



FOR BIDDER REFERENCE ONLY

November 4, 2016

Reference No. 11122323

Mr. Kevin Smith, P.E.
Thomas & Hutton
50 Park of Commerce Way
Savannah, Georgia 31405

Dear Mr. Smith:

Re: Report of Limited Shallow Subsurface Investigation and Geotechnical Evaluation
Proposed New Recreation Facility – Monteith Road Site
Port Wentworth, Georgia

GHD is pleased to present the results of our Geotechnical Exploration and Evaluation at the above referenced site. Our services were performed in general accordance with our Proposal No. 11122323-98 dated August 12, 2016.

1. Project Understanding

GHD received site and project information from phone and email correspondence with you. Information provided included an exhibit titled, "Recreation Complex, Monteith Road Site" prepared by Thomas & Hutton, dated October 2016, having an aerial photograph background and denoting the general location of the subject site and locations of the proposed improvements within the site. According to the provided exhibit, the project is to consist of the design and construction of a new recreation facility. The recreation facility will include several playing fields, an entrance drive, parking lots, and a stormwater pond.

Based on our interpretation of the project requirements, the purpose of this study was to provide preliminary geotechnical information concerning the proposed recreation fields, parking areas, driveway and a fishing pond, including preliminary site preparation recommendations for and the suitability of the existing soils for support of the proposed development, and an estimation of the variation of the groundwater levels within the proposed project limits.

At the time of this writing, we have not been provided with any topographic or civil design information with regard to potential cuts or fills to achieve the final site grades. However, we assume that no more than two feet of fill below the playing field and paved areas will be necessary to attain the desired final grades.

2. Site Description

The project site is an irregular shaped, ±66.2-acre parcel located south of the Newport Subdivision which is located on the south side of Highway 30 in Port Wentworth, Georgia. The subject site is wooded and contains mature trees with sparse to thick underbrush. The topography of the site is relatively flat by visual estimation with elevation fluctuation of no more than 4 feet over the entire site.



3. Subsurface Exploration

The scope of our exploration included twelve (12) hand-auger borings performed to depths of 5 feet below the existing ground surface. The approximate locations of our explorations are shown on **Figure 1**. The provided exhibit was referenced by a GHD professional in locating the hand-auger boring locations in the field by using a hand-held GPS tracking system depicting a recent aerial photograph overlain by the proposed site development. The boring locations should, therefore, be considered approximate according to the methods used.

The soils at each hand-auger location were examined by manually twisting a steel auger into the soil and retrieving samples of the cuttings at regular depth intervals. The consistency of the soils encountered at various depths at each location was estimated with a Dynamic Cone Penetrometer (DCP) in general conformance with ASTM Special Technical Publication #399. In the Cone Penetrometer test, a 1-1/2 inch conical point is seated 1-3/4 inches to penetrate loose cuttings, then driven two additional 1-3/4 inch increments with blows from a 15 pound hammer falling 20 inches. The hammer blows are recorded and provide an index to soil strength and density when properly evaluated. Our personnel visually classified the soils encountered in the field. The logs of the hand-auger borings are presented as **Attachment A, Hand-Auger Boring Logs**.

Representative soil samples obtained from the explorations were placed in individual containers, properly sealed and marked for identification. The soils samples were then transported to our laboratory for analysis and classification by a GHD professional in general accordance with ASTM D2487 (Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)).

Selected samples of the soils collected from the explorations were tested in our laboratory to determine their percent fines (ASTM D1140), Atterberg limits (ASTM D4318), and natural moisture content (ASTM D2216). The laboratory data was used to aid in the classification of the soils in accordance with ASTM D2487 and to further define their engineering properties. The laboratory test results are presented on the hand-auger boring logs in **Attachment A**.

4. Subsurface Conditions Encountered

4.1 Subsurface Soils

A GHD professional developed the final boring log information from the field boring logs and visual review and analyses of the recovered soil samples in our laboratory. Similar soils were grouped into strata, with each stratum described in general accordance with the nomenclature used in ASTM D2487. Although indicated on the boring logs as distinct changes, the transition from one soil type or stratum to another may be gradual or may occur at slightly differing elevations than indicated between soil samples. Soil conditions may also vary from our findings at locations in areas of the site not explored.



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For reference, a generalized stratigraphic profile developed from the hand-auger boring results is provided in **Table 3.1**. For a more detailed description, please refer to **Attachment A**.

Table 3.1: Generalized Stratigraphic Profile

Approximate Depth Below Ground Surface (in)	Material Description	Relative Density from SPT testing
0 to 23	4 to 6 inches of topsoil, leaf and pine straw cover / Silty fine SAND (SM)	Loose to Medium Dense
23 to 27	Clayey fine SAND (SC)	Medium Dense
27 to 60	Very clayey fine SAND (SC)	Loose to Medium Dense

Notable exceptions and/or variations to the generalized stratigraphic profile is as follows:

- Our hand-auger boring location HA-8 encountered fine very sandy clay at a depth of approximately 22 inches below the existing ground surface
- Our hand-auger boring locations HA-5 through HA-11 encountered very clayey fine sands (SC) immediately below the surficial silty sand (SM) layer.
- While the average thickness of the silty sand layer was 23 inches, the thickness of this layer varied from 14 to 38 inches at each of the individual test locations.
- While the average depth to the very clayey fine sand (SC) layer was 27 inches, the depth to this layer varied from 14 to 38 inches. The depth to this layer at our hand-auger boring locations within the proposed parking and driveway areas ranged from 22 to 38 inches. The depth to this layer at our hand-auger boring locations within the proposed fishing pond ranged between 26 and 28 inches.

4.2 Groundwater Variation

Groundwater was encountered at our hand-auger boring location HA-11 at a depth of approximately 34 inches below the ground surface during our field exploration. After a stabilization period, groundwater at our hand-auger boring location HA-11 was measured at approximately 22 inches below the existing ground surface and was also encountered at hand-auger boring location HA-10 at approximately 57 inches.



4.3 Estimation of Seasonal High Groundwater Level

As stated previously, stabilized groundwater was encountered in only two of our hand-auger borings and ranged between the depths of 22 and 57 inches below the existing ground surface. Soil mottling was not observed.

Table 4.2 summarizes soils information provided by the *Soil Survey of Bryan and Chatham Counties, Georgia*, prepared by the US Department of Agriculture (USDA) Soil Conservation Service (now the National Resources Conservation Service) for each hand-auger boring location. The table also includes our estimate of the seasonal high groundwater at each hand-auger boring location. The groundwater levels in our hand-auger borings were used as a starting point for these values, taking into account the lack of soil mottling and infiltration characteristics of the soils at each test location.

Table 4.1: USDA Soils Information and Estimation of Seasonal High Groundwater

Hand-Auger Location	USDA Soil Classification	USDA Estimate of Seasonal High Groundwater Level (in)	GHD / Site Specific Seasonal High Groundwater Level (in)**
HA-1, HA-2	'Craven loamy fine sand' (Cx)*	20 – 24	60
HA-3 through HA-7, HA-9	'Olustee fine sand' (OI)*	15 – 30	60
HA-8, HA-12	'Pelham loamy sand' (PI)*	0 – 6	60
HA-10	'Olustee fine sand' (OI)*	15 – 30	18
HA-11	'Olustee fine sand' (OI)*	15 – 30	54

*Poorly drained, as described in the *Soil Survey of Bryan and Chatham Counties, Georgia*

**Does not consider perched groundwater conditions

Due to the relatively impervious very clayey sand and sandy clay layers near the ground surface, a perched groundwater condition should be expected after heavy or prolonged periods of rain, post site development. The depth to the very clayey fine sand (SC) layer, which will impede the vertical percolation of stormwater causing a temporary perched groundwater condition, varied from 14 to 38 inches.



5. Conclusions and Recommendations

5.1 General

The following limited conclusions and recommendations are based on our understanding of the project characteristics as previously described, the data obtained in our field exploration, and our experience with similar subsurface conditions and site development and construction projects. If the final site grades are proposed to be significantly different than assumed for this evaluation, or if subsurface conditions different from those disclosed by the hand-auger borings are encountered during site development, we should be notified so that we might review and possibly modify the following recommendations.

It is our opinion that the shallow subsurface conditions as encountered by the hand-auger borings performed within the proposed pavement and recreation field areas are suitable for support of the proposed development following implementation of the site preparation and design recommendations detailed below. *Of particular note is the potential for perched groundwater conditions, post site development.*

5.2 Site Preparation

5.2.1 Moisture Control

Our hand-auger borings encountered moisture sensitive clayey near surficial soils. Strict moisture control will need to be maintained in these areas to avoid softening of the soils during site development. Failure to control moisture in clayey soils may result in the need for removal and replacement of otherwise suitable soils. Moisture control methods should also be implemented even where more favorable soils are located within the upper two feet. Moisture control methods should include, but are not necessarily be limited to:

- Staging the work to avoid excessive exposure to inclement weather;
- Maintaining positive drainage at the end of each work day or prior to inclement weather;
- Using a smooth drum roller or bulldozer to seal areas to facilitate runoff;
- And minimizing/limiting rubber-tired vehicle traffic by utilizing low contact pressure or tracked equipment whenever possible across the work area.

We recommend that surface water across the area be managed prior to, during and after stripping and grubbing operations to avoid excessive surface moisture which can lead to an unstable working surface and thus, undue mixing of the organic debris with the underlying sandy soils. Therefore, it may be necessary to drain ponded surface water and to reduce the moisture content of the surficial and shallow subgrade soils prior to initiating general site preparation procedures.



5.2.2 Reclamation of Ditches

Reclamation of all existing ditches encountered within the site should include the removal of all vegetation and soft/loose sediments prior to backfilling with compacted fill. These activities should be accomplished in the dry. We recommend that, during and after the soft soils are removed, an experienced engineering technician under the direction of a licensed professional engineer inspect the area to assist in determining the depth of removal, as well as to verify complete removal of the soft soils and/or determine where additional soft soils should be removed prior to backfilling.

5.2.3 Stripping and Grubbing

Site preparation should include the complete removal of all surficial organic materials, trees, major root systems (roots larger than finger size), topsoil, and other deleterious materials from beneath and to three feet beyond the limits of pavement and recreational recreation field areas. Although, where encountered, we measured 4 to 6 inches of topsoil in our explorations, it should be anticipated that removal of deleterious material to greater depths may be required due to major root systems of trees, as well as due to disturbance of the surface soils by site preparation equipment during stripping, grubbing, root raking, etc.

5.2.4 Structural Fill/Utility Backfill Placement and Compaction

All fill within the proposed recreation fields should be placed in level lifts not to exceed 12 inches loose thickness, and should be inorganic sand with a maximum of 50% silt and/or clay content (SP, SP-SM, SP-SC, SM, SC) compacted to a minimum of 90% of the soil's "Modified" Proctor maximum dry density as determined by ASTM D1557. It may be prudent to allow for a minimum 12-inch thick layer of 'clean' sand fill between any permeable surfaces and the underlying soils to enhance drainage for stormwater and/or irrigation runoff.

Fill/backfill below a depth of 24 inches in pavement areas, should be placed in level lifts not to exceed 12 inches loose thickness, and should be inorganic sand with a maximum of 20% silt and/or clay content (SP, SP-SM, SP-SC, SM, SC) compacted to a minimum of 95 percent of the soil's Modified Proctor maximum dry density as determined by ASTM D 1557.

In the upper 24 inches of pavement areas, fill/backfill should be placed in level lifts not to exceed 12 inches loose thickness, and should be inorganic sand or slightly silty/clayey sand with a maximum of 20% silt and/or clay content (SP, SP-SM, SP-SC, SM, SC) compacted to a minimum of 98 percent of the soil's Modified Proctor maximum dry density as determined by ASTM D 1557.

Fill should extend a minimum of 3 feet beyond pavement edges to prevent possible erosion or undermining of curb or pavement edges.

Backfill for utility trenches should comply with the material characteristics and minimum compaction requirements for the location and depth of placement as detailed above.



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In restricted working areas, if compaction is accomplished with lightweight, hand-guided compaction equipment, then the lift thickness should be limited to a maximum of 6 inches loose thickness. In-place density tests should be performed on each fill lift by an experienced engineering technician working under the direction of a licensed geotechnical engineer to verify that the recommended degree of compaction has been achieved.

5.3 Site Drainage Considerations

Due to the potential for near-surface, perched groundwater conditions, post site construction, final grading of the site will be paramount to maintaining stable, unsaturated surfaces. It would be beneficial to include a subsurface drainage system in areas where final topography cannot promote proper drainage.

5.4 Soil Borrow and Reuse

In terms of reuse, soils can generally be grouped into four major categories:

- 1) Sands with less than 20 percent silt/clay (SP, SP-SM, SM, SC) – All Purpose Structural Fill (Roadway Fill / Subgrade, Building Pad Fill, Playing Field Fill, Utility Backfill)
- 2) Sands with 20 to 30 percent silt/clay (SM, SC) – Building Pad Fill, Playing Field, Utility Backfill
- 3) Very silty/clayey sands (30 to 50 percent silt/clay) (SM, SC), silty/clayey sands with significant seams of 30 to 50 percent silt/clay or sandy clay, and sandy clay (CL) – Marginal Building Pad Fill, Marginal Playing Field Fill, Marginal Utility Backfill
- 4) High plastic clay (CH), or *nearly saturated to saturated* sands with 30 to 50 percent silt/clay (SM, SC), topsoil and organic debris – Non-structural fill

The soils encountered at our hand-auger boring explorations consisted of 4 to 6 inches of topsoil and surficial vegetative debris, followed by silty or clayey fine sands (SM, SC) (reference numbers 1 and 2 above) to between 2 and 3 feet and then very clayey sands (SC) (reference number 3 above) to 5 feet. Each stratum encountered has been assigned a category number as detailed above and is presented on the hand-auger boring logs in **Attachment A**.

Please note the following when considering reuse of the soils from within the proposed fishing pond area, as well as in other potential excavated areas of the site:

- For soil strata 3 feet in thickness or less, it may be difficult to separate suitable soils from the soils above and/or below them due to the likelihood of mixing during earthwork operations.
- Where clayey or very clayey sands are to be reused as playing field fill, strict moisture control will need to be maintained during site preparation. It should be realized that much of these soils may be excavated in a wet condition, will retain moisture and will require additional effort to achieve the



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prescribed dry density and a stable condition. Failure to control moisture in these soils may result in undercutting of otherwise suitable borrow soils after placement.

5.5 Preliminary Pavement Recommendations

The following pavement design guidelines are made without the benefit of specific traffic information and/or reference to any local minimum section standards, and are intended as a general guide for the design engineer's evaluation. Site design decisions may dictate alterations to certain aspects of these guidelines. The following recommendations assume that site preparation procedures, including removal and replacement of unsuitable near surface soils/debris and upper in situ soil densification, have been completed where necessary. The data generated is preliminary and may need to be augmented with additional data as the design process proceeds.

All asphalt pavements, concrete pavements and base courses should be constructed in accordance with the guidelines of the latest applicable Georgia Department of Transportation Specifications.

5.5.1 Asphalt Drive and Parking

Assuming a very limited amount of heavy truck traffic, following completion of the site preparation procedures detailed above, we anticipate that a pavement section consisting of a minimum of 24 inches of properly compacted, inorganic granular material with less than 20 percent passing the No. 200 sieve; 6 inches of graded aggregate base course; and 2 inches of asphalt surface course should be adequate for the parking lot and drive areas.

5.5.2 Suitability of Surficial Soils

The near surface soils encountered at our hand-auger boring locations included very clayey fine sands (SC) and fine sandy clays (CL). These soil types are typically not considered suitable for use as pavement subgrade due to their poor drainage properties and significant strength reduction even when drainage conditions are good. If a 2-foot separation between these clayey soils and the bottom of the graded aggregate base course cannot be established by raising site grades as necessary, over-excavation and replacement with suitable subgrade soils as defined herein will be required.

5.5.3 Underdrains

We recommend underdrains along the roadways and parking lots within the development. The underdrain backfill can be any granular material such as #57 stone or gravel. The trench should be lined with a non-woven fabric to minimize the loss of soil fines into the trench. The purpose of the underdrain system is to minimize groundwater intrusion into the subbase section of the roadway thereby reducing the strength of the subgrade soils.



6. Closure

GHD's scope of work for this project has not included investigation, detection, or evaluation related to the presence of any biological pollutants. The term 'biological pollutants' includes, but is not limited to, mold, fungi, spores, bacteria, and viruses, and the byproducts of any such biological organisms. Further, evaluation or review to determine compliance with State and/or Federal regulatory requirements, assessment of potential contamination migration from or onto the subject site, and/or any similar environmental analyses were beyond the scope of this study.

We have prepared this report exclusively for Thomas and Hutton and their client for use as a guide for geotechnical aspects of the design and construction of the proposed development at the referenced site. The scope of the explorations, tests, and analyses for this study, and the recommendations in this report were selected or developed based on our understanding of the project as described in this report. If pertinent details of the project change or otherwise differ from our descriptions, we request that we be notified and authorized to review the changes and to modify our recommendations, if needed. This report has been prepared with the intent that it not be separated. Information from this report should not be distributed or made available to designers or contractors in partial form. This report should be made available to prospective contractors for information only, and not as a warranty of subsurface conditions.

We appreciate the opportunity to work with you on this project. We trust that the information provided in the report is clear and complete. Should it require any clarification or amplification, please contact us at (912) 235 3021.

Sincerely,

GHD



Robin M. Moutray, P.E.



Sean M. McCubbins, LEED® AP

RM/sm/admin

Encl.

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Attachment A

Hand-Auger Boring Logs

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Attachment A Log of Hand-Auger Borings

Project: Proposed New Recreation Facility

Technicians: James Collins/ Josh Desimas

Reference No: 11122323

Location: See Figure 1

Date: 10-17-16

Location	Depth Below Ground Surface (ft)	Soil Description	Depth (ft)	Blow Counts (blows/inch)				Reuse Category
				1st	2nd	3rd	Ave.	
HA-1	0 – 4"	Topsoil / Leaf and pine straw cover	0	-	-	-	-	4
	4" – 10"	Brown and gray silty fine SAND (SM)	-1	9	7	12	9.5	1
	10" – 18"	Tan clayey fine SAND (SC) <MC=9.7; -200=15.7>	-2	9	11	14	12.5	1
	18" – 28"	Tan and orange clayey fine SAND (SC)	-3	25	-	-	25	2
	28" – 38"	Gray, brown and orange very clayey fine SAND (SC)	-4	25	-	-	25	3
	38" – 60"	Gray and orange very clayey fine to medium SAND (SC)	-5	25	-	-	25	3
HA-2	0 – 4"	Topsoil / Leaf and pine straw cover	0	-	-	-	-	4
	4" – 20"	Dark brown silty fine SAND (SM)	-1	11	10	10	10	1
	20" – 26"	Brown and gray clayey fine SAND (SC)	-2	13	9	7	8	2
	26" – 60"	Brownish gray and orange very clayey fine SAND (SC)	-3	14	16	15	15.5	3
			-4	14	14	17	15.5	
			-5	25	-	-	25	
HA-3	0 – 4"	Topsoil / Leaf and pine straw cover	0	-	-	-	-	4
	4" – 28"	Gray and tan silty fine SAND (SM)	-1	25	-	-	25	1
	28" - 46"	Brown and orange clayey fine SAND (SC)	-2	25	-	-	25	2
	46" – 54"	Brown and orange very clayey fine SAND (SC)	-3	25	-	-	25	3
	54" – 60"	Brown and orange very clayey fine to medium SAND (SC)	-4	25	-	-	25	3
			-5	25	-	-	25	

Comments: MC = Moisture Content; -200 = Percent Silt/Clay

Attachment A FOR BIDDER REFERENCE ONLY Log of Hand-Auger Borings

Project: Proposed New Recreation Facility

Technicians: James Collins/ Josh Desimas

Reference No: 11122323

Location: See Figure 1

Date: 10-17-16

Location	Depth Below Ground Surface (ft)	Soil Description	Depth (ft)	Blow Counts (blows/inch)				Reuse Category
				1st	2nd	3rd	Ave.	
HA-4	0 – 4"	Topsoil / Leaf and pine straw cover	0	-	-	-	-	4
	4" – 24"	Brown to tan silty fine SAND (SM)	-1	7	10	14	12	1
			-2	11	10	10	10	
	24" – 60"	Grayish tan and orange to gray and orange very clayey fine SAND (SC)	-3	10	10	12	11	3
			-4	19	25	-	25	
-5			25	-	-	25		
HA-5	0 – 4"	Topsoil / Leaf and pine straw cover	0	-	-	-	-	4
	4" – 18"	Brown to tan silty fine SAND (SM)	-1	8	10	11	10.5	1
	18" - 60"	Grayish tan and orange very clayey fine SAND (SC) <MC=20.39; -200=42.5>	-2	8	9	10	9.5	3
			-3	15	11	17	14	
			-4	14	17	22	19.5	
-5	17	25	-	25				
HA-6	0 – 4"	Topsoil / Leaf and pine straw cover	0	-	-	-	-	4
	4" – 14"	Brown silty fine SAND (SM)	-1	20	25	-	25	1
	14" – 30"	Tan and orange very clayey fine SAND (SC)	-2	8	9	10	9.5	3
	30" – 60"	Brown and orange very clayey fine SAND (SC)	-3	9	9	10	9.5	3
			-4	12	14	16	15	
-5	16	25	-	25				

Comments: MC = Moisture Content; -200 = Percent Silt/Clay

Attachment A FOR BIDDER REFERENCE ONLY Log of Hand-Auger Borings

Project: Proposed New Recreation Facility

Technicians: James Collins/ Josh Desimas

Reference No: 11122323

Location: See Figure 1

Date: 10-17-16

Location	Depth Below Ground Surface (ft)	Soil Description	Depth (ft)	Blow Counts (blows/inch)				Reuse Category
				1st	2nd	3rd	Ave.	
HA-7	0 – 4"	Topsoil / Leaf and pine straw cover	0	-	-	-	0	4
	4" – 22"	Brown and tan silty fine SAND (SM)	-1	10	12	15	13.5	1
	22" – 60"	Grayish tan and orange to gray and orange very clayey fine SAND (SC) <MC=19.2; -200=45.8>	-2	8	10	12	11	3
			-3	15	15	16	15.5	
			-4	12	14	15	14.5	
-5	12	25	-	25				
HA-8	0 – 6"	Topsoil / Leaf and pine straw cover	0	-	-	-	-	4
	6" – 22"	Dark brown to brown silty fine SAND (SM)	-1	10	20	25	25	2
	22" – 60"	Brown and orange very sandy CLAY (CL) <MC=25.5; -200=66.6; LL=43; PI=23>	-2	10	9	8	8.5	3
			-3	10	12	11	11.5	
			4	12	13	14	13.5	
-5	16	25	-	-				
HA-9	0 – 4"	Topsoil / Leaf and pine straw cover	0	-	-	-	-	4
	4" – 18"	Brown and gray silty fine SAND (SM)	-1	10	11	12	11.5	1
	18" – 28"	Tan and gray silty fine SAND (SM) with trace of clay	-2	14	11	11	11	2
	28" – 36"	Tan and gray clayey fine SAND (SC)	-3	11	12	12	12	2
	36" – 60"	Tannish gray and orange very clayey fine SAND (SC)	-4	25	-	-	25	3
-5			25	-	-	25		

Comments: MC = Moisture Content; -200 = Percent Silt/Clay; LL = Liquid Limit; PI = Plasticity Index

Attachment A FOR BIDDER REFERENCE ONLY Log of Hand-Auger Borings

Project: Proposed New Recreation Facility

Technicians: James Collins/ Josh Desimas

Reference No: 11122323

Location: See Figure 1

Date: 10-17-16

Location	Depth Below Ground Surface (ft)	Soil Description	Depth (ft)	Blow Counts (blows/inch)				Reuse Category
				1st	2nd	3rd	Ave.	
HA-10	0 – 6"	Topsoil / Leaf and pine straw cover	0	-	-	-	-	4
	6" – 14"	Brown silty fine SAND (SM) with trace of clay	-1	10	10	10	10	1
	14" – 30"	Light brown silty fine SAND (SM)	-2	6	6	7	6.5	1
	30" – 60"	Gray and orange very clayey SAND (SC)	-3	7	6	7	6.5	3
			-4	6	9	9	9	
		-5	18	17	14	15.5		
HA-11	0 – 6"	Topsoil / Leaf and pine straw cover	0	-	-	-	-	4
	6" – 38"	Gray silty fine SAND (SM) <MC=13.5; -200=17.2>	-1	9	10	9	9.5	1
	38" – 56"	Gray and brown very clayey fine SAND (SC)	-2	3	4	4	4	3
			-3	3	4	5	4.5	
			4	4	4	7	5.5	
56" – 60"	Brown and orange very clayey fine SAND (SC)	-5	6	8	9	8.5	3	
HA-12	0 – 4"	4" Topsoil / Leaf and pine straw cover	0	-	-	-	-	4
	4" – 16"	Brown silty fine SAND (SM)	-1	16	17	18	17.5	1
	16" – 30"	Tan and orange clayey fine SAND (SC) <MC=14.4; -200=22.1>	-2	18	25	-	25	2
	30" – 60"	Brown and orange very clayey fine SAND (SC)	-3	16	25	-	25	3
			-4	21	25	-	25	
		-5	25	-	-	25		

Comments: MC = Moisture Content; -200 = Percent Silt/Clay

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**Correlation of Penetration Resistance with
Relative Density and Consistency**

<u>Sands and Gravels</u>		<u>Silts and Clays</u>	
No. of Blows, N	Relative Density	No. of Blows, N	Relative Density
0 – 4	Very loose	0 – 2	Very soft
5 – 10	Loose	3 – 4	Soft
11 – 31	Medium dense	5 – 8	Firm
31 – 50	Dense	9 – 15	Stiff
Over 50	Very dense	16 – 30	Very stiff
		31 – 50	Hard
		Over 50	Very hard

**Particle Size Identification
(Unified Classification System)**

Boulders:	Diameter exceeds 8 inches
Cobbles:	3 to 8 inches diameter
Gravel:	Coarse - 3/4 to 3 inches diameter Fine - 4.76 mm to 3/4 inch diameter
Sand:	Coarse - 2.0 mm to 4.76 mm diameter Medium - 0.42 mm to 2.0 mm diameter Fine - 0.074 mm to 0.42 mm diameter
Silt and Clay:	Less than 0.07 mm (particles cannot be seen with naked eye)

Modifiers

The modifiers provide our estimate of the amount of silt, clay or sand size particles in the soil sample.

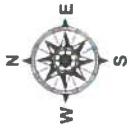
Approximate Content	Modifiers
≤ 5%:	Trace
5% to 12%:	Slightly silty, slightly clayey, slightly sandy
12% to 30%:	Silty, clayey, sandy
30% to 50%:	Very silty, very clayey, very sandy

Field Moisture Description	
Saturated:	Usually liquid; very wet, usually from below the groundwater table
Wet:	Semisolid; requires drying to attain optimum moisture
Moist:	Solid; at or near optimum moisture
Dry:	Requires additional water to attain optimum moisture

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Figure



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HA-1  Denotes approximate location and designation of hand-auger boring with dynamic cone penetrometer testing

NOTE: This drawing utilizes a copy of an exhibit, exhibit titled, "Recreation Complex, Monteith Road Site" prepared by Thomas & Hutton, dated October 2016. The boring locations were added by GHD for the purpose of denoting our test locations, only.

Figure 1: Location Plan

Proposed New Recreation Complex, Port Wentworth, Georgia

Prepared By: RM
Date: 11-4-16

Checked By: SM
Date: 11-4-16

Reference No. 11122323

