Express Oil Change - Kingsland

Geotechnical Engineering Report

February 23, 2024 | Terracon Project No. EQ245006

Prepared for:

Brakes Plus, Inc
1880 Southpark Drive
Birmingham, Alabama 35244

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P (904) 900-6494
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February 23, 2024

Brakes Plus, Inc
1880 Southpark Drive
Birmingham, Alabama 35244

Attn: Mr. Justin Duck
P: (205) 397-1142
E: justin.duck@expressoil.com

Re: **Geotechnical Engineering Report**
Express Oil Change - Kingsland
276 Kenneth Gay Drive
Kingsland, Georgia
Terracon Project No. EQ245006

Dear Mr. Duck:

We have completed the scope of Geotechnical Engineering services for the above referenced project in general accordance with Terracon Proposal No. PEQ245006 dated January 18, 2024. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations 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

Matt Darden
Staff Engineer

GEORGIA REGISTERED No. PE019180 PROFESSIONAL ENGINEER THOMAS SELFRIDGE

Tom Selfridge, P.E.
Senior Engineer
GA Registration No. 19180

2/23/2024

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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 Change to be located at 276 Kenneth Gay Drive in Kingsland, Georgia. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface conditions
- Groundwater conditions
- Site preparation and earthwork
- Foundation design and construction
- Floor slab design and construction
- Pavement design and construction

The geotechnical engineering Scope of Services for this project included the performance of 6 soil test borings, laboratory testing, engineering analysis, and preparation of this report.

Drawings showing the site and boring locations are shown on the **Topographic Vicinity Map** and **Exploration Location Plan**, respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs and lab summary table in the **Exploration Results** section.

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	An area site plan (prepared by Bennet Surveying Inc. and dated December 27, 2023) was provided via email correspondence by Mr. Justin Duck of Express Oil and Tire Engineers on January 16,2024.
Project Description	The project includes the construction of a new Express Oil Change auto shop with a footprint area of about 4,300 square feet with associated parking areas and access drives.

Item	Description
Maximum Loads (Assumed)	Not provided at the time of this report. Assumed based on similar previous projects: ▪ Individual Columns: 50 kips ▪ Bearing Walls: 3 kips per linear foot (klf) ▪ Floor Slab Live Load: 100 pounds per square foot (psf)
Grading/Slopes	We anticipate that no more than 3 feet of earthwork fill will be required to grade the site for the new construction. Final slope angles of no steeper than 3H:1V (Horizontal:Vertical) are expected.
Below-Grade Structures	We understand that an approximately 10-foot-deep pit structure will be constructed in shop area of building.
Pavements	We understand that both flexible (asphaltic concrete) and rigid (Portland cement concrete) pavement sections will be considered. Pavement design criteria have not been provided to us; however, our assumed traffic is as follows: ▪ Autos/light trucks: 100 vehicles per day. Assumed 10 percent trucks ▪ Light delivery and trash collection vehicles: 20 vehicles per week ▪ Pavement design period is 20 years
Stormwater Management	A stormwater plan has not been provided at the time of this report. Stormwater can be addressed under separate scope and cover if requested.

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

Site Conditions

The following description of site conditions is derived from our site visit on January 30, 2024, in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at 276 Kenneth Gay Drive in Kingsland, Georgia. Latitude: 30.78462 Longitude; -81.64176 (approximate) See **Topographic Vicinity Map**
Existing Improvements	The site is currently an undeveloped site with the majority covered in maintained grass and a small portion in the southwest covered in moderately dense to dense underbrush.
Existing Topography	Relatively flat and level, sloping gently to wooded area on the southwest of the site. A shallow drainage swale runs from front to the back of the site. The swale appeared to be up to a few feet in depth.

We also collected photographs at the time of our field exploration program. Representative photos are provided in our **Photography Log**.

Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs, GeoModel, and Generalized Subsurface Profile can be found in the **Exploration Results** 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	**SAND**	Loose to Medium Dense Fine Sand, Fine Sand with Silt, and Fine sand with Clay (SP, SP-SM, SP-SC)
2	**SILTY SAND**	Loose to Medium Dense Silty Sand (SM)
3	**CLAYEY SAND**	Loose to Medium Dense (SC)

The soil borings encountered a relatively consistent subsurface profile, initially consisting of a sandy topsoil layer followed by loose to medium dense fine sand, fine sand with silt, silty fine sand, and clayey fine sand (Unified Soil Classifications of SP, SP-SM, SM, and SC) to the maximum boring termination depth of approximately 20 feet. We note that borings B-2, B-5, and B-6 all encountered a relatively shallow clayey sand layer starting at approximately 2 feet-bgs.

Groundwater Conditions

Groundwater was encountered at depths ranging from 1.5 to 2 feet below the existing ground surface at the time of drilling. Long term monitoring in cased holes or piezometers would be required to better define groundwater conditions and potential variability at the site.

Groundwater level fluctuations may occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

Geotechnical Overview

The site appears suitable for the proposed construction based upon geotechnical conditions encountered in the test borings, provided that the recommendations provided in this report are implemented in the design and construction phases of this project. The primary geotechnical issue associated with this site is a shallow water table (about 1.5 to 2 feet below existing grade). We assume that the site will require some grading fill which should help provide favorable separation between the finished grade and underlying clayey soils as well as the groundwater level

Based on the conditions encountered and estimated load-settlement relationships, the proposed structures can be supported on conventional continuous or spread footings, as described in **Shallow Foundations**.

The **Floor Slabs** section addresses slab-on-grade support of the structure. The near surface on-site soils are expected to be suitable for reuse as engineered fill. Typically, loose to medium dense sandy soils were encountered in the upper 2 to 4 feet below the existing grade, and there were no apparent indicators of deleterious constituents. It should be noted that borings B-2, 5 and 6 encountered a shallow clayey sand layer at approximately 2 feet below existing grades. The upper 1.5 to 2 feet of sands are typically loose and are above the water table. The **Earthwork** section of this report outlines our recommended procedures for site and subgrade preparation which will focus on site drainage and uniform densification of the existing soils as well as detecting and treating isolated weak or "soft" subgrades, should they be encountered during construction.

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 using methodology contained in ACI 330 "Guide to Design and Construction of Concrete Parking Lots" / NAPA IS-109 "Design of Hot Mix Asphalt Pavements" and adjusted with consideration to local practice. 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 site drainage, clearing and grubbing, 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

During our exploration, no apparent site preparation had been initiated or performed in preparation for development of the site. Site drainage and runoff control measures should be implemented as early as possible in the construction process. This can be accomplished by excavating multiple temporary interceptor drainage ditches to collect surface water and to lower the groundwater table. These ditches should be open pumped if they cannot be lowered by gravity. The existing drainage swale should be cleared and grubbed, and the stripped surface should be observed by a representative of the Geotechnical Engineer to confirm that any soft or disturbed unsuitable soils are acceptably removed before placing and compacting grading fill in this area. We assume that drainage currently diverted to the swale will need to be accommodated by the project Civil Engineer in design of the grading plan for the site.

Subgrade Preparation

Throughout the project area, sandy soils were present during our exploration. Sandy soils above the water table typically respond well to mechanical densification using a vibratory drum roller. The densification process will help improve the uniformity of the loose to medium dense upper sands. Following stripping and establishment of positive site drainage and associated groundwater control, the exposed sandy subgrade soils within the planned building and pavement areas should be compacted with at least eight overlapping passes of a moderate weight vibratory drum roller having a total static operating weight of at least 5 tons and a drum diameter of 3 feet. A larger roller is not recommended due to the close proximity of the water table and the potential for inducing pumping instability of the compacted surface. The roller passes should be divided into an equal number of passes in perpendicular directions. An initial test strip should be conducted and evaluated by the Geotechnical Engineer. A compaction criterion equal to 95% of the soil's maximum dry density (ASTM D1557) should be achieved to a depth of at least 12 inches. The effectiveness of the densification process will be dependent on the moisture content of the subsoils at the time of construction. If pumping occurs, the vibratory component of the roller should be disengaged to allow excess pore water pressures to dissipate.

Failure to protect the subgrade soils and control surface water runoff can significantly impact the earthwork construction schedule. Surface water control measures should include excavation of perimeter gravity draining cutoff ditches with supplemental lateral ditches extending into the site, as required. The ditches should be constructed and maintained to gravity drain throughout the site preparation process.

Fill Material Types

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

Reuse of On-Site Soil: Excavated on-site soil is likely to be suitable for reuse as structural or general fill. Material property requirements for on-site soil for use as general fill and structural fill are noted in the table below:

Property	General and Structural Fill
Composition	Free of organic material
Maximum particle size	3 inches
Fines content	No more than 10% Passing No. 200 sieve
Plasticity	Non-plastic
GeoModel Layer Expected to be Suitable[1]	1

1. Based on subsurface exploration. Actual material suitability should be determined in the field at time of construction.

Imported Fill Materials: Imported fill materials should meet the following material property requirements. Regardless of its source, compacted fill should consist of approved materials that are non-plastic and free of organic matter and debris.

Soil Type [1]	USCS Classification	Acceptable Parameters (for Structural Fill)
Granular	SP, SP-SM	No more than 10% passing No. 200 sieve

1. Structural and general fill should consist of approved materials free of organic matter and debris. 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 and general fill should meet the following compaction requirements.

Item	Structural Fill	General Fill
Maximum Lift Thickness	■ 12 inches or less in loose thickness when relatively heavy, self-propelled compaction equipment is used ■ 4 to 6 inches in loose thickness when a bulldozer or lighter hand-guided equipment (e.g., jumping jack or plate compactor) are used	Same as structural fill
Minimum Compaction Requirements [1]	■ 95% of maximum density in uppermost 12 inches below foundations and 98% within upper 1 foot beneath pavement base ■ 95% of max. above foundations, below floor slabs, and more than 1 foot below finished pavement subgrade	92% of max.
Water Content Range [1]	Granular: -3% to +3% of optimum	As required to achieve min. compaction requirements

1. Maximum density and optimum water content as determined by the modified Proctor test (ASTM D 1557).

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.

Trench backfills 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. Flooding or jetting for placement and compaction of backfill is not recommended.

Grading and Drainage

All grades must provide effective drainage away from the building during and after construction and should be maintained throughout the life of the structure. Water retained next to the building 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 building 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 structure 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 the floor slab 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 desiccates, saturates, or is disturbed, the affected material should be removed and/or 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.

Groundwater Considerations

Although a grading plan is not yet available, it is likely that groundwater will be a consideration during site preparation and construction. If required at the time of construction, groundwater can generally be lowered one to three feet for short time periods by pumping from barrel sumps located in perimeter ditches or pits if gravity drainage cannot be established. All sump inlets should be located outside of the bearing areas to avoid loosening of the fine sandy bearing soils due to upward seepage pressures. Groundwater should be maintained at least one foot below the bottom of any excavations made during construction and two feet below the surface of any vibratory compaction operations. In areas where deeper groundwater drawdown or control is required or where more positive groundwater control is desired for prolonged periods, a fully sanded vacuum wellpoint system may be required.

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 and topsoil), and confirmation of adequate site drainage.

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 area and 5,000 square feet in pavement areas. Where not specified by local ordinance, one density and water content test should be performed for every 100 linear feet of compacted utility trench backfill and a minimum of one test performed for every 12 vertical inches of compacted backfill.

In areas of foundation excavations, the prepared bearing subgrade should be tested for density and water content at a frequency of at least one test for every 100 square feet of spread footing bearing surface and at least one test per 50 feet for continuous strip footings. If unanticipated conditions are encountered, 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
Net Allowable Bearing Pressure [1, 2]	2,500 psf
Required Bearing Stratum	Upper 12 inches of native soil densification to at least 98% of ASTM D 1557 or compacted fill as described in **Earthwork**
Minimum Foundation Dimensions	Columns – 24 inches Continuous – 18 inches
Sliding Resistance [3]	0.40 allowable coefficient of sliding friction
Minimum Embedment below Finished Grade [4]	18 inches
Estimated Total Settlement from Structural Loads [2]	Less than 1/2 inch
Estimated Differential Settlement [2, 5]	About 1/2 of total settlement

1. The allowable net 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, and that densification of the upper 2 to 3 feet of existing loose sands occurs following site drainage
2. Values provided are for maximum loads noted in **Project Description**. Additional geotechnical consultation will be necessary if higher loads are anticipated.
3. Can be used to compute sliding resistance where foundations are placed on compacted clean sands. Frictional resistance for granular materials is dependent on the bearing pressure which may vary due to load combinations.

Item	Description

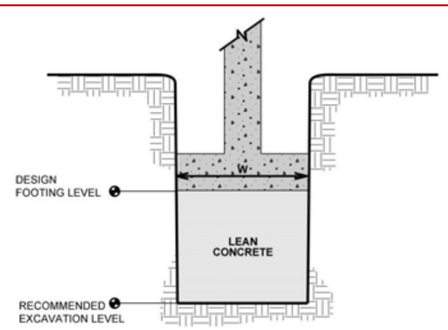
4. Embedment necessary to minimize the effects of seasonal water content variations. For sloping ground, maintain depth below the lowest adjacent exterior grade within 5 horizontal feet of the structure.
5. Differential settlements are noted for equivalent-loaded foundations and bearing elevation as measured over a span of 50 feet.

Deeper footing excavations may encounter clayey sand bearing soils at this site. If encountered in footing excavations, in lieu of attempting to compact these moisture sensitive soils, clayey sand bearing soils should be evaluated for acceptability by a representative of the Geotechnical Engineer using hand auger borings supplemented with either static or dynamic cone penetrometer testing. Suitable clayey sand foundation bearing soils should be undercut nominally and protected from further disturbance (from foot traffic during reinforcement placement or accumulated rainfall, for example) by placement of a 6-inch-thick gravel or 3-inch-thick lean concrete mud mat.

Foundation Construction Considerations

As noted in **Earthwork**, the footing excavations should be evaluated under the observation of Terracon. 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.

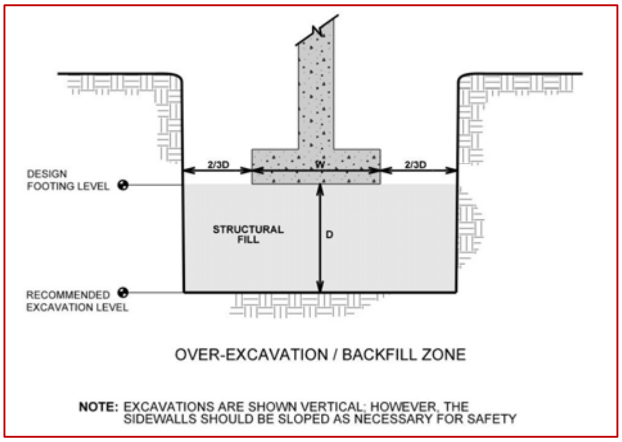
If unsuitable bearing soils are observed at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. The lean concrete replacement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



LEAN CONCRETE BACKFILL

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

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



Floor Slab

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

Floor Slab Design Parameters

Item	Description
Floor Slab Support[1]	Floor slabs should be constructed over a uniform and stable subgrade compacted to a depth of at least 12 inches. The subgrade should be constructed as described below: ▪ On-site sandy soil (Model Layer 1) or imported sand meeting the requirements of Granular Fill should be placed for the first 12 inches immediately below the slab. ▪ An optional 4-inch-thick base course meeting the material specifications of ACI 302 may be used. Locally these materials are referred to as crusher run or graded aggregate base (GAB). ▪ Subgrade should be compacted to recommendations outlined in **Earthwork**
Estimated Modulus of	200 pounds per square inch per inch (psi/in) for anticipated slab loading conditions

Item	Description
Subgrade Reaction [2]	

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 value is an estimated value based upon our experience with the subgrade conditions, the requirements noted in **Earthwork**, and the floor slab support as noted in this table.

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 turned-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 the floor slab is constructed. If the subgrade should become damaged or desiccated prior to construction of the floor slab, the affected material should be moisture conditioned and recompacted prior to concrete placement. Final conditioning of the finished subgrade should be performed immediately prior to placement of the floor slab support course.

Terracon should observe the condition of the floor slab subgrade 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

We understand that construction will include a pit structure as deep as 10 feet. Soil properties for use in the design of buried structures (by others) are presented in the table below. Placement and compaction of fill or backfill against concrete structures should be carefully monitored. Depending upon the structure rigidity, the methods and degree of compaction of the backfill soil against the structure can significantly affect the earth pressure coefficient value.

The methods and degree of compaction must be carefully specified and performed so that the assumed earth pressure condition is not exceeded by construction operations. Relatively large compaction equipment or other construction equipment should not be allowed within ten feet of the structure during backfilling. Compaction of the backfill within ten feet should be performed using relatively light weight, walk behind vibratory sleds or rollers having a total operating static weight not exceeding 1,500 pounds.

Lateral Earth Pressure Design Parameters

Compacted Structural Fill or Backfill Material[1]	Unit Weight (pcf)			Angle of Internal Friction[2], ϕ (degrees)	Wall Friction Ratio[3] δ/ϕ	Earth Pressure Coefficients[4]		
	Damp	Saturated	Submerged			Active[5] (Ka)	At-Rest[5] (Ko)	Passive[5] (Kp)
Fine SAND, Fine SAND with Silt, Fine SAND with Clay (SP, SP-SM, SP-SC)	110	125	63	33	0.5	0.29	0.46	3.4

1. These materials are granular and do not exhibit appreciable cohesion.
2. The friction angle value is based on upon a compacted density equivalent to 95% of the Modified Proctor maximum dry density (ASTM D 1557).
3. Wall friction ratio – assumed smooth, formed concrete against granular soil.

Lateral Earth Pressure Design Parameters

Compacted Structural Fill or Backfill Material[1]	Unit Weight (pcf)			Angle of Internal Friction[2], ϕ (degrees)	Wall Friction Ratio[3] δ/ϕ	Earth Pressure Coefficients[4]		
	Damp	Saturated	Submerged			Active[5] (Ka)	At-Rest[5] (Ko)	Passive[5] (Kp)

4. Short-Term (immediately after backfilling) and long-term conditions should be essentially equivalent due to the relatively free draining granular nature of the backfill.
5. The active and passive coefficients were determined by the Rankine Method.

Backfill placed against structures should consist of granular soils. For the granular values to be valid, the granular backfill must extend out from the base of the wall at an angle of at least 45 and 60 degrees from vertical for the active and passive cases, respectively. To calculate the resistance to sliding, a value of 0.4 should be used as the ultimate coefficient of friction between the footing and the underlying soil.

To control hydrostatic pressure behind the wall we recommend that a drain be installed at the foundation wall with a collection pipe leading to a reliable discharge. If this is not possible, then combined hydrostatic and lateral earth pressures should be calculated for granular backfill.

Design Considerations for Pit Structures

We assume that below grade pit structures will be fully waterproofed and designed for hydrostatic uplift. Subsurface drainage of the walls and floors of the pits will therefore not be necessary. Hydrostatic uplift calculations should consider high groundwater levels resulting from intense tropical storms which occur frequently in the area. Such storms can result in temporary saturation of the soil profile extending downward from the ground surface. If hydrostatic uplift of the pit structures cannot be accomplished with reasonable foundation geometry/dimensions, helical anchors could be considered for additional uplift resistance of pit structures.

Pavements

General Pavement Comments

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

Pavement Design Parameters

Traffic patterns and anticipated vehicular traffic conditions were not available at the time that this report was prepared. However, we anticipate that traffic loads will be produced primarily by daily automobile traffic and periodic delivery and trash removal trucks throughout a given week. The thickness of pavements subjected to heavy truck traffic should be determined using expected traffic volumes, vehicle types, and vehicle loads and should be in accordance with local, city or county ordinances.

Pavement thickness can be determined using AASHTO, Asphalt Institute and/or other appropriate methods based on specific wheel loads, axle configurations, frequencies, and desired pavement life, if higher traffic loading/frequency is anticipated.

Pavement Section Thicknesses

Minimum Recommended Pavement Section (inches)						
Traffic Area	**Alternative**	**Asphaltic Concrete Surface Course**	**Limerock or Crushed Concrete Base Course**	**Stabilized[1] Subbase Course (LBR=40)**	**Portland Cement Concrete[2]**	**Free Draining Subbase[3]**
Light Duty (Car Parking)	Rigid[4]	-	-	-	5.0	12.0
	Flexible	1.5	6.0	12	-	-
Heavy Truck (Truck & Drive Areas)	Rigid[4]	-	-	-	6.0	12.0
	Flexible	2.0	8.0	12	-	-
Dumpster Approach/Apron	Rigid[4]	-	-	-	6.0	12.0

1. Stabilization of sandy subgrades is considered necessary to provide additional stability for base layer and asphalt placement and compaction and is commonly performed in the project area by blending limerock base material with the upper 12 inches of sandy subgrade and compacting the mixture in-place. This is routinely performed to help improve the stability of clean sandy subgrade soils in Florida.
2. The PCCP design thickness is based on a concrete unconfined compressive strength of 4,000 psi at 28 days. Air content should be at 4.5 +/- 1.5% and will require air entrainment.
3. Unified Soil Classification System classification of SP, SP-SM, or SP-SC (with less than 10 percent fines) is considered free draining and these soils are considered acceptable for rigid pavement subgrades when prepared in accordance with the recommendations in this report. The existing near surface soils at the site appear to meet this criterion.
4. Rigid pavements for similar developments with relatively low volume of heavy truck traffic in the Jacksonville, Florida area are typically unreinforced due to relatively favorable subgrade bearing conditions.

The minimum recommended thicknesses in the table above are considered adequate for the following traffic loading assumptions:

- Design Life = 20 years
- For the light duty automobile drives and parking areas includes a maximum of 20,000 Equivalent Single 18-kip Axle Loads (ESAL's) over the design life of the pavement
- For truck and heavy-duty automobile drives, the drive thru, and the dumpster pad includes a maximum of 50,000 ESAL's over the design life of the pavement
- A soil characterization of good, based on the sandy subsurface soils encountered at the site and expected at the pavement subgrade elevation

If anticipated traffic loading is greater than the assumptions above, Terracon can provide revised thickness recommendations; however, detailed traffic loading information, including anticipated vehicle types and weights, as listed above, will be required.

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 affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. 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.

Attachments

Exploration and Testing Procedures

Field Exploration

Number of SPT Borings	Approximate SPT Boring Depth (feet)	Location
2	20	Building Area
4	10	Parking/Drive Areas

Boring Layout and Elevations: Justin Duck of Express Oil and Tire Engineers provided the boring locations and Terracon personnel provided the boring layout using handheld GPS equipment (estimated horizontal accuracy of about ±10 feet). If elevations and more precise boring locations are desired, we recommend that the borings be surveyed.

Subsurface Exploration Procedures: The borings were drilled using an ATV-mounted drill rig equipped with an automatic hammer with a hammer efficiency of 89.9%.

Five samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. Soil samples were obtained by split barrel sampling in general accordance with the Standard Penetration Test (SPT) procedure. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a hydraulically operated 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon is recorded at an interval of 6 inches. The sum of blows in the second and third interval of a normal 18-inch or 24-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. This value is used to estimate the in-situ relative density of cohesionless soils and the consistency of cohesive soils.

The sampling depths, penetration distances, and other sampling information were recorded on the field boring log. The samples were placed in appropriate containers and transported to our geotechnical laboratory for testing and classification by a geotechnical engineer. Our exploration team prepares field boring logs as part of the drilling operations. These field logs include visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs are 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. The sampling depths and penetration distances, plus the standard penetration resistance values, are shown on the Boring Logs in **Exploration Results**.

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
- Fines Content
- Atterberg Limits
- Organic Content

The laboratory testing program included classification 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. Laboratory test results have been tabulated in the Attachments and presented on the individual Boring Logs.

Moisture Content
In order to determine the moisture content of the selected soil sample, the test specimen was dried in an oven to constant mass in general accordance with ASTM D 2216. The water content is then calculated using the mass of the water and the mass of the dry specimen. The water content is used to express the phase relationship of air, water, and solid in a given volume of material.

Fines Content
Select samples were analyzed for fines content by measuring the percentage by weight of dry soil sample passing a U.S. standard No. 200 sieve in general accordance with ASTM D 1140. Based on the tests results, soils were classified in general accordance with the Unified Soil Classification System (USCS).

Plasticity (Atterberg Limits)

The Liquid Limit is the moisture content at which the soil flows as a heavy viscous fluid and is determined in general accordance with ASTM D4318. The Plastic Limit is the moisture content at which the soil begins to crumble when rolled into a 1/8-inch diameter thread and is also determined in general accordance with ASTM D4318. The Plasticity Index (PI) of a soil is the numerical difference between the Liquid Limit (LL) and the Plastic Limit (PL).

Organic Content
In order to determine the organic content of some soils, organic content tests were performed on selected soil samples collected from soil layers suspected of containing significant amounts of organic material. Organic content is determined by methods similar to those employed to determine water content. The dry test specimen was burnt in a hot oven until it reached a constant mass. The loss of mass due to burning is considered to be the organic material in

the soil. The soil organic content was then calculated using the mass of the organics and the mass of the burnt specimen.

Laboratory Classification and Index Property Testing Results

The soil samples were classified in general accordance with ASTM D2488, the attached General Notes and the Unified Soil Classification System based on the material's texture and plasticity. The estimated group symbol for the Unified Soil Classification System is shown on the boring logs and a brief description of the Unified Soil Classification System is included in the supporting information section of this report.

Boring No.	Sample No.	Depth Range (feet)	Moisture Content (%)	Fines Content (%)	Atterberg Limits (LL-PL-PI)	Organic Content	USCS Classification
B-1	1	0.0 – 2.0	18.6	7	-	0.7	SP-SM
B-1	4	6.0 – 8.0	24.2	29	NP	-	SC
B-2	2	2.0 – 4.0	19.4	17	-	-	SC
B-2	6	13.5 – 15.0	29.6	11	-	-	SP-SM
B-3	1	0.0 – 2.0	23.2	17	-	5.1	SM
B-4	4	6.0 – 8.0	21.5	7	-	-	SP-SM
B-5	2	2.0 – 4.0	19.9	19	-	-	SC
B-6	3	4.0 – 6.0	21.2	15	-	-	SC

Photography Log

Looking southwest from center of site

Looking west at Boring B-3

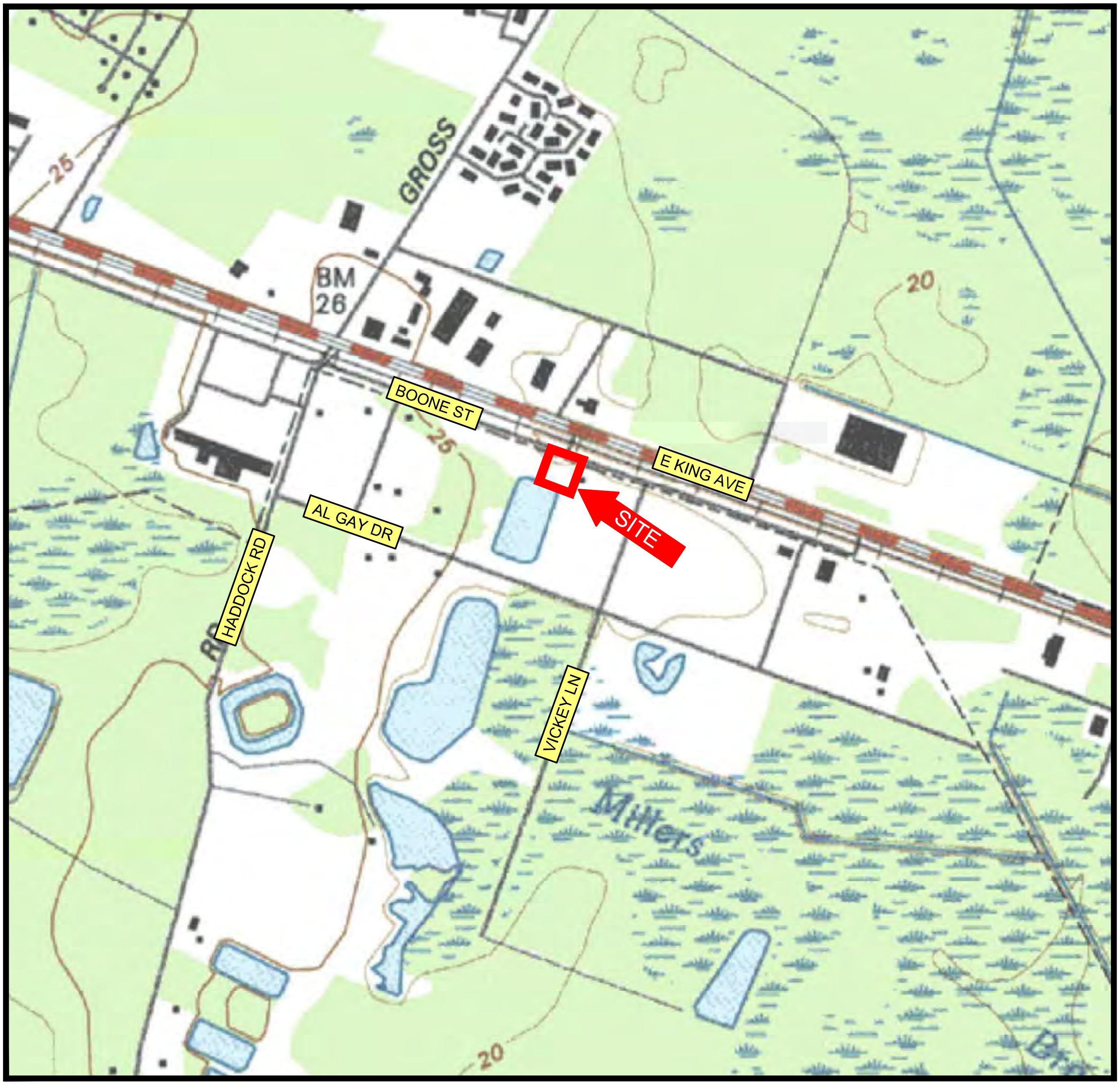
Looking southwest at Boring B-1

Looking southwest at Boring B-5

Site Location and Exploration Plans

Contents:

UNITED STATES — DEPARTMENT OF THE INTERIOR — GEOLOGICAL SURVEY



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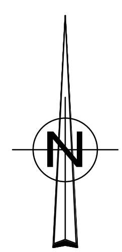
ISSUED: 1993
7.5 MINUTE SERIES (QUADRANGLE)



Project Mngr: MAD	Project No. EQ245006	Terracon Explore with us	TOPOGRAPHIC VICINITY MAP
Drawn By: PJC	Scale: AS SHOWN	8001 BAYMEADOWS WAY - SUITE 1 JACKSONVILLE, FLORIDA 32256	GEOTECHNICAL ENGINEERING REPORT EXPRESS OIL CHANGE
Checked By: MAD	File No. EQ245006	PH. (904) 900-6494 FAX. (904) 268-5255	276 KENNETH GAY DRIVE KINGSLAND, CAMDEN COUNTY, GEORGIA
Approved By: TES	Date: 2-8-2024		

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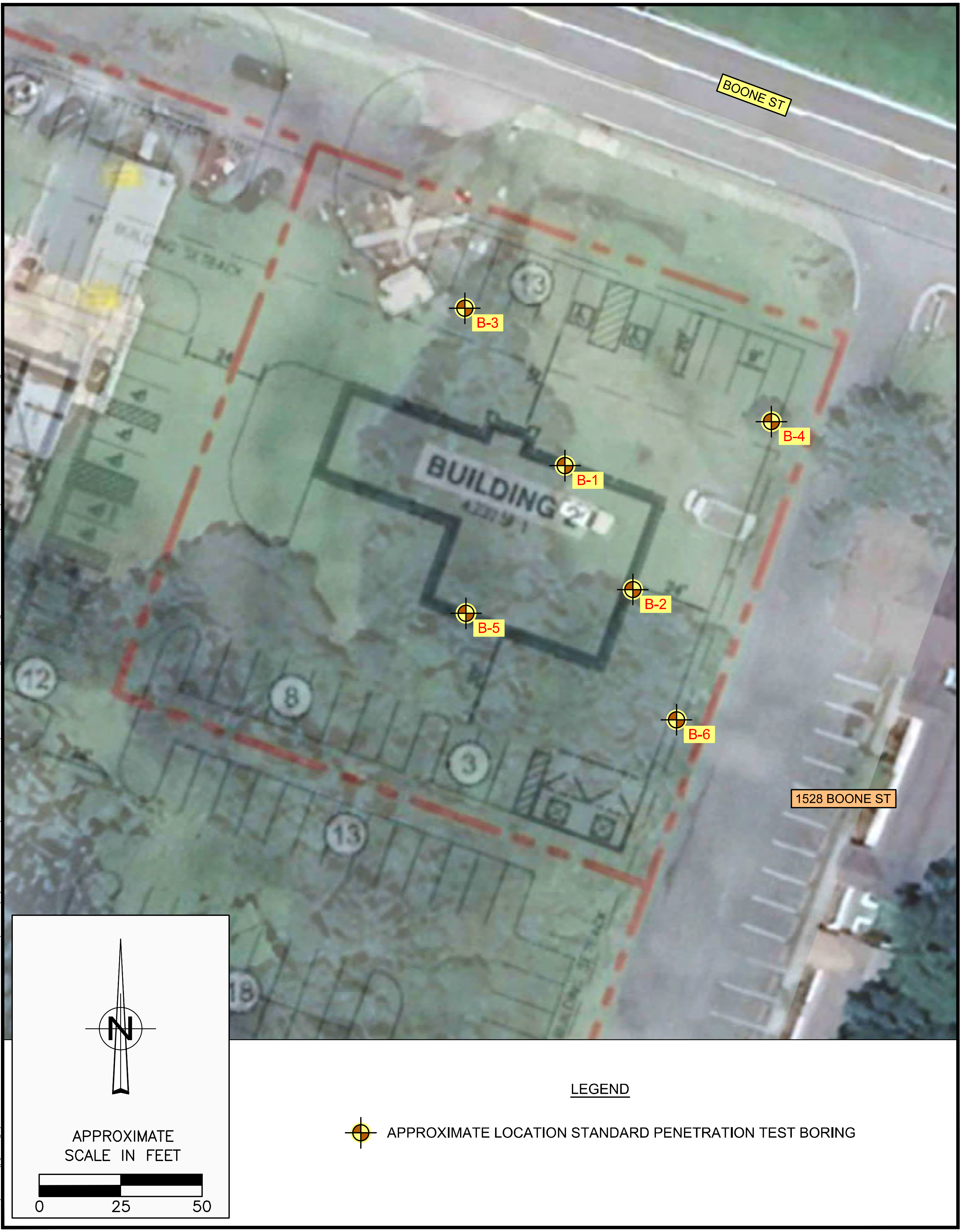

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Project Mngr: MAD	Project No. EQ245006		
Drawn By: PJC	Scale: AS SHOWN		
Checked By: MAD	File No. EQ245006		
Approved By: TES	Date: 2-8-2024		

Terracon
Explore with us

8001 BAYMEADOWS WAY - SUITE 1
JACKSONVILLE, FLORIDA 32256
PH. (904) 900-6494 FAX. (904) 268-5255

EXPLORATION LOCATION PLAN

GEOTECHNICAL ENGINEERING REPORT
EXPRESS OIL CHANGE

276 KENNETH GAY DRIVE
KINGSLAND, CAMDEN COUNTY, GEORGIA

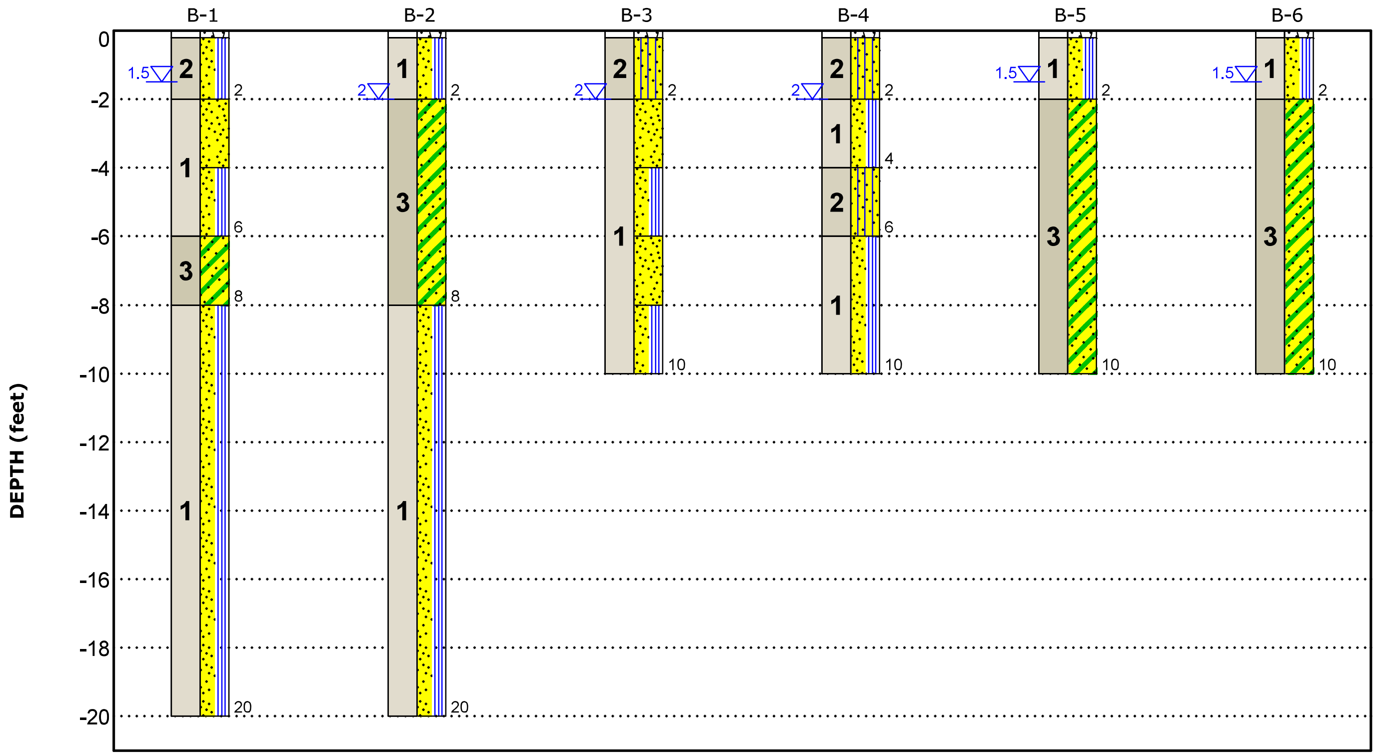
Exploration and Laboratory Results

Contents:

Express Oil Change - Kingsland
276 kenneth Gay Drive | Kingsland, Georiga
Terracon Project No. EQ245006

8001 Baymeadows Way Ste 1
Jacksonville, FL

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	SAND	Loose to Medium Dense Fine Sand, Fine Sand with Silt, and Fine Sand with Clay (SP, SP-SM, SP-SC)
2	SILTY SAND	Loose to Medium Dense Silty Sand (SM)
3	CLAYEY SAND	Loose to Medium Dense Clayey Sand (SC)

Legend

- Topsoil
- Poorly-graded Sand with Silt
- Poorly-graded Sand
- Clayey Sand
- Silty Sand

▽ First Water Observation

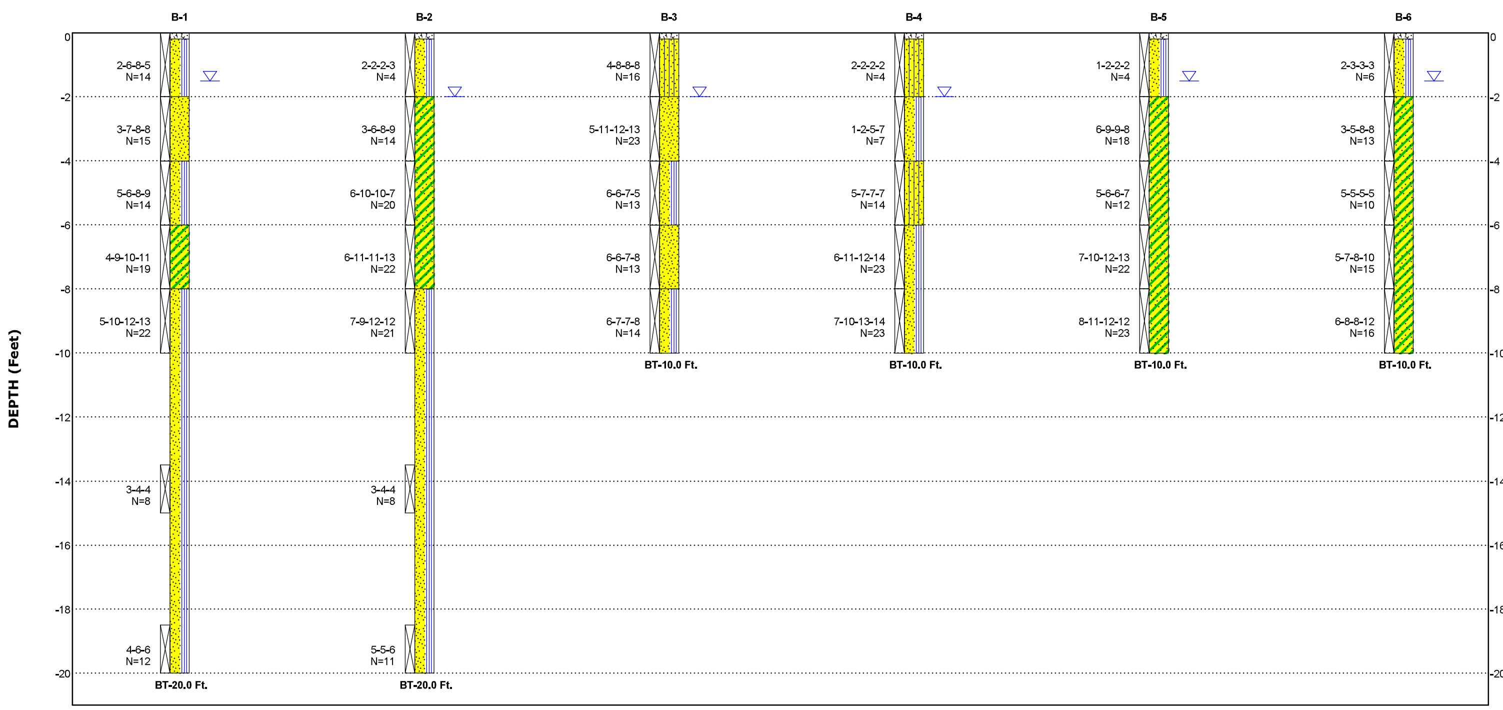
Groundwater levels are temporal. The levels shown are representative of the date and time of our exploration. Significant changes are possible over time.
Water levels shown are as measured during and/or after drilling. In some cases, boring advancement methods mask the presence/absence of groundwater.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

Express Oil Change - Kingsland
276 kenneth Gay Drive | Kingsland, Georiga
Terracon Project No. EQ245006

Generalized Subsurface Profile

Terracon
8001 Baymeadows Way Ste 1
Jacksonville, FL



Notes	Water Level Observations	Explanation	Material Legend
See Exploration Plan for orientation of soil profile. See General Notes in Supporting Information for symbols and soil classifications. Soils profile provided for illustration purposes only. Soils between borings may differ BT - Boring Termination Automatic Hammer Efficiency - 89.9%	Water Level Reading at time of drilling.	B-1 — Borehole Number Sampling (See General Notes) — Borehole Lithology BT — Borehole Termination Type	Topsoil Poorly-graded Sand with Silt Poorly-graded Sand Clayey Sand Silty Sand

Terracon
8001 Baymeadows Way Ste 1
Jacksonville, FL

Boring Log No. B-1

Location: See Exploration Plan

Latitude: 30.7845° Longitude: -81.6418°

Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Organic Content (%)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
0.2	**TOPSOIL**, (approximately 2" thick)								
2.0	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, light brown, medium dense, trace roots		▽	X	2-6-8-5 N=14	0.7	18.6		7
4.0	**POORLY GRADED SAND (SP)**, fine grained, light brown, medium dense			X	3-7-8-8 N=15				
6.0	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, light brown and light gray, medium dense	5		X	5-6-8-9 N=14				
8.0	**CLAYEY SAND (SC)**, fine grained, brown and light gray, medium dense			X	4-9-10-11 N=19		24.2	NP	29
	POORLY GRADED SAND WITH SILT (SP-SM), fine grained, light gray and light brown, medium dense			X	5-10-12-13 N=22				
		10							
	below 13.5 feet - light gray and gray, loose			X	3-4-4 N=8				
		15							
20.0	below 18.5 feet - medium dense			X	4-6-6 N=12				
	Boring Terminated at 20 Feet	20							

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 encountered at 1.5' on 2024

Drill Rig
D-50

Hammer Type
Automatic

Driller
M. Waller

Notes
- Automatic Hammer Efficiency - 89.9%

Advancement Method
Mud Rotary

Abandonment Method
Boring backfilled with Auger Cuttings and Bentonite

Logged by
J. Patino

Boring Started
02-05-2024

Boring Completed
02-05-2024

Terracon
8001 Baymeadows Way Ste 1
Jacksonville, FL

Boring Log No. B-2

Location: See Exploration Plan

Latitude: 30.7844° Longitude: -81.6418°

Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Organic Content (%)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
0.2	**TOPSOIL**, (approximately 2" thick)								
2.0	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, light brown and brown, loose, trace roots		▽ (2.0)	X	2-2-2-3 N=4				
8.0	**CLAYEY SAND (SC)**, fine grained, brownish gray and light brown, medium dense			X	3-6-8-9 N=14		19.4		17
		5		X	6-10-10-7 N=20				
				X	6-11-11-13 N=22				
	POORLY GRADED SAND WITH SILT (SP-SM), fine grained, light brown and brown, medium dense			X	7-9-12-12 N=21				
		10							
	below 13.5 feet - light gray, loose			X	3-4-4 N=8		29.6		11
		15							
20.0	below 18.5 feet - light brown and brown, medium dense			X	5-5-6 N=11				
	Boring Terminated at 20 Feet	20							

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 encountered at 2.0' on 2024

Drill Rig
D-50

Hammer Type
Automatic

Driller
M. Waller

Notes
- Automatic Hammer Efficiency - 89.9%

Advancement Method
Mud Rotary

Abandonment Method
Boring backfilled with Auger Cuttings and Bentonite

Logged by
J. Patino

Boring Started
02-05-2024

Boring Completed
02-05-2024

Terracon
8001 Baymeadows Way Ste 1
Jacksonville, FL

Boring Log No. B-3

Location: See Exploration Plan

Latitude: 30.7847° Longitude: -81.6419°

Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Organic Content (%)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
0.2	**TOPSOIL**, (approximately 2" thick)								
2.0	**SILTY SAND (SM)**, fine grained, dark brown, medium dense, few roots		▽	X	4-8-8-8 N=16	5.1	23.2		17
4.0	**POORLY GRADED SAND (SP)**, fine grained, light brown, medium dense			X	5-11-12-13 N=23				
6.0	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, brown and light brown, medium dense	5		X	6-6-7-5 N=13				
8.0	**POORLY GRADED SAND (SP)**, fine grained, light brown, medium dense			X	6-6-7-8 N=13				
10.0	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, light brown and light gray, medium dense	10		X	6-7-7-8 N=14				

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 encountered at 2.0' on 2024

Drill Rig
D-50

Hammer Type
Automatic

Driller
M. Waller

Notes
- Automatic Hammer Efficiency - 89.9%

Advancement Method
Mud Rotary

Abandonment Method
Boring backfilled with Auger Cuttings and Bentonite

Logged by
J. Patino

Boring Started
02-05-2024

Boring Completed
02-05-2024

Terracon
8001 Baymeadows Way Ste 1
Jacksonville, FL

Boring Log No. B-4

Location: See Exploration Plan

Latitude: 30.7846° Longitude: -81.6416°

Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Organic Content (%)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
0.2	**TOPSOIL**, (approximately 2" thick)								
2.0	**SILTY SAND (SM)**, fine grained, dark gray and dark brown, loose, trace roots		▽ (2.0)	X	2-2-2-2 N=4				
4.0	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, brown and light brown, loose			X	1-2-5-7 N=7				
6.0	**SILTY SAND (SM)**, fine grained, light gray, medium dense	5		X	5-7-7-7 N=14				
	POORLY GRADED SAND WITH SILT (SP-SM), fine grained, light brown, medium dense			X	6-11-12-14 N=23		21.5		7
10.0	below 8.0 feet - brown and light brown	10		X	7-10-13-14 N=23				

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 encountered at 2.0' on 2024

Notes
- Automatic Hammer Efficiency - 89.9%

Advancement Method
Mud Rotary

Abandonment Method
Boring backfilled with Auger Cuttings and Bentonite

Drill Rig
D-50

Hammer Type
Automatic

Driller
M. Waller

Logged by
J. Patino

Boring Started
02-05-2024

Boring Completed
02-05-2024

Terracon
8001 Baymeadows Way Ste 1
Jacksonville, FL

Boring Log No. B-5

Location: See Exploration Plan

Latitude: 30.7844° Longitude: -81.6419°

Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Organic Content (%)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
0.2	**TOPSOIL**, (approximately 2" thick)								
2.0	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, gray and brown, loose, trace roots		▽		1-2-2-2 N=4				
	CLAYEY SAND (SC), fine grained, gray and dark brown, medium dense				6-9-9-8 N=18		19.9		19
	below 4.0 feet - grayish brown	5			5-6-6-7 N=12				
					7-10-12-13 N=22				
10.0					8-11-12-12 N=23				
	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 encountered at 1.5' on 2024

Drill Rig
D-50

Hammer Type
Automatic

Driller
M. Waller

Notes
- Automatic Hammer Efficiency - 89.9%

Advancement Method
Mud Rotary

Abandonment Method
Boring backfilled with Auger Cuttings and Bentonite

Logged by
J. Patino

Boring Started
02-05-2024

Boring Completed
02-05-2024

Terracon
8001 Baymeadows Way Ste 1
Jacksonville, FL

Boring Log No. B-6

Location: See Exploration Plan

Latitude: 30.7843° Longitude: -81.6417°

Graphic Log Depth (Ft.)	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Organic Content (%)	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
0.2	**TOPSOIL**, (approximately 2" thick)								
2.0	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, light brown and brown, loose, trace roots		▽		2-3-3-3 N=6				
	CLAYEY SAND (SC), fine grained, brown and gray, medium dense				3-5-8-8 N=13				
	below 4.0 feet - light brown and light gray	5			5-5-5-5 N=10		21.2		15
					5-7-8-10 N=15				
10.0	below 8.0 feet - grayish brown	10			6-8-8-12 N=16				

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 encountered at 1.5' on 2024

Drill Rig
D-50

Hammer Type
Automatic

Driller
M. Waller

Notes
- Automatic Hammer Efficiency - 89.9%

Advancement Method
Mud Rotary

Abandonment Method
Boring backfilled with Auger Cuttings and Bentonite

Logged by
J. Patino

Boring Started
02-05-2024

Boring Completed
02-05-2024

Supporting Information

Contents:

SPT GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING	WATER LEVEL	FIELD TESTS
Auger	Water Initially Encountered	(HP) Hand Penetrometer
Split Spoon	Water Level After a Specified Period of Time	(T) Torvane
Shelby Tube	Water Level After a Specified Period of Time	(b/f) Standard Penetration Test (blows per foot)
Macro Core		(PID) Photo-Ionization Detector
Ring Sampler		(OVA) Organic Vapor Analyzer
Rock Core		
Grab Sample		
No Recovery		

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.

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

LOCATION AND ELEVATION NOTES: Unless otherwise noted, Latitude and Longitude are approximately determined using a handheld GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topography survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More that 50% retained on No. 200 sieve) Density determined by Standard Penetration Resistance		
Descriptive Term (Density)	Safety Hamer SPT N_{60}-Value (Blows/Ft.)	Automatic Hammer SPT N-Value (Blows/Ft.)
Very Loose	0 – 3	< 3
Loose	4 – 9	3 – 8
Medium Dense	10 – 29	9 – 24
Dense	30 – 50	24 – 40
Very Dense	> 50	> 40

CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve) Consistency determined by laboratory shear strength testing, field visual-manual procedures or Standard Penetration Resistance			
Descriptive Term (Consistency)	Unconfined Compressive Strength Qu, (psf)	Safety Hamer SPT N_{60}-Value (Blows/Ft.)	Automatic Hamer SPT N-Value (Blows/Ft.)
Very Soft	Less than 500	0 – 1	< 1
Soft	500 – 1,000	2 – 4	1 – 3
Medium Stiff	1,000 – 2,000	5 – 8	4 – 6
Stiff	2,000 – 4,000	9 – 15	7 – 12
Very Stiff	4,000 – 8,000	16 – 30	13 – 24
Hard	> 8,000	> 30	> 24

RELATIVE PROPORTIONS OF GRAVEL, SAND FINES, OR ORGANIC MATTER	
Descriptive Terms of Constituents	Percent of Dry Weight
Trace	< 5%
Few	5 to < 12%
Little	12 to < 30%
Some	30 to < 50%
Mostly	>50%

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

PLASTICITY DESCRIPTION	
Term	Plasticity Index
Non-Plastic	0
Low Plasticity	1-10
Medium Plasticity	11-30
High Plasticity	>30

ROCK CEMENTATION (NORTH FLORIDA LIMESTONE) CORRELATION OF LABORATORY UNCONFINED COMPRESSION TEST RESULTS AND PENETRATION RESISTANCE WITH RELATIVE DEGREE OF CEMENTATION			
Relative Degree of Cementation	**Unconfined Compressive Strength (ksf)**	**Standard Penetration Resistance (# of Blows, N_{60})**	**Manual Test on Recovered Core**
Weakly Cemented	Uc < 50	N < 100	Friable, easily crumbled or broken with hands
Cemented	50 < Uc < 250	N – 100 or more w/recovery	Some difficulty in breaking with hands
Well Cemented	Uc > 250	No recovery – N>100	Cannot be broken with hands

CORRELATION OF RATE OF EFFERVESCENCE OF DILUTE HYDROCHLORIC ACID WITH RELATIVE DEGREE OF CALCAREOUSNESS	
Relative Degree of Calcareousness	Rate of Effervescence
Slightly calcareous	Weak or Slow
Calcareous	Moderate or Mild
Very Calcareous	Strong or Violent

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] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ w
[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.