GWINNETT COUNTY
DEPARTMENT OF FINANCIAL SERVICES
PURCHASING DIVISION

75 Langley Drive | Lawrenceville, GA 30046-6935
O: 770.822.8720 | F: 770.822.8735
GwinnettCounty.com

September 11, 2024

ADDENDUM #1
BL107-24, Construction of Beaver Ruin Wetland Park

****The question deadline for BL107-24 has been extended until Friday, September 13, 2024 at 3:00 PM. All questions regarding bids shall be directed to Jake Scarpone, Purchasing Associate II, via email at jake.scarpone@gwinnettcounty.com or via phone at 770-822-8722.****

CLARIFICATIONS:

C1. Revise the Table of Contents to add Division 11, Section 11 6813 Playground Equipment and to revise Section 02 3000 Subsurface Investigation to add Appendix A.
C2. Revise Gwinnett County's front-end page 3 SCOPE OF WORK the 5TH bullet to delete the word "future."
C3. Add Section 11 6813 Playground Equipment.
C4. Add Playground Site Plan as prepared by KOMPAN sheets K1.0 dated 09/11/24.
C5. Revise Section 02 3000 Subsurface Investigation to add Appendix A.
C6. Include Geotechnical Investigation as Appendix A.

QUESTIONS & ANSWERS:

Q1. After a site visit of the Beaver Ruin Wetland area, I saw that there was an additional construction entrance that was being utilized by Clean Water Consultants at BP gas station (4450 Satellite Blvd, Duluth, GA 30096). Will this be a possible point of access for the project?
A1. No, this location will not be available as an access point to the property.

Q2. I could not find anything within the contract specifications pertaining to who will be responsible for submitting the Sustainable SITE certification information and paying the associated fees with this. Is this something that Gwinnett County will handle?
A2. The County has paid all associated fees for SITES certification. The contractor will need to participate in the process and provide the required documentation and comply with all other requirements of the Contract Documents.

Q3. Under the section titled "Special Provisions" number 22. GEOTECHNICAL on page 8, the paragraph calls out that the geotechnical report is attached in Appendix A, however Appendix A cannot be located.
A3. Revise Section 02 3000 Subsurface Investigation to add Appendix A. Please see Attachment 6 for the geotechnical report.

Q4. Is there a CAD file for this project and if so, will it be made available?
A4. CAD files will be provided to the awarded contractor.

Q5. Sheet 101 of 169 (sheet PT-09 Precast Concrete Specs) of the plan drawings states in section 1.3F states that "all precast shall consist of integrally colored concrete". Please confirm that

color is in fact required since it does explicitly state this in the Precast Structural Concrete specification, Section 03-4100.

A5. Yes, all precast shall consist of integrally colored concrete from one of PermaTrak's "standard colors". The owner selected standard color will be Adelaide Gray.

Q6. Sheet 101 of 169 (sheet PT-09 Precast Concrete Specs) of the plan drawings states in section 1.3D states "walking surface of top surface of treads shall have a formliner finish". Please confirm that a hand or broom troweled top surface of treads is not acceptable.

A6. Permatrak treads walking surface will have the standard Permatrak finish PermaGrip. Hand or broom troweled top surface of treads is not acceptable.

Q7. Does the Precast Concrete Specifications noted above supersede the Precast Structural Specification, Section 03-4100?

A7. No.

Q8. Are you able to share the Geotechnical report for this project?

A8. Revise Section 02 3000 Subsurface Investigation to add Appendix A. Please see Attachment 6 for the geotechnical report.

Q9. Can the question deadline be extended?

A9. The question deadline has been extended until Friday, September 13, 2024 at 3:00 PM. All questions shall be directed to Jake Scarpone, Purchasing Associate II, via email at jake.scarpone@gwinnettcounty.com or via phone at 770-822-8722.

This addendum should be acknowledged in the space provided on page 15 of the bid documents and returned with your bid. Failure to do so may result in your bid being deemed non-responsive.

Thank you,

Jake Scarpone

Jake Scarpone
Purchasing Associate II

Attachments:

1. Pre-Bid Conference Sign In Sheet
2. Revised Table of Contents
3. Section 11 6813 – Playground Equipment
4. Playground Plan
5. Section 02 3000 - Subsurface Investigation
6. Geotechnical Report

PRE-BID CONFERENCE

BL107-24

	Representative Name	Company Name	Phone #	E-Mail Address
	(DEPARTMENT REPRESENTATIVES SIGN-IN AT BOTTOM)			
1.	Brad Williams	Crowder	404-938-7012	bwilliams@crowderusa.com
2.	Latrice Land	Diversified Constr of GA	(678) 705-4373	bids@dcofgeorgia.com
3.	Andrew Dial	Gunnison	4785503858	Adial@woodsontree.com
4.	Neil Blasingame	Strack Inc	678-591-9542	neilb@strackinc.com
5.	Luke Miller	Strack, Inc	412-951-2477	lukem@strackinc.com
6.	Madeline Layson	Multiplex LLC	678-317-2040	madeline@multiplexllc.com
7.	JASON PHILBIN	PERMATRAK CONCRETE	BOARDWALK 950-229-3036	JPHILBIN@PERMATRAK-COM
8.	Liz Camacho	Tri Scapes	678 939 8424	liz@triscapes.com
9.	Aaron Steele	Tailor trails	678-614-8300	AaronSteele@tailoredtrails.Net
10.	Jeremy Vanay	GDOCS	770-853-0054	Jeremy.Vanay@Gwinnettcounty.com
11.	Joseph Powell	CPL	770-831-9000	jpowell@cplteam.com
12.				
13.				

Department Representative Name	Department	Department Representative Name	Department
Jake Scarpone	DOFS		
DANIEL DAPT	DoCS		

SECTION 00 0010 – TABLE OF CONTENTS

REVISION DATE

REVISION DATE

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05 5000	Metal Fabrications	
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05 5213	Pipe and Tube Railings	
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06 1326	Heavy Timber Trusses	
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07 2726	Fluid-Applied Membrane Air Barriers	
07 4113	Metal Roof Panels	
07 4646	Fiber-Cement Siding	
07 6200	Sheet Metal Flashing and Trim	
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08 3323	Overhead Coiling Doors	
08 4500	Translucent Wall Panels	

DIVISION 09 - FINISHES

09 6700	Fluid-Applied Flooring	
09 9113	Exterior Painting	
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10 2113.17	Phenolic Toilet Compartments	
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REVISION DATE

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22 0529	Hangers and Supports for Plumbing Piping and Equipment
22 0553	Identification for Plumbing Piping and Equipment
22 0719	Plumbing Piping Insulation
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23 0553	Identification for HVAC Piping and Equipment
23 0593	Testing, Adjusting and Balancing for HVAC
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26 0533.13	Conduit for Electrical Systems
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32 1723	Pavement Markings

REVISION DATE

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DIVISION 33 – UTILITIES
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33 1416 Site Water Utility Distribution Piping
33 3113 Site Sanitary Sewerage Gravity Piping
33 4211 Stormwater Gravity Piping

END OF SECTION 00 0010

SECTION 11 6813
PLAYGROUND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete footings for playground equipment.

B. Playground equipment.

C. Location of each item of playground equipment is indicated on drawings.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete: Footings for playground equipment.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2021.

C. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2020.

D. ASTM A513/A513M - Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing; 2020a.

E. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings; 2018, with Editorial Revision.

F. ASTM B108/B108M - Standard Specification for Aluminum-Alloy Permanent Mold Castings; 2019.

G. ASTM B179 - Standard Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Casting Processes; 2018.

H. ASTM D3363 - Standard Test Method for Film Hardness by Pencil Test; 2022.

I. ASTM F1292 - Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment; 2022.

J. ASTM F1487 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use; 2021.

K. CPSC Pub. No. 325 - Public Playground Safety Handbook; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: For manufactured equipment, provide manufacturer's product data showing materials of construction, compliance with specified standards, installation procedures, safety limitations, and the number of users permitted.

C. Shop Drawings: Detailed scale drawings showing play event layout, Use Zone perimeters, and fall height for each play event.
   1. Show locations and dimensions of footings and anchorage points.
   2. Clearly identify mounting elevations in relation to a fixed survey point on site and to subgrade elevation and depth of protective surfacing.

D. Letter from manufacturer certifying that the installer is approved.

1.05 QUALITY ASSURANCE

A. Maintain one copy of the latest edition of ASTM F1487 and CPSC Pub. No. 325 at project site.

B. Installer Qualifications: Company certified by manufacturer for training and experience installing playground equipment.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store equipment to project site in accordance with manufacturer's recommendations.

B. Store materials in a dry, covered area, elevated above grade.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's standard warranty.

PART 2 PRODUCTS

2.01 NOTE:

A. Where manufacturers are listed, add "Or approved equal".

B. All references to manufacturer(s) and “approved equal" are included for description of quality and content of the designated equipment/materials. Equivalent items may be accepted if they meet all standards of quality and purpose for the intended use, as determined by Gwinnett County.

C. Substitutions request requirements: Refer to Section 01 6300 – Substitutions.

2.02 MANUFACTURERS

A. Playground Equipment:
   1. KOMPAN, INC.

2.03 PLAYGROUND EQUIPMENT - GENERAL

A. Design Assumptions: Because the safety of the playground depends on strict compliance with design criteria, this information is provided for Contractor's information.
   1. Playground has been designed for children ages 2-5 and 5-12.
   2. If deviations from specified dimensions, especially fall heights, is required, obtain approval prior to proceeding; follow approval request procedure as specified for substitutions.

B. Mount equipment on concrete footings, unless otherwise indicated.

1. Protective Surfacing Depth: As indicated on drawings.
2. Provide supports as required to mount equipment at proper height above finish and sub-grades to allow installation of sufficient depth of protective surfacing; portion of support below top of surfacing must comply with specified requirements for equipment.
3. Paint portion of support that is intended to be installed below top surface of protective surfacing a different color, or mark in other permanent way, so that installers and maintainers of protective surfacing can easily determine whether sufficient depth has been installed.

C. Provide permanent label for each equipment item stating age group that equipment was designed for, manufacturer identification, and warning labels in accordance with ASTM F1487.

2.04 PLAYGROUND EQUIPMENT

A. Comply with ASTM F1487 and CPSC Pub. No. 325; provide equipment complying with specified requirements for relevant age group(s).
   1. Provide components having factory-drilled holes; do not use components with extra holes that will not be filled by hardware or covered by other components.

B. Equipment Schedule:
   1. Refer to Civil drawings.

C. Equipment Locations:
   1. Refer to Civil drawings.

2.05 MATERIALS

A. Steel Pipe and Tube: Comply with ASTM A135/A135M, ASTM A500/A500M, or ASTM A513/A513M; hot-dipped galvanized and free of excess weld and spatter.
   1. Tensile Strength: 45,000 psi, minimum.
   2. Yield Point: 33,000 psi, minimum.
   3. Galvanizing: Hot-dip metal components in zinc after fabrication, in accordance with ASTM A123/A123M; remove tailings and sharp protrusions and burnish edges.

B. 513/A513M; hot-dipped galvanized and free of excess weld and spatter. Metal

C. Fireman's poles, handles, spacers, chains and bars are made from stainless steel.

D. Brackets, support legs and chains are hot dip galvanized steel tested for compliance with US CPSIA requirements regarding lead content as well as the European Standard EN 71-3 regarding migration of unwanted substances.

E. Springs are made of steel qualities that meet DIN 17221. The springs are subjected to shot peening to prevent crack formation and fatigue fracture. Spring durability and expected life in use are tested on a sampling basis to ascertain that the spring will function after more than 5 years of normal use. Springs are fitted with patented anti-pinch clamps of cast nylon.

F. Extruded Aluminum: ASTM B221 or ASTM B221M, Alloy 6061, 6062, or 6063.

1. Tensile Strength: 39,000 psi, minimum.
2. Yield Point: 36,500 psi, minimum.

G. Cast Aluminum: ASTM B26/B26M, ASTM B108/B108M, or ASTM B179.

H. Chain: Corrosion resistant zinc plated steel; minimum size 4/0; polyvinyl chloride (PVC) coating.

I. Rope Cable: Strands of steel cable with UV-stabilized polypropylene synthetic covering; ends capped to prevent fraying.
   1. Nets and ropes:
      a. Nets and ropes are made of UV-stabilized PP (polypropylene) with inner steel cable reinforcement. Ultimate tensile strength of the rope is at least 2,500 kg. The net connectors are KOMPAN-designed and made from a specially formulated injection-molded PA (polyamide) in order to perform the maximum strength and UV stability. Nets and ropes are equipped with stainless steel chains in the end for adjustment due to variation in Robinia dimensions.

J. Plastic: Panels for decoration and attachment of slides are made of 19MM Ecocoretm.

K. Hardware: Provide without hazardous protrusions, corners, or finishes, and that require tools for removal after installation; countersunk fasteners are preferred.
   1. Use stainless steel for metal-to-metal connections; select type to minimize galvanic corrosion of materials connected by hardware.
   2. Use stainless steel for wood-to-wood and wood-to-metal connections.
   3. Use stainless steel with plastic components.
   4. Bearings: Self lubricating.
   5. Hooks, Including S-Hooks: Closed loop; maximum gap 0.04 inches, less than the thickness of a dime.
   6. Rails, Loops, and Hand Bars: Same metal as item is mounted on or aluminum; with powder coating.
   7. Anchors: In accordance with manufacturer's recommendations.

L. Wood posts, crossbars and other un-fabricated parts:
   1. Species: Robinia (Black Locust)
      a. De-barked and sap free Robinia trunks.
      b. Cut to meet safety requirements of ASTM F1487.
      c. From FSC-certified sources.

M. Polyvinyl Chloride (PVC) Coating: Ultraviolet (UV) stabilized and mold-resistant; slip-resistant finish; prime parts to be coated with clear acrylic thermosetting solution, and preheat prior to dipping in liquid PVC.
   1. Thickness: 0.08 inch, minimum, plus/minus 0.02 inch.
   2. Hardness: 85 durometer, when tested in accordance with ASTM D3363.

N. Concrete: As specified in Section 03 3000.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that playground area has been graded to subgrade elevations required and that excess soil, rocks, and debris have been removed.

B. Verify that playground equipment footings have been installed in proper locations and at proper elevations.

C. Verify location of underground utilities and facilities in playground area; damage to underground utilities and facilities will be repaired at Contractor's expense.

3.02 INSTALLATION

A. Coordinate work with preparation for and installation of protective surfacing specified in Section 32 1816.13; install protective surfacing after playground equipment installation.

B. Install in accordance with CPSC Pub. No. 325, ASTM F1487, manufacturer's instructions, and requirements of authorities having jurisdiction (AHJ).

C. Anchor equipment securely below bottom elevation of resilient surfacing layer.

D. Install without sharp points, edges or protrusions, entanglement hazards, pinch, crush, or shear points.

E. Do not modify play events on site without written approval of manufacturer.

F. Install required signage if not factory-installed.

3.03 FIELD QUALITY CONTROL

A. Obtain the services of the equipment manufacturer's field representative to review the finished installation for compliance with specified requirements and with design criteria to the extent known to the Contractor; submit report of field review.

B. Owner or Owner's representative will inspect playground equipment after installation to verify that playground meets specified design safety and accessibility requirements.

C. Repair or replace rejected work until compliance is achieved.

3.04 CLEANING

A. Restore adjacent existing areas that have been damaged from the construction.

B. Clean playground equipment of construction materials, dirt, stains, filings, and blemishes due to shipment or installation; clean in accordance with manufacturer's instructions, using cleaning agents as recommended by manufacturer.

C. Clean playground area of excess construction materials, debris, and waste.

D. Remove excess and waste material and dispose of off-site in accordance with requirements of authorities having jurisdiction (AHJ).

3.05 PROTECTION

A. Protect installed products until Date of Substantial Completion.

#	Product Number	Product Name	M.F.H.	Count
A	NRO925-CUSTOM-FSC_20309338	5 Seats Robinia Swing 2 Infants, 2 Belts, 1 ADA	7'11"	1
B	NRO895036	Double Embankment Slide		1
C	COR882956	Climbing Net	5' 2"	1
D	NRC60201-CUST-FSC_20309344	Triple Wonder Play Panel	0'0"	1
E	NRO104-0412FSC	Spring Board	1'6"	1
F	NRO115-0411FSC	Snail Springer	1'8"	1
G	NRO112-0431FSC	Forest Bug Springer	1'8"	1
H	ELE400158-xx17DT	Junior Spica	0'7"	1
I	GXY960014-5017	Supernova	2'4"	1

#	Product Number	Product Name	M.F.H.	Count
J	MOM162156	woodpecker seesaw	3'3"	1
K	NRO110-0911FSC	Spinner Plate	1'7"	1
L	CRP630301-CUSTOM_20299977	Hill Climber Rope with EPDM, Type 6	0'0"	1
M	ELE400065-3017SC	Tipi Carousel	3'3"	1
N	KRS8201006	Robinia tree with ramp and bridge	5'10"	1
O	KRS8200499	2-5 Robinia Tree	3'2"	1
P	KRS8200883	nature play	2'3"	1
Q	KRS8200312	Robinia maze	0"	2

Beaver Ruin Wetlands Park

Gwinnett County, GA
Site Plan

0 8 16
1/8"=1'-0" ON 24" x 36" SHEET

N

MANUFACTURER'S SHOP DRAWING:

FOR USE BY CONTRACTOR, ENGINEER, OR DESIGN PROFESSIONAL OF RECORD. SEE SIGNED SALES PROPOSAL FOR COMPLETE SCOPE TO BE PROVIDED BY KOMPAN OR REPRESENTING AGENCY. CONFIRM FINAL PLAN AND SCOPE WITH KOMPAN SALES REP OR PROJECT MANAGER PRIOR TO USE FOR REVIEW, PERMITTING, OR CONSTRUCTION.

TO BE READ CONTINGENTLY WITH KOMPAN'S STANDARDS FOR SITE PREPARATION, MATERIALS AND INSTALLATION PROCESSES; PROVIDED AFTER EQUIPMENT PURCHASE. A COMPLIANT PLAYGROUND TO KOMPAN'S STANDARDS MUST SATISFY ALL REQUIREMENTS IN THE CODE OF CONDUCT.

SLAB BY OTHERS UNLESS OTHERWISE NOTED. FOR SURFACE MOUNT OPTIONS, THE CONCRETE REQUIREMENTS MAY BE UP TO 5½" OF 3,500 PSI MINIMUM COMPRESSIVE STRENGTH. CONTACT KOMPAN FOR SPECIFIC PRODUCT REQUIREMENTS. ALL COMPOSITE STRUCTURES SHOWN REQUIRE A SITE GRADE OF 2% MAXIMUM, 1% OPTIMAL. SPECIFICATIONS FOR EACH KOMPAN STRUCTURE MAY BE FOUND AT KOMPAN.COM/KOMPANMASTER

DIMENSIONS OF PLAY AREA, SIZE AND ORIENTATION, LOCATIONS OF ALL EXISTING UTILITIES, EQUIPMENT AND SITE FURNISHINGS TO BE FIELD VERIFIED PRIOR TO CONSTRUCTION.

SALES REPRESENTATIVE			SHEET
-			K1.0
REVIEW BY	DRAWN BY	DATE	
DESIGN	-	09/11/24	
REV. NO.	REV. BY	REV. DATE	REVISION NOTES
-	-	-	-

LAYOUT IS IN ACCORDANCE WITH ASTM F1487
LAYOUT IS IN ACCORDANCE WITH ASTM F2373
LAYOUT IS IN ACCORDANCE WITH ASTM F3101

SECTION 02 3000
SUBSURFACE INVESTIGATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Attached subsurface evaluation report - Appendix A.

1.02 DESCRIPTION

A. A soils investigation report titled Report of Geotechnical Exploration Beaver ruin Wetlands Park, dated January 7th, 2021, has been prepared for the site of this work by UNITED CONSULTING and is attached.

B. *A soils investigation report titled Report of Geotechnical Exploration Beaver ruin Wetlands Park, dated December 21, 2020, has been prepared for the site of this work by UNITED CONSULTING and is attached.*

C. *A Boardwalk Foundation Recommendations letter from Tetra Tech dated December 31, 2020.*

D. Such information is not a warranty of subsurface conditions and may not reflect subsurface conditions over the entire proposed construction area. The Contractor shall be responsible for their interpretations and use of the information.

E. The availability or use of the soils investigation report and logs of test borings shall not be construed as a waiver of the Contractor's duty to examine the site and the conditions affecting the work, and does not relieve the Contractor from the risk of soil or subsurface conditions which could reasonably be anticipated.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 02 3000

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UNITED CONSULTING

REPORT

For Gwinnett County Department of Water Resources

Geotechnical Exploration
Beaver Ruin Wetlands Park
Duluth, Gwinnett County, Georgia

Project No.: GCDWR-20-GA-04273-01
December 21, 2020

625 Holcomb Bridge Road, Norcross, GA 30071 • 770-209-0029 • unitedconsulting.com

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in e ely

UNITED CONSULTING

GEORGIA REGISTERED No. 22149 PROFESSIONAL ENGINEER RAFAEL I. OSPINA

Rafael I. Ospina, P.E.
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Chris L. Roberds, P.G.
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TABLES

APPENDIX

1.0 EXECUTIVE SUMMARY

nite ons lting has o plete a eote hni al plo ation fo the Bea e in etlan s a k to be lo ate to the so th of atellite Bo le a in l th innett o nty eo gia lease efe to the te t of the epo t fo a o e etaile is ssion of the ite s s a i□e belo

The eote hni al plo ation p og a in l e t el e 12 T oil Bo ings an li ite labo ato y testing

1 Belo the g o n s fa e bo ing B- en o nte e 2 feet of fill soils The fill en o nte e onsiste of loose an ith t a es of silt an lay an gene ally appea e to be f ee of eb is an o gani ontent ith a tan a enet ation Test esistan e - al e of blo s pe foot bpf

2 a tially eathe e o k as en o nte e in bo ings B-2 th o gh B- at epths anging f o 1 feet to 2 feet ge ef sal o e in bo ings B-1 B-2 an B- at epths anging f o 1 feet to 2 feet iffi lt e a ation on itions ipping an o blasting asso iate ith o o k a e not gene ally e pe te fo ass g a ing of the site e note that shallo e o o k ay be p esent bet een o a ay f o the a eas e plo e

o n ate as en o nte e in ea h of the bo ings at epths anging f o 1 foot to feet at the ti e of illing o 24 ho s afte illing o n ate ont ol ill be e i e fo this p o e t The ont a to sho l be p epa e to e o e pe he ate an o g o n ate as nee e o n ate le els sho l be anti ipate to fl t ate ith the hange of seasons ing pe io s of e y lo o high p e ipitation o e to hanges in the floo plain o ate she pst ea f o the a ea

4 o i e that the site is p epa e as e o en e it is o opinion that the p opose boa alks an be s ppo te on heli al pie footings etaile e o en ations fo fo n ations a e in l e in the te t

2.0 PROJECT INFORMATION

The o e t ite is lo ate so th of atellite Bo le a in l th innett o nty eo gia The p o e t site is lo ate in a etlan an g ass a ea ith eeks st ea s an onse ation ease ents The o e t ite as a esse ia atellite Bo le a p o i e site s ey as tili□e to ete ine the bo n a ies of the o e t ite The site as bo n by atellite Bo le a an o e ial st t es to the no th an by esi ential a eas to the est by oo e a eas an - to the so th an by oo e a eas an esi en es to the east The gene al lo ation of the p o e t site is sho n on the atta he ite Lo ation lan ig e 1

topog aphi site plan as p o i e by the lient ate file ate 11 22 201 le ations at the site ange f o abo t 0 in the no the n o ne nea atellite Bo le a to 7 along the eek nning in the ent al-no the n po tion of the site

e n e stan that the p o e t ill onsist of st ea esto ation an e elop ent of a pa k hi h ill in l e boa alks on ete t ails t ss b i ges a ent e pi ni a eas obse ation to e s an othe a enities The s ope of this p o e t as only li ite to the t ail an the st ea esto ation a eas

Base on an - ail an asso iate atta h ent f o ohn yle at e aT ak ate 11 2 2020 e n e stan that the boa alk pie ea tions ill be as follo s

Table 1: Boardwalk Pier Reaction Loads

Direction	Service Loads (kips)	Factored Loads (kips)
ial e ti al	2 4 L LL	4 L LL
Late al o i□ontal	1 0	2

f the a t al plans an site g a ing info ation a y signifi antly f o the abo e anti ipate al es nite ons lting st be onta te to ete ine if o e o en ations sho l be e-e al ate an o e ise

3.0 PURPOSE

The p pose of this eote hni al plo ation as to assess the gene al type an on ition of the s bs fa e ate ials at the o e t ite an to p o i e fo n ation e o en ations fo boa alks etaining alls g a ing ea th o k ality ont ol an othe geote hni al elate iss es ee e pe tinent to this p o e t

4.0 SCOPE

The s ope of o geote hni al e plo ation in l e the follo ing ite s

1 Bo ing layo t an lea ing n e g o n tilities

2 is al e onnaissan e of the site f o a geote hni al stan point

illing t el e 12 tan a enet ation Test T bo ings to assess the ality an onsisten y of the s bs fa e soils

4 is al e al ation of the soil sa ples obtaine ing o fiel -testing p og a fo f the i entifi ation an lassifi ation

e fo ing labo ato y testing onsisting of fifteen 1 g ain si□e analysis ith hy o ete an fifteen 1 tte be g Li its fo ty-se en 47 nat al oist e tests t o 2 stan a o to tests fi e n onfine o p ession tests an one 1 t ia ial test on ep esentati e soil sa ples as ell as si p esisti ity hlo i e an s lfate tests at ep esentati e lo ations

naly□ing the e isting soil on itions ith espe t to the p opose onst tion an

7 epa ing this epo t to o ent the es lts of o fiel -testing p og a enginee ing analysis an to p o i e o fin ings an gene al e o en ations

5.0 SUBSURFACE CONDITIONS

The geote hni al e plo ation fo the p o e t onsiste of t el e 12 T oil Bo ings esignate B-1 to B- along the t ail an as -1 to - along the st ea esto ation a ea

nitially ea h of the bo ings en o nte e a thin s fi ial laye Beneath the s fi ial ate ials Belo the g o n s fa e bo ing B- en o nte e 2 feet of fill soils The fill en o nte e onsiste of loose an ith t a es of silt an lay The tan a enet ation Test esistan e - al es in the fill an s as blo s pe foot bpf

Belo the fill in bo ing B- an the g o n s fa e in the e aining bo ings typi al esi al soils of the ie ont hysiog aphi o in e of eo gia e e en o nte e in the bo ings The esi al soils gene ally onsiste of e y loose to e y ense an ith a ying a o nts of silt lay i a an o k f ag ents o e y soft to stiff lay ith a ying a o nts of san silt i a an o k f ag ents o soft to fi ilt ith a ying a o nts of san lay i a an o k f ag ents - al es ithin the esi al an s ange f o 2 to 4 bpf those ithin the esi al lays ange f o 2 to bpf an those ithin the esi al ilts ange f o to bpf

a tially eathe e o k as en o nte e in bo ings B-2 th o gh B- at epths anging f o 1 feet to 2 feet is a te fo esi that an be penet ate ith a soil illing a ge b t has - al es in e ess of 100 bpf The en o nte e as lassifie as e y ense an ith a ying a o nts of o k f ag ents lay silt an i a

ge ef sal as en o nte e in bo ings B-1 B-2 an B- at epths anging f o 1 feet to 2 feet ge ef sal in T bo ings is the epth that the bo ing annot be a an e ith a soil illing a ge ge ef sal ithin esi al soils gene ally ep esents a sea of ense bo l e s o top of assi e be o k

o n ate as en o nte e in ea h of the bo ings at epths anging f o 1 foot to feet at the ti e of illing o 24 ho s afte illing o n ate le els sho l be anti ipate to fl t ate ith the hange of seasons ing pe io s of e y lo o high p e ipitation o e to hanges in the floo plain o ate she pst ea of the site

The bo ings e e ba kfille ith soil ttings

o a o e etaile es iption of the s bs fa e on itions en o nte e please efe to the bo ing logs in The ppen i bo ing s a y table is p esente belo

Table 2: Summary of Subsurface Conditions

Location	Boring No.	Ground Surface Elevation[1] (ft-msl)	Bottom of Fill Depth (ft)	24-hr GW Depth (ft.)	Depth to PWR (ft.)	Depth to Refusal (ft.)	Termination Depth (ft)
T ail	B-1	1					0
	B-2				1	1	1
	B-	7		1	1	1	1
	B-4	7			2		0
	B-		2		1	2	2
	B-	2			2		0
t ea esto ation ea	-1	0					1
	-2	2					1
	-			4			1
	-4						1
	-	0		4			1
	-	0					1

otes

1 o n s fa e ele ations e e esti ate f o site topog aphi ap p o i e by the lient ate file ate 11 22 201

6.0 LABORATORY TESTING PROGRAM

Labo ato y testing fo this p o e t in l e fifteen 1 g ain si□e analysis ith hy o ete an fifteen 1 tte be g Li its fo ty-se en 47 nat al oist e tests t o 2 stan a o to tests fi e n onfine o p ession tests an one 1 t ia ial test on ep esentati e soil sa ples The es lts of the oist e ontent tests a e sho n on the bo ing logs ne t to the espe ti e sa ples teste na ati e es iption of the labo ato y tests an the labo ato y test es lts a e in l e in The ppen i

i p esisti ity hlo i e an s lfate tests e e also on te on ep esentati e soil sa ples an the es lts tab late belo

Table 3: Soil Corrosivity Test Results

Boring	Depth (ft.)	Soil pH (S.U.)	Soil Resistivity (ohm-cm)	Chloride (mg/kg)	Sulfate (mg/kg)
B-1	2 □		74 0	44	
B-2	2 □4	74	4 0	4	4
B-	2 □	44	0 0	4	40
B-4	2 □	74	1 400	42	1
B-	2 □	0	1 00	40	0
B-	2 □	1	1 00	4	1

7.0 DISCUSSION AND RECOMMENDATIONS

The follo ing e o en ations a e base on o n e stan ing of the p opose onst tion the ata obtaine in the soil test bo ings a site e onnaissan e an o e pe ien e ith s bs fa e on itions like those en o nte e at the p o e t site

e e o en that nite ons lting be p o i e ith p ate o ents ea ly in the p epa ation of final onst tion a ings to ete ine if o e o en ations a e still ali o sho l be e-e al ate an e ise

7.1 Existing Fill

Belo the g o n s fa e bo ing B- en o nte e 2 feet of fill soils The fill en o nte e onsiste of loose an ith t a es of silt an lay an gene ally appea e to be f ee of eb is an o gani ontent ith a tan a enet ation Test esistan e - al e of blo s pe foot bpf

s ith any site ontaining n o ente e isting fill ate ials it is not n o on to fin eepe a eas of fill soft soils t ash pits o b ie t ash topsoil bo l e s e nants of p io onst tion blast o k o othe ns itable ate ials ithin e isting fill ate ials The ality of the fill sho l be f the e al ate at the ti e of onst tion by p oof olling an possibly the e a ation of test pits an soft o othe ise ns itable soils if en o nte e sho l be e o e f o the a ea of the planne onst tion nite ons lting e o en s that the p o e t b get in l es ontingen y f n s in the e ent that a eas ontaining lo onsisten y soils that annot be ensifie in pla e o othe ns itable ate ials e i ing e o al a e en o nte e ithin the fill

7.2 Site Preparation

io to e elop ent ainly fo b il ings on g a e e isting egetation an t ees in l ing thei oot at sho l be e o e f o the a ea of the p opose onst tion e o al of t ees sho l in l e e o al of thei oot ball hi h ay e ten to se e al feet belo g a e

ny e nants of p io n e g o n onst tion o n e g o n tilities sho l be elo ate to at least 10 feet o tsi e the pe i ete of p opose b il ing footp ints ban one tility lines sho l be e a ate an e o e f aban one tility pipes a e left in pla e ithin the non-st t al a eas of the site they sho l be fille -in n e p ess e ith e ent g o t ha ing a 2 - ay o p essi e st ength of at least 00 psi

io to pla e ent of any enginee e fill o o en e ent of onst tion a eas to e ei e fill shallo fo n ations slabs an pa e ents sho l be p oof olle ith a f lly loa e tan e -a le p t k oof olling sho l be pe fo e n e the obse ation of the eote hni al nginee o his ep esentati es so that a eas hi h e hibit p ping a e type ispla e ent ing p oof olling ay be t eate by a etho e o en e by the eote hni al nginee This etho ay onsist of n e tting an ba kfilling ith s itable enginee e fill epla ing ith s ge stone an a laye of she n o so e othe etho that is ee e s itable

e to the p esen e of n o ente e isting fill soils a eas e i ing stabili ation an o e o al an epla e ent ith enginee e fill sho l be anti ipate an b gete fo ing site p epa ation

7.3 Difficult Excavation

a tially eathe e o k as en o nte e in bo ings B-2 th o gh B- at epths anging f o 1 feet to 2 feet ge ef sal o e in bo ings B-1 B-2 an B- at epths anging f o 1 feet to 2 feet iffi lt e a ation on itions ipping an o blasting asso iate ith o o k a e not gene ally e pe te fo ass g a ing of the site e note that shallo e o o k ay be p esent bet een o a ay f o the a eas e plo e

t is also i po tant to note that epths to an o k an a y o e sho t ho i ontal istan es in the ie ont geologi a ea an an o k o l be en o nte e ing onst tion at shallo e epths bet een an o tsi e the bo ing lo ations fo this st y

typi ally e i es loosening by ipping ith la ge o e s p lling single tooth ippe s in ass e a ation The se of spe iali e e a ation e ip ent s h as a -hoes a kha e s o possibly blasting is typi ally e i e fo e a ation in onfine t en h e a ations elati ely so n assi e o k typi ally e i es blasting fo e o al in ass o t en h e a ation

nite ons lting e o en s that the follo ing etho -base efinitions fo o k be in l e in bi o ents n l sion of s h efinitions an help a oi ont a t isp tes o e o k e a ation ing onst tion

1 ene al a ation ny ate ial o pying an o iginal ol e of o e than 1 bi ya hi h annot be e a ate ith a single-tooth ippe a n by a a le t a to ha ing a ini a ba p ll ating of not less than 0 000 lbs sable p ll ate pilla - o la ge

2 T en h a ation ny ate ial o pying an o iginal ol e of o e than 1 2 bi ya hi h annot be e a ate ith a ba khoe ha ing a b ket ling fo e ate at not less than 40 000 lbs sing a o k b ket an o k teeth

7.4 Groundwater Considerations

o n ate as en o nte e in ea h of the bo ings at epths anging f o 1 foot to feet at the ti e of illing o 24 ho s afte illing hallo g o n ate is not e pe te to signifi antly i pa t onst tion o n ate le els sho l be anti ipate to fl t ate ith the hange of seasons ing pe io s of e y lo o high p e ipitation o e to hanges in the floo plain o ate she pst ea f o the a ea

7.5 Caving Considerations

ll e a ations sho l be on te in a o an e ith the pational afety an ealth inist ation g i elines lattening of the e a ation si e alls an o the se of b a ing ay be nee e to aintain stability ing onst tion

7.6 Foundation Design and Construction

hallo sp ea footings e e initially onsi e e fo this p o e t ho e e e to the p esen e of soft loose soils ithin the ppe fi e to ten feet belo g o n s fa e an the p esen e of shallo g o n ate shallo sp ea footings a e not onsi e e a iable fo n ation option fo the boa alk p o e t eli al pie s e e then onsi e e as a ost-effe ti e eep fo n ation syste fo the boa alk p o e t

eli al pie s a e installe by otating heli al an ho s th o gh the ppe o e b en ate ial to ense bea ing st ata epen ing on the an fa t e an the spe ifi pie type heli al pie s ay be esigne fo a o king o p essi e apa ity of tons The heli al pie s ay ha e an plift apa ity si ila to the o p ession apa ity p o i e the e is s ffi ient e be ent of the heli al pie lea se tion Late al esistan e is typi ally p o i e by installing pie s at a batte f o 1h 4 14° to 1h 1 4 ° The heli al pie an fa t e installe typi ally p o i es etaile esign an installation ite ia eli al pie lea s a e typi ally p o i e ith t o to th ee heli es ith helices spa e typi ally at ti es the heli ia ete a i of the t o a a ent heli es an ange in si□e typi ally f o 10 12 an 14 in hes in ia ete eli al pie s shafts o e in iffe ent types an si□es anging f o s a e soli steel shafts 1 □□to 2 □□in si□e to hallo stea shafts anging f o 2 7 □to 4 □□ the heli al pie onfig ations an si□es a e also a ailable by iffe ent heli al pie s pplie s The apa ity of the heli al pie s is ont olle by the a i to e that an be applie to the heli al pie an lea asse bly ing installation The no inal lti ate heli al pie o p ession tension apa ity is o elate to the to e eas e ing installation

ing installation of the heli al pie s etaile e o s sho l be aintaine by a ep esentati e of o fi to e ify pie type lo ation length installation on itions an esti ate apa ity e e est that e be allo e to e ie the ont a to s p opose e ip ent an installation p o e e p io to obili□ation an onst tion

epen ing on ate ial a ailability an othe fa to s it is possible that othe eep fo n ation alte nati es ay be e ono i ally feasible fo this p o e t e o l be gla to e al ate othe eep fo n ation options an p o i e e o en ations fo s h if nee e itional s bs fa e e plo ation o l be e i e epen ing on the type of alte nati e eep fo n ation option onsi e e

Base on the loa s p o i e nite ons lting pe fo e p eli ina y heli al pie esign al lations to ete ine heli al pie si□e an onfig ation an esti ate installation epths The p eli ina y heli al pie s fo n ation syste onsists of t o 2 batte e piles at 1h 4 14° installation angle ith th ee heli es 10□12□an 14□ ia ete installe to epths botto heli anging f o 14 to 2 feet epen ing on the s bs fa e on itions en o nte e in the si bo ings o plete along the boa alk fo this p o e t The batte e heli al pie s a e esigne to p o i e 0 kips of e i e o p ession Loa 24 4 kips of a i a ial loa an 2 kips of a ial loa f o the late al loa 1 kips pile on e te into o p ession o tension loa e note that heli al pie s installation ont a to s ill e elop thei o n esign fo the p o e t an that the p o i e e o en ations a e fo esti ating fo n ation antities an enginee s ost esti ates The p eli ina y heli al pie fo n ation e o en ations a e s a i□e in Table 4 and the helical pile design calculations summary is included in The ppen i

Table 4: Summary of Preliminary Helical Pier Design Recommendations

Structure	Boring No.	Depth to Dense Soil (ft-bgs) (N_{60} > 30 bpf)	Pile Type	Battered Pile Design Compression Service Load[1] (kips)	Battered Pile Minimum Installation Torque (Ft-lb) (K_t= 10 ft^{-1})	Minimum Depth to Bottom Helix (ft-bgs)
Boa alk T ail	B-1	0	17 - a e 1- haft 14 12 10 eli es 2 Batte e iles at 1h 4 14 ° ft To e ating 10 00 t-lb	0	10	2
	B-2	1				1
	B-	1				17
	B-4	1				17
	B-	1				14
	B-	2				24

otes

1 Batte e piles a e esigne to han le the se i e a ial loa 24 4 kips an late al loa 1 kips The 1 kips se i e late al loa in ea h pile total of kips pe bent is t ansfe e to pile a ial o p ession an tension loa espe ti ely hen the loa is applie along the bent

2 t least one e ti al pile loa test sing the top la ge heli 14 sho l be pe fo e to he k the t fa to se to al late the lti ate heli al pile lti ate o inal t ength bea ing apa ity f o the installation to e eas e in the fiel The esti ate ini to e p o i e abo e is base on a t 10 ft^{-1}

7.7 Ground Floor Slabs

o slabs on g a e e e o en a s bg a e o l s of 120 po n s pe bi in h p i be se fo slab esign t has been o e pe ien e that the floo slab s bg a e is often ist be by eathe fo n ation an tility line installation an othe onst tion a ti ities bet een o pletion of g a ing an slab onst tion o this eason o geote hni al enginee sho l e al ate the s bg a e i e iately p io to pla ing the on ete eas ge by the geote hni al enginee to be nstable sho l be e- o pa te o n e t an epla e ith enginee e fill o pa te to at least pe ent of its stan a o to a i y ensity

7.8 Earthwork

The onsite soils if f ee of o gani an othe elete io s ate ials sho l gene ally be s itable fo e se as enginee e fill ith p ope oist e ont ol a tially eathe e o k an be se as enginee e fill if it b eaks p s ffi iently to eet g a ation e i e ents an also be i e ith soil to eet g a ation e i e ents

e to the p esen e of high silt ontents so e of the onsite soil ay be sensiti e to oist e a iation ing ainy seasons these soils ill be iffi lt to y s a p a ti al onsi e ation ing e ten e pe io s of et eathe et onsite soils ay nee to be is a e an epla e ith ie soils These soils sho l be pla e ithin a na o ange of thei opti oist e ontent typi ally ithin abo t pe ent of opti oist e to a hie e p ope o pa tion Typi al est i tions on s itable fill a e no o gani s plasti ity in e less than 2 an a i pa ti le si□e of fo in hes ith not o e than 0 pe ent g eate than 4-in h These est i tions sho l also be applie to i po te bo o soils if nee e

ositi e ainage sho l al ays be aintaine to p e ent sat ation of e pose soils in ase of s en ains olling the s fa e of ist be soils ill also i p o e noff an e e the soil oist e an onst tion elays The eg ee of soil stability p oble s ill also be epen ent pon the p e a tions taken by the ont a to to help p ote t the soils f o sat ation ing onst tion

oist e- ensity ete inations sho l be pe fo e fo ea h soil type se to p o i e ata ne essa y fo ality ass an e testing oil oist e ontents at the ti e of o pa tion sho l be a ste so that they a e ithin oist e ontent li its that ill allo the e i e o pa tion to be obtaine

7.9 Slopes

e e o en that he e fill is to be pla e on e isting slopes o g llies g eate than 4 1 the slopes be ben he to p e ent sli ing of the fill ass along the e isting s fa e This an be a hie e by not hing the slope fa e by at least abo t t o feet ho i□ontally ith the o pa to bla e as ea h lift is o pa te typi al ben hing etail is p o i e in The ppen i

e anent slopes sho l be onst te no steepe than 2 1 ill slopes of p to 20 feet in total height onst te to 2 1 sho l be a eptable fo this p o e t ass ing p ope ben hing an pla e ent an o pa tion of enginee e fill lopes g eate than 20 feet st be e al ate fo global stability an sho l be esigne by a li ense eote hni al nginee lopes highe than feet sho l be ben he f less than esi able soils s h as topsoil o et soils a e to be aste on slopes o if an app op iate le el of ality ont ol an o pa tion testing n e the s pe ision of the geote hni al enginee is not planne ing slope onst tion 2 1 slopes ill not likely be a e ate an flatte slopes sho l be onsi e e

ll slopes sho l be p ote te f o e osion ing onst tion an p o i e ith app op iate pe anent egetation o othe o e afte onst tion lopes sho l be p ote te f o on ent ate n-off flo by eans of be s an ainage it hes to i e t noff a o n slopes o th o gh on ete hannels pp op iate egetati e o e sho l onsist of fast-g o ing g asses that ill api ly eate a ense oot

at o e the enti e slope Lan s aping onsisting of isolate sh bs an pine st a ill not p o i e a e ate slope p ote tion

ini b il ing o etaining all setba k f o the nea est e ge of fo n ations of at least 10 feet f o the est of slopes is e o en e ini setba k of feet is e o en e fo pa e ent an bs

7.10 Fill Placement

oist e- ensity ete inations sho l be pe fo e fo ea h soil type se to p o i e ata ne essa y fo ality ass an e testing The nat al oist e ontent at the ti e of o pa tion sho l be ithin oist e ontent li its hi h ill allo the e i e o pa tion to be obtaine This is gene ally ithin th ee pe entage points of the opti oist e The ont a to sho l be p epa e to in ease o e ease soil ate ontent as nee e to a hie e the e i e eg ees of o pa tion

The fill sho l be pla e in thin lifts not to e ee -in h loose thi kness an o pa te e e o en the fill be o pa te to at least pe ent of tan a o to T a i y ensity ithin top t o feet an at least pe ent of tan a o to a i y ensity else he e on the site o t en h ba kfill alk-behin type o pa tion e ip ent is typi ally se fo o pa tion so e e o en pla ing fill in thin lifts not to e ee 4 in hes spe ially ithin oa ays an pa e ent a eas

eote hni al nginee on a f ll-ti e basis sho l obse e g a ing ope ations n-pla e ensity tests taken by that in i i al ill assess the eg ee of o pa tion being obtaine The f e en y of the testing sho l be ete ine by the eote hni al nginee

7.11 Retaining Walls

The follo ing etaining all e o en ations pe tain to ast-in-pla e b il ing an site etaining alls ithin the a eas e plo e an a e not inten e fo o la blo k o alls f o la blo k o alls a e planne on the site nite ons lting sho l be notifie be a se a itional e al ation ill be e i e to p o i e e o en ations spe ifi to the planne all types an lo ations

The esign of etaining alls st in l e the ete ination of the late al p ess e that ill a t on the all The late al ea th p ess e is a f n tion of the soil p ope ties s ha ge loa s behin the all an a o nt of efo ation that the all an n e go This efo ation is basi ally epen ent pon the elati e igi ity of the all syste

The a ti e ea th p ess e on ition e elops hen the all o es a ay f o the soil o e a s ffi ient istan e s h as fo a f eestan ing antile e all The at- est on ition e ists hen the e is no late al st ain on the soil s h as alls hi h a e igi ly est aine like a base ent o s b-fo n ation all The passi e on ition o s hen the all o es into the soil

The follo ing e i alent fl i p ess es a e e o en e fo th ee ea th p ess e on itions

Table 5 - Lateral Earth Pressures

Earth Pressure Condition	Earth Pressure Coefficient	Recommended Equivalent Fluid Pressure
ti e	0	4 psf foot
t- est	0	4 psf foot
assi e	2 77	2 psf foot

e note that onsi e able ho i□ontal efle tions a e e i e to obili□e the passi e p ess e the efo e the esigne sho l onsi e a safety fa to of 2 to the state lti ate passi e ea th p ess e in esign

The e o en e e i alent fl i p ess es a e base on an ass e soil ensity of 120 p f an inte nal f i tion angle of 2 eg ees an ohesion of □e o oeffi ient of f i tion of 0 4 fo sli ing ay be se fo the etaining all esign

The pa a ete s liste abo e a e base on a le el p ope ly o pa te ba kfill no f i tion at the all-soil inte fa e an no s ha ge effe ts o esign of etaining alls hi h o l be in n ate the b oyant nit eight of the in n ate soil sho l be se to ete ine the late al ea th p ess e The hy ostati p ess e base on the a i pon ing ele ation sho l be tili□e in the analysis

ea y o pa tion e ip ent sho l not be se to o pa t ba kfill ithin feet late ally behin any etaining all nless the all is esigne fo the in ease p ess e o te po a ily b a e The efo e light o pa tion e ip ent ay be e i e in this □one etaining all ba kfill sho l be o pa te to pe ent of the tan a o to a i y ensity pe anent ainage syste s h as a footing ain o a fab i ain s h as nka ain i a ain et is e o en e fo any etaining alls hi h a e o e than feet in height

The etaining alls sho l be esigne by a p ofessional enginee fa ilia ith etaining all esign an egiste e in eo gia The esigne sho l onsi e sloping ba kfill s ha ges an othe fa to s affe ting all loa ings The esigne sho l also onsi e lobal tability

8.0 LIMITATIONS

This epo t is fo the e l si e se of **Gwinnett County** an the esigne s of the p o e t es ibe he ein an ay only be applie to this spe ifi p o e t on l sions an e o en ations ha e been p epa e sing gene ally a epte stan a s of eote hni al nginee ing p a ti e in the tate of eo gia o othe a anty is e p esse o i plie fi is not esponsible fo on l sions opinions o e o en ations of othe s

The ight to ely pon this epo t an the ata ithin ay not be assigne itho t T LT itten pe ission

The s ope of this e al ation as li ite to an e al ation of the loa - a ying apabilities an stability of the s bsoils il ha a o s aste a ioa ti ity i itants poll tants ol s o othe ange o s s bstan e an on itions e e not the s b e t of this st y Thei p esen e an o absen e a e not i plie o s ggeste by this epo t an sho l not be infe e

on l sions an e o en ations a e base pon esign info ation f nishe to s ata obtaine f o the p e io sly es ibe e plo ation an testing p og a an o e pe ien e They o not efle t a iations in s bs fa e on itions that ay e ist inte e iate of o bo ings an in ne plo e a eas of the site ho l s h a iations be o e appa ent ing onst tion it ill be ne essa y to e- e al ate o on l sions an e o en ations base pon on-site obse ations of the on itions

f the esign o lo ation of the p o e t is hange the e o en ations ontaine he ein st be onsi e e in ali nless o fi e ie s the hanges an o e o en ations a e eithe e ifie o o ifie in iting hen esign is o plete e sho l be gi en the oppo t nity to e ie the fo n ation plan g a ing plan an appli able po tions of the spe ifi ations to onfi that they a e onsistent ith the intent of o e o en ations

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APPENDIX

General Notes/Narrative of Drilling Operations
Figure 1 – Boring Location Plan
Exploration Procedures
Laboratory Procedures
SPT Boring Logs (12)
Helical Pile Design Calculations Summary (1)
Lab Summary Sheet (4)
Liquid and Plastic Test Report (2)
Moisture Content Results (4)
Grain Size Distribution Curves (15)
Unconfined Compression Test Report (5)
Compaction Report (2)
Triaxial Test Results (2)
Analytical Lab Test Results (16)
Benching Detail

GENERAL NOTES

The soil classifications noted on the Boring Logs are visual classifications unless otherwise noted. Minor constituents of a soil sample are termed as follows:

Trace	0 - 10%
Some	11 - 35%
Suffix "y" or "ey"	36 - 49%

LEGEND

Split Spoon Sample obtained during Standard Penetration Testing

Relatively Undisturbed Shelby Tube Sample

Groundwater Level at Time of Boring Completion

Groundwater Level at 24 hours (or as noted) after Termination of Boring

w	Natural Moisture Content	
LL	Liquid Limit	
PL	Plastic Limit	Atterberg Limits
PI	Plasticity Index	
PF	Percent Fines (Percent Passing #200 Sieve)	
γ_d	Dry Unit Weight (Pounds per Cubic Foot or PCF	
γ_m	Moist or In-Situ Unit Weight (PCF)	
γ_{sat}	Saturated Unit Weight (PCF)	

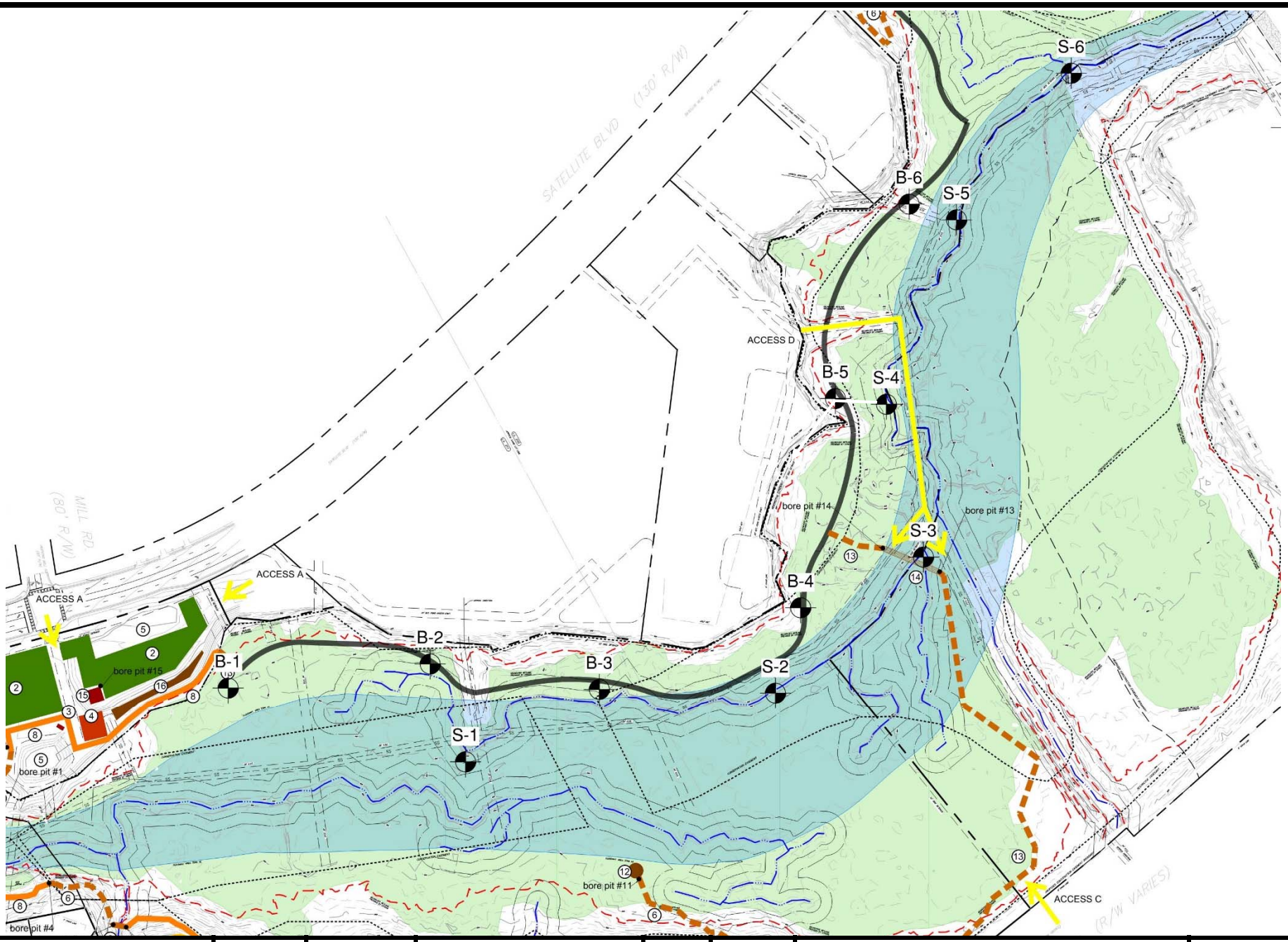
B L T T LL T

The test bo ings e e a e by e hani ally a an ing heli al hollo ste a ge s into the g o n a ples e e olle te at eg la inte als in ea h of the bo ings follo ing establishe p o e es fo pe fo ing the tan a enet ation Test in a o an e ith T pe ifi ation 1 oil sa ples e e obtaine ith a stan a 1 4□ 2 0□ split ba el sa ple The sa ple is fi st seate □to penet ate any loose ttings an then i en an a itional foot ith the blo s e i e of a 140-po n ha e f eely falling a istan e of 0 in hes The n be of blo s e i e to i e the sa ple the final foot is esignate the □stan a penet ation esistan e □ The i ing esistan e kno n as the □ □ al e an be o elate ith the elati e ensity of g an la soils an the onsisten y of ohesi e eposits

The follo ing table es ibes soil onsisten y an elati e ensities base on stan a penet ation esistan e al es ete ine by the tan a enet ation Test T

	□ □	onsisten y
lay an ilt	0-2	e y oft
	-4	oft
	-	i
	-1	tiff
	1 - 0	e y tiff
	e 1	a

	□ □	elati e ensity
an	0-4	e y Loose
	-10	Loose
	11-1	i
	20-2	e i ense
	0-4	ense
	0	e y ense



UNITED CONSULTING	N	Scale:	NTS	Notes	**Client:**	**Gwinnett County Dept. of Water Resources**
		Prepared:	SRT		**Site:**	**Beaver Ruin Wetlands Park South of Satellite Boulevard Duluth, Gwinnett County, Georgia**
		Checked:	RIO			
		Project No.:	GCDWR-20-GA-04273-01		**Title:**	**Boring Location Plan**

FIG. 1

EXPLORATION PROCEDURES

Standard Penetration Test (SPT) borings

T el e 12 T bo ings esignate B-1 th o gh B- an -1 th o gh - e e pe fo e at the app o i ate lo ations in i ate on the atta he Bo ing Lo ation lan ig e 1 The T bo ings e e pe fo e in gene al a o an e ith T 1 oil sa ples obtaine ing testing e e is ally e al ate by the o e t nginee an lassifie a o ing to the is al- an al p o e e es ibe in T 24 na ati e of fiel ope ations is in l e in The ppen i

The test lo ations in the fiel e e ete ine by the o e t nginee sing a han hel nit an o eas ing istan es f o e isting site feat es The test lo ations sho l the efo e be onsi e e app o i ate o n s fa e ele ations e e obtaine f o topog aphi ap p o i e by lient ate file ate 11 22 201 so g o n s fa e ele ations at the bo ing lo ations sho l be onsi e e app o i ate

LABORATORY PROCEDURES

Grain Size (Sieve) Analysis with or without Hydrometer

ain i e nalysis tests e e pe fo e to ete ine the pa ti le si e ist ib tion of sele te sa ples teste The g ain si e ist ib tion of soils oa se than a n be 200 sie e as ete ine by passing the sa ples th o gh a stan a set of neste sie es ate ials fine than the n be 200 sie es e e s spen e in ate an the g ain si e ist ib tion o p te f o the ti e ate of settle ent of the iffe ent si e pa ti les i - ie soil passe th o gh a 200 sie e 0 g a s of that st soak in s agent fo a ini of ho s oil is then p t in g a ate ylin e ith a hy o ete ea ings a e taken at spe ifie ti es g aph is a n f o ata These tests e e like those es ibe by T 421 an 422 The es lts a e in l e in The ppen i

Liquid and Plastic Limits (Atterberg Limits)

Li i Li it an lasti Li it tests ai in the lassifi ation of the soils an p o i e an in i ation of the soil beha io ith oist e hange The lasti ity n e is b a kete by the Li i Li it LL an the lasti Li it L The Li i Li it is the oist e ontent at hi h the soil ill flo as a hea y is o s fl i an is the ppe li it of the plasti ange as ete ine in a o an e ith T 4 1 The lasti Li it is the oist e ontent at hi h the soil begins to lose its plasti ity as ete ine in a o an e ith T 4 1 The lasti ity n e is the iffe en e bet een the Li i Li it an lasti Li it The Li i ity n e is the atio of the iffe en e bet een the in-pla e oist e an the plasti li it to the lasti ity Li it The ata obtaine a e in The ppen i

Moisture Content

The oist e ontent as ete ine fo sele te soil sa ples obtaine in the split spoon sa ple ep esentati e po tion of ea h sa ple as eighe an then pla e in an o en an ie at 110 eg ees entig a e fo at least 1 to 1 ho s fte e o al f o the o en the soil as again eighe The eight of the oist e lost ing ying th s as ete ine o this ata the oist e ontent of the sa ple as then al late as the eight of oist e i i e by y eight of the soil e p esse as a pe entage This test as on te a o ing to T 221 The oist e ontent es lts a e in i ate on the atta he bo ing logs

oist e ontent is a sef l in e of a soil s o p essibility f the soil is to be se as fill the oist e ontent ay be o pa e to the ange of ate ontent fo hi h p ope o pa tion ay be a hie e

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BORING LOG

CONTRACTED WITH: Gwinnett County Department of Water Resources BORING NO.: B-1
PROJECT NAME: Beaver Ruin Wetlands Park DATE: 9/22/20
JOB NO.: GCDWR-20-GA-04273-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 3" Topsoil	0							Automatic Hammer with Efficiency=94.7%
890	Sand - some clay and silt, trace mica; very loose; dark-tan (Residual) (SM)		1		1-1-2-2	3	6	30.9	PL=26; LL=34; PI=8
	Clay - trace silt and sand; soft; orange-brown/gray		2		2-2-2	4	16		
		5	3		N/A	N/A	24		Shelby tube sample collected from 4'-6' bgs
885	- firm		4		2-3-3-3	6	1	26.4	Groundwater encountered at 7 feet at the time of drilling and at 6 feet 24 hours after drilling
	- soft		5		1-2-2-3	4	24	27.6	
		10							
880									
	Sand - some silt, trace clay, trace mica, some rock; very loose; brown/dark gray	15	6		2-2-2	4	18	27.9	
875									
	- trace rock; loose; tan-brown	20	7		3-4-5	9	18		
870									
	- firm	25	8		3-5-7	12	18		
865									
		30	9		4-6-7	13	18		
	BORING TERMINATED AT 30 FEET								
860									
		35							
855									
		40							LL=Liquid Limit PL=Plastic Limit PI=Plasticity Index
850									

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BORING LOG

CONTRACTED WITH: Gwinnett County Department of Water Resources BORING NO.: B-2
PROJECT NAME: Beaver Ruin Wetlands Park DATE: 9/22/20
JOB NO.: GCDWR-20-GA-04273-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
890	Grass; 4" Topsoil	0							Automatic Hammer with Efficiency=94.7%
	Clay - silty, some sand; soft; orange-brown/ gray (Residual) (CL)		1		1-1-2-2	3	24	24.9	Bulk sample collected from 0'-5' bgs: PL=22; LL=40; PI=18 NM=25.2%
	- firm; gray-tan		2		2-3-3	6	18		
885			3		N/A	N/A	24		Shelby tube sample collected from 4'-6' bgs
			4		2-3-2-2	5	24	26.0	Groundwater encountered at 6 feet at the time of drilling and at 5 feet 24 hours after drilling
880	Sand - trace silt and clay, trace rock; loose; orange-brown/gray	10	5		2-4-5-4	9	24	21.8	
875	Partially weathered rock sampled as Sand - some silt, trace clay, some rock; very dense; brownish-gray	15	6		4-22-50/5	50/5	15	17.6	
870		20	7		50/0	50/0	0		
	AUGER REFUSAL AT 19.5 FEET								
865		25							
860		30							
855		35							
850		40							LL=Liquid Limit PL=Plastic Limit PI=Plasticity Index NM=Natural Moisture

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BORING LOG

CONTRACTED WITH: Gwinnett County Department of Water Resources BORING NO.: B-3
PROJECT NAME: Beaver Ruin Wetlands Park DATE: 9/22/20
JOB NO.: GCDWR-20-GA-04273-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 4" Topsoil	0							Automatic Hammer with Efficiency=94.7%
	No Recovery		1		1-2-2-2	4	0		
885	Clay - some sand, trace silt; soft; orange-brown/gray (Residual) (CL)		2		2-2-2	4	10		Groundwater encountered at 3 feet at the time of drilling and at 1 feet 24 hours after drilling
	- silty-sandy; gray-brown	5	3		N/A	N/A	24		Shelby tube sample collected from 4'-6' bgs: 4'-4.5': PL=20; LL=38; PI=18; NM=22.7% 4.5'-5.5': PL=16; LL= 25; PI= 9; NM=20.8% 5.5'-6': Non-Plastic; NM=22.5%
880	Sand - some silt and clay, trace rock; very loose; gray (SC) - trace silt and clay (SP)		4		1-1-1-1	2	24	34.9	
	- firm; orange-brown/gray	10	5		3-5-8-6	13	19	18.1	
875									
	- some rock	15	6		7-9-9	18	18	19.1	
870									
	PWR sampled as Sand - trace silt and clay, some rock; very dense; gray	20	7		50/2	50/2	1	18.2	
	AUGER REFUSAL AT 19 FEET								
865		25							
860		30							
855		35							
850		40							

LL=Liquid Limit
PL=Plastic Limit
PI=Plasticity Index
NM=Natural Moisture

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BORING LOG

CONTRACTED WITH: Gwinnett County Department of Water Resources BORING NO.: B-4
PROJECT NAME: Beaver Ruin Wetlands Park DATE: 9/22/20
JOB NO.: GCDWR-20-GA-04273-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass & Pine Needles; 4" Topsoil	0							Automatic Hammer with Efficiency=94.7%
	Sand - some clay and silt, some mica; loose; orange-brown/tan-brown (Residual) (SM)		1		2-4-5-6	9	24	25.7	
885	- firm		2		3-5-7	12	18		Bulk sample collected from 0'-5' bgs: PL=35; LL=52; PI=17 NM=21.6%
			3		N/A	N/A	24		Shelby tube sample collected from 4'-6' bgs
	- some silt, trace clay, some rock; loose; tan-brown/dark brown		4		3-3-4-4	7	24	20.2	Groundwater encountered at 8 feet at the time of drilling and at 5 feet 24 hours after drilling
880			5		3-4-5-5	9	24	23.9	
		10							
875									
	- firm		6		4-7-10	17	18		
		15							
870									
	- medium dense		7		7-10-16	26	18	19.0	
		20							
865									
	Partially weathered rock sampled as Sand - some silt, trace clay, some rock; very dense; brownish-gray		8		7-10-50/5	50/5	15		
		25							
860									
			9		50/1	50/1	1		
		30							
	BORING TERMINATED AT 30 FEET								
855									
		35							
850									
		40							LL=Liquid Limit PL=Plastic Limit PI=Plasticity Index NM=Natural Moisture

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BORING LOG

CONTRACTED WITH: Gwinnett County Department of Water Resources BORING NO.: B-5
PROJECT NAME: Beaver Ruin Wetlands Park DATE: 9/21/20
JOB NO.: GCDWR-20-GA-04273-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 3" Topsoil	0							Automatic Hammer with Efficiency=94.7%
	Sand - trace silt and clay; loose; gray-brown (Fill)		1		2-2-4-5	6	24	13.9	
885	Sand - some clay, trace silt; loose; orange brown/ gray-brown (Residual)		2		4-4-4	8	18		
	- trace silt and clay	5	3		N/A	N/A	24		Shelby tube sample collected from 4'-6' bgs
	- firm		4		4-6-6-5	12	24	25.0	Groundwater encountered at 8 feet at the time of drilling and at 6 feet 24 hours after drilling
880	- loose		5		3-5-5-7	10	24	18.4	
		10							
875									
	Partially weathered rock sampled as Sand - trace silt and clay, some rock; very dense; brownish-gray		6		50/5	50/5	4	15.4	
		15							
870									
			7		10-12-50/4	50/4	15		
		20							
865									
	- orange-brown/black/white		8		23-28-36	64	12		
		25							
	AUGER REFUSAL AT 26 FEET								
860									
		30							
855									
		35							
850									
		40							

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BORING LOG

CONTRACTED WITH: Gwinnett County Department of Water Resources BORING NO.: B-6
PROJECT NAME: Beaver Ruin Wetlands Park DATE: 9/23/20
JOB NO.: GCDWR-20-GA-04273-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 2" Topsoil	0							Automatic Hammer with Efficiency=94.7%
	Sand - some clay and silt, trace mica; very loose; orange-brown/red-brown (Residual) (SC)		1		1-1-2-2	3	12	23.6	PL=27; LL=46; PI=19
890	- trace clay, some mica; red-brown/tan-brown		2		2-2-2	4	18		Bulk sample collected from 0'-5' bgs
	- some clay (SM)	5	3		N/A	N/A	24		Shelby tube sample collected from 4'-6' bgs: 4'-4.5': PL=32; LL=57; PI=25; NM=27.9% 5'-6': PL=25; LL=35; PI=10; NM=40.8%
	Silt - sandy, some clay; soft; gray-brown (ML)		4		2-1-2-2	3	12	19.9	
885			5		1-2-2-1	4	9		Groundwater encountered at 8 feet at the time of drilling and at 6 feet 24 hours after drilling
		10							
880									
	Sand - some silt, trace clay, some mica, trace rock; loose; orange-brown/gray-brown	15	6		1-3-2	5	18	40.0	
875									
		20	7		3-4-5	9	12	29.8	
870									
	- firm; orange-brown/gray-brown	25	8		6-6-11	17	18	22.8	
865									
	Partially weathered rock sampled as Sand - some silt, trace clay, trace mica, some rock; very dense; gray-brown	30	9		18-40-50/5	50/5	16		
	BORING TERMINATED AT 30 FEET								
860									
		35							
855									
		40							

LL=Liquid Limit
PL=Plastic Limit
PI=Plasticity Index
NM=Natural Moisture

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BORING LOG

CONTRACTED WITH: Gwinnett County Department of Water Resources BORING NO.: S-1
PROJECT NAME: Beaver Ruin Wetlands Park DATE: 9/22/20
JOB NO.: GCDWR-20-GA-04273-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
890	Grass; 4" Topsoil	0							Automatic Hammer with Efficiency=94.7%
	Sand - trace silt and clay, trace mica; very loose; red-brown/tan-brown (Residual)		1		2-1-2-2	3	4	20.7	
	Clay - silty, some sand; firm; red-brown/gray (CL)		2		2-2-3-4	5	24	22.5	PL=24; LL=39; PI=15
885	Sand - some clay, trace silt, trace rock; loose; gray-brown	▼	3		2-4-3-2	7	19	18.0	Groundwater encountered at 8 feet at the time of drilling and at 5 feet 24 hours after drilling
	Clay - some sand, trace silt; firm; dark gray		4		3-2-3-2	5	24	38.1	
	Sand - some clay, trace silt, some rock; very loose; dark gray	▽	5		1-1-1-1	2	24	23.0	
880		10							
	- trace clay; medium dense; gray-brown	15	6		5-10-11	21	18		
875	BORING TERMINATED AT 15 FEET								
870		20							
865		25							
860		30							
855		35							
850		40							LL=Liquid Limit PL=Plastic Limit PI=Plasticity Index

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BORING LOG

CONTRACTED WITH: Gwinnett County Department of Water Resources BORING NO.: S-2
PROJECT NAME: Beaver Ruin Wetlands Park DATE: 9/22/20
JOB NO.: GCDWR-20-GA-04273-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 3" Topsoil	0							Automatic Hammer with Efficiency=94.7%
	Sand - some clay, trace silt, trace rock; very loose; red-brown/orange-brown (Residual)		1		1-2-1-3	3	24	43.8	
880	Clay - some sand and silt; firm; orange-brown/gray (CL)	▼	2		2-2-4-4	6	24	29.6	PL=25; LL=45; PI=20
	- soft	▽	3		2-2-2-2	4	24	28.3	Groundwater encountered at 5 feet at the time of drilling and at 3 feet 24 hours after drilling
875	Silt - some sand, trace clay, trace mica; firm; gray-brown		4		4-4-4-4	8	24	34.0	
	Sand - trace silt and clay, trace mica, some rock; very loose; orange-brown/gray		5		2-2-2-2	4	19	34.5	
		10							
870									
	- some silt; loose		6		2-2-3	5	18		
		15							
	BORING TERMINATED AT 15 FEET								
865									
		20							
860									
		25							
855									
		30							
850									
		35							
845									
		40							

LL=Liquid Limit
PL=Plastic Limit
PI=Plasticity Index

UNITED CONSULTING
625 HOLCOMB BRIDGE ROAD
NORCROSS, GEORGIA 30071
(770)209-0029, FAX (770)582-2800

BORING LOG

CONTRACTED WITH: Gwinnett County Department of Water Resources BORING NO.: S-3
PROJECT NAME: Beaver Ruin Wetlands Park DATE: 9/22/20
JOB NO.: GCDWR-20-GA-04273-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 4" Topsoil	0							Automatic Hammer with Efficiency=94.7%
	Sand - some clay, trace silt, trace mica; very loose; orange-brown/red-brown (Residual) (SM)		1		1-1-2-2	3	19	39.1	
880	- some silt, trace gravel and clay; loose; dark tan		2		3-5-4-4	9	24	19.3	Non-Plastic
	Clay - some sand, trace silt; soft; brownish-gray	5	3		1-1-2-2	3	15	22.0	Groundwater encountered at 7 feet at the time of drilling and at 4 feet 24 hours after drilling
	Sand - trace silt and clay; loose; gray		4		2-3-4-4	7	24	23.4	
875	Clay - trace silt and sand, trace mica; soft; brownish-gray		5		1-1-2-1	3	24	60.5	
		10							
870									
	Sand - some silt, trace clay, some mica and rock; very loose; orange-brown/gray-brown	15	6		2-1-2	3	18		
	BORING TERMINATED AT 15 FEET								
865									
		20							
860									
		25							
855									
		30							
850									
		35							
845									
		40							

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BORING LOG

CONTRACTED WITH: Gwinnett County Department of Water Resources BORING NO.: S-4
PROJECT NAME: Beaver Ruin Wetlands Park DATE: 9/21/20
JOB NO.: GCDWR-20-GA-04273-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
885	Grass; 4" Topsoil	0							Automatic Hammer with Efficiency=94.7%
	Sand - some clay, trace silt, trace mica; very loose; orange-brown/tan-brown (Residual)		1		1-1-2-3	3	24	19.9	
	- orange-brown/gray (CL-ML)	▼	2		2-2-2-2	4	24	23.4	PL=20; LL=26; PI=6
880	- trace clay; loose; dark gray	▽ 5	3		1-3-2-4	5	24	27.1	Groundwater encountered at 4 feet at the time of drilling and at 3 feet 24 hours after drilling
	- firm; orange-brown/white/black		4		4-6-9-10	15	24	18.2	
	- medium dense		5		8-9-12-17	21	24	13.8	
875		10							
	- some rock; very dense	15	6		15-30-31	61	18		
870	BORING TERMINATED AT 15 FEET								
865		20							
860		25							
855		30							
850		35							
845		40							LL=Liquid Limit PL=Plastic Limit PI=Plasticity Index

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BORING LOG

CONTRACTED WITH: Gwinnett County Department of Water Resources BORING NO.: S-5
PROJECT NAME: Beaver Ruin Wetlands Park DATE: 9/23/20
JOB NO.: GCDWR-20-GA-04273-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
880	Grass; 3" Topsoil	0							Automatic Hammer with Efficiency=94.7%
	Sand - some clay, trace silt, trace mica; very loose; red-brown/tan-brown (Residual) (SM)		1		1-1-2-2	3	15	27.9	
	- some silt, trace clay and rock; loose; gray-brown/dark tan		2		2-3-3-3	6	24	23.9	PL=25; LL=34; PI=9
875	- trace rock; very loose	5	3		2-1-2-2	3	19	21.5	Groundwater encountered at 6 feet at the time of drilling and at 4 feet 24 hours after drilling
			4		1-2-1-1	3	24	20.8	
870	- some silt, trace clay; gray-brown/orange-brown	10	5		1-1-1-1	2	12	28.8	
	- loose	15	6		2-2-4	6	18		
865	BORING TERMINATED AT 15 FEET								
860		20							
855		25							
850		30							
845		35							
840		40							LL=Liquid Limit PL=Plastic Limit PI=Plasticity Index

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NORCROSS, GEORGIA 30071
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BORING LOG

CONTRACTED WITH: Gwinnett County Department of Water Resources BORING NO.: S-6
PROJECT NAME: Beaver Ruin Wetlands Park DATE: 9/23/20
JOB NO.: GCDWR-20-GA-04273-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
880	Grass; 3" Topsoil	0							Automatic Hammer with Efficiency=94.7%
	Clay - trace silt and sand, trace mica; soft; orange-brown (Residual) (CL)		1		1-1-2-3	3	24	35.9	
	- silty, some sand; stiff; dark brown	▼	2		3-5-4-4	9	24	32.1	PL=22; LL=32; PI=10
875	- trace silt; very soft; gray	▽ 5	3		1-1-1-1	2	24		Groundwater encountered at 4 feet at the time of drilling and at 3 feet 24 hours after drilling
	Sand - some clay, trace silt, trace rock; very loose; gray-brown		4		1-1-2-1	3	24	34.1	
	- some rock; gray		5		2-1-1-9	2	24	48.4	
870		10							
	- some silt, trace clay, some rock; medium dense	15	6		13-13-16	29	18		
865	BORING TERMINATED AT 15 FEET								
860		20							
855		25							
850		30							
845		35							
840		40							LL=Liquid Limit PL=Plastic Limit PI=Plasticity Index

Beaver Ruin Wetlands Park
Gwinnett County Department of Water Resources

			Helical Pile Design Calculations Summary (Axial and Lateral Capacity)											
Structure	**Boring ID**	**Ground Surface Elevation[1] (ft-msl)**	**Depth to Dense Soil (ft-bgs) (N_{60} > 30 bpf)**	**Factored Axial Loads[2] (Kips)**	**Service Level Axial Loads[2] (Kips)**	**Factored Lateral Load[2] (Kips)**	**Service Level Lateral Load[2] (Kips)**	**Service Level Lateral Load Converted to Compression/ Tension Load[3] (kips)**	**Pile Type[4,5]**	**Battered Pile Design Compression/ Tension Service Load[3] (Kips)**	**Battered Piles Minimum Installation Torque[6] (Ft-lb) K_t= 10 ft^{-1}**	**Minimum Depth to Top Helix (ft-bgs)**	**Minimum Depth to Bottom Helix Plate (Vertical Pile Length) (ft-bgs)**	**Estimated Helical Pile Tip Elevation[7] (ft-msl)**
DWR Trail/ Boardwalk	B-1	891	>30	33.54	24.34	2.63	1.5	6.2	CHANCE SS175 - Square 1-¾" Shaft 14",12",10" Helices (2 Battered Piles at 1h:4v (14°) @ ≥ 6 ft) Torque Rating 10,500 Ft-lb	30.5	6,108	18.5	25	866
	B-2	889	13.5									9.5	15	874
	B-3	887	18.5									10.5	17	870
	B-4	887	18.5									10.5	17	870
	B-5	888	13.5									7.5	14	874
	B-6	892	28.5									17.5	24	868

Notes:
(1) Ground Surface Elevations are interpolated from provided Topographic Plan provided by the client dated (file date) 11/22/2019 and should be considered approximate.
(2) Loads provided by John Pyle of PermaTrak in an E-Mail Attachment dated 11/23/2020
(3) Battered piles are designed to handle the axial and lateral Service Loads. The 1.5 kips Service Lateral Load in each pile (total of 3 kips per bent) is transfered to pile axial compression and tension load, respectively when the load is applied along the bent.
(4) Alternative pile sizes and helix size configurations may be used by the helical pile installer provided the minimum pile ultimate (Factored) capacities design loads specified for the project are met.
(5) We recommend a minimum FOS=2 for Compression and Tension Strength of helical piles.
(6) At least one vertical pile load test using the top large helix (14") should be performed to check the Kt factor used to calculate the ultimate helical pile ultimate (Nominal Strength) bearing capacity from the installation torque measured in the field.
(7) Final pile tip elevation to be determined in the field based on the minimum pile installation torque rating required to achieve the ultimate capacity of the pile.

Beaver Ruin Wetlands Park
SUMMARY OF SOIL DATA

Sample Identification		Sample Type	Sample Depth	Soil Classi-fication	As R'cd Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Organic Contant %	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
Borehole Number	Sample ID					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %			Moisture %	Dry (lb/cuft)		
B-1	1	Bag	0-2	SM	30.9	34	26	8	0.61	100.0	43.3	40.0	-	-	-	-	-	-	-	
B-1	2	Bag	2-3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,Re,C,S
B-1	4	Bag	6-8	-	26.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-1	5	Bag	8-10	-	27.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-1	6	Bag	13.5-15	-	27.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-1	4	Bag	6-8	-	26.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-2	1	Bag	0-2	-	24.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-2	1A	Bulk	0-5	CL	25.2	40	22	18	0.18	100.0	77.1	70	106.6	17.8	-	-	-	-	-	
B-2	2	Bag	2-3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,Re,C,S
B-2	4	Bag	6-8	-	26	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-2	5	Bag	8-10	-	21.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-2	6	Bag	13.5-15	-	17.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-3	2	Bag	2-3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,Re,C,S
B-3	3A	Shelby	4-4.5	CL	22.7	38	20	18	0.15	100.0	63.1	55	-	-	2.7	-	-	-	-	U
B-3	3B	Shelby	4.5-5.5	SC	20.8	25	16	9	0.53	100.0	45.8	40	-	-	2.7	-	-	-	-	U
B-3	3C	Shelby	5.5-6	SP	22.5	NV	NP	NP	NP	100.0	4.2	2	-	-	2.7	-	-	-	-	U
B-3	4	Bag	6-8	-	34.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-3	5	Bag	8-10	-	18.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-3	6	Bag	13.5-15	-	19.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-3	7	Bag	18.5-20	-	18.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-4	1	Bag	0-2	-	25.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

ABBREVIATIONS:
LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
MOISTURE (Mc)
NP - NO PLASTICITY
NV - NO VALUE

United Consulting

NOTES:
T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
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C = CHLORIDE CONTENT
P = pH
Re = Resistivity
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Beaver Ruin Wetlands Park
SUMMARY OF SOIL DATA

Sample Identification		Sample Type	Sample Depth	Soil Classi-fication	As R'cd Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Organic Contant %	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
Borehole Number	Sample ID					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %			Moisture %	Dry (lb/cuft)		
B-4	1A	Bulk (R)	0-5	SM	21.6	52	35	17	-0.79	100.0	45.6	42.0	101.3	20.6	2.7	-	26.7	97.9	-	T
B-4	2	Bag	2-3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,R,C,S
B-4	4	Bag	6-8	-	20.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-4	5	Bag	8-10	-	23.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-4	7	Bag	18.5-20	-	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-5	1	Bag	0-2	-	13.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-5	2	Bag	2-3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,R,C,S
B-5	4	Bag	6-8	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-5	5	Bag	8-10	-	18.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-5	6	Bag	13.5-15	-	15.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-6	1	Bag	0-2	SC	23.6	46	27	19	-0.18	100.0	47.5	45	-	-	-	-	-	-	-	
B-6	2	Bag	2-3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,R,C,S
B-6	3A	Shelby	4-4.5	SM	27.9	57	32	25	-0.16	100.0	46.8	43	-	-	2.7	-	-	-	-	U
B-6	3B	Shelby	5-6	ML	40.8	35	25	10	1.58	100.0	65.3	60	-	-	2.7	-	-	-	-	U
B-6	4	Bag	6-8	-	19.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-6	6	Bag	13.5-15	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-6	7	Bag	18.5-20	-	29.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-6	8	Bag	23.5-25	-	22.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-1	1	Bag	0-2	-	20.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-1	2	Bag	2-4	CL	22.5	39	24	15	-0.10	100.0	81	70	-	-	-	-	-	-	-	
S-1	3	Bag	4-6	-	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

ABBREVIATIONS:
LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
REMOLDED (R)
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NV - NO VALUE

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Beaver Ruin Wetlands Park
SUMMARY OF SOIL DATA

Sample Identification		Sample Type	Sample Depth	Soil Classi-fication	As R'cd Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Organic Contant %	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
Borehole Number	Sample ID					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %			Moisture %	Dry (lb/cuft)		
S-1	4	Bag	6-8	-	38.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-1	5	Bag	8-10	-	23.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-2	1	Bag	0-2	-	43.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-2	2	Bag	2-4	CL	29.6	45	25	20	0.23	100.0	71.6	65	-	-	-	-	-	-	-	
S-2	3	Bag	4-6	-	28.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-2	4	Bag	6-8	-	34.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-2	5	Bag	8-10	-	34.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-3	1	Bag	0-2	-	39.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-3	2	Bag	2-4	SM	19.3	NV	NP	NP	NP	95.0	15.3	13	-	-	-	-	-	-	-	
S-3	3	Bag	4-6	-	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-3	4	Bag	6-8	-	23.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-3	5	Bag	8-10	-	60.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-4	1	Bag	0-2	-	19.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-4	2	Bag	2-4	CL-ML	23.4	26	20	6	0.57	100.0	69.3	50	-	-	-	-	-	-	-	
S-4	3	Bag	4-6	-	27.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-4	4	Bag	6-8	-	18.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-4	5	Bag	8-10	-	13.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-5	1	Bag	0-2	-	27.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-5	2	Bag	2-4	SM	23.9	34	25	9	-0.12	100.0	31.4	25	-	-	-	-	-	-	-	
S-5	3	Bag	4-6	-	21.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-5	4	Bag	6-8	-	20.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

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Beaver Ruin Wetlands Park
SUMMARY OF SOIL DATA

Sample Identification		Sample Type	Sample Depth	Soil Classi-fication	As R'cd Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Organic Contant %	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
Borehole Number	Sample ID					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %			Moisture %	Dry (lb/cuft)		
S-5	5	Bag	8-10	-	28.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-6	1	Bag	0-2	-	35.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-6	2	Bag	2-4	CL	32.1	32	22	10	1.01	100.0	77.8	71	-	-	-	-	-	-	-	
S-6	4	Bag	6-8	-	34.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S-6	5	Bag	8-10	-	48.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

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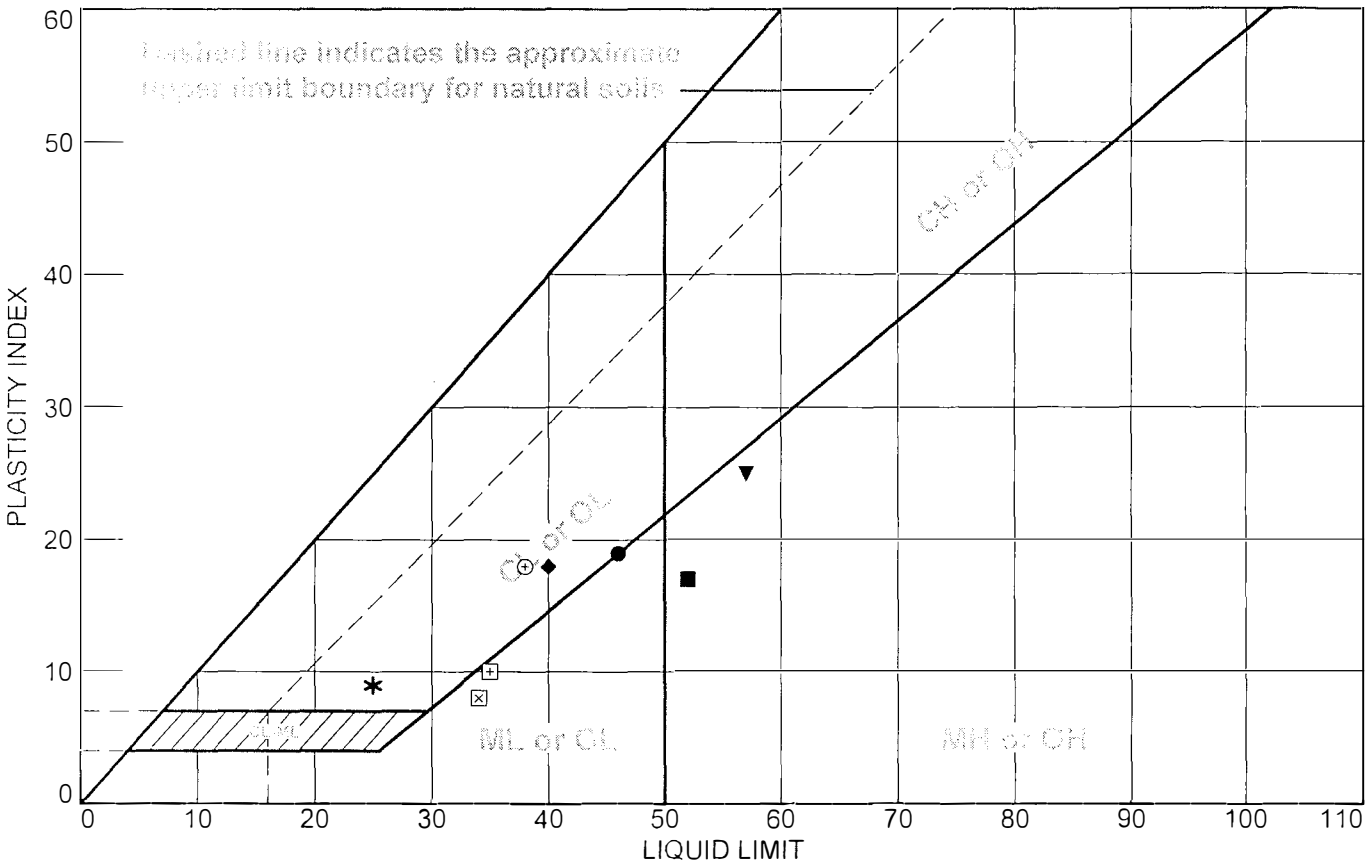
LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA								
	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		B-6	0-2 ft	23.6	27	46	19	SC
■		B-4(Bulk)	0-5.0'	21.6	35	52	17	SM
▲		B-3(Bottom)	5.5-6 ft	22.5	NP	NV	NP	SP
◆		B-2(Bulk)	0-5 ft	25.2	22	40	18	CL
▼		B-6 (Top)	4-4.5 ft	27.9	32	57	25	SM
✱		B-3(Middle)	4.5-5.5 ft	20.8	16	25	9	SC
⊙		B-3(Top)	4-4.5 ft	22.7	20	38	18	CL
⊡		B-6 (Bottom)	5-6 ft	40.8	25	35	10	ML
●		S-3	2-4 ft	19.3	NP	NV	NP	SM
⊠		B-1	0-2 ft	30.9	26	34	8	SM

United Consulting

Norcross, Georgia

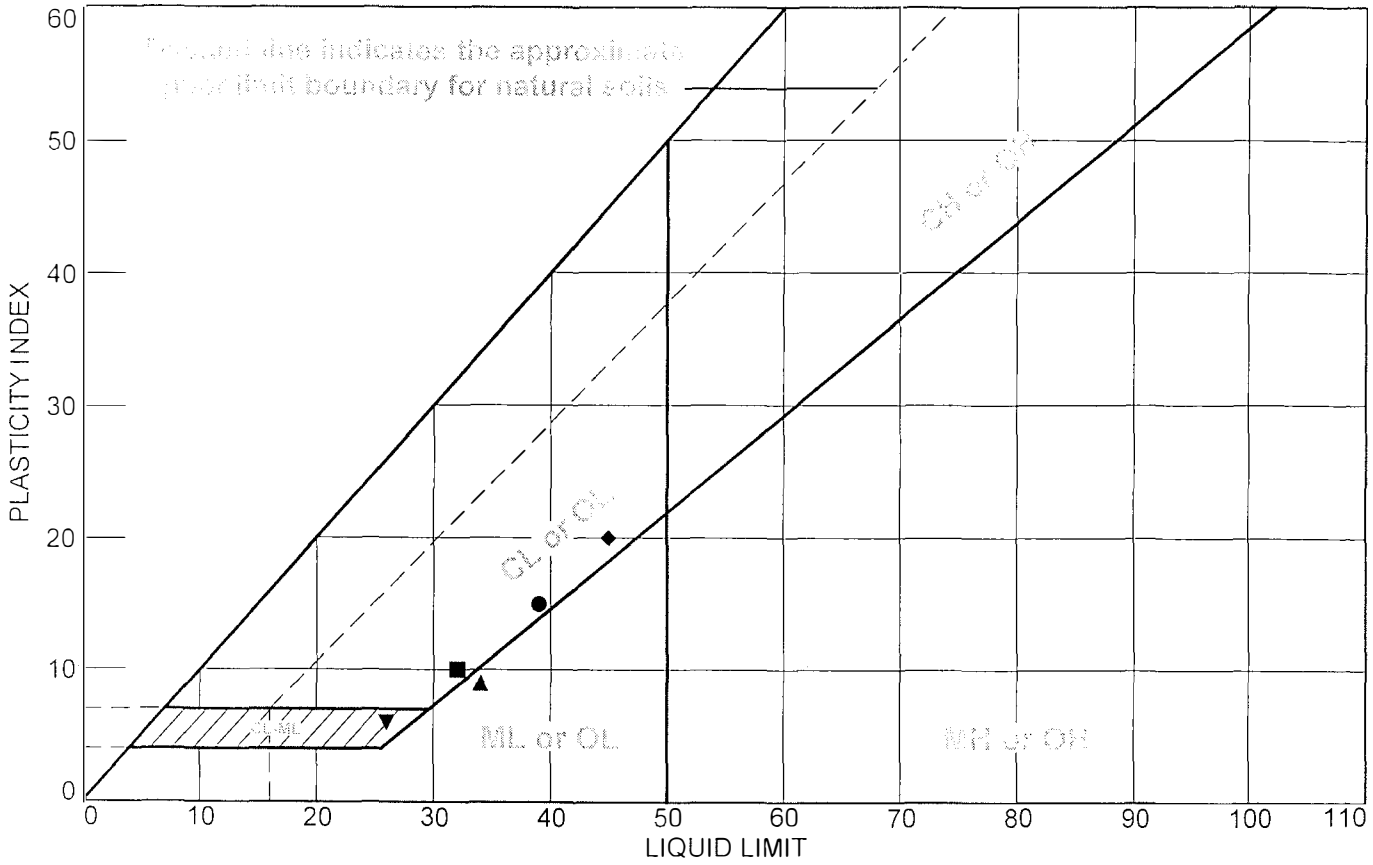
Client: Gwinnett co dept of Water Resources

Project: Beaver Ruin Wetlands Park

Project No.: GCDWR20GA0427301

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		S-1	2-4 ft	22.5	24	39	15	CL
■		S-6	2-4 ft	32.1	22	32	10	CL
▲		S-5	2-4 ft	23.9	25	34	9	SM
◆		S-2	2-4 ft	29.6	25	45	20	CL
▼		S-4	2-4 ft	23.4	20	26	6	CL-ML

United Consulting

Norcross, Georgia

Client: Gwinnett co dept of Water Resources

Project: Beaver Ruin Wetlands Park

Project No.: GCDWR20GA0427301

Figure

Moisture Content
ASTM D 2216 / AASHTO T-265 / UC SOP L4
DATA SHEET

Project #:	GCDWR20GA0427301	**Tested By:**	**SH**
Project Name:	Beaver Ruin Wetlands Park	**Date Tested:**	**11/6/2020**
Received Date:	**11/6/2020**	**Reviewed by:**	**MS**
		Revised date:	**11/23/2020**

BORING NO.	DEPTH (ft.)	Tare Weight (g)	Wet Sample and Tare (g)	Dry Sample and Tare (g)	Moisture Content (%)
B-6	6-8	37.65	174.74	152.00	**19.9**
S-1	6-8	32.94	165.60	128.99	**38.1**
B-3	18.5-20	37.63	158.21	139.63	**18.2**
B-5	13.5-15	33.06	143.91	129.14	**15.4**
S-5	4-6	37.85	196.42	168.33	**21.5**
B-6	18.5-20	37.48	193.91	157.97	**29.8**
S-5	6-8	33.00	244.70	208.27	**20.8**
B-2	8-10	33.07	235.05	198.87	**21.8**
S-4	8-10	33.17	176.09	158.79	**13.8**
B-5	8-10	32.92	195.64	170.41	**18.4**
B-4	6-8	27.11	198.00	169.27	**20.2**
B-4	18.5-20	27.07	172.80	149.58	**19.0**
B-2	6-8	32.81	201.74	166.86	**26.0**

Moisture Content
ASTM D 2216 / AASHTO T-265 / UC SOP L4
DATA SHEET

Project #: GCDWR20GA0427301
Project Name: Beaver Ruin Wetlands Park
Received Date: 11/6/2020

Tested By: SH
Date Tested: 11/6/2020
Reviewed by: MS
Revised date: 11/23/2020

BORING NO.	DEPTH (ft.)	Tare Weight (g)	Wet Sample and Tare (g)	Dry Sample and Tare (g)	Moisture Content (%)
B-5	0-2	37.66	193.30	174.29	**13.9**
B-4	8-10	37.45	190.60	161.02	**23.9**
S-3	6-8	32.82	188.97	159.32	**23.4**
S-3	4-6	22.59	148.79	126.03	**22.0**
B-6	23.5-25	22.58	136.24	115.11	**22.8**
S-2	0-2	22.61	140.45	104.54	**43.8**
S-5	0-2	22.48	146.66	119.55	**27.9**
S-2	4-6	22.33	157.97	128.04	**28.3**
S-4	0-2	22.73	157.27	134.91	**19.9**
B-6	13.5-15	22.37	149.53	113.18	**40.0**
B-3	13.5-15	22.74	134.82	116.82	**19.1**
B-4	0-2	123.01	284.03	251.08	**25.7**
S-2	6-8	22.79	166.12	129.74	**34.0**

Moisture Content
ASTM D 2216 / AASHTO T-265 / UC SOP L4
DATA SHEET

Project #: GCDWR20GA0427301
Project Name: Beaver Ruin Wetlands Park
Received Date: 11/6/2020

Tested By: SH
Date Tested: 11/6/2020
Reviewed by: MS
Revised date: 11/23/2020

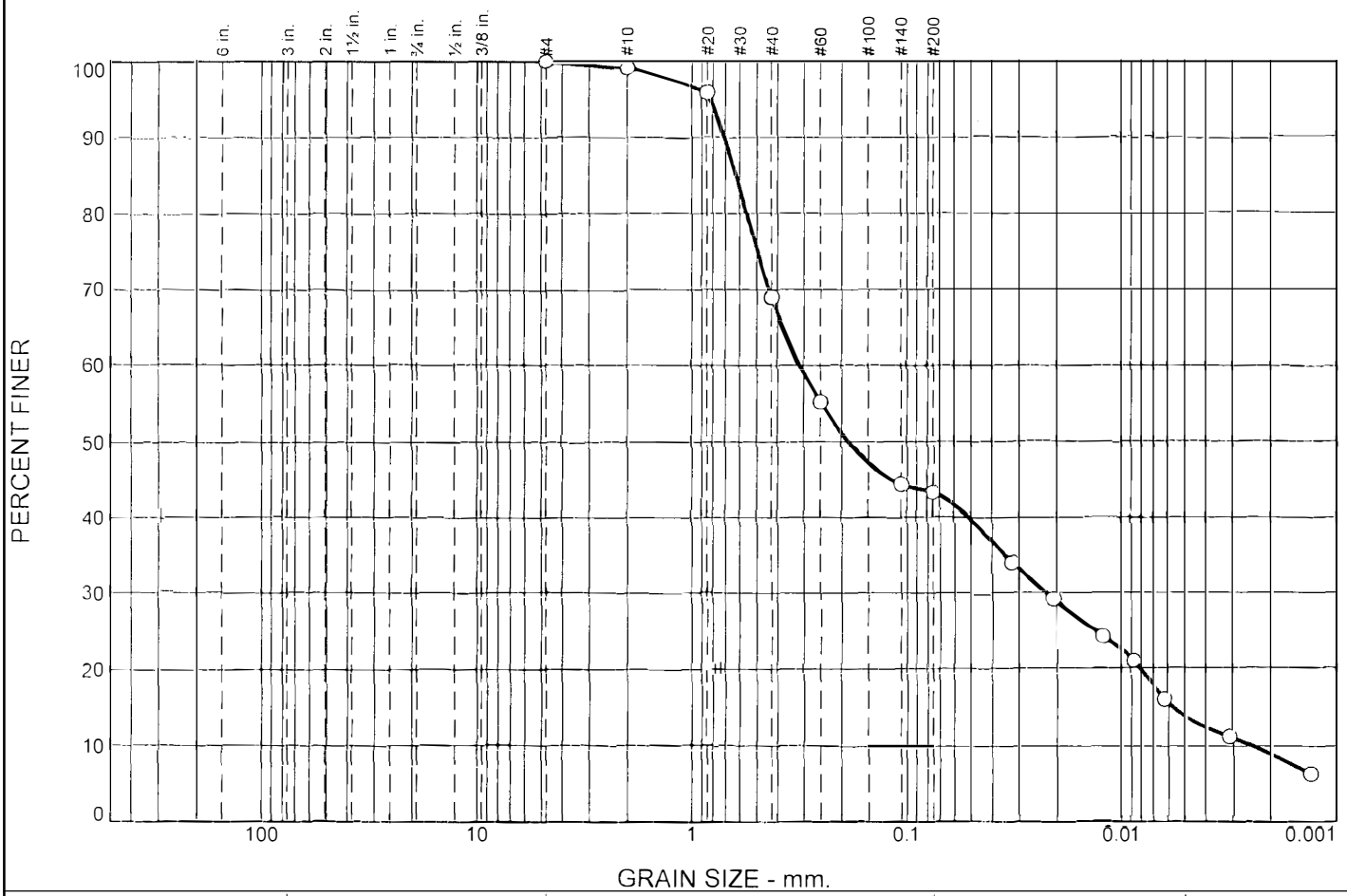
BORING NO.	DEPTH (ft.)	Tare Weight (g)	Wet Sample and Tare (g)	Dry Sample and Tare (g)	Moisture Content (%)
S-2	8-10	33.05	226.05	176.59	**34.5**
S-1	8-10	32.81	170.66	144.85	**23.0**
B-2	13.5-15	33.29	206.69	180.79	**17.6**
B-2	0-2	32.71	180.77	151.24	**24.9**
B-7	18.5-20	37.56	176.88	143.84	**31.1**
B-1	13.5-15	33.03	187.36	153.73	**27.9**
B-1	8-10	33.03	190.46	156.37	**27.6**
B-1	6-8	32.95	197.84	163.45	**26.4**
S-1	0-2	33.14	69.19	63	**20.7**
B-3	8-10	33.16	211.25	183.98	**18.1**
B-3	6-8	32.85	182.16	143.53	**34.9**
B-5	6-8	37.48	199.51	167.13	**25.0**
S-1	4-6	37.58	190.37	167.1	**18.0**

Moisture Content
ASTM D 2216 / AASHTO T-265 / UC SOP L4
DATA SHEET

Project #:	GCDWR20GA0427301	**Tested By:**	**SH**
Project Name:	Beaver Ruin Wetlands Park	**Date Tested:**	**11/6/2020**
Received Date:	**11/6/2020**	**Reviewed by:**	**MS**
		Revised date:	**11/23/2020**

BORING NO.	DEPTH (ft.)	Tare Weight (g)	Wet Sample and Tare (g)	Dry Sample and Tare (g)	Moisture Content (%)
S-5	8-10	22.50	161.73	130.58	**28.8**
S-6	6-8	14.92	124.14	96.37	**34.1**
S-3	0-2	15.00	123.29	92.86	**39.1**
S-6	8-10	14.96	122.06	87.13	**48.4**
S-4	6-8	14.73	105.35	91.41	**18.2**
S-3	8-10	14.94	113.87	76.57	**60.5**
S-4	4-6	14.70	127.67	103.56	**27.1**
S-6	0-2	14.41	106.02	81.82	**35.9**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	56.7	29.6	13.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.1		
#20	96.0		
#40	69.0		
#60	55.2		
#140	44.3		
#200	43.3		

* (no specification provided)

Material Description

Sand, some silt and clay, dark tan

Atterberg Limits

PL= 26 LL= 34 PI= 8

Coefficients

D_{90}= 0.7066 D_{85}= 0.6240 D_{60}= 0.3135
D_{50}= 0.1855 D_{30}= 0.0226 D_{15}= 0.0057
D_{10}= 0.0024 C_u= 128.08 C_c= 0.66

Classification

USCS= SM AASHTO= A-4(1)

Remarks

Sample Number: B-1 **Depth:** 0-2 ft

Date: 11/6/2020

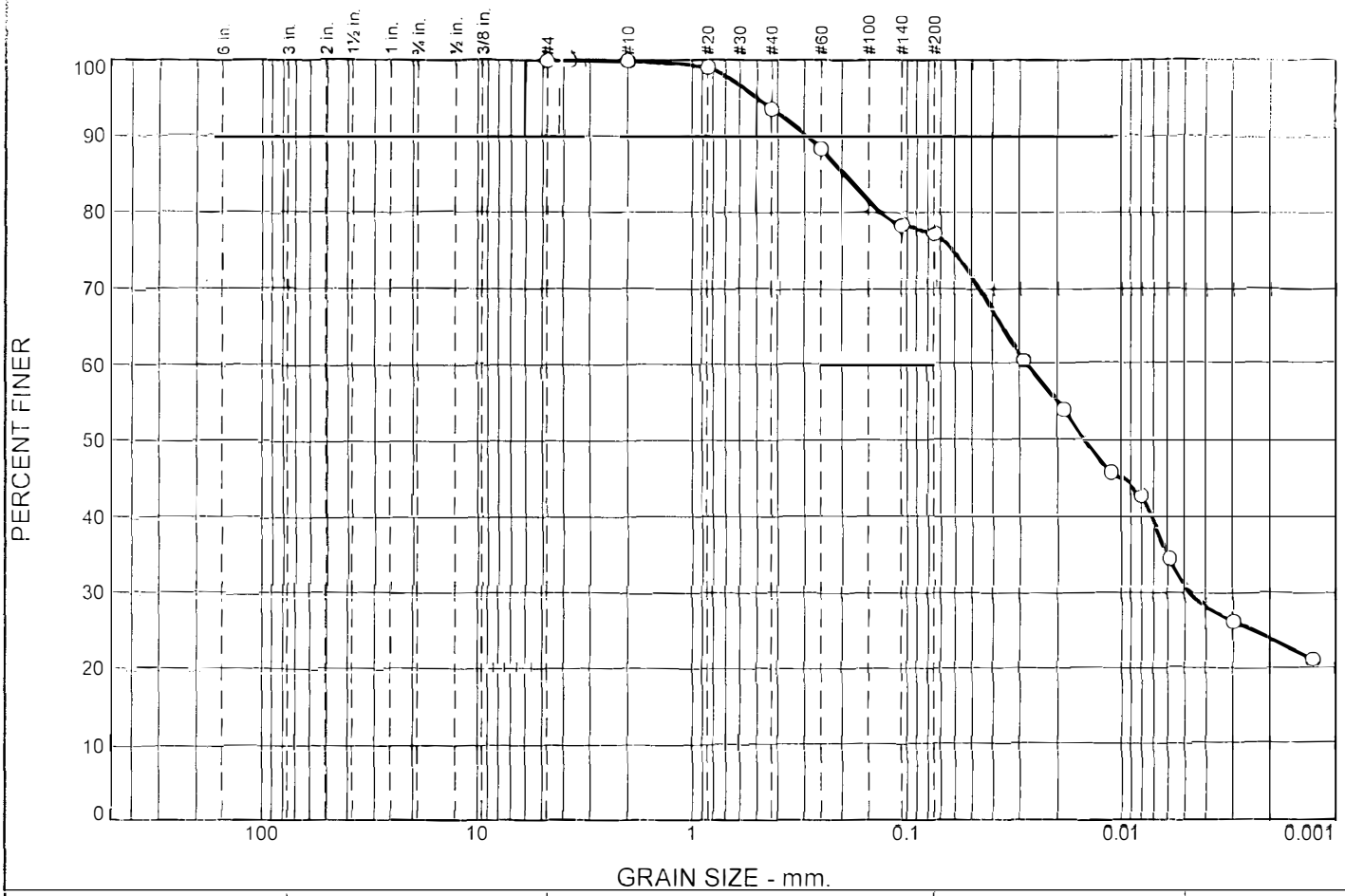
United Consulting

Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park

Project No: GCDWR20GA0427301 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	22 .9	46.2	30.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.0		
#40	93.6		
#60	88.3		
#140	78.3		
#200	77.1		

* (no specification provided)

Material Description

Clay-silty, some sand, gray tan

Atterberg Limits

PL= 22 LL= 40 PI= 18

Coefficients

D_{90}= 0.2913 D_{85}= 0.1959 D_{60}= 0.0276
D_{50}= 0.0149 D_{30}= 0.0047 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(13)

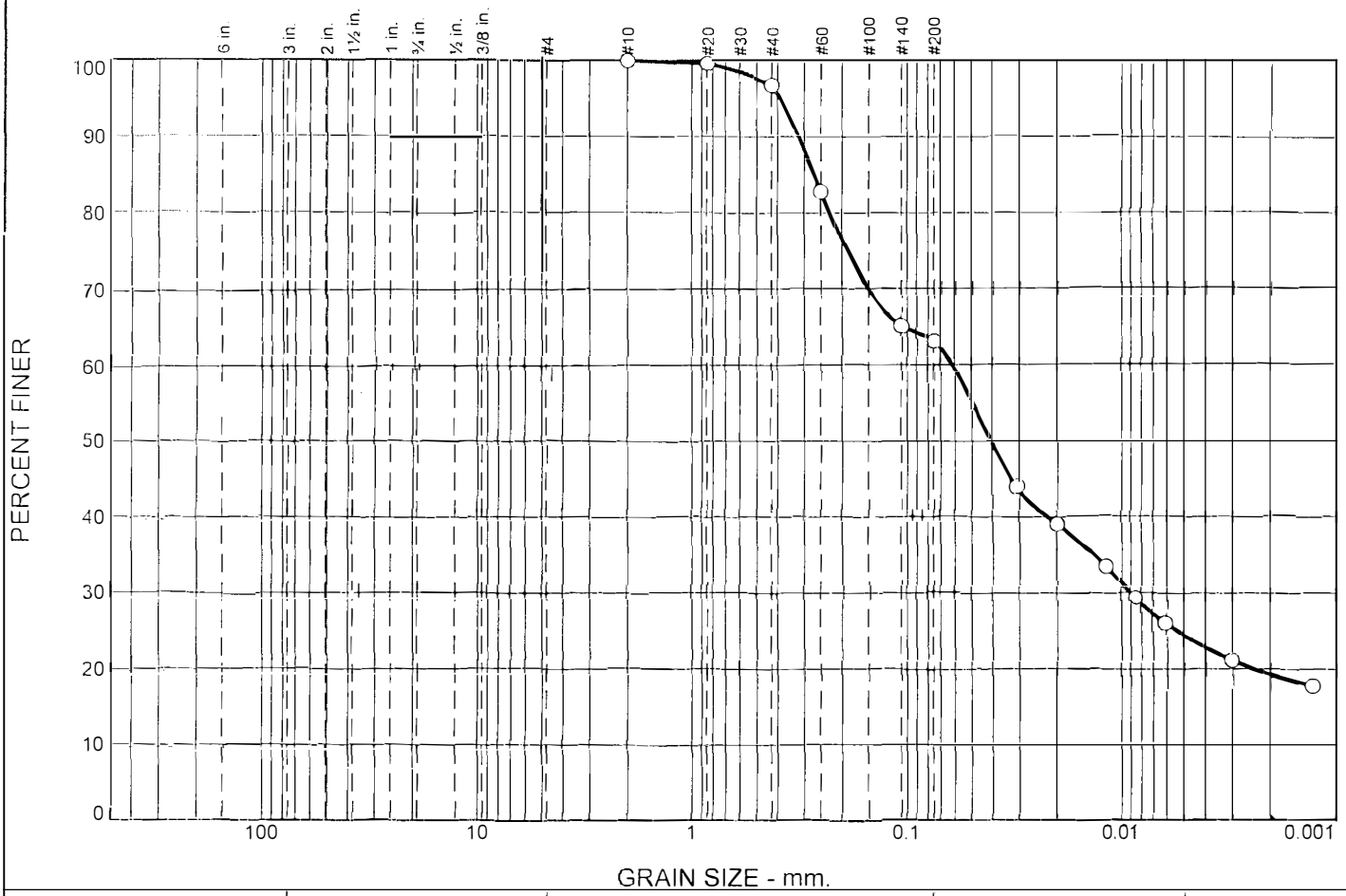
Remarks

Sample Number: B-2(Bulk) **Depth:** 0-5 ft

Date: 11/6/2020

United Consulting **Norcross, Georgia**	**Client:** Gwinnett co dept of Water Resources **Project:** Beaver Ruin Wetlands Park **Project No:** GCDWR20GA0427301 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	36.9	38.7	24.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.6		
#40	96.8		
#60	82.8		
#140	65.1		
#200	63.1		

* (no specification provided)

Material Description

Clay-silty-sandy, gray and brown

Atterberg Limits

PL= 20 LL= 38 PI= 18

Coefficients

D_{90}= 0.3184 D_{85}= 0.2689 D_{60}= 0.0613
D_{50}= 0.0406 D_{30}= 0.0090 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(9)

Remarks

Sample Number: B-3(Top) **Depth:** 4-4.5 ft

Date: 11/6/2020

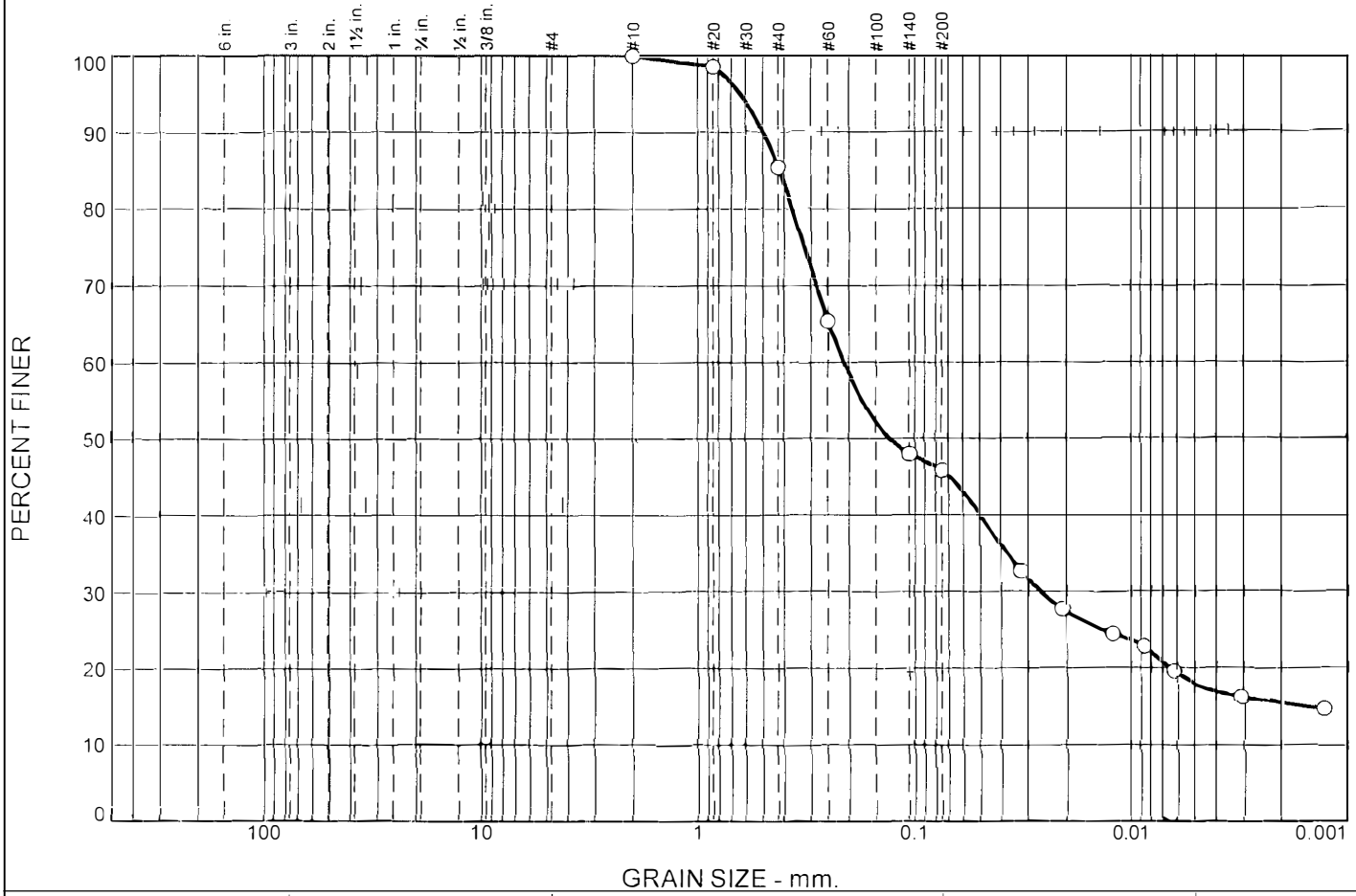
United Consulting

Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park

Project No: GCDWR20GA0427301 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	54.2	27.9	17.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	98.6		
#40	85.4		
#60	65.4		
#140	48.0		
#200	45.8		

* (no specification provided)

Material Description

Sand, some silt and clay, gray

Atterberg Limits

PL= 16 LL= 25 PI= 9

Coefficients

D_{90}= 0.4978 D_{85}= 0.4198 D_{60}= 0.2111
D_{50}= 0.1298 D_{30}= 0.0265 D_{15}= 0.0016
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-4(1)

Remarks

Sample Number: B-3(Middle) **Depth:** 4.5-5.5 ft

Date: 11/6/2020

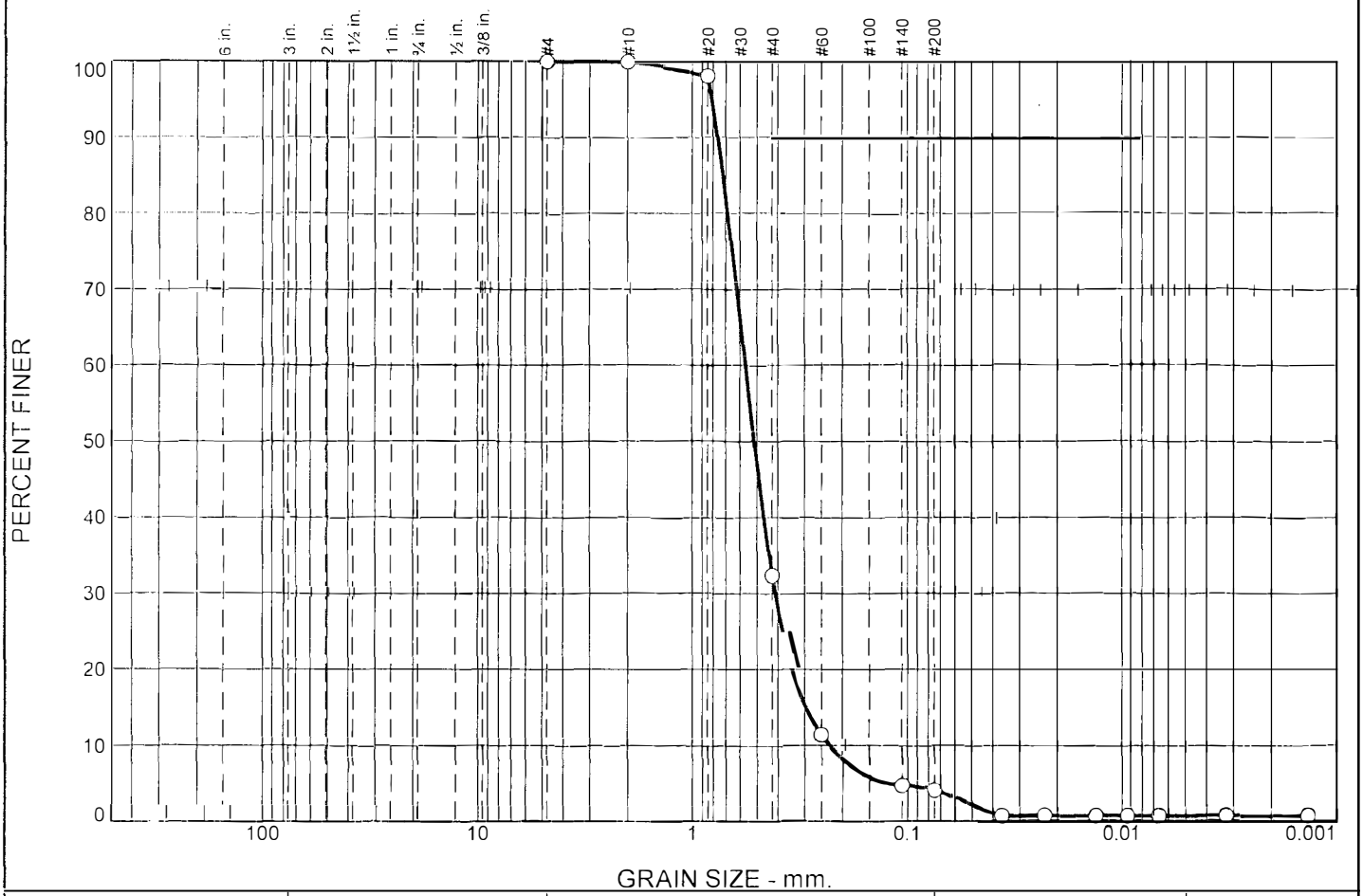
United Consulting

Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park

Project No: GCDWR20GA0427301 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	95.8	3.5	0.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	98.1		
#40	32.3		
#60	11.4		
#140	4.8		
#200	4.2		

* (no specification provided)

Material Description

Sand, trace silt and clay, gray

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.7625 D_{85}= 0.7208 D_{60}= 0.5660
D_{50}= 0.5150 D_{30}= 0.4117 D_{15}= 0.2971
D_{10}= 0.2294 C_u= 2.47 C_c= 1.31

Classification

USCS= SP AASHTO= A-1-b

Remarks

Sample Number: B-3(Bottom) **Depth:** 5.5-6 ft

Date: 11/6/2020

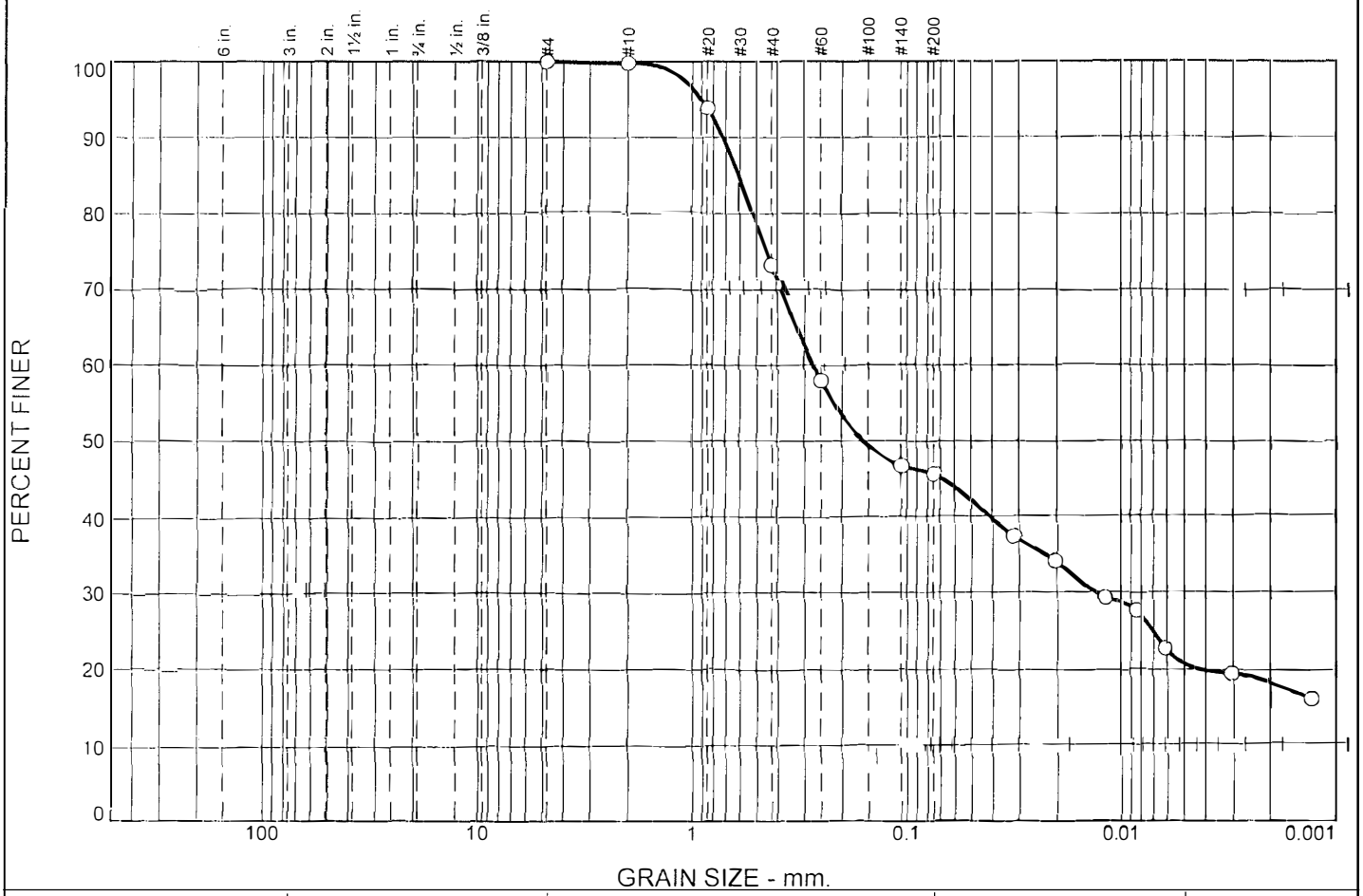
United Consulting

Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park

Project No: GCDWR20GA0427301 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	54.4	24.9	20.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	93.8		
#40	73.2		
#60	58.0		
#140	46.7		
#200	45.6		

* (no specification provided)

Material Description

Sand, some silt and clay, orange brown

Atterberg Limits

PL= 35 LL= 52 PI= 17

Coefficients

D_{90}= 0.7224 D_{85}= 0.6086 D_{60}= 0.2720
D_{50}= 0.1594 D_{30}= 0.0134 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-7-5(5)

Remarks

Sample Number: B-4(Bulk) **Depth:** 0-5.0'

Date: 11/6/2020

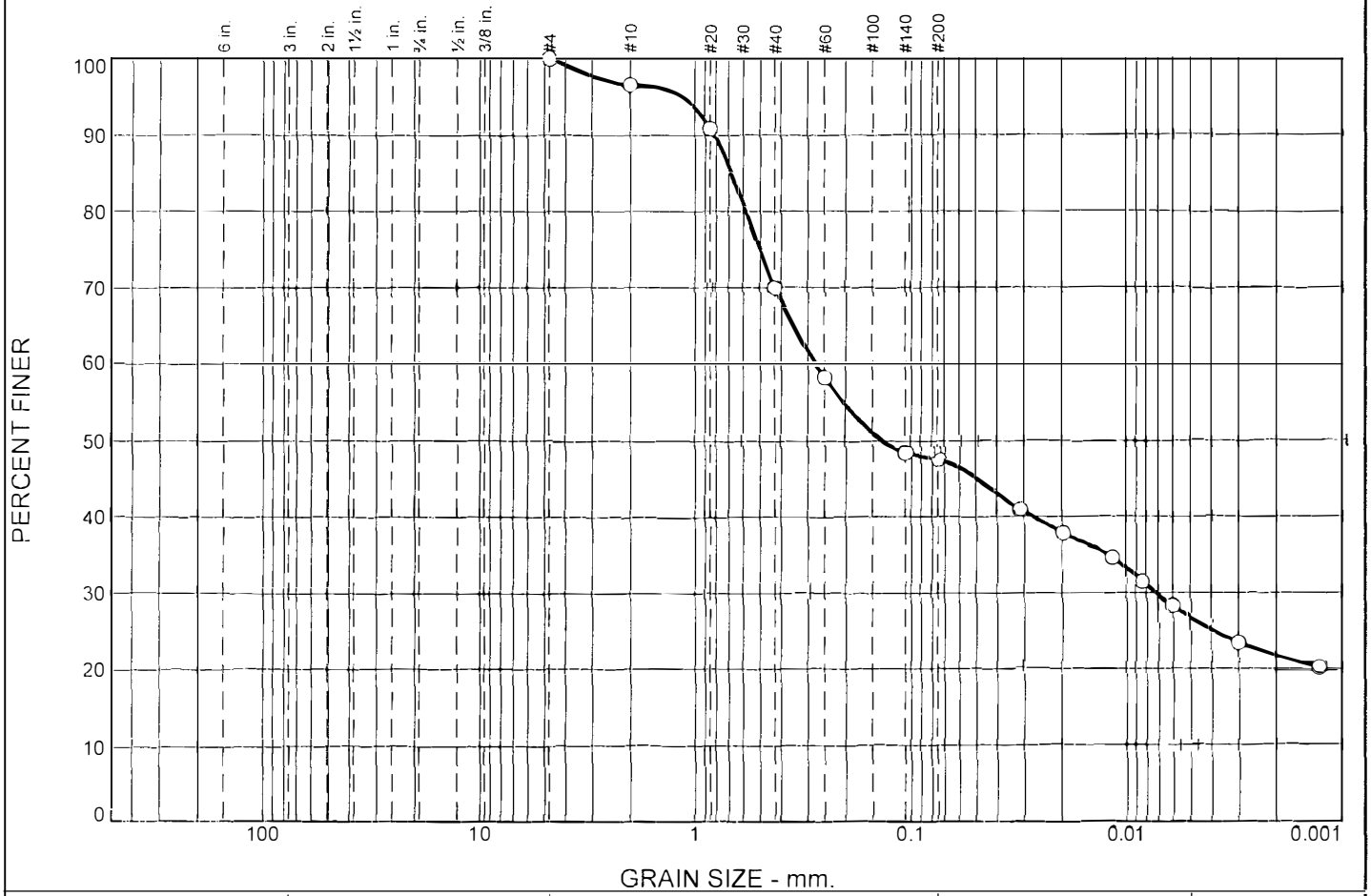
United Consulting

Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park

Project No: GCDWR20GA0427301 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	52.5	20.7	26.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	96.5		
#20	90.9		
#40	69.9		
#60	58.3		
#140	48.4		
#200	47.5		

* (no specification provided)

Material Description

Sand, some clay and silt, brown

Atterberg Limits

PL= 27 LL= 46 PI= 19

Coefficients

D_{90}= 0.8171 D_{85}= 0.6803 D_{60}= 0.2748
D_{50}= 0.1348 D_{30}= 0.0072 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SC AASHTO= A-7-6(6)

Remarks

Sample Number: B-6 **Depth:** 0-2 ft

Date: 11/6/2020

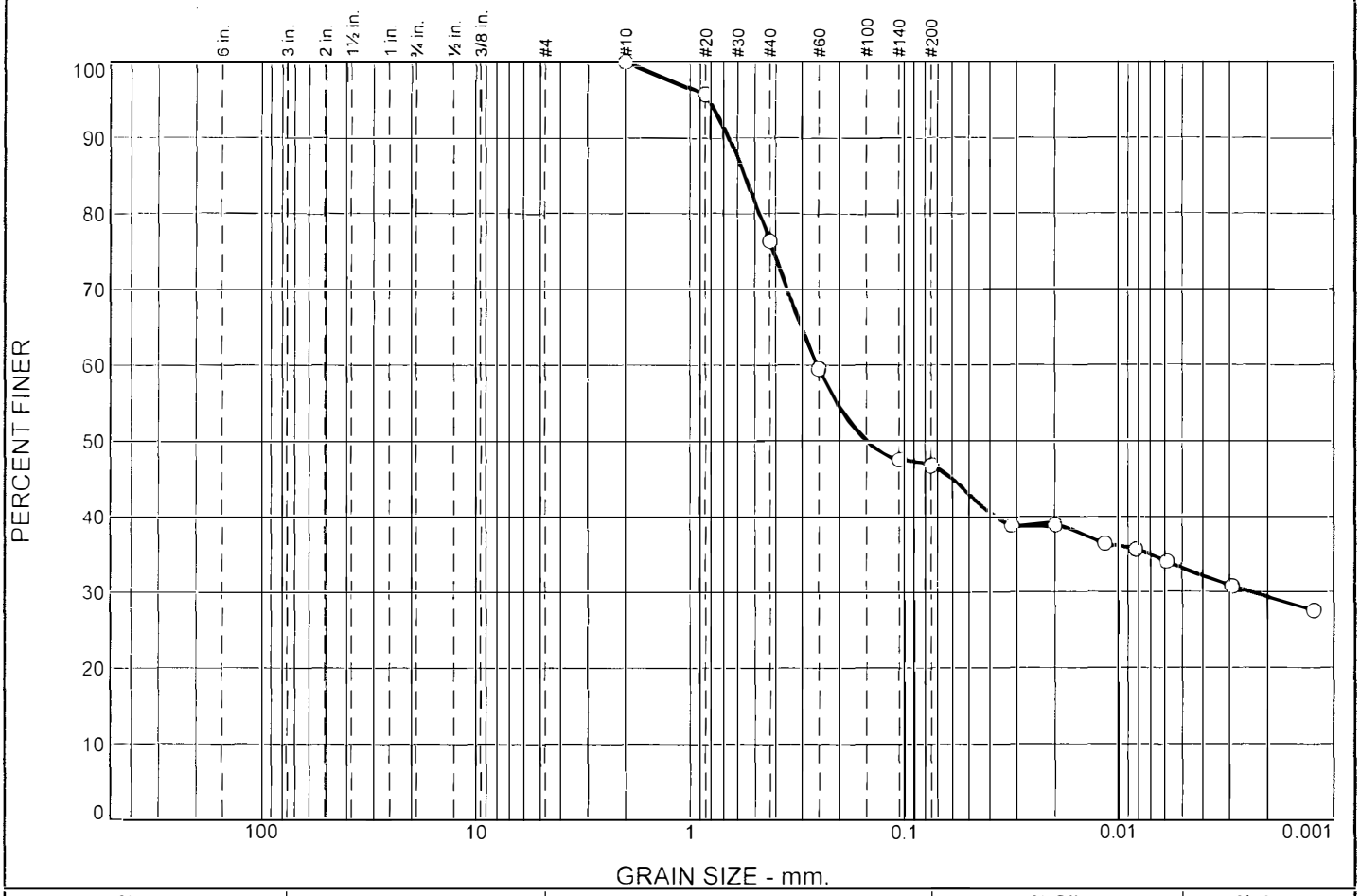
United Consulting

Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park

Project No: GCDWR20GA0427301 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	53.2	13.6	33.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	95.8		
#40	76.3		
#60	59.5		
#140	47.6		
#200	46.8		

* (no specification provided)

Material Description

Sand, some clay and silt, red brown

Atterberg Limits

PL= 32 LL= 57 PI= 25

Coefficients

D_{90}= 0.6580 D_{85}= 0.5541 D_{60}= 0.2543
D_{50}= 0.1493 D_{30}= 0.0024 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-7-5(8)

Remarks

Sample Number: B-6 (Top) **Depth:** 4-4.5 ft

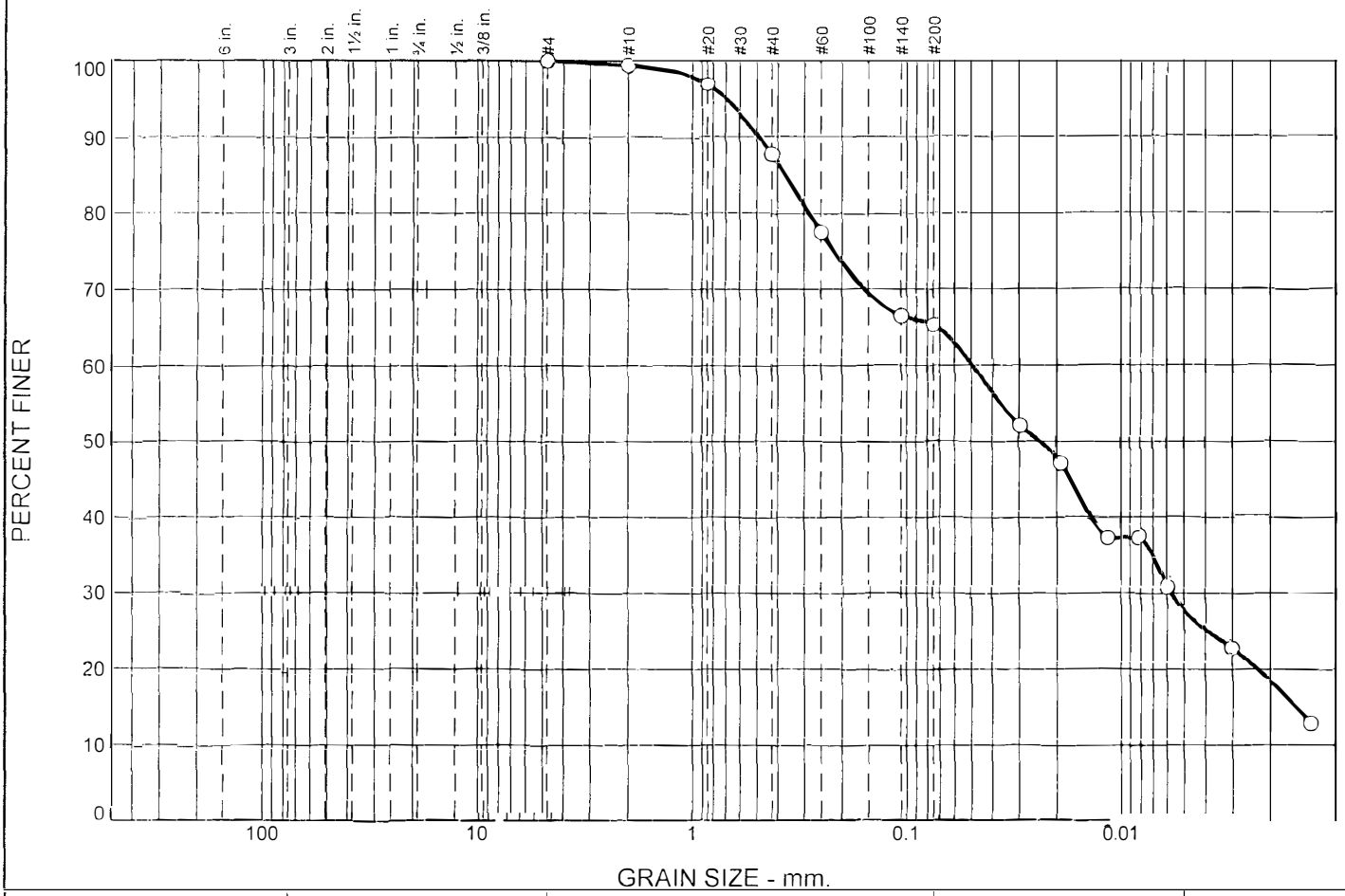
Date: 11/12/2020

United Consulting

Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park
Project No: GCDWR20GA0427301 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	34.7	37.7	27.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#20	96.8		
#40	87.7		
#60	77.6		
#140	66.4		
#200	65.3		

* (no specification provided)

Material Description

Silt-sandy, some clay, brown

Atterberg Limits

PL= 25 LL= 35 PI= 10

Coefficients

D_{90}= 0.4867 D_{85}= 0.3668 D_{60}= 0.0494
D_{50}= 0.0239 D_{30}= 0.0057 D_{15}= 0.0015
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-4(5)

Remarks

Sample Number: B-6 (Bottom) **Depth:** 5-6 ft

Date: 11/6/2020

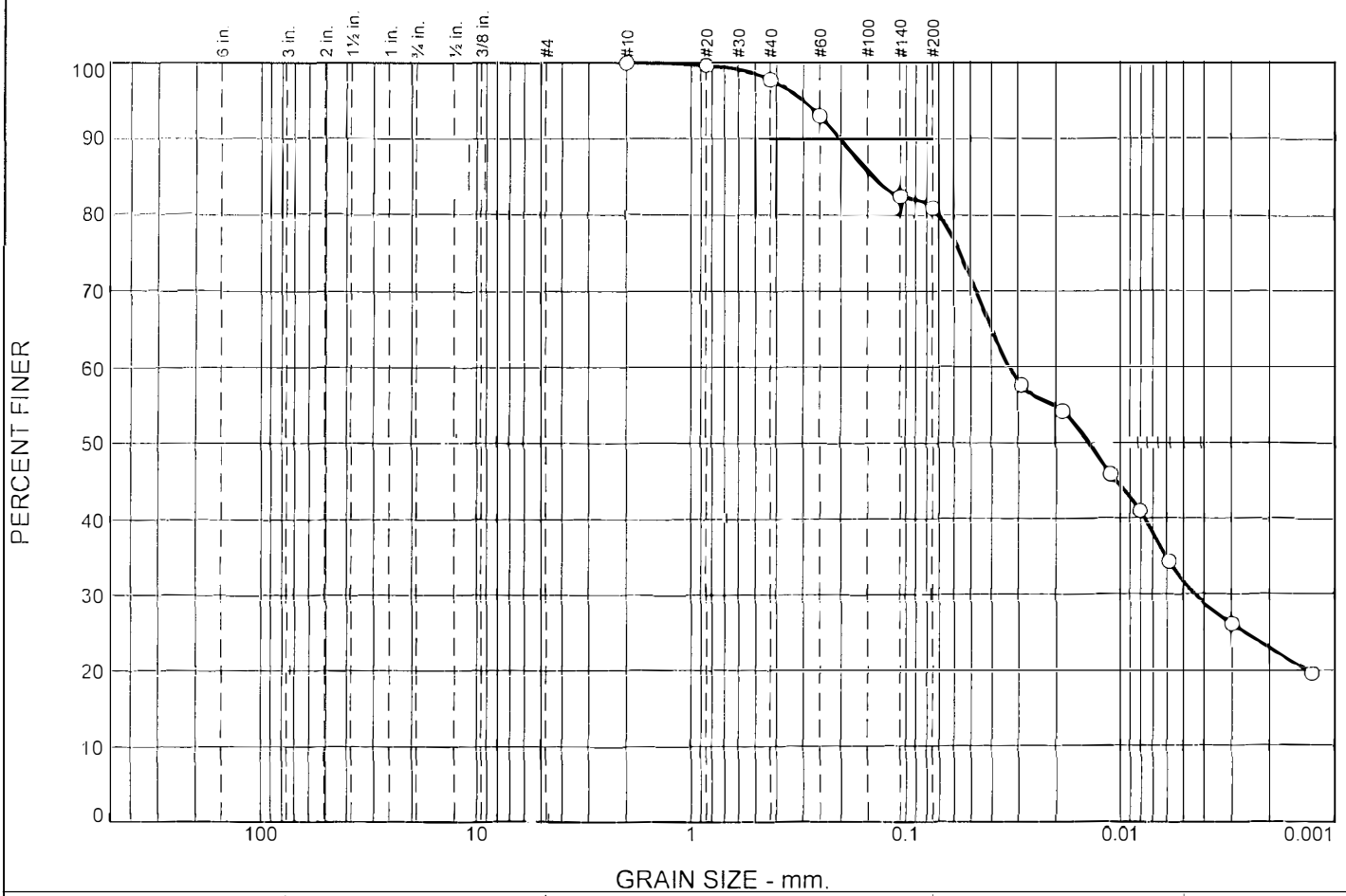
United Consulting

Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park

Project No: GCDWR20GA0427301 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	19.0	49.4	31.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.6		
#40	97.7		
#60	93.0		
#140	82.5		
#200	81.0		

* (no specification provided)

Material Description

Clay-silty, some sand, gray

Atterberg Limits

PL= 24 LL= 39 PI= 15

Coefficients

D_{90}= 0.2023 D_{85}= 0.1423 D_{60}= 0.0332
D_{50}= 0.0141 D_{30}= 0.0044 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(12)

Remarks

Sample Number: S-1 **Depth:** 2-4 ft

Date: 11/6/2020

United Consulting

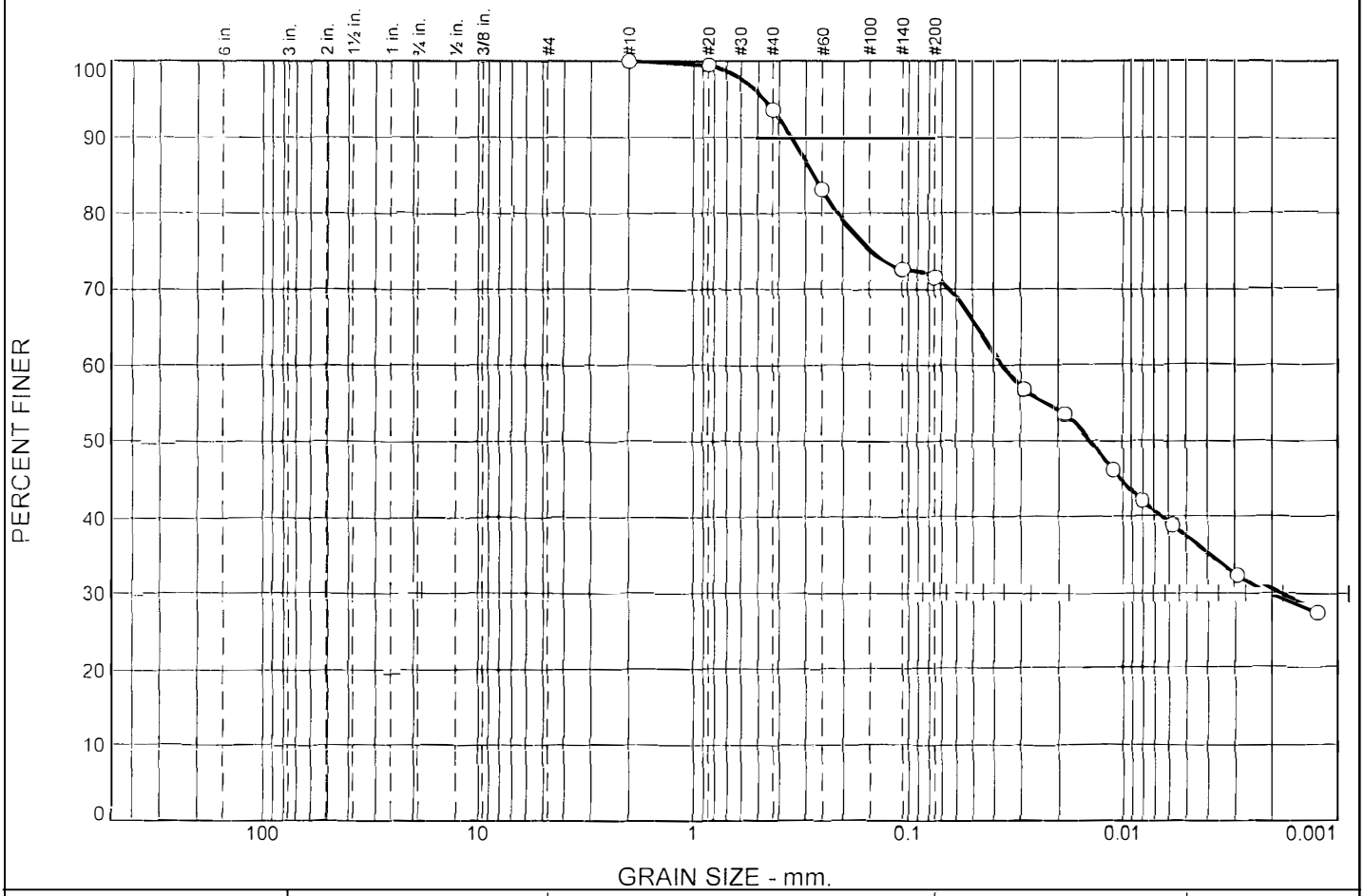
Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park

Project No: GCDWR20GA0427301

Figure

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	28.4	34.2	37.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.4		
#40	93.6		
#60	83.1		
#140	72.6		
#200	71.6		

* (no specification provided)

Material Description

Clay, some silt and sand, orange tan

Atterberg Limits

PL= 25 LL= 45 PI= 20

Coefficients

D_{90}= 0.3495 D_{85}= 0.2745 D_{60}= 0.0365
D_{50}= 0.0143 D_{30}= 0.0021 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(14)

Remarks

Sample Number: S-2 **Depth:** 2-4 ft

Date: 11/6/2020

United Consulting

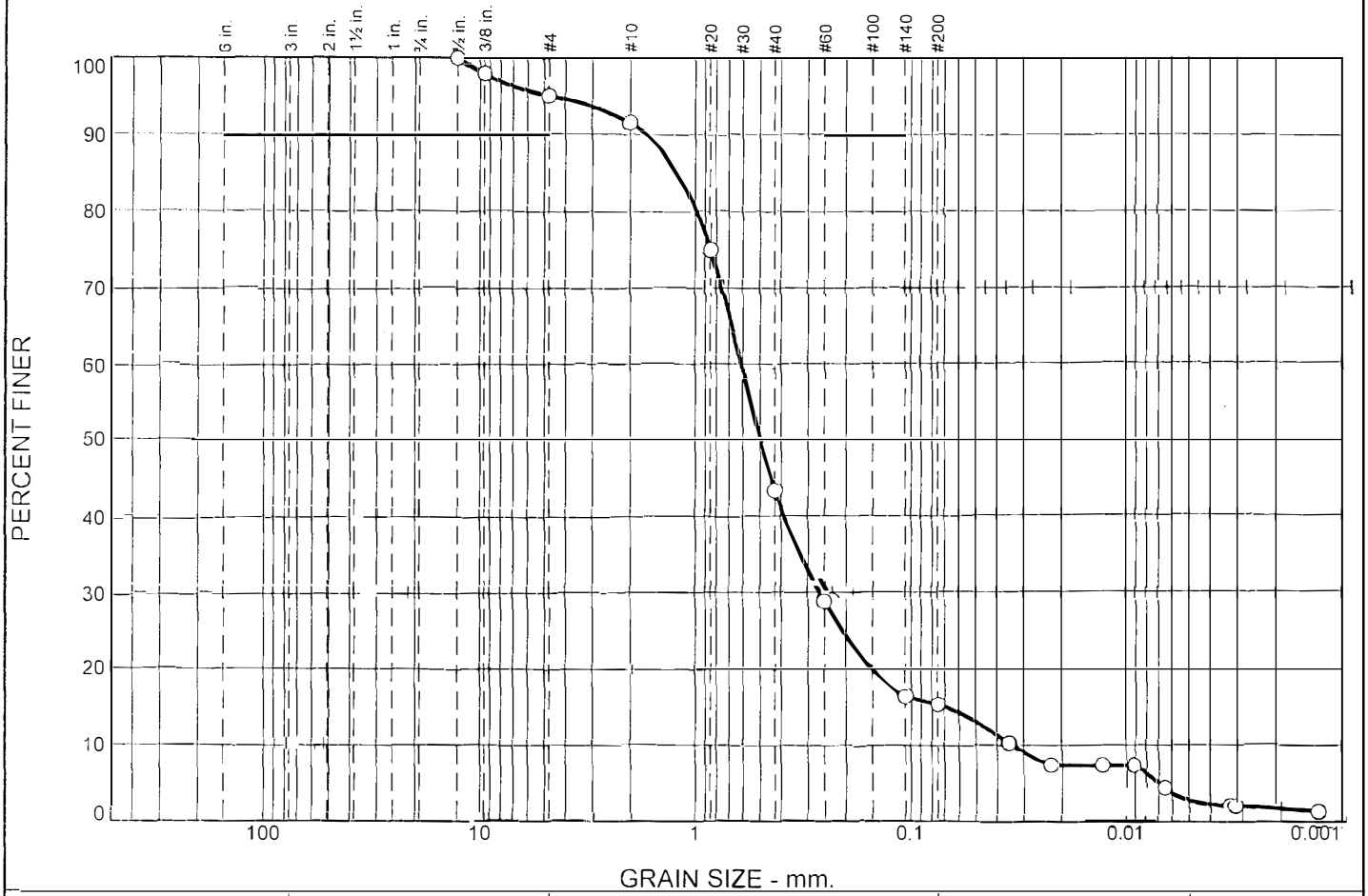
Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park

Project No: GCDWR20GA0427301

Figure

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	5.0	79.7	12.6	2.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.5	100.0		
0.375	97.9		
#4	95.0		
#10	91.5		
#20	74.9		
#40	43.4		
#60	28.9		
#140	16.5		
#200	15.3		

* (no specification provided)

Material Description

Sand, some silt, trace gravel and clay, dark tan

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.6813 D_{85}= 1.2049 D_{60}= 0.6115
D_{50}= 0.4964 D_{30}= 0.2634 D_{15}= 0.0689
D_{10}= 0.0338 C_u= 18.07 C_c= 3.35

Classification

USCS= SM AASHTO= A-1-b

Remarks

Sample Number: S-3 **Depth:** 2-4 ft

Date: 11/6/2020

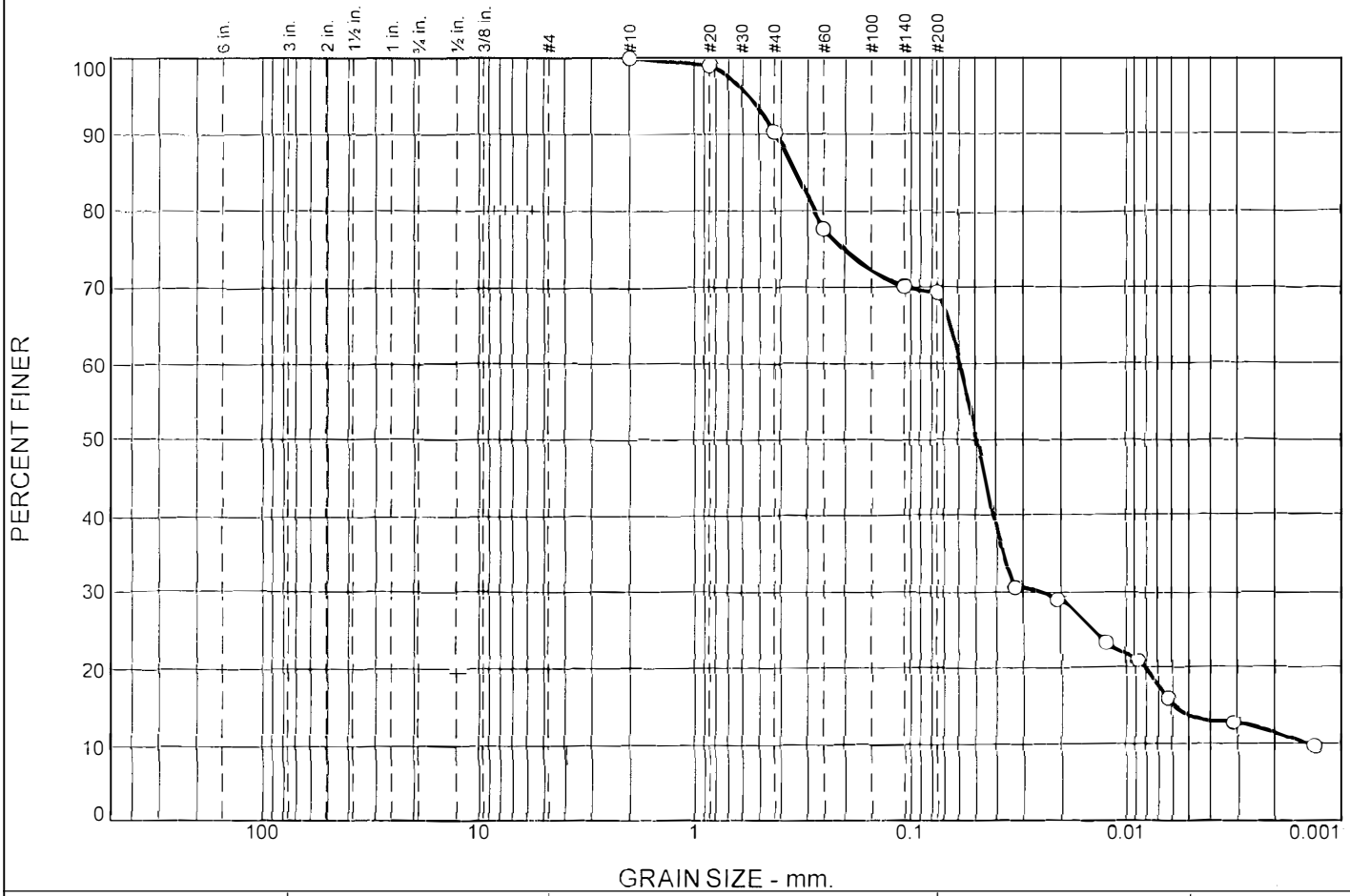
United Consulting

Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park

Project No: GCDWR20GA042730l

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0 .0	30.7	55.4	13.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	99.0		
#40	90.3		
#60	77.7		
#140	70.1		
#200	69.3		

* (no specification provided)

Material Description

Clay-silty, some sand, dark tan

Atterberg Limits

PL= 20 LL= 26 PI= 6

Coefficients

D_{90}= 0.4182 D_{85}= 0.3383 D_{60}= 0.0588
D_{50}= 0.0492 D_{30}= 0.0246 D_{15}= 0.0057
D_{10}= 0.0014 C_u= 40.96 C_c= 7.19

Classification

USCS= CL-ML AASHTO= A-4(2)

Remarks

Sample Number: S-4 **Depth:** 2-4 ft

Date: 11/6/2020

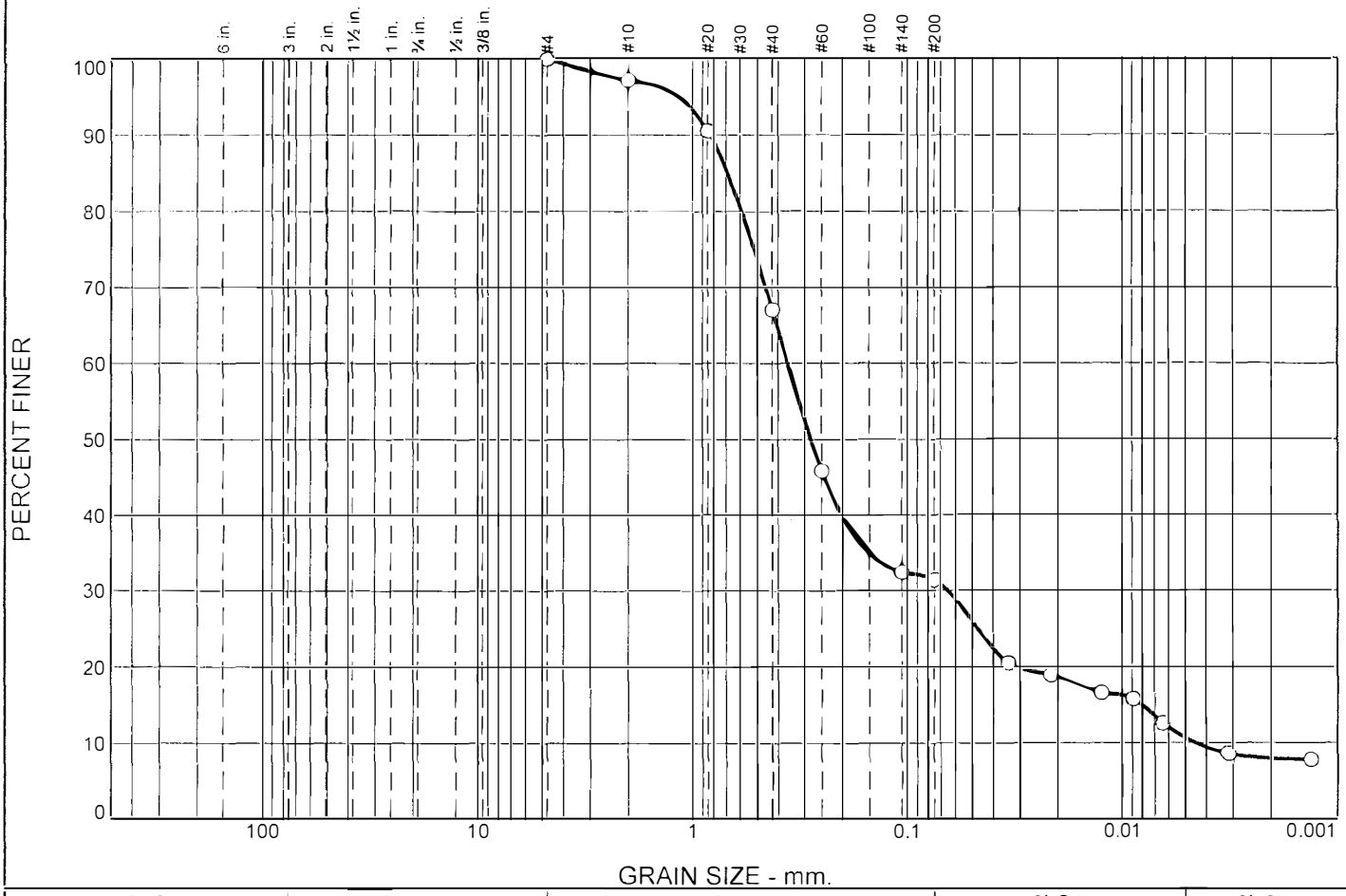
United Consulting

Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park

Project No: GCDWR20GA0427301 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	68.6	20.8	10.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	97.2		
#20	90.6		
#40	67.1		
#60	45.9		
#140	32.4		
#200	31.4		

* (no specification provided)

Material Description

Sand, some silt, trace clay, dark tan

Atterberg Limits

PL= 25 LL= 34 PI= 9

Coefficients

D_{90}= 0.8274 D_{85}= 0.6859 D_{60}= 0.3598
D_{50}= 0.2812 D_{30}= 0.0651 D_{15}= 0.0081
D_{10}= 0.0046 C_u= 79.00 C_c= 2.59

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Sample Number: S-5 **Depth:** 2-4 ft

Date: 11/6/2020

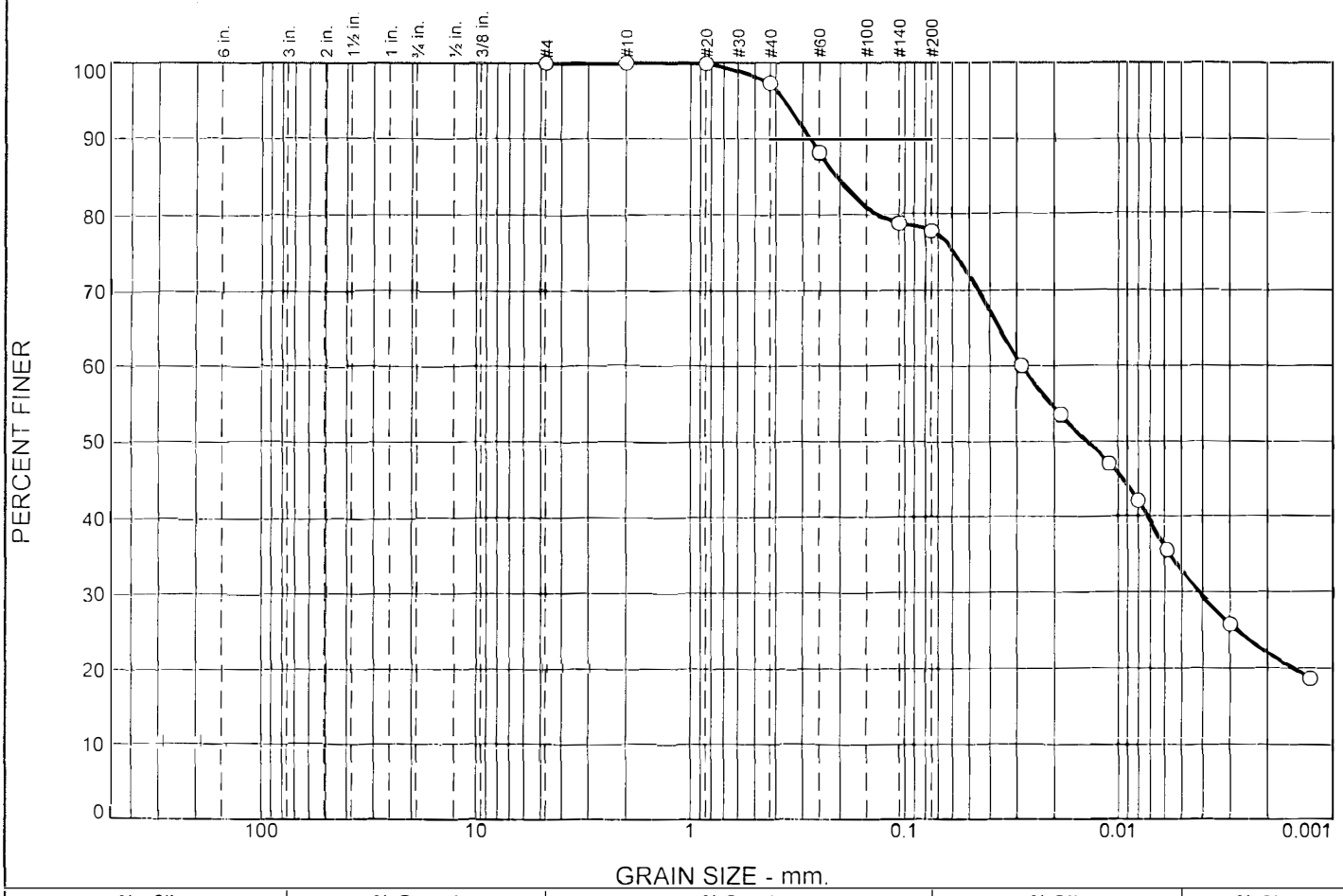
United Consulting

Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park

Project No: GCDWR20GA0427301 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	22.2	45.0	32.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	100.0		
#20	99.9		
#40	97.3		
#60	88.1		
#140	78.8		
#200	77.8		

* (no specification provided)

Material Description

Clay-silty, some sand, dark brown

Atterberg Limits

PL= 22 LL= 32 PI= 10

Coefficients

D_{90}= 0.2769 D_{85}= 0.2073 D_{60}= 0.0284
D_{50}= 0.0140 D_{30}= 0.0042 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-4(7)

Remarks

Sample Number: S-6 **Depth:** 2-4 ft

Date: 11/6/2020

United Consulting

Norcross, Georgia

Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park
Project No: GCDWR20GA0427301

Figure

COMPACTION TEST REPORT

Project No.: GCDWR20GA0427301 **Date:** 11/10/2020
Project: Beaver Ruin Wetlands Park
Client: Gwinnett co dept of Water Resources
Sample Number: B-2(Bulk) **Depth:** 0-5 ft

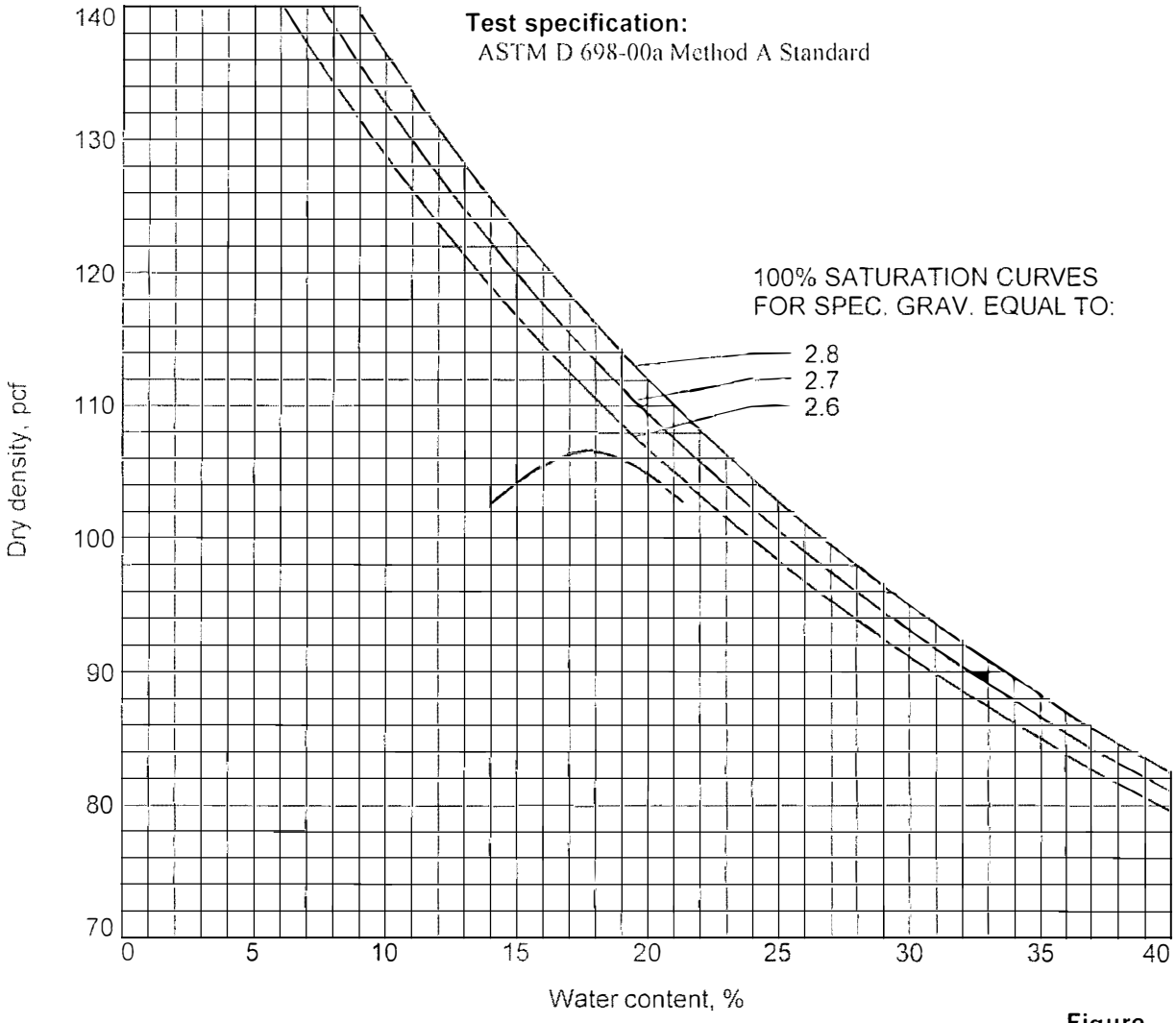
Remarks:

MATERIAL DESCRIPTION

Description: Clay-silty, some sand, gray tan

Classifications - **USCS:** CL **AASHTO:** A-6(13)
Nat. Moist. = 25.2 % **Sp.G. =**
Liquid Limit = 40 **Plasticity Index =** 18
% < No.200 = 77.1 %

TEST RESULTS
Maximum dry density = 106.6 pcf
Optimum moisture = 17.8 %



Figure

United Consulting

COMPACTION TEST REPORT

Project No.: GCDWR20GA042730 1 **Date:** 11/10/20
Project: Beaver Ruin Wetlands Park
Client: Gwinnett co dept of Water Resources
Sample Number: B-4(Bulk) **Depth:** 0-5.0'

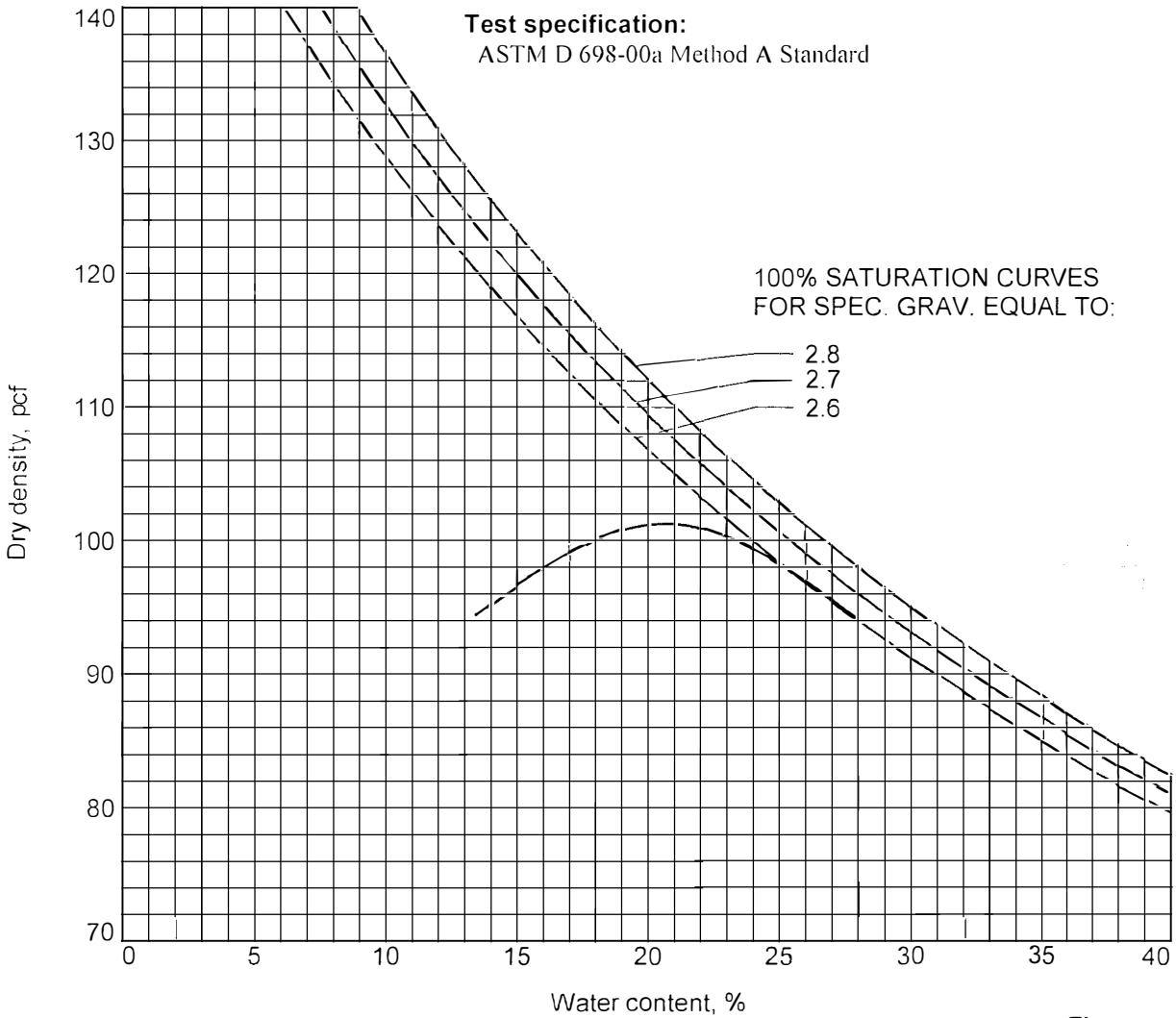
Remarks:

MATERIAL DESCRIPTION

Description: Sand, some silt and clay, orange brown

Classifications - **USCS:** SM **AASHTO:** A-7-5(5)
Nat. Moist. = 21.6 %
Liquid Limit = 52
Sp.G. =
Plasticity Index = 17
% < No.200 = 45.6 %

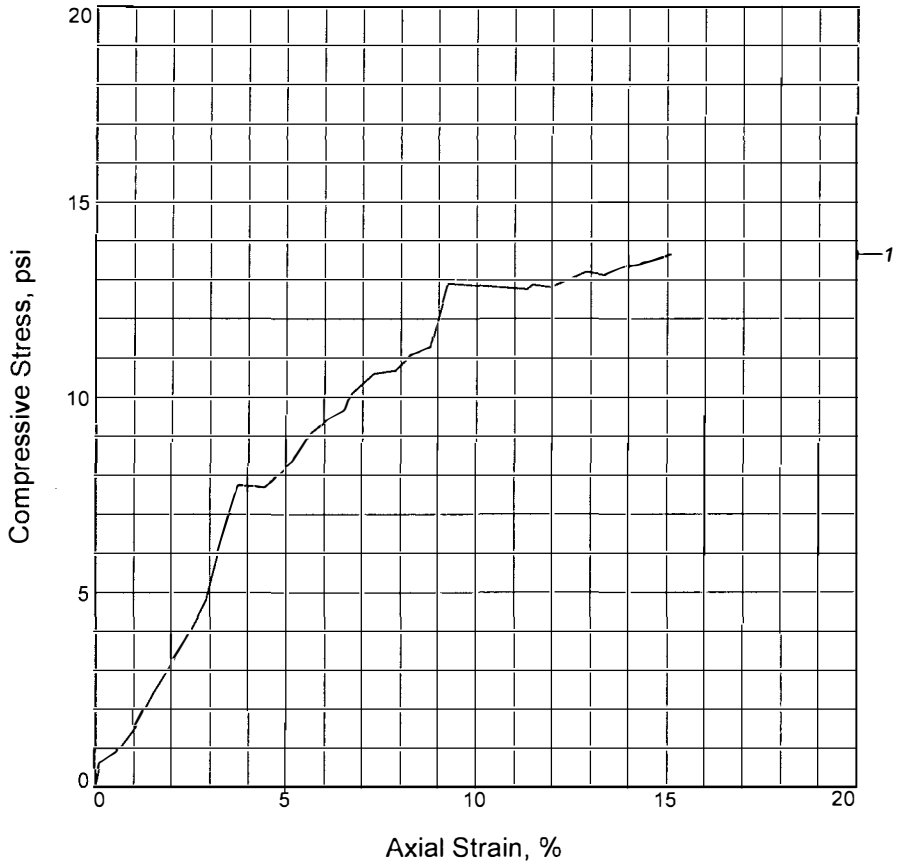
TEST RESULTS
Maximum dry density = 101.3 pcf
Optimum moisture = 20.6 %



Figure

United Consulting

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psi	13.65			
Undrained shear strength, psi	6.83			
Failure strain, %	15.1			
Strain rate, in./min.	0.030			
Water content, %	20.1			
Wet density, pcf	131.0			
Dry density, pcf	109.0			
Saturation, %	99.6			
Void ratio	0.5459			
Specimen diameter, in.	2.87			
Specimen height, in.	5.60			
Height/diameter ratio	1.95			

Description: Clay-silty-sandy, gray and brown

LL = 38	**PL** = 20	**PI** = 18	**GS**= 2.7	**Type:** Undisturbed

Project No.: GCDWR20GA0427301

Date Sampled: 11/6/2020

Remarks:

Figure _____

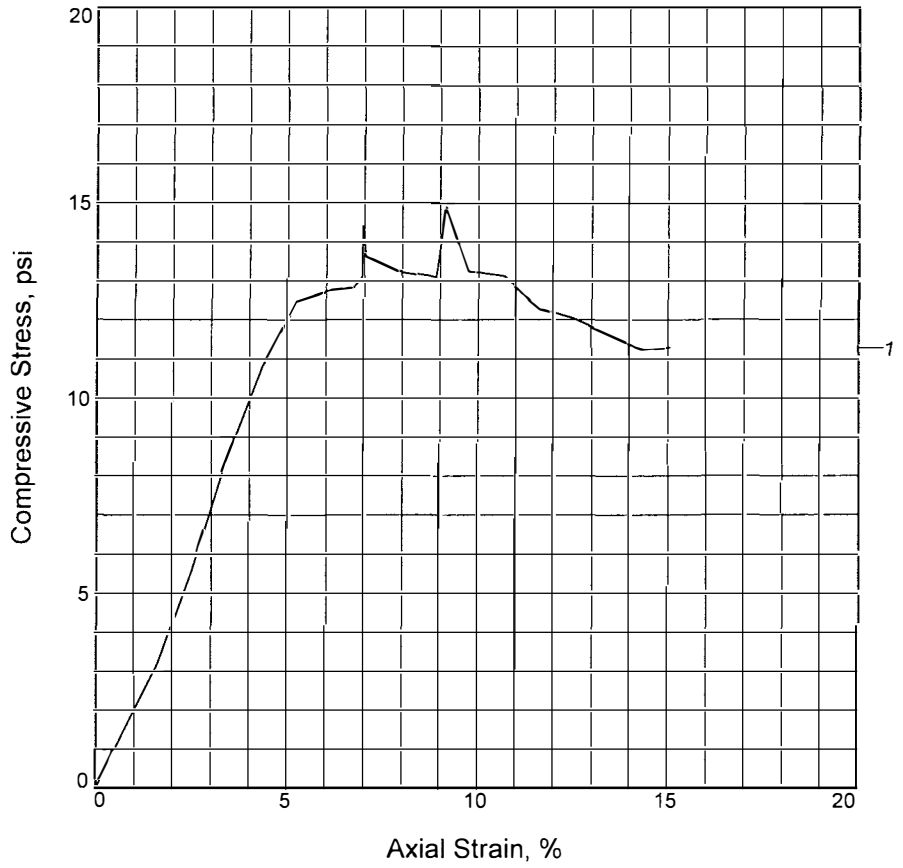
Client: Gwinnett co dept of Water Resources

Project: Beaver Ruin Wetlands Park

Sample Number: B-3(Top) **Depth:** 4-4.5 ft

UNCONFINED COMPRESSION TEST
United Consulting
Norcross, Georgia

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psi	14.88			
Undrained shear strength, psi	7.44			
Failure strain, %	9.2			
Strain rate, in./min.	0.030			
Water content, %	18.0			
Wet density, pcf	133.8			
Dry density, pcf	113.4			
Saturation, %	99.9			
Void ratio	0.4869			
Specimen diameter, in.	2.87			
Specimen height, in.	5.60			
Height/diameter ratio	1.95			

Description: Sand, some silt and clay, gray

LL = 25	**PL =** 16	**PI =** 9	**GS=** 2.7	**Type:** Undisturbed

Project No.: GCDWR20GA0427301

Date Sampled: 11/6/2020

Remarks:

Figure _____

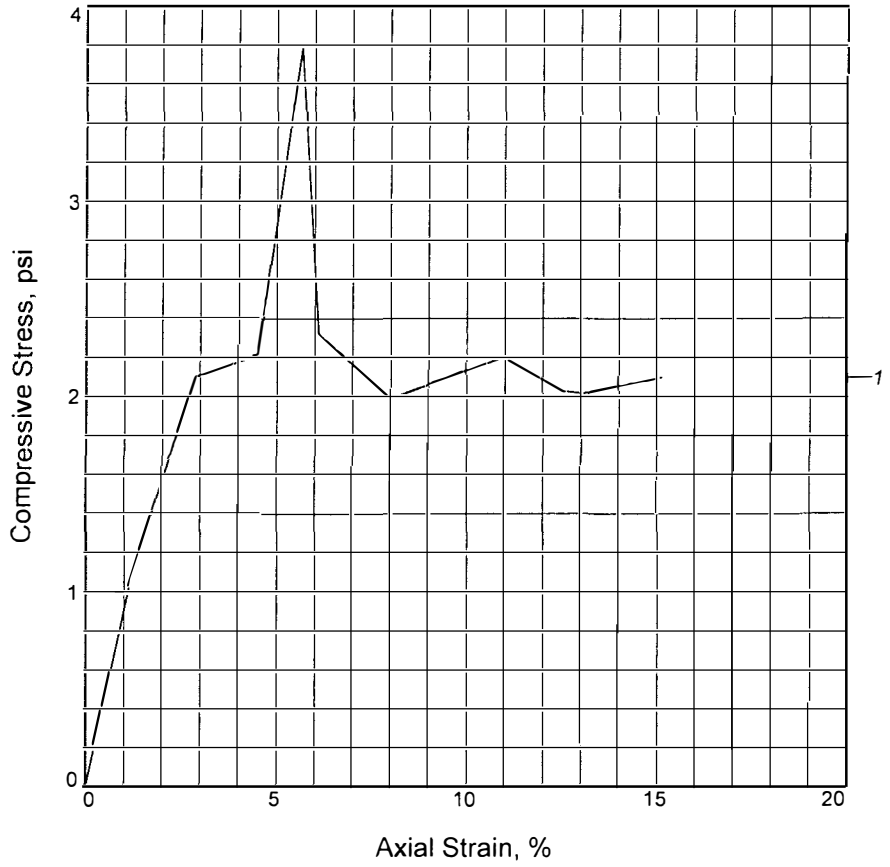
Client: Gwinnett co dept of Water Resources

Project: Beaver Ruin Wetlands Park

Sample Number: B-3(Middle) **Depth:** 4.5-5.5 ft

UNCONFINED COMPRESSION TEST
United Consulting
Norcross, Georgia

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psi	3.79			
Undrained shear strength, psi	1.90			
Failure strain, %	5.7			
Strain rate, in./min.	0.050			
Water content, %	21.5			
Wet density, pcf	123.8			
Dry density, pcf	101.9			
Saturation, %	88.7			
Void ratio	0.6535			
Specimen diameter, in.	2.87			
Specimen height, in.	5.00			
Height/diameter ratio	1.74			

Description: Sand, trace silt and clay, gray

LL =	**PL =**	**PI =**	**GS=** 2.7	**Type:** Undisturbed

Project No.: GCDWR20GA0427301

Date Sampled:

Remarks:

Figure _____

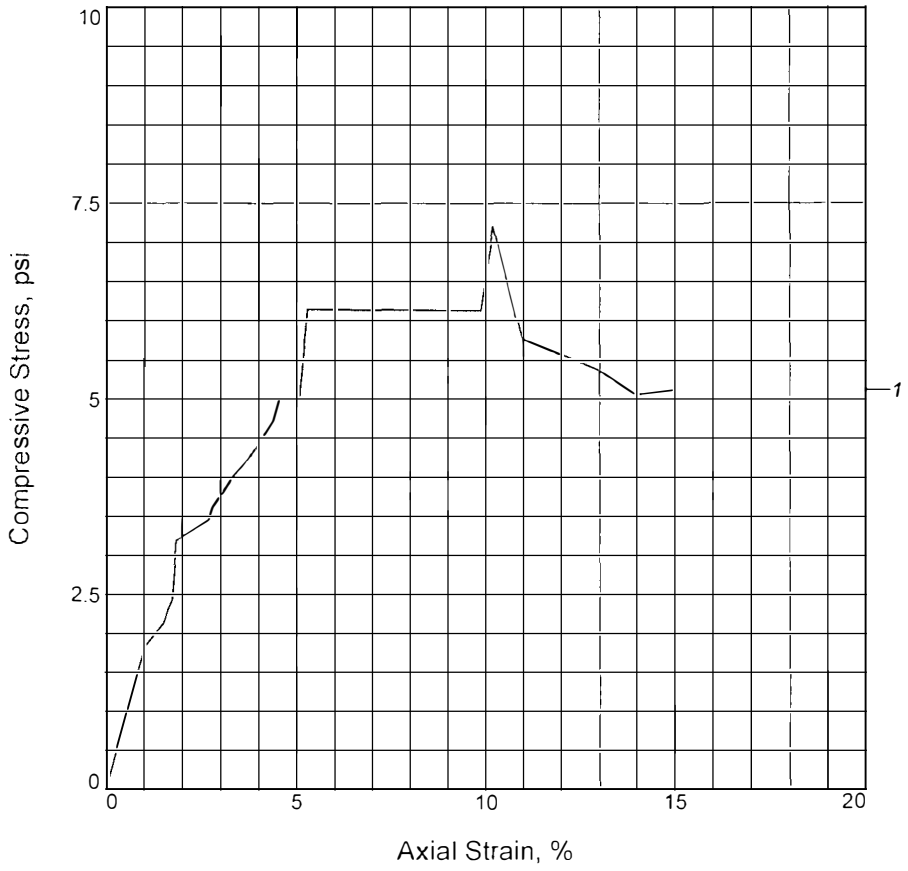
Client: Gwinnett co dept of Water Resources

Project: Beaver Ruin Wetlands Park

Sample Number: B-3(Bottom) **Depth:** 5.5-6 ft

UNCONFINED COMPRESSION TEST
United Consulting
Norcross, Georgia

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psi	7.22			
Undrained shear strength, psi	3.61			
Failure strain, %	10.2			
Strain rate, in./min.	0.030			
Water content, %	24.6			
Wet density, pcf	126.2			
Dry density, pcf	101.3			
Saturation, %	100.0			
Void ratio	0.6641			
Specimen diameter, in.	2.87			
Specimen height, in.	5.00			
Height/diameter ratio	1.74			

Description: Sand, some clay and silt, red brown

LL = 57	**PL =** 32	**PI =** 25	**GS=** 2.7	**Type:** Undisturbed

Project No.: GCDWR20GA042730I

Date Sampled: 11/12/2020

Remarks:

Client: Gwinnett co dept of Water Resources

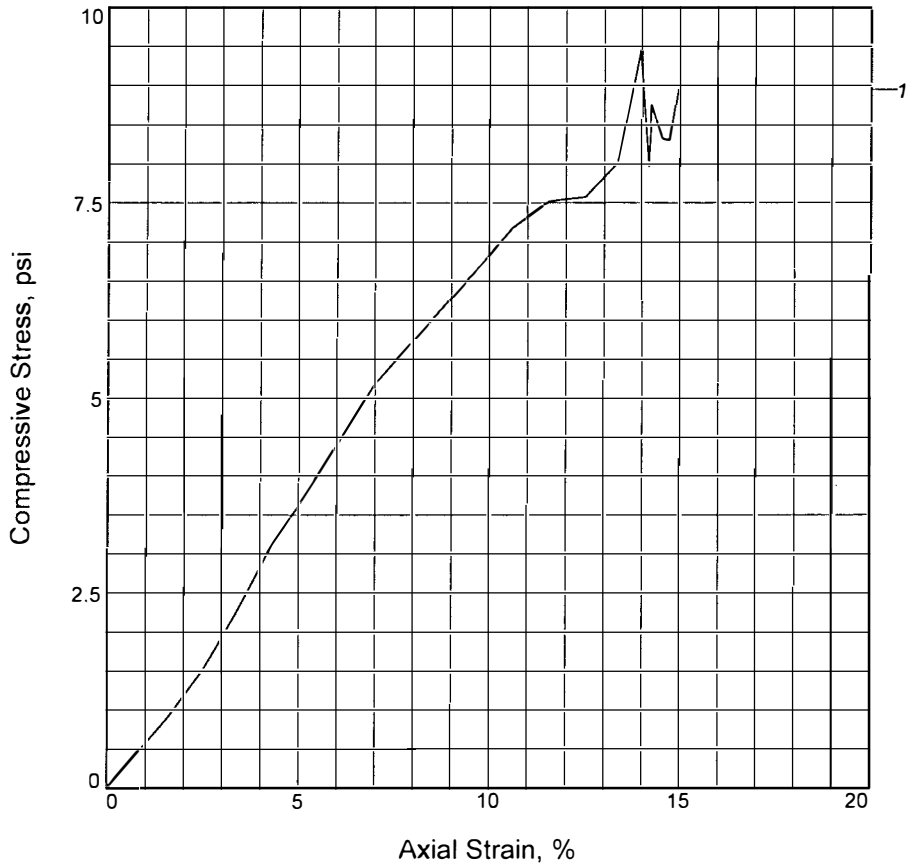
Project: Beaver Ruin Wetlands Park

Sample Number: B-6 (Top) **Depth:** 4-4.5 ft

Figure _____

UNCONFINED COMPRESSION TEST
United Consulting
Norcross, Georgia

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psi	9.44			
Undrained shear strength, psi	4.72			
Failure strain, %	13.9			
Strain rate, in./min.	0.030			
Water content, %	30.4			
Wet density, pcf	138.4			
Dry density, pcf	106.1			
Saturation, %	139.7			
Void ratio	0.5881			
Specimen diameter, in.	2.87			
Specimen height, in.	5.60			
Height/diameter ratio	1.95			

Description: Silt-sandy, some clay, brown

LL = 35	**PL =** 25	**PI =** 10	**GS=** 2.7	**Type:** Undisturbed

Project No.: GCDWR20GA0427301

Date Sampled: 11/6/2020

Remarks:
Bottom Sample consists of Organic Materials

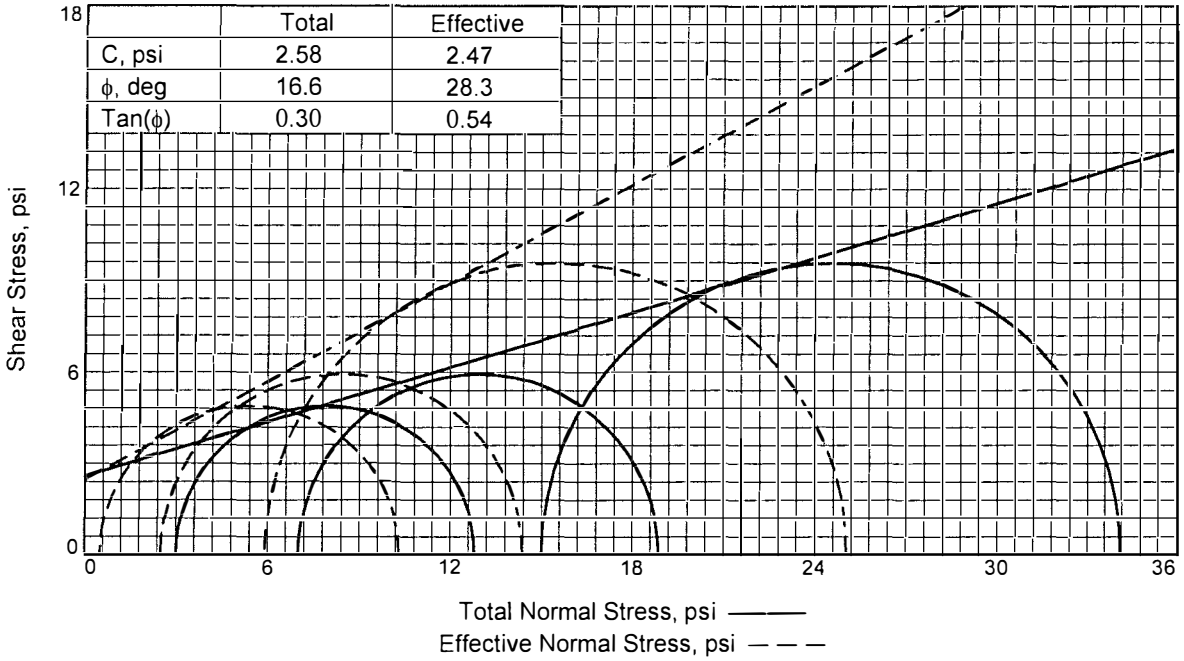
Client: Gwinnett co dept of Water Resources

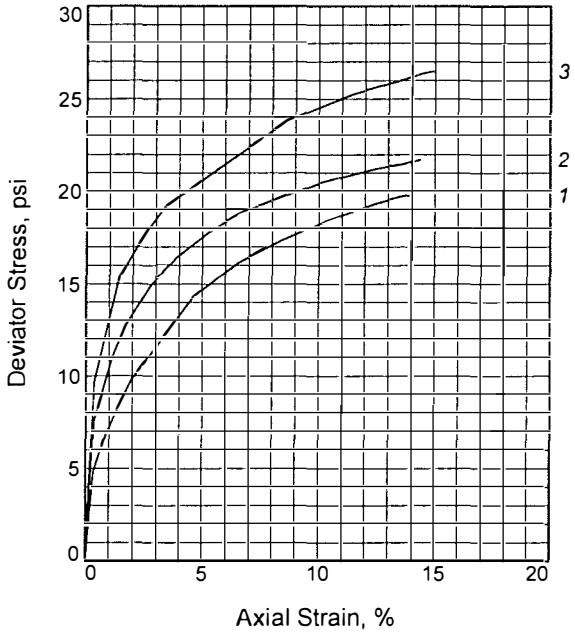
Project: Beaver Ruin Wetlands Park

Sample Number: B-6 (Bottom) **Depth:** 5-6 ft

Figure _____

UNCONFINED COMPRESSION TEST
United Consulting
Norcross, Georgia





Sample No.		1	2	3
Initial	Water Content, %	23.9	23.9	23.9
	Dry Density, pcf	96.4	96.4	96.4
	Saturation, %	86.1	86.1	86.2
	Void Ratio	0.7493	0.7492	0.7483
	Diameter, in.	2.87	2.87	2.87
	Height, in.	6.00	6.00	6.00
At Test	Water Content, %	26.7	26.7	23.0
	Dry Density, pcf	97.9	97.9	104.0
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.7222	0.7222	0.6202
	Diameter, in.	2.86	2.86	2.80
	Height, in.	5.97	5.97	5.85
Strain rate, in./min.		0.008	0.008	0.008
Back Pressure, psi		80.0	60.0	70.0
Cell Pressure, psi		83.0	67.0	85.0
Fail. Stress, psi		9.8	11.9	19.2
Total Pore Pr., psi		82.5	64.5	79.1
Ult. Stress, psi		19.8	21.7	26.5
Total Pore Pr., psi		77.5	59.8	76.2
$\bar{\sigma}_1$ Failure, psi		10.3	14.4	25.1
$\bar{\sigma}_3$ Failure, psi		0.5	2.5	5.9

Type of Test:
CU with Pore Pressures

Sample Type: Remolded

Description: Sand, some silt and clay, orange brown

LL= 52 **PL=** 35 **PI=** 17

Specific Gravity= 2.7

Remarks:

Client: Gwinnett co dept of Water Resources

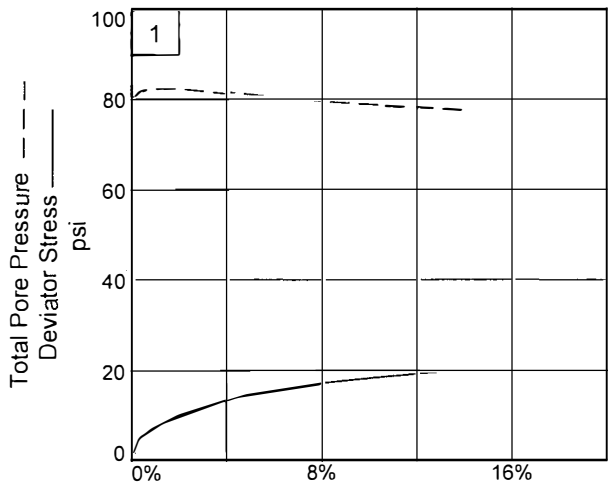
Project: Beaver Ruin Wetlands Park

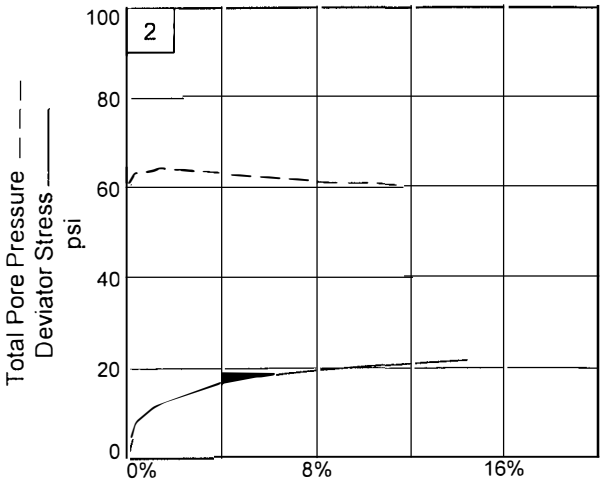
Sample Number: B-4(Bulk) **Depth:** 0-5.0'

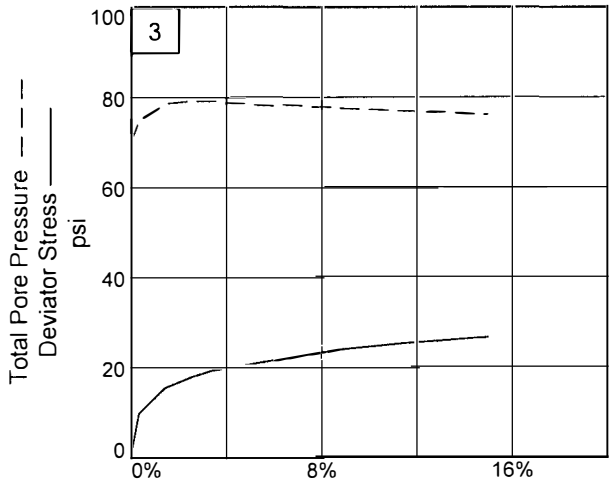
Proj. No.: GCDWR20GA0427301 **Date Sampled:** 11/6/2020

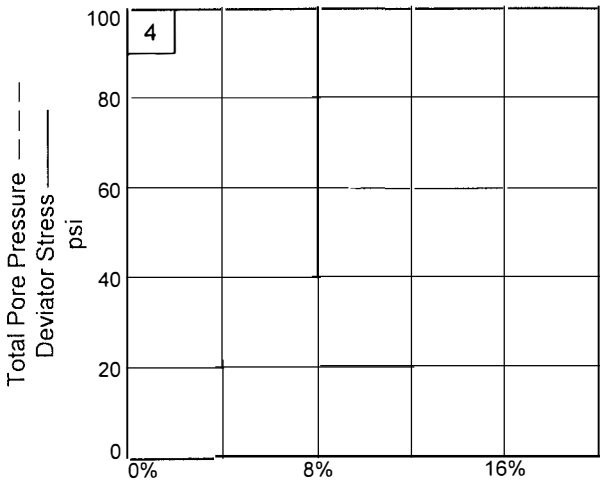
Figure _____

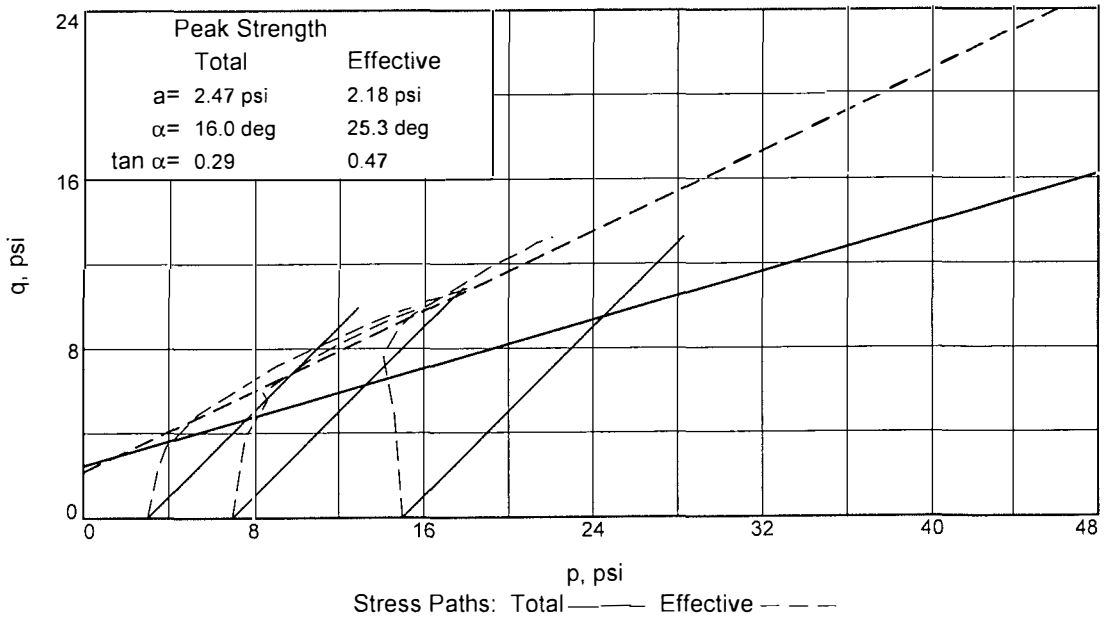
TRIAXIAL SHEAR TEST REPORT
United Consulting
Norcross, Georgia











Client: Gwinnett co dept of Water Resources
Project: Beaver Ruin Wetlands Park
Depth: 0-5.0' **Sample Number:** B-4(Bulk)
Project No.: GCDWR20GA0427301 **Figure** _____

United Consulting

AES

ANALYTICAL ENVIRONMENTAL SERVICES, INC.

December 01, 2020

Mahvand Saleki
United Consulting Group Inc.

625 Holcomb Bridge Rd
Norcross GA 30071

RE: Beaver Ruin Wetland Park

Dear Mahvand Saleki: Order No: 2011M90

Analytical Environmental Services, Inc. received 6 samples on 11/19/2020 2:35:00 PM for the analyses presented in following report.

"No problems were encountered during the analyses except as noted in the Case Narrative or by qualifiers in the report or QC Summary. Additionally, all results for the associated Quality Control samples were within EPA and/or AES established limits.
AES's accreditations are as follows:
-NELAP/State of Florida Laboratory ID E87582 for analysis of Non-Potable Water, Solid & Chemical Materials, Air & Emissions Volatile Organics, and Drinking Water Microbiology & Metals, effective 07/01/20-06/30/21.
State of Georgia, Department of Natural Resources ID #800 for analysis of Drinking Water Metals, effective through 06/30/21 and Total Coliforms/ E. coli, effective 04/20/20-04/24/23.
-AIHA-LAP, LLC Laboratory ID: 100671 for Industrial Hygiene samples (Metals and PCM Asbestos), Environmental Lead (Paint, Soil, Dust Wipes, Air), and Environmental Microbiology (Fungal) Direct Examination, effective until 11/01/21.
These results relate only to the items tested as received. This report may only be reproduced in full.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Ioana Pacurar

Ioana Pacurar

Project Manager

3080 Presidential Drive • Atlanta, Georgia 30340 • Tel: 770.457.8177 • Fax: 770.457.8188 • Toll Free: 800.972.4889
www.aesatlanta.com

SAMPLE CHAIN-OF-CUSTODY RECORD

2011M90

UNITED CONSULTING
625 Holcomb Bridge
NORCROSS, GEORGIA 30071
(770) 209-0029 FAX (770) 582-2895
www.unitedconsulting.com

PROJECT NAME:			Project#:			ANALYSES (indicate target list)								
Beaver Ruin Wetland Park			GCDWR20GA0427301											
TAT or DUE DATE:	CONTACT: Mahvand Saleki	PROJECT MANAGER:												
11/30/20202	msaleki@unitedconsulting.com	Rafael Ospina												
	PHONE#:	RECEIVING LAB:			PO#:									
	(770)582-2843	AES												
SAMPLE NUMBER	SAMPLE DESCRIPTION	Date Shipped	Sample Matrix	Preserva-tive	# / Size of Cont.	pH	Resistivity	Sulphate	Chloride					
B-1@2-3.5'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					
B-2@2-4'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					
B-3@2-3.5'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					
B-4@2-3.5'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					
B-5@2-3.5'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					
B-6@2-3.5'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					

SAMPLES RELINQUISHED BY:	DATE/ TIME	SAMPLES ACCEPTED BY:	DATE/ TIME	COMMENTS:
PHUC VO	11-19-20 2:34	Analyst	11/19/20 2:35 PM	

Analytical Environmental Services, Inc

Date: 1-Dec-20

Client: United Consulting Group Inc.
Project: Beaver Ruin Wetland Park
Lab ID: 2011M90

Case Narrative

pH Analysis by Method SW9045D:

Samples for pH analysis by Method SW9045D were received and analyzed outside holding time requirement of "immediate or 15 minutes."

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-1@2-3.5'
Project Name:	Beaver Ruin Wetland Park	**Collection Date:**	11/19/2020
Lab ID:	2011M90-001	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	7460	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	5.88	0.01	H	pH Units	306391	1	11/23/2020 13:28	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	44	13		mg/Kg-dry	306486	1	11/30/2020 15:23	IP
Sulfate	53	13		mg/Kg-dry	306486	1	11/30/2020 15:23	IP
PERCENT MOISTURE D2216								
Percent Moisture	20.7	0		wt%	R440362	1	11/22/2020 00:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-2@2-4'
Project Name:	Beaver Ruin Wetland Park	**Collection Date:**	11/19/2020
Lab ID:	2011M90-002	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	4850	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	5.74	0.01	H	pH Units	306391	1	11/23/2020 13:41	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	49	12		mg/Kg-dry	306486	1	11/30/2020 15:39	IP
Sulfate	34	12		mg/Kg-dry	306486	1	11/30/2020 15:39	IP
PERCENT MOISTURE D2216								
Percent Moisture	18.8	0		wt%	R440362	1	11/22/2020 00:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-3@2-3.5'
Project Name:	Beaver Ruin Wetland Park	**Collection Date:**	11/19/2020
Lab ID:	2011M90-003	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	9030	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	5.44	0.01	H	pH Units	306391	1	11/23/2020 13:43	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	43	12		mg/Kg-dry	306486	1	11/30/2020 15:55	IP
Sulfate	40	12		mg/Kg-dry	306486	1	11/30/2020 15:55	IP
PERCENT MOISTURE D2216								
Percent Moisture	16.2	0		wt%	R440362	1	11/22/2020 00:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-4@2-3.5'
Project Name:	Beaver Ruin Wetland Park	**Collection Date:**	11/19/2020
Lab ID:	2011M90-004	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	18400	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	5.74	0.01	H	pH Units	306391	1	11/23/2020 13:46	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	42	12		mg/Kg-dry	306486	1	11/30/2020 14:35	IP
Sulfate	16	12		mg/Kg-dry	306486	1	11/30/2020 14:35	IP
PERCENT MOISTURE D2216								
Percent Moisture	18.5	0		wt%	R440362	1	11/22/2020 00:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-5@2-3.5'
Project Name:	Beaver Ruin Wetland Park	**Collection Date:**	11/19/2020
Lab ID:	2011M90-005	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	13300	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	6.05	0.01	H	pH Units	306391	1	11/23/2020 13:49	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	40	11		mg/Kg-dry	306486	1	11/30/2020 14:51	IP
Sulfate	30	11		mg/Kg-dry	306486	1	11/30/2020 14:51	IP
PERCENT MOISTURE D2216								
Percent Moisture	13.2	0		wt%	R440362	1	11/22/2020 00:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-6@2-3.5'
Project Name:	Beaver Ruin Wetland Park	**Collection Date:**	11/19/2020
Lab ID:	2011M90-006	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	13900	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	5.19	0.01	H	pH Units	306391	1	11/23/2020 13:51	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	45	13		mg/Kg-dry	306486	1	11/30/2020 15:07	IP
Sulfate	BRL	13		mg/Kg-dry	306486	1	11/30/2020 15:07	IP
PERCENT MOISTURE D2216								
Percent Moisture	22.6	0		wt%	R440362	1	11/22/2020 00:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Clear Save as

ANALYTICAL ENVIRONMENTAL SERVICES, INC. AES

SAMPLE/COOLER RECEIPT CHECKLIST

1. Client Name: **United Consulting Group Inc.** AES Work Order Number: **2011M90**

2. Carrier: FedEx ☐ UPS ☐ USPS ☐ Client ■ Courier ☐ Other _____

		Yes	No	N/A	Details	Comments
3.	Shipping container/cooler received in good condition?	◉	○	○	damaged ☐ leaking ☐ other ☐	
4.	Custody seals present on shipping container?	○	◉	○		
5.	Custody seals intact on shipping container?	○	○	◉		
6.	Temperature blanks present?	○	◉	○		
7.	Cooler temperature(s) within limits of 0-6°C? [See item 13 and 14 for temperature recordings.]	◉	○	○	Cooling initiated for recently collected samples / ice present ☐	
8.	Chain of Custody (COC) present?	◉	○	○		
9.	Chain of Custody signed, dated, and timed when relinquished and received?	◉	○	○		
10.	Sampler name and/or signature on COC?	○	◉	○		
11.	Were all samples received within holding time?	○	◉	○		
12.	TAT marked on the COC?	◉	○	○	If no TAT indicated, proceeded with standard TAT per Terms & Conditions. ☐	

13. Cooler 1 Temperature 0.1 °C Cooler 2 Temperature _____ °C Cooler 3 Temperature _____ °C Cooler 4 Temperature _____ °C

14. Cooler 5 Temperature _____ °C Cooler 6 Temperature _____ °C Cooler 7 Temperature _____ °C Cooler 8 Temperature _____ °C

15. Comments: _____

I certify that I have completed sections 1-15 (dated initials). BH 11/20/20

		Yes	No	N/A	Details	Comments
16.	Were sample containers intact upon receipt?	◉	○	○		
17.	Custody seals present on sample containers?	○	◉	○		
18.	Custody seals intact on sample containers?	○	○	◉		
19.	Do sample container labels match the COC?	◉	○	○	incomplete info ☐ illegible ☐ no label ☐ other ☐	
20.	Are analyses requested indicated on the COC?	◉	○	○		
21.	Were all of the samples listed on the COC received?	◉	○	○	samples received but not listed on COC ☐ samples listed on COC not received ☐	
22.	Was the sample collection date/time noted?	◉	○	○		
23.	Did we receive sufficient sample volume for indicated analyses?	◉	○	○		
24.	Were samples received in appropriate containers?	◉	○	○		
25.	Were VOA samples received without headspace (< 1/4" bubble)?	○	○	◉		
26.	Were trip blanks submitted?	○	○	◉	listed on COC ☐ not listed on COC ☐	

27. Comments: _____

I certify that I have completed sections 16-27 (dated initials). BH 11/20/20

This section only applies to samples where pH can be checked at Sample Receipt.

		Yes	No	N/A	Details	Comments
28.	Have containers needing chemical preservation been checked? *	○	○	◉		
29.	Containers meet preservation guidelines?	○	○	◉		
30.	Was pH adjusted at Sample Receipt?	○	○	◉		

* Note: Certain analyses require chemical preservation but must be checked in the laboratory and not upon Sample Receipt such as Coliforms, VOCs and Oil & Grease/TPH. This also excludes metals by EPA 200.7, 200.8 and 245.1 which will be verified between 16 and 24 hours after preservation.

I certify that I have completed sections 28-30 (dated initials). BH 11/20/20

Locked

Analytical Environmental Services, Inc

Date: 1-Dec-20

Client: United Consulting Group Inc.
Project Name: Beaver Ruin Wetland Park
Lab Order: 2011M90

Dates Report

Lab Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	TCLP Date	Prep Date	Analysis Date
2011M90-001A	B-1@2-3.5'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020
2011M90-001A	B-1@2-3.5'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M90-001A	B-1@2-3.5'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/30/2020
2011M90-001A	B-1@2-3.5'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020
2011M90-002A	B-2@2-4'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020
2011M90-002A	B-2@2-4'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M90-002A	B-2@2-4'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/30/2020
2011M90-002A	B-2@2-4'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020
2011M90-003A	B-3@2-3.5'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020
2011M90-003A	B-3@2-3.5'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M90-003A	B-3@2-3.5'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/30/2020
2011M90-003A	B-3@2-3.5'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020
2011M90-004A	B-4@2-3.5'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020
2011M90-004A	B-4@2-3.5'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M90-004A	B-4@2-3.5'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/30/2020
2011M90-004A	B-4@2-3.5'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020
2011M90-005A	B-5@2-3.5'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020
2011M90-005A	B-5@2-3.5'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M90-005A	B-5@2-3.5'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/30/2020
2011M90-005A	B-5@2-3.5'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020
2011M90-006A	B-6@2-3.5'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020
2011M90-006A	B-6@2-3.5'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M90-006A	B-6@2-3.5'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/30/2020
2011M90-006A	B-6@2-3.5'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020

Client: United Consulting Group Inc.
Project Name: Beaver Ruin Wetland Park
Workorder: 2011M90

ANALYTICAL QC SUMMARY REPORT

BatchID: 306391

Sample ID: **LCS-306391**	Client ID:		Units: **pH Units**	Prep Date: **11/23/2020**	Run No: **440415**
SampleType: **LCS**	TestCode: **Laboratory Hydrogen Ion (pH) SW9045D**		BatchID: **306391**	Analysis Date: **11/23/2020**	Seq No: **10027582**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
pH	6.990	0.01	7.000		99.9	90	110				

Sample ID: **2011M90-001ADUP**	Client ID: **B-1@2-3.5'**		Units: **pH Units**	Prep Date: **11/23/2020**	Run No: **440415**
SampleType: **DUP**	TestCode: **Laboratory Hydrogen Ion (pH) SW9045D**		BatchID: **306391**	Analysis Date: **11/23/2020**	Seq No: **10027609**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
pH	5.800	0.01						5.880	1.37	10	H

Sample ID: **2011M91-002ADUP**	Client ID:		Units: **pH Units**	Prep Date: **11/23/2020**	Run No: **440415**
SampleType: **DUP**	TestCode: **Laboratory Hydrogen Ion (pH) SW9045D**		BatchID: **306391**	Analysis Date: **11/23/2020**	Seq No: **10027610**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
pH	5.850	0.01						5.940	1.53	10	H

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: United Consulting Group Inc.
Project Name: Beaver Ruin Wetland Park
Workorder: 2011M90

ANALYTICAL QC SUMMARY REPORT

BatchID: 306477

Sample ID: **LCS-306477**	Client ID:		Units: **ohms*cm**	Prep Date: **11/23/2020**	Run No: **440558**
SampleType: **LCS**	TestCode: **Soil Resistivity** **SW9050A**		BatchID: **306477**	Analysis Date: **11/24/2020**	Seq No: **10030885**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Resistivity (@100% Moisture Saturatic	9891	0	10000		98.9	90	110				

Sample ID: **2011M90-001ADUP**	Client ID: **B-1@2-3.5'**		Units: **ohms*cm**	Prep Date: **11/23/2020**	Run No: **440558**
SampleType: **DUP**	TestCode: **Soil Resistivity** **SW9050A**		BatchID: **306477**	Analysis Date: **11/24/2020**	Seq No: **10030887**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Resistivity (@100% Moisture Saturatic	7457	0						7463	0.075	30	

Sample ID: **2011M91-002ADUP**	Client ID:		Units: **ohms*cm**	Prep Date: **11/23/2020**	Run No: **440558**
SampleType: **DUP**	TestCode: **Soil Resistivity** **SW9050A**		BatchID: **306477**	Analysis Date: **11/24/2020**	Seq No: **10030901**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Resistivity (@100% Moisture Saturatic	9416	0						9425	0.094	30	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: United Consulting Group Inc.
Project Name: Beaver Ruin Wetland Park
Workorder: 2011M90

ANALYTICAL QC SUMMARY REPORT

BatchID: 306486

Sample ID: **MB-306486** Client ID: Units: **mg/Kg** Prep Date: **11/24/2020** Run No: **440738**
SampleType: **MBLK** TestCode: **ION SCAN SW9056A** BatchID: **306486** Analysis Date: **11/25/2020** Seq No: **10036056**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chloride	BRL	10									
Sulfate	BRL	10									

Sample ID: **LCS-306486** Client ID: Units: **mg/Kg** Prep Date: **11/24/2020** Run No: **440738**
SampleType: **LCS** TestCode: **ION SCAN SW9056A** BatchID: **306486** Analysis Date: **11/25/2020** Seq No: **10036057**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chloride	108.4	10	100.0		108	90	110				
Sulfate	272.0	10	250.0		109	90	110				

Sample ID: **2011M92-003AMS** Client ID: Units: **mg/Kg-dry** Prep Date: **11/24/2020** Run No: **440738**
SampleType: **MS** TestCode: **ION SCAN SW9056A** BatchID: **306486** Analysis Date: **11/25/2020** Seq No: **10036061**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chloride	172.7	11	114.1	44.88	112	80	120				
Sulfate	302.7	11	285.2	133.2	59.4	80	120				S

Sample ID: **2011M92-008AMS** Client ID: Units: **mg/Kg-dry** Prep Date: **11/24/2020** Run No: **440738**
SampleType: **MS** TestCode: **ION SCAN SW9056A** BatchID: **306486** Analysis Date: **11/28/2020** Seq No: **10042731**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chloride	155.9	12	115.7	45.12	95.8	80	120				
Sulfate	268.3	12	289.3	36.80	80.0	80	120				

Sample ID: **2011M92-003AMSD** Client ID: Units: **mg/Kg-dry** Prep Date: **11/24/2020** Run No: **440738**
SampleType: **MSD** TestCode: **ION SCAN SW9056A** BatchID: **306486** Analysis Date: **11/25/2020** Seq No: **10036062**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chloride	170.8	12	115.9	44.88	109	80	120	172.7	1.12	20	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: United Consulting Group Inc.
Project Name: Beaver Ruin Wetland Park
Workorder: 2011M90

ANALYTICAL QC SUMMARY REPORT

BatchID: **306486**

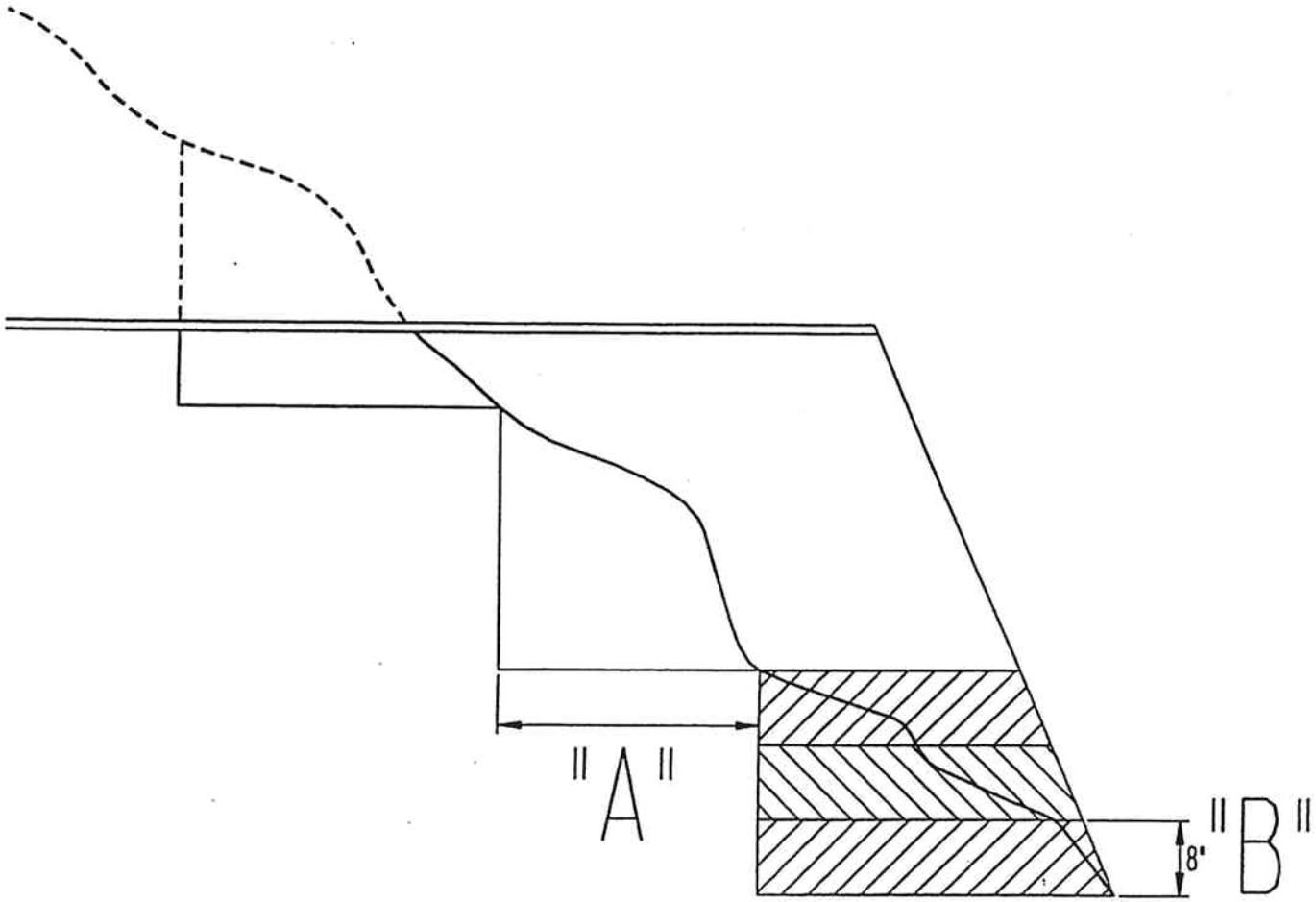
Sample ID: **2011M92-003AMSD** Client ID:
SampleType: **MSD** TestCode: **ION SCAN SW9056A**
Units: **mg/Kg-dry** Prep Date: **11/24/2020** Run No: **440738**
BatchID: **306486** Analysis Date: **11/25/2020** Seq No: **10036062**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Sulfate	307.6	12	289.7	133.2	60.2	80	120	302.7	1.61	20	S

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

End of Report



1. THE ABOVE DIAGRAM ILLUSTRATES A TYPICAL BENCHING FOR PLACEMENT OF FILL ON A SLOPING SURFACE.

2. THE DIAGRAM SHOWS THAT BEFORE FILL IS PLACED, THE FIRST STEP IS CUT INTO THE SLOPE A MAXIMUM DISTANCE OF ABOUT 8 FEET "A" (ABOUT ¾ THE WIDTH OF USUAL D-8 BULLDOZER BLADE). SUCCESSIVE LAYERS OF FILL ARE THEN PLACED. BEFORE FINAL LAYER IS PLACED, THE SECOND STEP IS CUT 8 FEET INTO THE SLOPE AND SUCCESSIVE LAYERS ARE AGAIN PLACED.

3. SELECT FILL MATERIAL SHOULD BE PLACED IN 8 INCH LIFTS AND COMPACTED TO THE SPECIFIED DENSITY ("B").

TYPICAL BENCHING DETAIL

UNITED CONSULTING
625 HOLCOMB BRIDGE ROAD, NORCROSS, GEORGIA 30071
OFFICE (770)-209-0029 FAX (770)-582-2900

Important Information about This

Geotechnical-Engineering Report

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

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

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

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

Read the Full Report

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

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

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

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

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

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

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

Subsurface Conditions Can Change

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

Most Geotechnical Findings Are Professional Opinions

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

A Report's Recommendations Are Not Final

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

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

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

Do Not Redraw the Engineer's Logs

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

Give Constructors a Complete Report and Guidance

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

Read Responsibility Provisions Closely

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

Environmental Concerns Are Not Covered

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

Obtain Professional Assistance To Deal with Mold

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

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

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

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

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Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

UNITED CONSULTING

REPORT

For Gwinnett County Government – Parks & Recreation

Geotechnical Exploration
Beaver Ruin Wetlands Park
Duluth, Gwinnett County, Georgia

Project No.: GCP&R-20-GA-04517-01
January 7, 2021

625 Holcomb Bridge Road, Norcross, GA 30071 • 770-209-0029 • unitedconsulting.com

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GCP&R-20-GA-04517-01

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UNITED CONSULTING

GEORGIA REGISTERED No. 22149 PROFESSIONAL ENGINEER RAFAEL I. OSPINA

Rafael I. Ospina, P.E.
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1.0 EXECUTIVE SUMMARY

nite ons lting has o plete a eote hni al plo ation fo the Bea e in etlan s a k to be lo ate to the so th of atellite Bo le a in l th innett o nty eo gia lease efe to the te t of the epo t fo a o e etaile is ssion of the ite s s a i□e belo

The eote hni al plo ation p og a in l e fifteen 1 T oil Bo ings one 1 offset bo ing an li ite labo ato y testing

1 Belo the g o n s fa e bo ing B-11 en o nte e app o i ately 2 feet of fill soils bo ings B-101 an B-11 en o nte e bet een 4 to feet of fill soils an bo ings B-102 an B-10 en o nte e 2 feet of fill soils The fill en o nte e gene ally onsiste of e y loose to fi an ith a ying a o nts of silt lay an i a gene ally appea e to be f ee of eb is an o gani ontent an ha tan a enet ation Test esistan e - al e of 2 blo s pe foot bpf to 11 to bpf

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4 o i e that the site is p epa e as e o en e it is o opinion that the p opose boa alks an be s ppo te on heli al pie footings the p opose t ss b i ge st t es an be s ppo te on shallo fo n ations ille pie s o o posite pile fo n ations an othe st t es an be s ppo te on on entional shallo fo n ations esigne fo a ying allo able soil bea ing p ess es etaile e o en ations fo fo n ations a e in l e in the te t

2.0 PROJECT INFORMATION

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topog aphi site plan as p o i e by the lient ate file ate 11 22 201 le ations at the site ange f o abo t 0 in the no the n o ne nea atellite Bo le a to 7 along the eek nning in the ent al-no the n po tion of the site

e n e stan that the p o e t ill onsist of st ea esto ation an e elop ent of a pa k hi h ill in l e boa alks on ete t ails t ss b i ges a ent e pi ni a eas obse ation to e s an othe a enities The s ope of this p o e t in l e an as only li ite to

- 2 7 L of 12□at-g a e on ete t ail
- 2 4 0 L of 12□ on ete boa alk
- 110 L an 1 0 L 12□t ss b i ges
- 2 400 L of □at-g a e l h t ail
- est oo s a ent e pi ni a ea obse ation to e s pi ni an obse ation pa ilions

Base on an - ail an asso iate atta h ent f o ohn yle at e aT ak ate 11 2 2020 e n e stan that the boa alk pie ea tions ill be as follo s

Table 1: Boardwalk Pier Reaction Loads

Direction	Service Loads (kips)	Factored Loads (kips)
ial e ti al	2 4 L LL	4 L LL
Late al o i□ontal	1 0	2

Base on an - ail an asso iate atta h ent f o oseph o ell at L ate 12 1 2020 e n e stan that the b i ge- onto t ss ill be s ppo te on 4 a span an ho s he e ea tions at ea h an ho lo ation ill be as follo s

Table 2: Bridge-Contour Truss Reaction Loads

Direction/Load Type	Unfactored Loads (kips)
ial e ti al L LL	47
Late al o i□ontal in	
plift e ti al o i□ontal in	-
plift e ti al e t ning in	-10

o p eli ina y fo n ation e o en ations e ill ass e a ial se i e loa s anging f o 20 kips o less to 0 kips fo the est oo obse ation pa ilion an othe st t es

f the a t al plans site g a ing an fo n ation loa s info ation a y signifi antly f o the abo e anti ipate al es nite ons lting st be onta te to ete ine if o e o en ations sho l be e-e al ate an o e ise

3.0 PURPOSE

The p pose of this eote hni al plo ation as to assess the gene al type an on ition of the s bs fa e ate ials at the o e t ite an to p o i e fo n ation e o en ations fo boa alks etaining alls obse ation to e s an othe fa ility st t es g a ing ea th o k ality ont ol an othe geote hni al elate iss es ee e pe tinent to this p o e t

4.0 SCOPE

The s ope of o geote hni al e plo ation in l e the follo ing ite s

1 Bo ing layo t an lea ing n e g o n tilities

2 is al e onnaissan e of the site f o a geote hni al stan point

illing fifteen 1 tan a enet ation Test T bo ings an one offset bo ing to assess the ality an onsisten y of the s bs fa e soils

4 is al e al ation of the soil sa ples obtaine ing o fiel -testing p og a fo f the i entifi ation an lassifi ation

e fo ing labo ato y testing onsisting of fifteen 1 g ain si□e analysis ith hy o ete an fifteen 1 tte be g Li its fo ty 40 nat al oist e tests t o 2 n onfine o p ession tests an one 1 t ia ial test on ep esentati e soil sa ples as ell as eight p esisti ity hlo i e an s lfate tests at ep esentati e lo ations

naly□ing the e isting soil on itions ith espe t to the p opose onst tion an

7 epa ing this epo t to o ent the es lts of o fiel -testing p og a enginee ing analysis an to p o i e o fin ings an gene al e o en ations

5.0 SUBSURFACE CONDITIONS

The geote hni al e plo ation fo the p o e t onsiste of fifteen 1 T oil Bo ings an one 1 offset bo ing esignate B-101 to B-11

nitially ea h of the bo ings en o nte e a thin s fi ial laye Beneath the s fi ial ate ials bo ing B-11 en o nte e app o i ately 2 feet of fill soils bo ings B-101 an B-11 en o nte e bet een 4 to feet of fill soils an bo ings B-102 an B-10 en o nte e 2 feet of fill soils The fill en o nte e onsiste of e y loose to fi an ith a ying a o nts of silt lay an i a Bo ings B-11 an B-11 also en o nte e laye s of fi lay ith so e san an t a es of silt an i a The tan a enet ation Test esistan e - al es in the fill an s ange f o 2 blo s pe foot bpf to 11 bpf an those ithin the fill lays as bpf

Belo the fill in afo e entione bo ings an the g o n s fa e in the e aining bo ings typi al esi al soils of the ie ont hysiog aphi o in e of eo gia e e en o nte e in the bo ings The esi al soils gene ally onsiste of e y loose to e y ense an ith a ying a o nts of silt lay i a an o k f ag ents e y soft to stiff lay ith a ying a o nts of san silt i a an o k f ag ents o soft to e y stiff ilt ith a ying a o nts of san lay i a an o k f ag ents - al es ithin the esi al an s ange f o 2 to 7 bpf those ithin the esi al lays ange f o 2 to 1 bpf an those ithin the esi al ilts ange f o to 2 bpf

a tially eathe e o k as en o nte e in bo ings B-101 th o gh B-10 B-10 B-10 an B-114 at epths anging f o feet to 2 feet is a te fo esi that an be penet ate ith a soil illing a ge that has - al es in e ess of 100 bpf The en o nte e as lassifie as e y ense an ith a ying a o nts of o k f ag ents lay silt an i a

ge ef sal o e in bo ings B-101 th o gh B-110 an B-114 at epths anging f o feet to 2 feet ge ef sal in T bo ings is the epth that the bo ing annot be a an e ith a soil illing a ge ge ef sal ithin esi al soils gene ally ep esents a sea of ense bo l e s o top of assi e be o k

o n ate as en o nte e in bo ings B-101 B-10 B-104 B-10 th o gh B-10 an B-111 th o gh B-114 at epths anging f o 1 foot to 1 feet at the ti e of illing o 24 ho s afte illing o n ate le els sho l be anti ipate to fl t ate ith the hange of seasons ing pe io s of e y lo o high p e ipitation o e to hanges in the floo plain o ate she pst ea of the site

The bo ings e e ba kfille ith soil ttings

o a o e etaile es iption of the s bs fa e on itions en o nte e please efe to the bo ing logs in The ppen i bo ing s a y table is p esente belo

Table 3: Summary of Subsurface Conditions

Structure	Boring No.	Ground Surface Elevation[1] (ft-msl)	Bottom of Fill Depth (ft)	24-hr GW Depth (ft.)	Depth to PWR (ft.)	Depth to Refusal (ft.)	Termination Depth (ft)
teel T ss e est ian B i ge	B-101						
	B-102		2			7	7
	B-114				1	2	2
on ete T ails Boa alk	B-10	01		2	0		
	B-104	02		1	2	2	2
	B-10	04			1	17	17
	B-10	01	2		0	7	7
	B-10	01			1	14	14
	B-10	0		1	0		
	B-10	0			1	1	1
	B-110					11	11
	B-111			4			0
	B-112	2					0
ent e i ni ea	B-107	07				1	1
i ni ea bse ation a ilion	B-11	1	2				2
est oo	B-11	12	4				20

otes
1 o n s fa e ele ations e e esti ate f o site topog aphi ap p o i e by the lient ate file ate 11 22 201

6.0 LABORATORY TESTING PROGRAM

Labo ato y testing fo this p o e t in l e fifteen 1 g ain si□e analysis ith hy o ete an fifteen 1 tte be g Li its fo ty 40 nat al oist e tests t o 2 n onfine o p ession tests an one 1 t ia ial test on ep esentati e soil sa ples The es lts of the oist e ontent tests a e sho n on the bo ing logs ne t to the espe ti e sa ples teste na ati e es iption of the labo ato y tests an the labo ato y test es lts a e in l e in The ppen i

ight p esisti ity hlo i e an s lfate tests e e also on te on ep esentati e soil sa ples an the es lts tab late belo

Table 4: Soil Corrosivity Test Results

Boring	Depth (ft.)	Soil pH (S.U.)	Soil Resistivity (ohm-cm)	Chloride (mg/kg, ppm)	Sulfate (mg/kg, ppm)
B-102	2 □4	72	14100		0
B-10	2 □	41	1 400		
B-104	2 □	04	1 00		27
B-10	2 □4		21 00	4	1 0
B-10	2 □4	1	10	74	4
B-110	2 □		10 00		21
B-112	2 □4	7	0	4	0
B-114	2 □		1 00	4	7

7.0 DISCUSSION AND RECOMMENDATIONS

The follo ing e o en ations a e base on o n e stan ing of the p opose onst tion the ata obtaine in the soil test bo ings a site e onnaissan e an o e pe ien e ith s bs fa e on itions like those en o nte e at the p o e t site

e e o en that nite ons lting be p o i e ith p ate o ents ea ly in the p epa ation of final onst tion a ings to ete ine if o e o en ations a e still ali o sho l be e-e al ate an e ise

7.1 Existing Fill

Belo the g o n s fa e bo ing B-11 en o nte e app o i ately 2 feet of fill soils bo ings B-101 an B-11 en o nte e bet een 4 to feet of fill soils an bo ings B-102 an B-10 en o nte e 2 feet of fill soils The fill en o nte e gene ally onsiste of e y loose to fi an ith a ying a o nts of silt lay an i a gene ally appea e to be f ee of eb is an o gani ontent an ha tan a enet ation Test esistan e - al e of 2 blo s pe foot bpf to 11 to bpf

s ith any site ontaining n o ente e isting fill ate ials it is not n o on to fin eepe a eas of fill soft soils t ash pits o b ie t ash topsoil bo l e s e nants of p io onst tion blast o k o othe ns itable ate ials ithin e isting fill ate ials The ality of the fill sho l be f the e al ate at the ti e of onst tion by p oof olling an possibly the e a ation of test pits an soft o othe ise ns itable soils if en o nte e sho l be e o e f o the a ea of the planne onst tion nite ons lting e o en s that the p o e t b get in l es ontingen y f n s in the e ent that a eas ontaining lo onsisten y soils that annot be ensifie in pla e o othe ns itable ate ials e i ing e o al a e en o nte e ithin the fill

7.2 Site Preparation

io to e elop ent ainly fo b il ings on g a e e isting egetation an t ees in l ing thei oot at sho l be e o e f o the a ea of the p opose onst tion e o al of t ees sho l in l e e o al of thei oot ball hi h ay e ten to se e al feet belo g a e

ny e nants of p io n e g o n onst tion o n e g o n tilities sho l be elo ate to at least 10 feet o tsi e the pe i ete of p opose b il ing footp ints ban one tility lines sho l be e a ate an e o e f aban one tility pipes a e left in pla e ithin the non-st t al a eas of the site they sho l be fille -in n e p ess e ith e ent g o t ha ing a 2 - ay o p essi e st ength of at least 00 psi

io to pla e ent of any enginee e fill o o en e ent of onst tion a eas to e ei e fill shallo fo n ations slabs an pa e ents sho l be p oof olle ith a f lly loa e tan e -a le p t k oof olling sho l be pe fo e n e the obse ation of the eote hni al nginee o his ep esentati es so that a eas hi h e hibit p ping a e type ispla e ent ing p oof olling ay be t eate by a etho e o en e by the eote hni al nginee This etho ay onsist of n e tting an ba kfilling ith s itable enginee e fill epla ing ith s ge stone an a laye of she n o so e othe etho that is ee e s itable

e to the p esen e of n o ente e isting fill soils a eas e i ing stabili□ation an o e o al an epla e ent ith enginee e fill sho l be anti ipate an b gete fo ing site p epa ation

7.3 Difficult Excavation

a tially eathe e o k as en o nte e in bo ings B-101 th o gh B-10 B-10 B-10 an B-114 at epths anging f o feet to 2 feet ge ef sal o e in bo ings B-101 th o gh B-110 an B-114 at epths anging f o feet to 2 feet iffi lt e a ation on itions ipping an o blasting asso iate ith o o k a e not gene ally e pe te fo ass g a ing of the site e note that shallo e o o k ay be p esent bet een o a ay f o the a eas e plo e

t is also i po tant to note that epths to an o k an a y o e sho t ho i□ontal istan es in the ie ont geologi a ea an an o k o l be en o nte e ing onst tion at shallo e epths bet een an o tsi e the bo ing lo ations fo this st y

typi ally e i es loosening by ipping ith la ge o□e s p lling single tooth ippe s in ass e a ation The se of spe iali□e e a ation e ip ent s h as a -hoes a kha e s o possibly blasting is typi ally e i e fo e a ation in onfine t en h e a ations elati ely so n assi e o k typi ally e i es blasting fo e o al in ass o t en h e a ation

nite ons lting e o en s that the follo ing etho -base efinitions fo o k be in l e in bi o ents n l sion of s h efinitions an help a oi ont a t isp tes o e o k e a ation ing onst tion

1 ene al a ation ny ate ial o pying an o iginal ol e of o e than 1 bi ya hi h annot be e a ate ith a single-tooth ippe a n by a a le t a to ha ing a ini a ba p ll ating of not less than 0 000 lbs sable p ll ate pilla - o la ge

2 T en h a ation ny ate ial o pying an o iginal ol e of o e than 1 2 bi ya hi h annot be e a ate ith a ba khoe ha ing a b ket ling fo e ate at not less than 40 000 lbs sing a o k b ket an o k teeth

7.4 Groundwater Considerations

o n ate as en o nte e in bo ings B-101 B-10 B-104 B-10 th o gh B-10 an B-111 th o gh B-114 at epths anging f o 1 foot to 1 feet at the ti e of illing o 24 ho s afte illing hallo g o n ate is not e pe te to signifi antly i pa t onst tion ho e e g o n ate ont ol e ate ing ay be e i e fo onst tion of shallo fo n ations nea the g o n ate le el o n ate le els sho l be anti ipate to fl t ate ith the hange of seasons ing pe io s of e y lo o high p e ipitation o e to hanges in the floo plain o ate she pst ea f o the a ea

7.5 Caving Considerations

ll e a ations sho l be on te in a o an e ith the pational afety an ealth inist ation g i elines lattening of the e a ation si e alls an o the se of b a ing ay be nee e to aintain stability ing onst tion

7.6 Foundation Design and Construction

7.6.1 First Steel Truss Pedestrian Bridge

The p opose p o e t in l es t o steel t ss pe est ian b i ges the fi st one lo ate on the est en of the p o e t by bo ings B-101 an B-102 an the se on one on the east en of the p o e t by bo ing B-114 Both shallo an eep fo n ation syste s e e e al ate fo the t o b i ges

7.6.1.1 Shallow Foundation Recommendations

ollo ing site p epa ation as e o en e the fi st steel t ss pe est ian b i ge st t e bo ings B-101 an B-102 a ea o l be s ppo te on a shallo fo n ation syste Base on the s bs fa e e plo ation ata an p o i e loa s a net allo able soil bea ing p ess e of 2 000 po n s pe s a e foot psf is e o en e fo fo n ation esign fo a a i total settle ent of 1 in h fo the footing bea ing at least 12 in hes belo the g o n s fa e f at least 2 feet belo the footing is n e t an ba kfille ith 12 in hes of 7 stone belo 12 in hes of o pa te oa se g a e agg egate base B then a net allo able soil bea ing p ess e of 000 po n s pe s a e foot psf an be se fo fo n ation esign o n ate as en o nte e in bo ing B-101 at feet belo g o n s fa e 24-h stabili□e ate le el epen ing on the footing bea ing ele ation g o n ate ont ol ay be e i e ing e a ation an pla e ent of g an la ba kfill an footing onst tion The e a ation an pla e ent of g an la ba kfill sho l e ten at least 2 feet o tsi e the footing li its

e e o en ini footing i ensions of 20 in hes fo st ip footings an 24 in hes fo s a e footings ootings sho l bea at least 12 in hes belo o tsi e finishe g a es fo f ost p ote tion The eote hni al nginee st e al ate ea h footing e a ation p io to steel einfo e ent o on ete pla e ent on itions that a e obse e sho l be o pa e to the test bo ing ata an esign e i e ents f ns itable bea ing ate ial is en o nte e it sho l be e a ate an epla e o othe ise t eate as e o en e by the eote hni al nginee

fa e ate ont ol sho l be aintaine to p e ent a lation of ate in footing e a ations tan ing ate in footing e a ations sho l be e o e p o ptly oil softene by the ate sho l be e o e an the eote hni al nginee o his ep esentati e sho l ee a ine the a ea

7.6.1.2 Deep Foundation Recommendations

e to the p esen e of shallo ef sal ithin the ppe se en feet belo g o n s fa e a fo n ation syste onsisting of i en piles as not onsi e e a iable fo n ation option fo the fi st steel t ss pe est ian b i ge o e e the st t e o l be s ppo te on en bea ing a ge ast piles pie s e ten e to a ge ef sal epths on o k app o i ately 7 feet belo g o n s fa e ith an

allo able bea ing p ess e of at least 20 ksf e e o en that the si e shea an the passi e p ess e in the ppe feet of the pile be negle te in the fo n ation analysis so si e esistan e is e pe te to be negligible fo this steel t ss pe est ian b i ge o the p opose esign loa s a ge ast ille pie s ith at least 1 in hes in ia ete f _ 4 000 psi installe to a ge ef sal ay be an alte nati e fo n ation syste fo the b i ge en bents to esist both a ial an late al loa s fo less than 0 in hes late al efle tion

7.6.2 Second Steel Truss Pedestrian Bridge

The se on steel t ss b i ge ay be s ppo te by both shallo o eep fo n ation syste s t al sele tion of the fo n ation syste ill epen on onst tion ost an onst tion i pa t to en i on entally sensiti e a eas

7.6.2.1 Shallow Foundation Recommendations

ollo ing site p epa ation as e o en e the se on steel t ss pe est ian b i ge st t e a ea of bo ing B-114 o l be s ppo te on shallo o eep fo n ations Base on the s bs fa e e plo ation ata an p o i e loa s f at least 2 feet belo the footing is n e t an ba kfille ith 12 in hes of 7 stone belo 12 in hes of o pa te oa se g a e agg egate base B then a net allo able soil bea ing p ess e of 2 00 po n s pe s a e foot psf an be se fo shallo fo n ation esign fo a a i total settle ent of 1 in h fo the footing bea ing at least 12 in hes belo the g o n s fa e o n ate in bo ing B-114 as en o nte e at feet belo g o n s fa e 24-h stabili e ate le el epen ing on the footing bea ing ele ation g o n ate ont ol ay be e i e ing e a ation an epla e ent ith o pa te g an la ba kfill an footing onst tion

e e o en ini footing i ensions of 20 in hes fo st ip footings an 24 in hes fo s a e footings ootings sho l bea at least 12 in hes belo o tsi e finishe g a es fo f ost p ote tion The eote hni al nginee st e al ate ea h footing e a ation p io to steel einfo e ent o on ete pla e ent on itions that a e obse e sho l be o pa e to the test bo ing ata an esign e i e ents f ns itable bea ing ate ial is en o nte e it sho l be e a ate an epla e o othe ise t eate as e o en e by the eote hni al nginee

fa e ate ont ol sho l be aintaine to p e ent a lation of ate in footing e a ations tan ing ate in footing e a ations sho l be e o e p o ptly oil softene by the ate sho l be e o e an the eote hni al nginee o his ep esentati e sho l ee a ine the a ea

7.6.2.2 Deep Foundation Recommendations

The se on steel t ss pe est ian b i ge ay be s ppo te on a eep fo n ation syste to ini i e i pa t to sensiti e en i on ental a eas etlan e n e stan top- o n boa alk onst tion is being onsi e e fo the p o e t This onst tion app oa h o l e i e installation of the eep fo n ation syste f o top of the boa alk ibe glass o posite i en piles installe ith a ib ato y ha e lo eight a e a iable eep fo n ation syste option fo the se on steel t ss pe est ian b i ge

nstallation of fibe glass piles sho l fallo an fa t e s e o en ations to ens e they a e not o e to e e to eing of the bolts an o al the piling an o p o ise the integ ity of the ate ial e si□e ashe s o ba king plates a e e o en e fo any bolte onne tions into the pile espite the high st ength of □be glass on ent ate loa s a e e i e to be sp ea o e a la ge a ea as o pa e to oo o steel ll onne tions sho l be a e sing ha a e spe i□e by the p o e t enginee

Base on the loa s p o i e nite ons lting pe fo e p eli ina y esign al lations to ete ine pile si□e an onfig ation an esti ate installation epths The p eli ina y fibe glass fo n ation syste onsists of 12□ ia ete piles ith a ini a ial o p essi e st ength of at least 0 ksi all thi kness of 0 7 in hes an installe to a ini epth of 1 feet 10□ ia ete pile hile it o l p o i e the a ial st t al an geote hni al loa apa ity it o l not p o i e the geote hni al late al loa apa ity keep late al efle tions to less than 0 in hes e i e fo the p o e t

e note that only one bo ing B-114 as ille in the lo ation of the se on t ss b i ge an this info ation sho l be s pple ente ith f the soil bo ings bo ing B-11 lo ate at the othe en bent of the b i ge as o tsi e the a ea ith a ight-of- nt y teel piles e e not onsi e e fo this p o e t as hea ie pile i ing anes o l be e i e fo pile installation an o l not be s itable fo boa alk top- o n onst tion

Table 5: Summary of Preliminary Truss Bridge Foundation Recommendations

Structure	Boring No.	Foundation Type	Allowable Bearing Pressure[2] (psf)	Pile Embedment Depth[2] (ft-bgs)
B i ge o 1	B-101 B-102	hallo [1]	000	
		1 - ia ete ge ast iles		7
B i ge o 2	B-114	hallo [1]	2 00	
		12 - ia ete ib eglass iles		1
otes 1 t least 2 feet belo the epth of footing nee s to be n e t an ba kfille ith 12 in hes of 7 stone belo 12 in hes of o pa te oa se g a e agg egate base B 2 Loa s e e p o i e in an - ail an asso iate atta h ent f o oseph o ell at L ate 12 1 2020				

7.6.3 Concrete Trails/Boardwalks

hallo sp ea footings e e initially onsi e e fo the boa alks ho e e e to the p esen e of soft loose soils ithin the ppe fi e to ten feet belo g o n s fa e an the p esen e of shallo g o n ate shallo sp ea footings a e not onsi e e a iable fo n ation option fo the boa alk p o e t eli al pie s e e then onsi e e as a ost-effe ti e eep fo n ation syste fo the boa alk p o e t

eli al pie s a e installe by otating heli al an ho s th o gh the ppe o e b en ate ial to ense bea ing st ata epen ing on the an fa t e an the spe ifi pie type heli al pie s ay be esigne fo a o king o p essi e apa ity of tons The heli al pie s ay ha e an plift apa ity si ila to the o p ession apa ity p o i e the e is s ffi ient e be ent of the heli al pie lea se tion Late al esistan e is typi ally p o i e by installing pie s at a batte f o 1h 4 14º to 1h 1 4 º The heli al pie an fa t e installe typi ally p o i es etaile esign an installation ite ia eli al pie lea s a e typi ally p o i e ith t o to th ee heli es ith heli es spa e typi ally at ti es the heli ia ete a i of the t o a a ent heli es an ange in si□e typi ally f o 10 12 an 14 in hes in ia ete eli al pie s shafts o e in iffe ent types an si□es anging f o s a e soli steel shafts 1 □□to 2 □□in si□e to hallo stea shafts anging f o 2 7 □to 4 □□ the heli al pie onfig ations an si□es a e also a ailable by iffe ent heli al pie s pplie s The apa ity of the heli al pie s is ont olle by the a i to e that an be applie to the heli al pie an lea asse bly ing installation The no inal lti ate heli al pie o p ession tension apa ity is o elate to the to e eas e ing installation pe ial heli al pie lea s a e a ailable fo shallo installations he e the botto of the lea is e pe te to be i en into o k eating a □spin o t□ on ition

ing installation of the heli al pie s etaile e o s sho l be aintaine by a ep esentati e of o fi to e ify pie type lo ation length installation on itions an esti ate apa ity e e est that e be allo e to e ie the ont a to □s p opose e ip ent an installation p o e e p io to obili□ation an onst tion

epen ing on ate ial a ailability an othe fa to s it is possible that othe eep fo n ation alte nati es ay be e ono i ally feasible fo this p o e t e o l be gla to e al ate othe eep fo n ation options an p o i e e o en ations fo s h if nee e itional s bs fa e e plo ation o l be e i e epen ing on the type of alte nati e eep fo n ation option onsi e e

7.6.3.1 Helical Pier Recommendations

Base on the loa s p o i e nite ons lting pe fo e p eli ina y heli al pie esign al lations to ete ine heli al pie si□e an onfig ation an esti ate installation epths The p eli ina y heli al pie s fo n ation syste onsists of t o 2 batte e piles at 1h 4 14º installation angle ith lti heli es 10□ 12□an 14□ ia ete as e i e installe to epths botto heli anging f o 14 to 2 feet epen ing on the s bs fa e on itions en o nte e in the si bo ings o plete along the boa alk fo this p o e t The batte e heli al pie s a e esigne to p o i e 0 kips of e i e o p ession Loa 24 4 kips of a i a ial loa an 2 kips of a ial loa f o the late al loa 1 kips pile on e te into o p ession o tension loa e note that heli al pie s installation ont a to s ill e elop thei o n esign fo the p o e t an that the p o i e e o en ations a e fo esti ating fo n ation antities an enginee □s ost esti ates The p eli ina y heli al pie fo n ation e o en ations pe bo ing lo ation a e s a i□e belo an in o e etail in The ppen i

epen ing on ate ial a ailability an othe fa to s it is possible that othe eep fo n ation alte nati es ay be e ono i ally feasible fo this p o e t e o l be gla to e al ate othe eep fo n ation options an p o i e e o en ations fo s h if nee e itional s bs fa e e plo ation o l be e i e epen ing on the type of alte nati e eep fo n ation option onsi e e

Table 6: Summary of Preliminary Helical Pier Design Recommendations

Structure	Boring No.	Depth to Dense Soil (ft-bgs) (N_{60} > 30 bpf)	Pile Type	Battered Pile Design Compression Service Load[1] (kips)	Battered Pile Minimum Installation Torque[2] (Ft-lb) (K_t= 10 ft^{-1})	Minimum Depth to Bottom Helix (ft-bgs)
on ete T ails Boa alk	B-10		17 - a e 1-□ haft 14 12 10 eli es as e i e 2 Batte e iles at 1h 4 14 ° ft To e ating 10 00 t-lb	0	10	
	B-104	1				11
	B-10	4				12
	B-10 10					1
	B-10					
	B-10	1				1
	B-110					11
	B-111	2				2
	B-112	2				2

otes

1 Batte e piles a e esigne to han le the se i e a ial loa 24 4 kips an late al loa 1 kips The 1 kips se i e late al loa in ea h pile total of kips pe bent is t ansfe e to pile a ial o p ession an tension loa espe ti ely hen the loa is applie along the bent

2 t least one e ti al pile loa test sing the top la ge heli 14 sho l be pe fo e to he k the t fa to se to al late the lti ate heli al pile lti ate o inal t ength bea ing apa ity f o the installation to e eas e in the fiel The esti ate ini to e p o i e abo e is base on a t 10 ft^{-1} pin-o t piles e ten e to o k a ge ef sal

7.6.4 Lightly Loaded Structures

ollo ing site p epa ation as e o en e the p opose lightly loa e st t es s h as the a ent e pi ni a ea obse ation pa ilion an est oo s o l be s ppo te on shallo fo n ation syste s Base on the s bs fa e e plo ation ata an ass e a ial se i e loa s f o 20 kips o less to p to 0 kips a ange of net allo able soil bea ing p ess es f o 1 00 to 000 po n s pe s a e foot psf

a e e o en e fo fo n ation esign fo a a i total settle ent of 1 in h These a e s a i□e in the table belo

Table 7: Allowable Bearing Pressure for Lightly Loaded Structures

Boring	Structure	Column Loads (kips)	Allowable Bearing Pressure (psf)
B-107	ent e i ni ea	≤20	000
		0	2 00
		0	2000
B-11	i ni ea bse ation a ilion	≤20	2 00
		0	2000
		0	1 00
B-11	est oo	≤20	000
		0	2 00
		0	2000

7.7 Ground Floor Slabs

o slabs on g a e e e o en a s bg a e o l s of 120 po n s pe bi in h p i be se fo slab esign t has been o e pe ien e that the floo slab s bg a e is often ist be by eathe fo n ation an tility line installation an othe onst tion a ti ities bet een o pletion of g a ing an slab onst tion o this eason o geote hni al enginee sho l e al ate the s bg a e i e iately p io to pla ing the on ete eas ge by the geote hni al enginee to be nstable sho l be e- o pa te o n e t an epla e ith enginee e fill o pa te to at least pe ent of its stan a o to a i y ensity

7.8 Earthwork

The onsite soils if f ee of o gani an othe elete io s ate ials sho l gene ally be s itable fo e se as enginee e fill ith p ope oist e ont ol a tially eathe e o k an be se as enginee e fill if it b eaks p s ffi iently to eet g a ation e i e ents an also be i e ith soil to eet g a ation e i e ents

e to the p esen e of high silt ontents so e of the onsite soil ay be sensiti e to oist e a iation ing ainy seasons these soils ill be iffi lt to y s a p a ti al onsi e ation ing e ten e pe io s of et eathe et onsite soils ay nee to be is a e an epla e ith ie soils These soils sho l be pla e ithin a na o ange of thei opti oist e ontent typi ally ithin abo t pe ent of opti oist e to a hie e p ope o pa tion Typi al est i tions on s itable fill a e no o gani s plasti ity in e less than 2 an a i pa ti le si□e of fo in hes ith not o e than 0 pe ent g eate than 4-in h These est i tions sho l also be applie to i po te bo o soils if nee e

ositi e ainage sho l al ays be aintaine to p e ent sat ation of e pose soils in ase of s en ains olling the s fa e of ist be soils ill also i p o e noff an e e the soil oist e an onst tion elays The eg ee of soil stability p oble s ill also be epen ent pon the p e a tions taken by the ont a to to help p ote t the soils f o sat ation ing onst tion

oist e- ensity ete inations sho l be pe fo e fo ea h soil type se to p o i e ata ne essa y fo ality ass an e testing oil oist e ontents at the ti e of o pa tion sho l be a ste so that they a e ithin oist e ontent li its that ill allo the e i e o pa tion to be obtaine

7.9 Slopes

e e o en that he e fill is to be pla e on e isting slopes o g llies g eate than 4 1 the slopes be ben he to p e ent sli ing of the fill ass along the e isting s fa e This an be a hie e by not hing the slope fa e by at least abo t t o feet ho i□ontally ith the o pa to bla e as ea h lift is o pa te typi al ben hing etail is p o i e in The ppen i

e anent slopes sho l be onst te no steepe than 2 1 ill slopes of p to 20 feet in total height onst te to 2 1 sho l be a eptable ass ing p ope ben hing an pla e ent an o pa tion of enginee e fill lopes g eate than 20 feet st be e al ate fo global stability an sho l be esigne by a li ense eote hni al nginee lopes highe than feet sho l be ben he f less than esi able soils s h as topsoil o et soils a e to be aste on slopes o if an app op iate le el of ality ont ol an o pa tion testing n e the s pe ision of the geote hni al enginee is not planne ing slope onst tion 2 1 slopes ill not likely be a e ate an flatte slopes sho l be onsi e e

ll slopes sho l be p ote te f o e osion ing onst tion an p o i e ith app op iate pe anent egetation o othe o e afte onst tion lopes sho l be p ote te f o on ent ate n-off flo by eans of be s an ainage it hes to i e t noff a o n slopes o th o gh on ete hannels pp op iate egetati e o e sho l onsist of fast-g o ing g asses that ill api ly eate a ense oot at o e the enti e slope Lan s aping onsisting of isolate sh bs an pine st a ill not p o i e a e ate slope p ote tion

ini b il ing o etaining all setba k f o the nea est e ge of fo n ations of at least 10 feet f o the est of slopes is e o en e ini setba k of feet is e o en e fo pa e ent an bs

7.10 Fill Placement

oist e- ensity ete inations sho l be pe fo e fo ea h soil type se to p o i e ata ne essa y fo ality ass an e testing The nat al oist e ontent at the ti e of o pa tion sho l be ithin oist e ontent li its hi h ill allo the e i e o pa tion to be obtaine This is gene ally ithin th ee pe entage points of the opti oist e The ont a to sho l be p epa e to in ease o e ease soil ate ontent as nee e to a hie e the e i e eg ees of o pa tion

The fill sho l be pla e in thin lifts not to e ee -in h loose thi kness an o pa te e e o en the fill be o pa te to at least pe ent of tan a o to T a i y ensity ithin top t o feet an at least pe ent of tan a o to a i y ensity else he e on the site o t en h ba kfill alk-behin type o pa tion e ip ent is typi ally se fo o pa tion so e e o en pla ing fill in thin lifts not to e ee 4 in hes spe ially ithin oa ays an pa e ent a eas

eote hni al nginee on a f ll-ti e basis sho l obse e g a ing ope ations n-pla e ensity tests taken by that in i i al ill assess the eg ee of o pa tion being obtaine The f e en y of the testing sho l be ete ine by the eote hni al nginee

7.11 Retaining Walls

The follo ing etaining all e o en ations pe tain to ast-in-pla e b il ing an site etaining alls ithin the a eas e plo e an a e not inten e fo o la blo k o alls f o la blo k o alls a e planne on the site nite ons lting sho l be notifie be a se a itional e al ation ill be e i e to p o i e e o en ations spe ifi to the planne all types an lo ations

The esign of etaining alls st in l e the ete ination of the late al p ess e that ill a t on the all The late al ea th p ess e is a f n tion of the soil p ope ties s ha ge loa s behin the all an a o nt of efo ation that the all an n e go This efo ation is basi ally epen ent pon the elati e igi ity of the all syste

The a ti e ea th p ess e on ition e elops hen the all o es a ay f o the soil o e a s ffi ient istan e s h as fo a f eestan ing antile e all The at- est on ition e ists hen the e is no late al st ain on the soil s h as alls hi h a e igi ly est aine like a base ent o s b-fo n ation all The passi e on ition o s hen the all o es into the soil

The follo ing e i alent fl i p ess es a e e o en e fo th ee ea th p ess e on itions

Table 8 - Lateral Earth Pressures

Earth Pressure Condition	Earth Pressure Coefficient	Recommended Equivalent Fluid Pressure
ti e	0	4 psf foot
t- est	0	4 psf foot
assi e	2 77	2 psf foot

e note that onsi e able ho i□ontal efle tions a e e i e to obili□e the passi e p ess e the efo e the esigne sho l onsi e a safety fa to of 2 to the state lti ate passi e ea th p ess e in esign

The e o en e e i alent fl i p ess es a e base on an ass e soil ensity of 120 p f an inte nal f i tion angle of 2 eg ees an ohesion of □e o oeffi ient of f i tion of 0 4 fo sli ing ay be se fo the etaining all esign

The pa a ete s liste abo e a e base on a le el p ope ly o pa te ba kfill no f i tion at the all-soil inte fa e an no s ha ge effe ts o esign of etaining alls hi h o l be in n ate the b oyant nit eight of the in n ate soil sho l be se to ete ine the late al ea th p ess e The hy ostati p ess e base on the a i pon ing ele ation sho l be tili□e in the analysis

ea y o pa tion e ip ent sho l not be se to o pa t ba kfill ithin feet late ally behin any etaining all nless the all is esigne fo the in ease p ess e o te po a ily b a e The efo e light o pa tion e ip ent ay be e i e in this □one etaining all ba kfill sho l be o pa te to pe ent of the tan a o to a i y ensity pe anent ainage syste s h as a footing ain o a fab i ain s h as nka ain i a ain et is e o en e fo any etaining alls hi h a e o e than feet in height

The etaining alls sho l be esigne by a p ofessional enginee fa ilia ith etaining all esign an egiste e in eo gia The esigne sho l onsi e sloping ba kfill s ha ges an othe fa to s affe ting all loa ings The esigne sho l also onsi e lobal tability

8.0 LIMITATIONS

This epo t is fo the e l si e se of **Gwinnett County** an the esigne s of the p o e t es ibe he ein an ay only be applie to this spe ifi p o e t on l sions an e o en ations ha e been p epa e sing gene ally a epte stan a s of eote hni al nginee ing p a ti e in the tate of eo gia o othe a anty is e p esse o i plie fi is not esponsible fo on l sions opinions o e o en ations of othe s

The ight to ely pon this epo t an the ata ithin ay not be assigne itho t T LT itten pe ission

The s ope of this e al ation as li ite to an e al ation of the loa - a ying apabilities an stability of the s bsoils il ha a o s aste a ioa ti ity i itants poll tants ol s o othe ange o s s bstan e an on itions e e not the s b e t of this st y Thei p esen e an o absen e a e not i plie o s ggeste by this epo t an sho l not be infe e

on l sions an e o en ations a e base pon esign info ation f nishe to s ata obtaine f o the p e io sly es ibe e plo ation an testing p og a an o e pe ien e They o not efle t a iations in s bs fa e on itions that ay e ist inte e iate of o bo ings an in ne plo e a eas of the site ho l s h a iations be o e appa ent ing onst tion it ill be ne essa y to e- e al ate o on l sions an e o en ations base pon on-site obse ations of the on itions

f the esign o lo ation of the p o e t is hange the e o en ations ontaine he ein st be onsi e e in ali nless o fi e ie s the hanges an o e o en ations a e eithe e ifie o o ifie in iting hen esign is o plete e sho l be gi en the oppo t nity to e ie the fo n ation plan g a ing plan an appli able po tions of the spe ifi ations to onfi that they a e onsistent ith the intent of o e o en ations

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APPENDIX

General Notes/Narrative of Drilling Operations
Figure 1 – Boring Location Plan
Exploration Procedures
Laboratory Procedures
SPT Boring Logs (16)
Helical Pile Design Recommendations (1)
Lab Summary Sheet (3)
Liquid and Plastic Test Report (2)
Moisture Content Results (2)
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Triaxial Test Results (2)
Analytical Lab Test Results (19)
Benching Detail

GENERAL NOTES

The soil classifications noted on the Boring Logs are visual classifications unless otherwise noted. Minor constituents of a soil sample are termed as follows:

Trace	0 - 10%
Some	11 - 35%
Suffix "y" or "ey"	36 - 49%

LEGEND

Split Spoon Sample obtained during Standard Penetration Testing

Relatively Undisturbed Shelby Tube Sample

Groundwater Level at Time of Boring Completion

Groundwater Level at 24 hours (or as noted) after Termination of Boring

w	Natural Moisture Content	
LL	Liquid Limit	
PL	Plastic Limit	Atterberg Limits
PI	Plasticity Index	
PF	Percent Fines (Percent Passing #200 Sieve)	
γ_d	Dry Unit Weight (Pounds per Cubic Foot or PCF	
γ_m	Moist or In-Situ Unit Weight (PCF)	
γ_{sat}	Saturated Unit Weight (PCF)	

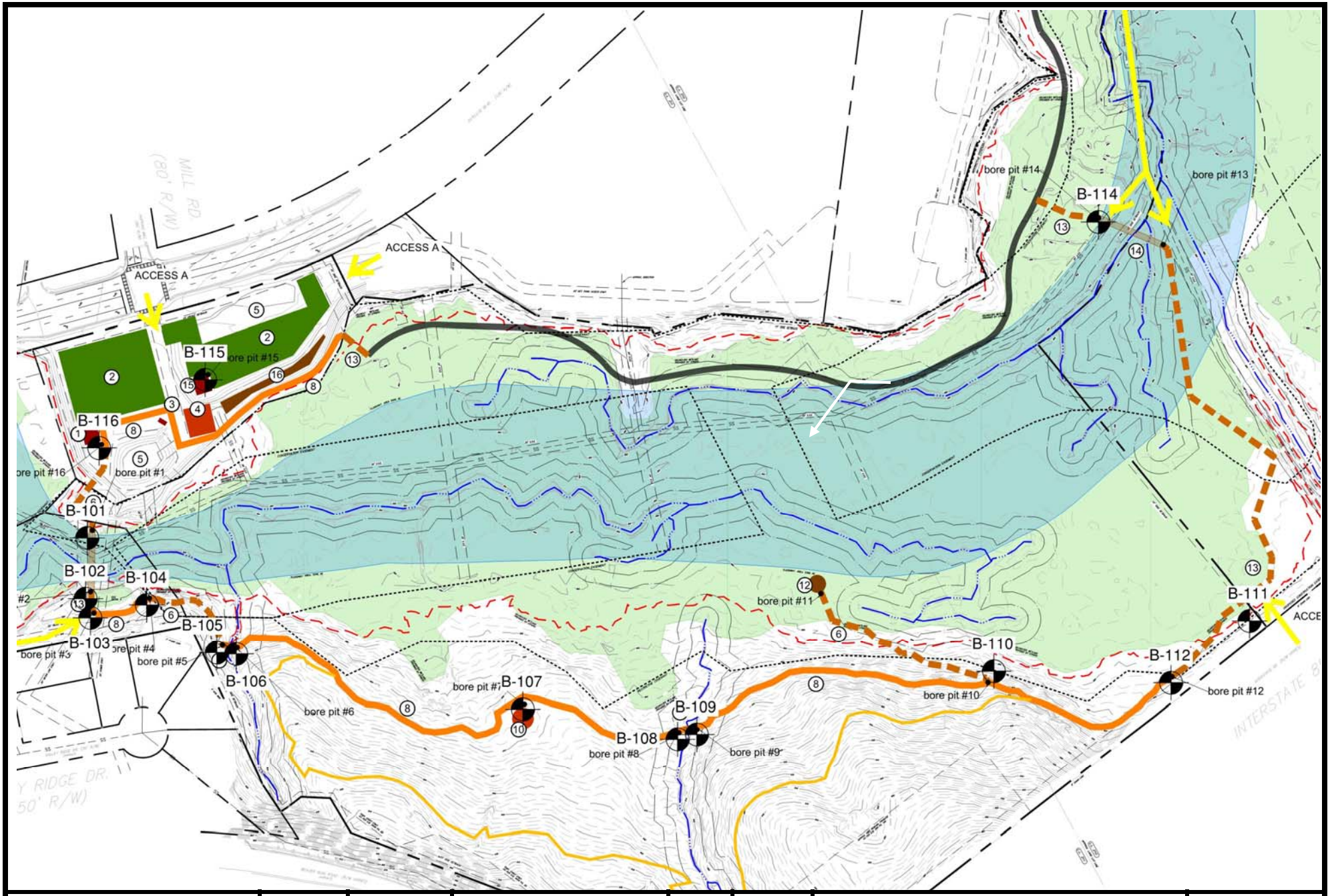
B L T T LL T

The test bo ings e e a e by e hani ally a an ing heli al hollo ste a ge s into the g o n a ples e e olle te at eg la inte als in ea h of the bo ings follo ing establishe p o e es fo pe fo ing the tan a enet ation Test in a o an e ith T pe ifi ation 1 oil sa ples e e obtaine ith a stan a 1 4□ 2 0□ split ba el sa ple The sa ple is fi st seate □to penet ate any loose ttings an then i en an a itional foot ith the blo s e i e of a 140-po n ha e f eely falling a istan e of 0 in hes The n be of blo s e i e to i e the sa ple the final foot is esignate the □stan a penet ation esistan e □ The i ing esistan e kno n as the □ □ al e an be o elate ith the elati e ensity of g an la soils an the onsisten y of ohesi e eposits

The follo ing table es ibes soil onsisten y an elati e ensities base on stan a penet ation esistan e al es ete ine by the tan a enet ation Test T

	□ □	onsisten y
lay an ilt	0-2	e y oft
	-4	oft
	-	i
	-1	tiff
	1 - 0	e y tiff
	e 1	a

	□ □	elati e ensity
an	0-4	e y Loose
	-10	Loose
	11-1	i
	20-2	e i ense
	0-4	ense
	0	e y ense



We're here for you UNITED CONSULTING	N	Scale:	NTS	Notes	**Client:**	**Gwinnett County Parks and Recreation**
		Prepared:	SRT		**Site:**	**Beaver Ruin Wetlands Park South of Satellite Boulevard Duluth, Gwinnett County, Georgia**
		Checked:	RIO			
		Project No.:	GCP&R-20-GA-04517-01		**Title:**	**Boring Location Plan**

FIG. 1

UNITED CONSULTING

EXPLORATION PROCEDURES

Standard Penetration Test (SPT) borings

ifteen 1 T bo ings esignate B-101 th o gh B-112 B-114 th o gh B-11 an one 1 offset bo ing esignate as B-10 e e pe fo e at the app o i ate lo ations in i ate on the atta he Bo ing Lo ation lan ig e 1 The T bo ings e e pe fo e in gene al a o an e ith T 1 oil sa ples obtaine ing testing e e is ally e al ate by the o e t nginee an lassifie a o ing to the is al- an al p o e e es ibe in T 24 na ati e of fiel ope ations is in l e in The ppen i

The test lo ations in the fiel e e ete ine by the o e t nginee sing a han hel nit an o eas ing istan es f o e isting site feat es The test lo ations sho l the efo e be onsi e e app o i ate o n s fa e ele ations e e obtaine f o topog aphi ap p o i e by lient ate file ate 11 22 201 so g o n s fa e ele ations at the bo ing lo ations sho l be onsi e e app o i ate

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LABORATORY PROCEDURES

Grain Size (Sieve) Analysis with or without Hydrometer

ain i□e nalysis tests e e pe fo e to ete ine the pa ti le si□e ist ib tion of sele te sa ples teste The g ain si□e ist ib tion of soils oa se than a n be 200 sie e as ete ine by passing the sa ples th o gh a stan a set of neste sie es ate ials fine than the n be 200 sie es e e s spen e in ate an the g ain si□e ist ib tion o p te f o the ti e ate of settle ent of the iffe ent si□e pa ti les i - ie soil passe th o gh a 200 sie e 0 g a s of that st soak in s agent fo a ini of ho s oil is then p t in g a ate ylin e ith a hy o ete ea ings a e taken at spe ifie ti es g aph is a n f o ata These tests e e like those es ibe by T 421 an 422 The es lts a e in l e in The ppen i

Liquid and Plastic Limits (Atterberg Limits)

Li i Li it an lasti Li it tests ai in the lassifi ation of the soils an p o i e an in i ation of the soil beha io ith oist e hange The lasti ity n e is b a kete by the Li i Li it LL an the lasti Li it L The Li i Li it is the oist e ontent at hi h the soil ill flo as a hea y is o s fl i an is the ppe li it of the plasti ange as ete ine in a o an e ith T 4 1 The lasti Li it is the oist e ontent at hi h the soil begins to lose its plasti ity as ete ine in a o an e ith T 4 1 The lasti ity n e is the iffe en e bet een the Li i Li it an lasti Li it The Li i ity n e is the atio of the iffe en e bet een the in-pla e oist e an the plasti li it to the lasti ity Li it The ata obtaine a e in The ppen i

Moisture Content

The oist e ontent as ete ine fo sele te soil sa ples obtaine in the split spoon sa ple ep esentati e po tion of ea h sa ple as eighe an then pla e in an o en an ie at 110 eg ees entig a e fo at least 1 to 1 ho s fte e o al f o the o en the soil as again eighe The eight of the oist e lost ing ying th s as ete ine o this ata the oist e ontent of the sa ple as then al late as the eight of oist e i i e by y eight of the soil e p esse as a pe entage This test as on te a o ing to T 221 The oist e ontent es lts a e in i ate on the atta he bo ing logs

oist e ontent is a sef l in e of a soil□s o p essibility f the soil is to be se as fill the oist e ontent ay be o pa e to the ange of ate ontent fo hi h p ope o pa tion ay be a hie e

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation BORING NO.: B-101
PROJECT NAME: Beaver Ruin Parks and Recreation DATE: 9/21/20
JOB NO.: GCP&R-20-GA-04517-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
895	Grass; 3" Topsoil	0							Automatic Hammer Efficiency = 94.7%
	Sand - some silt and clay, trace mica, some rock; loose; dark brown (Fill) (SC-SM)		1		3-3-4-5	7	19	13.9	PL=21; LL=27; PI=6
	- firm	▼	2		5-7-4	11	18	13.7	PL=17; LL=24; PI=7
890		▽ 5	3		N/A	N/A	12		Offset 5' west and auger refusal at 6' Shelby tube sample collected from 4'-6' bgs
	Partially weathered rock sampled as Sand - trace silt and clay, some rock; very dense; gray (Residual)		4		50/1"	50/1"	1		
	AUGER REFUSAL AT 6.5 FEET								Groundwater encountered at 4 feet at the time of drilling and at 3 feet 24 hours after drilling
885		10							
880		15							
875		20							
870		25							
865		30							
860		35							
855		40							LL=Liquid Limit PL=Plastic Limit PI=Plasticity Index

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation BORING NO.: B-102
PROJECT NAME: Beaver Ruin Parks and Recreation DATE: 9/25/20
JOB NO.: GCP&R-20-GA-04517-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
900	Grass; 4" Topsoil	0							Automatic Hammer Efficiency = 94.7%
	Sand - some clay, trace silt; very loose; red-brown (Fill)		1		1-1-1-1	2	3		
	Sand - trace clay and silt, some rock; medium dense; orange-brown/black/white (Residual) (SM)		2		4-12-16-19	28	6		
895	- some silt and clay, trace gravel; loose; brown and tan	5	3		18-4-3-2	7	15	22.3	PL=27; LL=43; PI=16
	Partially weathered rock sampled as Sand - some clay, trace silt, some rock; very dense; orange-brown/gray-brown		4		4-50/5"	50/5"	9	20.7	No groundwater encountered at time of boring
890	AUGER REFUSAL AT 7 FEET	10							
885		15							
880		20							
875		25							
870		30							
865		35							
860		40							LL=Liquid Limit PL=Plastic Limit PI=Plasticity Index

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation | BORING NO.: B-103
PROJECT NAME: Beaver Ruin Parks and Recreation | DATE: 9/25/20
JOB NO.: GCP&R-20-GA-04517-01 | DRILLER: Carolina Drilling | RIG: CME 45 | LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	3" Topsoil	0							Automatic Hammer Efficiency = 94.7% PL=26; LL=35; PI=9
900	Sand - some silt and clay, trace mica; very loose; red-brown/orange-brown (Residual) (SM)		1		1-1-2-1	3	24	19.6	
	- some clay, trace silt, trace rock; loose		2		2-1-6	7	18		Near drain ditch and creek
	- trace clay; tan-brown/red-brown	5	3		N/A	N/A	24		Shelby tube sample collected from 4'-6' bgs
895	- some silt, trace clay; dense; gray-brown/ orange-brown		4		12-14-23-30	37	24	15.3	Groundwater encountered at 2 feet at the time of and 24 hours after drilling
	Partially weathered rock sampled as Sand - some clay, trace silt, some rock; very dense; brownish-gray		5		50/3"	50/3"	3	12.3	
890	AUGER REFUSAL AT 9 FEET	10							
		15							
885									
		20							
880									
		25							
875									
		30							
870									
		35							
865									
		40							
860									

LL=Liquid Limit
PL=Plastic Limit
PI=Plasticity Index

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation | BORING NO.: B-104
PROJECT NAME: Beaver Ruin Parks and Recreation | DATE: 9/24/20
JOB NO.: GCP&R-20-GA-04517-01 | DRILLER: Carolina Drilling | RIG: CME 45 | LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 3" Topsoil	0							Automatic Hammer Efficiency = 94.7%
	Sand - some silt, trace clay, trace mica; loose; orange-brown/tan-brown (Residual)		1		3-3-3-3	6	24	9.4	
900	- trace rock		2		3-4-6	10	18		
	Clay - some sand, trace silt, trace mica; orange-brown	5	3		N/A	N/A	24		Shelby tube sample collected from 4'-6' bgs
	Sand - trace silt and clay, trace mica; loose; orange-brown		4		4-4-5-9	9	24	13.3	
895	- firm		5		7-9-9-8	18	24		
		10							
890									
	- some silt, some mica; golden brown		6		4-7-9	16	18		
		15							
		▼							Groundwater encountered at 16 feet 24 hours after drilling
885		▽							Groundwater encountered at 18 feet at the time of drilling
	- some rock; dense		7		21-23-25	48	18		
		20							
880									
	Partially weathered rock sampled as Sand - trace silt and clay, some rock; very dense; brownish-gray	25	8		50/6"	50/6"	5		
	AUGER REFUSAL AT 25 FEET								
875									
		30							
870									
		35							
865									
		40							

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation | BORING NO.: B-105
PROJECT NAME: Beaver Ruin Parks and Recreation | DATE: 9/25/20
JOB NO.: GCP&R-20-GA-04517-01 | DRILLER: Carolina Drilling | RIG: CME 45 | LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
905	Grass; 3" Topsoil	0							Automatic Hammer Efficiency = 94.7% PL=24; LL=45; PI=21
	Clay - sandy, some silt, trace mica; soft; red-brown/orange-brown (Residual) (CL)		1		2-2-2-2	4	24	27.5	
	Sand - trace silt and clay, trace mica; firm; orange-brown/gray-brown		2		3-5-7-7	12	24	16.4	Offset 15' North
900	- trace rock; medium dense	5	3		8-12-15-14	27	24	8.5	
			4		8-12-15-10	27	24	15.7	
	- some rock; firm		5		5-5-6-4	11	24		
895		10							
890	Partially weathered rock sampled as Sand - trace silt and clay, some rock; very dense; red-brown/gray	15	6		6-50/3"	50/3"	5		
	AUGER REFUSAL AT 17.5 FEET								No groundwater encountered at time of boring
885		20							
880		25							
875		30							
870		35							
865		40							LL=Liquid Limit PL=Plastic Limit PI=Plasticity Index

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation | BORING NO.: B-106
PROJECT NAME: Beaver Ruin Parks and Recreation | DATE: 9/24/20
JOB NO.: GCP&R-20-GA-04517-01 | DRILLER: Carolina Drilling | RIG: CME 45 | LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 3" Topsoil	0							Automatic Hammer Efficiency = 94.7%
900	Sand - trace silt and clay, trace mica; loose; red-brown (Fill)		1		2-3-3-3	6	24	15.9	
	Sand - some clay, trace silt, trace mica; loose; orange-brown/red-brown (Residual)		2		4-3-6-6	9	24		
	- trace clay, trace rock; orange-brown/gray brown	5	3		4-6-4-2	10	24	15.8	
895									
	Partially weathered rock sampled as Sand - trace silt and clay, some rock; very dense; gray-brown		4		4-50/4	50/4"	8	6.9	No groundwater encountered at time of boring
	AUGER REFUSAL AT 7 FEET	10							
890									
		15							
885									
		20							
880									
		25							
875									
		30							
870									
		35							
865									
		40							
860									

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation | BORING NO.: B-106A
PROJECT NAME: Beaver Ruin Parks and Recreation | DATE: 9/24/20
JOB NO.: GCP&R-20-GA-04517-01 | DRILLER: Carolina Drilling | RIG: CME 45 | LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 3" Topsoil	0							Offset 10 feet north of B-106; Straight-augered to 8 feet bgs
900									
									Groundwater encountered at 5 feet 24 hours after drilling
895									
	Sand - some silt, trace clay, trace mica and rock; firm; tan-brown/dark brown (Residual)		5		3-5-10-9	15	24		
		10							Groundwater encountered at 10 feet at the time of drilling
890									
	Partially weathered rock sampled as Sand - trace silt, some rock; very dense; gray	15	6		50/1"	50/1"	1		
885	AUGER REFUSAL AT 14 FEET								
		20							
880									
		25							
875									
		30							
870									
		35							
865									
		40							
860									

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation | BORING NO.: B-107
PROJECT NAME: Beaver Ruin Parks and Recreation | DATE: 9/24/20
JOB NO.: GCP&R-20-GA-04517-01 | DRILLER: Carolina Drilling | RIG: CME 45 | LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 3" Topsoil	0							Automatic Hammer Efficiency = 94.7%
	Clay - some sand, trace silt, trace mica; firm; red-brown/tan-brown (Residual)		1		2-3-3-4	6	24		
905	- stiff		2		3-4-5	9	18		
		5	3		N/A	N/A	24		Shelby tube sample collected from 4'-6' bgs
	Sand - some silt, trace clay, trace rock; loose; golden-brown	▽	4		2-3-3-2	6	24		Groundwater encountered at 6 feet 24 hours after drilling
900		▽ 10	5		2-3-5-5	8	24		Groundwater encountered at 8 feet at the time of drilling
895									
	- some rock; dense	15	6		5-8-23	31	18		
890	AUGER REFUSAL AT 16.5 FEET	20							
885		25							
880		30							
875		35							
870		40							

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation BORING NO.: B-108
PROJECT NAME: Beaver Ruin Parks and Recreation DATE: 9/24/20
JOB NO.: GCP&R-20-GA-04517-01 DRILLER: Carolina Drilling RIG: CME 45 LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
905	Grass; 4" Topsoil	0							Automatic Hammer Efficiency = 94.7%
	Sand - some clay, trace silt, trace mica; loose; red-brown/gray (Residual)	▼	1		2-3-4-4	7	24	19.0	Groundwater encountered at 1 foot 24 hours after drilling
	Clay - some sand, trace silt, trace mica; firm; gray-brown/tan-brown		2		3-3-4-3	7	24		Offset 10 feet east and refused at 10 feet bgs
900		5 ▽	3		2-2-3-3	5	24	23.3	Groundwater encountered at 5.5 feet at the time of drilling
	Sand - some clay, trace silt, trace rock; loose; gray-brown		4		3-3-3-3	6	24	20.8	
	Partially weathered rock sampled as Sand - trace silt, some rock; very dense; gray		5		50/3"	50/3"	1		
895	AUGER REFUSAL AT 9.5 FEET	10							
890		15							
885		20							
880		25							
875		30							
870		35							
865		40							

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation | BORING NO.: B-109
PROJECT NAME: Beaver Ruin Parks and Recreation | DATE: 9/24/20
JOB NO.: GCP&R-20-GA-04517-01 | DRILLER: Carolina Drilling | RIG: CME 45 | LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 3" Topsoil	0							Automatic Hammer Efficiency = 94.7%
905	Clay - sandy, some silt, trace gravel; firm; orange-brown/gray (Residual) (CL)		1		2-3-4-3	7	24	23.1	PL=26; LL=46; PI=20
		▼	2		2-3-3	6	18	26.0	Groundwater encountered at 4 feet at the time of drilling and at 3 feet 24 hours after drilling
		▽ 5	3		N/A	N/A	24	30.3	Shelby tube sample collected from 4'-6' bgs: PL=35; LL=50; PI=15
900	Sand - some silt and clay; loose; dark tan (SM)								
	- trace clay, mica and rock fragments; golden brown		4		2-3-3-2	6	24	38.6	
			5		2-2-3-2	5	16		
		10							
895									
			6		3-13-50/2"	50/2"	12		
	Partially weathered rock sampled as Sand - trace silt and clay, some rock; very dense; gray-brown	15							
890	AUGER REFUSAL AT 15 FEET								
		20							
885									
		25							
880									
		30							
875									
		35							
870									
		40							
865									

PL=Plastic Limit
LL=Liquid Limit
PI=Plasticity Index
NM=Natural Moisture

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation | BORING NO.: B-110
PROJECT NAME: Beaver Ruin Parks and Recreation | DATE: 9/25/20
JOB NO.: GCP&R-20-GA-04517-01 | DRILLER: Carolina Drilling | RIG: CME 45 | LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 3" Topsoil	0							Automatic Hammer Efficiency = 94.7%
895	Sand - some clay, trace silt, trace rock; firm; red-brown/orange-brown (Residual)		1		2-4-8-6	12	17	18.2	
	- some rock; very loose		2		5-2-2	4	14	11.9	Offset 15' SW
	- trace rock	5	3		N/A	N/A	24		Shelby tube sample collected from 4'-6' bgs
890	- trace clay; medium dense; red brown/black/white		4		8-12-10-16	22	24	25.0	
	- some rock; very dense		5		18-25-42-16	67	24		
		10							
885	AUGER REFUSAL AT 11.5 FEET								No groundwater encountered at time of boring
		15							
880									
		20							
875									
		25							
870									
		30							
865									
		35							
860									
		40							
855									

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation | BORING NO.: B-111
PROJECT NAME: Beaver Ruin Parks and Recreation | DATE: 9/25/20
JOB NO.: GCP&R-20-GA-04517-01 | DRILLER: Carolina Drilling | RIG: CME 45 | LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
890	Grass; 3" Topsoil	0							Automatic Hammer Efficiency = 94.7% PL=34; LL=51; PI=17
	Silt - sandy, some clay, trace mica; firm; red-brown/orange-brown (Residual) (MH)		1		2-2-3-2	5	24	25.9	
	- trace clay; soft; red-brown/tan-brown		2		3-2-2	4	18	19.9	
885	- some sand and clay; dark brown (ML)	▼ 5	3		N/A	N/A	24	30.6	Shelby tube sample collected from 4'-6' bgs: PL=30; LL=49; PI=19
	Clay - some sand, trace silt; soft; gray		4		2-2-2-2	4	24	36.6	
	- very soft								Groundwater encountered at 5 feet at the time of drilling and at 4 feet 24 hours after drilling
880			5		1-1-1-1	2	24		
		10							
875	Silt - some sand, trace clay, trace mica; firm; orange-brown/gray-brown	15	6		4-2-3	5	18		
870	Sand - some clay, trace silt, trace mica and rock; loose; orange-brown/gray-brown	20	7		2-3-6	9	15		
865	- medium dense	25	8		6-12-11	23	18		
860	Clay - some sand, trace silt, trace mica and rock; stiff; orange-brown/gray-brown	30	9		3-3-7	10	18		
	BORING TERMINATED AT 30 FEET								
855		35							
850		40							LL=Liquid Limit PL=Plastic Limit PI=Plasticity Index

UNITED CONSULTING
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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation | BORING NO.: B-112
PROJECT NAME: Beaver Ruin Parks and Recreation | DATE: 9/25/20
JOB NO.: GCP&R-20-GA-04517-01 | DRILLER: Carolina Drilling | RIG: CME 45 | LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 3" Topsoil	0							Automatic Hammer Efficiency = 94.7%
	Sand - some silt, trace clay, trace mica; loose; red-brown/orange-brown (Residual)		1		1-2-3-2	5	24	16.7	
890	- very loose		2		2-2-2-2	4	24		Bulk sample collected from 0'-5' bgs
		▼							
	- some clay	▽	3		2-2-1-2	3	24	26.1	Groundwater encountered at 5 feet at the time of drilling and at 3.5 feet 24 hours after drilling
885	Clay - some sand, trace silt; very soft; gray		4		1-1-1-1	2	24		
	Sand - some clay, trace silt, trace mica; very loose; red-brown/gray		5		1-1-1-1	2	4		
		10							
880									
	Silt - some sand, trace clay, trace mica; soft; golden brown		6		1-2-1	3	10		
		15							
875									
	- firm		7		2-2-3	5	18		
		20							
870									
	- trace rock; stiff		8		3-4-6	10	10		
		25							
865									
	- very stiff		9		6-11-14	25	18		
		30							
	BORING TERMINATED AT 30 FEET								
860									
		35							
855									
		40							

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation | BORING NO.: B-114
PROJECT NAME: Beaver Ruin Parks and Recreation | DATE: 9/23/20
JOB NO.: GCP&R-20-GA-04517-01 | DRILLER: Carolina Drilling | RIG: CME 45 | LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
885	Grass; 3" Topsoil	0							Automatic Hammer Efficiency = 94.7%
	Sand - some silt and clay, trace mica; loose; dark brown (Residual) (SC)		1		2-2-3-3	5	17	21.4	PL=25; LL=41; PI=16
	- trace silt; orange-brown/red-brown		2		2-2-3	5	5		
880	Clay - sandy, some silt, trace mica; tan-gray (CL)	▼	3		N/A	N/A	24	15.5	Shelby tube sample collected from 4'-6' bgs: PL=19; LL=34; PI=15
	Sand - some gravel, trace silt and clay; firm; gray-brown (SW-SM)	▽	4		3-5-8-7	13	24	19.8	Non-Plastic
	- some silt, trace rock fragments; loose; orange-brown/gray-brown (SM)	10	5		2-3-3-3	6	24	35.1	Non-Plastic
875									Groundwater encountered at 7 feet at the time of drilling and at 5 feet 24 hours after drilling
	- trace gravel; firm	15	6		3-4-8	12	18	22.7	Non-Plastic
870									
	Partially weathered rock sampled as Sand - some silt, trace clay, some rock; very dense; gray-brown	20	7		30-50/6"	50/6"	10	13.7	
865									
	Sand - trace clay, silt, and rock fragments; dense; gray	25	8		10-16-24	40	18	12.4	
860									
	Partially weathered rock sampled as Sand - some silt, trace clay, some rock; very dense; gray-brown	30	9		50/1"	50/1"	1		
855	AUGER REFUSAL AT 29 FEET								
850		35							
845		40							LL=Liquid Limit PL=Plastic Limit PI=Plasticity Index

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation | BORING NO.: B-115
PROJECT NAME: Beaver Ruin Parks and Recreation | DATE: 9/21/20
JOB NO.: GCP&R-20-GA-04517-01 | DRILLER: Carolina Drilling | RIG: CME 45 | LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
920	Grass; 4" Topsoil	0							Automatic Hammer Efficiency = 94.7%
	Sand - some silt, trace clay, trace mica; loose; red-brown (Fill)		1		2-3-2-2	5	16		
	- some clay, trace silt, trace rock		2		4-3-3	6	18		Bulk sample collected from 0'-5' bgs
915	- some silt, trace clay	5	3		N/A	N/A	24		Shelby tube sample collected from 4'-6' bgs
	- some clay		4		2-3-2-2	5	12		
	- trace silt		5		3-4-4-4	8	24		
910		10							
905	Clay - some sand, trace silt, trace mica; firm; red-brown	15	6		3-4-4	8	18		
900	Sand - some clay, trace silt, trace mica; firm; red-brown	20	7		3-4-7	11	18		
895	Clay - some sand, trace silt, trace mica; firm; red-brown/tan-brown (Residual)	25	8		3-3-5	8	18		
	BORING TERMINATED AT 25 FEET								No groundwater encountered at time of boring
890		30							
885		35							
880		40							

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BORING LOG

CONTRACTED WITH: Gwinnett County Parks and Recreation | BORING NO.: B-116
PROJECT NAME: Beaver Ruin Parks and Recreation | DATE: 9/21/20
JOB NO.: GCP&R-20-GA-04517-01 | DRILLER: Carolina Drilling | RIG: CME 45 | LOGGED BY: J.J.

ELEV.	DESCRIPTION	DEPTH in FEET	SAMPLES NO.	TYPE	BLOWS/6"	N-VALUE	RECOV. (")	W (%)	NOTES
	Grass; 3" Topsoil	0							Automatic Hammer Efficiency = 94.7%
	Sand - some clay, trace silt, some mica, trace rock; loose; red-brown (Fill)		1		2-3-3-3	6	24		
910	Clay - some sand, trace silt, trace mica; firm; red-brown		2		3-3-5-5	8	24		
	Sand - some clay, trace silt, some mica; loose; red-brown/tan-brown (Residual)	5	3		2-3-4-4	7	19		
905	Clay - some sand, trace silt, trace mica; stiff; red-brown/tan-brown		4		4-7-6-7	13	15		
	Sand - some clay, trace silt, trace mica and rock; loose; red-brown/gray-brown		5		2-2-3-3	5	17		
		10							
900									
	- very loose; gray-brown		6		1-1-2	3	18		
		15							
895									
	Clay - some sand, trace silt, trace mica; firm; gray-brown/orange-brown		7		2-3-4	7	18		
		20							
	BORING TERMINATED AT 20 FEET								No groundwater encountered at time of boring
890									
		25							
885									
		30							
880									
		35							
875									
		40							

Beaver Ruin Wetlands Park
Gwinnett County - Parks and Recreation

			Helical Pile Design Calculations Summary (Axial and Lateral Capacity)												
Structure	**Boring ID**	**Ground Surface Elevation[1] (ft-msl)**	**Depth to Dense Soil (ft-bgs) (N_{60} > 30 bpf)**	**Factored Axial Loads[2] (Kips)**	**Service Level Axial Loads[2] (Kips)**	**Factored Lateral Load[2] (Kips)**	**Service Level Lateral Load[2] (Kips)**	**Service Level Lateral Load Converted to Compression/ Tension Load[3] (kips)**	**Pile Type[4,5]**	**Battered Pile Design Compression/ Tension Service Load[3] (Kips)**	**Battered Piles Minimum Installation Torque[6] (Ft-lb) K_t= 10 ft^{-1}**	**Minimum Depth to Top Helix (ft-bgs)**	**Minimum Depth to Bottom Helix Plate (Vertical Pile Length) (ft-bgs)**	**Spin Out Pile (Plate Extended to Rock)**	**Estimated Helical Pile Tip Elevation[7] (ft-msl)**
Concrete Trails/ Boardwalk	B-103	901	6	33.54	24.34	2.63	1.5	6.2	CHANCE SS175 - Square 1-¾" Shaft 14",12",10" Helices as Required (2 Battered Piles at 1h:4v (14°) @ ≥ 6 ft) Torque Rating 10,500 Ft-lb	30.5	6,108	5.5	9	Y	892
	B-104	902	18.5									4.5	11	N	891
	B-105	904	4									5.5	12	N	892
	B-106 & 106A	901	6									6.5	13	N	888
	B-108	905	8									6.5	9.5	Y	895.5
	B-109	906	13.5									8.5	15	Y	891
	B-110	896	6									4.5	11	N	885
	B-111	889	23.5									18.5	25	N	864
	B-112	892	28.5									22.5	29	N	863

Notes:
(1) Ground Surface Elevations are interpolated from provided Topographic Plan provided by the client dated (file date) 11/22/2019 and should be considered approximate.
(2) Loads provided by John Pyle of PermaTrak in an E-Mail Attachment dated 11/23/2020
(3) Battered piles are designed to handle the axial and lateral Service Loads. The 1.5 kips Service Lateral Load in each pile (total of 3 kips per bent) is transfered to pile axial compression and tension load, respectively whe
the load is applied along the bent.
(4) Alternative pile sizes and helix size configurations may be used by the helical pile installer provided the minimum pile ultimate (Factored) capacities design loads specified for the project are met
(5) We recommend a minimum FOS=2 for Compression and Tension Strength of helical piles.
(6) At least one vertical pile load test using the top large helix (14") should be performed to check the Kt factor used to calculate the ultimate helical pile ultimate (Nominal Strength) bearing capacity from the installation torque
measured in the field.
(7) Final pile tip elevation to be determined in the field based on the minimum pile installation torque rating required to achieve the ultimate capacity of the pile.

Beaver Ruin Wetlands Park
SUMMARY OF SOIL DATA

Sample Identification		Sample Type	Sample Depth	Soil Classi-fication	As R'cd Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Organic Contant %	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
Borehole Number	Sample ID					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %			Moisture %	Dry (lb/cuft)		
B-101	1	Bag	0-2	SC-SM	13.9	27	21	6	-1.18	97.2	36.7	30.0	-	-	-	-	-	-	-	
B-101	2	Bag	2-4	SC-SM	13.7	24	17	7	-0.47	100.0	39.1	36.0	-	-	-	-	-	-	-	
B-102	2	Bag	2-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,Re,C,S
B-102	3	Bag	4-6	SM	22.3	43	27	16	-0.29	90.3	31.9	29.0	-	-	-	-	-	-	-	
B-102	4	Bag	6-8	SM	20.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-103	1	Bag	0-2	SM	19.6	35	26	9	-0.71	100.0	32.5	28.0	-	-	-	-	-	-	-	
B-103	2	Bag	2-3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,Re,C,S
B-103	4	Bag	6-8	-	15.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-103	5	Bag	8-10	-	12.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-104	1	Bag	0-2	-	9.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-104	2	Bag	2-3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,Re,C,S
B-104	4	Bag	6-8	-	13.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-105	1	Bag	0-2	CL	27.5	45	24	21	0.17	100.0	55.6	50.0	-	-	-	-	-	-	-	
B-105	2	Bag	2-4	-	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-105	3	Bag	4-6	-	6.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-106	1	Bag	0-2	-	15.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-106	2	Bag	2-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,Re,C,S
B-106	3	Bag	4-6	-	15.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-106	4	Bag	6-8	-	6.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-108	1	Bag	0-2	-	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-108	2	Bag	2-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,Re,C,S

ABBREVIATIONS:
LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
MOISTURE (Mc)
NP - NO PLASTICITY
NV - NO VALUE

United Consulting

NOTES:
T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
S = SULFATE CONTENT
C = CHLORIDE CONTENT
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Vc = Volume /shrinkage change

Beaver Ruin Wetlands Park
SUMMARY OF SOIL DATA

Sample Identification		Sample Type	Sample Depth	Soil Classi-fication	As R'cd Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Organic Contant %	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
Borehole Number	Sample ID					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %			Moisture %	Dry (lb/cuft)		
B-108	3	Bag	4-6	-	23.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-108	4	Bag	6-8	-	20.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-109	1	Bag	0-2	CL	23.1	46	26	20	-0.15	98.2	50.5	49	-	-	-	-	-	-	-	
B-109	2	Bag	2-3.5	-	26.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-109	3	Shelby	4-6	SM	30.3	50	35	15	-0.31	100.0	33.3	30	-	-	2.7	-	-	-	-	U
B-109	4	Bag	6-8	-	38.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-110	1	Bag	0-2	-	18.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-110	2	Bag	2-3.5	-	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,R,C,S
B-110	4	Bag	6-8	-	25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-111	1	Bag	0-2	MH	25.9	51	34	17	-0.48	100.0	62.4	59	-	-	-	-	-	-	-	
B-111	2	Bag	2-3.5	-	19.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-111	3	Shelby	4-6	ML	30.6	49	30	19	0.03	100.0	67.7	63	-	-	-	-	-	-	-	U
B-111	4	Bag	6-8	-	36.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-112	1	Bag	0-2	-	16.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-112	1A	Bulk	0-5	SC	22.2	34	24	10	-0.18	100.0	29.7	28	-	-	-	-	-	-	-	
B-112	2	Bag	2-4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,Re,C,S
B-112	3	Bag	4-6	-	26.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-114	1	Bag	0-2	SC	21.4	41	25	16	-0.23	100.0	43.5	38	-	-	-	-	-	-	-	
B-114	2	Bag	2-3.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P,Re,C,S
B-114	3	Shelby	4-6	CL	15.5	34	19	15	-0.23	100.0	53.1	46	-	-	2.7	-	16.7	116.2	-	T
B-114	4	Bag	6-8	SW-SM	19.8	NV	NP	NP	NP	84.1	9.6	7	-	-	-	-	-	-	-	

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Beaver Ruin Wetlands Park
SUMMARY OF SOIL DATA

Sample Identification		Sample Type	Sample Depth	Soil Classi-fication	As R'cd Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Organic Contant %	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
Borehole Number	Sample ID					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %			Moisture %	Dry (lb/cuft)		
B-114	5	Bag	8-10	SM	35.1	NV	NP	NP	NP	100.0	14.9	12.0	-	-	-	-	-	-	-	
B-114	6	Bag	13.5-15	SM	22.7	NV	NP	NP	NP	98.9	18.9	14.0	-	-	-	-	-	-	-	
B-114	7	Bag	18.5-20	-	13.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
B-114	8	Bag	23.5-25	-	12.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

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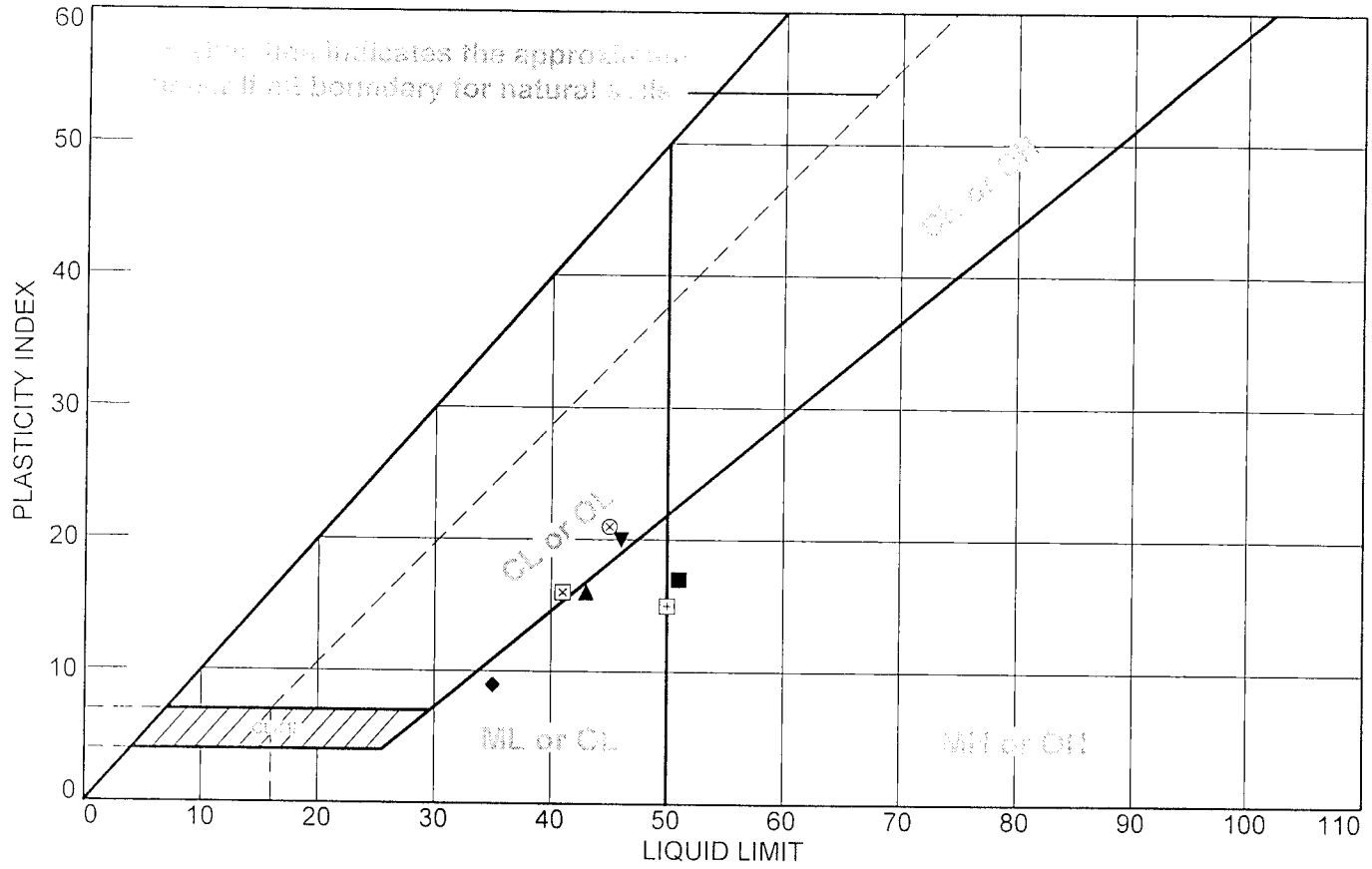
LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
	B-114	6-8 ft	19.8	NP	NV	NP	SW-SM
	B-111	0-2 ft	25.9	34	51	17	MH
	B-102	4-6 ft	22.3	27	43	16	SM
	B-103	0-2 ft	19.6	26	35	9	SM
	B-109	0-2 ft	23.1	26	46	20	CL
	B-114	13.5-15 ft	22.7	NP	NV	NP	SM
	B-114	8-10 ft	35.1	NP	NV	NP	SM
	B-109 (Top)	4-6 ft	30.3	35	50	15	SM
	B-105	0-2 ft	27.5	24	45	21	CL
	B-114	0-2 ft	21.4	25	41	16	SC

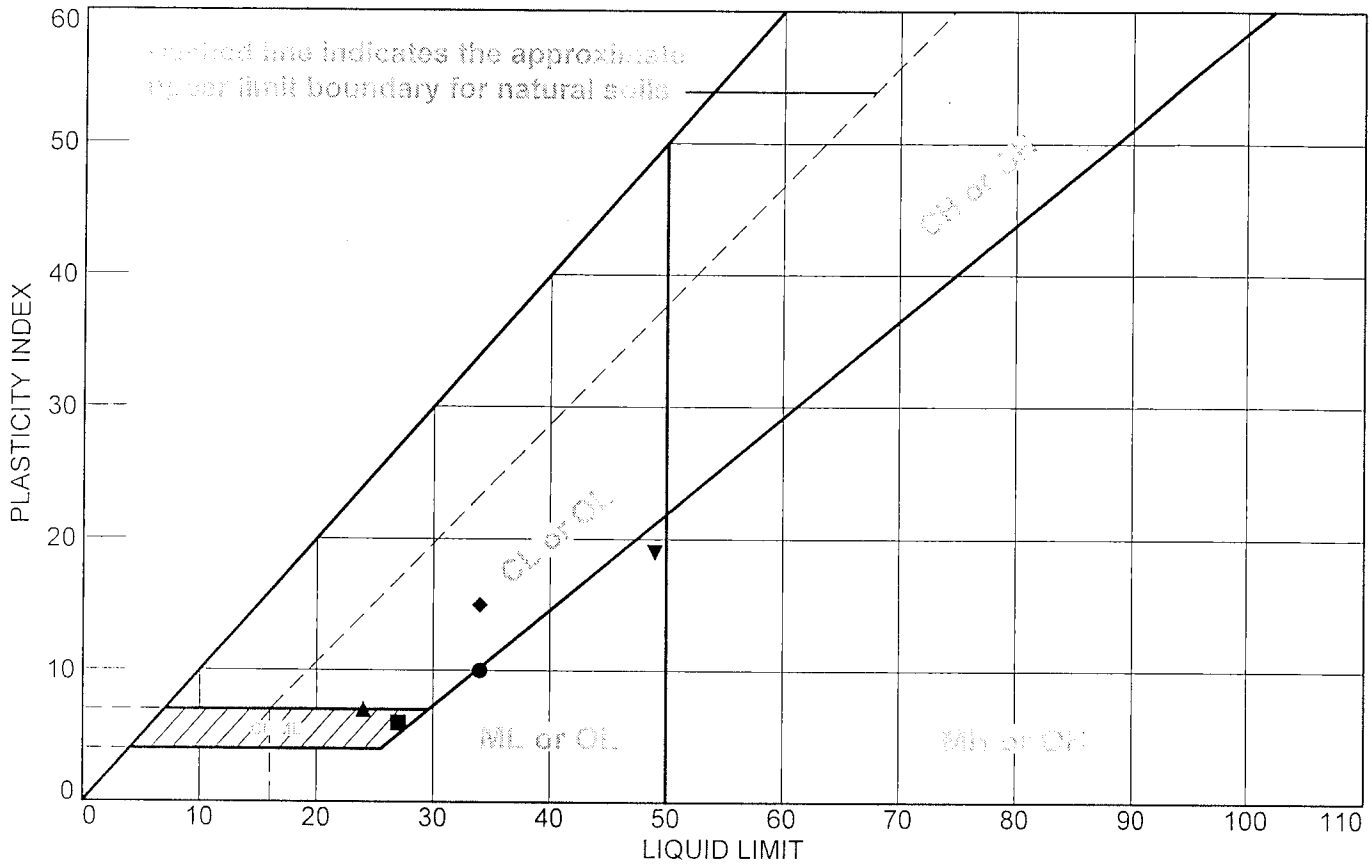
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No.: GCP&R20GA0451701 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



SOIL DATA

	SOURCE	SAMPLE NO.	DEPTH	NATURAL WATER CONTENT (%)	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	PLASTICITY INDEX (%)	USCS
●		B-112	0-5 ft	22.2	24	34	10	SC
■		B-101	0-2 ft	13.9	21	27	6	SC-SM
▲		B-101	2-4 ft	13.7	17	24	7	SC-SM
◆		B-114	4-6 ft	15.5	19	34	15	CL
▼		B-111 (Middle)	4-6 ft	30.6	30	49	19	ML

United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No.: GCP&R20GA0451701 **Figure**

Moisture Content
ASTM D 2216 / AASHTO T-265 / UC SOP L4
DATA SHEET

Project #: GCP&R20GA0451701
Project Name: Beaver Ruin Parks & Recreation
Received Date: **11/12/2020**

Tested By: **SH**
Date Tested: **11/6/2020**
Reviewed by: **MS**
Revised date: **11/23/2020**

BORING NO.	DEPTH (ft.)	Tare Weight (g)	Wet Sample and Tare (g)	Dry Sample and Tare (g)	Moisture Content (%)
B-103	6-8	32.99	155.24	139.03	**15.3**
B-111	6-8	33.31	167.10	131.24	**36.6**
B-112	0-2	32.80	164.12	145.29	**16.7**
B-106	4-6	32.96	155.89	139.11	**15.8**
B-106	0-2	37.63	183.09	163.13	**15.9**
B-108	4-6	32.86	207.08	174.18	**23.3**
B-104	6-8	33.05	154.70	140.43	**13.3**
B-110	0-2	32.67	203.26	176.97	**18.2**
B-105	6-8	32.86	161.61	144.15	**15.7**
B-109	2-3.5	32.89	172.24	143.45	**26.0**
B-104	0-2	32.97	155.72	145.19	**9.4**
B-106	6-8	33.1	164.69	156.18	**6.9**
B-108	0-2	27.16	161.10	139.67	**19.0**

Moisture Content
ASTM D 2216 / AASHTO T-265 / UC SOP L4
DATA SHEET

Project #: GCP&R20GA0451701
Project Name: Beaver Ruin Parks & Recreation
Received Date: **11/12/2020**

Tested By: **SH**
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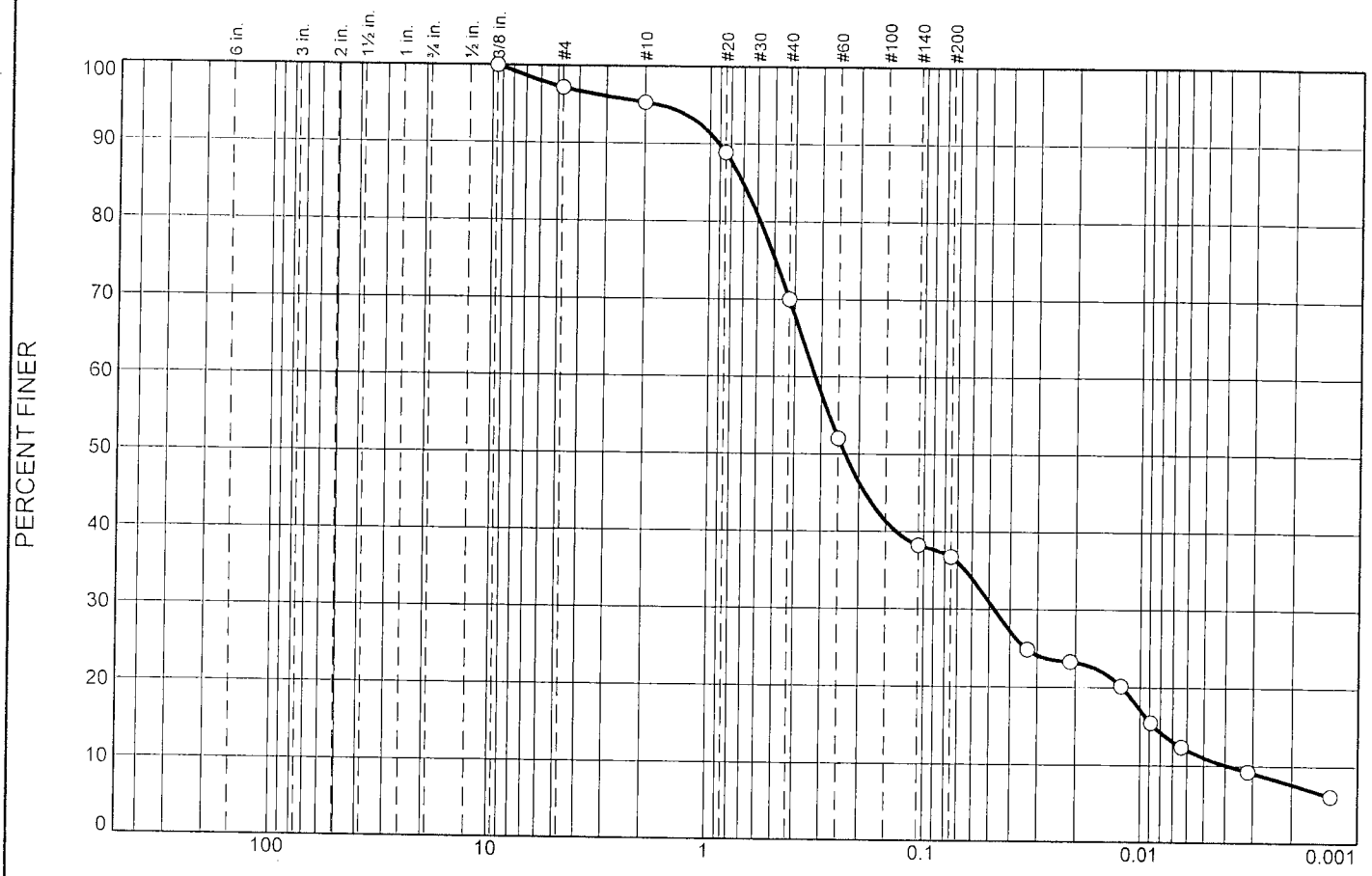
Revised date: **11/23/2020**

BORING NO.	DEPTH (ft.)	Tare Weight (g)	Wet Sample and Tare (g)	Dry Sample and Tare (g)	Moisture Content (%)
B-103	8-10	33.15	203.53	184.83	**12.3**
B-105	2-4	33.35	157.41	139.95	**16.4**
B-105	4-6	33.18	167.50	157.03	**8.5**
B-114	18.5-20	33.12	190.83	171.79	**13.7**
B-110	6-8	37.49	202.58	169.55	**25.0**
B-108	6-8	37.43	167.16	144.78	**20.8**
B-109	6-8	33.27	166.01	129.06	**38.6**
B-111	2-3.5	33.1	175.84	152.13	**19.9**
B-102	6-8	32.99	178.65	153.64	**20.7**
B-114	23.5-25	27.11	170.42	154.56	**12.4**
B-112	4-6	37.58	216.11	179.13	**26.1**
B-110	2-3.5	22.99	209.05	189.23	**11.9**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	2.8	60.5	25.7	11.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	97.2		
#10	95.3		
#20	88.9		
#40	70.0		
#60	52.0		
#140	38.2		
#200	36.7		

* (no specification provided)

Material Description

Sand, some silt and clay, trace silt, brown

Atterberg Limits

PL= 21 LL= 27 PI= 6

Coefficients

D_{90}= 0.9084 D_{85}= 0.7045 D_{60}= 0.3201
D_{50}= 0.2327 D_{30}= 0.0475 D_{15}= 0.0086
D_{10}= 0.0039 C_u= 81.10 C_c= 1.78

Classification

USCS= SC-SM AASHTO= A-4(0)

Remarks

Sample Number: B-101 **Depth:** 0-2 ft

Date: 11/6/2020

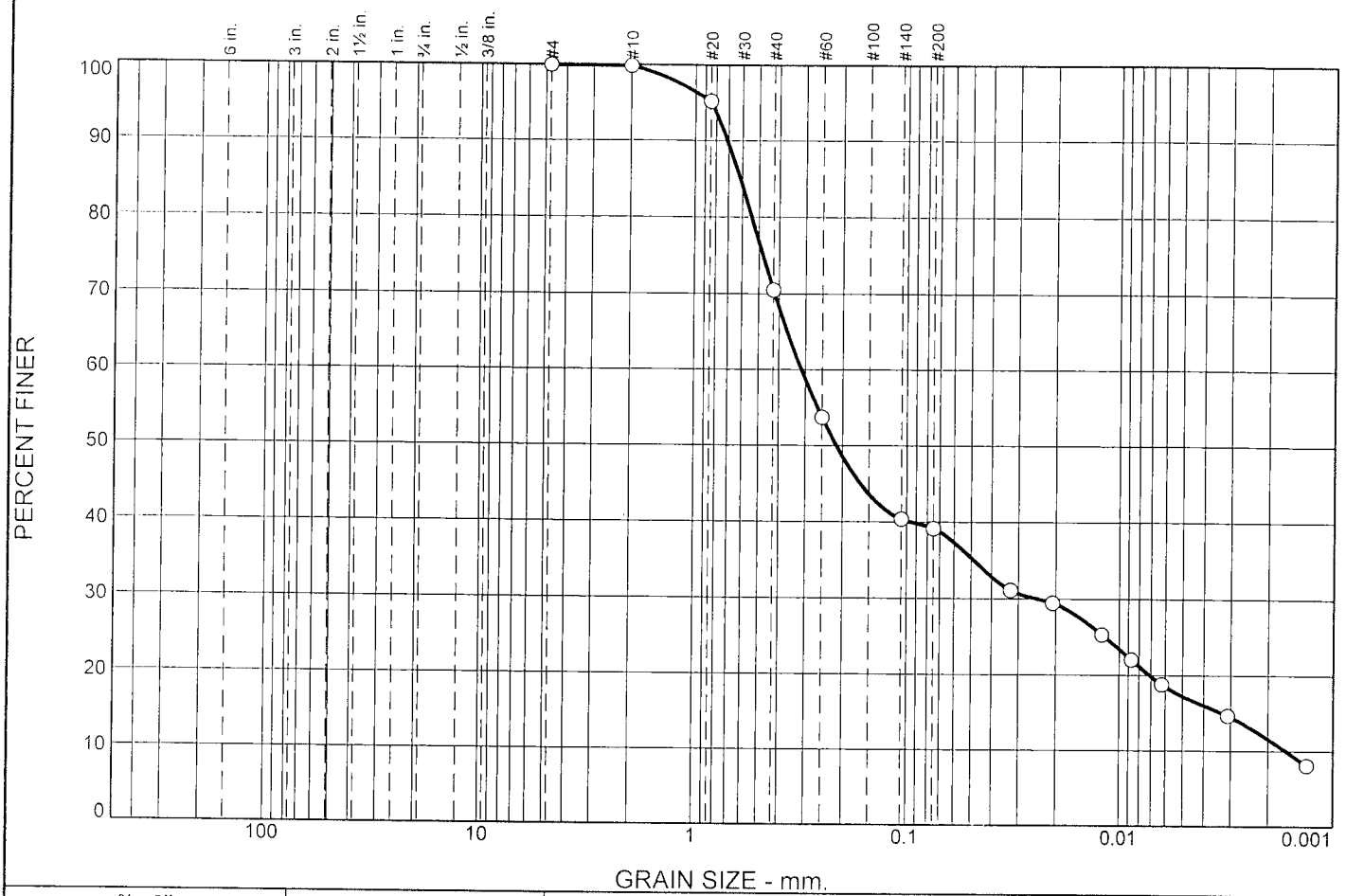
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	60.9	21.9	17.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	95.2		
#40	70.4		
#60	53.7		
#140	40.3		
#200	39.1		

* (no specification provided)

Material Description

Sand, some silt and clay, dark brown

Atterberg Limits

PL= 17 LL= 24 PI= 7

Coefficients

D_{90}= 0.7082 D_{85}= 0.6156 D_{60}= 0.3130
D_{50}= 0.2143 D_{30}= 0.0245 D_{15}= 0.0033
D_{10}= 0.0017 C_u= 189.13 C_c= 1.15

Classification

USCS= SC-SM AASHTO= A-4(0)

Remarks

Sample Number: B-101 **Depth:** 2-4 ft

Date: 11/6/2020

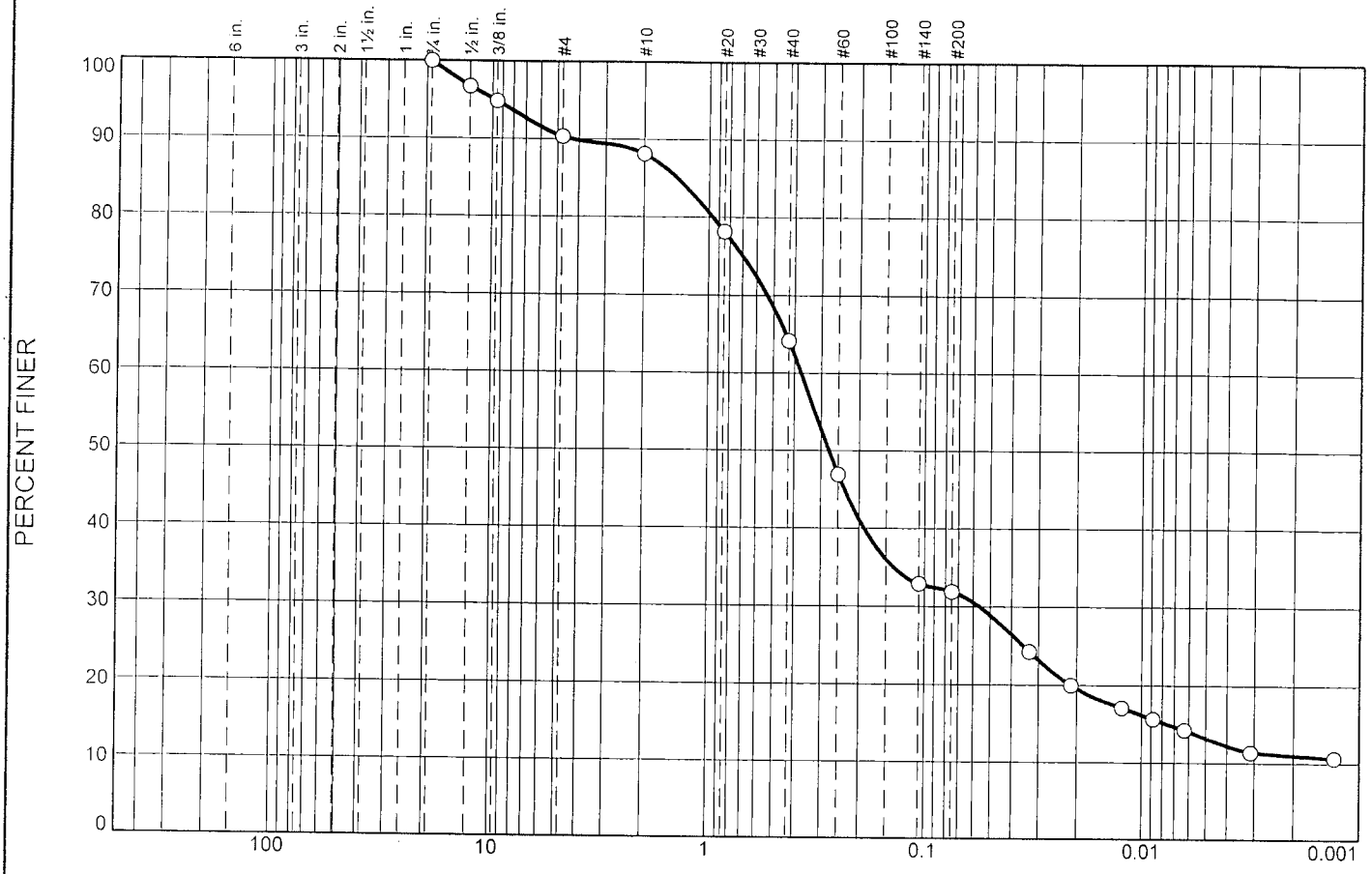
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	9.7	58.4	18.7	13.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.75	100.0		
0.5	96.7		
0.375	94.9		
#4	90.3		
#10	88.1		
#20	78.2		
#40	64.1		
#60	46.9		
#140	32.9		
#200	31.9		

* (no specification provided)

Material Description

Sand, some silt and clay, trace gravel, brown and tan

Atterberg Limits

PL= 27 LL= 43 PI= 16

Coefficients

D_{90}= 4.3019 D_{85}= 1.4034 D_{60}= 0.3722
D_{50}= 0.2764 D_{30}= 0.0562 D_{15}= 0.0076
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-7(1)

Remarks

Sample Number: B-102 **Depth:** 4-6 ft

Date: 11/6/2020

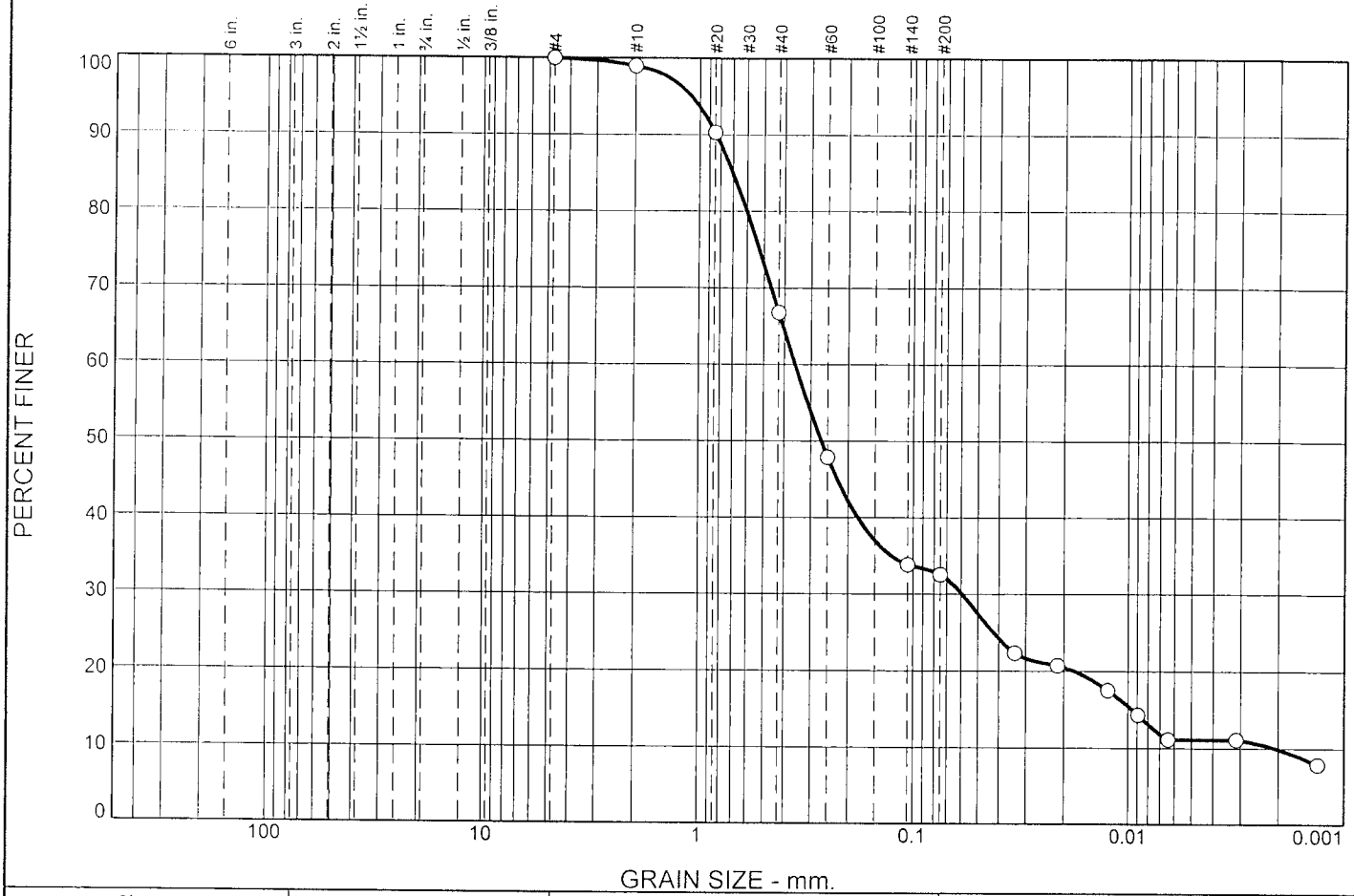
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	67.5	21.4	11.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.0		
#20	90.3		
#40	66.8		
#60	47.9		
#140	33.8		
#200	32.5		

* (no specification provided)

Material Description

Sand, some silt and clay, dark brown

Atterberg Limits

PL= 26 LL= 35 PI= 9

Coefficients

D_{90}= 0.8381 D_{85}= 0.7008 D_{60}= 0.3563
D_{50}= 0.2679 D_{30}= 0.0593 D_{15}= 0.0096
D_{10}= 0.0021 C_u= 171.35 C_c= 4.75

Classification

USCS= SM AASHTO= A-2-4(0)

Remarks

Sample Number: B-103 **Depth:** 0-2 ft

Date: 11/6/2020

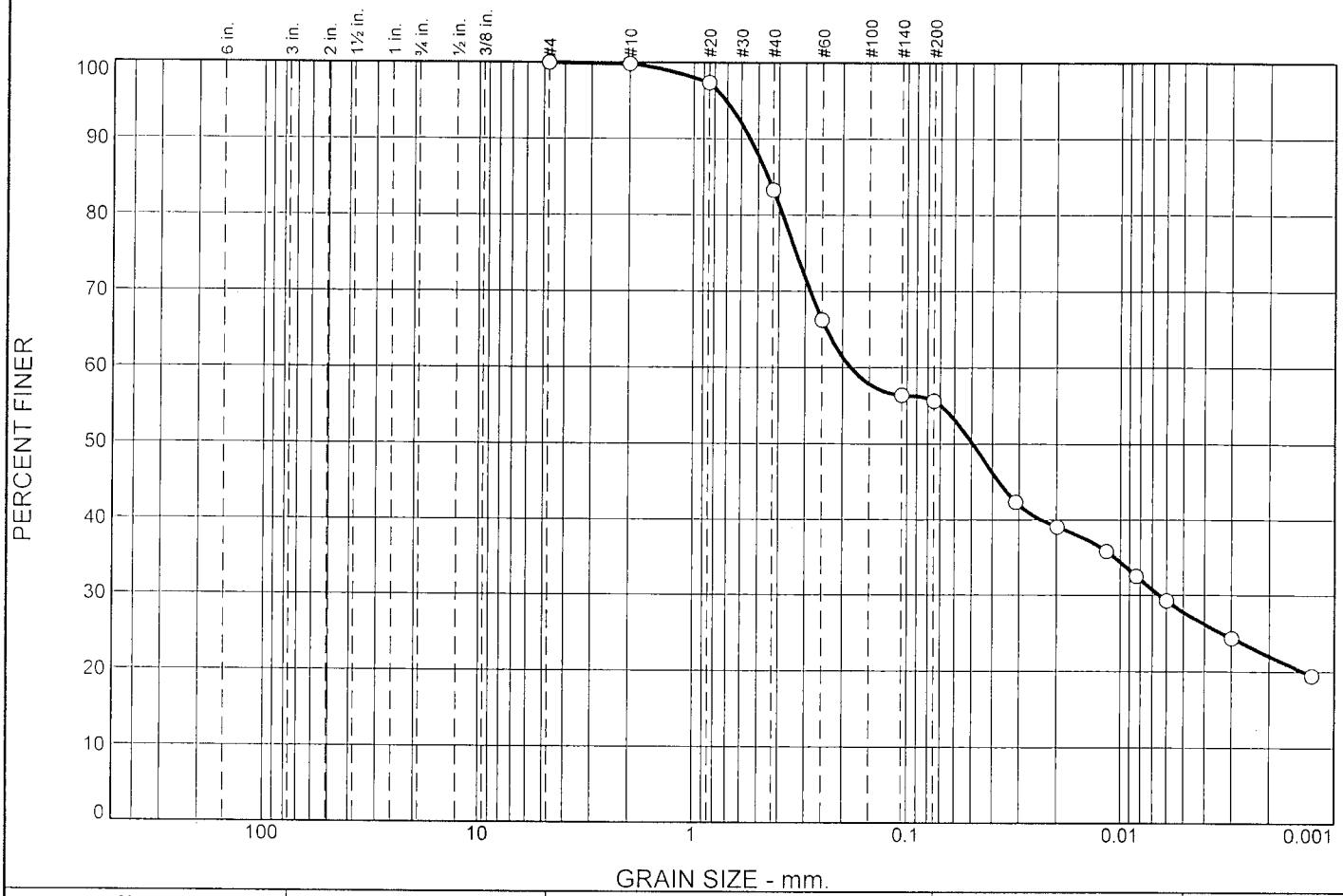
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	44.4	27.9	27.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	97.4		
#40	83.3		
#60	66.2		
#140	56.4		
#200	55.6		

* (no specification provided)

Material Description

Clay-sandy, some silt, dark brown

Atterberg Limits

PL= 24 LL= 45 PI= 21

Coefficients

D_{90}= 0.5454 D_{85}= 0.4500 D_{60}= 0.1834
D_{50}= 0.0494 D_{30}= 0.0065 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(9)

Remarks

Sample Number: B-105 **Depth:** 0-2 ft

Date: 11/6/2020

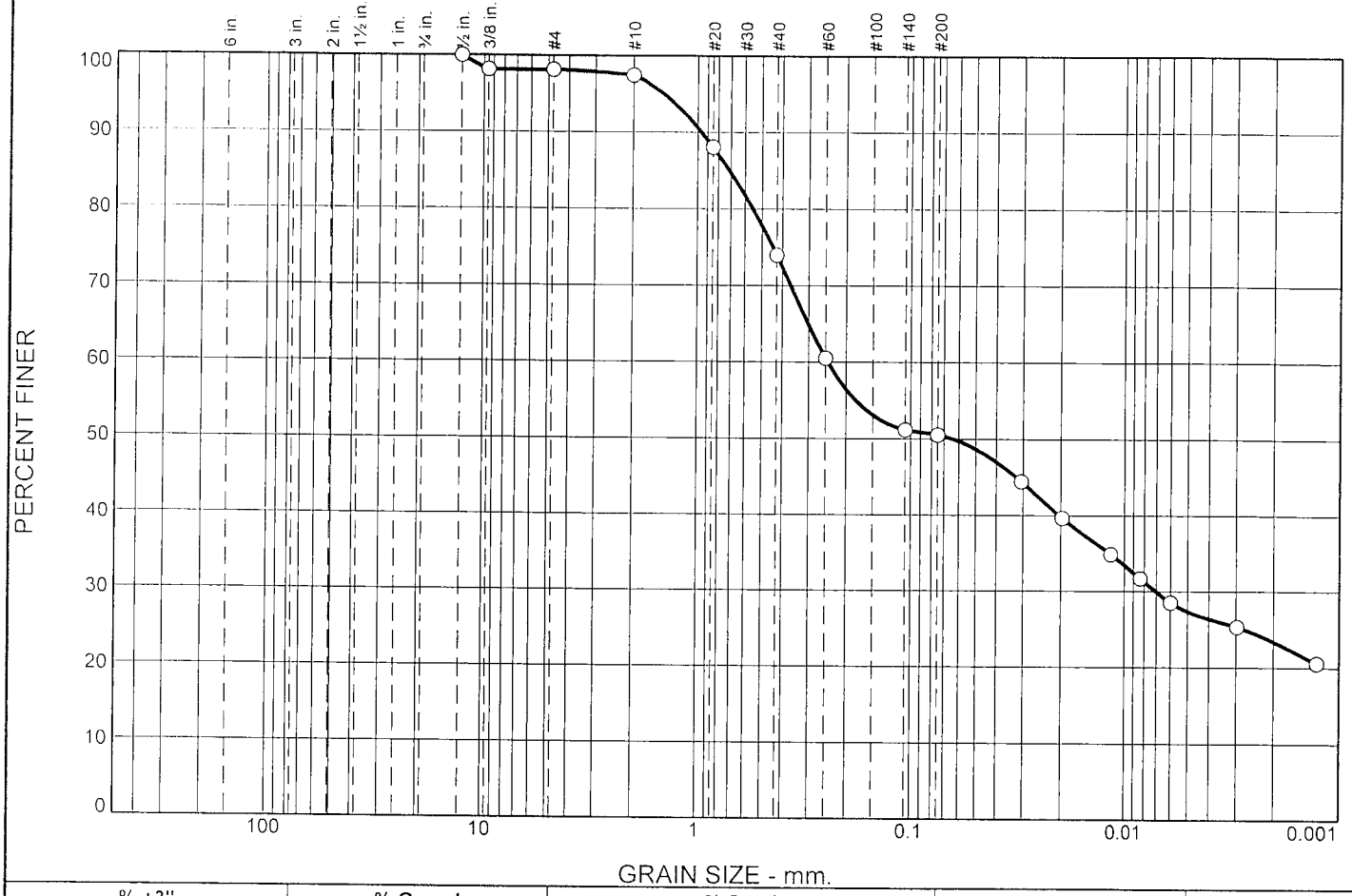
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	1.8	47.7	23.2	27.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.5	100.0		
0.375	98.2		
#4	98.2		
#10	97.5		
#20	88.1		
#40	73.9		
#60	60.5		
#140	51.2		
#200	50.5		

* (no specification provided)

Material Description

Clay-sandy, some silt, trace gravel, dark tan

Atterberg Limits

PL= 26 LL= 46 PI= 20

Coefficients

D_{90}= 0.9628 D_{85}= 0.7101 D_{60}= 0.2444
D_{50}= 0.0638 D_{30}= 0.0071 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-7-6(7)

Remarks

Sample Number: B-109 **Depth:** 0-2 ft

Date: 11/6/2020

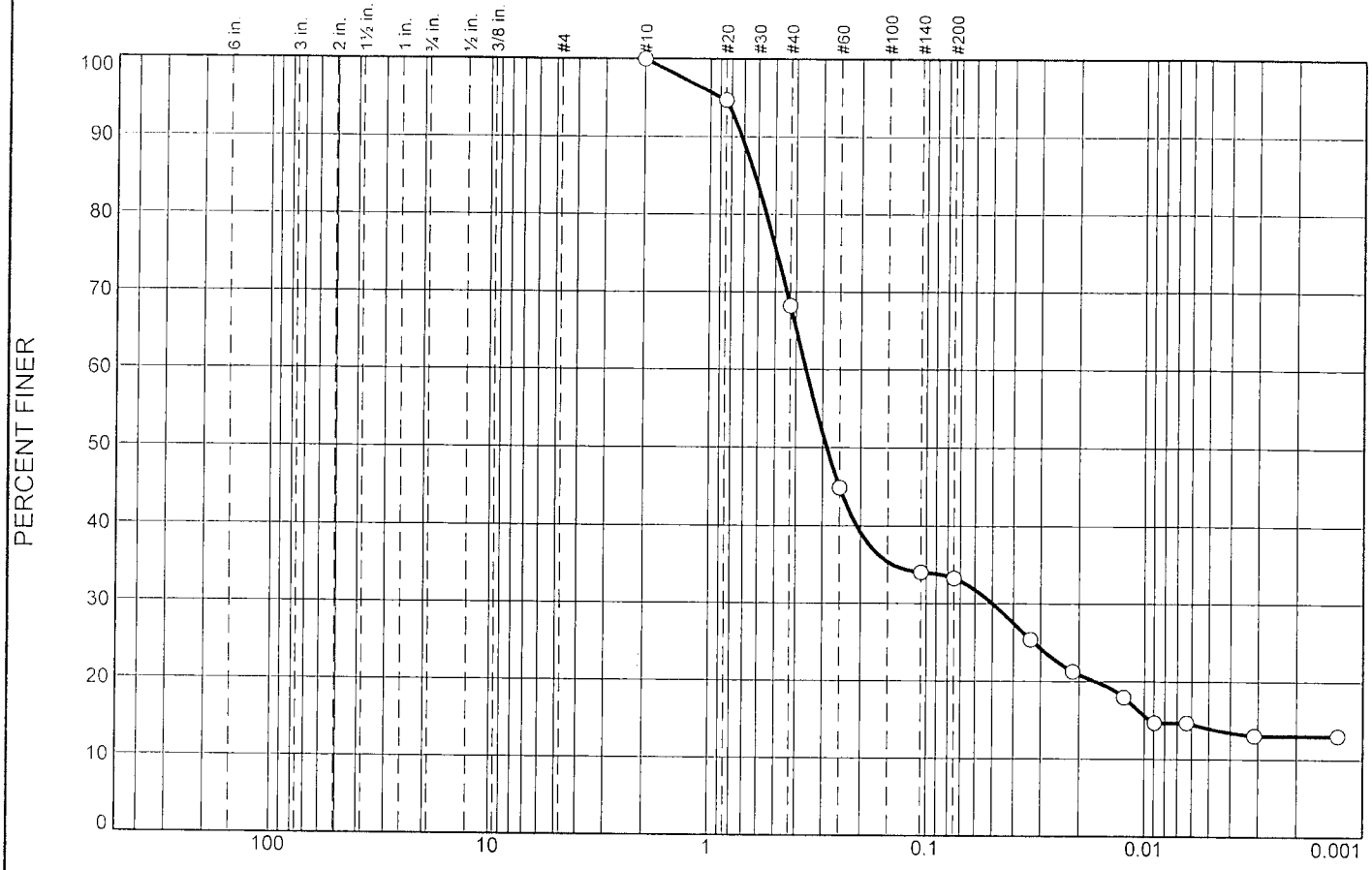
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	66.7	19.3	14.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	94.7		
#40	68.2		
#60	44.9		
#140	34.0		
#200	33.3		

* (no specification provided)

Material Description

Sand, some silt and clay, dark tan

Atterberg Limits

PL= 35 LL= 50 PI= 15

Coefficients

D_{90}= 0.7172 D_{85}= 0.6229 D_{60}= 0.3586
D_{50}= 0.2870 D_{30}= 0.0499 D_{15}= 0.0094
D_{10}= C_u= C_c=

Classification

USCS= SM AASHTO= A-2-7(1)

Remarks

Sample Number: B-109 (Top) **Depth:** 4-6 ft

Date: 11/6/2020

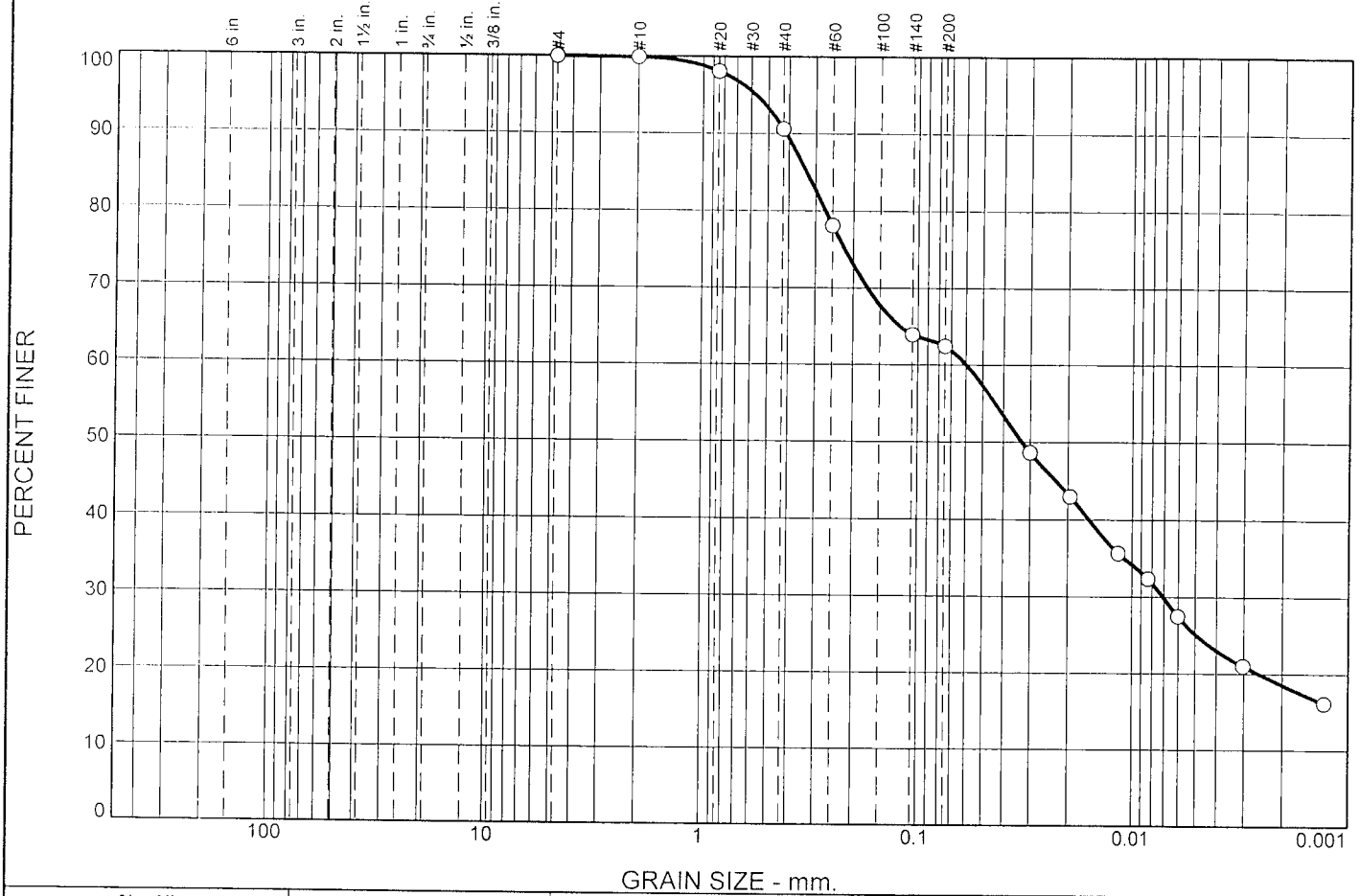
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	37.6	37.3	25.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	98.1		
#40	90.6		
#60	78.1		
#140	63.9		
#200	62.4		

* (no specification provided)

Material Description

Silt-sandy, some clay, red brown

Atterberg Limits

PL= 34 LL= 51 PI= 17

Coefficients

D_{90}= 0.4122 D_{85}= 0.3300 D_{60}= 0.0596
D_{50}= 0.0328 D_{30}= 0.0071 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= MH AASHTO= A-7-5(10)

Remarks

Sample Number: B-111 **Depth:** 0-2 ft

Date: 11/6/2020

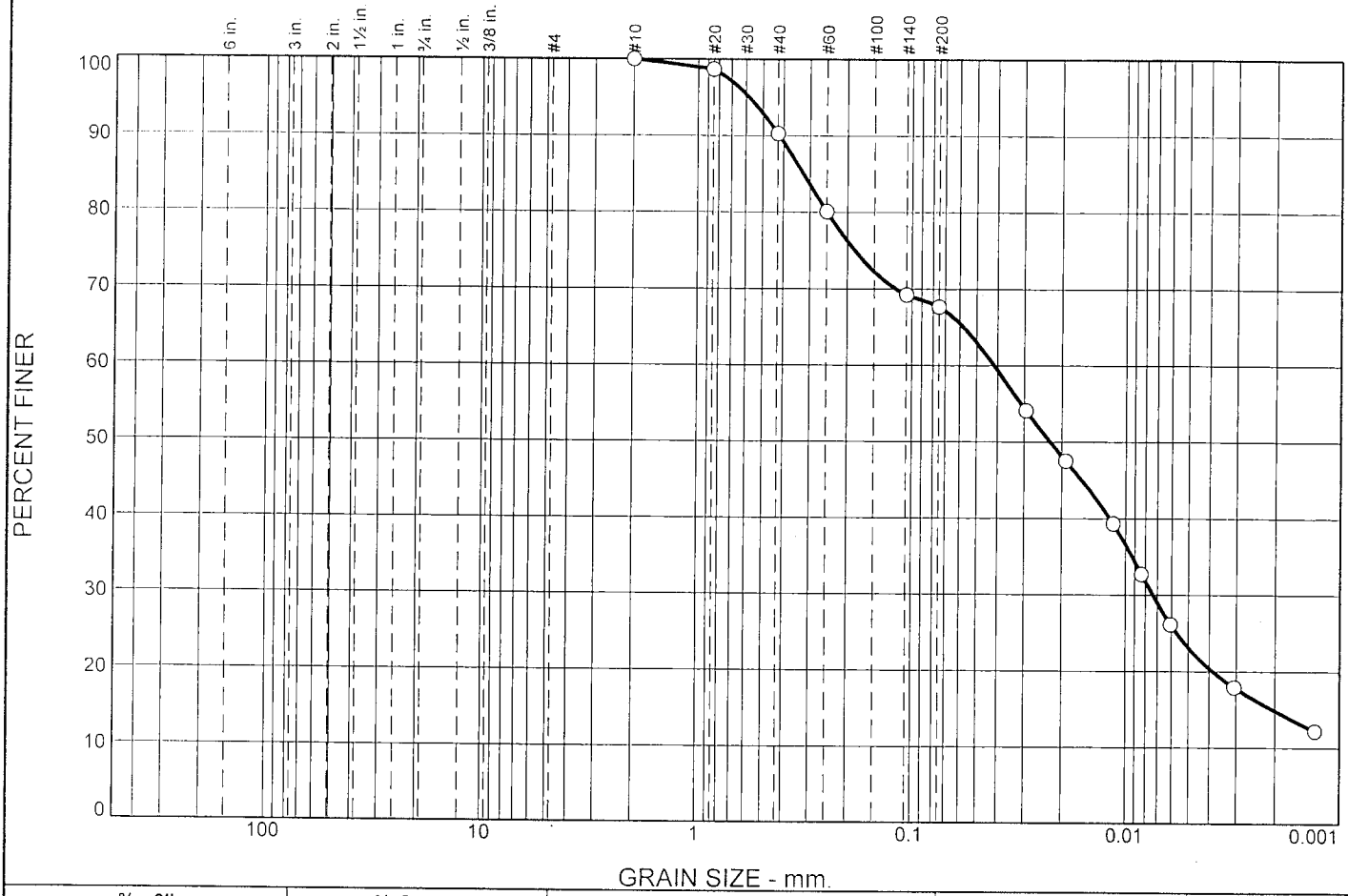
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	32.3	44.6	23.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#20	98.7		
#40	90.3		
#60	80.1		
#140	69.2		
#200	67.7		

* (no specification provided)

Material Description

Silt, some sand and clay, dark brown

Atterberg Limits

PL= 30 LL= 49 PI= 19

Coefficients

D_{90}= 0.4183 D_{85}= 0.3219 D_{60}= 0.0415
D_{50}= 0.0227 D_{30}= 0.0074 D_{15}= 0.0021
D_{10}= C_u= C_c=

Classification

USCS= ML AASHTO= A-7-5(13)

Remarks

Sample Number: B-111 (Middle) **Depth:** 4-6 ft

Date: 11/6/2020

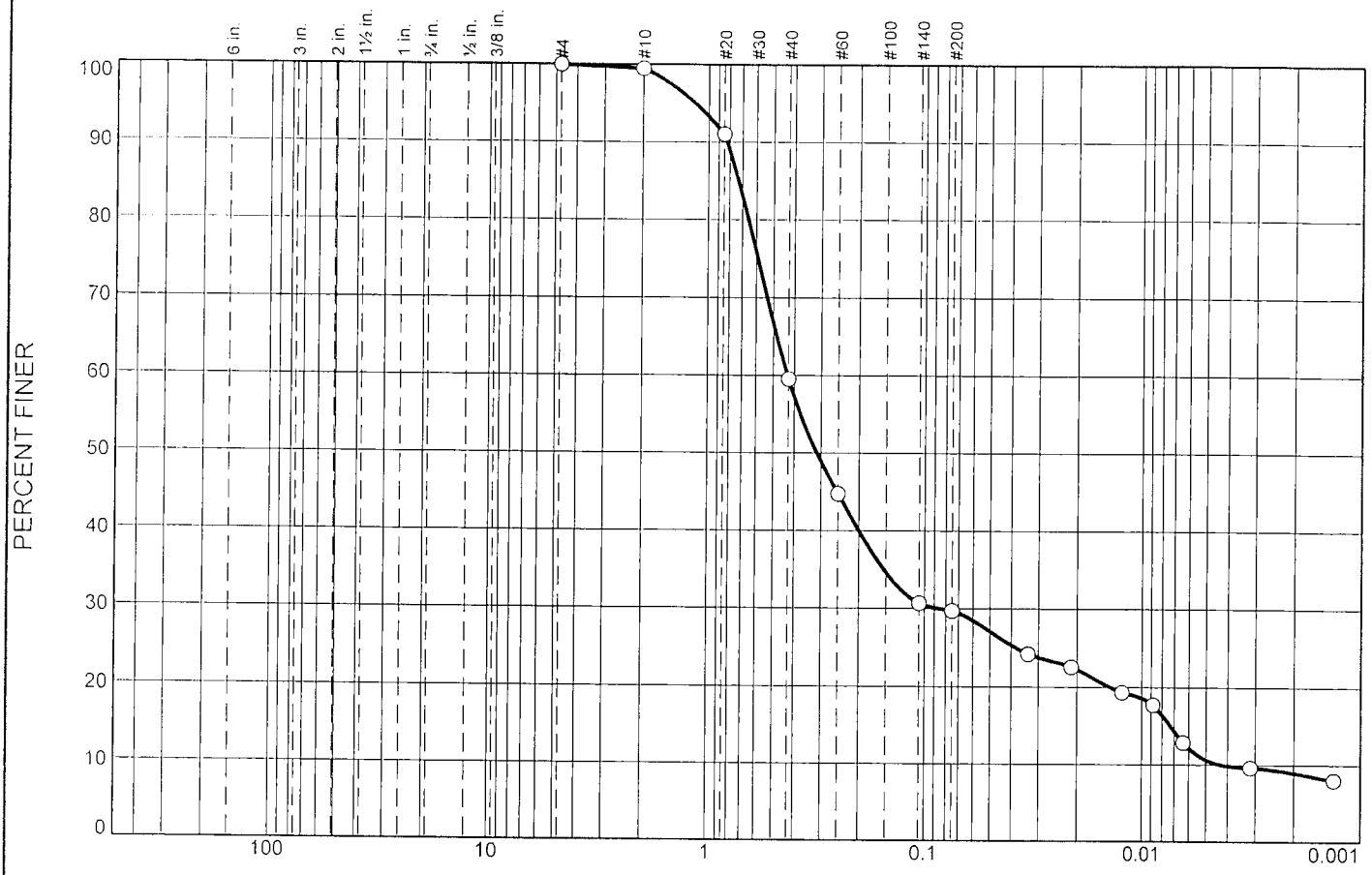
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	70.3	19.1	10.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.5		
#20	91.1		
#40	59.6		
#60	44.7		
#140	30.6		
#200	29.7		

* (no specification provided)

Material Description

Sand, some silt, trace clay, brown

Atterberg Limits

PL= 24 LL= 34 PI= 10

Coefficients

D_{90}= 0.8243 D_{85}= 0.7281 D_{60}= 0.4298
D_{50}= 0.3142 D_{30}= 0.0867 D_{15}= 0.0073
D_{10}= 0.0044 C_u= 98.36 C_c= 4.01

Classification

USCS= SC AASHTO= A-2-4(0)

Remarks

Sample Number: B-112 **Depth:** 0-5 ft

Date: 11/6/2020

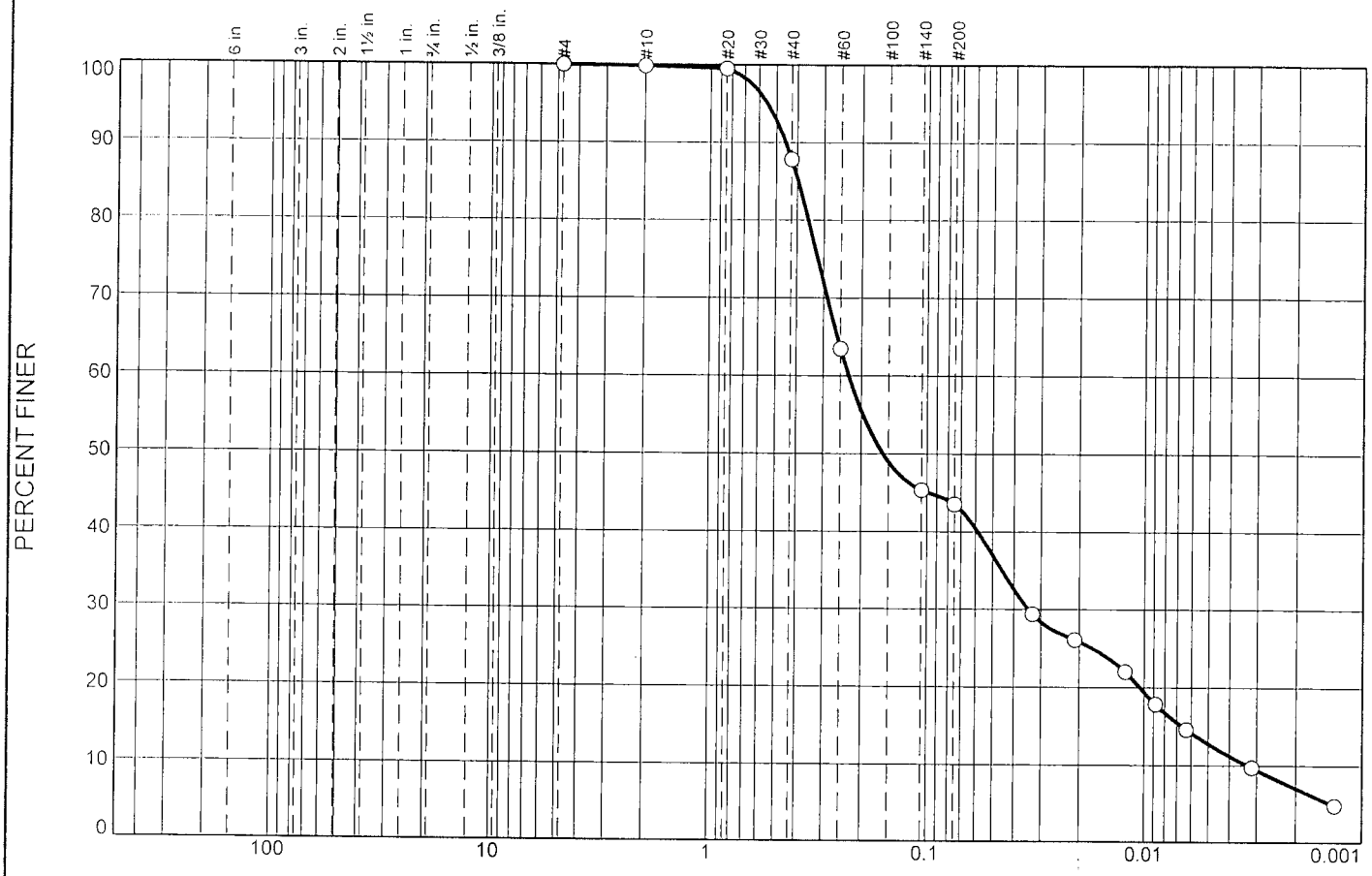
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	56.5	30.8	12.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	99.5		
#40	87.8		
#60	63.4		
#140	45.3		
#200	43.5		

* (no specification provided)

Material Description

Sand, some silt and clay, dark brown

Atterberg Limits

PL= 25 LL= 41 PI= 16

Coefficients

D_{90}= 0.4524 D_{85}= 0.3958 D_{60}= 0.2292
D_{50}= 0.1593 D_{30}= 0.0344 D_{15}= 0.0066
D_{10}= 0.0033 C_u= 69.01 C_c= 1.55

Classification

USCS= SC AASHTO= A-7-6(4)

Remarks

Sample Number: B-114 **Depth:** 0-2 ft

Date: 11/6/2020

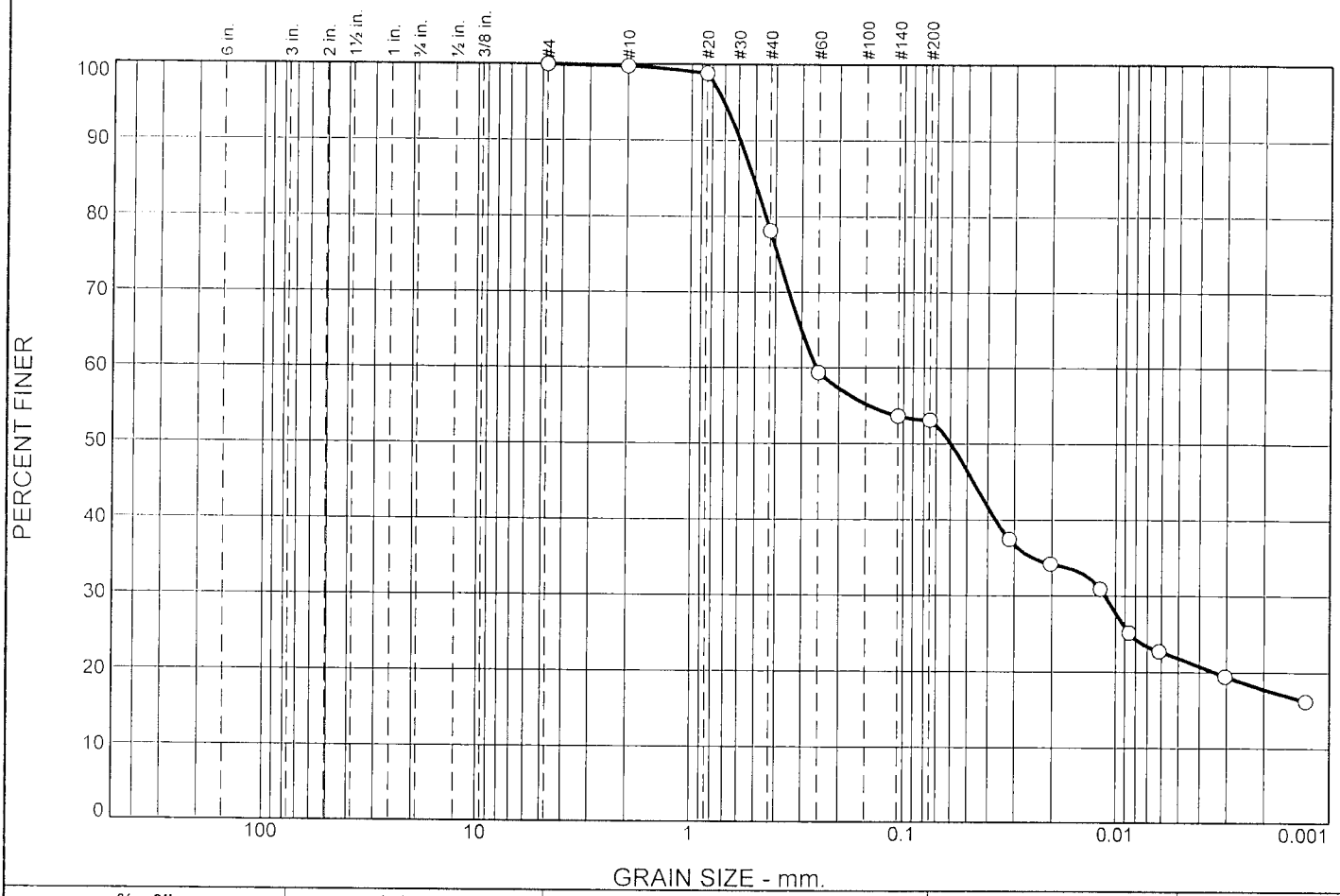
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	46.9	31.3	21.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.7		
#20	98.8		
#40	78.1		
#60	59.4		
#140	53.6		
#200	53.1		

* (no specification provided)

Material Description

Clay-sandy, some silt, tan and gray

Atterberg Limits

PL= 19 LL= 34 PI= 15

Coefficients

D_{90}= 0.5909 D_{85}= 0.5099 D_{60}= 0.2560
D_{50}= 0.0596 D_{30}= 0.0113 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(5)

Remarks

Sample Number: B-114 **Depth:** 4-6 ft

Date: 11/6/2020

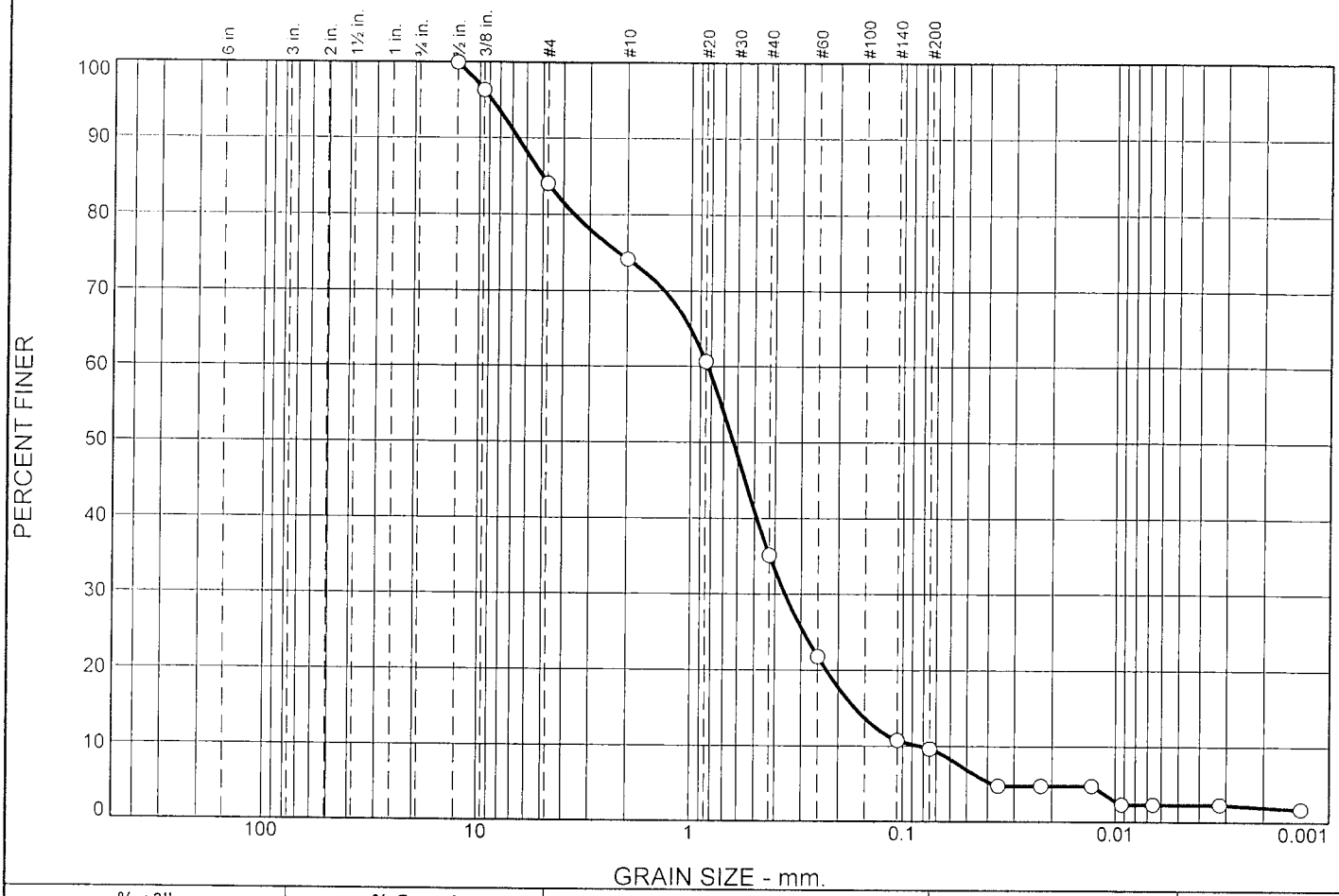
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	15.9	74.5	7.3	2.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.5	100.0		
0.375	96.3		
#4	84.1		
#10	74.1		
#20	60.7		
#40	35.1		
#60	21.8		
#140	10.7		
#200	9.6		

* (no specification provided)

Material Description

Sand, some gravel, trace silt and clay, tan

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 6.6005 D_{85}= 5.0148 D_{60}= 0.8318
D_{50}= 0.6295 D_{30}= 0.3587 D_{15}= 0.1670
D_{10}= 0.0836 C_u= 9.95 C_c= 1.85

Classification

USCS= SW-SM AASHTO= A-1-b

Remarks

Sample Number: B-114 **Depth:** 6-8 ft

Date: 11/6/2020

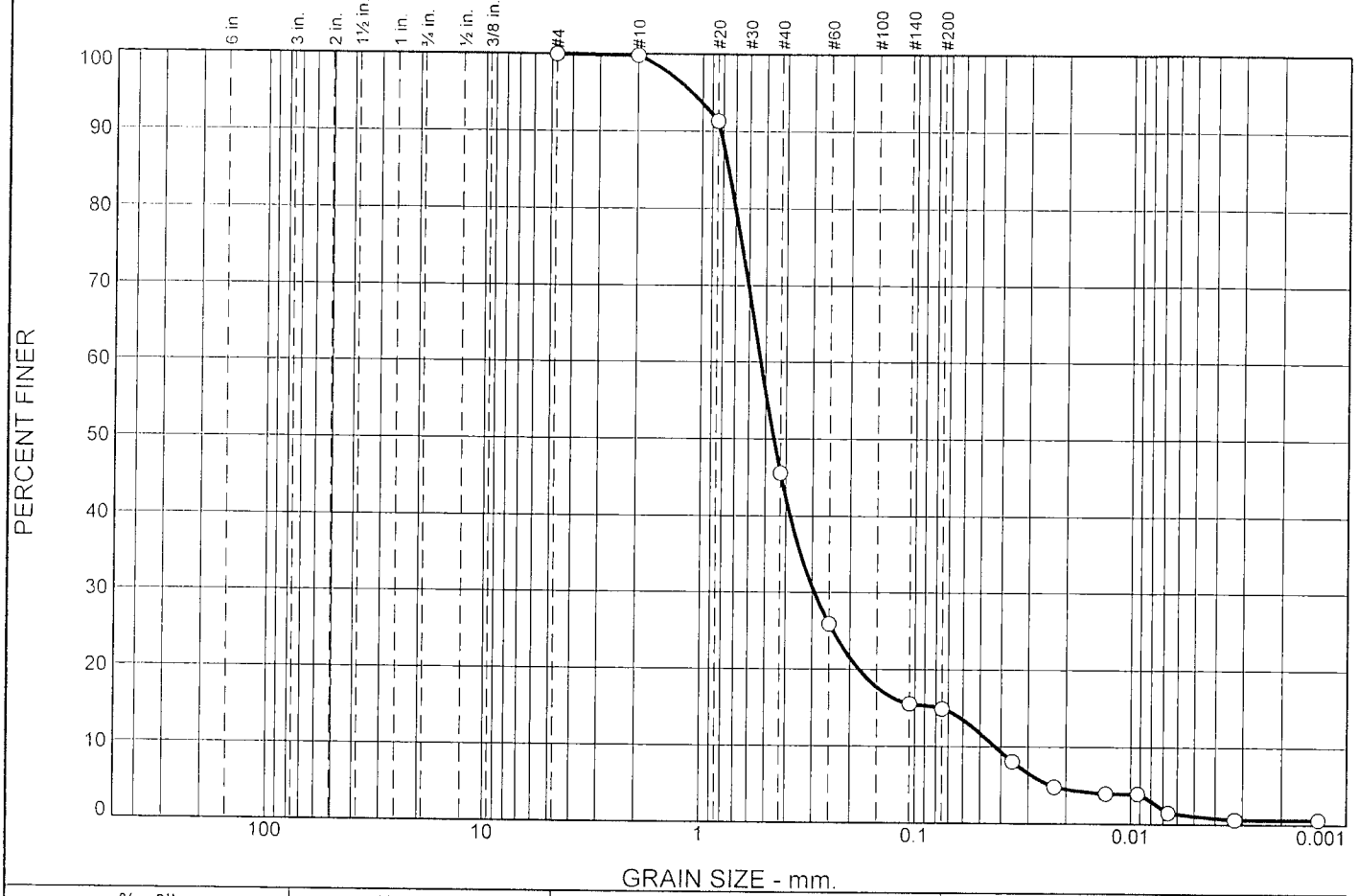
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	0.0	85.1	13.8	1.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.8		
#20	91.3		
#40	45.5		
#60	25.9		
#140	15.5		
#200	14.9		

* (no specification provided)

Material Description

Sand, some silt, trace clay, green tan

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.8268 D_{85}= 0.7554 D_{60}= 0.5283
D_{50}= 0.4570 D_{30}= 0.2933 D_{15}= 0.0775
D_{10}= 0.0427 C_u= 12.38 C_c= 3.82

Classification

USCS= SM AASHTO= A-1-b

Remarks

Sample Number: B-114 **Depth:** 8-10 ft

Date: 11/6/2020

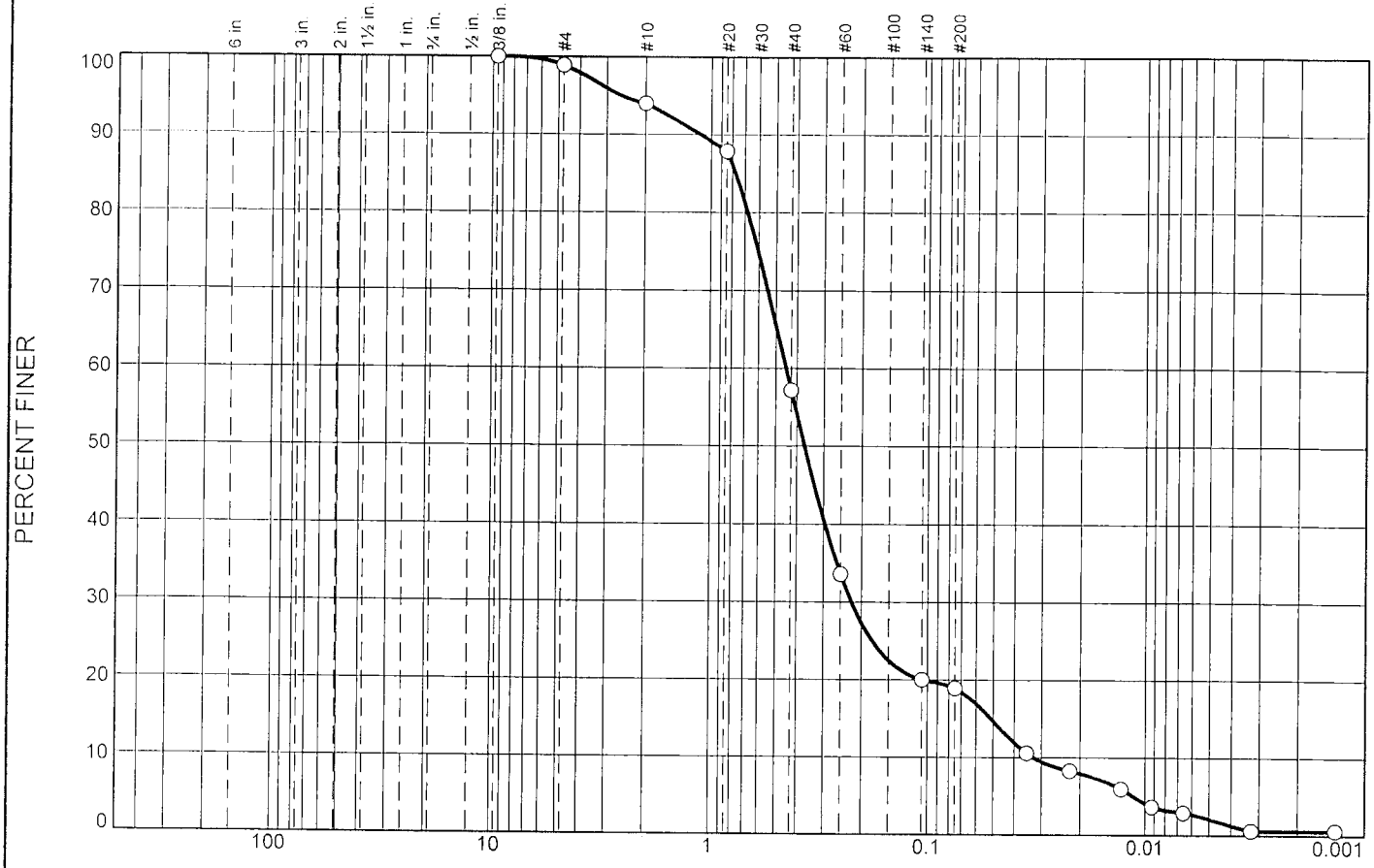
United Consulting

Norcross, Georgia

Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation

Project No: GCP&R20GA0451701 **Figure**

Particle Size Distribution Report



% +3"	% Gravel	% Sand	% Silt	% Clay
0.0	1.1	80.0	16.8	2.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
0.375	100.0		
#4	98.9		
#10	94.0		
#20	87.9		
#40	57.2		
#60	33.6		
#140	20.0		
#200	18.9		

* (no specification provided)

Material Description

Sand, some silt, trace clay and gravel, tan

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.1191 D_{85}= 0.7736 D_{60}= 0.4490
D_{50}= 0.3683 D_{30}= 0.2227 D_{15}= 0.0513
D_{10}= 0.0328 C_u= 13.67 C_c= 3.36

Classification

USCS= SM AASHTO= A-2-4(0)

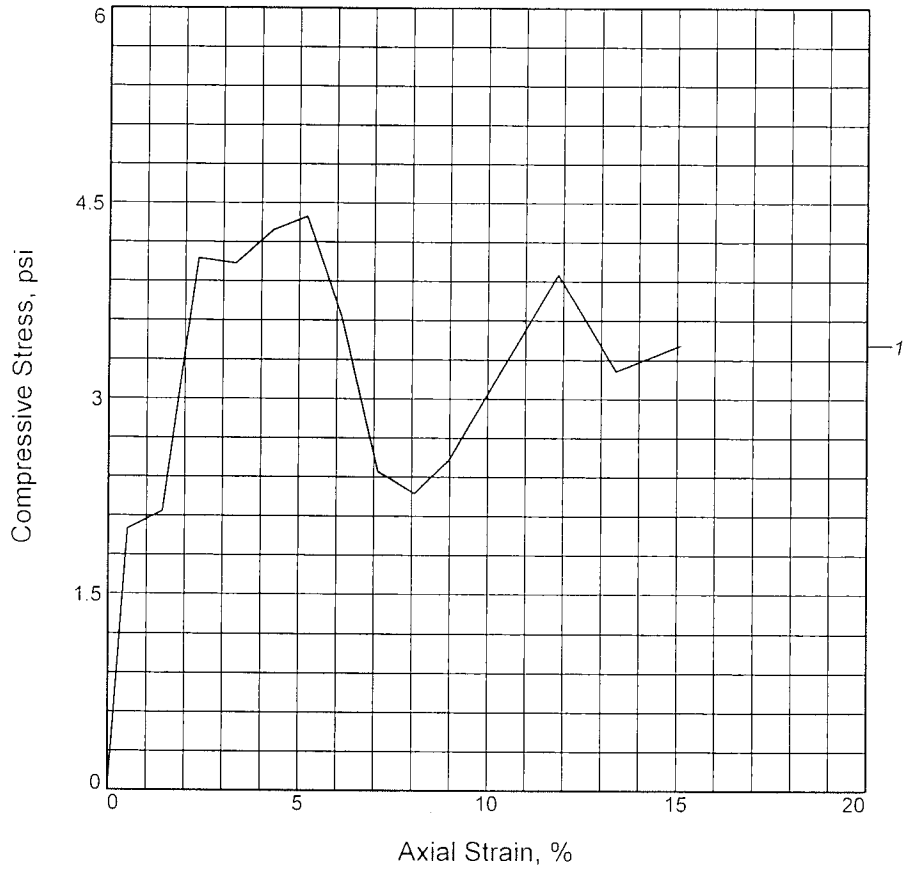
Remarks

Sample Number: B-114 **Depth:** 13.5-15 ft

Date: 11/6/2020

United Consulting	**Client:** GWINNETT CO PARKS & RECREATION
Norcross, Georgia	**Project:** Beaver Ruin Parks and Recreation
	Project No: GCP&R20GA0451701 **Figure**

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psi	4.40			
Undrained shear strength, psi	2.20			
Failure strain, %	5.2			
Strain rate, in./min.	0.050			
Water content, %	32.2			
Wet density, pcf	119.1			
Dry density, pcf	90.0			
Saturation, %	99.8			
Void ratio	0.8722			
Specimen diameter, in.	2.87			
Specimen height, in.	5.60			
Height/diameter ratio	1.95			

Description: Sand, some silt and clay, dark tan

LL = 50	PL = 35	PI = 15	GS= 2.7	**Type:** Undisturbed

Project No.: GC P&R20GA0151701

Date Sampled: 11/6/2020

Remarks:

Figure _____

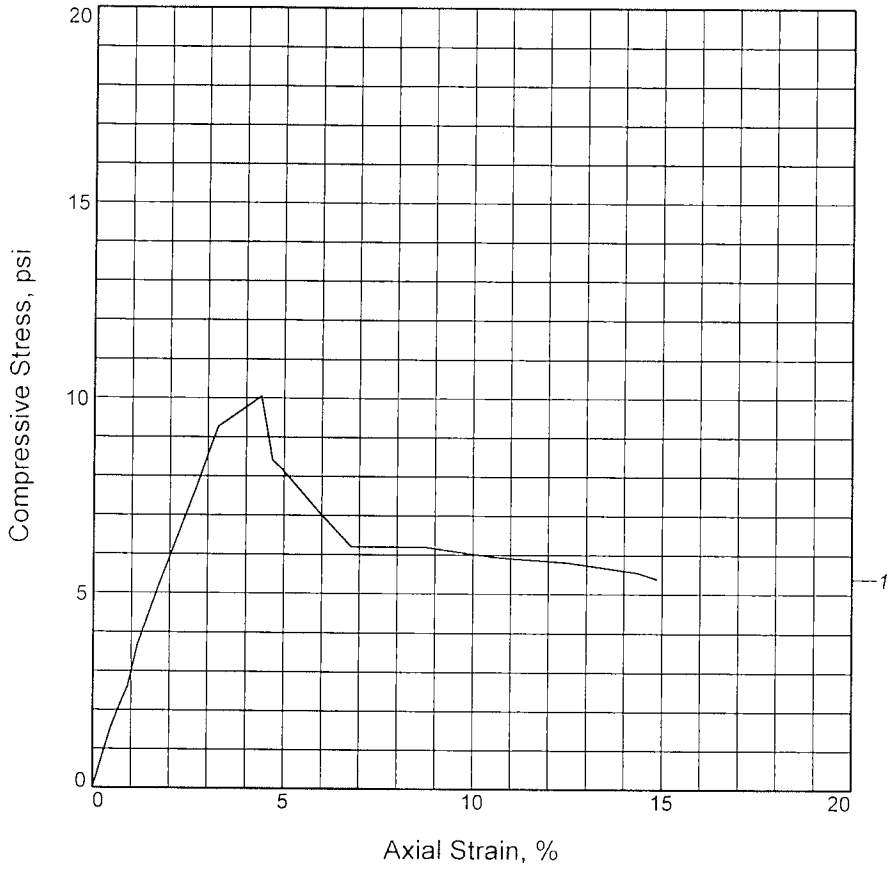
Client: GWINNETT CO PARKS & RECREATION

Project: Beaver Ruin Parks and Recreation

Sample Number: B-109 (Top) **Depth:** 4-6 ft

UNCONFINED COMPRESSION TEST
United Consulting
Norcross, Georgia

UNCONFINED COMPRESSION TEST



Sample No.	1			
Unconfined strength, psi	10.05			
Undrained shear strength, psi	5.02			
Failure strain, %	4.4			
Strain rate, in./min.	0.050			
Water content, %	26.1			
Wet density, pcf	128.0			
Dry density, pcf	101.5			
Saturation, %	106.7			
Void ratio	0.6605			
Specimen diameter, in.	2.87			
Specimen height, in.	5.60			
Height/diameter ratio	1.95			

Description: Silt, some sand and clay, dark brown

LL = 49	PL = 30	PI = 19	GS= 2.7	**Type:** Undisturbed

Project No.: GCPA\R20GA0451701

Date Sampled: 11/6/2020

Remarks:

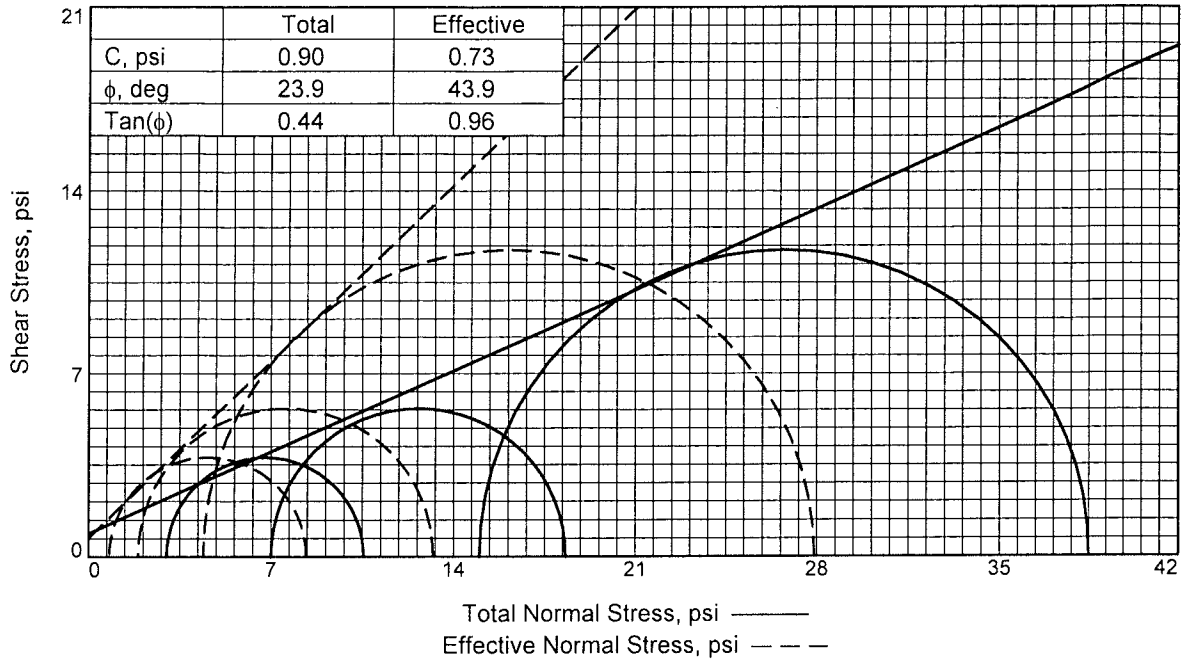
Figure _____

Client: GWINNETT CO PARKS & RECREATION

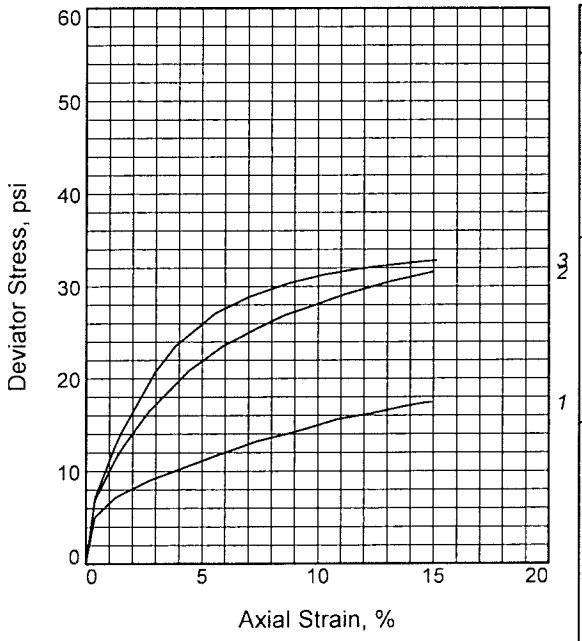
Project: Beaver Ruin Parks and Recreation

Sample Number: B-111 (Middle) **Depth:** 4-6 ft

UNCONFINED COMPRESSION TEST
United Consulting
Norcross, Georgia



	Total	Effective
C, psi	0.90	0.73
ϕ, deg	23.9	43.9
Tan(ϕ)	0.44	0.96



Sample No.		1	2	3
Initial	Water Content, %	19.7	17.9	16.8
	Dry Density, pcf	104.0	109.7	112.6
	Saturation, %	85.6	90.0	91.0
	Void Ratio	0.6211	0.5367	0.4974
	Diameter, in.	2.87	2.87	2.87
	Height, in.	5.60	5.60	5.60
At Test	Water Content, %	20.5	17.3	16.7
	Dry Density, pcf	108.6	114.8	116.2
	Saturation, %	100.0	100.0	100.0
	Void Ratio	0.5523	0.4682	0.4504
	Diameter, in.	2.83	2.83	2.84
	Height, in.	5.52	5.52	5.54
Strain rate, in./min.		0.008	0.008	0.008
Back Pressure, psi		75.0	70.0	85.0
Cell Pressure, psi		78.0	77.0	100.0
Fail. Stress, psi		7.6	11.3	23.5
Total Pore Pr., psi		77.2	75.1	95.6
Ult. Stress, psi		17.4	31.5	32.8
Total Pore Pr., psi		73.1	65.2	89.9
$\bar{\sigma}_1$ Failure, psi		8.4	13.2	27.9
$\bar{\sigma}_3$ Failure, psi		0.8	1.9	4.4

Type of Test:
CU with Pore Pressures

Sample Type: Undisturbed

Description: Clay-sandy, some silt, tan and gray

LL= 34 **PL=** 19 **PI=** 15

Specific Gravity= 2.7

Remarks:

Client: GWINNETT CO PARKS & RECREATION

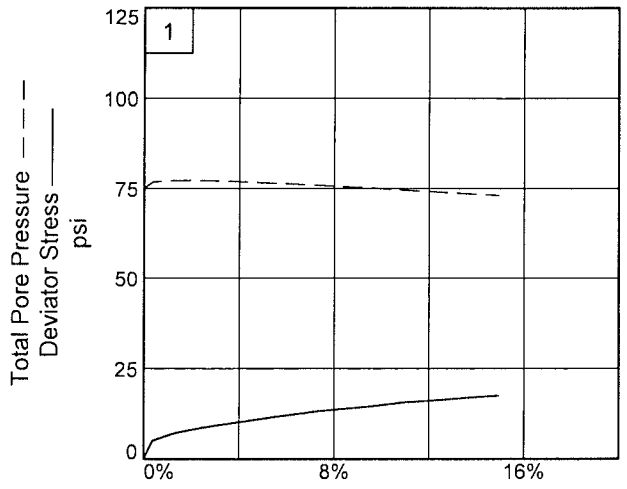
Project: Beaver Ruin Parks and Recreation

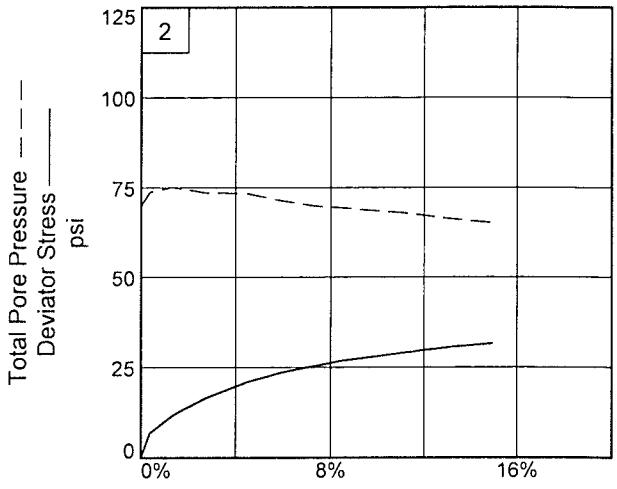
Sample Number: B-114 **Depth:** 4-6 ft

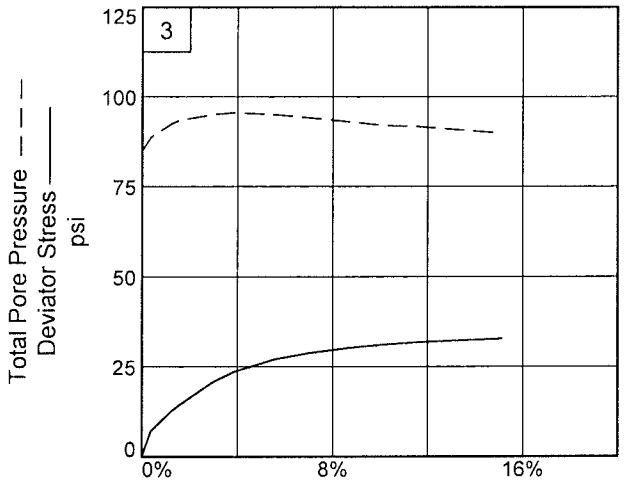
Proj. No.: GCP&R20GA0451701 **Date Sampled:** 11/6/2020

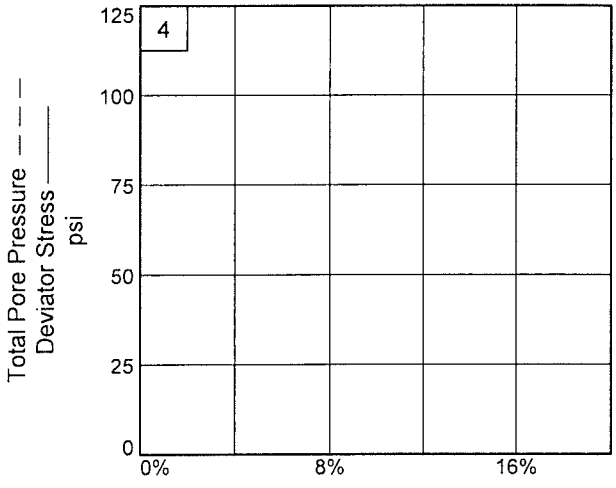
TRIAXIAL SHEAR TEST REPORT
United Consulting
Norcross, Georgia

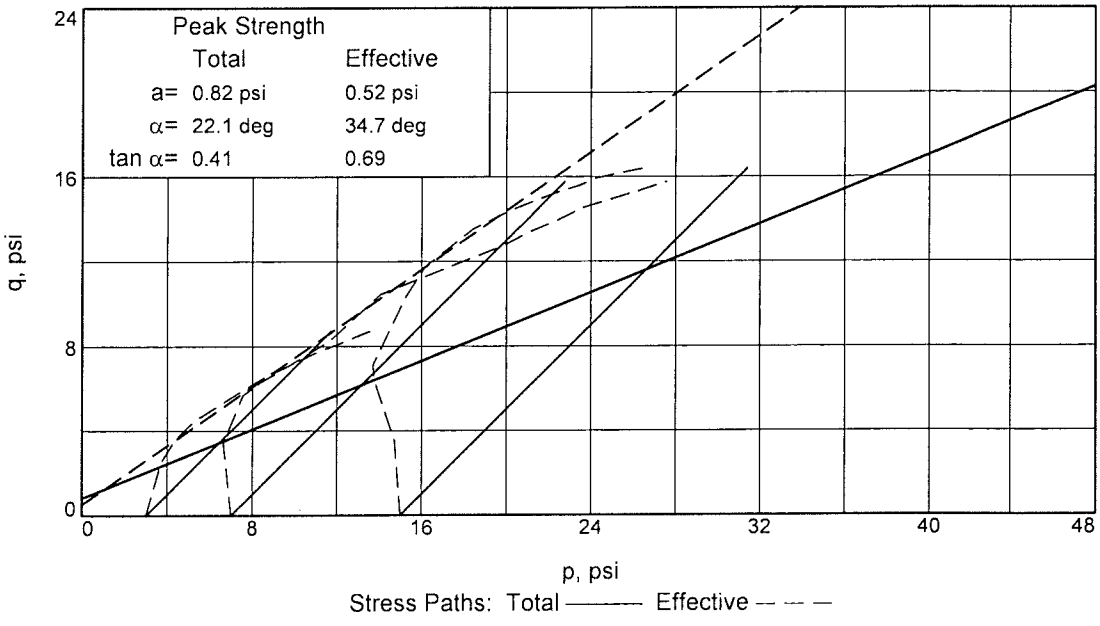
Figure _____











Client: GWINNETT CO PARKS & RECREATION
Project: Beaver Ruin Parks and Recreation
Depth: 4-6 ft **Sample Number:** B-114
Project No.: GCP&R20GA0451701 **Figure** _____

United Consulting

AES

ANALYTICAL ENVIRONMENTAL SERVICES, INC.

December 01, 2020

Mahvand Saleki
United Consulting Group Inc.

625 Holcomb Bridge Rd
Norcross GA 30071

RE: Beaver Ruin Parks and Recreation

Dear Mahvand Saleki: Order No: 2011M92

Analytical Environmental Services, Inc. received 8 samples on 11/19/2020 2:35:00 PM for the analyses presented in following report.

"No problems were encountered during the analyses except as noted in the Case Narrative or by qualifiers in the report or QC Summary. Additionally, all results for the associated Quality Control samples were within EPA and/or AES established limits.
AES's accreditations are as follows:
-NELAP/State of Florida Laboratory ID E87582 for analysis of Non-Potable Water, Solid & Chemical Materials, Air & Emissions Volatile Organics, and Drinking Water Microbiology & Metals, effective 07/01/20-06/30/21.
State of Georgia, Department of Natural Resources ID #800 for analysis of Drinking Water Metals, effective through 06/30/21 and Total Coliforms/ E. coli, effective 04/20/20-04/24/23.
-AIHA-LAP, LLC Laboratory ID: 100671 for Industrial Hygiene samples (Metals and PCM Asbestos), Environmental Lead (Paint, Soil, Dust Wipes, Air), and Environmental Microbiology (Fungal) Direct Examination, effective until 11/01/21.
These results relate only to the items tested as received. This report may only be reproduced in full.

If you have any questions regarding these test results, please feel free to call.

Sincerely,

Ioana Pacurar

Ioana Pacurar

Project Manager

SAMPLE CHAIN-OF-CUSTODY RECORD

2011M92

UNITED CONSULTING
625 Holcomb Bridge
NORCROSS, GEORGIA 30071
(770) 209-0029 FAX (770) 582-2895
www.unitedconsulting.com

PROJECT NAME: **Beaver Ruin Parks And Recreation**

Project#: GCP&R20GA0451701

TAT or DUE DATE: 11/30/20202

CONTACT: Mahvand Saleki
msaleki@unitedconsulting.com

PHONE#: (770)582-2843

PROJECT MANAGER: Rafael Ospina

RECEIVING LAB: AES

PO#:

SAMPLE NUMBER	SAMPLE DESCRIPTION	Date Shipped	Sample Matrix	Preserva-tive	# / Size of Cont.	ANALYSES (indicate target list) pH	Resistivity	Sulphate	Chloride					
B-103@2-3.5'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					
B-104@2-3.5'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					
B-106@2-4'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					
B-108@2-4'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					
B-110@2-3.5'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					
B-112@2-4'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					
B-102@2-4'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					
B-114@2-3.5'	Soil	11/19/2020	S	ICE	8OZ	X	X	X	X					

SAMPLES RELINQUISHED BY:	DATE/ TIME	SAMPLES ACCEPTED BY:	DATE/ TIME	COMMENTS:
PHUC VO	11-19-20 2:34		11/19/20 2:35 PM	

Analytical Environmental Services, Inc

Date: 1-Dec-20

Client: United Consulting Group Inc.
Project: Beaver Ruin Parks and Recreation
Lab ID: 2011M92

Case Narrative

pH Analysis by Method SW9045D:

Samples for pH analysis by Method SW9045D were received and analyzed outside holding time requirement of "immediate or 15 minutes."

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-103@2-3.5'
Project Name:	Beaver Ruin Parks and Recreation	**Collection Date:**	11/19/2020
Lab ID:	2011M92-001	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	13400	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	6.41	0.01	H	pH Units	306391	1	11/23/2020 14:00	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	38	12		mg/Kg-dry	306486	1	11/30/2020 14:19	IP
Sulfate	56	12		mg/Kg-dry	306486	1	11/30/2020 14:19	IP
PERCENT MOISTURE D2216								
Percent Moisture	17.9	0		wt%	R440362	1	11/22/2020 07:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-104@2-3.5'
Project Name:	Beaver Ruin Parks and Recreation	**Collection Date:**	11/19/2020
Lab ID:	2011M92-002	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	13500	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	6.04	0.01	H	pH Units	306391	1	11/23/2020 14:02	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	38	11		mg/Kg-dry	306486	1	11/28/2020 17:01	IP
Sulfate	27	11		mg/Kg-dry	306486	1	11/28/2020 17:01	IP
PERCENT MOISTURE D2216								
Percent Moisture	7.62	0		wt%	R440362	1	11/22/2020 07:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-106@2-4'
Project Name:	Beaver Ruin Parks and Recreation	**Collection Date:**	11/19/2020
Lab ID:	2011M92-003	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	21500	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	5.88	0.01	H	pH Units	306391	1	11/23/2020 15:35	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	45	11		mg/Kg-dry	306486	1	11/25/2020 16:38	IP
Sulfate	130	11		mg/Kg-dry	306486	1	11/25/2020 16:38	IP
PERCENT MOISTURE D2216								
Percent Moisture	13.7	0		wt%	R440362	1	11/22/2020 07:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-108@2-4'
Project Name:	Beaver Ruin Parks and Recreation	**Collection Date:**	11/19/2020
Lab ID:	2011M92-004	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	6310	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	5.91	0.01	H	pH Units	306391	1	11/23/2020 15:39	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	74	12		mg/Kg-dry	306486	1	11/28/2020 16:45	IP
Sulfate	43	12		mg/Kg-dry	306486	1	11/28/2020 16:45	IP
PERCENT MOISTURE D2216								
Percent Moisture	18.5	0		wt%	R440362	1	11/22/2020 07:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-110@2-3.5'
Project Name:	Beaver Ruin Parks and Recreation	**Collection Date:**	11/19/2020
Lab ID:	2011M92-005	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	10600	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	5.85	0.01	H	pH Units	306391	1	11/23/2020 15:40	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	38	11		mg/Kg-dry	306486	1	11/28/2020 16:29	IP
Sulfate	21	11		mg/Kg-dry	306486	1	11/28/2020 16:29	IP
PERCENT MOISTURE D2216								
Percent Moisture	11.1	0		wt%	R440362	1	11/22/2020 07:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-112@2-4'
Project Name:	Beaver Ruin Parks and Recreation	**Collection Date:**	11/19/2020
Lab ID:	2011M92-006	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	5580	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	7.33	0.01	H	pH Units	306391	1	11/23/2020 15:43	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	49	12		mg/Kg-dry	306486	1	11/28/2020 17:17	IP
Sulfate	90	12		mg/Kg-dry	306486	1	11/28/2020 17:17	IP
PERCENT MOISTURE D2216								
Percent Moisture	19.3	0		wt%	R440362	1	11/22/2020 07:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-102@2-4'
Project Name:	Beaver Ruin Parks and Recreation	**Collection Date:**	11/19/2020
Lab ID:	2011M92-007	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	14100	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	6.72	0.01	H	pH Units	306391	1	11/23/2020 15:47	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	36	11		mg/Kg-dry	306486	1	11/30/2020 14:03	IP
Sulfate	30	11		mg/Kg-dry	306486	1	11/30/2020 14:03	IP
PERCENT MOISTURE D2216								
Percent Moisture	5.75	0		wt%	R440362	1	11/22/2020 07:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Analytical Environmental Services, Inc **Date:** 1-Dec-20

Client:	United Consulting Group Inc.	**Client Sample ID:**	B-114@2-3.5'
Project Name:	Beaver Ruin Parks and Recreation	**Collection Date:**	11/19/2020
Lab ID:	2011M92-008	**Matrix:**	Soil

Analyses	Result	Reporting Limit	Qual	Units	BatchID	Dilution Factor	Date Analyzed	Analyst
Soil Resistivity SW9050A				**(SW9050)**				
Resistivity (@100% Moisture Saturation)	18800	0		ohms*cm	306477	1	11/24/2020 15:18	CB
Laboratory Hydrogen Ion (pH) SW9045D				**(SW9045D)**				
pH	5.85	0.01	H	pH Units	306391	1	11/23/2020 15:50	CB
ION SCAN SW9056A				**(SW9056A)**				
Chloride	45	12		mg/Kg-dry	306486	1	11/28/2020 13:37	IP
Sulfate	37	12		mg/Kg-dry	306486	1	11/28/2020 13:37	IP
PERCENT MOISTURE D2216								
Percent Moisture	15.3	0		wt%	R440362	1	11/22/2020 07:00	JW

Qualifiers:

*	Value exceeds maximum contaminant level	E	Estimated (value above quantitation range)
BRL	Below reporting limit	S	Spike Recovery outside limits due to matrix
H	Holding times for preparation or analysis exceeded	Narr	See case narrative
N	Analyte not NELAC certified	F	Analyzed in the lab which is a deviation from the method
B	Analyte detected in the associated method blank	<	Less than Result value
>	Greater than Result value	J	Estimated value detected below Reporting Limit

Clear Save as

ANALYTICAL ENVIRONMENTAL SERVICES, INC.

SAMPLE/COOLER RECEIPT CHECKLIST

1. Client Name: **United Consulting Group Inc.** AES Work Order Number: **2011M92**

2. Carrier: FedEx ☐ UPS ☐ USPS ☐ Client ■ Courier ☐ Other _____

		Yes	No	N/A	Details	Comments
3.	Shipping container/cooler received in good condition?	●	○	○	damaged ☐ leaking ☐ other ☐	
4.	Custody seals present on shipping container?	○	●	○		
5.	Custody seals intact on shipping container?	○	○	●		
6.	Temperature blanks present?	○	●	○		
7.	Cooler temperature(s) within limits of 0-6°C? [See item 13 and 14 for temperature recordings.]	●	○	○	Cooling initiated for recently collected samples / ice present ☐	
8.	Chain of Custody (COC) present?	●	○	○		
9.	Chain of Custody signed, dated, and timed when relinquished and received?	●	○	○		
10.	Sampler name and/or signature on COC?	○	●	○		
11.	Were all samples received within holding time?	○	●	○		
12.	TAT marked on the COC?	●	○	○	If no TAT indicated, proceeded with standard TAT per Terms & Conditions. ☐	

13. Cooler 1 Temperature 0.1 °C Cooler 2 Temperature _____ °C Cooler 3 Temperature _____ °C Cooler 4 Temperature _____ °C

14. Cooler 5 Temperature _____ °C Cooler 6 Temperature _____ °C Cooler 7 Temperature _____ °C Cooler 8 Temperature _____ °C

15. Comments: _____

I certify that I have completed sections 1-15 (dated initials). BH 11/20/20

		Yes	No	N/A	Details	Comments
16.	Were sample containers intact upon receipt?	●	○	○		
17.	Custody seals present on sample containers?	○	●	○		
18.	Custody seals intact on sample containers?	○	○	●		
19.	Do sample container labels match the COC?	●	○	○	incomplete info ☐ illegible ☐ no label ☐ other ☐	
20.	Are analyses requested indicated on the COC?	●	○	○		
21.	Were all of the samples listed on the COC received?	●	○	○	samples received but not listed on COC ☐ samples listed on COC not received ☐	
22.	Was the sample collection date/time noted?	●	○	○		
23.	Did we receive sufficient sample volume for indicated analyses?	●	○	○		
24.	Were samples received in appropriate containers?	●	○	○		
25.	Were VOA samples received without headspace (< 1/4" bubble)?	○	○	●		
26.	Were trip blanks submitted?	○	○	●	listed on COC ☐ not listed on COC ☐	

27. Comments: _____

I certify that I have completed sections 16-27 (dated initials). BH 11/20/20

This section only applies to samples where pH can be checked at Sample Receipt.

		Yes	No	N/A	Details	Comments
28.	Have containers needing chemical preservation been checked? *	○	○	●		
29.	Containers meet preservation guidelines?	○	○	●		
30.	Was pH adjusted at Sample Receipt?	○	○	●		

* Note: Certain analyses require chemical preservation but must be checked in the laboratory and not upon Sample Receipt such as Coliforms, VOCs and Oil & Grease/TPH. This also excludes metals by EPA 200.7, 200.8 and 245.1 which will be verified between 16 and 24 hours after preservation.

I certify that I have completed sections 28-30 (dated initials). BH 11/20/20

Locked

Client: United Consulting Group Inc.
Project Name: Beaver Ruin Parks and Recreation
Lab Order: 2011M92

Dates Report

Lab Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	TCLP Date	Prep Date	Analysis Date
2011M92-001A	B-103@2-3.5'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020
2011M92-001A	B-103@2-3.5'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M92-001A	B-103@2-3.5'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/30/2020
2011M92-001A	B-103@2-3.5'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020
2011M92-002A	B-104@2-3.5'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020
2011M92-002A	B-104@2-3.5'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M92-002A	B-104@2-3.5'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/28/2020
2011M92-002A	B-104@2-3.5'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020
2011M92-003A	B-106@2-4'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020
2011M92-003A	B-106@2-4'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M92-003A	B-106@2-4'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/25/2020
2011M92-003A	B-106@2-4'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020
2011M92-004A	B-108@2-4'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020
2011M92-004A	B-108@2-4'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M92-004A	B-108@2-4'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/28/2020
2011M92-004A	B-108@2-4'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020
2011M92-005A	B-110@2-3.5'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020
2011M92-005A	B-110@2-3.5'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M92-005A	B-110@2-3.5'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/28/2020
2011M92-005A	B-110@2-3.5'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020
2011M92-006A	B-112@2-4'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020
2011M92-006A	B-112@2-4'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M92-006A	B-112@2-4'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/28/2020
2011M92-006A	B-112@2-4'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020
2011M92-007A	B-102@2-4'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020
2011M92-007A	B-102@2-4'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M92-007A	B-102@2-4'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/30/2020
2011M92-007A	B-102@2-4'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020
2011M92-008A	B-114@2-3.5'	11/19/2020 12:00:00AM	Soil	Laboratory Hydrogen Ion (pH)		11/23/2020 7:33:00AM	11/23/2020

Client: United Consulting Group Inc.
Project Name: Beaver Ruin Parks and Recreation
Lab Order: 2011M92

Dates Report

Lab Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	TCLP Date	Prep Date	Analysis Date
2011M92-008A	B-114@2-3.5'	11/19/2020 12:00:00AM	Soil	Soil Resistivity		11/23/2020 7:30:00AM	11/24/2020
2011M92-008A	B-114@2-3.5'	11/19/2020 12:00:00AM	Soil	ION SCAN		11/24/2020 5:13:22PM	11/28/2020
2011M92-008A	B-114@2-3.5'	11/19/2020 12:00:00AM	Soil	PERCENT MOISTURE			11/22/2020

Client: United Consulting Group Inc.
Project Name: Beaver Ruin Parks and Recreation
Workorder: 2011M92

ANALYTICAL QC SUMMARY REPORT

BatchID: 306391

Sample ID: **LCS-306391** Client ID: Units: **pH Units** Prep Date: **11/23/2020** Run No: **440415**
SampleType: **LCS** TestCode: **Laboratory Hydrogen Ion (pH) SW9045D** BatchID: **306391** Analysis Date: **11/23/2020** Seq No: **10027582**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
pH	6.990	0.01	7.000		99.9	90	110				

Sample ID: **2011M90-001ADUP** Client ID: Units: **pH Units** Prep Date: **11/23/2020** Run No: **440415**
SampleType: **DUP** TestCode: **Laboratory Hydrogen Ion (pH) SW9045D** BatchID: **306391** Analysis Date: **11/23/2020** Seq No: **10027609**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
pH	5.800	0.01						5.880	1.37	10	H

Sample ID: **2011M91-002ADUP** Client ID: Units: **pH Units** Prep Date: **11/23/2020** Run No: **440415**
SampleType: **DUP** TestCode: **Laboratory Hydrogen Ion (pH) SW9045D** BatchID: **306391** Analysis Date: **11/23/2020** Seq No: **10027610**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
pH	5.850	0.01						5.940	1.53	10	H

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: United Consulting Group Inc.
Project Name: Beaver Ruin Parks and Recreation
Workorder: 2011M92

ANALYTICAL QC SUMMARY REPORT

BatchID: 306477

Sample ID: **LCS-306477** Client ID: Units: **ohms*cm** Prep Date: **11/23/2020** Run No: **440558**
SampleType: **LCS** TestCode: **Soil Resistivity SW9050A** BatchID: **306477** Analysis Date: **11/24/2020** Seq No: **10030885**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Resistivity (@100% Moisture Saturatic	9891	0	10000		98.9	90	110				

Sample ID: **2011M90-001ADUP** Client ID: Units: **ohms*cm** Prep Date: **11/23/2020** Run No: **440558**
SampleType: **DUP** TestCode: **Soil Resistivity SW9050A** BatchID: **306477** Analysis Date: **11/24/2020** Seq No: **10030887**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Resistivity (@100% Moisture Saturatic	7457	0						7463	0.075	30	

Sample ID: **2011M91-002ADUP** Client ID: Units: **ohms*cm** Prep Date: **11/23/2020** Run No: **440558**
SampleType: **DUP** TestCode: **Soil Resistivity SW9050A** BatchID: **306477** Analysis Date: **11/24/2020** Seq No: **10030901**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Resistivity (@100% Moisture Saturatic	9416	0						9425	0.094	30	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: United Consulting Group Inc.
Project Name: Beaver Ruin Parks and Recreation
Workorder: 2011M92

ANALYTICAL QC SUMMARY REPORT

BatchID: 306486

Sample ID: **MB-306486** Client ID: Units: **mg/Kg** Prep Date: **11/24/2020** Run No: **440738**
SampleType: **MBLK** TestCode: **ION SCAN SW9056A** BatchID: **306486** Analysis Date: **11/25/2020** Seq No: **10036056**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chloride	BRL	10									
Sulfate	BRL	10									

Sample ID: **LCS-306486** Client ID: Units: **mg/Kg** Prep Date: **11/24/2020** Run No: **440738**
SampleType: **LCS** TestCode: **ION SCAN SW9056A** BatchID: **306486** Analysis Date: **11/25/2020** Seq No: **10036057**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chloride	108.4	10	100.0		108	90	110				
Sulfate	272.0	10	250.0		109	90	110				

Sample ID: **2011M92-003AMS** Client ID: **B-106@2-4'** Units: **mg/Kg-dry** Prep Date: **11/24/2020** Run No: **440738**
SampleType: **MS** TestCode: **ION SCAN SW9056A** BatchID: **306486** Analysis Date: **11/25/2020** Seq No: **10036061**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chloride	172.7	11	114.1	44.88	112	80	120				
Sulfate	302.7	11	285.2	133.2	59.4	80	120				S

Sample ID: **2011M92-008AMS** Client ID: **B-114@2-3.5'** Units: **mg/Kg-dry** Prep Date: **11/24/2020** Run No: **440738**
SampleType: **MS** TestCode: **ION SCAN SW9056A** BatchID: **306486** Analysis Date: **11/28/2020** Seq No: **10042731**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chloride	155.9	12	115.7	45.12	95.8	80	120				
Sulfate	268.3	12	289.3	36.80	80.0	80	120				

Sample ID: **2011M92-003AMSD** Client ID: **B-106@2-4'** Units: **mg/Kg-dry** Prep Date: **11/24/2020** Run No: **440738**
SampleType: **MSD** TestCode: **ION SCAN SW9056A** BatchID: **306486** Analysis Date: **11/25/2020** Seq No: **10036062**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Chloride	170.8	12	115.9	44.88	109	80	120	172.7	1.12	20	

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

Client: United Consulting Group Inc.
Project Name: Beaver Ruin Parks and Recreation
Workorder: 2011M92

ANALYTICAL QC SUMMARY REPORT

BatchID: 306486

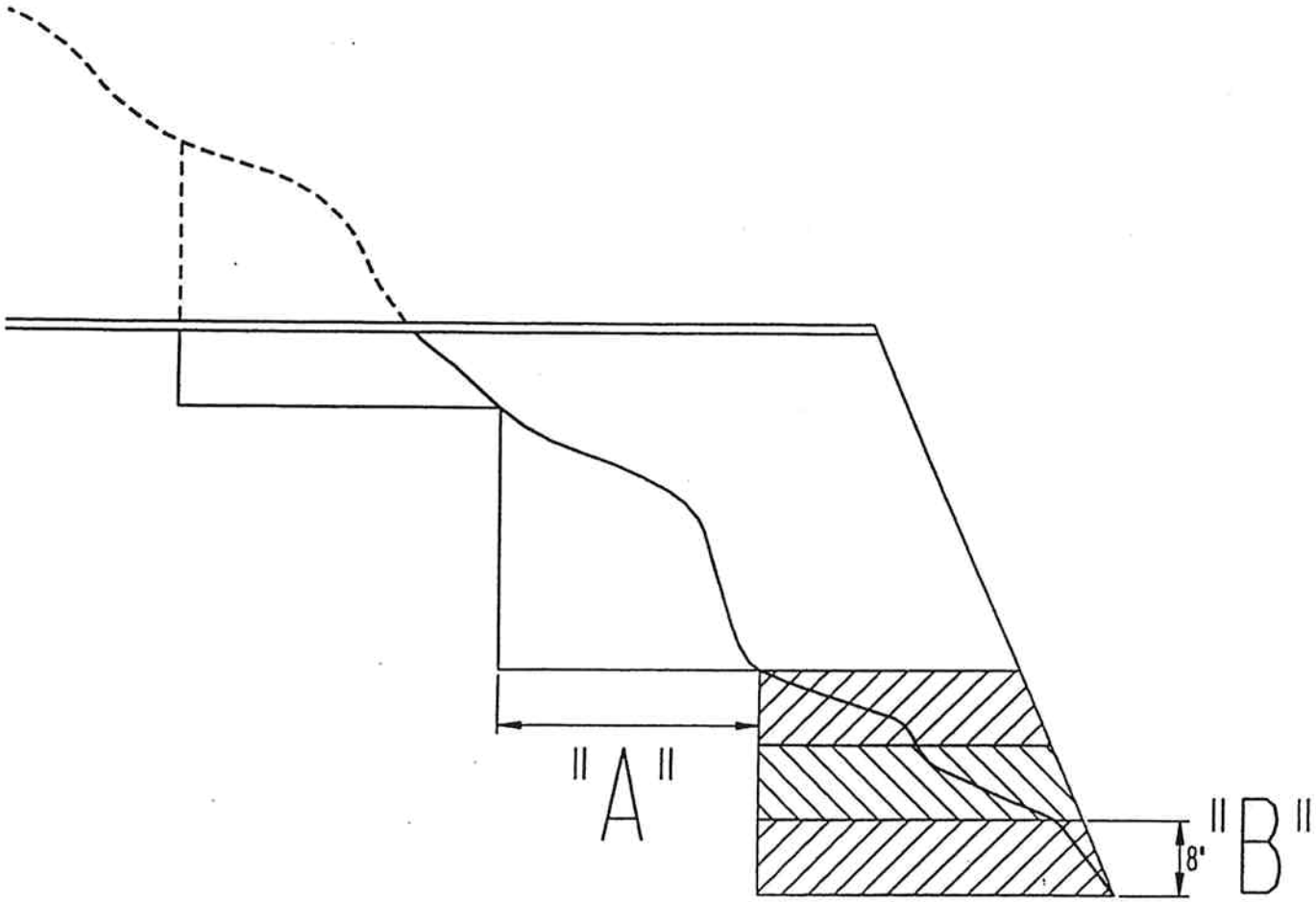
Sample ID: **2011M92-003AMSD** Client ID: **B-106@2-4'** Units: **mg/Kg-dry** Prep Date: **11/24/2020** Run No: **440738**
SampleType: **MSD** TestCode: **ION SCAN SW9056A** BatchID: **306486** Analysis Date: **11/25/2020** Seq No: **10036062**

Analyte	Result	RPT Limit	SPK value	SPK Ref Val	%REC	Low Limit	High Limit	RPD Ref Val	%RPD	RPD Limit	Qual
Sulfate	307.6	12	289.7	133.2	60.2	80	120	302.7	1.61	20	S

Qualifiers:

>	Greater than Result value	<	Less than Result value	B	Analyte detected in the associated method blank
BRL	Below reporting limit	E	Estimated (value above quantitation range)	H	Holding times for preparation or analysis exceeded
J	Estimated value detected below Reporting Limit	N	Analyte not NELAC certified	R	RPD outside limits due to matrix
Rpt Lim	Reporting Limit	S	Spike Recovery outside limits due to matrix		

End of Report



1. THE ABOVE DIAGRAM ILLUSTRATES A TYPICAL BENCHING FOR PLACEMENT OF FILL ON A SLOPING SURFACE.

2. THE DIAGRAM SHOWS THAT BEFORE FILL IS PLACED, THE FIRST STEP IS CUT INTO THE SLOPE A MAXIMUM DISTANCE OF ABOUT 8 FEET "A" (ABOUT ¾ THE WIDTH OF USUAL D-8 BULLDOZER BLADE). SUCCESSIVE LAYERS OF FILL ARE THEN PLACED. BEFORE FINAL LAYER IS PLACED, THE SECOND STEP IS CUT 8 FEET INTO THE SLOPE AND SUCCESSIVE LAYERS ARE AGAIN PLACED.

3. SELECT FILL MATERIAL SHOULD BE PLACED IN 8 INCH LIFTS AND COMPACTED TO THE SPECIFIED DENSITY ("B").

TYPICAL BENCHING DETAIL

UNITED CONSULTING
625 HOLCOMB BRIDGE ROAD, NORCROSS, GEORGIA 30071
OFFICE (770)-209-0029 FAX (770)-582-2900

Important Information about This

Geotechnical-Engineering Report

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

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

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

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

Read the Full Report

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

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

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

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

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

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

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

Subsurface Conditions Can Change

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

Most Geotechnical Findings Are Professional Opinions

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

A Report's Recommendations Are Not Final

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

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

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

Do Not Redraw the Engineer's Logs

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

Give Constructors a Complete Report and Guidance

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

Read Responsibility Provisions Closely

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

Environmental Concerns Are Not Covered

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

Obtain Professional Assistance To Deal with Mold

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

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

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

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

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

TETRA TECH

December 31, 2020

Charles E. Crowell, Jr., PE, CPESC, CPSWQ, CFM
Stormwater Section Manager, Engineering and Construction
Gwinnett County, Georgia
Department of Water Resources
684 Winder Highway
Lawrenceville, Georgia 30045

Subject: Beaver Ruin Wetland Enhancement – Boardwalk Foundation Recommendations

Dear Mr. Crowell:

United Consulting has performed a subsurface exploration for the boardwalk project and prepared a report that documents the boring findings and presents recommendations for the boardwalk foundations. Tetra Tech has reviewed their subsurface exploration report and takes no exception to the recommendations presented in the report. A copy of their report is attached to this letter for reference. Pertinent information from our review is presented below.

A total of six borings (B-1 through B-6) were drilled by United Consulting for the proposed boardwalk alignment. The boring depths ranged between 19 and 30 feet. Boring B-5 encountered a couple of feet of fill at the ground surface. Below the fill in boring B-5 and the ground surface in the remaining borings, the borings encountered residual clays and sands that are typical for the area. The upper five to 10 feet was soft or loose. Weathered bedrock, consisting of very dense sand, was encountered in borings B-2 through B-6 at depths of 13.5 feet to 28.5 feet. Boring B-1 did not encounter weathered bedrock to its completion depth of 30 feet. Groundwater was encountered within 8 feet of the ground surface in the six borings at the time the borings were drilled.

It is understood that spread footings were originally considered to support the proposed boardwalk. However, because of the presence of the soft and loose upper soils, shallow foundations are not practical due to the risk of settlement. Consequently, deep foundations, consisting of helical piers, were considered to support the proposed boardwalk.

Based on information from the boardwalk supplier, the proposed boardwalk foundations are subject to both axial and lateral loads. Therefore, battered helical piers will be used to resist the lateral loads. It is anticipated that the helical piers will have to be extended to the dense sands or weathered rock to achieve the desired capacity. The table below presents the preliminary pier capacities at each boring location based on the subsurface conditions encountered in each boring. For additional details regarding the helical pier recommendations, please refer to the attached report.

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Boring	Battered Pile Design Compression Service Loads (kips)	Battered Pile Minimum Installation Torque (ft-lb)	Minimum Depth to Bottom Helix (ft)
B-1	30.5	6,108	25
B-2			15
B-3			17
B-4			17
B-5			14
B-6			24

We would also note that there are different suppliers of helical piers, each with different component sizes and helix configurations. Therefore, the final design of the helical pier foundations should be provided by the helical pier supplier based on the anticipated loads from the boardwalk supplier. In addition, the construction documents should require load tests on the installed helical piers to confirm their load capacity.

For the design of earth retention structures, the parameters in the table below may be used. For additional recommendations on retaining wall design for the project, please refer to the attached report.

Earth Pressure Condition	Earth Pressure Coefficient	Recommended Equivalent Fluid Pressure (psf/ft)
Active	$K_a = 0.36$	43
At-Rest	$K_o = 0.53$	64
Passive	$K_p = 2.77$	332

The seismic site classification is impacted by the soft clays and loose soils in the upper 5 to 10 feet of the subsurface profile. Based on the presence of these weaker soils at the site, it is recommended that Site Class E be used for any seismic design.

If you have any questions or require any further information, please do not hesitate to contact us.

Respectfully submitted,

Tetra Tech, Inc.

Frederic M Shmurak

Frederic (Rick) M. Shmurak, PE
Senior Project Manager