Express Oil Northport

Geotechnical Engineering Report

May 6, 2024 | Terracon Project No. E1245061

Prepared for:

Express Oil Change, LLC
1880 Southpark Drive
Birmingham, AL 35244

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May 6, 2024

Express Oil Change, LLC
1880 Southpark Drive
Birmingham, AL 35244

Attn: Tyler Hendon
P: (205) 703-7758
E: tyler.hendon@expressoil.com

Re: Geotechnical Engineering Report
Express Oil Service Building
2509 Lurleen B Wallace Blvd
Northport, Alabama
Terracon Project No. E1245061

Dear Tyler:

We have completed the scope of Geotechnical Engineering services for the above referenced project in general accordance with Terracon Proposal No. PE1245061. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, pavements, and floor slabs for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon

ALABAMA REGISTERED NO. 17908 PROFESSIONAL ENGINEER BRYAN C. RITENOUR

Hamilton Brannon
Staff Engineer

Bryan Ritenour, P.E.
Senior Engineer

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Attachments

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

Refer to each individual Attachment for a listing of contents.

Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed Express Oil Service Building to be located at 2509 Lurleen B Wallace Blvd in Northport, Alabama. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Seismic site classification per IBC based on N-values
- Site preparation and earthwork
- Foundation design and construction
- Floor slab design and construction
- Pavement design and construction based on local practice
- Lateral earth pressures

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

Drawings showing the site and boring locations are shown on the Site Location and Exploration Plan. The results of the laboratory testing performed on soil samples obtained from the site during our field explorations are included on the boring logs in the Exploration Results section.

Project Description

Our final understanding of the project conditions is as follows:

Item	Description
Information Provided	A site boundary survey with proposed building layout was provided by Mr. Tyler Hendon. (via E-mail)
Project Description	The project will include a new oil change building and new service building with associated parking areas, drive lanes, and dumpster pad.
Building Construction	We assume that the structure will include load-bearing masonry walls and brick or stone façade.

Item	Description
Finished Floor Elevation	Not provided; The building FFE is assumed to be within 5 feet of existing grades.
Below Grade Areas	Below grade pits are anticipated for the oil change building.
Free-Standing Retaining Walls	None anticipated
Maximum Loads	Anticipated structural loads were not provided. In the absence of information provided by the design team, we have used the following loads in estimating settlement based on our experience with similar projects. ■ Columns: 75 kips ■ Walls: 3 kips per linear foot (klf) ■ Slabs: 100 pounds per square foot (psf)
Grading/Slopes	We anticipate that fills and/or cuts of 5 feet or less will be required. No significant slopes are anticipated.
Pavements	Paved driveway and parking will be constructed. Both flexible (asphalt) and rigid (PCC) pavements will be considered. Anticipated traffic loading was not available at the time this report was prepared. We assume that the traffic classification will consist of: ■ Automobile traffic – 200 cars per day ■ Truck traffic – 2 trucks per day
Building Code	2018 IBC

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

Site Conditions

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

Item	Description
Parcel Information	The property is located along the east side of 2509 Lurleen B Wallace Blvd, in Northport, Alabama Approximate Latitude/Longitude: 33.2340° N, 87.5762° W See Site Location

Item	Description
Existing Improvements	None
Current Ground Cover	Grassed lot with a few trees
Existing Topography	Gently sloping, with surface elevations near EL. 218 to 226 based on Google Earth.
Local Geology	The site is underlain by the Alluvial, Costal, and Low Terrance deposits. These deposits consist of varicolored fine to coarse quartz sand containing clay lenses and gravel in places.

Geotechnical Characterization

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

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

Model Layer	Layer Name	General Description
1	Surface Cover	Bare soils and topsoil ranging from 1 to 6 inches-thick.
2	Existing Fill	Orange and brown, sandy lean clay, low consistency
3	Native Clays and Silts	Variable colored, sandy lean clays (CL), sandy silts (ML), and silts (ML), stiff to very stiff consistency, with variable amounts of mica and gravel.
4	Native Sands	Variable colored, silty sands (SM), clayey sands (SC), and poorly graded sands (SP), medium dense density, with variable amounts of mica.

Groundwater Conditions

The boreholes were observed while drilling and after completion for the presence and level of groundwater. Groundwater was present at approximately 11 to 14 feet below existing grades in borings B-3 and B-4. Groundwater was not observed within any other boreholes at the time of exploration.

Due to the relatively short amount of time the boreholes remained open after drilling completion, groundwater levels may have not had sufficient time to stabilize. A relatively long period of time may be necessary for a groundwater level to develop and stabilize in the soils present at the site.

Long term observations in piezometers or observation wells sealed from the influence of surface water are often required to define groundwater levels. Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed.

Seismic Site Class

The seismic design requirements for buildings and other structures are based on Seismic Design Category. Site Classification is required to determine the Seismic Design Category for a structure. The Site Classification is based on the upper 100 feet of the site profile defined by a weighted average value of either shear wave velocity, standard penetration resistance, or undrained shear strength in accordance with Section 20.4 of ASCE 7 and the International Building Code (IBC). Based on the soil properties observed at the site and as described on the exploration logs and results, our professional opinion is that the Seismic Site Classification of D. Subsurface explorations at this site were extended to a maximum depth of 20 feet. The site properties below the boring depth to 100 feet were estimated based on our experience and knowledge of geologic conditions of the general area.

Geotechnical Overview

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided

Beneath the surface cover (bare soils or topsoil 1 to 6 inches-thick) existing fill was encountered in borings B-3 and P-2. The existing fill consisted of sandy lean clays with low consistency N-values and the fill extended to a depth of 3 feet below the surface cover.

Underlaying the existing fill (were encountered) the borings encountered native sandy lean clays (CL), sandy silts (ML), and silts (ML) with consistencies ranging from stiff to very stiff. Native silty sands (SM), clayey sands (SC), and poorly graded sands (SP) were also encountered with relative densities of medium dense. The native soils also contained variable amounts of mica and gravel.

The depths of necessary cut/fill will vary from location to location depending on the required grading and the site conditions at the time of earthwork. Grading during dry summer months would reduce the overall volume of necessary undercut. Conversely, grading during wet seasons or in wet site conditions would increase the amount of necessary undercut and replacement. Recommendations for undercut and additional site preparation recommendations, including subgrade improvement and fill placement, are discussed in the Earthwork section

The Shallow Foundations section addresses support of the buildings directly bearing on medium dense/stiff or better native soils, or on engineered fill. Based on the conditions encountered and estimated load-settlement relationships, the proposed structures can be supported on conventional continuous or spread footings. Terracon recommends an allowable bearing pressure of 2,500 pounds per square foot (psf) for conventional continuous or spread footings. The Floor Slabs section addresses slab-on-grade support of the buildings using overexcavation techniques.

Our opinion of pavement section thickness design has been developed based on our understanding of the intended use, assumed traffic, and subgrade preparation recommended herein. The Pavements section includes minimum pavement component thickness.

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

Earthwork

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

Site Preparation

Prior to placing fill, existing vegetation, topsoil, and root mats should be removed. Complete stripping of the topsoil should be performed in the proposed building and parking/driveway areas.

Although no evidence of underground facilities (such as septic tanks, cesspools, basements, and utilities) was observed during the exploration and site reconnaissance, such features could be encountered during construction. Underground facilities are encountered, such features should be removed, and the excavation thoroughly cleaned prior to backfill placement and/or construction.

Subgrade Preparation

Following stripping of vegetation and topsoil, areas of construction should be scarified to a minimum depth of 10 inches, moisture conditioned as necessary, and compacted per the compaction requirements in this report. Proofrolling should then be performed across the construction areas with an adequately loaded vehicle, such as a fully-loaded tandem-axle dump truck, under the observation of the Geotechnical Engineer or representative.

Areas excessively deflecting under the proofroll should be delineated and subsequently addressed by the Geotechnical Engineer. Areas where low consistency fill were encountered will most likely deflect during the proofroll. Undercut of any soft, loose, or otherwise unsuitable soils disclosed by the proofroll, will be required prior to the placement of any addition fill material. Excessively wet or dry material should either be removed and replaced, or moisture conditioned, or chemically modified, and recompacted.

Compacted structural fill soils should then be placed to the proposed design grade. All on-site and off-site soils to be used as structural fill should be evaluated by the Geotechnical Engineer prior to placement and compaction.

The on-site soils are almost always above optimum moisture content and require drying prior to compaction. The moisture content and compaction of subgrade soils should be maintained until foundation or pavement construction.

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

Existing Fill

As noted in Geotechnical Characterization, B-3 and P-2 encountered previously placed existing clayey fill to a depth of 3 feet below ground surface. Existing fill encountered in the building pad should be removed prior to the placement of engineered fill.

After the existing fill soils are removed or exposed, the entire subgrade areas should be proofrolled with heavy, rubber tire construction equipment, to aid in delineating areas of soft, loose, or otherwise unsuitable soil. Areas of soft, loose, or otherwise unsuitable material should be undercut and replaced with new structural fill.

Excavation

We anticipate that excavations for the proposed construction can be accomplished with conventional earthmoving equipment. The bottom of excavations should be thoroughly cleaned of loose soils and disturbed materials prior to backfill placement and/or construction.

Soil Stabilization

Methods of subgrade improvement, as described below, could include scarification, moisture conditioning and recompaction, or removal of unstable materials and replacement with granular fill (with or without geosynthetics). The appropriate method of improvement, if required, would be dependent on factors such as schedule, weather, the size of area to be stabilized, and the nature of the instability. More detailed recommendations can be provided during construction as the need for subgrade stabilization occurs. Performing site grading operations during warm seasons and dry periods would help reduce the amount of subgrade stabilization required.

If the exposed subgrade is unstable during proofrolling operations, it could be stabilized using one of the methods outlined below.

- Scarification and Recompaction - It may be feasible to scarify, dry, and recompact the exposed soils. The success of this procedure would depend primarily upon favorable weather and sufficient time to dry the soils. Stable subgrades likely would not be achievable if the thickness of the unstable soil is greater than about 1 foot, if the unstable soil is at or near groundwater levels, or if construction is performed during a period of wet or cool weather when drying is difficult.
- Crushed Stone - The use of crushed stone or crushed gravel is a common procedure to improve subgrade stability. Typical undercut depths would be expected to range from about 12 to 36 inches below finished subgrade elevation.

The use of high modulus geotextiles (i.e., engineering fabric or geogrid) could also be considered after underground work such as utility construction is completed. Prior to placing the fabric or geogrid, we recommend that all below grade construction, such as utility line installation, be completed to avoid damaging the fabric or geogrid. Equipment should not be operated above the fabric or geogrid until one full lift of crushed stone fill is placed above it. The maximum particle size of granular material placed over geotextile fabric or geogrid should not exceed 1-1/2 inches.

Further evaluation of the need and recommendations for subgrade stabilization can be provided during construction as the geotechnical conditions are exposed.

Fill Material Types

Fill required to achieve design grade should be classified as structural fill. Structural fill is material used below, or within 10 feet of structures, pavements or constructed slopes.

Reuse of On-Site Soil: Excavated on-site soil may be selectively reused as fill. The clays and silts will be sensitive to moisture conditions (particularly during seasonally wet periods) and will usually require drying prior to compaction.

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

Property	Structural Fill
Composition	Free of deleterious material
Maximum particle size	4 inches
Fines content	Not limited
Plasticity	Maximum liquid limit of 50 Maximum plasticity index of 25
GeoModel Layer Expected to be Suitable[1]	2,3,4

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

Soil Type [1]	USCS Classification	Acceptable Parameters (for Structural Fill)

Low Plasticity Cohesive	CL, CL-ML, ML, SM, SC	Liquid limit less than 50 Plasticity index less than 25
Granular	GW, GP, GM, GC SW, SP, SM, SC	Less than 50% passing No. 200 sieve

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

Fill Placement and Compaction Requirements

Structural fill should meet the following compaction requirements.

Item	Structural Fill
Maximum Lift Thickness	8 inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6 inches in loose thickness when hand-guided equipment (i.e. jumping jack or plate compactor) is used
Minimum Compaction Requirements [1,2,3]	98% of maximum standard Proctor density at all locations and elevations
Water Content Range [1]	Low plasticity cohesive: -2% to +2% of optimum Granular: -3% to +3% of optimum

Utility Trench Backfill

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

On-site materials are considered suitable for backfill of utility and pipe trenches from 1 foot above the top of the pipe to the final ground surface, provided the material is free of organic matter and deleterious substances and meets the utility material manufacture's requirements.

Trench backfill should be mechanically placed and compacted as discussed earlier in this report. Compaction of initial lifts should be accomplished with hand-operated tampers or other lightweight compactors. Where trenches are placed beneath slabs or footings, the backfill should satisfy the requirements of engineered fill discussed in this report. Flooding or jetting for placement and compaction of backfill is not recommended.

Grading and Drainage

All grades must provide effective drainage away from the buildings during and after construction and should be maintained throughout the life of the structures. Water retained next to the buildings can result in soil movements greater than those discussed in this report. Greater movements can result in unacceptable differential floor slab and/or foundation movements, cracked slabs and walls, and roof leaks. The roof should have gutters/drains with downspouts that discharge onto splash blocks at a distance of at least 10 feet from the building.

Exposed ground should be sloped and maintained at a minimum 5% away from the buildings for at least 10 feet beyond the perimeter of the building. Locally, flatter grades may be necessary to transition ADA access requirements for flatwork. After building construction and landscaping have been completed, final grades should be verified to document effective drainage has been achieved. Grades around the structure should also be periodically inspected and adjusted, as necessary, as part of the structure's maintenance program. Where paving or flatwork abuts the structure, a maintenance program should be established to effectively seal and maintain joints and prevent surface water infiltration.

Earthwork Construction Considerations

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

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

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

Construction Observation and Testing

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

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, as recommended by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content at a frequency of at least one test for every 2,500 square feet of compacted fill in the building areas and 5,000 square feet in pavement areas.

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

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

Shallow Foundations

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

Design Parameters – Compressive Loads

Item	Description
Maximum Net Allowable Bearing Pressure [1, 2]	2,500 pounds per square foot (psf)

Item	Description
Required Bearing Stratum [3]	GeoModel Layers 3, 4 or new structural fill
Minimum Foundation Dimensions	Per IBC 1809.7
Ultimate Passive Resistance[4] (equivalent fluid pressures)	330 pcf (cohesive backfill) 420 pcf (granular backfill)
Sliding Resistance [5]	0.30 ultimate coefficient of friction – onsite soil or structural fill 0.35 ultimate coefficient of friction – granular material
Minimum Embedment below Finished Grade [6]	18 inches
Estimated Total Settlement from Structural Loads [2]	Less than about 1 inch
Estimated Differential Settlement [2, 7]	About 1/2 of total settlement

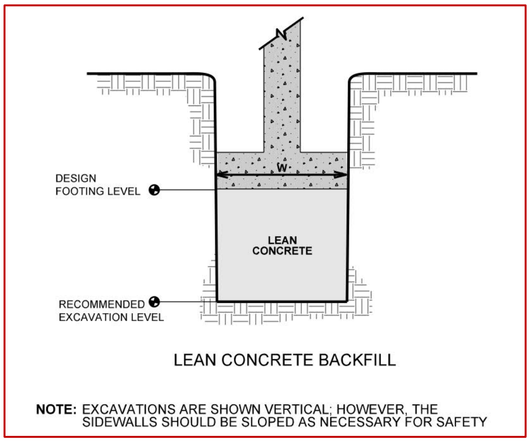
1. The maximum net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Values assume that exterior grades are no steeper than 20% within 10 feet of structure.
2. Values provided are for maximum loads noted in Project Description. Additional geotechnical consultation will be necessary if higher loads are anticipated.
3. Unsuitable or soft soils should be overexcavated and replaced per the recommendations presented in Earthwork.
4. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete placed neat against these vertical faces or that the footing forms be removed and compacted structural fill be placed against the vertical footing face. Assumes no hydrostatic pressure. Apply a factor of safety of at least 1.5 when designing for lateral force resistance.
5. Can be used to compute sliding resistance where foundations are placed on suitable soil/materials. Frictional resistance for granular materials is dependent on the bearing pressure which may vary due to load combinations. For fine-grained materials, lateral resistance using cohesion should not exceed ½ the dead load.
6. Embedment necessary to minimize the effects of frost and/or seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
7. Differential settlements are noted for equivalent-loaded foundations and bearing elevation as measured over a span of 50 feet.

Foundation Construction Considerations

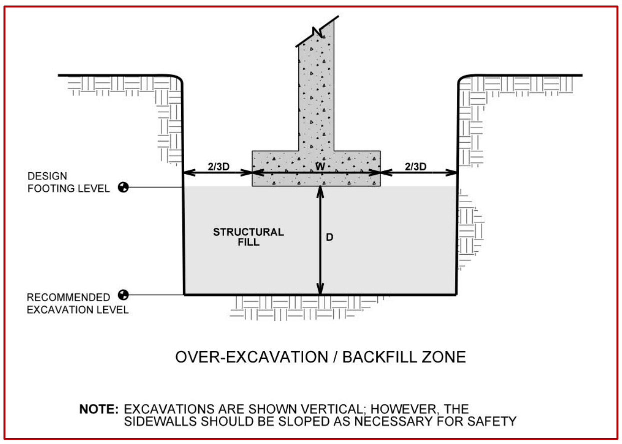
As noted in Earthwork, the footing excavations should be evaluated under the observation of the Geotechnical Engineer. The base of all foundation excavations should be free of water and loose soil, prior to placing concrete. Concrete should be placed soon after excavating to reduce bearing soil disturbance.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

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

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



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



Floor Slabs

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

Depending upon the finished floor elevation, unsuitable, weak, and/or soft to medium stiff soils may be observed at the floor slab subgrade level. These soils should be replaced with structural fill.

Floor Slab Design Parameters

Item	Description
Floor Slab Support[1]	Minimum 4 inches base course meeting material specifications of ACI 302 Subgrade compacted to recommendations in Earthwork
Estimated Modulus of Subgrade Reaction [2]	100 pounds per square inch per inch (psi/in) for point loads

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

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

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

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

Floor Slab Construction Considerations

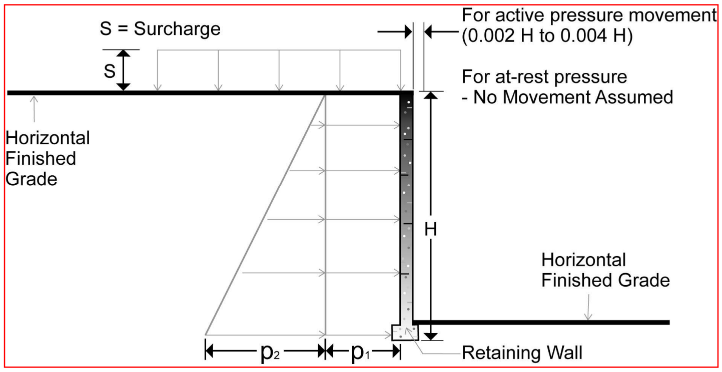
Finished subgrade, within and for at least 10 feet beyond the floor slab, should be protected from traffic, rutting, or other disturbance and maintained in a relatively moist condition until floor slabs are constructed. If the subgrade should become damaged or desiccated prior to construction of floor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

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

Lateral Earth Pressures

Design Parameters

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



Lateral Earth Pressure Design Parameters

Earth Pressure Condition [1]	Coefficient for Backfill Type [2]	Surcharge Pressure [3] p_1 (psf)	Equivalent Fluid Pressures (psf) [2,4]	
			Unsaturated [5]	Submerged [5]
Active (Ka)	Granular - 0.24 Fine Grained - 0.36	(0.24)S (0.36)S	(26)H (43)H	(80)H (85)H
At-Rest (Ko)	Granular - 0.38 Fine Grained - 0.53	(0.38)S (0.53)S	(42)H (64)H	(90)H (95)H

1. For active earth pressure, wall must rotate about base, with top lateral movements 0.002 H to 0.004 H, where H is wall height. For passive earth pressure, wall must move horizontally to mobilize resistance. Fat clay or other expansive soils should not be used as backfill behind the wall.
2. Uniform, horizontal backfill, with a maximum unit weight of 120 pcf for cohesive soils and 110 pcf for granular soils. Granular material should consist of an open-graded stone such as ALDOT #57 stone.
3. Uniform surcharge, where S is surcharge pressure.
4. Loading from heavy compaction equipment is not included.
5. To achieve "Unsaturated" conditions, follow guidelines in Subsurface Drainage for Below-Grade Walls below. "Submerged" conditions are recommended when drainage behind walls is not incorporated into the design.

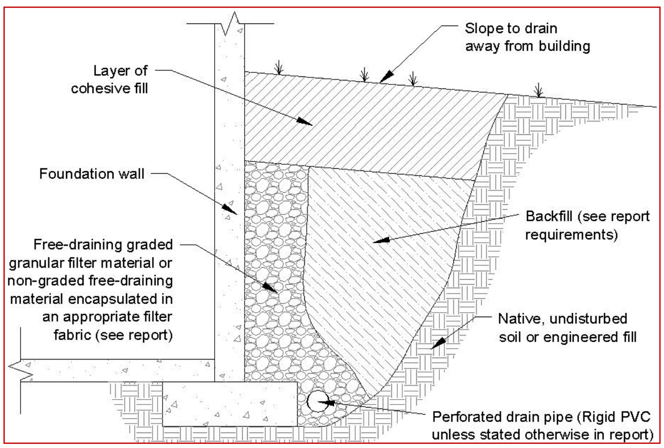
Backfill placed against structures should consist of granular soils or low plasticity cohesive soils. For the granular values to be valid, the granular backfill must extend out and up from the base of the wall at an angle of at least 45 degrees from vertical for the active case, and 60 degrees for the at-rest case.

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

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

Subsurface Drainage for Below-Grade Walls

A perforated rigid plastic drain line installed behind the base of walls and extends below adjacent grade is recommended to prevent hydrostatic loading on the walls. The invert of a drain line around a below-grade building area or exterior retaining wall should be placed near foundation bearing level. The drain line should be sloped to provide positive gravity drainage to daylight or to a sump pit and pump. The drain line should be surrounded by clean, free-draining granular material having less than 5% passing the No. 200 sieve, such as No. 57 aggregate. The free-draining aggregate should be encapsulated in a filter fabric. The granular fill should extend to within 2 feet of final grade, where it should be capped with compacted cohesive fill to reduce infiltration of surface water into the drain system.



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

Pavements

General Pavement Comments

Pavement designs are provided for the traffic conditions as noted in Project Description and in the following sections of this report. A critical aspect of pavement performance is site preparation and a subgrade that remains dry for the life of the project. Pavement designs noted in this section must be applied to the site which has been prepared as recommended in the Earthwork section.

Pavement Design Parameters

The values used in our design were empirically derived based upon our experience with similar soil types, expected subgrade soils, and our expectation of the quality of the subgrade as prescribed by the Site Preparation conditions as outlined in Earthwork. Traffic loads of 200 cars per day for standard duty pavement and 2 trucks per day for medium duty pavement were assumed for our pavement design.

Pavement Section Thicknesses

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

Asphaltic Concrete Design

Layer	Thickness (inches)	
	Light Duty [1]	Heavy Duty [1]
AC Wearing Surface [2]	1.0	1.0
AC Binder [2]	2.0	2.5
Aggregate Base [2]	6.0	8.0

1. See Project Description for more specifics regarding traffic assumptions.
2. All materials should meet the current Alabama Department of Transportation (ALDOT) Standard Specifications for Highway and Bridge Construction.

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

Portland Cement Concrete Design

Layer	Thickness (inches)	
	Standard Duty[1]	Medium Duty/Dumpster Pad[1]
PCC [2]	5.0	6.0
Aggregate Base	4.0	4.0

1. See Project Description for more specifics regarding traffic classifications.
2. All materials should meet the current Alabama Department of Transportation (ALDOT) Standard Specifications for Highway and Bridge Construction.

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

Although not required for structural support, a minimum 4-inch thick base course layer is recommended to help reduce potential for slab curl, shrinkage cracking, and subgrade pumping through joints. Proper joint spacing will also be required to prevent excessive slab curling and shrinkage cracking. Joints should be sealed to prevent entry of foreign material and doweled where necessary for load transfer. PCC pavement details for joint spacing, joint reinforcement, and joint sealing should be prepared in accordance with ACI 330 and ACI 325.

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

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

Pavement Drainage

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

Pavement Maintenance

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

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

- Final grade adjacent to paved areas should slope down from the edges at a minimum 2%.
- Subgrade and pavement surfaces should have a minimum 2% slope to promote proper surface drainage.
- Install pavement drainage systems surrounding areas anticipated for frequent wetting.
- Install joint sealant and seal cracks immediately.
- Seal all landscaped areas in or adjacent to pavements to reduce moisture migration to subgrade soils.
- Place compacted, low permeability backfill against the exterior side of curb and gutter.
- Place curb, gutter and/or sidewalk directly on clay subgrade soils rather than on unbound granular base course materials.

General Comments

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

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

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

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

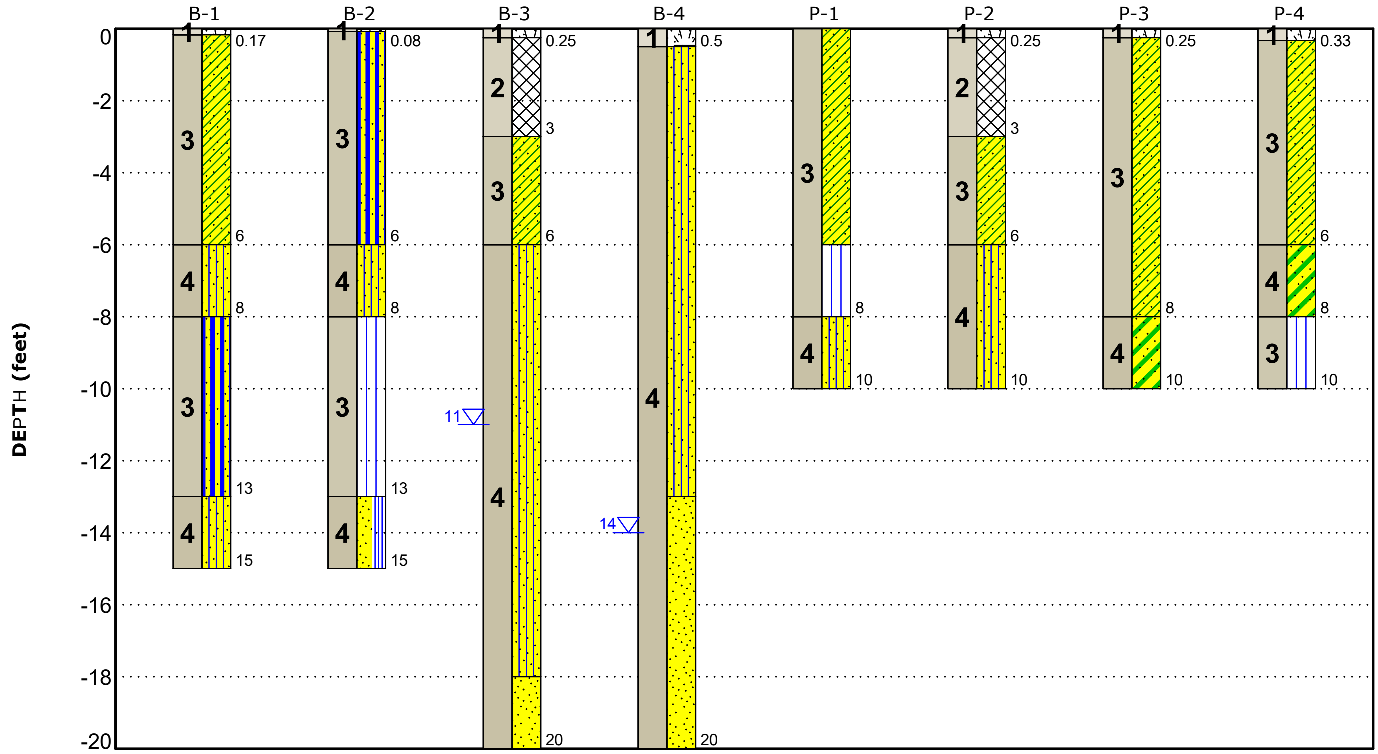
Figures

Contents:

Express Oil Northport
2509 Lurleen B Wallace Blvd | Northport, AL
Terracon Project No. E1245061

2147 Riverchase Office Rd
Hoover, AL

GeoModel



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

Model Layer	Layer Name	General Description
1	Surface Cover	Bare soils and topsoil ranging from 1 to 6 inches-thick.
2	Existing Fill	Orange and brown, sandy lean clay, low consistency
3	Native Clays and Silts	Variable colored, sandy lean clays (CL), sandy silts (ML), and silts (ML), stiff to very stiff consistency, with variable amounts of mica and gravel.
4	Native Sands	Variable colored, silty sands (SM), clayey sands (SC), and poorly graded sands (SP), medium dense density, with variable amounts of mica.

Legend

- Topsoil
- Sandy Lean Clay
- Silty Sand
- Sandy Silt
- Silt
- Poorly-graded Sand with Silt
- Fill
- Poorly-graded Sand
- Clayey Sand

First Water Observation

Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater. See individual logs for details.

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

Attachments

Exploration and Testing Procedures

Field Exploration

Number of Borings	Boring Depth (feet)	Location
2	20	Oil Change Building Area
2	15	Service Building Area
1	10	Dumpster Pad
3	10	Parking Area

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

Subsurface Exploration Procedures for Borings: We advanced the borings with a truck-mounted rotary drill rig using continuous flight augers (solid stem and/or hollow stem, as necessary, depending on soil conditions). Four samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound hammer configured with rope and cathead falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. We observed and recorded groundwater levels during drilling and sampling. For safety purposes, all borings were backfilled with auger cuttings after their completion.

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

Laboratory Testing

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

- Moisture Content
- Atterberg Limits
- Sieve Analysis

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

Site Location and Exploration Plans

Contents:

Site Location

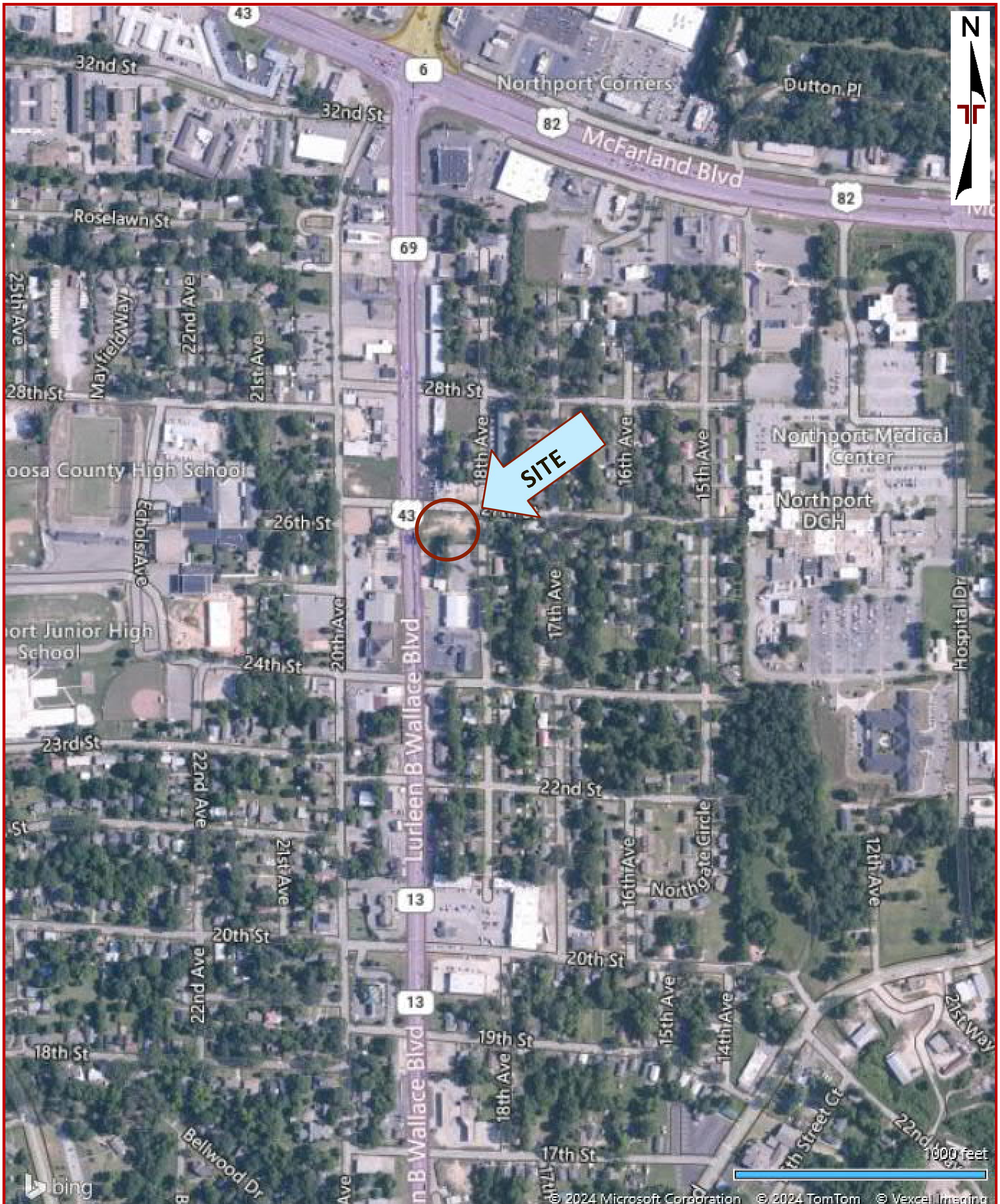


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan

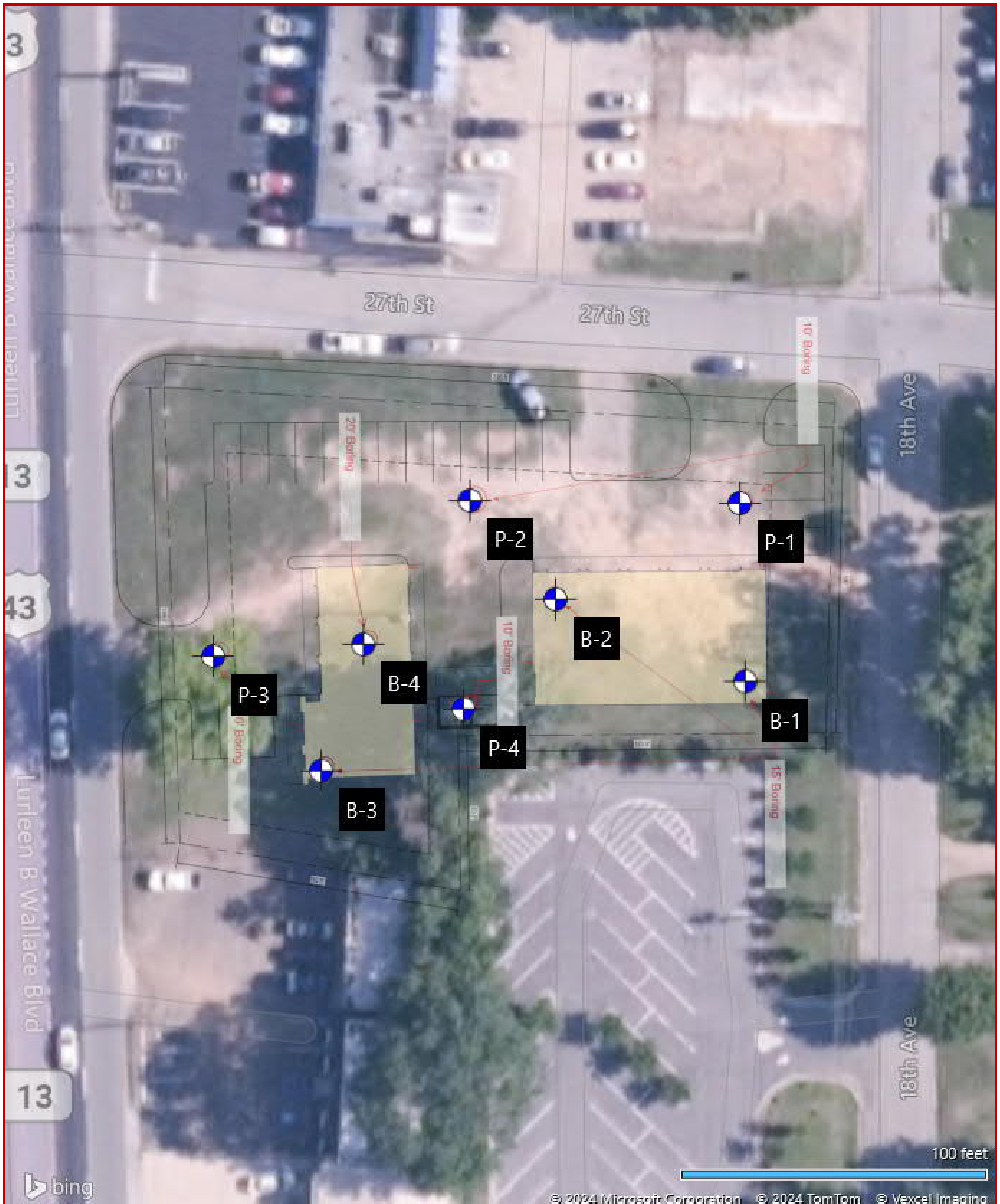


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

SITE PLAN PROVIDED BY EXPRESS OIL

Exploration and Laboratory Results

Contents:

Terracon
2147 Riverchase Office Rd
Hoover, AL

Boring Log No. B-1

Location: See Exploration Plan

Latitude: 33.2339° Longitude: -87.5759°

Model Layer	Depth (Ft.)	Material Description	Sample Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1	0.2	**TOPSOIL (2")**											
3		**SANDY LEAN CLAY (CL)**, yellowish brown, very stiff	1.5–3.0		X	5-10-14 N=24				18.8		34-21-13	66
		becomes yellowish brown with red mottle	3.5–5.0		X	5-8-11 N=19				25.6			
	6.0												
4		**SILTY SAND (SM)**, with mica, red with white mottle, medium dense	6.0–7.5		X	6-11-13 N=24				16.0			
	8.0												
3		**SANDY SILT (ML)**, with mica, red with yellow mottle, very stiff	8.5–10.0		X	5-7-11 N=18							
	13.0												
4		**SILTY SAND (SM)**, with mica, orange, medium dense	13.5–15.0		X	5-5-7 N=12							
	15.0	***Boring Terminated at 15 Feet***											

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

Water Level Observations
Groundwater not encountered

Drill Rig
CME 45

Hammer Type
Rope and Cathead

Driller
Smith drillling

Notes

Advancement Method
SSA

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
THB

Boring Started
04-22-2024

Boring Completed
04-22-2024

Terracon
2147 Riverchase Office Rd
Hoover, AL

Boring Log No. B-2

Location: See Exploration Plan

Latitude: 33.2340° Longitude: -87.5761°

Model Layer	Depth (Ft.)	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1	0.1	**TOPSOIL (1")**											
3		**SANDY SILT (ML)**, with mica, red with yellow mottle, stiff			X	3-6-7 N=13				24.6			
		becomes red with white mottle and very stiff			X	4-7-10 N=17				25.6			
	6.0		5										
4	8.0	**SILTY SAND (SM)**, with mica, yellowish brown, medium dense			X	5-12-10 N=22				25.9			
3	13.0	**SILT (ML)**, with mica, pink with white mottle, stiff	10		X	5-6-7 N=13							
4	15.0	**POORLY GRADED SAND WITH SILT (SP)**, with mica, white with yellow mottle, medium dense	15		X	7-8-10 N=18							
		Boring Terminated at 15 Feet											

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

Water Level Observations
Groundwater not encountered

Drill Rig
CME 45

Hammer Type
Rope and Cathead

Driller
Smith drillling

Notes

Advancement Method
SSA

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
THB

Boring Started
04-22-2024

Boring Completed
04-22-2024

Boring Log No. B-3

Location: See Exploration Plan

Latitude: 33.2339° Longitude: -87.5763°

Model Layer	Graphic Log	Depth (Ft.) / Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Test Type	Compressive Strength (tsf)	Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.3 **TOPSOIL (3")**											
2		**FILL - SANDY LEAN CLAY**, orange											
					X	1-2-3 N=5				19.2			
		3.0											
3		**SANDY LEAN CLAY (CL)**, orange with white mottle, stiff											
					X	4-5-9 N=14				20.6		36-21-15	77
			5										
		6.0											
4		**SILTY SAND (SM)**, with mica, orange with red mottle, medium dense			X	5-13-16 N=29				20.1			
					X	9-7-11 N=18							
			10	▽									
		becomes tan											
					X	4-5-6 N=11							
			15										
		18.0											
		POORLY GRADED SAND (SP), with mica, yellowish brown, medium dense			X	6-7-9 N=16							
		20.0	20										
		Boring Terminated at 20 Feet											

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

Water Level Observations
▽ At completion of drilling

Drill Rig
CME 45

Hammer Type
Rope and Cathead

Driller
Smith drillling

Notes

Advancement Method
SSA

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
THB

Boring Started
04-22-2024

Boring Completed
04-22-2024

Terracon
2147 Riverchase Office Rd
Hoover, AL

Boring Log No. B-4

Location: See Exploration Plan

Latitude: 33.2340° Longitude: -87.5763°

Model Layer	Depth (Ft.)	Material Description	Water Level Observations	Field Test Results	Water Content (%)	Test Type	Compressive Strength (tsf)	Strain (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1	0.5	**TOPSOIL (6")**									
4		**SILTY SAND (SM)**, yellow with red mottle, medium dense		5-10-10 N=20	19.9						
		becomes orange		7-11-14 N=25	15.3						
		becomes orangish tan with mica		11-12-14 N=26	14.2						
	13.0			7-5-10 N=15							
		POORLY GRADED SAND (SP), with mica, tan, medium dense	▽	5-5-9 N=14							
	20.0	becomes orange		4-6-8 N=14							
		Boring Terminated at 20 Feet									

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

Water Level Observations
▽ At completion of drilling

Drill Rig
CME 45

Hammer Type
Rope and Cathead

Driller
Smith drillling

Notes

Advancement Method
SSA

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
THB

Boring Started
04-22-2024

Boring Completed
04-22-2024

Terracon
2147 Riverchase Office Rd
Hoover, AL

Boring Log No. P-1

Location: See Exploration Plan

Latitude: 33.2341° Longitude: -87.5759°

Model Layer	Depth (Ft.) / Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
3	**SANDY LEAN CLAY (CL)**, yellowish brown, medium stiff											
				X	3-3-3 N=6				14.2			
	becomes medium stiff to stiff with mica			X	4-4-4 N=8				20.1			
	6.0	5										
	SILT (ML), with mica, white with red mottle, stiff			X	5-5-6 N=11				22.4			
	8.0											
4	**SILTY SAND (SM)**, with mica, yellowish brown with white mottle, medium dense			X	8-7-5 N=12							
	10.0	10										
	Boring Terminated at 10 Feet											

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

Water Level Observations
Groundwater not encountered

Drill Rig
CME 45

Hammer Type
Rope and Cathead

Driller
Smith drillling

Notes

Advancement Method
SSA

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
THB

Boring Started
04-22-2024

Boring Completed
04-22-2024

Terracon
2147 Riverchase Office Rd
Hoover, AL

Boring Log No. P-2

Location: See Exploration Plan

Latitude: 33.2341° Longitude: -87.5762°

Model Layer	Depth (Ft.)	Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1	0.3	**TOPSOIL (3")**											
2	3.0	**FILL - SANDY LEAN CLAY**, brown			SPT	1-2-2 N=4				16.5			
3	6.0	**SANDY LEAN CLAY (CL)**, with gravel, yellowish brown, stiff	5		SPT	2-4-6 N=10				19.1			
4	10.0	**SILTY SAND (SM)**, with mica, tan with pink mottle, medium dense			SPT	7-15-11 N=26				24.0			
			10		SPT	6-8-9 N=17							

Boring Terminated at 10 Feet

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

See Supporting Information for explanation of symbols and abbreviations.

Water Level Observations
Groundwater not encountered

Drill Rig
CME 45

Hammer Type
Rope and Cathead

Driller
Smith drillling

Notes

Advancement Method
SSA

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
THB

Boring Started
04-22-2024

Boring Completed
04-22-2024

Terracon
2147 Riverchase Office Rd
Hoover, AL

Boring Log No. P-3

Location: See Exploration Plan

Latitude: 33.2340° Longitude: -87.5765°

Model Layer	Depth (Ft.)	Description	Sample Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1	0.3	**TOPSOIL (3")**											
3		**SANDY LEAN CLAY (CL)**, yellowish brown, stiff											
					X	3-4-5 N=9				20.9			
		becomes yellowish with red mottle											
					X	4-5-6 N=11				22.9			
			5										
	8.0	becomes stiff to very stiff and yellowish brown with white mottle			X	5-7-8 N=15				21.3			
4	10.0	**CLAYEY SAND (SC)**, reddish brown, medium dense			X	5-8-9 N=17							
		Boring Terminated at 10 Feet	10										

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

Water Level Observations
Groundwater not encountered

Drill Rig
CME 45

Hammer Type
Rope and Cathead

Driller
Smith drillling

Notes

Advancement Method
SSA

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
THB

Boring Started
04-22-2024

Boring Completed
04-22-2024

Terracon
2147 Riverchase Office Rd
Hoover, AL

Boring Log No. P-4

Location: See Exploration Plan

Latitude: 33.2339° Longitude: -87.5762°

Model Layer	Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Strength Test: Test Type	Strength Test: Compressive Strength (tsf)	Strength Test: Strain (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1	0.3	**TOPSOIL (4")**											
3	6.0	**SANDY LEAN CLAY (CL)**, yellow with red mottle, very stiff				6-12-15 N=27				17.0			
						5-12-13 N=25				21.0			
			5										
4	8.0	**CLAYEY SAND (SC)**, yellowish brown, medium dense				9-14-13 N=27				15.5			
3	10.0	**SILT (ML)**, with mica, pink with white mottle, very stiff				6-8-8 N=16							
		Boring Terminated at 10 Feet	10										

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

Water Level Observations
Groundwater not encountered

Drill Rig
CME 45

Hammer Type
Rope and Cathead

Driller
Smith drillling

Notes

Advancement Method
SSA

Abandonment Method
Boring backfilled with auger cuttings upon completion.

Logged by
THB

Boring Started
04-22-2024

Boring Completed
04-22-2024

Supporting Information

Contents:

Terracon
2147 Riverchase Office Rd
Hoover, AL

General Notes

Sampling	Water Level		Field Tests	
Standard Penetration Test		Water Initially Encountered	N	Standard Penetration Test Resistance (Blows/Ft.)
		Water Level After a Specified Period of Time	(HP)	Hand Penetrometer
		Water Level After a Specified Period of Time	(T)	Torvane
		Cave In Encountered	(DCP)	Dynamic Cone Penetrometer
	Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.		UC	Unconfined Compressive Strength
			(PID)	Photo-Ionization Detector
			(OVA)	Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance		**Consistency of Fine-Grained Soils** (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance		
Relative Density	**Standard Penetration or N-Value (Blows/Ft.)**	**Consistency**	**Unconfined Compressive Strength Qu (tsf)**	**Standard Penetration or N-Value (Blows/Ft.)**
Very Loose	0 - 3	Very Soft	less than 0.25	0 - 1
Loose	4 - 9	Soft	0.25 to 0.50	2 - 4
Medium Dense	10 - 29	Medium Stiff	0.50 to 1.00	4 - 8
Dense	30 - 50	Stiff	1.00 to 2.00	8 - 15
Very Dense	> 50	Very Stiff	2.00 to 4.00	15 - 30
		Hard	> 4.00	> 30

Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Unified Soil Classification System

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

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