish brown, reddish brown, gray	
		☒	S-03	4 6 8			
		☒	S-04	3 4 8		stiff, dark red, reddish brown	Borehole collapsed at 8.8 feet at time of drilling.
		☒	S-05	7 10 14		hard, yellowish brown, gray, red	
15.0	466.0					Boring Terminated at 15 feet.	Groundwater not encountered at time of drilling. Borehole backfilled on date drilled unless otherwise noted. Consistency/Relative Density based on correction factor for Automatic hammer.

SAMPLE TYPE ☒ Standard Penetration Test

N-VALUE STANDARD PENETRATION RESISTANCE (AASHTO T-206)
% MOISTURE PERCENT NATURAL MOISTURE CONTENT
∇ GROUNDWATER LEVEL IN THE BOREHOLE AT TIME OF DRILLING
▼ STABILIZED GROUNDWATER LEVEL

REC RECOVERY
RQD ROCK QUALITY DESIGNATION
UD UNDISTURBED
Qu POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH

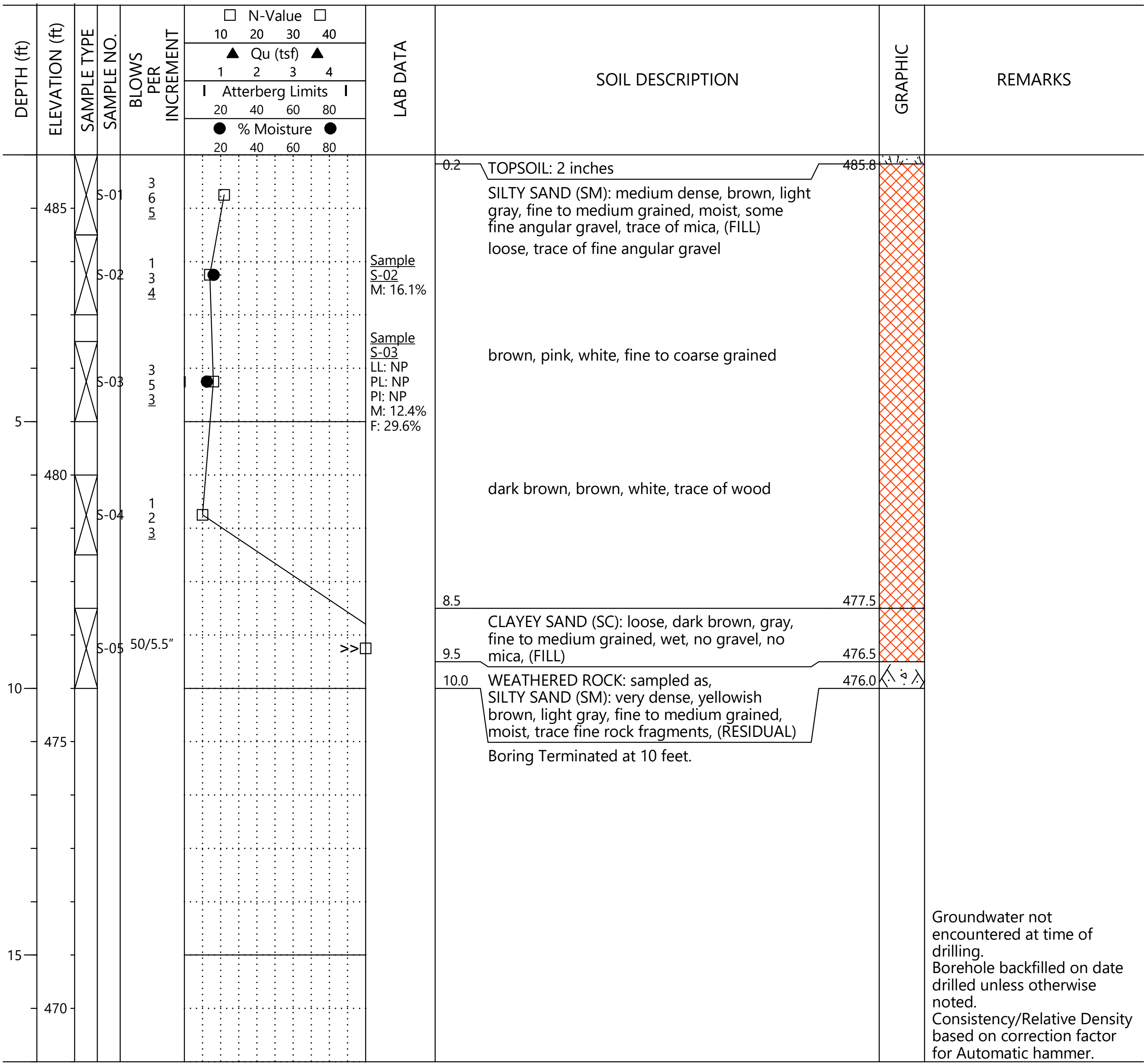
LL: LIQUID LIMIT
PL: PLASTIC LIMIT
PI: PLASTICITY INDEX
M: NATURAL MOISTURE CONTENT
F: PERCENT PASSING NO. 200 SIEVE

BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

95 Lee Road 46, Suite C
Auburn, AL 36830
Office: (334) 821-1445
www.BuildingAndEarth.com

LOG OF BORING
Designation: P-01
Sheet 1 of 1

PROJECT NAME: Auburn Islamic Center
PROJECT NUMBER: AU250152
DRILLING METHOD: Hollow Stem Auger
EQUIPMENT USED: Geoprobe 3126GT
HAMMER TYPE: Automatic
BORING LOCATION: Parking Lot: North: 32.547306°,-85.502555°
LOCATION: Auburn, AL
DATE DRILLED: 8/26/25
WEATHER: 80°, Sunny
ELEVATION: 486
DRILL CREW: Building & Earth
LOGGED BY: Z. Houde



Depth (ft)	Elevation (ft)	Sample No.	Blows per Increment	Lab Data	Soil Description
0.2	485.8				TOPSOIL: 2 inches
		S-01	3 6 5		SILTY SAND (SM): medium dense, brown, light gray, fine to medium grained, moist, some fine angular gravel, trace of mica, (FILL)
		S-02	1 3 4	Sample S-02 M: 16.1%	loose, trace of fine angular gravel
		S-03	3 5 3	Sample S-03 LL: NP PL: NP PI: NP M: 12.4% F: 29.6%	brown, pink, white, fine to coarse grained
		S-04	1 2 3		dark brown, brown, white, trace of wood
8.5	477.5				CLAYEY SAND (SC): loose, dark brown, gray, fine to medium grained, wet, no gravel, no mica, (FILL)
9.5	476.5	S-05	50/5.5"		
10.0	476.0				WEATHERED ROCK: sampled as, SILTY SAND (SM): very dense, yellowish brown, light gray, fine to medium grained, moist, trace fine rock fragments, (RESIDUAL)
					Boring Terminated at 10 feet.

Groundwater not encountered at time of drilling.
Borehole backfilled on date drilled unless otherwise noted.
Consistency/Relative Density based on correction factor for Automatic hammer.

SAMPLE TYPE ☒ Standard Penetration Test

N-VALUE STANDARD PENETRATION RESISTANCE (AASHTO T-206)
% MOISTURE PERCENT NATURAL MOISTURE CONTENT
▽ GROUNDWATER LEVEL IN THE BOREHOLE AT TIME OF DRILLING
▼ STABILIZED GROUNDWATER LEVEL
REC RECOVERY
RQD ROCK QUALITY DESIGNATION
UD UNDISTURBED
Qu POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH
LL: LIQUID LIMIT
PL: PLASTIC LIMIT
PI: PLASTICITY INDEX
M: NATURAL MOISTURE CONTENT
F: PERCENT PASSING NO. 200 SIEVE

BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

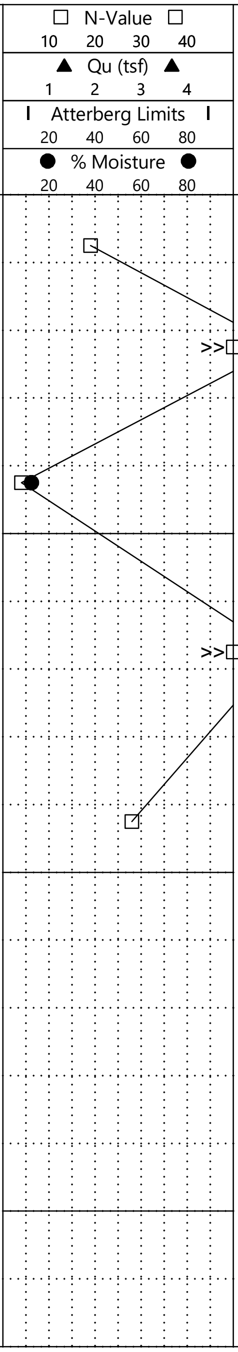
95 Lee Road 46, Suite C
Auburn, AL 36830
Office: (334) 821-1445
www.BuildingAndEarth.com

LOG OF BORING

Designation: P-02

Sheet 1 of 1

PROJECT NAME:	Auburn Islamic Center	LOCATION:	Auburn, AL
PROJECT NUMBER:	AU250152	DATE DRILLED:	8/26/25
DRILLING METHOD:	Hollow Stem Auger	WEATHER:	80°, Sunny
EQUIPMENT USED:	Geoprobe 3126GT	ELEVATION:	483
HAMMER TYPE:	Automatic	DRILL CREW:	Building & Earth
BORING LOCATION:	Parking Lot: South: 32.546987°,-85.502545°	LOGGED BY:	Z. Houde



DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	BLOWS PER INCREMENT	LAB DATA	SOIL DESCRIPTION	GRAPHIC	REMARKS
0.3	482.8					TOPSOIL: 3 inches		
		☒	S-01	2 3 16		SILTY SAND (SM): medium dense, brown, white, pink, fine to medium grained, moist, some fine angular gravel, (FILL)		
		☒	S-02	50/4"		very dense, light brown, pink, no gravel		
	480							
		☒	S-03	1 1 3	Sample S-03 M: 12.4%	loose, brown, reddish brown, fine to coarse grained, moist, trace of fine angular gravel		
5								
6.0	477.0					WEATHERED ROCK: sampled as, SILTY SAND (SM): very dense, yellowish brown, light brown, fine to coarse grained, moist, trace of fine angular rock fragments, (RESIDUAL)		
		☒	S-04	50/5"				
	475							
8.5	474.5					SILTY SAND (SM): dense, yellowish brown, brown, fine to coarse grained, moist, (RESIDUAL)		
		☒	S-05	19 15 13				
10.0	473.0					Boring Terminated at 10 feet.		
	470							
15								Groundwater not encountered at time of drilling. Borehole backfilled on date drilled unless otherwise noted. Consistency/Relative Density based on correction factor for Automatic hammer.

SAMPLE TYPE ☒ Standard Penetration Test

N-VALUE	STANDARD PENETRATION RESISTANCE (AASHTO T-206)	**REC**	RECOVERY	**LL:** LIQUID LIMIT	**M:** NATURAL MOISTURE CONTENT
% MOISTURE	PERCENT NATURAL MOISTURE CONTENT	**RQD**	ROCK QUALITY DESIGNATION	**PL:** PLASTIC LIMIT	**F:** PERCENT PASSING NO. 200 SIEVE
▽	GROUNDWATER LEVEL IN THE BOREHOLE AT TIME OF DRILLING	**UD**	UNDISTURBED	**PI:** PLASTICITY INDEX	
▼	STABILIZED GROUNDWATER LEVEL	**Qu**	POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH		

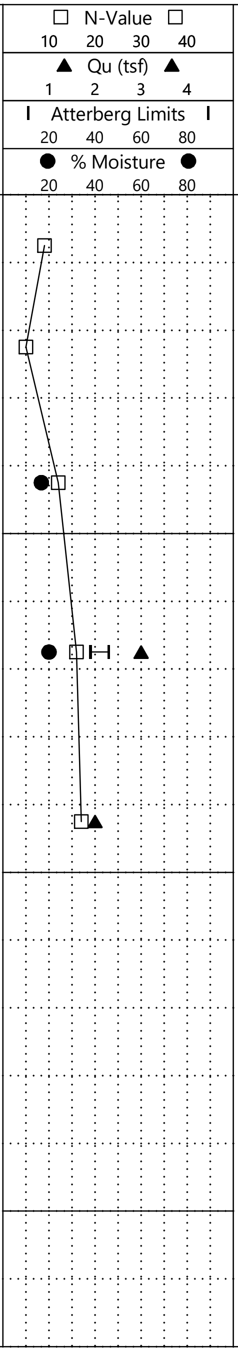
BUILDING & EARTH
Geotechnical, Environmental, and Materials Engineers

LOG OF BORING
Designation: P-03
Sheet 1 of 1

95 Lee Road 46, Suite C
Auburn, AL 36830
Office: (334) 821-1445
www.BuildingAndEarth.com

PROJECT NAME: Auburn Islamic Center
PROJECT NUMBER: AU250152
DRILLING METHOD: Hollow Stem Auger
EQUIPMENT USED: Geoprobe 3126GT
HAMMER TYPE: Automatic
BORING LOCATION: Parking Lot: Loop: 32.547006°,-85.502101°
LOCATION: Auburn, AL
DATE DRILLED: 8/26/25
WEATHER: 80°, Sunny
ELEVATION: 482
DRILL CREW: Building & Earth
LOGGED BY: Z. Houde

DEPTH (ft)	ELEVATION (ft)	SAMPLE TYPE	SAMPLE NO.	BLOWS PER INCREMENT	LAB DATA	SOIL DESCRIPTION	REMARKS
0.3	481.7					TOPSOIL: 4 inches	
		☒	S-01	4 5 4		SANDY SILT (ML): stiff, yellowish brown, reddish brown, brown, low plasticity, moist, (RESIDUAL)	
	480	☒	S-02	3 2 3		medium stiff, trace of mica	
		☒	S-03	5 6 6	Sample S-03 M: 16.7%	stiff, yellowish brown, gray	
5							
	475	☒	S-04	6 6 10	Sample S-04 LL: 46 PL: 38 PI: 8 M: 20.0% F: 71.3%	very stiff, yellowish brown, red, gray	
		☒	S-05	6 7 10		yellowish brown, gray	
10.0	472.0					Boring Terminated at 10 feet.	
	470						
15							
	465						Groundwater not encountered at time of drilling. Borehole backfilled on date drilled unless otherwise noted. Consistency/Relative Density based on correction factor for Automatic hammer.



SAMPLE TYPE ☒ Standard Penetration Test

N-VALUE STANDARD PENETRATION RESISTANCE (AASHTO T-206)
% MOISTURE PERCENT NATURAL MOISTURE CONTENT
∇ GROUNDWATER LEVEL IN THE BOREHOLE AT TIME OF DRILLING
▼ STABILIZED GROUNDWATER LEVEL
REC RECOVERY
RQD ROCK QUALITY DESIGNATION
UD UNDISTURBED
Qu POCKET PENETROMETER UNCONFINED COMPRESSIVE STRENGTH
LL: LIQUID LIMIT
PL: PLASTIC LIMIT
PI: PLASTICITY INDEX
M: NATURAL MOISTURE CONTENT
F: PERCENT PASSING NO. 200 SIEVE

LABORATORY TEST PROCEDURES

A brief description of the laboratory tests performed is provided in the following sections.

DESCRIPTION OF SOILS (VISUAL-MANUAL PROCEDURE) (ASTM D2488)

The soil samples were visually examined by our engineer and soil descriptions were provided. Representative samples were then selected and tested in accordance with the aforementioned laboratory-testing program to determine soil classifications and engineering properties. This data was used to correlate our visual descriptions with the Unified Soil Classification System (USCS).

POCKET PENETROMETER

Pocket Penetrometer tests were performed on cohesive soil samples. The pocket penetrometer provides a consistency classification, and an indication of the soils unconfined compressive strength (Qu).

NATURAL MOISTURE CONTENT (ASTM D2216)

Natural moisture contents (M%) were determined on selected samples. The natural moisture content is the ratio, expressed as a percentage, of the weight of water in a given amount of soil to the weight of solid particles.

ATTERBERG LIMITS (ASTM D4318)

The Atterberg Limits test was performed to evaluate the soil's plasticity characteristics. The soil Plasticity Index (PI) is representative of this characteristic and is bracketed by the Liquid Limit (LL) and the Plastic Limit (PL). The Liquid Limit is the moisture content at which the soil will flow as a heavy viscous fluid. The Plastic Limit is the moisture content at which the soil is between "plastic" and the semi-solid stage. The Plasticity Index (PI = LL - PL) is a frequently used indicator for a soil's potential for volume change. Typically, a soil's potential for volume change increases with higher plasticity indices.

MATERIAL FINER THAN NO. 200 SIEVE BY WASHING (ASTM D1140)

Grain-size tests were performed to determine the partial soil particle size distribution. The amount of material finer than the openings on the No. 200 sieve (0.075 mm) was determined by washing soil over the No. 200 sieve. The results of wash #200 tests are presented on the boring logs included in this report and in the table of laboratory test results.

LABORATORY TEST RESULTS

The results of the laboratory testing are presented in the following tables.

BORING NO.	DEPTH	MOISTURE CONTENT (%)	LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	% PASSING #200 SIEVE	CLASSIFICATION
B-01	1.5 - 3.0	10.6					
B-01	3.5 - 5.0	9.0					
B-01	6.0 - 7.5	17.0					
B-02	1.5 - 3.0	19.3					
B-02	3.5 - 5.0	13.4					
B-02	6.0 - 7.5	16.8				75	
B-03	1.5 - 3.0	18.3					
B-03	3.5 - 5.0	13.8	44	37	7	69	ML
B-03	6.0 - 7.5	14.3					
B-04	1.5 - 3.0	15.0					
B-04	3.5 - 5.0	11.8					
B-05	1.5 - 3.0	19.5				76	
B-05	3.5 - 5.0	15.0					
P-01	1.5 - 3.0	16.1					
P-01	3.5 - 5.0	12.4	NP	NP	NP	30	SM
P-02	3.5 - 5.0	12.4					
P-03	3.5 - 5.0	16.7					
P-03	6.0 - 7.5	20.0	46	38	8	71	ML

TABLE L-1: General Soil Classification Test Results

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GBC
GEOTECHNICAL
BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org