VA247-17-R-0763
Project#508-342
"Construct Parking Structure, Trinka Davis Veterans Village"

Request for Information (RFI) LOG
Amendment #A00001

Question #	Question	Government Response
1	We had a metal working subcontractor look through the plans and noticed copper fascia with aluminum around it. Copper Fascia with Aluminum will corrode the Aluminum when rain runs off the copper ions.Aluminum will be very susceptible to galvanic corrosion in contact with copper, assuming that the two metals are also in contact with a common electrolyte (such as water with some ionic content.) ... This will improve bolted joints by reducing the resistance, and resists corrosion. We would like to ask if the VAMC would approve our recommendation…100% Copper or 100% Aluminum.	Dissimilar metals should not touch. Where aluminum coping meets copper fascia and trim, replace aluminum coping with copper flashing. Refer to revised details on AS411.
2	Is there a Geotech Report available for this project? I wanted to see if there is any rock expected in the earthwork or utilities.	See Attached
3	Sheet SB601, Detail 3, states "ACP SEE SCHEDULE". An ACP Schedule cannot be located. Please advise	See Detail 4/SB601 for Typical Auger Cast Pile construction
4	Sheet SB601, Note 2, states, "ACP 16 indicates 16" diameter auger cast pile x 30' long". There are also 18" ACPs shown on drawings – are they to be 30' long as well? Is a ACP schedule available showing the bearing and/or top of pile elevations?	All Auger Cast Piles to be ACP16, 16" diameter, 30' long with reinforcing and embedment per Detail 4/SB601. Top of pile elevations are to be determined from pile cap elevations.
5	Sheet SB601, Detail 4, is the "Typical Auger Cast Pile ACP18". Do the ACP16s shown for PC7 and PC8 in Detai1 have the same reinforcement requirements?	All Auger Cast Piles to be ACP16, 16" diameter, 30' long with reinforcing and embedment per Detail 4/SB601.
6	Spec Section 2.10; J. Refers to Section 13 05 41 Seismic Restraints. This section is not included in the current specs. Please provide.	Seismic restraints are not required for the MEP work.
7	Please provide the Geotechnical Report.	See Attached
8	Who is the manufacturer of the fire alarm system in the main building?	Honeywell.
9	Who is the manufacturer and model number of the existing CCTV system? Does it have enough room and or licenses to add the additional cameras?	Pelco/Tyco.
10	Is PCI MNL 117 specifically required for this project? This designation is for cladding projects, instead of a structural product with an architectural finish. PCI MNL117 will be more expensive.	PCI MNL 117 is required for this project.
11	Precast finish color is listed as light/buff but doesn't state what the finish is – I assume light sandblast. Please confirm. Is there a particular PCI finish code that is desired?	PC-1 to be light buff to match existing campus building. Finish to be light sandblasted. Refer to revised specification 09 06 00.
12	Please confirm stainless steel connections are not required for the precast. There is no reference in the plans and this is not standard in our area.	Stainless steel connections are not required for the precast concrete.
13	Detail 2/AP601 does not work – you cannot attach anything this low in the double tee stem. Please confirm precaster will be able to coordinate this detail during design.	Detail is appropriate as shown. Coordinate location and depth of embeds with prestressing strand locations.
14	Alternate C, Reduce Architecture states: Omit natural stone veneer on first floor and copper fascia banding at first and second floor with project scope. Please advise on what to put in lieu of natural stone veneer and the copper fascia banding.	For Alternate C, provide PC-1 in lieu of natural stone veneer. In lieu of copper fascia, not including roof overhang and canopy, provide painted precast concrete color to match copper fascia.
15	Spec Section 01.00.00 calls for the Contractor to carry a National Pollutant Discharge Elimination System (NPDES) permit. Please verify this is correct.	The engineer will submit for the NPDES on behalf of the owner. The contractor will be listed and sign as the operator.
16	Sheet SB401 Detail 2 "Elevator/Stair Plan @ Foundation" does not state which pile cap is to be used. Please provide.	Detail references the Mat Slab Schedule on SB601.
17	Sheet SB401 Detail 3 "Stair Plan @ Foundation" does not state which pile cap is to be used. Please provide.	Detail references the Mat Slab Schedule on SB601.
18	I'm unable to locate a Basis of Design for the Ductless Air Conditioning Unit (DCU & DFCU). Are you able to confirm a Basis of Design and/or acceptable manufacturer's we can use?	Designer used Daikin FAQ/RZQ during design. Other manufacturers meeting specificaitons, schedule and line lengths shown on drawings may be submitted for review. Coordinate selected manufacturer with electrical subcontractor and COR.
19	Can we use earth forms for the footings?	Earth forms are permitted.
20	Electrical/Telecomm feeds are about 350 ft away. Is it acceptable to install a manhole to aid in pulling the wires?	Underground installations shall be per Spec Section 26 05 41 - Underground Electrical Construction. Manholes and pullboxes for feeds back to main facility is acceptable. Any locations no shown on plans will need to be approved by the COR.
21	Can you provide information about the call boxes and where they are located on the plans?	Refer to Specification sections 28 26 00 - Electronic Personal Protection System and 28 52 31 - Emergency Call System. Emergency call boxes are shown on plans, as depicted by the Emergency Callbox Station and Area of Rescue symbols shown on the Electrical Symbol Legend, sheet ES002.
22	Do the steel fabricators and erectors have to be AISC certified?	No.

Question #	Question	Government Response
23	Page EL101 Note 9 states "All conduits shall be concealed in walls or above ceiling" Because this is a precast deck concealing the conduit will be extremely expensive. Can we wall mount the electrical conduit?	Conduit work can be run exposed on walls and ceilings at precast members, provided rigid or IMC conduit is used (damp/wet locations). Should drywall or lay-in construction be used, then conduit shall be run concealed as noted.
24	What is the existing fire alarm panels (brand / model) that we are to tie back into from the parking decks stand-alone FACP?	Honeywell/MS-9600 UDLS.
25	Can the Geotechnical Report be provided for the Trinka Davis Parking Garage? Also, is one available for the Fort McPherson parking garages?	See Attached
26	Please clarify what areas receive a traffic coating and what areas receive the silane water repellant.	The only area of the garage that receives the traffic coating is the area above the Storage/IT/Electrical rooms (see the dark gray hatched area on AW102). Everywhere else gets the silane water repellant.
27	Specification Section 01 00 00 1.20 Availability and Use of Utility Services states that the Contractor shall install electrical meters to measure the amount of electricity used for construction and that the Contractor is required to pay for the amount used at the prevailing rates charged to the Government. Please verify that this requirement is applicable to this project.	This is not a requirement for this project.
28	Specification Section 05 12 00 Structural Steel Framing requires the manufacturer and erector to be certified by AISC. This drastically reduces competition and disqualifies companies that are qualified but not certified. Can this requirement be removed?	Yes
29	Can the natural stone veneer be clarified? The Specifications indicate to match existing. What are we matching. Can a manufacturer be identified?	The natural stone veneer is to match the existing Trinka Davis Campus stone veneer. A basis of design has not been selected and the contractor should review the existing stone veneer on campus and match.
30	What is the applied natural stone veneer indicated to be installed around the steel canopy columns?	The natural stone veneer is to match the existing Trinka Davis Campus stone veneer. A basis of design has not been selected and the contractor should review the existing stone veneer on campus and match.

Geotechnical Engineering Report

Trinka Davis Parking Deck
180 Martin Drive
Carrollton, Georgia
November 16, 2016
Terracon Project No. 49165249

Prepared For:
Guidon Design, Inc
Indianapolis, Indiana

Prepared By:
Terracon Consultants, Inc.
Atlanta, Georgia

November 16, 2016

Guidon Design, Inc.
905 North Capitol Avenue, Suite 100
Indianapolis, Indiana 46204

Attn: Mr. Mark VanderWoude, PE

Re: Geotechnical Engineering Report
Trinka Davis Parking Lot
180 Martin Drive
Carrollton, Georgia
Terracon Project No. 49165249

Dear Mr. VanderWoude:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. These services were performed in general accordance with our Proposal Number P49165249TD, dated August 18, 2016, as authorized by you on October 11, 2016.

This report presents the results of the subsurface exploration and provides geotechnical engineering recommendations relative to earthwork and the design and construction of foundations and pavements for the proposed project.

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

Sincerely,
Terracon Consultants, Inc.

Veronica V. Finol, E.I.T.
Senior Staff Geotechnical Engineer

GEORGIA REGISTERED No 12692 PROFESSIONAL ENGINEER RICHARD MOCKRIDGE

Richard Mockridge, P.E.
Senior Consultant

Copies to: Addressee (1 via e-mail)

TABLE OF CONTENTS

EXECUTIVE SUMMARY

A geotechnical engineering exploration has been performed for the proposed parking deck for the Trinka Davis Veterans Village located at 180 Martin Drive in Carrollton, Georgia. Terracon's geotechnical engineering scope of work included the advancement of eight soil test borings to depths of approximately 10 to 37 feet below existing site grades. One of the proposed borings (Boring B-1) could not be advanced to the planned termination depth because an existing water pipe was damaged during drilling.

The following geotechnical engineering considerations were identified:

- All of the borings penetrated 3 to 8 feet of undocumented fill soils, exhibiting standard penetration resistance values ranging from 4 to 28 blows per foot (bpf). Documentation of fill placement and quality control testing were not provided to us at the time of this report.

- Below the fill soils were Piedmont residual soils having standard penetration resistances of 3 to 24 blows per foot.

- Partially Weathered rock was encountered in all, but one boring, at depths of 23 to 28 feet below ground surface. Boring B-5 encountered auger refusal at a depth of 37 feet below ground surface. The remaining borings were extended to their planned termination depths. We do not anticipate difficult excavation during construction.

- Groundwater was only encountered in Boring B-5 at about 25 feet shortly after drilling.

- The upper fill soils encountered in some of the borings were dry. These soils have moisture contents below their estimated optimum moisture content. We recommend scarifying and moisture conditioning the surface soils and recompacting as discussed herein to provide a uniform stable subgrade for pavement construction.

- The Piedmont residual soils were derived from parent amphibolite bedrock. These soils typically display a very high moisture content, low unit weights, and high void ratio. These soils are prone to consolidation when loads are applied which could result in excessive settlement. Also, these soils typically provide poor subgrade support. Therefore, some subgrade stabilization and drying will be needed prior to construction. Drying should typically be possible during hot, dry summer months. If grading is performed during cool, wetter times of the year, drying will be difficult. Replacement of the high moisture content soils or chemical drying are typically required. A contingency for subgrade stabilization and drying should be included in the construction budget.

- Based on the assumed loads, and the low consistency soils encountered during this exploration, we recommend the proposed parking garage to be supported by deep foundations or improved soils. Two alternatives are recommended, deep foundations consisting of auger, cast-in-place piles, or ground improvement such as stone columns (geopiers/vibropiers).

Close monitoring of the construction operations discussed herein will be critical in achieving the design subgrade support. We therefore recommend that Terracon be retained to monitor this portion of the work.

This summary should be used in conjunction with the entire report for design purposes. It should be recognized that details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of the report limitations.

GEOTECHNICAL ENGINEERING REPORT
TRINKA DAVIS PARKING DECK
180 MARTIN DRIVE
CARROLLTON, GEORGIA
Terracon Project No. 49165249
November 16, 2016

1.0 INTRODUCTION

This report presents the results of our geotechnical engineering services performed for the proposed parking deck for the Trinka Davis Veterans Village located at 180 Martin Drive in Carrollton, Georgia. Our geotechnical engineering scope of work for this project included the advancement of eight soil test borings to depths ranging from approximately 10 to 37 feet below existing site grades. One of the proposed borings (Boring B-1) could not be advanced to the planned termination depth because an existing water pipe was damaged during drilling. Boring Logs along with a Site Location Plan and Boring Location Plan are included in Appendix A of this report.

The purpose of these services is to provide the following information and geotechnical engineering recommendations relative to the proposed project:

- subsurface soil conditions
- groundwater conditions
- earthwork
- foundation design and construction
- slab-on-grade design and construction
- seismic considerations
- pavement thickness and construction

2.0 PROJECT INFORMATION

Our understanding of the project is based upon information provided in your e-mail received on August 12, 2016. Additionally, you e-mailed us the "Parking Garage-Recommended Option" on October 31, 2016.

2.1 Project Description

Item	Description
Site layout	Refer to the Site Location Plan and Boring Location Plan (Exhibits A-1 and A-2 in the Appendix)
Building	The project will consist of a 125 foot wide by 300 foot long, 3 level parking deck on the west side of the site, and a surface parking lot to the east.
Building construction, Assumed	We expect the additions to be of concrete frame construction.
Maximum loads, Assumed	Building: Column Load – 400 kips Continuous Load-Bearing Wall Loads – 3 to 5 klf Maximum Uniform Slab Load – 100 psf
Grading	Assumed to be less than 3 feet.
Free-standing retaining walls	None
Below Grades	None

2.2 Site Location and Description

Item	Description
Location	Site is inside the Trinka Davis Veteran Village located at 180 Martin Drive in Carrollton, Georgia
Existing Improvements	Pre-graded outparcel.
Current ground cover	Grass.
Existing topography	Most of the site is relatively flat and level.

3.0 SUBSURFACE CONDITIONS

3.1 Site Geology

The project site is located in the Piedmont Physiographic Province of Georgia which is characterized by medium to high grade metamorphic rocks and scattered igneous intrusions. The term metamorphic describes rocks that have been subjected to high temperatures and/or pressures, usually deep within the earth's crust. These high temperatures and pressures cause the textural and mineralogical characteristics of the original rock to be altered and can also cause certain rock types to fully melt, becoming what is known as magma. Magma is less dense than the surrounding solidified rock and tends to move upward through fractures and joints, displacing the surrounding rock. This rock type is known as an igneous intrusion. Metamorphic rocks are predominant in this region but, due to erosion and uplift, both of these rocks will eventually become exposed at the land surface.

The subsurface bedrock in this region has undergone differing rates of weathering, which often produces a considerable variation in depth to competent rock over short horizontal distances. It is also not unusual for lenses and boulders of hard rock and zones of partially weathered rock to be present within the soil mantle above the general bedrock level. The typical residual soil profile consists of clayey soils near the surface, where soil weathering is more advanced, underlain by sandy silts and silty sands, which often consist of saprolites (native soils which maintain the original fabric of the parent rock). Generally the soil becomes harder with depth to the top of parent crystalline rock or "massive bedrock" which occurs at depth.

The boundary between soil and rock is typically not sharply defined. A transitional zone termed "partially weathered rock" is normally found overlying bedrock. Partially weathered rock (PWR) is defined for engineering purposes as residual material with a standard penetration resistance exceeding 100 blows per foot (bpf).

According to the" Geology of the Greater Atlanta Region" (Bulletin 96) by McConnell and Abrams, 1984, the site is located within the Dog River Formation. The bedrock geology within the immediate site vicinity consists of Precambrian to Paleozoic age materials, comprising of granitic gneiss, biotite schist and amphibolite.

Fill soils are those soils that have been placed or reworked by man in conjunction with past construction grading, underground utility installation, farming or other previous activity at the site. Fill can be composed of different soil types from various sources and can contain debris from building demolition, organics, topsoil, trash, etc. The engineering properties of the fill depend primarily on its composition, density, and moisture content.

3.2 Typical Subsurface Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as follows:

Description	Approximate Depth to Bottom of Stratum	Material Encountered	Consistency/Density
Stratum 1	0 to ½ inches	Topsoil	---
Stratum 2	3 to 8 feet	Fill[1]- Sandy SILT Silty Sand	Medium Stiff to hard Medium Dense
Stratum 2	8 to 33 feet, and to below boring termination.	Residual- Sandy SILT Silty SAND	Soft to Stiff Very Loose to Dense
Stratum 3	37 feet to below boring termination.	Partially Weathered Rock	Very Dense
Stratum 4	37 feet[2]	Auger Refusal	---

[1] We note that several of the surface soil samples were assessed to be dry of their estimated optimum moisture content.
[2] Encountered in Boring B-5.

Laboratory tests were conducted on selected soil samples and the test results are presented on the boring logs. Specific conditions encountered at each boring location are indicated on the individual boring logs in Appendix A. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual.

3.3 Groundwater

The boreholes were observed while drilling and after completion for the presence and level of groundwater. Groundwater was observed in Boring B-5 at a depth of 25 feet shortly after drilling. Due to the low permeability of the soils encountered in the borings, a relatively long period of time may be necessary for a groundwater level to develop and stabilize in a borehole in these materials.

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. 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.

3.4 Laboratory Results

Select soil samples were subject to natural moisture content tests. The testing procedures are described in the Appendix. Natural moisture content of the tested samples varied from 11 to 55 percent. Please refer to boring records B-2, B-5 and B-8 for specific results.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Based on the subsurface exploration, and geotechnical engineering analyses, we anticipate support of the proposed parking deck on a shallow foundation system would not be recommended due to excessive settlement. Therefore, we recommend that these two structures be supported on a deep foundation system or improved soils consisting of augered cast-in-place piles or stone columns.

Due to the presence of amphibolitic soils, we anticipate that portions of the subgrade soils will have elevated moisture content and may be unstable when proofrolled. Therefore, drying and/or stabilization of subgrade soils will be needed.

Geotechnical engineering recommendations for foundation systems and other earth connected phases of the project are outlined below. The recommendations contained in this report are based upon the results of data presented herein, engineering analyses, and our current understanding of the proposed project.

4.2 Earthwork

We currently expect only minimal fills and cuts during earthwork operations. The following sections present recommendations for site preparation, excavation, subgrade preparation and placement of engineered fills on the project. The recommendations presented for design and construction of earth supported elements including foundations, slabs-on-grade, and pavements are contingent upon following the recommendations outlined in this section.

Earthwork on the project should be observed and evaluated by Terracon. The evaluation of earthwork should include observation and testing of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during the construction of the project.

4.2.1 Site Preparation

We anticipate construction will be initiated by stripping any loose, soft or otherwise unsuitable material. Stripping depths between our boring locations and across the site could vary. We recommend actual stripping depths be evaluated by a representative of Terracon during construction.

The fine grained soils encountered in the borings may be sensitive to disturbance from construction activity and water seepage. If precipitation occurs prior to or during construction, the near-surface soils could increase in moisture content and become more susceptible to disturbance. Construction activity should be monitored, and should be curtailed if the construction activity is causing subgrade disturbance. A Terracon representative can help with monitoring and developing recommendations to aid in limiting subgrade disturbance.

After stripping, proofrolling should be performed with heavy rubber tire construction equipment such as a fully loaded tandem-axle dump truck. A geotechnical engineer or his representative should observe proofrolling to aid in locating unstable subgrade materials. Proofrolling should be performed after a suitable period of dry weather to avoid degrading an otherwise acceptable subgrade and to reduce the amount of undercutting/remedial work required. Unstable materials located should be stabilized as directed by the engineer based on conditions observed during construction. Again, if amphibolitic soils are exposed, some subgrade remediation (undercutting/recompaction/stabilization) may be required.

4.2.2 Materials Types

Engineered fill should consist of approved materials, free of organic material, debris and particles larger than about 3 inches. Soils for use as engineered fill material should conform to the following specifications:

Fill Type [1]	USCS Classification	Acceptable Location for Placement
Fine Grain Soils	CL and ML (LL<45; PI<25)	All locations and elevations
Granular Soils	SP, SM, SC, SW	All locations and elevations
On-site soils	SM, ML	All locations and elevations

1. Controlled, 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. A sample of each material type should be submitted to the geotechnical engineer for evaluation.

4.2.3 Compaction Requirements

Recommended compaction and moisture content criteria for engineered fill materials are as follows:

Material Type and Location[1, 2]	Per the Standard Proctor Test (ASTM D 698)		
	Minimum Compaction Requirement (%)	Range of Moisture Contents for Compaction[3]	
		Minimum	Maximum
Acceptable soil or approved imported fill soils:			
Beneath foundations and slabs:	95	-2%	+3%
Beneath pavements:	95	-2%	+3%
12 inches directly below pavements:	98	-2%	+3%
	Per the Modified Proctor Test (ASTM D 1557)		
Aggregate base (beneath slabs)	95	-3%	+3%
Aggregate base (beneath pavements)	98	-3%	+3%

1. Engineered fill materials should be placed in horizontal, loose lifts not exceeding 9 inches in thickness and should be thoroughly compacted. Where light compaction equipment is used, as is customary in utility trenches, the lift thickness may need to be reduced to achieve the desired degree of compaction. Soils removed which will be used as engineered fill should be protected to aid in preventing an increase in moisture content due to rain.
2. We recommend that engineered fill be tested for moisture content and compaction during placement. Should the results of the in-place density tests indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified moisture and compaction requirements are achieved.
3. Specifically, moisture levels should be maintained low enough to allow for satisfactory compaction to be achieved without pumping when proofrolled. The fill should have a minimum dry unit of 90 pcf.

4.2.4 Grading and Drainage

Adequate positive drainage should be provided during construction and maintained throughout the life of the development to prevent an increase in moisture content of the foundation, pavement and backfill materials. Surface water drainage should be controlled to prevent undermining of fill slopes and structures during and after construction.

Gutters and downspouts that drain water a minimum of 10 feet beyond the footprint of the proposed structures are recommended. This can be accomplished through the use of splash-blocks, downspout extensions, and flexible pipes that are designed to attach to the end of the downspout. Splash-blocks should also be considered below hose bibs and water spigots.

It is recommended that all exposed earth areas be seeded to provide protection against erosion as soon as possible after completion. Seeded areas should be protected until the vegetation is established. Sprinkler systems should not be installed behind or in front of walls without the approval of the civil engineer and wall designer.

4.2.5 Earthwork Construction Considerations

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

Upon completion of filling and grading, care should be taken to maintain the subgrade moisture content prior to construction of slab and pavements. Construction traffic over the completed subgrade should be avoided to the extent practical. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. If the subgrade should become frozen, desiccated, saturated, or disturbed, the affected material should be removed or these materials should be scarified, moisture conditioned, and recompacted prior to slab and pavement construction and observed by Terracon.

Surface water should not be allowed to pond on the site and soak into the soil during construction. Construction staging should provide drainage of surface water and precipitation away from the building and pavement areas. Any water that collects over or adjacent to construction areas should be promptly removed, along with any softened or disturbed soils.

All excavations should be sloped or braced as required by OSHA regulations to provide stability and safe working conditions. Temporary excavations will probably be required during grading operations. The grading contractor, by his contract, is usually responsible for designing and constructing stable, temporary excavations and should shore, slope or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state and federal safety regulations, including the current Occupational Health and Safety Administration (OSHA) Excavation and Trench Safety Standards.

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 that Terracon is assuming any responsibility for construction site safety or the contractor's activities; such responsibility shall neither be implied or inferred.

4.3 Foundation Support

Due to the relatively heavy structural loads, and low consistency of the on-site soils, we recommend that the proposed new parking deck be supported by a deep pile foundation system consisting of auger, cast-in-place piles, or a ground improvement such as stone columns (geopiers/vibropiers).

4.3.1 Stone Columns

As an alternative to deep foundations, it may be possible to support the proposed parking deck on a ground improved system such as stone columns. Stone columns are designed and constructed by proprietary design-build contractors. Locally these typically include Hayward Baker and Geopier Foundation Company. These companies can provide design and pricing information for the referenced improvement systems:

Hayward Baker, Inc. - **Vibropiers**
Mr. Joe Persichetti or Mr. Matt Hammett
515 Nine North Court
Alpharetta, Georgia 30004-2961
Tel: (770) 442-1801
Fax: (770) 442-8344
E-Mail: mwterry@haywardbaker.com
www.haywardbaker.com

Geopier Foundation Company - Rammed Aggregate Piers (**Geopier**®)
Mr. Bill Beckler, P.E.
5665 Highway 9
Suite 103-178
Alpharetta, GA 30004
Tel: (770) 667-9864
Fax: (770) 343-9963
E-Mail: geopier@mindspring.com
www.geopiers.com

The Geopier support elements are typically constructed by drilling a hole, removing a volume of soil, and then building a bottom bulb of clean, open-graded stone while vertically pre-stressing and pre-straining subsoils underlying the bottom bulb. The Geopier shaft is built on top of the bottom bulb, using open-graded base course stone placed in thin lifts. Geopier elements are a proprietary subgrade reinforcing system and should be designed and constructed by an installer licensed by the Geopier Foundation Company, Inc.

Stone columns are constructed in a similar manner except the hole can be formed with a large vibrator which forces the soil aside as it is extended into the ground thereby densifying the surrounding soils. Pre-drilling for stone columns can be required in dense soils and/or to speed construction. Once the design depth is obtained, the vibrator remains in the hole and is typically lifted about 2 to 4 feet from the bottom of the hole which is filled about ¼ full with stone, often No. 67 or 57 Stone. The vibrator then penetrates the stone to the bottom of the hole and is withdrawn to about the top of the stone layer and then allowed to re-penetrate about two-thirds of the stone lift. The re-penetration process is repeated in increments between one-quarter to one-third the stone lift thickness. The remainder of the hole is filled to the existing ground surface in this manner. Stone columns are also designed and installed by specialized contractors.

The installer of either system should provide detailed design calculations sealed by a professional engineer licensed in the State of Georgia. The design calculations should demonstrate that the Vibropier/Geopier soil improved system is estimated to control long-term total and differential settlements. The specialty contractor should warrant their work as well as the maximum total and differential settlements they predict. We recommend the design parameters be verified by a full-scale modulus test (similar to a pile load test) performed in the field. Terracon should be retained to monitor the modulus test and subsequent production Vibropier/Geopier installation.

Spread footings supported on stone columns can typically be designed for maximum net allowable bearing pressures between 3,000 to 6,000 psf. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Wall bearing footings and isolated column footings should have minimum widths recommended by the design-build contractor. Perimeter footings and footings beneath unheated areas should bear at least 1½ feet below lowest adjacent finished grade for frost protection. Additional savings can often be achieved where spread footings are designed for higher bearing pressures.

The selected design-build contractor should pay special attention to the widely variation of soil conditions at the site. We have seen in similar jobs deep loose zones that result in greater than allowable settlement as the stone columns transfer loading to this loose zone. The design-build contractor will need this report and a foundation drawing which indicates Dead Load (DL) and Live Load (LL) at each footing location to perform the level of assessment needed at this site.

4.3.2 Augered Cast-In-Place (ACIP) Piles

ACIP piles are installed by augering down to a suitable bearing stratum with a continuous flight hollow stem auger. Grout (a mixture of sand aggregate, cement, and water) is pumped under pressure through the auger as it is withdrawn from the borehole. This creates a vertical column of grout that hardens into a pile. Reinforcement cages are normally inserted in the fluid grout immediately upon auger withdrawal. Full uplift resistance requires reinforcement be installed along the entire length of the pile.

Design Considerations: For this project we recommend the use of sixteen inch diameter ACIP piles, designed for an allowable compressive capacity of 100 tons each. All piles should be installed to at least 10 feet into the underlying PWR, or to the pile equipment "refusal," defined as 12 inches of auger penetration or less during a one minute period. A minimum pile length of 30 feet is recommended. The recommended equipment torque and weight (see below) must be applied to the auger. Variation in length should be expected. The field geotechnical engineer should carefully observe drilling resistance and confirm embedment length into the harder partially weathered rock materials, or to pile rig refusal.

Uplift resistance capacities may be calculated using skin friction values of 0.5 ksf for residual soils and 3 ksf for PWR materials. For initial design purposes, it appears that an allowable uplift capacity of 30 tons per pile may be possible, assuming a minimum pile length of about 30 feet. Shorter piles would have correspondingly smaller uplift capacities. If actual uplift loads exceed these criteria, a full scale load test should be performed to confirm allowable uplift capacity. The design should include a minimum pile length consistent with uplift loading conditions.

For laterally loaded piles, we recommend an allowable design capacity of 20 kips per pile for groups of 4 piles or less. For larger pile groups, a reduction factor of 0.65 should be applied to each pile. These design recommendations apply to minimum pile lengths of 30 feet, and are based on an estimated deflection of ¼ inch. They also assume the piles are partially restrained at the top. After consutling with the structural engineer, Terracon can provide additional pile deflection, moment and shear estimates through the use of computer analyses using LPILE software for specific cases.

Design pile spacing should not be less than three diameters center-to-center. Adjacent piles spaced at less than six pile diameters should not be drilled on the same day to help guard against grout and pile damage.

The recommended pile capacities are estimates based on static analyses, anticipated installation techniques, subsurface conditions at the site and our experience in the area. Except for the lateral loading condition, the recommended capacities include a factor of safety of at least 2 and should result in deflections of one half inch or less. Group capacity reduction factors for compressive loads are not applicable to this site due to the embedment of the pile tips into relatively incompressible materials.

We recommend that two compressive pile load tests be performed in accordance with ASTM D1143, latest version, using the standard method of testing. One test pile should be installed to refusal and drilled in a "short" length area. The second pile should be installed in a deep soil area, and terminated before reaching auger refusal. This test is aimed at limiting overall pile length.

The test pile should develop a safety factor of at least 2. The contractor should supply all the load testing equipment, including a jack and gauge system that has been calibrated within the past 6 months. The Contractor should provide all necessary equipment to obtain readings of the devices during load testing. The Geotechnical Engineer should observe the entire load test program performed by the Contractor.

The test pile program provides information required for production pile installation. We suggest that production pile installation not begin until the load test data has been analyzed by the geotechnical engineer. Depending on field and performance conditions, additional load tests may be required.

Construction Considerations: To help select the specific load test location, we recommend the piling contractor drill at least eight to ten probe holes across the site with the installation equipment. Probe holes should not be made at design pile locations. The geotechnical engineer should help select the probe hole locations and observe the drilling.

The equipment used to install the probe holes and test piles should be the same equipment used for production piling. The installation equipment should be suited to the length and design capacity of the piles, and should have a minimum gearbox weight of 5,000 pounds, and a minimum torque of 30,000 foot-pounds.

During the pile drilling process, when the recommend tip elevation or auger refusal is reached, the tip of the auger should be slightly raised to start grout pumping. A grout head of at least 8 feet should be achieved before the auger flight is raised. This minimum head should be maintained throughout grout placement. At any depth, if the grouting operation is interrupted, the auger should be advanced a minimum of 5 feet into the existing grout or as recommended by the on-site engineer based on individual circumstances. This procedure will aid maintaining grout continuity. Withdrawal of the auger should be slow enough to maintain the cross section of the drilled hole.

The volume of grout placed in the pile hole should be approximately 20 percent or more than the theoretical volume of the augered hole (grout ratio). The production piles should have a grout ratio similar or greater than the test pile.

Grout sampling and testing should be performed during pile installation. We recommend a minimum of one set of grout samples per half day of installation. A set consists of either six, 2-inch cubes, or six, 3-inch by 6-inch cylinders. A flow cone may be used to check the fluidity of the grout mix in accordance with ASTM C939, Standard Method for Flow of Grout Pre-placed-Aggregate Concrete, using a ¾-inch orifice. The structural engineer should select appropriate maximum temperature for the grout, and maximum mixing times prior to placement.

The grout pump should be a positive displacement pump capable of developing pressures of at least 350 pounds per square inch (psi). The pump should contain a grout pressure gauge and a stroke counter, both in good working order and in clear view of the operator.

4.4 Seismic Considerations

Code Used	Site Classification
2012 International Building Code (IBC) [1]	D [2]

1. In general accordance with the *2012 International Building Code, which refers to ASCE7*
2. The *2012 International Building Code (IBC)* requires a site soil profile characterization extending a depth of 100 feet for seismic site classification. The current scope requested does not include the required 100 foot soil profile determination. . Borings for the building extended to a maximum depth of approximately 37 feet and this seismic site class definition considers that very dense silty sand continues below the maximum depth of the subsurface exploration. Additional exploration to deeper depths could be performed to confirm the conditions below the current depth of exploration. Alternatively, a geophysical exploration could be utilized in order to attempt to justify a higher seismic site class.

4.5 Slab-On-Grade

4.5.1 Slab- On-Grade Design Recommendations

DESCRIPTION	VALUE
Lower level slab-on-grade	Concrete slab-on-grade.
Slab support	Minimum 12 inches of approved on-site or imported soils placed and compacted in accordance with Earthwork section of this report.
Subbase	4-inch compacted layer of free draining, granular subbase material
Modulus of subgrade reaction	125 pounds per square inch per in (psi/in) for point loading conditions for a soil subgrade prepared as recommended in this report.

1. Lower level slab should be structurally independent of any building footings or walls to reduce the possibility of slab cracking caused by differential movements between the slab and foundation. The slabs should be appropriately reinforced to support the proposed loads.
2. We recommend subgrades be maintained at the proper moisture condition until lower level slab and pavements are constructed. If the subgrade should become desiccated prior to construction of slabs and pavements, the affected material should be removed or the materials scarified, moistened, and recompacted. Upon completion of grading operations, care should be taken to maintain the recommended subgrade moisture content and density prior to construction of the slabs.
3. The slab design may include a capillary break, comprised of free-draining, compacted, granular material, at least 4 inches thick.

A subgrade prepared and tested as recommended in this report should provide adequate support for the slab on grade.

Where appropriate, saw-cut control 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.

The use of a vapor retarder or barrier could be considered beneath concrete slabs on grade.

4.5.2 Slab Construction Considerations

On most project sites, the site grading is generally accomplished early in the construction phase. However as construction proceeds, the subgrade may be disturbed due to utility excavations, construction traffic, desiccation, rainfall, etc. As a result, the slab subgrade may not be suitable for placement of base rock and concrete and corrective action may be required.

We recommend the area underlying the slab be rough graded and then thoroughly proofrolled with a loaded tandem axle dump truck prior to final grading and placement of base rock. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the affected material with properly compacted fill. Subgrade areas should be moisture conditioned and properly compacted to the recommendations in this report immediately prior to placement of the base rock and concrete.

4.6 Pavements

The following paragraphs present recommendations, and discussions of pavements. These comments should not be construed to constitute a quantitative design. Terracon would be pleased to provide such design after we are provided with traffic volume and perform the necessary laboratory testing.

4.6.1 Subgrade Preparation

On most project sites, the site grading is accomplished relatively early in the construction phase and fills are placed and compacted in a uniform manner. However, as construction proceeds, excavations are made into these areas, rainfall and surface water saturates some areas, heavy traffic from concrete trucks and other delivery vehicles disturbs the subgrade and many surface irregularities are filled in with loose soils to improve trafficability temporarily. As a result, the pavement subgrades, initially prepared early in the project, should be carefully evaluated as the time for pavement construction approaches.

We recommend the moisture content and density of the top 12 inches of the subgrade be evaluated and the pavement subgrades be proofrolled within two days prior to commencement of actual paving operations. Areas not in compliance with the required ranges of moisture or density should be moisture conditioned and recompacted. Particular attention should be paid to high traffic areas that were rutted and disturbed earlier and to areas where backfilled trenches are located. Areas where unsuitable conditions are located should be repaired by removing and replacing the materials with properly compacted fills. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

After proofrolling and repairing subgrade deficiencies, the entire subgrade should be scarified and developed as recommended in Section **4.2** of the **Earthwork** section this report to provide a uniform subgrade for pavement construction. Areas that appear severely desiccated following site stripping may require further undercutting and moisture conditioning. If a significant precipitation event occurs after the evaluation or if the surface becomes disturbed, the subgrade should be reviewed by qualified personnel immediately prior to paving. The subgrade should be in its finished form at the time of the final review.

4.6.2 Pavement Design Considerations

Traffic patterns and anticipated loading conditions were not available at the time that this report was prepared. However, we anticipate that traffic loads will be produced primarily by automobile traffic and occasional delivery and trash removal trucks. 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 methods if specific wheel loads, axle configurations, frequencies, and desired pavement life are provided. Terracon can provide thickness recommendations for pavements subjected to loads other than personal vehicle and occasional delivery and trash removal truck traffic if this information is provided, and perform the necessary laboratory testing and analysis.

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 parking lots and drives should slope down from pavement edges at a minimum 2%;
- The subgrade and the pavement surface should have a minimum ¼ inch per foot slope to promote proper surface drainage;
- Install pavement drainage surrounding areas anticipated for frequent wetting (e.g., garden centers, wash racks);
- 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; and,
- Place curb, gutter and/or sidewalk directly on low permeability subgrade soils rather than on unbound granular base course materials.

4.6.3 Estimates of Minimum Pavement Thickness

A quantitative pavement design was not performed. However, based on our past experience with similar site usage in this area, we recommend the following typical pavement section be considered.

Material	Automobiles Only Thickness (inches)	Combined Automobiles and Occasional Trucks Thickness (inches)	GDOT
Subgrade	Upper 12 inches of existing soil or engineered fill	Upper 12 inches of existing soil or engineered fill	98% of Standard Proctor MMD, -2 to +3% OMC
Aggregate Base	6	8	GAB, Section 815 and 310
Asphalt Binder Course	-	1¾	SP19 - Section 400, 424, 824 and 828
Asphalt Surface Course	2	1¼	SP9.5 - Section 400, 424, 824 and 828

The graded aggregate base should be compacted to a minimum of 98 percent of the material's modified Proctor (ASTM D-1557, Method C) maximum dry density. Where base course thickness exceeds 6 inches, the material should be placed and compacted in two or more lifts of equal thickness.

The listed pavement component thicknesses should be used as a guide for pavement systems at the site for the traffic classifications stated herein. These recommendations assume a 20-year pavement design life. If pavement frequencies or loads will be different than that specified Terracon should be contacted and allowed to review these pavement sections.

Asphalt concrete aggregates and base course materials should conform to the Georgia Department of Transportation (GDOT) "Standard Specifications for Construction of Transportation System". Current GDOT asphalt surface courses are Superpave mixes.

We expect that a Portland cement concrete (PCC) pavement be utilized in entrance and exit sections, as well as the lower level slab on grade, or other areas where extensive wheel maneuvering is expected. We recommend a minimum of 6½ inches of PCC underlain by 4 inches of GAB. Although not required for structural support, the base course layer is recommended to help reduce potentials 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. All joints should be sealed to prevent entry of foreign material and dowelled where necessary for load transfer.

Portland cement concrete should be designed with proper air-entrainment and have a minimum compressive strength of 4,000 psi after 28 days of laboratory curing. Adequate reinforcement and number of longitudinal and transverse control joints should be placed in the rigid pavement in accordance with ACI requirements. The joints should be sealed as soon as possible (in accordance with sealant manufacturer's instructions and ACI requirements) to minimize infiltration of water into the soil.

4.6.4 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.

We recommend drainage be included at the bottom of the GAB layer at the storm structures to aid in removing water that may enter this layer. Drainage could consist of small diameter weep holes excavated around the perimeter of the storm structures. The weep holes should be excavated at the elevation of the GAB and soil interface. The excavation should be covered with No. 57 stone which is encompassed in Mirafi 140 NL or approve equivalent which will aid in reducing fines from entering the storm system.

4.6.5 Pavement Maintenance

The pavement sections provided in this report represent minimum recommended thicknesses and, as such, periodic maintenance should be anticipated. Therefore preventive maintenance should be planned and provided for through an on-going pavement management program. Preventive maintenance activities are intended to slow the rate of pavement deterioration, and to preserve the pavement investment. Preventive maintenance consists of both localized maintenance (e.g., crack and joint sealing and patching) and global maintenance (e.g., surface sealing). Preventive maintenance is usually the first priority when implementing a planned pavement maintenance program and provides the highest return on investment for pavements. Prior to implementing any maintenance, additional engineering observation is recommended to determine the type and extent of preventive maintenance. Even with periodic maintenance, some movements and related cracking may still occur and repairs may be required.
Joints or any cracks in pavement areas that develop should be sealed with a water-proof, non-extruding compressible compound specifically recommended for heavy duty concrete pavement and wet environments.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, 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. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

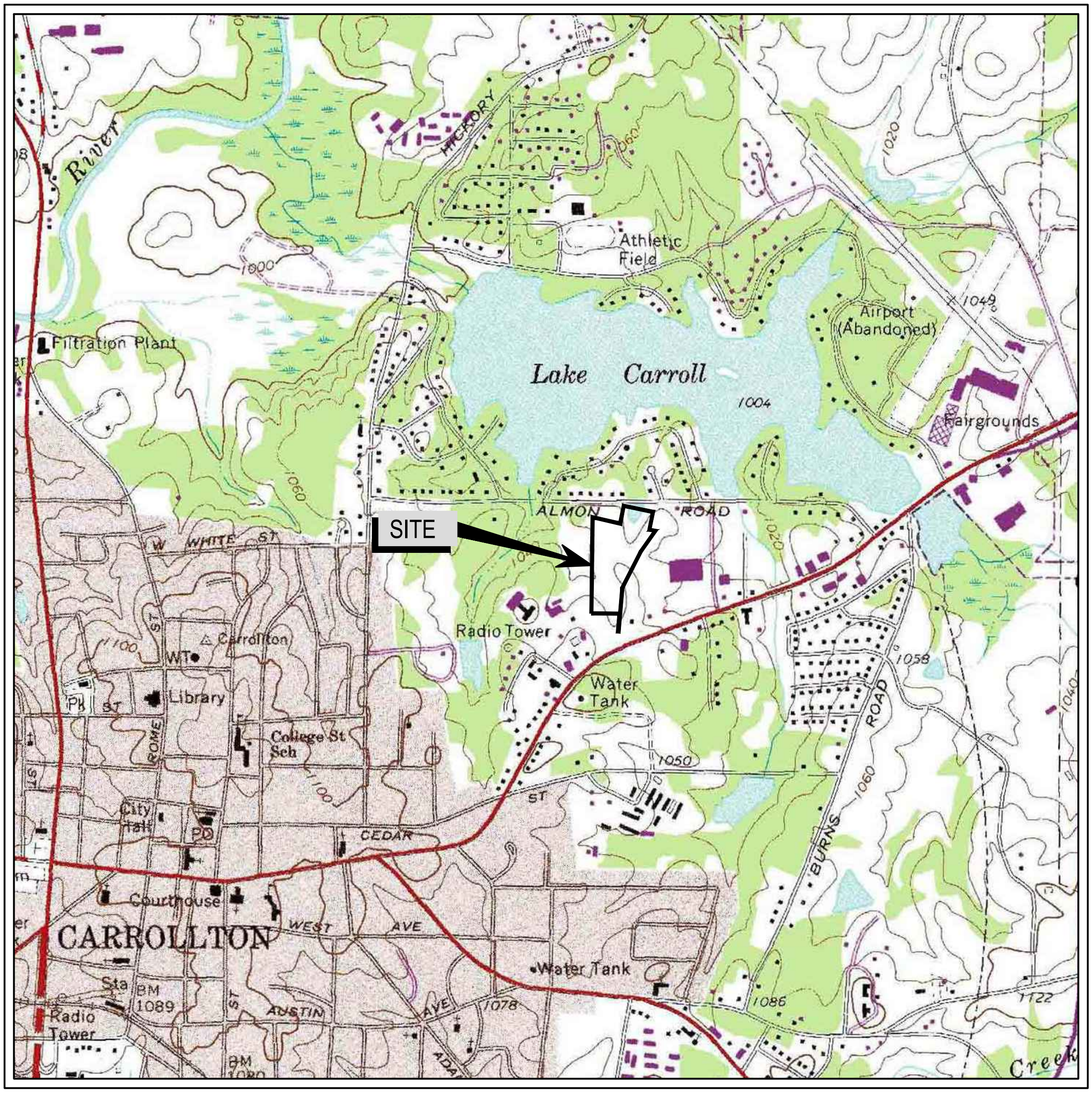
The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential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

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A

FIELD EXPLORATION AND LABORATORY TESTING

UNITED STATES — DEPARTMENT OF THE INTERIOR — GEOLOGICAL SURVEY



SCALE 1:24 000

1 .5 0 KILOMETERS 1 2

1000 0 METERS 1000 2000

1 .5 0 MILES 1

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10 000 FEET

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

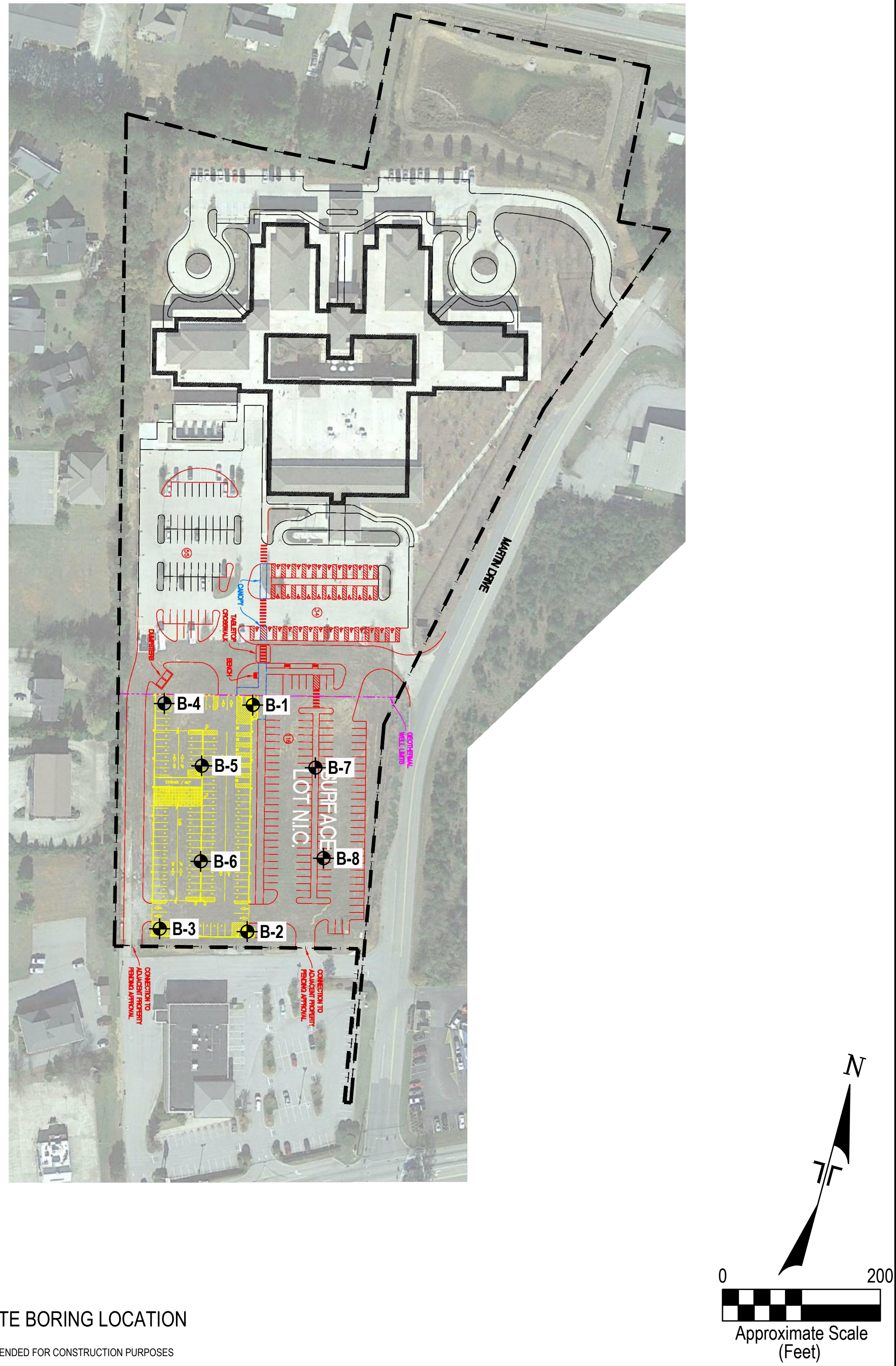
QUADRANGLE
CARROLLTON, GA
1982

7.5 MINUTE SERIES (TOPOGRAPHIC)

N

Project Mngr: VF	Project No. 49165249	Terracon Consulting Engineers and Scientists	SITE LOCATION PLAN
Drawn By: JSL	Scale: AS SHOWN		GEOTECHNICAL ENGINEERING REPORT
Checked By: MRF/VF	File No. GEO49165249-A1		TRINKA DAVIS PARKING DECK 180 MARTIN DRIVE
Approved By: VF	Date: NOVEMBER 2016	2105 Newpoint Place, Ste. 600 Lawrenceville, GA 30043 (770) 623-0755 (770) 623-9628	CARROLLTON, GA

EXHIBIT
A-1



LEGEND

SITE

APPROXIMATE BORING LOCATION

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

Project Mngr: VF	Project No. 49165249	Terracon Consulting Engineers and Scientists	BORING LOCATION PLAN	EXHIBIT
Drawn By: JSL	Scale: AS SHOWN		GEOTECHNICAL ENGINEERING REPORT	
Checked By: MRF/VF	File No. GEO49165249-A2		TRINKA DAVIS PARKING DECK	A-2
Approved By: VF	Date: NOVEMBER 2016	2105 Newpoint Place, Ste. 600 Lawrenceville, GA 30043 (770) 623-0755 (770) 623-9628	180 MARTIN DRIVE CARROLLTON, GA	

Field Exploration Description

The boring locations were staked by Terracon personnel. Distances from these locations to the reference features indicated on the attached diagram are approximate and estimated. The locations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were drilled with ATV-mounted rotary drill rig using hollow stem augers to advance the boreholes. Representative soil samples were obtained by the split-barrel sampling procedure. In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (N). These values are indicted on the borings logs at the depths of occurrence. This value is used to estimate the in-situ relative density of cohesionless soils and the consistency of cohesive soils. The sampling depths and penetration distance, plus the standard penetration resistance values, are shown on the boring logs. The samples were sealed and taken to the laboratory for testing and classification.

A CME automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count (N) value by increasing the penetration per hammer blow over what would obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

Field logs of each boring were prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent an interpretation of the field logs and include modifications based on laboratory observation and tests of the samples.

The samples were classified in the laboratory based on visual observation, texture and plasticity. The descriptions of the soils indicated on the boring logs are in general accordance with the enclosed General Notes and the Unified Soil Classification System. Estimated group symbols according to the Unified Soil Classification System are given on the boring logs. A brief description of this classification system is attached to this report.

Laboratory Testing

As part of the testing program, all samples were examined in the laboratory by experienced personnel and classified in accordance with the attached General Notes and the Unified Soil Classification System based on the texture and plasticity of the soils. The group symbol for the Unified Soil Classification System is shown in the appropriate column on the boring logs and a brief description of the classification system is included with this report in the Appendix.

At that time, the field descriptions were confirmed or modified as necessary and an applicable laboratory testing program was formulated to determine engineering properties of the subsurface materials.

Laboratory tests were conducted on selected soil samples and the test results are presented in this appendix. The laboratory test results were used for the geotechnical engineering analyses, and the development of foundation and earthwork recommendations. Laboratory tests were performed in general accordance with the applicable ASTM, local or other accepted standards.

Selected soil samples obtained from the site were tested for the following engineering properties:

- In-situ Water Content

BORING LOG NO. B-1

PROJECT: Trinka Davis Parking Deck

CLIENT: Guidon Design, Inc.

**SITE: 180 Martin Drive
Carrollton, Georgia**

LOCATION

Latitude: 33.588781° Longitude: -85.058106°

DEPTH	Material Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
	FILL - SILTY SAND (SM), fine to medium grained, brown, medium dense			X	3-5-6 N=11	
3.0	**RESIDUUM- SILTY SAND (SM)**, fine to medium grained, red-brown, orange, loose	5		X	2-3-3 N=6	
7.5	- medium dense			X	5-3-7 N=10	
	Boring Terminated at 7.5 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

Boring terminated at 7 1/2 feet because a water pipe was damaged during drilling

WATER LEVEL OBSERVATIONS

Terracon
2105 Newpoint Pl Ste 600
Lawrenceville, GA

Boring Started: 11/4/2016

Boring Completed: 11/4/2016

Drill Rig: CME-550

Driller: Midway - Lee

Project No.: 49165249

BORING LOG NO. B-2

PROJECT: Trinka Davis Parking Deck

CLIENT: Guidon Design, Inc.

SITE: 180 Martin Drive, Carrollton, Georgia

LOCATION

Latitude: 33.58803° Longitude: -85.057913°

DEPTH	Material Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
0.0	**TOPSOIL**, 1/2"					
	FILL - SANDY SILT (ML), red-brown, orange, very stiff			X	6-8-8 N=16	29
	- dark brown, medium stiff	5		X	3-3-4 N=7	24
6.0	**RESIDUUM - SILTY SAND (SM)**, fine grained, orange, black, medium dense			X	3-5-6 N=11	38
		10		X	6-6-7 N=13	43
		15		X	4-6-6 N=12	47
	- orange-brown, loose	20		X	4-3-4 N=7	39
23.0	**PARTIALLY WEATHERED ROCK - SAMPLED AS SILTY SAND**, fine to medium grained, gray, very dense	25		X	34-29-50/3" 79/9"	18
30.0		30		X	50/2"	11

Boring Terminated at 30 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None Encountered While Drilling

Terracon
2105 Newpoint Pl Ste 600
Lawrenceville, GA

Boring Started: 11/4/2016	Boring Completed: 11/4/2016
Drill Rig: CME-550	Driller: Midway - Lee
Project No.: 49165249	

BORING LOG NO. B-3

PROJECT: Trinka Davis Parking Deck

CLIENT: Guidon Design, Inc.

**SITE: 180 Martin Drive
Carrollton, Georgia**

LOCATION

Latitude: 33.587972° Longitude: -85.058257°

GRAPHIC LOG / DEPTH	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
	FILL - SILTY SAND (SM), fine to medium grained, trace rock fragments, tan, medium dense			X	7-13-11 N=24	
3.0	**RESIDUUM - SANDY SILT (ML)**, trace clay, red-brown, medium stiff			X	2-3-2 N=5	
	- less clay, orange, brown, stiff	5		X	4-4-5 N=9	
				X	4-6-7 N=13	
13.0	**SILTY SAND (SM)**, fine to medium grained, orange-brown, medium dense	10		X	3-5-6 N=11	
	- medium grained, trace quartz fragments	15		X	9-10-7 N=17	
23.0	**PARTIALLY WEATHERED ROCK - SAMPLED AS SILTY SAND**, fine to medium grained, gray, very dense	20		X	27-50/3" 50/3"	
		25		X	50/4"	
30.0	***Boring Terminated at 30 Feet***	30				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None Encountered While Drilling

Terracon
2105 Newpoint Pl Ste 600
Lawrenceville, GA

Boring Started: 11/4/2016	Boring Completed: 11/4/2016
Drill Rig: CME-550	Driller: Midway - Lee
Project No.: 49165249	

BORING LOG NO. B-4

PROJECT: Trinka Davis Parking Deck

CLIENT: Guidon Design, Inc.

SITE: 180 Martin Drive
Carrollton, Georgia

LOCATION
Latitude: 33.588725° Longitude: -85.05844°

GRAPHIC LOG / DEPTH	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
6.0	**FILL - SILTY SAND (SM)**, fine to medium grained, with rock fragments, gray, tan, medium dense	5		X	6-7-10 N=17; 10-12-13 N=25	
8.0	**FILL - SANDY SILT (ML)**, red-brown, stiff			X	15-6-4 N=10	
13.0	**RESIDUUM - SANDY SILT (ML)**, orange, stiff	10		X	5-5-6 N=11	
23.0	**SILTY SAND (SM)**, fine to medium grained, orange, brown, loose - medium dense	15, 20		X	3-3-4 N=7; 4-7-6 N=13	
30.0	**PARTIALLY WEATHERED ROCK - SAMPLED AS SILTY SAND**, fine to medium grained, gray, very dense	25, 30		X	27-31-50/2" 81/8"; 50/1"	

Boring Terminated at 30 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
None Encountered While Drilling

Terracon
2105 Newpoint Pl Ste 600
Lawrenceville, GA

Boring Started: 11/4/2016	Boring Completed: 11/4/2016
Drill Rig: CME-550	Driller: Midway - Lee
Project No.: 49165249	

BORING LOG NO. B-5

PROJECT: Trinka Davis Parking Deck

CLIENT: Guidon Design, Inc.

SITE: 180 Martin Drive, Carrollton, Georgia

LOCATION: Latitude: 33.58855° Longitude: -85.058223°

DEPTH	Material Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
0.0	**TOPSOIL**, 1/2"					
	FILL - SANDY SILT (ML), trace clay, tan, red-brown, very stiff			X	6-13-15 N=28	10
	- less clay, trace topsoil, red-brown, medium stiff	5		X	2-2-2 N=4	36
8.0	- less topsoil			X	7-3-4 N=7	37
	RESIDUUM - SANDY SILT (ML), orange, brown, medium stiff	10		X	2-3-4 N=7	51
18.0	- white, tan, soft	15		X	1-2-1 N=3	46
	SILTY SAND (SM), fine to medium grained, orange, medium dense	20		X	3-5-8 N=13	43
	- white, very loose	25	▽	X	2-1-2 N=3	31
33.0	- orange, brown, loose	30		X	2-2-3 N=5	55
37.0	**PARTIALLY WEATHERED ROCK - SAMPLED AS SILTY SAND**, fine to medium grained, gray, very dense	35		X	50/4"	

Auger Refusal at 37 Feet

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *25' While Drilling*

Terracon
2105 Newpoint Pl Ste 600
Lawrenceville, GA

Boring Started: 11/4/2016	Boring Completed: 11/4/2016
Drill Rig: CME-550	Driller: Midway - Lee
Project No.: 49165249	

BORING LOG NO. B-6

PROJECT: Trinka Davis Parking Deck

CLIENT: Guidon Design, Inc.

SITE: 180 Martin Drive, Carrollton, Georgia

LOCATION

Latitude: 33.588225° Longitude: -85.058139°

DEPTH	Description	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
0.0	**TOPSOIL**, 1/2"					
	FILL - SILTY SAND (SM), fine to medium grained, pink, medium dense			X	7-9-9 N=18	
3.0	**FILL - SANDY SILT (ML)**, red-brown, medium stiff			X	3-3-4 N=7	
		5		X	4-4-6 N=10	
7.0	**RESIDUUM - SILTY SAND (SM)**, fine to medium grained, orange-brown, medium dense			X	3-6-7 N=13	
		10				
		15		X	3-5-5 N=10	
		20		X	4-5-6 N=11	
	- gray	25		X	5-7-16 N=23	
28.0	**PARTIALLY WEATHERED ROCK - SAMPLED AS SILTY SAND**, fine to medium grained, gray, very dense			X	31-50/1" 50/1"	
30.0	***Boring Terminated at 30 Feet***	30				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

None Encountered While Drilling

Terracon
2105 Newpoint Pl Ste 600
Lawrenceville, GA

Boring Started: 11/4/2016	Boring Completed: 11/4/2016
Drill Rig: CME-550	Driller: Midway - Lee
Project No.: 49165249	

BORING LOG NO. B-7

PROJECT: Trinka Davis Parking Deck

CLIENT: Guidon Design, Inc.

SITE: **180 Martin Drive**
Carrollton, Georgia

GRAPHIC LOG	LOCATION Latitude: 33.588619° Longitude: -85.057761° DEPTH	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
	0.0 **TOPSOIL**, 1/2"					
	FILL - SANDY SILT (ML), trace clay, red-brown, tan, hard			X	8-17-13 N=30	
	3.0					
	RESIDUUM - SILTY SAND (SM), fine to medium grained, orange, medium dense			X	4-6-9 N=15	
		5		X	9-13-11 N=24	
	8.0					
	PARTIALLY WEATHERED ROCK - SAMPLED AS SILTY SAND, fine to medium grained, gray, very dense			X	50/5"	
	10.0	10				
	Boring Terminated at 10 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method: Hollow Stem Auger	See Exhibit A-3 for description of field procedures	Notes:
Abandonment Method: Backfilled with soil cuttings	See Appendix B for explanation of symbols and abbreviations.	

WATER LEVEL OBSERVATIONS	Terracon		
None Encountered While Drilling	2105 Newpoint Pl Ste 600 Lawrenceville, GA	Boring Started: 11/4/2016	Boring Completed: 11/4/2016
		Drill Rig: CME-550	Driller: Midway - Lee
		Project No.: 49165249	

BORING LOG NO. B-8

PROJECT: Trinka Davis Parking Deck

CLIENT: Guidon Design, Inc.

**SITE: 180 Martin Drive
Carrollton, Georgia**

LOCATION
Latitude: 33.588329° Longitude: -85.05765°

GRAPHIC LOG	DEPTH	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	WATER CONTENT (%)
	0.0	**TOPSOIL**, 1/2"					
	3.0	**FILL - SANDY SILT (ML)**, trace clay, red-brown, tan, very stiff			X	7-11-13 N=24	11
		RESIDUUM - SILTY SAND (SM), fine to medium grained, trace mica, orange, black, brown, loose	5		X	2-3-3 N=6	35
					X	2-3-5 N=8	
	10.0	- medium dense	10		X	4-6-8 N=14	
		Boring Terminated at 10 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hollow Stem Auger

Abandonment Method:
Backfilled with soil cuttings

See Exhibit A-3 for description of field procedures

See Appendix B for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS
None Encountered While Drilling

Terracon
2105 Newpoint Pl Ste 600
Lawrenceville, GA

Boring Started: 11/4/2016	Boring Completed: 11/4/2016
Drill Rig: CME-550	Driller: Midway - Lee
Project No.: 49165249	

APPENDIX B

SUPPORTING DOCUMENTATION

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING

Auger	Split Spoon
Shelby Tube	Macro Core
Ring Sampler	Rock Core
Grab Sample	No Recovery

WATER LEVEL

- Water Initially Encountered
- Water Level After a Specified Period of Time
- Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

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

LOCATION AND ELEVATION NOTES

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

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

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

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

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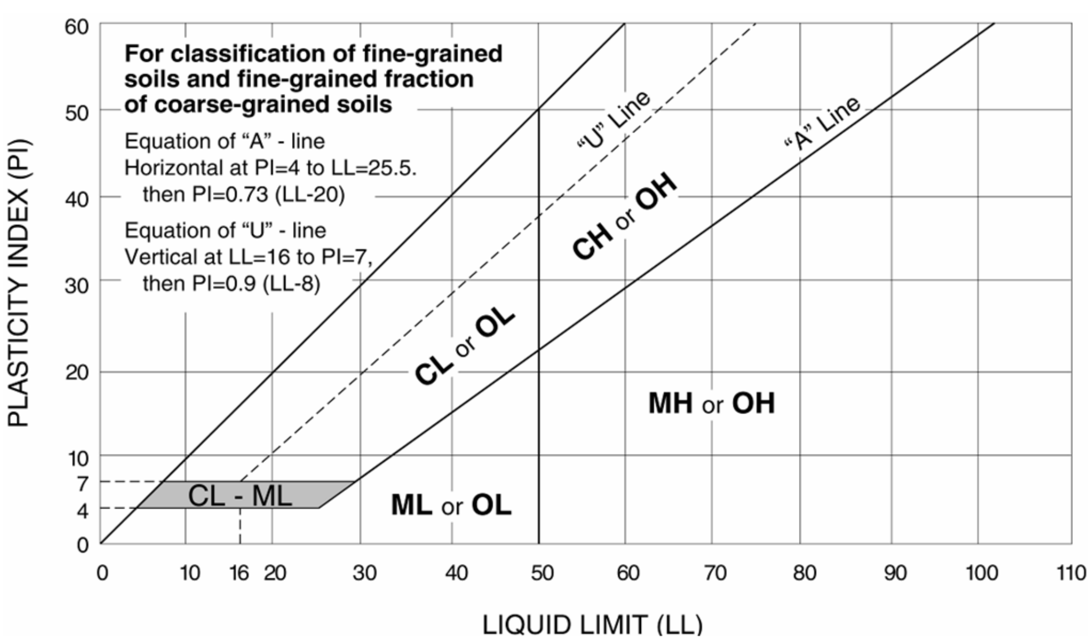
UNIFIED SOIL CLASSIFICATION SYSTEM

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]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [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]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [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 on or above "A" line [J]		CL	Lean clay [K,L,M]
			$PI < 4$ or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			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:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			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] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains $\geq$ 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 $\geq$ 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 $\geq$ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] $PI \geq 4$ 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.



December 8, 2016

Terracon

Guidon Design, Inc.
905 North Capitol Avenue, Suite 100
Indianapolis, Indiana 46204

Attn: Mr. Mark VanderWoude, PE

Re: Geotechnical Engineering Report- Addendum 1
Trinka Davis Parking Lot
180 Martin Drive
Carrollton, Georgia
Terracon Project No. 49165249

Dear Mr. VanderWoude:

Terracon Consultants, Inc. (Terracon) completed geotechnical engineering services for the above referenced project and delivered the engineering report on November 16, 2016. On December 7, 2016, you requested by e-mail that we provide seismic considerations using the 2015 International Building Code (IBC). Our recommendations are as follow:

Code Used	Site Classification
2015 International Building Code (IBC) [1]	D [2]

1. In general accordance with the *2015 International Building Code,* which refers to ASCE7
2. The *2015 International Building Code (IBC)* requires a site soil profile characterization extending a depth of 100 feet for seismic site classification. The current scope requested does not include the required 100 foot soil profile determination. Borings for the building extended to a maximum depth of approximately 37 feet and this seismic site class definition considers that very dense silty sand continues below the maximum depth of the subsurface exploration. Additional exploration to deeper depths could be performed to confirm the conditions below the current depth of exploration. Alternatively, a geophysical exploration could be utilized in order to attempt to justify a higher seismic site class.

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

Terracon Consultants, Inc.

Veronica V. Finol, E.I.T.
Senior Staff Geotechnical Engineer

GEORGIA REGISTERED No. 12692 PROFESSIONAL ENGINEER RICHARD MOCKRIDGE

Richard Mockridge, P.E.
Senior Consultant