CITY OF ATLANTA

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DEPARTMENT OF PROCUREMENT
Adam L. Smith, Esq., CPPO, CPPB, CPPM, CPP, CIPC, CISCC, CIGPM
Chief Procurement Officer
asmith@atlantaga.gov

October 30, 2015

Dear Potential Proponents:

Re: FC-8188, RM Clayton WRC Nutrient Harvesting Design-Build Project

Attached is one (1) copy of **Addendum Number 2,** which is hereby made a part of the above-referenced project.

For additional information, please contact Ms. Jill Watkins, Contracting Officer, at (404) 865-8703 or by email at jewatkins@atlantaga.gov.

Sincerely,

Adam L. Smith

ALS/jew

ADDENDUM NO. 2

This Addendum No. 2 forms a part of the Request for Proposals ("**RFP**")and modifies the original solicitation package and any prior Addenda as noted below and is issued to incorporate the following:

1. **Revised due date: Wednesday, December 2, 2015 @ 2:00 P.M. EST.**

2. **Revision:** Part 2, Contents of Proposals/Required Submittals, Section 3.2.4.3; Add the following sentence to the end of Section 3.2.4.3: "This Section shall only pertain to the experience of the Nutrient Recovery System Manufacturer/Supplier."

3. **Attachment No. 1:** Baseline Geotechnical Engineering Services Report RM Clayton Water Reclamation Center Expansion – April 9, 2015.

4. **Revision:** Part 5, Exhibit D-1 Scope of Work, Section 1.8; Modify the date of the Technical Memorandum referenced in Footnote 1, to March 11, 2015. Technical Memorandum, City of Atlanta, Water Resources Management Plan: Wastewater Component Process Modeling, BGR, March 11, 2013 is provided in **Attachment No. 2.**

5. **Revision:** Part 1, Information and Instructions to Proponents, Paragraph 26, Agreement Terms; Replace "twenty three (23) months" with "twenty one (21) months" and "fourteen (14) days of Substantial Completion," with "twenty three (23) months of Notice to Proceed."

6. **Revision:** Part 5, Standard Form of Agreement Between Owner and Design-Builder – Lump Sum, Article 5, Contract Time, paragraph 5.5; Replace both instances of "fourteen (14) days of the Substantial Completion Date," with "twenty three (23) months of Notice to Proceed."

7. **Attachment No. 3:** As-Built Documents.

8. **Revision:** Part 2, Contents of Proposals/Required Submittals, Section 3.2.4, Overall Experience; Replace paragraphs 1 and 2 in their entirety with the following:

   3.2.4.1. Proponent Design-Build Team shall have successfully completed at least five (5) design/build contracts involving design and construction or refurbishment of similar design-build projects at wastewater treatment facilities. At least two (2) of the five (5) shall involve Nutrient Recovery Systems or side stream treatment systems. These projects are to also demonstrate and document experience with piping, installation of mechanical equipment, electrical and instrumentation systems in an operating system in coordination with ongoing operations. The projects shall have a construction value of not less than Five Million Dollars ($5,000,000) each. Proponent shall provide the names, addresses, and current

phone numbers of project owner contacts for the projects listed above. Preference will be given to project references that include one or more of the Key Personnel identified in Paragraph 3.2.3.1.

3.2.4.2. Proponent and Manufacturer's Representative/Project Manager shall provide the names, addresses, and current phone numbers of a minimum of five (5) references at municipal water reclamation facilities where they have successfully completed design/build projects with evaluator preference for references of similar design-build projects and references associated with manufacturer's equipment installations. The Manufacturer's Representative/Project Manager shall provide at least five (5) references for which Proponent's proposed Manufacturer's equipment has been installed. (Use Form 7 provided by City at Part 4; Required Procurement Documents). Provide a complete listing of operating installations and installations under contract but not completed (Use "Related Experience by Proposed Equipment Manufacturer" form provided by City at Part 4; Required Procurement Documents). This will serve as references for the proposed manufacturer of the Nutrient Recovery System. Include a brief description of the installation, whether phosphorus removal is included in the installation and the current contact information for each installation. List in order of similarity of size and influent characteristics to RM Clayton WRC.

9. Appendices A and B were erroneously inserted after page 1 of Part 4 in the RFP. Following Appendix B, the remaining document pages were order correctly, starting with the Required Submittal Forms. The error has been corrected on the City's website and the RFP is accessible at: http://procurement.atlantaga.gov/?s=8188&submit=Search.

10. Revision: Part 4, Required Submittal Forms, Cost Proposal Form; Replace the Cost Proposal Form in its entirety with the revised form in **Attachment No. 4**.

11. Revision: Part 5, Exhibit C, Division 01 Specification; Replace Specification 01350 in its entirety with the revised Specification in **Attachment No. 5**.

12. Attachment No. 6: Response to Questions (34 Questions). The City is in receipt of additional questions, which will be responded to via future addendum.

The last day for questions was Wednesday, October 14, 2015, at 1:00 P.M. EDT.

The Proposal due date <u>HAS</u> been modified and Proposals are due on <u>Wednesday, December 2, 2015</u> and should be time stamped in no later than <u>2:00 P.M. EST</u> and delivered to the address listed below:

Adam L. Smith, Esq., CPPO, CPPB, CPPM, CPP,
CIPC, CISCC, CIGPM
Chief Procurement Officer
Department of Procurement
55 Trinity Avenue, S. W.
City Hall South, Suite 1900
Atlanta, Georgia 30303

****All other pertinent information is to remain unchanged****

<u>Acknowledgment of Addendum No. 2</u>

Proponents must sign below and return this form with Proposal to the Department of Procurement, 55 Trinity Avenue, City Hall South, Suite 1900, Atlanta, Georgia 30303 as acknowledgment of receipt of this Addendum.

This is to acknowledge receipt of Addendum No. 2 for **FC-8188, RM Clayton WRC Nutrient Harvesting Design-Build Project** on this the _____ day of _____, 20__.

_____
Legal Company Name of Proponent

_____
Signature of Authorized Representative

_____
Printed Name

_____
Title

_____
Date

ATTACHMENT NO. 1

Baseline Geotechnical Engineering Services Report
RM Clayton Water Reclamation Center Expansion
April 9, 2015

April 9, 2015

Ms. Giny Jacob, PE
BGR/Black and Veatch/Gresham Smith and Partners/Rohadfox
2325 Lakeview Parkway, Suite 400
Alpharetta, Georgia 30009

Baseline Geotechnical Engineering Services Report
RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia
MC² Inc. Project No. A091417.098

MC Squared, Inc. (**MC²**) has completed this baseline geotechnical engineering services report for the referenced project. This study was performed in general accordance with **MC²** revised proposal No. A091417.098 dated February 15, 2015. The services were authorized through a subcontract agreement between **MC²** and **Black & Veatch Corporation/Gresham Smith and Partners/Rohadfox.** This report, presented herein, includes the subsurface data and general recommendations for this study.

We trust that this report will assist you in the design and construction of the proposed project. We appreciate the opportunity to be of service and should you have any questions, please do not hesitate to contact us.

Respectfully submitted,
MC²

Jodonna J Jimenez, PE
Project Engineer
GA PE No. 031327

Sam Moussly
Project Manager/CEO

Nicholas Diorio, PE
Project Manager
GA PE No. 038390

Rees Nickerson, PE
Chief Engineer

TABLE OF CONTENTS

1.0 PROJECT INFORMATION 1

1.1 PROJECT AUTHORIZATION 1
1.2 PROJECT DESCRIPTION 1

2.0 SCOPE OF WORK AND SERVICES 1

2.1 STANDARD PENETRATION TEST METHOD 5
2.2 ROCK CORING PROCEDURES 6
2.2.1 ROCK DESCRIPTIONS 6
2.2.2 RECOVERY AND RQD 6
2.2.3 WEATHERING 7

3.0 SITE AND SUBSURFACE INVESTIGATION 8

3.1 REGIONAL GEOLOGY 8
3.2 FULTON COUNTY SOIL SURVEY 9
3.3 SUBSURFACE CONDITIONS – SOIL 9
3.4 SUBSURFACE CONDITIONS – ROCK 10
3.4.1 SEISMIC REFRACTION 10
3.4.2 ROCK CORING RESULTS 11
3.5 GROUND WATER INFORMATION 12
3.6 SEISMIC CRITERIA FOR STRUCTURAL ENGINEER 13

4.0 LABORATORY TESTING 15

4.1 SOIL CLASSIFICATION TESTING 15
4.2 PERCENT PASSING THE NO. 200 SIEVE 15
4.3 ATTERBERG LIMITS 15
4.4 MOISTURE CONTENT 15
4.5 ENVIRONMENTAL CLASSIFICATION (CORROSION TESTS) 16
4.6 BACKPRESSURE PERMEABILITY TESTING 16
4.7 UNCONFINED COMPRESSION TEST IN ROCK 16
4.8 SPILT TENSILE STRENGTH TESTING IN ROCK 16

5.0 EVALUATIONS AND RECCOMENDATIONS 17

5.1 HEADWORKS STRUCTURE 17
5.1.1 GENERAL 17
5.1.2 HEADWORKS STRUCTURE FOUNDATION ALTERNATIVES 18
5.1.3 SHALLOW FOUNDATION 18
5.1.3.a SETTLEMENT 19
5.1.3.b ROCK ANCHORS FOR UPLIFT RESISTANCE 19
5.1.4 SHALLOW FOUNDATION (MAT FOUNDATION SYSTEM WITH UNDERDRAINS OPTION) 22
5.1.5 SITE PREPARATION 22
5.1.6 EXCAVATION CHARACTERISTICS OF ON-SITE SOIL AND ROCK 22
5.1.7 DRAINAGE AND GROUND WATER CONSIDERATIONS 23
5.1.8 SELECTION AND PLACEMENT OF FILL AND STRUCTURAL FILL 25
5.1.9 USE OF PARTIALLY WEATHERED ROCK AND ROCK AS FILL (IF APPLICABLE)
5.2 UTILITY PIPE CONSIDERATIONS AND RECOMMENDATIONS 25
5.3 RETAINING WALLS 26
5.3.1 ROCK ANCHORS 27
5.3.2 EXCAVATION CHARACTERISTICS OF ON-SITE SOIL AND ROCK 27
5.4 EXCAVATION RECOMMENDATIONS 28
5.5 EARTH PRESSURES FOR WALLS, SHEETING AND EXCAVATION SUPPORT 30

APPENDIX A

Sheet 1 - Project Location Plan
Sheet 2 - Boring Location Plan

APPENDIX B

Table 1 - Summary of Boring Information, Ground water Tables and Depth/Elevations to Partially Weathered Rock/Rock
Table 2 – Rock Core Summary
Table 3 – Rock Core Test Summary
Table 4 – Definition of Weathering Indices
Table 5 - Summary of Corrosion Parameter Testing
Summary of Laboratory Results
Atterberg Limit Results
Grain Size Distribution Graph
Grain Size Distribution with Hydrometer Graph
Unconfined Compression and Splitting Tensile Test Curves
Report of Core Borings (Soil Profiles) – Sheets 3 through 5
gINT Logs (Soil Profiles) (17 pages)
Test Procedures

APPENDIX C

Figure 1 – Seismic Refraction Traverse (Line 1)
Figure 2 – Seismic Refraction Compressional (P-Wave) Profile
Figure 3 – Shear Wave Velocity Determination Approximate Locations (Line 2)
Figure 4 – 1-D Shear Wave Velocity Model (Line 2)
Figure 5 – Shear Wave Velocity Determination Approximate Location (Line 3)
Figure 6 – 1-D Shear Wave Velocity Model (Line 3)

APPENDIX D

Core Photographs - Pages 1 through 66
Rock Core Testing Photographs - Pages 1 through 17

1.0 PROJECT INFORMATION

1.1 PROJECT AUTHORIZATION

Authorization to proceed with this project was issued by **Black & Veatch Corporation/Gresham Smith and Partners/Rohadfox** through a subcontract agreement for services dated February 17, 2012. A formal contract has been executed between **Black & Veatch Corporation/Gresham Smith and Partners** and **MC²** for these services. Throughout the report the reference to **BGR** is the joint venture agreement between **Black & Veatch Corporation/Gresham Smith and Partners/Rohadfox.**

Project information has been provided by **BGR** through verbal and e-mail communications including a preliminary site plan, as built plans, site visits and additional discussions pertaining to the scope of work.

1.2 PROJECT DESCRIPTION

The RM Clayton Water Reclamation Center (WRC) receives influent flows from a combined storm-water and sanitary sewer collection system. Sanitary sewer flows are also stored and conveyed to the WRC through a deep rock tunnel system, which is pumped to the WRC influent collection box by the Nancy Creek pumping station located at the WRC. These various sources of influent flow result in wide fluctuations in the WRC influent flow rates, and fluctuations in the solids loading at the Headworks facility.

The purpose of this project is to design and construct improvements at the WRC's Headworks facility. The project includes complete replacement of the existing coarse screening and grit removal systems in the Headworks facility with new equipment and the construction of a new Grit Removal Unit process to effectively treat the raw influent. Additionally, new influent flow monitoring equipment is required to accurately measure and report the influent flows to the Headworks facility.

The Design/Builder (DB) shall develop the site layout and facilities for the coarse screening and grit removal unit operations, unit processes, buildings, to provide a fully functional Headworks facility.

2.0 SCOPE OF WORK AND SERVICES

The purpose of this study is to provide relevant site information with regards to existing soil, rock and ground water conditions to aid the Design-Build (D-B) team in the design and construction of cost-effective solutions for this project. Recommendations in this report are intended to be general in nature and the D-B team must verify and assume full responsibility.

Our geotechnical study began with a visit to the site on January 28, 2015 for the purpose of evaluating the existing conditions and site access. We also reviewed the available subsurface test data for the area including a research of the historic and existing topography at the site location as well as the USDA Fulton County Soil Survey and Geology for the area. Based on this information and conversations with **BGR** the site exploration and testing program consisted of the following services:

- Visited the site for the purpose of locating the proposed borings using GPS equipment and existing site features. The boring locations were staked or painted on the ground in the field. Stakes were replaced at the drilled locations after completion of the drilling. GPS of the borings were obtained after drilling to locate the actual boring positions. Elevations of the boring locations were provided by BGR's sub-consultant to MC Squared, Inc.

- Cleared underground utilities and visually located overhead utilities prior to commencing the drilling operations. Utility services locations were provided by BGR's sub-consultant.

- Performed Standard Penetration Test (SPT) borings and cored the rock as follows:

    1. For the proposed Headworks expansion, we performed a total of six (6) Standard Penetration Test (SPT) borings (B-4 through B-9) to auger refusal at a depth ranging from 15 to 39 feet below existing ground surface or elevation 741.4 to766.7 feet.
    2. Cored the existing rock at five (5) of the SPT boring locations (borings B-4 through B-9) for the proposed Headworks Structure (No coring performed at B-8). Cores were obtained generally from the auger refusal depth to a depth ranging from 50 to 60 feet below existing grade.
    3. Performed three (3) SPT borings (B-1 through B-3) to auger refusal at a depth ranging from 26 to 31 or elevations ranging from 805.1 to 811.0 feet below ground surface at the top of slope for the proposed retaining wall.
    4. Cored the rock at boring locations B-1 through B-3 to a depth ranging from 75 to 76 feet or elevation ranging from 761 to 762 feet below ground surface.
    5. Installed a piezometer at boring location B-9 for future ground water readings.
    6. Pushed two (2) Shelby Tubes to obtain undisturbed samples for the Headworks Structure. The Shelby tube was advanced at boring location B-9 from a depth of 9 to 11 feet below existing grade or elevation 771 To 769 feet. The second tube was pushed at boring location B-6, however, due to rock in the fill the sampling was unsuccessful. We therefore, obtained a bag sample at boring location B-6 near the ground surface from elevation 763.1 to 761.6. Back pressure permeability tests were performed on these samples.

- SPT's were conducted at closely spaced intervals in the top 10 feet and on 5 foot intervals thereafter.

- All borings were performed under the full-time direct supervision of a geotechnical engineer or geologist.

- Ground water tables were recorded in each boring if encountered at the time of drilling, and days later at boring B-6 through B-8. Ground water was measured at boring B-9 at the time of drilling and after piezometer installation.

- All borings were backfilled with drill cuttings upon completion of the fieldwork.

- Classified all soil samples in accordance with the visual-manual soil classification method per ASTM D-2488.

- Performed a Seismic Refraction Survey at the top of the slope near elevation 815 feet to determine the depths of the soil, partially weathered rock and competent rock layers as well as the estimated quality of the rock that may be encountered when cutting the slope to make space for the Headworks Structure. One seismic refraction line was evaluated.

- Performed Seismic Velocity Surveys of two (2) traverse lines to determine the site's Seismic Classification and design criteria. One line was performed on the west side of the Headworks Structure and the second line was performed near the grit removal structure. Seismic Classification was the only data obtained for the grit and removal structure.

- Performed a series of laboratory testing to verify the visual classifications which included sieve analysis with -200 wash, hydrometer and Atterberg Limit tests. Additional laboratory testing was performed on soil samples to include environmental corrosion testing, and backpressure permeability testing.

- Performed laboratory testing of the rock core samples to include unconfined compression strength tests and splitting tensile testing.

- Provided analyses and made preliminary recommendations to include type of foundation system, bearing capacities, total and differential settlements, active and passive earth pressure for tanks and wall structures, dewatering and earthwork recommendations.

The field exploration was performed by qualified staff geologists and overseen by a geotechnical engineer. The evaluations were performed and the report prepared by licensed professional geotechnical engineers in the State of Georgia. All soil samples collected are retained in house for 60 days and subsequently discarded.

The scope of our services did not include an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic materials in the soil, bedrock, ground water, or air, on or below or around the area where the borings were performed.

MC^2 presented the following data and preliminary recommendations in our report:

- General assessment of area geology based on our past experience within the project vicinity, study of available geological literature and boring information.

- General suitability of materials within the site for use as engineered fills and general backfill.

- General location and description of potentially deleterious materials encountered in the borings, which may interfere with the buildings and wall construction or performance, including existing fill, surficial organics and/or rock.

- Discussed critical design and/or construction considerations based on the soil, rock and ground water conditions developed from the borings including excavation support criteria.

- Addressed ground water levels in the borings and design ground water elevation. Provided recommendations for de-watering, as required.

- Provided recommendations for foundation design and construction, including net allowable bearing pressures for typical shallow foundations and estimated settlement.

- Provided recommendations for ultimate rock stress should rock anchors be used to support the retaining wall.

- Horizontal earth pressures (active, and at-rest) in drained and un-drained cases are provided for use in the design of below grade structures.

- Provided recommendations for the design of the retaining walls and slope stability.

- Provided recommendations for backfill materials and geofabric. Evaluated existing soils for use as backfill and provide recommendations for imported fill, if required.

- Provided recommendation for coefficient of friction for sliding.

- Provided recommendation for the frequency for backfill testing and foundation bearing strata inspection during construction.

- Provided seismic design criteria, including peak acceleration (Aa), effective velocity related acceleration (Av) and the soil profile type (S) in accordance with IBC 2012 and 2014 Georgia amendments.

- Provided the subsurface rock profile interpretation at the top of the slope developed from seismic refraction.

The approximate location of the project is included on the **Project Location Plan (Sheet 1)** in **Appendix A**. The locations of the borings performed are included on the **Boring Location Plan (Sheet 2)** in **Appendix A**. In addition, the **Report of Core Borings (soil profiles) (Sheets 3 to 5)** were also prepared using the **gINT** format and are included in **Appendix B**.

2.1 STANDARD PENETRATION TEST METHOD

The SPT borings were conducted in general accordance with ASTM D-1586 (Standard Test Method for Penetration Test and Split Barrel Sampling of Soils) using hollow stem augers to drill through the soil to the test depth. Standard Penetration sampling was performed at closely spaced intervals in the upper 10 feet and at 5-foot intervals thereafter. After seating the sampler 6 inches into the bottom of the borehole, the number of blows required to drive the sampler one foot further with a standard 140 pound hammer is known as the “N” value or penetration resistance. The N-value has been empirically correlated to soil properties. The recovered samples were placed into containers and returned to our office to confirm field classification and further laboratory testing.

From a depth of 9 to 11 feet below ground surface (BGS) within the SPT boring at boring location B-9, a thin walled tube was pushed to obtain an undisturbed sample. This sample was used to perform a backpressure permeability laboratory test. The undisturbed sampling was conducted in accordance with ASTM D-1587 Standard Practice for Thin-Walled Tube Sampling of Soils for Geotechnical Purposes.

In addition, a piezometer was placed in one (1) of the Standard Penetration Test borings at boring B-9 for the purpose of long term ground water readings. The piezometer was installed by advancing screened and unscreened PVC Tubing to a depth of approximately 39 feet below existing ground surface.

Select soil samples were tested in the laboratory to determine material properties for our evaluation. Laboratory testing was accomplished in general accordance with ASTM standards. Laboratory test results are shown in the **Summary of Laboratory Results** in the **Appendix B** and on the soil profiles.

2.2 ROCK CORING PROCEDURES

Rock coring was performed at most all of the boring locations to determine the type of rock, rock descriptions, recovery, RQD, and joint characteristics.

Core borings were performed using an NQ/NX double barrel core system. This core barrel system produces an approximately 3 inch diameter hole and a 2.15 inch diameter core. The double tube system is the standard. The outer barrel rotates with the cutting bit and the inner barrel is either fixed or swivel type that retains the core sample. Coring was performed using clear water as a drilling fluid. Casing was used to temporarily stabilize the borehole and maintain drilling operations during coring of the rock, mostly at the core locations of the Headworks Structure. Rock cores were placed in waxed corrugated cardboard boxes by our geologist. Each core box was labeled with the boring number, run number, depth range, and up hole direction, as well as, recovery, RQD and other notes as required. The rock cores, to the extent possible, were marked with joint locations and joint spaces. Cores for testing were labeled with the boring number, depth and top hole direction.

All cores were logged by **MC Squared, Inc**. geologists at the drilling rig and again at our laboratories. After all the cores were logged, they were checked for consistency and accuracy, and revised accordingly. The cores were photographed and are presented in **Appendix D, Pages 1 through 66.**

Rock cores will be made available to be reviewed and inspected by the Design-Build teams prior to procurement at the discretion of the City of Atlanta Watershed Management

2.2.1 Rock Descriptions

Final rock core descriptions were made by MC Squared, Inc. geologists. Rock descriptions generally consisted of five components: name, color, texture, mineralogy, and other information as appropriate. Color determinations were based on the Rock Color Chart published by Munsell Color. Descriptions of rock texture followed standard Geological terminology.

The rock was classified and named to describe the essential character of the rocks while keeping the number of different names reasonable. The major rock names used on the boring logs are described in section 3.4.2 of this report.

2.2.2 Recovery and RQD

Recovery and RQD are calculated to determine the strength characteristics of the rock. Recovery is determined by measuring the length of the core recovered. Percent recovery is determined by dividing the length of the core by the length of the cored interval. Recovery values less than 100 indicate some portion of the core was not recovered. RQD is based on the total length of core pieces great than 4 inches long. Percent RQD is equal to the total

length of cores greater than 4 inches divided by the total cored run interval. RQD values less than 100% indicate the presence of breaks in the cores spaced closer than 4 inches apart. The following index is used for the Rock Mass Quality for this project.

RQD Classification Index	
RQD	**Rock Mass Quality**
• < 25%	Very Poor
• 25 – 50%	Poor
• 50 – 75%	Fair
• 75 – 90%	Good
• 90 – 100%	Excellent

It should be noted that every attempt is made by the geologist to distinguish between mechanical breaks and natural breaks. Mechanical breaks are not accounted for in the RQD. Natural breaks can be caused by physical or chemical weathering, incipient exfoliation fractures or older fractures. Mechanical breaks can occur along weak micaceous laminations that occur during coring or breaks from rough drilling or extra down pressure during coring. Questionable breaks were counted as natural fractures to be on the conservative side. Results of Recovery and RQD are summarized in **Table 2, Rock Core Summary, Appendix B**.

Joints are defined as any fracture surface in the core that penetrated through the core, that appeared to be naturally occurring and that was not thoroughly healed with a strong mineral content. Joints are described on the Soil Profiles (gINT logs), **Appendix B.**

2.2.3 Weathering

Weathering indices are used to describe the degree to which the rock has been degraded by weathering. The weathering index was measured and stratified as required to describe the rock core. Briefly, the weathering index can range from Fresh to Thoroughly Weathered. Fresh rock has no visible degradation or staining even along tightly spaced joints. Highly Weathered rock is where weathering permeates the entire rock reducing strength to that of a hard residual soil. Thoroughly Weathered rock is completely degraded into a soil with the structure of the rock visible but in this study will be recovered during Standard Penetration Testing. A chart describing the definitions of the weathering indices are in **Table 4** in **Appendix B**.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 REGIONAL GEOLOGY

The site of the proposed RM Clayton Water Reclamation Center Expansion is located in the Piedmont physiographic province of Georgia. Soils in this area have been formed by the in-place weathering of the underlying rock and are generally termed "Residual" soils. Near the ground surface, where the weathering is most advanced, residual soils may consist of Clay, Silty Sand, Clayey Silt or Silty Clay. With increased depth, soils become less weathered and generally transition to coarser-grained sandy silt or silty sand.

Partially weathered rock represents the transition zone between soil and the parent rock from which they are derived. The thickness of the zone of partially weathered rock and the depth to the relatively un-weathered rock surface has both been found to vary greatly over relatively short distances in the Piedmont region. It is not unusual to find layers of highly weathered rock in the upper soil profile.

The following is a summary of the geology of the area, obtained from the Department of Natural Resources, Environmental Protection Division, Georgia Geologic Survey, and United States Geologic Survey. This summary briefly describes the formation types found at or near the proposed site.

The proposed project area is geologically located within the Brevard Fault Zone, which is a distinct linear zone of intense ductile shearing. Interpretations regarding the nature of movement of the Brevard Fault Zone are widely varied, and are too numerous to list in this report. For the purposes of this report, only rocks that have undergone intense ductile shearing are included in the Brevard Fault Zone. Rocks present in the Fault zone are as follows:

- Protomylonite – cohesive medium grained foliated metamorphic rock with a mylonitic texture.

- Mylonite – A compact, chert-like rock without cleavage, but with a streaky or banded structure produced by the extreme granulation and shearing of rocks that have been pulverized and rolled during overthrusting or intense dynamic metamorphism.

- Blastomylonite – A coarse grained cohesive foliated metamorphic rock with, often having a sugary appearance without distinct tectonic banding.

- Button Mica Schist – A schist whose essential constituents are mica and quartz, and whose schistosity is mainly due to the parallel arrangement of mica flakes.

- Phyllonite – A term often used to indicate a mica-rich mylonite.

- Gneiss - A foliated rock formed by regional metamorphism, in which bands or lenticles of granular minerals alternate with bands or lenticles in which minerals having flaky or elongate prismatic habits predominate. Generally less than 50% of the minerals show preferred orientation.

3.2 FULTON COUNTY SOIL SURVEY

The U.S. Department of Agriculture - Soil Conservation Service, now known as the Natural Resources Conservation Service (NRCS), has mapped the shallow soils in this area of Fulton County. This information is available through the NRCS Web Soil Survey. The area of this project is covered with one (1) soil mapping units as described below.

a. Urban land - mapping unit – Ub

Urban land consists of areas that have been altered by cutting, filling, and shaping. Schools, parking lots, streets, commercial buildings, and residential dwellings are located in these areas.

3.3 SUBSURFACE CONDITIONS – SOIL

The boring locations and the depths were determined by **MC^2,** approved by **BGR,** and located in the field by **MC^2** using a combination of GPS and measuring from known locations in the field. Boring depths were adjusted as the project proceeded and as approved by **BGR.** The approximate boring locations and soil profiles are shown on the **Boring Location Plan (Sheet 2)** in **Appendix A** and **Report of Core Borings (Sheets 3 through 5)** in **Appendix B.**

The descriptions discussed below are of a generalized nature to highlight the major subsurface stratification features and material characteristics. The **soil profile gINT logs** included in **Appendix B** should be reviewed for specific information at individual boring locations. The boring profiles include soil description, stratification, penetration resistances, and laboratory test results. The stratifications shown on the boring profiles represent the conditions only at the actual boring locations. Variations may occur and should be expected between and among boring locations.

Three (3) SPT borings (B-1 through B-3) were performed to a depth of 26 to 31 feet (elev. 811.0 to 805.1 feet) near the top of slope to determine the properties of the soil above the rock layer. Below the topsoil the initial soil layer consisted generally of loose to very dense brown to dark brown, orange, gray, white micaceous silty medium to fine sand (SM) to elevation 831, 833 and 818 feet at borings B-1, B-2 and B-3, respectively. Beneath the silty sand at borings B-1 and B-2 were clay soils consisting of firm to stiff brown to dark brown, red micaceous sandy Clay (CL) to elevation 824, feet at B-1, the same soil was encountered to elevation 828.5 feet at B-2 followed by stiff gray, brown micaceous heavy Clay CH at B-2 to elevation 827 feet. The clay soil at B-1 and B-2 and silty sand (SM) soil at B-3 was

underlain by a layer of stiff to hard white, brown, to dark brown, orange micaceous medium to fine sandy silt (ML). The sandy silt (ML) soil ranged from about elevation 813.5 feet to 812.5 feet. Following the silt layer is partially weathered rock to auger refusal at elevation ranging from 812 feet to 807 feet. Parts of these upper soils are fill which may range from about 8-1/2 to 18 feet below existing ground surface.

Borings B-4 through B-9 were drilled to determine the type and characteristics of the soil for the Headworks Structure. These borings extended to auger refusal ranging from about elevation 766.7 to 741.4 feet. The soils at these locations generally consisted of loose to very dense brown to dark brown, orange, gray, white micaceous silty medium to fine sand (SM) and soft to very hard brown to dark brown, orange, white, red micaceous medium to fine sandy silt (ML) to an elevation of about 770 to 757 feet. With exception to boring B-9 where these soils extended to about elevation 742 feet. There are a couple of thin layers of very dense brown, white, orange micaceous clayey medium to fine sand (SC) just a few feet thick.

3.4 SUBSURFACE CONDITIONS – ROCK

In order to make a determination of the quality and type of rock at the proposed construction areas, both Seismic Refraction and coring of the rock was performed. Seismic Refraction was performed at the top of slope to determine the characteristics of the rock for both excavation purposes and retaining wall design. This information was backed up with actual cores of the rock to better describe the type, color, rock quality and joint spacing and description.

3.4.1 SEISMIC REFRACTION

MC Squared, Inc. conducted an analysis, to explore for rock, the approximate mid-height of a slope, which is adjacent to the Headworks Structure. One (1) Seismic Refraction traverse was deployed, designated as Line I, approximate location shown on **Figure 1** in **Appendix C**. The seismic refraction method is based on the measurement of the travel time of seismic waves refracted at the interfaces between subsurface layers of different velocity. Seismic energy is created by a source located at the surface. The energy is detected on the surface using a linear array (or spread) of geophones spaced at regular intervals. Wave velocities increase as they are refracted off harder layers. The field establishes time versus distance graphs, which are used to calculate velocities and corresponding depths of subsurface materials.

One (1) 24- 11.5 Hz geophone spread was deployed, depicted as Line 1, in **Figure 1** in **Appendix C**. A 20 lb. sledge hammer striking a steel plate was used as the source. Several off end shots, and one center shot, were taken along the alignment in the course of this survey; at 50 ft., 25 ft. and 5 ft. off each end in addition to a shot between geophones 12 and 13.

The gathered data was analyzed using the SeisImager software suite, produced by Geometrics, Inc. The output comprises a depth profile of the refractor layers and a velocity model of the subsurface. The profile is attached as **Figure 2** in **Appendix C** of this report.

It is assumed that subsurface material gets denser with depth, therefore, this technique cannot predict hidden layers (or weaker zones) present under rock layers. The following typical range of velocities could be used as a reference to excavate-ability:

- 0-2000 ft./sec Softer material generally consisting of soils & Saprolites which can be excavated using backhoes and scrapers.

- 2000 – 5000 ft./sec Partially weathered and fractured rock which can usually be ripped using large earth moving equipment in mass excavation. Trench excavation may require blasting for removal.

- >5000 ft./sec Competent rock normally requiring blasting in trench or mass excavations

Assuming a generally level traverse elevation profile at 815 ft. MSL, the seismic refraction profile showed a velocity range between 1,300 ft./sec and 2,000 ft./sec for the overburden material approximately 10 to 15 feet (elev. 805 to 800 feet) thick. The overburden is underlain by what appears to be more competent material, ranging in velocity from 2,000 ft./sec to 4,900 ft./sec, which could connote layers of dense PWR and/or fractured rock material. The depth of which layer is approximately 10 feet (elev. 795-700 feet). A velocity exceeding 5,000 ft./sec was encountered at a depth ranging from 20 to 25 feet (elev. 795 to 790 feet) below the ground surface elevation along Line 1.

3.4.2 ROCK CORING RESULTS

Rock coring was performed at all boring locations except boring location B-8 to determine the type of rock, characteristics, recovery, RQD, and joint spacing.

Core borings were performed using an NQ double-tube system. An NQ double tube coring system produces an approximately 3.5 inch diameter hole and a 3.19 inch diameter core. Casing was required in the upper 15 to 23 feet at boring locations B-4 to B-7 due to the fractured nature of the rock at these locations.

All cores were logged by **MC Squared, Inc**. geologists at the drilling rig and again at the office. After all the cores were logged, they were checked for consistency and accuracy, and revised accordingly. The cores were photographed and are presented on **Pages 1 to 66** in **Appendix D.**

Rock descriptions generally consisted of five components: name, color, texture, foliation angle, and other information as appropriate. Two (2) rock types were encountered at this

project site as follows:

Mylonite (Black) – Composed of Biotite, Quartz and Feldspar.

Mylonite (White) – Composed of Muscovite, Biotite, Quartz and Feldspar

RETAINING WALL

Rock was drilled at boring locations B-1 through B-3 from auger refusal at elevation 811 to 805 feet to about elevation 762 to 761 feet. The rock was described as mainly Black Mylonite with some areas of White Mylonite, dark gray to grayish black, white, fine grained, with a 20 to 70 degree foliation. Although recovery percentages were fair, the rock quality can be described as highly varied at boring location B-1 ranging from very poor to excellent but was a little more consistent at borings B-2 and B-3. At these two borings, to about elevation 800 to 795, the rock was classified as good to excellent to the core termination elevation of about 762 feet at B-2 and to about elevation 771 feet at B-3. The last two 5 foot runs at boring location B-3 are described as fair rock quality.

HEADWORKS STRUCTURE

Rock cored at locations B-4 through B-9 was also described as Black Mylonite primarily with some areas of White Mylonite as described above. The quality of the rock in borings B-4 and B-5 can be described as generally good to excellent for the most part with some area of rock described as fair quality. Very poor rock was measured at the top core runs of B-4 from about 770 to about 761 feet. At locations B-6 and B-7, the rock for the most part was described as very poor starting at core run 1, elevations 757 to 760 feet at these two locations and extending to about 730 feet at location B-7. At B-6 beneath the very poor quality rock was rock described mostly as fair with one run of rock measured as excellent. Boring B-9 was cored 12 feet starting at about elevation 741 feet. All of the rock at this location is described as very poor.

Table 2, Rock Core Summary, in **Appendix B** summarizes the core information to include depth and elevation of core run, recovery, RQD, and rock quality description. Detailed descriptions of the rock can be found on the **Report of Core Borings (Boring Profiles** in **Appendix B.**

3.5 GROUND WATER INFORMATION

Ground water was only encountered in boring B-9. Ground water information was recorded at elevation 749.2 feet at the time of drilling for SPT sampling and at elevation 756.7 feet 168 hours (7 days) after drilling had been completed. A piezometer was placed within boring B-9 for future ground water measurements. The 7-day ground water elevation recorded was measured approximately 2 hours after installation of the piezometer.

It should be noted that ground water levels tend to fluctuate during periods of prolonged drought and extended rainfall and may be affected by man-made influences. In addition, a seasonal effect will also occur in which higher ground water levels are normally recorded in rainy seasons.

The ground water levels presented in this report are the levels that were measured at the time of field activities. Fluctuations should be anticipated. We recommend that the contractor determine the actual ground water levels at the time of the construction to determine ground water impact on the construction procedure.

The ground water table depths, measured at each boring location during our field survey, when encountered, are presented on the **gINT Logs**, **Report of Core Borings (Soil Profiles)** and Summarized on **Table 1** in **Appendix B**.

3.6 SEISMIC CRITERIA FOR STRUCTURAL ENGINEER

MC^2 conducted an analysis, utilizing the Multi-Channel Analysis of Surface Waves (MASW) technique, to determine the Seismic Site Classification for the proposed site. Multi-channel analysis of surface waves was performed at two (2) locations, one at the grit removal structure (Line 2) and the second at the Headworks Structure (Line 3). The scope of work for the grit removal structure was removed from the project however, the seismic classification analysis was already performed at this location so the results are provided herein.

The Probabilistic Ground Motion values were retrieved for a central location within the project site, utilizing the USGS Earthquake Hazards Program, using latitude (N 33.82493°) & longitude (W -84.45237°). The following are the Spectral Response Acceleration Parameters for a 2% probability in 50 years:

<u>Grit Removal Facility</u>
Ss: *Short period (0.2 second), Spectral Response* = **0.192**
S1*: 1-second period, Spectral Response* = **0.091**

<u>Headworks Structure</u>
Ss: *Short period (0.2 second), Spectral Response* = **0.193**
S1*: 1-second period, Spectral Response* = **0.091**

The site classification was undertaken in general accordance with the International Building Code 2012 (IBC2012), Table 1613.3.2 and chapter 20 of ASCE 7 by relying on the shear wave velocity for the upper 100 ft. of the subgrade.

A site-specific seismic evaluation was carried out by conducting surface velocity testing and performing a Multi-Channel Analysis of Surface Waves (MASW) in order to determine the Seismic Site Classification for the proposed project. Both active and passive modes were utilized for this study. Two (2) traverse lines were deployed, as shown on attached **Figures 3 and 5** in **Appendix C**. MASW utilizes seismic energy of Rayleigh type surface

waves to calculate the shear wave velocity. For this method, the geophones (receivers) remain stationary and data is collected with the source located off the end of the line of geophones. Data for the active mode of survey is collected at multiple locations (i.e., offsets) in order to obtain the optimal survey settings that would yield the most coherent data set. This data is then processed and inverted to calculate a 1-D shear wave velocity profile. A weighted average of the 1-D shear wave velocity profile can then be used to get an average shear wave velocity down to the maximum depth of the 1-D shear wave velocity profile.

The sites were visited on February 26, 2015 in which a proprietary pressure-coupled land streamer was deployed with Geophones spaced 5 ft. apart and the source position was located 25, 30, 35, 40, 45, and 50 ft. off the northern end of the transect. The source consisted of a 20 pound hammer striking a steel plate. The surface along which the land streamer was deployed was a soil subgrade. The data was collected using a 24-channel Geode seismograph, manufactured by Geometrics, Inc., with 4.5 Hz geophones.

The data was processed using the KGS SurfSeis 3 software package, developed by Kansas Geologic Survey. This software is used to process and invert the surface wave data, and produces a 1-D shear wave velocity model, presented **in Figures 4 and 6** in **Appendix C** of this report.

The analysis yielded an average shear wave velocity (for the upper 100 ft.) Vs100 at 1,292 ft./sec. This value corresponded to a Seismic Site Class ‘C’. A Site Class C correlates to the following site coefficients adjusted for site class, based on Tables 1613.3.3(1) and 1613.3.3(2) of IBC 2012:

<u>Grit Removal Facility and Headworks Structure</u>
Fa = 1.2
Fv = 1.7

The maximum considered earthquake spectral response accelerations for short periods and at 1-second periods follow:

<u>Grit Removal Facility and Headworks Structure</u>
SMS = 0.231 Equation (16-37, IBC2012)
SM1 = 0.155 Equation (16-38, IBC2012)

This translates to the following Design Spectral Response Acceleration Parameters:

<u>Grit Removal Facility and Headworks Structure</u>
SDS = 0.154 Equation (16-39, IBC2012)
SD1 = 0.103 Equation (16-40, IBC2012)

4.0 LABORATORY TESTING

4.1 Soil and Rock Classification Testing

Representative soil samples collected from the SPT borings were visually reviewed in the laboratory by a geotechnical engineer to confirm the field classifications. The samples were classified and stratified in general accordance with the Unified Soil Classification System (USCS). Classification was based on visual observations with the results of the laboratory testing used to confirm the visual classification. Laboratory classification tests consisting of percent passing the No. 200 sieve, grain size analysis with hydrometer, Atterberg Limits, moisture content determinations, back pressure permeability and corrosion parameters were performed on select soil samples believed to be representative of the materials encountered. Rock testing consisted of unconfined compression testing and split tensile strength. A summary of the laboratory test results are provided in our **Summary of Laboratory Results** in **Appendix B.**

4.2 Percent Passing the No. 200 Sieve

The wash gradation test measures the percentage of a dry soil sample passing the No. 200 sieve. By definition in the USCS, the percentage by weight passing the No. 200 sieve is the silt and clay content. The amount of silt and clay in a soil influences its properties, including permeability, workability and suitability as fill. This test was performed in general accordance with ASTM D-1140 (Standard Test Methods for Amount of Material Finer than the No. 200 (75 μm) Sieve).

4.3 Atterberg Limits

The Atterberg liquid and plastic limit tests are performed on silty/clayey soils and measure the moisture contents at which a soil behaves as a viscous fluid and becomes plastic, respectively. The difference between the two limits is defined as the plasticity index. These moisture contents have been correlated to soil properties, such as suitability for fill and shrink-swell tendency. ASTM D 4318 (Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils) was used as a guideline for this testing.

4.4 Moisture Content

The laboratory moisture content test consists of the determination of the percentage of moisture contents in selected samples in general accordance with ASTM test designation D-2216. Briefly, natural moisture content is determined by weighing a sample of the selected material and then drying it in a warm oven. Care is taken to use a gentle heat so as not to destroy any organics. The sample is removed from the oven and reweighed. The difference of the two weights is the amount of moisture removed from the sample. The weight of the moisture divided by the weight of the dry soil sample is the percentage by weight of the moisture in the sample.

4.5 ENVIRONMENTAL CLASSIFICATION (CORROSION TESTS)

Environmental corrosion tests were conducted on soil samples obtained from borings B-2, B-5 and B-9 at a depth of approximately 6 to 7.5 feet (elev.831 to 829.5 feet) below ground surface at boring location B-2 and 10 to 12 feet (elev. 772 to 770 feet) below existing ground surface at boring locations B-5 and B-9. Environmental corrosion tests measuring parameters such as pH, resistivity, sulfate content, chloride content and redox potentials were performed using ASTM standards. Test results obtained are summarized in **Table 5** in **Appendix B.**

4.6 BACKPRESSURE PERMEABILITY TESTING

Test method ASTM D-5084 is a Standard Test Method for Measurement of Hydraulic Conductivity. The test measures the hydraulic conductivity of saturated porous materials using a flexible wall permeameter. Tests are performed on undisturbed samples obtained from the field using thin walled tubes which are then extracted before testing or on compacted specimens remolded to a specific density and moisture content. The sample is placed in a membrane and cell and then filled with water and the specimen is saturated by applying pressures to both ends of the sample to force water into the sample. Once the sample is saturated measurements of volume of water vs. time are taken until a steady-state condition and the hydraulic conductivity is calculated.

4.7 UNCONFINED COMPRESSION TEST IN ROCK

The test is performed on intact rock cores with a specimen height-to-diameter ratio between 2.0 and 2.5. The specimen is placed in the testing machine and loaded axially at an approximate constant rate such that failure occurs within 2 to 15 minutes. The test was performed in accordance with ASTM 2938. Nine (9) rock samples were tested from both the slope and the Headworks Expansion area. The testing yielded results ranging from 6765 to 16297 psi. Details of the results can be found in **Table 3, Rock Core Test Results,** in **Appendix B**. Curves depicting the stress (psi) vs strain (%) relationship are shown in **Appendix B**.

4.8 SPLIT TENSILE STRENGTH TESTING IN ROCK

The test is an indirect tensile strength test, similar to the point load test; however, the compressive loads are line loads applied parallel to the core's axis by steel bearing plates. The specimen is placed horizontally between the steel bearing plates. Loading is applied continuously such that failure occurs within one to 10 minutes. The test was performed in accordance with ASTM D 3967 and the required thickness-diameter-ratio (t/d) is between 0.2 and 0.75. A thickness-to-diameter (t/d) ratio of about 0.5 was used during testing. Eight (8) rock core samples were tested from both the slope borings and the Headworks Expansion borings. The testing yielded results ranging from 1085 to 2917 psi and can be found in **Table 3, Rock Core Test Results** in **Appendix B**. Curves depicting the stress (psi) vs strain (%) relationship are shown in **Appendix B**.

5.0 EVALUATION AND RECOMMENDATIONS

5.1 HEADWORKS STRUCTURE

5.1.1 GENERAL

Based on our evaluation of the existing and proposed construction and **MC²** discussions with **BGR** we have evaluated several foundation types for the proposed expansion of the Headworks Structure. In our evaluation we considered peak flooding events, therefore it will be necessary for the Design-Build team to include uplift resistance due to buoyancy in their evaluation. Geotechnical design parameters to include options for a shallow mat foundation system with rock anchors or with an extensive underdrain system is presented. Deep foundations were not considered due to the planned floor elevation and depth of rock encountered.

- Approximate Existing Ground Elevation (At our boring locations within the foot print of the Headworks Expansion area) = 781 feet.

- Approximate Proposed Concrete Floor Elevation = 744.0 feet. Bottom of Concrete Floor Elevation = 742.0 feet.

- Approximate Proposed Bottom of Aggregate Base = 739.0 feet.

We understand the project surveyor has provided the 100 year flood elevation as 773.4 feet near the confluence of Peach Tree Creek and the Chattahoochee River. We recommend the flood water elevation at the site be used for design of uplift resistance.

In general, the borings consisted of mostly sandy silts (ML) and silty sands (SM) with some clayey sand (SC) from the ground surface to auger refusal depths. Some of these soils contain gravel and roots and most likely is fill from previous construction operations. The material ranged from loose to very dense and soft to firm. Partially weathered rock was found under the soil layer at varying depths ranging from an approximate elevation of 770 to 755 feet. The rock cored at these locations indicated rock of quality very poor to excellent with most of the very poor quality rock found at boring locations B-7 and B-9. The rock is classified as mostly Black Mylonite with some areas of White Mylonite. The compressive strength of this rock ranged from 6,765 to 12,520 psi and the splitting tensile strength ranged from 1,495 to 2,917 psi. We believe that some of the rock that has a quality of poor to very poor may be due to the existing fault or may have become jointed during previous blasting operations to construct the current Headworks Facility.

The proposed expansion of the Headworks Structure is a design/build project, however we anticipate that it will be to the south and west of the existing facility. The area of expansion is limited for space. A steep slope to the south of the Headworks Structure which starts

approximately 20 feet away from the existing structure and ranges in elevation from approximately 781 to 850 feet will require removal of a portion of the slope to make space for the expansion. Because of the slope's elevation change and the existing structures both north and south of the slope, a relatively tall retaining wall will be required. Using information obtained from a seismic refraction study and our borings, we have evaluated options for the proposed retaining wall to include a shallow foundation with the retaining wall anchored into the rock. Evaluations and general recommendations for the retaining wall and rock anchor system can be found in section 5.1 and 5.3.1 of this report, respectively.

5.1.2 HEADWORKS STRUCTURE FOUNDATION ALTERNATIVES

A shallow mat foundation system with a rock anchor system is shown on the as-built plans for the existing structure. This is the recommended and preferred method to support the Headworks structure expansion.

The use of shallow foundations is typically the most cost effective. With shallow foundation system, the structure loads are transmitted to the subsurface soil/rock at a pressure suited for the properties of the foundation material. These properties are typically governed by the allowable bearing pressures and the total and differential settlement criteria. This alternative was selected, and recommendations are presented in this report. The use of this foundation type is contingent upon proper consideration of anticipated uplift pressures caused by the flood level.

5.1.3 SHALLOW FOUNDATION (MAT FOUNDATION SYSTEM AND NO. 57 STONE OPTION)

Based on the information provided by **BGR** stated in Section 5.1 above, a rigid mat foundation system can be used to support the Headworks Expansion Structure provided that the existing rock can be removed by blasting or hydraulic hammers and the uplift pressure caused by the flood water is accounted for during design.

The net bearing pressure from the structure at the bottom of the mat foundation is considered to be negligible as the weight of excavated materials will likely exceed the added weight of the structure The weathered nature of the rock at elevation 742 feet in borings B-7 and B-9 may result in the bottom of the excavations being very irregular. We recommend using a layer (minimum 12 inches thick) of crushed stone to account for the uneven excavated rock surface or pouring a concrete mud mat at least 12 inches thick to provide a level working surface

The design modulus for a mat foundation takes into account a reduction for the size of the mat. The design modulus if stone is used should not exceed 75 pci. The stone should be compacted and inspected by visual observation. A filter fabric (Mirafi 160N or equivalent) interface type should be used if soil is encountered at the bottom of the excavation between the soil and GDOT No. 57 stone in order to minimize migration of fine soil particles into the openings between the stones.

5.1.3.a SETTLEMENT

Based upon our analysis, the total and differential settlements are negligible, provided the site preparation and recommendations previously stated are utilized (including uniform subgrade materials with rock removal).

A Geotechnical Engineer or his representative should verify the condition of the foundation materials after excavation and prior to the placement of stone. It is important to note that the excavation is assumed to be founded on exposed rock. If conditions exist that are not as assumed, re-evaluation and additional recommendations may be necessary.

Based on our assumptions of the proposed construction, rock present at the bearing elevation is suitable for support of the proposed construction. Once design has been completed and design loads are known, our assumptions can be re-evaluated and confirmed.

5.1.3.b ROCK ANCHORS FOR UPLIFT RESISTANCE

Rock anchors are used in a variety of engineering situations. For this project rock anchors may be used to counteract the effects of hydrostatic uplift loads due to the estimated flood elevation. Rock anchors should be installed per manufacturer's instruction based on the information provided herein for the rock characteristics at the site of the proposed construction.

The rock encountered at the site of the proposed Headworks Expansion is described as Black or White Mylonite ranging mostly from fair to excellent at boring locations B-4 through B-6 but is considered to be very poor at boring locations B-7 through B-9 including a seam of sand found at an elevation of 735 to 730 feet at boring location B-7. Due to the very poor quality of the weathered rock pressure grouted type anchors should be considered for this project. This rock, even though rated very poor at some locations, is suitable to develop uplift resistance particularly where grouted type rock anchors are used. Individual uplift capacities are highly dependent on the Contractor's construction methods, particularly when anchors are constructed below the ground water level as will be required for this project. Rock anchor drilling will be required for this project.

Elastic elongation under load or the grout/rock interface may control design rather than strength of the rock. If elongations are excessive the steel cross sectional area or pre-stressing can decrease the elongation.

The Rock Anchor Contractor should also be made aware of past blasting that has occurred at this site and that discontinuities or joints in the rock could have been caused by previous construction. Failure of rock anchors can occur with

discontinuities.

A specialized and experienced contractor should be used to design the rock bolt anchor system to include the type of anchor, length required for design capacity, spacing, size and bond material.

Ultimate Bond Stress Recommendations

Samples of intact Mylonite from various depths and boring locations were selected and tested to determine the unconfined compressive strength and the tensile splitting strength of the specimen tested. The Mylonite rock materials had unconfined compressive strengths ranging from 6,765 to 12,520 psi and tensile splitting strengths of 1,495 to 2,917 psi. Individual rock test results can be found in **Table 3, Rock Test Summary** in **Appendix B**.

Based on the above information and quality of rock (RQD) determined from coring, we recommend an allowable rock anchor bond stress of 300 psi in rock encountered below the foundation level at borings B-4 through B-6 and 150 psi in rock at boring locations B-7 through B-9. Where rock was not explored, we recommend an allowable rock anchor bond stress of 150 psi.

Rock Anchor Uplift Recommendations

Individual anchor capacities are very sensitive to construction techniques, discontinuities and possible failure of ground mass ahead of the rock anchor, or failure due to group action. When anchored into the rock, rock anchor allowable capacity may be determined by the circumference of the drilled hole in rock times the length of the rock anchor bond times the allowable rock anchor bond stress. We recommend a minimum rock anchor bonded length of 10 feet. Further, we recommend a minimum unbounded length of rock anchor should be 15 feet for strand tendons and 10 feet for bar tendons

Rock Anchor Electrochemical Recommendations

Protecting the metallic components of the anchor tendon against detrimental effects caused by corrosion is necessary for the long term durability of the anchor system. Barriers to protect against corrosion can include anchorage covers, corrosion inhibiting compounds, sheaths, epoxy coatings, etc. The selection of the barrier depends on the design life of the structure, the aggressivity of the ground environment, and the consequences if failure occurs of the anchored system. Corrosion testing consisting of pH, Sulfate, Chlorides, Resistivity, and Redox Potential were performed on samples obtain for the proposed construction. Results are given in **Table 5 Summary of Corrosion Parameter Testing,** in **Appendix B.** These results along with the considerations mentioned above should be used by the Contractor in determining the type and amount of corrosion

coverage required.

Rock Anchor Field Testing

Individual anchor capacity is very sensitive to construction techniques. The embedded anchor is to be field tested for the pull out capacity designed for this project. The objective of the test is to measure anchor performance and not the performance of the rock bolt itself. Ideally the rock bolt anchor should fail by shear at the anchor-rock interface or bond. Therefore, the local characteristics of the rock, such as roughness and induced fractures, are significant factors in the anchor strength. To obtain realistic strength values the test holes should be drilled using the same methods as the construction rock bolt holes.

In establishing a testing program, the following factors should be considered:

- Anchor pull tests should be conducted in all rock types in which construction bolts will be installed. The tests should be conducted in the orientations at which the construction bolt will be installed.

- In each rock type, at each orientation, and for each anchor system, a sufficient number of tests should be conducted to determine the average bolt capacities within a fixed uncertainty at the 95 % confidence level. The allowable uncertainty band depends on the project and involves such factors as the rock quality, expected project lifetime, and importance of the areas to be bolted. Its determination will require considerable engineering judgment.

- It should be noted that the quality of the result produced by this standard is dependent on the competence of the personnel performing it, and the suitability of the equipment and facilities used. It is recommended that the testing be inspected by agencies that meet the criteria of ASTM D3740 (Standard Practice for Agencies Engaged in Testing and/or Inspection of Soil and Rock used in Engineering Design and Construction) The agency engaged for the inspection should demonstrate experience with similar rock anchoring projects.

Both Performance tests and Production testing (Rock Bolt Anchor Pull Test) should be performed for this project. The Rock Bolt Anchor Pull Test should be performed in accordance with Standard Test Method for Rock Bolt Anchor Pull Test (ASTM D4435).

Performance tests should be performed at a minimum of 2% of the total number of rock anchors required for the given structure. The Performance test should be performed to a maximum of 133% of the design load or a maximum of 80% of the steel strength. Production rock anchor testing should be performed for each rock anchor bolt at 100% of the design load.

5.1.4 SHALLOW FOUNDATION (MAT FOUNDATION SYSTEM WITH UNDERDRAINS OPTION)

A mat foundation system with underdrains is also an option for this project. Ground water was only encountered in one boring, boring location B-9, and was measured at an elevation of 756.7 feet. We understand the design flood elevation is at 773.4 feet for this project. Based on this information, if this option is chosen, it will be necessary to design a comprehensive underdrain system that will reduce the net hydrostatic uplift pressure on the structure for the flood event.

Water collected from the underdrain system will need to be pumped and "daylighted" to the river or other out source.

5.1.5 SITE PREPARATION

The proposed Headworks Expansion will be located south and west of the existing structure and will extend to the south into what is currently a gravel drive followed by a sloped hillside. The sloped hillside will require excavation and/or blasting to meet the required elevations of the proposed construction and adjacent site work. Slope excavation evaluation and recommendations are included in Section 5.3.2 of the report. For other construction areas, not included in the slope excavation typical stripping and grubbing prior to construction will be required.

<u>Stripping and Grubbing:</u> Demolition, site grubbing and stripping should be performed during dry weather conditions to reduce the potential for rutting and mixing of surficial debris with otherwise suitable underlying soils.

The initial step in routine site preparation should be the complete removal of the gravel drive, and other deleterious materials from both beneath and extending to a minimum of 10 feet beyond proposed structures. Based on the results of the initial borings, the typical stripping thickness is expected to be about 6 inches at this site. However, the stripping depth will vary from place-to-place.

5.1.6 EXCAVATION CHARACTERISTICS OF ON-SITE SOIL AND ROCK

Based on our field exploration, most of the soils encountered on site should generally be easily excavated using conventional excavation equipment, such as scrapers, front-end loaders, bulldozers, etc. However, materials above the required excavation depths having SPT resistances greater than 50 blows per foot may require pre-loosening (ripping) with heavy equipment. Soils or partially weathered rock where SPT blow counts were greater than 50, are at an elevation of about 755 to 767 feet near the expansion structure. Ripping should generally be performed using a Caterpillar D-8 or equivalent large bulldozer equipped with a single-tooth ripper blade.

Rock described as Mylonite (Black and White) which consists of muscovite, biotite, quartz and feldspar, partially weathered to fresh, was encountered at all boring locations where

the rock was cored starting at elevations of about 743 to 767 feet at boring locations B-4 to B-9 performed for the Headworks Expansion, Structure.

Based on RQD values, most of the rock for borings B-4 through B-6 was rated fair to excellent but at boring locations B-7 through B-9 the rock was rated very poor quality. At the top of the slope the rock varies from very poor to excellent but most of the rock rated very poor quality was near the surface. Most of the rock encountered in the slope and on the south side of the existing Headworks Facility will likely require blasting or hydraulic fracturing to reach the bottom of the foundation excavation required. On the west side of the existing Headworks Structure where borings B-7 through B-9 were performed and where we expect that past construction fractured the rock, additional hydraulic fracturing and ripping may be enough to complete the excavation. For estimation purposes some form of blasting should be considered in this area and for rock below auger refusal depths.

Unconfined compression strength and splitting tensile strength tests performed on rock samples selected from borings B-4 through B-9, indicated strengths on the order of 6,765 to 12,520 psi and 1,495 to 2,917 psi, respectively. Rock Test Summary **(Table 3, Appendix B)** should be referred to for exact strength results and locations of the test.

When blasting near proposed finished grades or within foundation excavations, the contractor should exercise caution to avoid damaging the underlying material. Any material that is damaged during blasting should be removed prior to commencing construction.

The contractor should take appropriate precautionary measures prior to commencing blasting to ensure that the nearby facilities, structures, and utility lines are not adversely impacted. We recommend that a pre-blast survey be performed to record the condition of the existing structures and existing utilities prior to blasting and blast monitoring devices be installed at critical locations to monitor vibrations. The blasting and all associated tasks including precautionary measures, related to blasting, should be the sole responsibility of the contractor.

5.1.7 DRAINAGE AND GROUND WATER CONSIDERATIONS

We recommend that the contractor determine the ground water levels at the time of construction at the structure to further determine ground water impact on the construction procedures.

Surface water and ground water control will be necessary during construction to keep the excavation walls stable, to keep water out of the deep excavation and to stabilize the foundation if a seam of soil is encountered. Dewatering consisting of well points (within the soil horizon) has been successful in the past. An option to well points is the use of educator wells as a possible method of ground water control during construction. Dewatering must be conducted with care to avoid settlement of nearby structures, roads or utilities, and in such a manner that the areas possibly affected are as small as possible.

A backpressure permeability test was performed on two (2) samples obtained at this site. One (1) undisturbed sample was obtained from boring location B-9 at an elevation of approximately 771 To 769 feet. A second sample, collected from boring location B-6 at an elevation of approximately 763.1 to 761.6 feet, was remolded to mimic the relative dry density of the existing subsurface soil in the area collected. Results of the backpressure permeability tests revealed permeability rates on the order of 9.57E-08 to 2.51E-09 ft. /sec, respectively. It should be noted that gravel is found in many locations in the upper soils so the results of these tests performed on samples without gravel may vary from the actual field conditions and this variability should be taken into consideration when designing a dewatering system. We would expect that the permeability of the in situ soils would be at a faster rate.

Ground water is a significant concern dependent on final grades and the time of year construction is performed. For limited excavations below the ground water table that may be performed to install piping for instance, pumping from sumps below the bottom of the excavations may be possible to control ground water seepage. However, dewatering methods should not cause instability of the trench bottom. Deeper and larger excavations, such as the ones required for the structure, will require more sophisticated dewatering measures. The depth of the ground water level which was encountered only at boring location B-9 during our exploration was at an elevation of approximately 757 feet (about 24 feet below ground surface). Effective dewatering can performed within the soil horizon only. Dewatering should be designed to a depth of 5 feet below the bottom of any structure foundation or at least 2 feet below the lowest expected excavation if soil is encountered. The design and maintenance of the dewatering system will be the responsibility of the contractor.

Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, ground water or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of excavation. Surface drainage should be collected and discharged such that water is not permitted to infiltrate the immediate area where construction is being performed.

Site specific information, such as permeability, confining layers, rain events (re-charge), etc. to estimate the drawdown effect (distance from bottom of the excavation to where it levels off is not available) is not part of our scope. The extent of drawdown must be calculated by the contractor prior to dewatering and monitoring the structures, if needed.

Care should be taken during the design and implementation of the dewatering system as not to cause settlement to nearby structures and underground utilities.

5.1.8 SELECTION AND PLACEMENT OF FILL AND STRUCTURAL FILL (SUITABILITY OF EXISTING SOILS)

The residual and fill soils encountered in our borings generally appear suitable for use as structural fill, provided it is free of organic materials (roots which may be encountered), excessive amounts of clays, large rock fragments greater than 3", and any other deleterious material. Some of the micaceous to highly micaceous silts may require very tight moisture control to achieve proper compaction. Residual soils excavated just above and below the ground water table will require drying prior to reuse as structural fill.

Structural Fill Criteria

Based on visual classifications and limited laboratory testing, most of the soils at the site classified as SM, ML and SC will be acceptable for reuse as structural fill. Soils not meeting these requirements (CL, CH) will need to be used in non-structural areas or be removed from the site. If off-site sources of fill are needed, then we recommend that these soils be sampled, tested, and approved by the geotechnical engineer prior to being transported to the site. Imported soils should have a standard Proctor maximum dry density greater than 95 pcf, have an Atterberg liquid limit of less than 50, a plasticity index less than 30, and a maximum particle size of 3 inches or less (particle size exclusive of "rock fill"). The above criteria for on-site soils should be considered if off-site sources do not meet the more "typical" criteria.

We recommend that a qualified Geotechnical Engineer, or his representative, be present during construction operations to help assess the usability of excavated materials. The Geotechnical Engineer (or representative) should collect representative samples of soils for laboratory testing, as appropriate. All materials to be used for structural fill or backfill should be evaluated and, if necessary, tested prior to placement to determine suitability for their intended use.

All other structural fill should be compacted to at least 98 percent of the soil's standard Proctor maximum dry density within +/-3% of the optimum moisture content (ASTM D-698).

5.2 UTILITY PIPE CONSIDERATIONS AND RECOMMENDATIONS

The location, size and depth of any proposed utility pipes to be installed are unknown. In general, the borings performed indicated soft to very hard silts (ML) and loose to very dense silty sands (SM) followed by partially weathered rock and rock.

Settlement due to the presence of the pipeline should be minimal unless the subsoil is excessively disturbed during the installation, or the phreatic surface is lowered for a substantial period of time, or if new loads are placed above or near the pipe. Hydrostatic uplift pressure from the ground water will need to be considered for the design flood level. Rock anchors for any piping may also need to be considered to counteract buoyancy effects

due to the flood design level.

Surface water and ground water control will be necessary during construction as stated in section 5.1.7 of this report.

A density of at least 98% of the standard Proctor maximum dry density (ASTM D-698, +/- 2% of the optimum moisture content) is recommended for all fill materials and natural subgrade under the pipeline. The subgrade soils should be firm and stable prior to placement of the pipe. Once the pipe is placed, it is recommended that backfill around the sides of the pipe be placed and compacted in equal lifts with a vibratory tamper in lifts not to exceed 6-inches (loose) to avoid laterally displacing the pipeline. Failure to compact the backfill will result in future settlement of the ground surface.

Pipe backfill should be free of clay, rubble, organics and debris and placed in 6 to 8 inch compacted lifts. Some contractors like to place a gravel working bed in wet areas. Fine gravel, such as No. 57, and No. 67 stone may be used in limited areas. A continuous gravel bed should not be placed for the full pipe length to prevent a flow conduit under the pipeline. The gravel, where used, should be compacted and the compaction confirmed by visual observation.

The non-organic micaceous silty sands (SM) and sandy silts (ML) encountered on this project are suitable for backfill soils above the pipe but not for use as pipe embedment provided that moisture content is controlled.

It should be mentioned that water seepage through construction joints in the completed pipeline may have a tendency to erode soil from around the pipeline. All such openings should be backed by a geotextile. An ultraviolet resistant high strength geotextile is recommended to prevent damage during construction.

5.3 RETAINING WALLS

One of the challenges of the site is the limited available area for expansion of the Headworks Structure which will likely be constructed to the south and west of the existing facility. Along the proposed expansion on the south side, a significant steep hill with very large exposed boulders is visible. The challenges of this site consist of limited available area for expansion which will require a very tall retaining wall, significant underground utilities, and the very steep hill with exposed rock requiring rock removal either by drilling and peeling, blasting, or a combination of the two. The elevation top of hill is approximately 850 feet and proposed elevation for concrete floor and bottom of aggregate base is 744.0 and 739.0 feet, respectively.

Retaining wall design information is not available at the time of this report. It is likely that the top elevation of the wall is at 810+/- feet and the bottom of the wall will be at elevation 745+/- feet. Once preliminary design information is known, we can evaluate the conditions of the founding soils and provide recommendations as to bearing capacity along with

estimated settlements.

In general, the bottom of the wall will likely be founded on competent rock; therefore the potential of settlement is negligible considering the bearing capacity of the rock is very high.

The Design-Build team should consider several factors affecting the successful design and construction of the retaining wall. These factors should include the potential buildup of hydrostatic pressure behind the wall and the need for drainage system due to rain run off atop of the wall, seepage of ground water through the soil and slope stability of the over-burden. Additionally, erosion of soil into the space between the excavated rock face and the wall should be considered and mitigated.

5.3.1 ROCK ANCHORS

Rock anchors are used in a variety of engineering situations. For the retaining wall rock anchors may be used to stabilize the retaining wall and resist active pressures and over turning. Rock anchors should be installed per manufacturer's instruction based on the information provided herein on the rock characteristics at the site of the proposed construction. Please refer to section 5.1.3.b of this report for design and testing of a rock anchor system. For the retaining wall, the rock anchor system will not be designed for uplift capacity but will be designed for stabilization of the wall and slope. At this time, there is no design information for the proposed retaining wall. The Rock Anchor Contractor will be required to design a system once this information is known.

5.3.2 EXCAVATION CHARACTERISTICS OF ON-SITE SOIL AND ROCK

Based on our field exploration, most of the existing in-place soils should generally be easily excavated using conventional excavation equipment, such as scrapers, front-end loaders, bulldozers, etc. However, materials having SPT resistances greater than 50 blows per foot may require pre-loosening (ripping) with heavy equipment. SPT blow counts greater than 50 were found generally at about elevation 814. The rock encountered at the borings at the top of slope is described as Mylonite (Black and White) which consists of muscovite, biotite, quartz and feldspar, partially weathered to fresh. Rock quality ranges from very poor to excellent. Very poor quality rock was found mostly at the surface of the rock layer at boring location B-2 and was about 15 feet thick and in the last run from elevation 767 to 762 feet at boring location B-1. Aside from these areas most of the rock was found to be in fair to excellent condition.

The contractor should also refer to the seismic refraction survey performed at the top of slope for additional information pertaining to the soil and rock encountered. The Seismic Refraction was performed at line 1 shown on **Figure 1 in Appendix B**. The seismic refraction survey gives the P-Wave Velocity (ft./sec) of the material composition which correlates to an interpretation of the material present and its excavate ability. For this traverse 0-2000 ft./sec correlates to softer material generally consisting of soils and

saprolites which can be excavated using backhoes and scrapers. 0-2000 ft./sec material exists to an elevation of approximately 800 to 805 feet. Partially weathered rock defined as 2000-5000 ft./sec can generally be ripped using large earth moving equipment in mass excavation and may require blasting in trench excavation. According to the Seismic Refraction study this material extends to about 790 feet. The Seismic Refraction Compressional (P-Wave) Profile is shown in **Figure 2,** in **Appendix B**.

Unconfined compression strength and splitting tensile strength tests indicated strengths on the order of 7,361 to 16,297 psi and 1,085 to 1,974 psi, respectively. Rock Test Summary (**Table 3, Appendix B**) should be referred to for exact strength results and locations of the test.

5.4 EXCAVATION RECOMMENDATIONS

Soils overlying the partially weathered rock or rock consisting of sandy silts (ML) and silty sands (SM) should be sloped at a minimum of 2.0(H) to 1(V) provided that ground water is controlled. Stable vertical rock excavation with a slope of 1(H) to 1(V) should be possible at boring locations B-4 through B-5 below an elevation of approximately 765 feet. At boring location B-6 through B-9, this elevation may be at about 755 feet. Developing a stable vertical rock excavation is subject to the techniques and skills of the blasting contractor.

In Federal Register Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P." This document was issued to better insure the safety of workmen entering trenches or excavations. It is mandated by this federal regulation that all excavations, whether they be utility trenches, basement excavations, or footing excavations, be constructed in accordance with the revised OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in these local, state, and federal safety regulations.

We are providing this information solely as a service to our client. **MC^2** is not assuming responsibility for construction site safety or the contractor’s activities; such responsibility is not being implied and should not be inferred.

5.5 EARTH PRESSURES FOR WALLS, SHEETING, SHORING AND EXCAVATION SUPPORT

Based on the existing soil and rock conditions encountered at the site and the fact that there is limited space for construction of the proposed expansion we recommend that temporary de-watered slopes should be no steeper than 1.0(H) to 1.0(V) for partially weathered rock and rock zones and 2.0(H) to 1.0(V) for soil zones. Where there is a retaining wall structure, any permanent slopes consisting of the upper soils, partially weathered rock or competent intact rock can remain at 1.0(H) to 1.0(V). Soil zones not supported by a retaining wall should be sloped at 2.0(H) to 1.0(V). The foundation of any structure should be set back at least 10 feet from the edge of any slopes.

Static Earth Pressure

Below grade walls, such as the structure walls, sheeting, shoring or any excavation support must be designed to resist lateral earth pressures. The "at rest" earth pressure state should be used for soils supporting rigidly restrained walls. The onsite soils are generally suitable materials for use as wall backfill provided they are free from deleterious material and gravel greater than 3 inches in diameter. The table below presents recommended values of earth pressure coefficients for Piedmont fill soils, assuming an approximate angle of internal friction of 28 degrees. Equivalent fluid densities are frequently used for the calculation of lateral earth pressures. Equivalent fluid densities for the "at-rest" and active conditions are based upon a total unit weight of 120 pcf and a fluid unit weight of 62.4 pcf. Static earth pressure parameters are shown in the table below.

Static Earth Pressure Parameters				
Earth Pressure State	**Earth Pressure Coefficient**	**Equivalent Fluid Pressure (pcf)**		
		Above Water Table	Below Water Table (No Hydrostatic Pressure)	Below Water Table (with Hydrostatic Pressure)
At-Rest (soil backfill)	0.5	60	30	90
Active	0.33	40	20	80
Passive	3.0	360	175	235

The design values and recommendations presented above assume that the backfill behind the wall will be horizontal with no surcharge loads. Equivalent fluid densities for *no hydrostatic pressure and including hydrostatic pressure are given above. Walls below the ground water level should include hydrostatic pressures.*

Large roller and other heavy construction equipment should not be permitted to compact

backfill immediately behind any retaining wall. All wall backfill should be compacted to at least 98% of the soil's standard Proctor maximum dry density. Compaction behind retaining walls will require the use of light compaction equipment such as hand-operated “wacker-packer” or remote control operated mini-rollers. All exterior retaining walls that are exposed to surface water infiltration should be protected using a footing and wall drain. The drain should consist of a perforated schedule 40 PVC pipe, placed in washed #57 stone, and wrapped in a 4-ounce nonwoven filter fabric.

The lateral loads on shallow foundations may be resisted by passive pressures against the side of the footing or sliding resistance on the base. Using a factor of safety of about 2, an allowable equivalent fluid pressure of 150 pcf may be used for passive resistance. A factor of safety of 2 is recommended for passive resistance due to the large deflections required to mobilize full passive resistance. Using a factor of safety of 1.5, an allowable friction factor of 0.4 may be used to calculate lateral resistance at the base of the footings.

6.0 REPORT LIMITATIONS

The recommendations submitted are based on the available soil information obtained by **MC^2** and design details furnished by the **BGR** for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, **MC^2**should be notified immediately to determine if changes in the foundation, or other, recommendations are required. If **MC^2** is not retained to perform these functions, **MC^2** cannot be responsible for the impact of those conditions on the performance of the project.

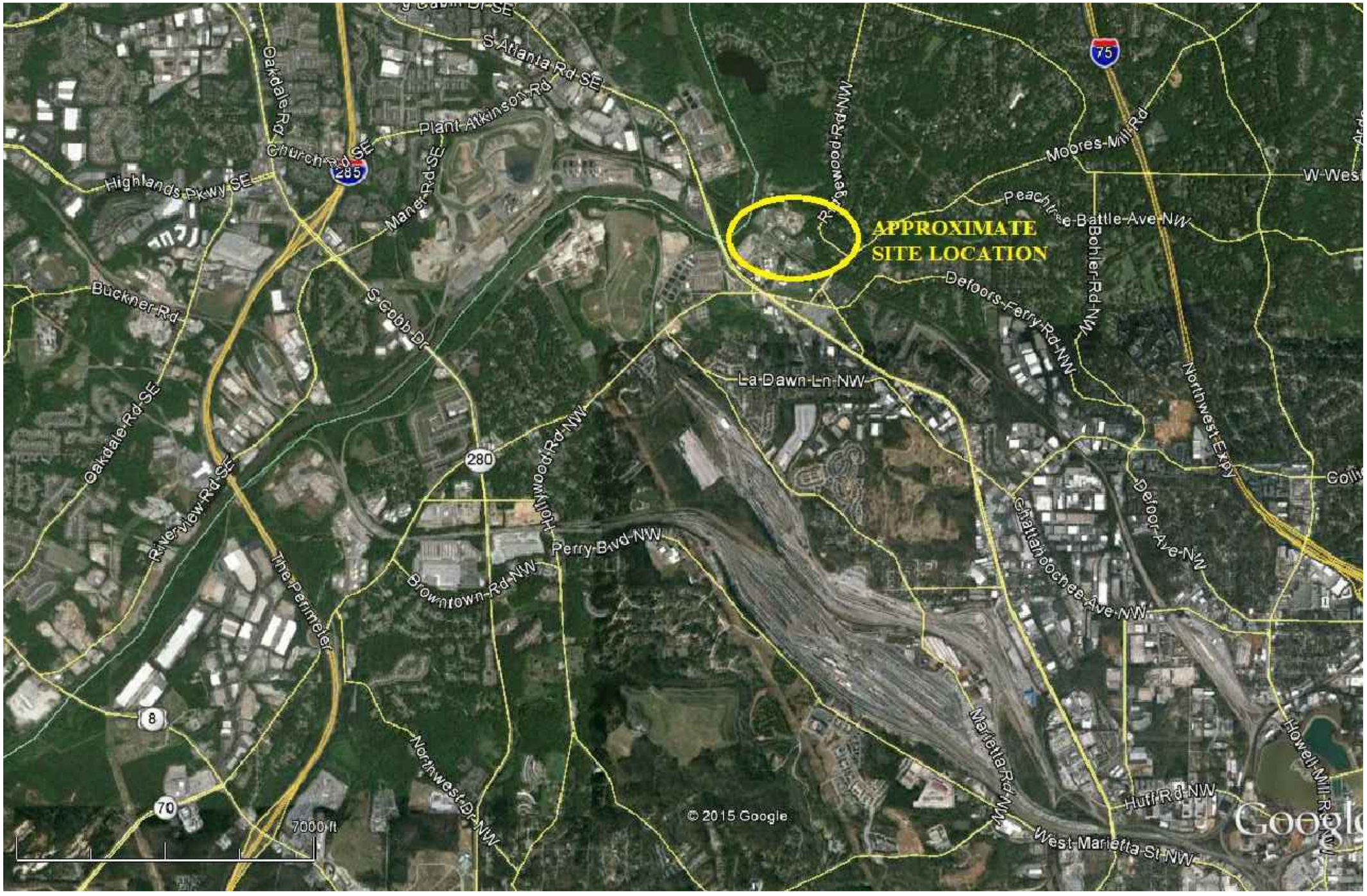
The Geotechnical Engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional Geotechnical Engineering practices in the local area. No other warranties are implied or expressed.

After the plans and specifications are more complete, the Geotechnical Engineer should be provided the opportunity to review them to assess that our engineering recommendations have been properly incorporated into the design documents. At that time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of **BGR** for the specific application to the proposed improvements of the RM Clayton Water Reclamation Center Expansion Project, Atlanta, Georgia.

APPENDIX A

Sheet 1 – Project Location Plan

Sheet 2 – Boring Location Plan



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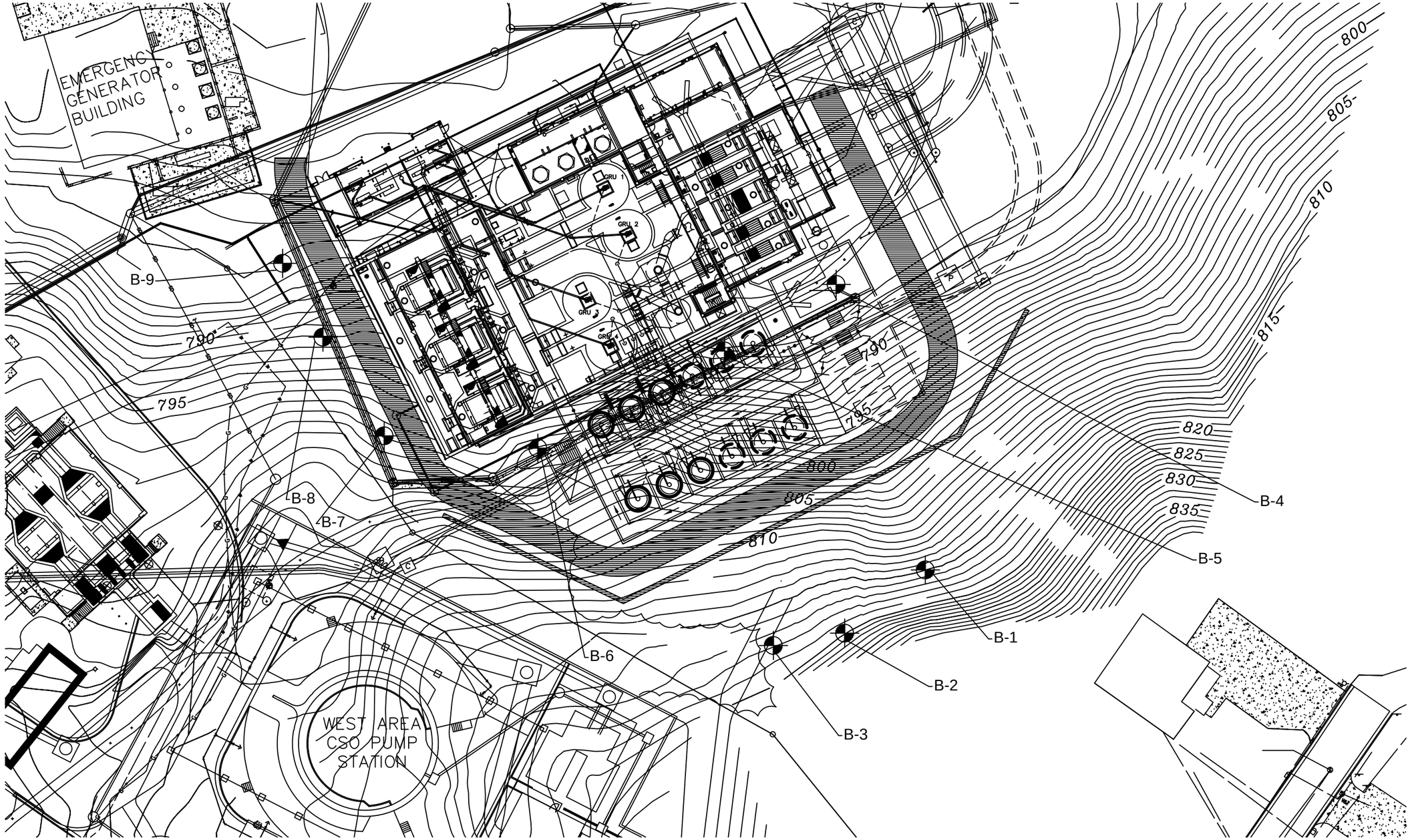
GEORGIA ENGINEERING CERTIFICATE OF AUTHORIZATION No. PEF004822
Jodonna J. Jimenez, P.E.
GEORGIA LICENSE No. PE 031327

	NAME	DATE
DESIGNED BY:	LC	3/24/15
DRAWN BY:	LC	3/24/15
CHECKED BY:	JJ	3/24/15
SUPERVISED BY:		

PROJECT LOCATION PLAN	MC2 PROJ. NO.	SHEET NO.
RM Clayton Water Reclamation Center Expansion Atlanta, Georgia 30318	A091417.098	1



LEGEND

APPROXIMATE BORING LOCATION

SCALE: 1" = 50'

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BORING LOCATION PLAN

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia 30318

MC2 PROJ. NO.: A091417.098

SHEET NO.: 2

APPENDIX B

Table 1 – Summary of Boring Information, Ground water Table and Depths to Rock/Partially Weathered Rock

Table 2 – Rock Core Summary

Table 3 – Rock Core Test Summary

Table 4 Definition of Weathering Indices

Table 5 – Summary of Corrosion Parameter Testing

Summary of Laboratory Results

Atterberg Limit Results

Grain Size Distribution (2 Pages)

Grain Size Distribution with Hydrometer

Unconfined Compression and SplittingTensile Test Curves (9 Pages)

Sheets 3 to 5 – Report of Core Borings (Soil Profiles)

gINT Logs (Soil Profiles) (17 Pages)

Test Procedures

Table 1
Summary of Boring Information, Groundwater Tables, and Depths/Elevations to Partially Weathered Rock/Rock

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia
MC Squared Inc. Project No. A091417.098

Boring No.	Boring Elevation (ft)	Boring Depth/Elev. (ft)	Water Table Depth/Elev. During Drilling (ft)	Water Table Depth/Elev. After 7 Days (ft)	Depth/Elev. to Partially Weathered Rock (ft)	Depth/Elev. to Auger Refusal (ft)	Piezometer Tip Depth/Elev. (ft)
B-1	837.3	75/762.3	NE	NE	23.5/813.8	31/806.3	NA
B-2	837.0	76/761.0	NE	NE	23.5/813.5	26/811.0	NA
B-3	836.1	75/761.1	NE	NE	30/806.1	31/805.1	NA
B-4	781.7	55/726.7	NE	NE	6/775.7	15/766.7	NA
B-5	781.6	60/721.6	NE	NE	12/769.6	16/765.6	NA
B-6	781.6	60/721.6	NE	NE	24/757.6	28/753.6	NA
B-7	780.7	50/730.7	NE	NE	25.0/755.7	37/743.7	NA
B-8	780.0	33/745.0	NE	NE	23.5/756.5	33/747.0	NA
B-9	780.4	51/729.4	31.2/749.2	23.7/756.7	39/741.4	39/741.4	39/741.4

Notes:

1. NE = Not Encountered
2. NA = Not Applicable
3. All measurements are approximate

Table 2
Rock Core Summary

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia
MC Squared, Inc., Project No. A091417.098

Boring No.	Run Number	Core Run Depth (ft)	Core Run Elev. (ft)	Recovery (%)	Rock Quality Designation (%)	Description of Rock Quality
B-1	1	30 - 35	807.3 - 802.3	97	90	Good
	2	35 - 40	802.3 - 797.3	100	98	Excellent
	3	40 - 45	797.3 - 792.3	100	76	Good
	4	45 - 50	792.3 - 787.3	87	32	Poor
	5	50 - 55	787.3 - 782.3	86	47	Good
	6	55 - 60	782.3 - 777.3	98	63	Fair
	7	60 - 65	777.3 - 772.3	98	88	Good
	8	65 - 70	772.3 - 767.3	98	89	Good
	9	70 - 75	767.3 - 762.3	79	24	Very Poor
B-2	1	25 - 26	812.0 – 811.0	75	0	Very Poor
	2	26 - 31	811.0 – 806.0	83	8	Very Poor
	3	31 - 36	806.0 – 801.0	93	24	Very Poor
	4	36 - 41	801.0 – 796.0	90	64	Fair
	5	41 - 46	796.0 – 791.0	100	96	Excellent
	6	46 - 51	791.0 – 786.0	100	99	Excellent
	7	51 - 56	786.0 – 781.0	100	100	Excellent
	8	56 - 61	781.0 – 776.0	100	100	Excellent
	9	61 - 66	776.0 – 771.0	100	100	Excellent
	10	66 - 71	771.0 – 766.0	100	91	Excellent
	11	71 - 76	766.0 – 761.0	100	100	Excellent
B-3	1	30 - 35	806.1 – 801.1	78	50	Poor
	2	35 - 40	801.1 – 796.1	88	76	Good
	3	40 - 45	796.1 – 791.1	98	79	Good
	4	45 - 50	791.1 – 786.1	100	99	Excellent
	5	50 - 55	786.1 – 781.1	100	100	Excellent
	6	55 - 60	781.1 – 776.1	100	96	Excellent
	7	60 - 65	776.1 – 771.1	100	86	Good
	8	65 - 70	771.1 – 767.1	100	62	Fair
	9	70 - 75	767.1 – 761.1	100	66	Fair

Table 2
Rock Core Summary

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia
MC Squared, Inc., Project No. A091417.098

Boring No.	Run Number	Core Run Depth (ft)	Core Run Elev. (ft)	Recovery (%)	Rock Quality Designation (%)	Description of Rock Quality
B-4	1	12 - 15	769.7 – 766.7	86	0	Very Poor
	2	15 - 20	766.7 – 761.7	90	0	Very Poor
	3	20 - 25	761.7 – 756.7	86	66	Fair
	4	25 - 30	756.7 – 751.7	96	82	Good
	5	30 - 35	751.7 – 746.7	92	61	Fair
	6	35 - 40	746.7 – 741.7	98	61	Fair
	7	40 - 45	741.7 – 736.7	100	92	Excellent
	8	45 - 50	736.7 – 731.7	100	82	Good
	9	50 - 55	731.7 – 726.7	100	93	Excellent
B-5	1	16 - 20	765.6 – 761.6	100	97	Excellent
	2	20 - 25	761.6 – 756.6	100	100	Excellent
	3	25 - 30	756.6 – 751.6	100	100	Excellent
	4	30 - 35	751.6 – 746.6	100	88	Good
	5	35 - 40	746.6 – 741.6	100	87	Good
	6	40 - 45	741.6 – 736.6	100	100	Excellent
	7	45 - 50	736.6 – 731.6	97	68	Fair
	8	50 - 55	731.6 – 726.6	100	42	Poor
	9	55 - 60	726.6 – 721.6	100	100	Excellent
B-6	1	24 - 25	757.6 – 756.6	88	0	Very Poor
	2	25 - 30	756.6 – 751.6	58	0	Very Poor
	3	30 - 35	751.6 – 746.6	100	21	Very Poor
	4	35 - 40	746.5 – 741.6	98	26	Poor
	5	40 - 45	741.6 – 736.6	100	96	Excellent
	6	45 - 50	736.6 – 731.6	98	63	Fair
	7	50 - 55	731.6 – 726.6	78	62	Fair
	8	55 - 60	726.6 – 721.6	100	64	Fair
B-7	1	20 - 25	760.7 – 755.7	48	0	Very Poor
	2	25 - 30	755.7 – 750.7	47	0	Very Poor
	3	30 - 35	750.7 – 745.7	42	0	Very Poor
	4	35 - 40	745.7 – 740.7	53	0	Very Poor
	5	40 - 45	740.7 – 735.7	62	0	Very Poor
	6	45 - 50	735.7 – 730.7	0	0	Very Poor
B-8		No coring performed		NA	NA	NA
B-9	1	39 - 41	741.4 – 739.4	77	0	Very Poor
	2	41 - 46	739.4 – 734.4	40	0	Very Poor
	3	46 - 51	734.4 – 729.4	25	0	Very Poor

Table 3
Rock Core Test Summary
Splitting Tensile and Unconfined Compressive Strength

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia
MC Squared, Inc., Project No. A091417.098

Boring No.	Run No.	Elevation, (ft)	Depth Below Ground Surface	Bulk Density (lb/ft^3)	Compressive Strength (psi)	Splitting Tensile Strength, (psi)
B-1	2	798.9 – 798.5	38’5” - 38’10”	172.9	14684	1974
B-1	8	771.5 – 771.1	65’10” - 66’3”	172.9	7361	1205
B-2	3	803.9 – 803.5	33’1” - 33’6”	171.6	12151	1331
B-2	9	773.8 – 773.4	63’2” – 63’7”	167.2	13280	1904
B-3	7	776.0 – 775.6	60’1” – 60’6”	172.8	13294	1085
B-3	7	775.6 – 775.2	60’6” – 60’11”	167.4	16297	1810
B-4	4	753.6 – 753.2	28’1” – 28’6”	164.2	9838	Not Performed
B-5	2	759.6 – 759.2	22’0” – 22’5”	173.0	6765	1495
B-6	5	739.4 – 739.0	42’2” – 42’7”	170.0	12520	2917

Table 4
Definition of Weathering Indices
RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia
MC Squared Inc., Project No. A091417.098

INDEX	NAME	DEFINITION
0	Fresh	No visible degradation or staining, even along joints. Joints generally tight or tightly healed with strong mineral cements.
1	Faintly Weathered	Visible degradation or staining limited to joint surfaces. No visible degradation or discoloration of rock matrix. Includes thin coatings on the joint surfaces, such as limonite (iron stain), clay, san, loose mica, or rock flour.
2	Slightly Weathered	Visible degradation or discoloration extends into rock matrix along the joints but does not fully permeate the rock. Rock appears to be full or nearly full strength away from the joints. Includes bands of infilling, gouge, fluffed mica or weathering less than 4 inches thick. Includes washouts or voids less than 4 inches wide. Typically causes auger refusal for a medium sized drill rig.
3	Moderately Weathered (also call Partially Weathered Rock)	Visible degradation extends through rock matrix. Rock matrix typically discolored, depending on mineralogy and chemical conditions. Feldspar and mafic minerals partially but not fully degraded, forming some intergranular porosity in the rock matrix. Strength of rock is considerably reduced, but the rock typically cannot be broken by hand or scratched deeply with a fingernail without great effort. RQD values will typically be low. Typically can be augered but with SPT N values greater than 100 blows per foot.
4	Highly Weathered	Weathering permeates entire rock; strength reduced to that of a hard residual soil. Can typically be indented or deeply scratched with a fingernail and small pieces should be breakable with moderate to strong finger pressure. Generally produces very low to no recovery during rock coring and SPT N values range typically between 30 and 100.
5	Thoroughly Weathered	Rock completely degraded into residual soil but with the original texture and structure of the rock clearly visible. Can be classified as a soil with SPT blowcounts typically less than about 30.

Table 5
Summary of Corrosion Parameters Testing
RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia
MC2 Inc., Project No. A091417.098

Boring No.	Soil Sample Depth (ft)	Unified Soil Classification	pH 9045D	Resistivity (ohm-cm) ASTM G57	Sulfates (ppm)	Chlorides (ppm)	Redox Potential (mV)
B-2	6-7.5	CL	6.65	7870	160	BRL	259.1
B-5	10-12	ML	7.69	13600	130	BRL	277.2
B-9	10-12	ML	7.03	4130	35	BRL	233.6

Notes:

1. BRL – Below Readable Limits

SUMMARY OF LABORATORY RESULTS

MC Squared

GEOTECHNICAL • ENVIRONMENTAL MATERIALS TESTING

CLIENT Black & Veatch Corporation/ Gresham Smith and Partners **PROJECT NAME** RM Clayton Water Reclamation Facility Expansion

PROJECT NUMBER A 091417.098 **PROJECT LOCATION** Atlanta, Georgia

Borehole	Depth	Liquid Limit	Plastic Limit	Plasticity Index	Class-ification	%<#3/8 Sieve	%<#4 Sieve	%<#10 Sieve	%<#20 Sieve	%<#40 Sieve	%<#60 Sieve	%<#100 Sieve	%<#200 Sieve	Water Content (%)
B-1 (13.5-15 ft)	15.0	37	31	6	ML	100.0	99.7	96.9	92.0	87.9	84.5	80.8	73.7	18.5
B-2 (13.5-15 ft)	15.0				ML		100.0	99.7	98.6	97.3	95.9	93.5	88.0	19.3
B-2 (8.5-10 ft)	10.0	52	27	25	CH	100.0	98.9	97.4	94.9	93.1	91.3	89.2	85.1	24.6
B-3 (3.5-5 ft)	5.0				SM	93.9	82.1	73.5	66.2	60.9	56.5	52.0	45.2	14.9
B-5 (6-7.5 ft)	7.5	40	28	12	ML	88.8	84.7	80.3	75.6	72.0	69.0	65.9	61.0	27.0
B-6 (18.5-20 ft)	20.0	36	30	6	ML	100.0	97.2	92.9	88.8	84.4	80.8	76.9	70.5	29.2
B-6 (3.5-5 ft)	5.0	38	27	11	ML	100.0	96.6	93.4	86.8	81.4	77.2	73.3	67.1	22.1
B-7 (6-7.5 ft)	7.5				ML	98.9	96.6	93.2	88.8	84.9	81.6	78.2	72.7	25.1
B-9 (8.5-10 ft)	10.0	39	28	11	ML	100.0	99.5	97.4	93.3	88.9	84.7	79.9	72.4	30.6
B-9(ST)(10-10.5ft)	10.5	35	28	7	ML		100.0	97.2	82.0	70.8	62.9	58.2	51.1	2.0

ATTERBERG LIMITS' RESULTS

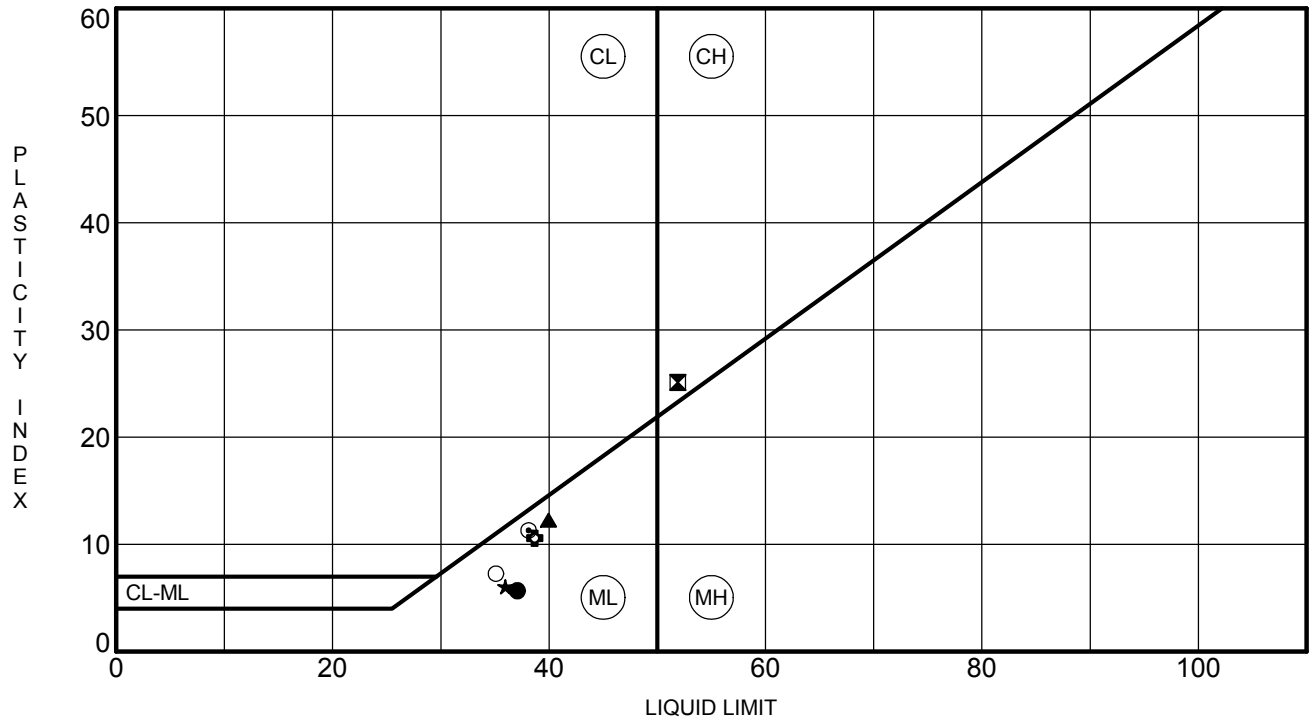
MC Squared

CLIENT: BGR

PROJECT NAME RM Clayton Water Reclamation Facility Expansion

PROJECT NUMBER A 091417.098

PROJECT LOCATION Atlanta, Georgia



	Specimen Identification		LL	PL	PI	Fines	Classification
●	B-1 (13.5-15 ft)	15.0	37	31	6	74	Brown SILT with M to F sand (slightly micaceous) (ML)
⊠	B-2 (8.5-10 ft)	10.0	52	27	25	85	Brown, Reddish brown fat CLAY (CH)
▲	B-5 (6-7.5 ft)	7.5	40	28	12	61	White, Brown M to F sandy SILT with gravel (micaceous) (ML)
★	B-6 (18.5-20 ft)	20.0	36	30	6	70	Brown SILT with M to F sand (ML)
⊙	B-6 (3.5-5 ft)	5.0	38	27	11	67	White, brown M to F sandy SILT (micaceous) (ML)
✿	B-9 (8.5-10 ft)	10.0	39	28	11	72	Orange, brown, gray SILT with M to F sand (micaceous) (ML)
○	B-9 (ST) (10-10.5 ft)	10.5	35	28	7	51	Brown M to F sandy SILT (ML)

ATTERBERG LIMITS - GINT STD US LAB.GDT - 4/2/15 09:04 - Z:\PROP AND RPTS\ATL\ATL 14 PRJS\A091417.098 RM CLAYTON GEO\GRESHAM & BV\LAB TEST\LABORATORY TEST.GPJ

GRAIN SIZE DISTRIBUTION

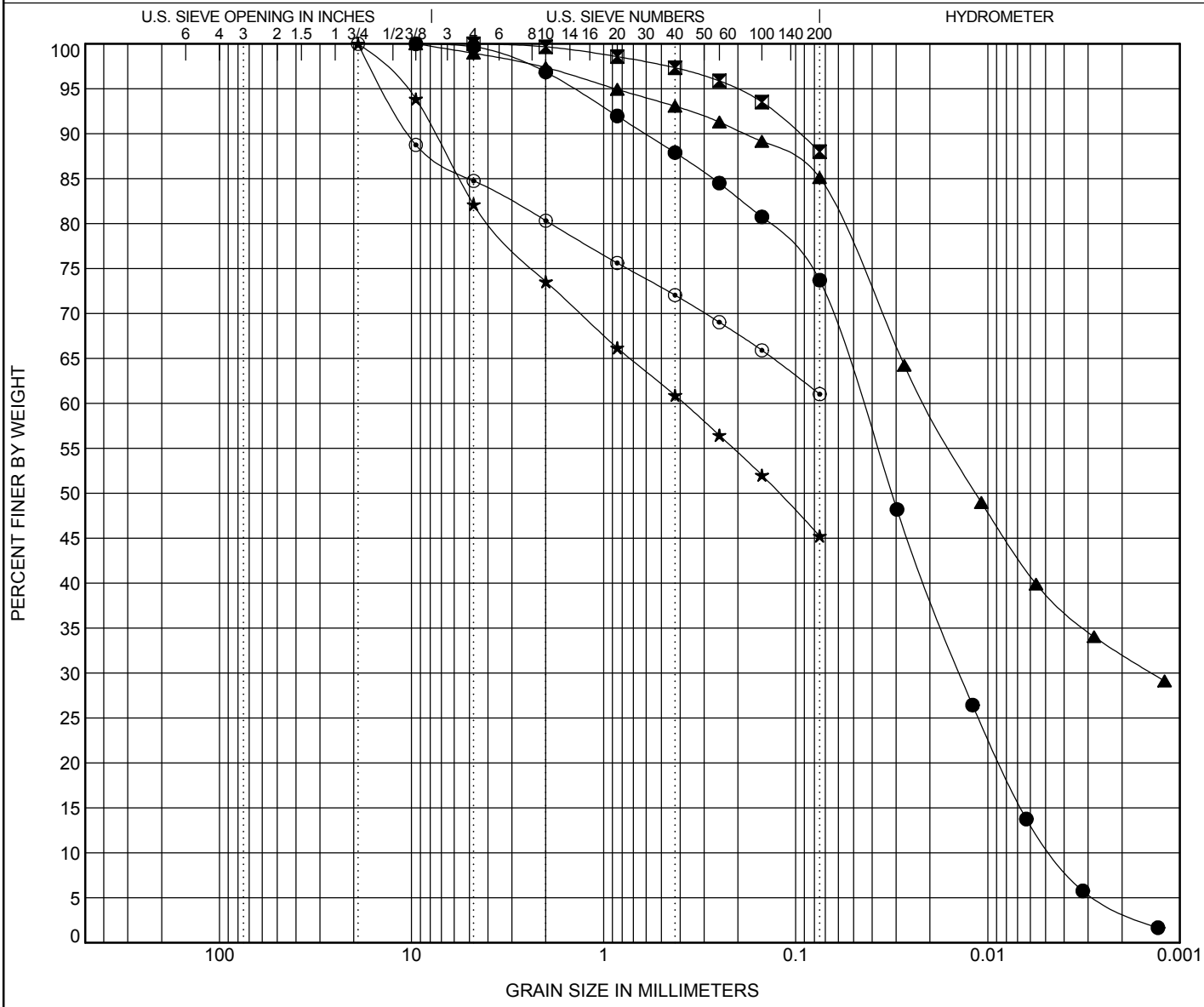
MC Squared

CLIENT BGR

PROJECT NAME RM Clayton Water Reclamation Facility Expansion

PROJECT NUMBER A 091417.098

PROJECT LOCATION Atlanta, Georgia



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-1 (13.5-15 ft)	Brown SILT with M to F sand (slightly micaceous) (ML)	37	31	6	0.93	9.95
⊠	B-2 (13.5-15 ft)	Brown silt (micaceous) (ML)					
▲	B-2 (8.5-10 ft)	Brown, Reddish brown fat CLAY (CH)	52	27	25		
★	B-3 (3.5-5 ft)	Brown silty C to F SAND with gravel (micaceous) (SM)					
⊙	B-5 (6-7.5 ft)	White, Brown M to F sandy SILT with gravel (micaceous) (ML)	40	28	12		

	Specimen Identification	D100	D60	D30	D10	NMC	%Gravel	%Sand	%Silt	%Clay
●	B-1 (13.5-15 ft)	9.5	0.046	0.014	0.005	18.5	0.3	26.0	62.7	11.0
⊠	B-2 (13.5-15 ft)	4.75				19.3	0.0	12.0	88.0	
▲	B-2 (8.5-10 ft)	9.5	0.021	0.001		24.6	1.1	13.8	46.2	38.9
★	B-3 (3.5-5 ft)	19	0.382			14.9	17.9	36.9	45.2	
⊙	B-5 (6-7.5 ft)	19				27.0	15.3	23.7	61.0	

GRAIN SIZE WITH M.C MULTI - GINT STD US LAB.GDT - 4/2/15 09:04 - Z:\PROP AND RPTS\ATL\ATL 14 PRJS\A091417.098 RM CLAYTON GEO\GRESHAM & BV\LAB TEST\LABORATORY TEST.GPJ

GRAIN SIZE DISTRIBUTION

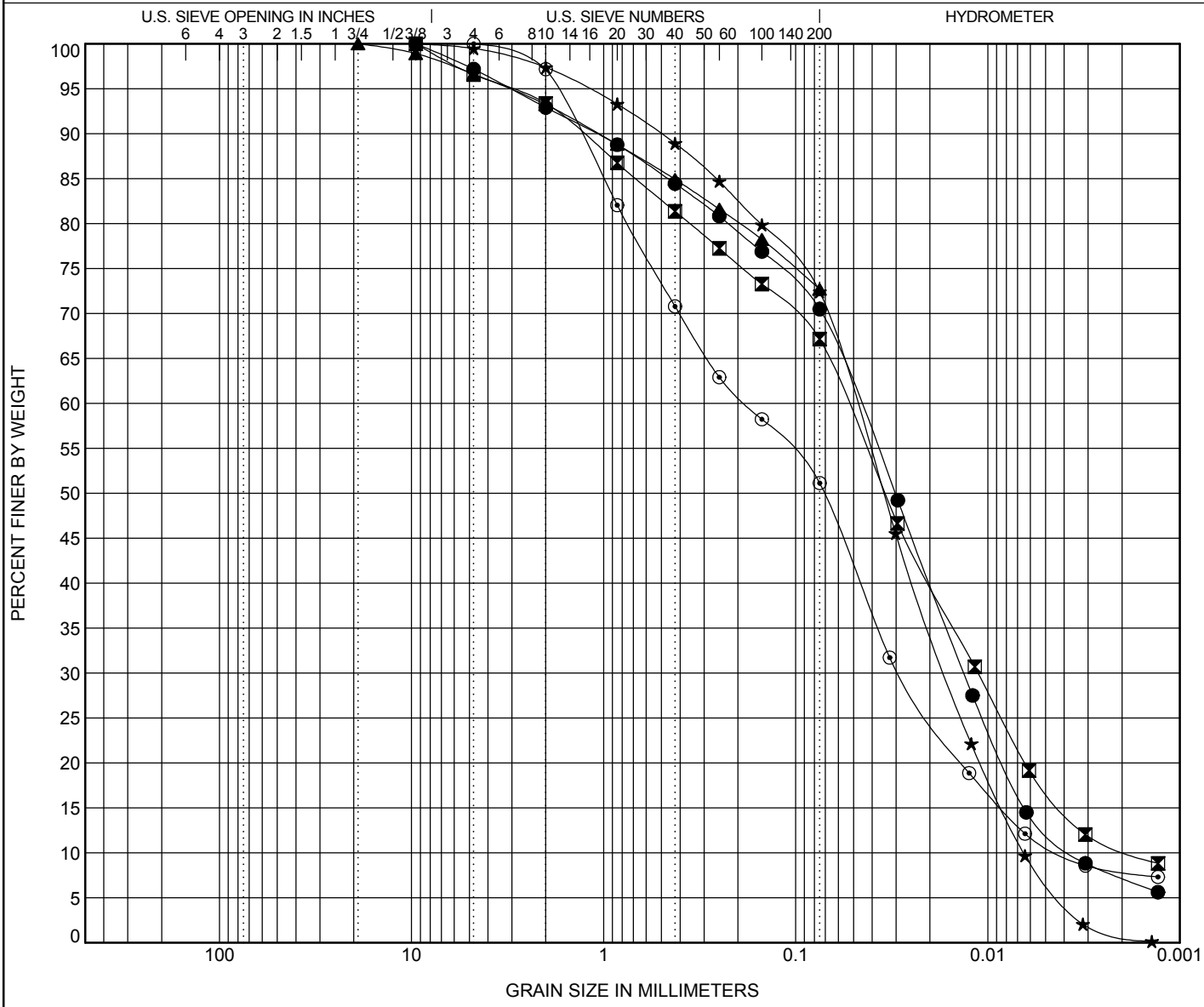
MC Squared

CLIENT BGR

PROJECT NAME RM Clayton Water Reclamation Facility Expansion

PROJECT NUMBER A 091417.098

PROJECT LOCATION Atlanta, Georgia



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	B-6 (18.5-20 ft)	Brown SILT with M to F sand (ML)	36	30	6	1.04	13.18
⊠	B-6 (3.5-5 ft)	White, brown M to F sandy SILT (micaceous) (ML)	38	27	11	1.31	30.35
▲	B-7 (6-7.5 ft)	White, Reddish brown, brown silt with sand (micaceous) (ML)					
★	B-9 (8.5-10 ft)	Orange, brown, gray SILT with M to F sand (micaceous) (ML)	39	28	11	0.85	7.57
⊙	B-9 (ST) (10-10.5 ft)	Brown M to F sandy SILT (ML)	35	28	7	1.08	43.89

	Specimen Identification	D100	D60	D30	D10	NMC	%Gravel	%Sand	%Silt	%Clay
●	B-6 (18.5-20 ft)	9.5	0.047	0.013	0.004	29.2	2.8	26.7	57.8	12.7
⊠	B-6 (3.5-5 ft)	9.5	0.054	0.011	0.002	22.1	3.4	29.4	50.1	17.1
▲	B-7 (6-7.5 ft)	19				25.1	3.4	23.9	72.7	
★	B-9 (8.5-10 ft)	9.5	0.049	0.017	0.007	30.6	0.5	27.1	65.5	7.0
⊙	B-9 (ST) (10-10.5 ft)	4.75	0.182	0.029	0.004	2.0	0.0	48.9	40.2	10.9

GRAIN SIZE WITH M.C MULTI - GINT STD US LAB.GDT - 4/2/15 09:04 - Z:\PROP AND RPTS\ATL\ATL 14 PRJS\A091417.098 RM CLAYTON GEO\GRESHAM & BV\LAB TEST\LABORATORY TEST.GPJ

GRAIN SIZE DISTRIBUTION

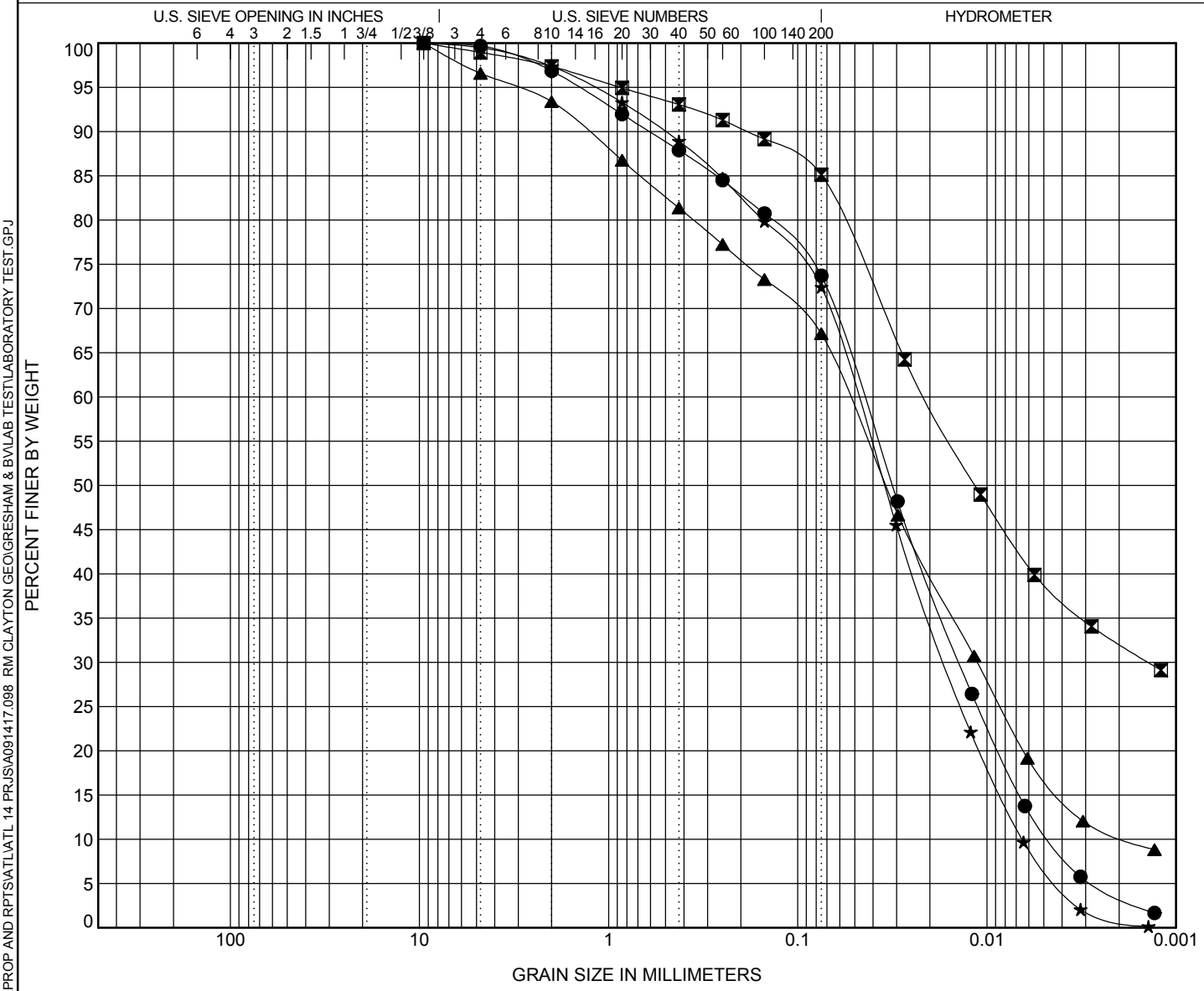
MC Squared

CLIENT BGR

PROJECT NAME RM Clayton Water Reclamation Facility Expansion

PROJECT NUMBER A 091417.098

PROJECT LOCATION Atlanta, Georgia



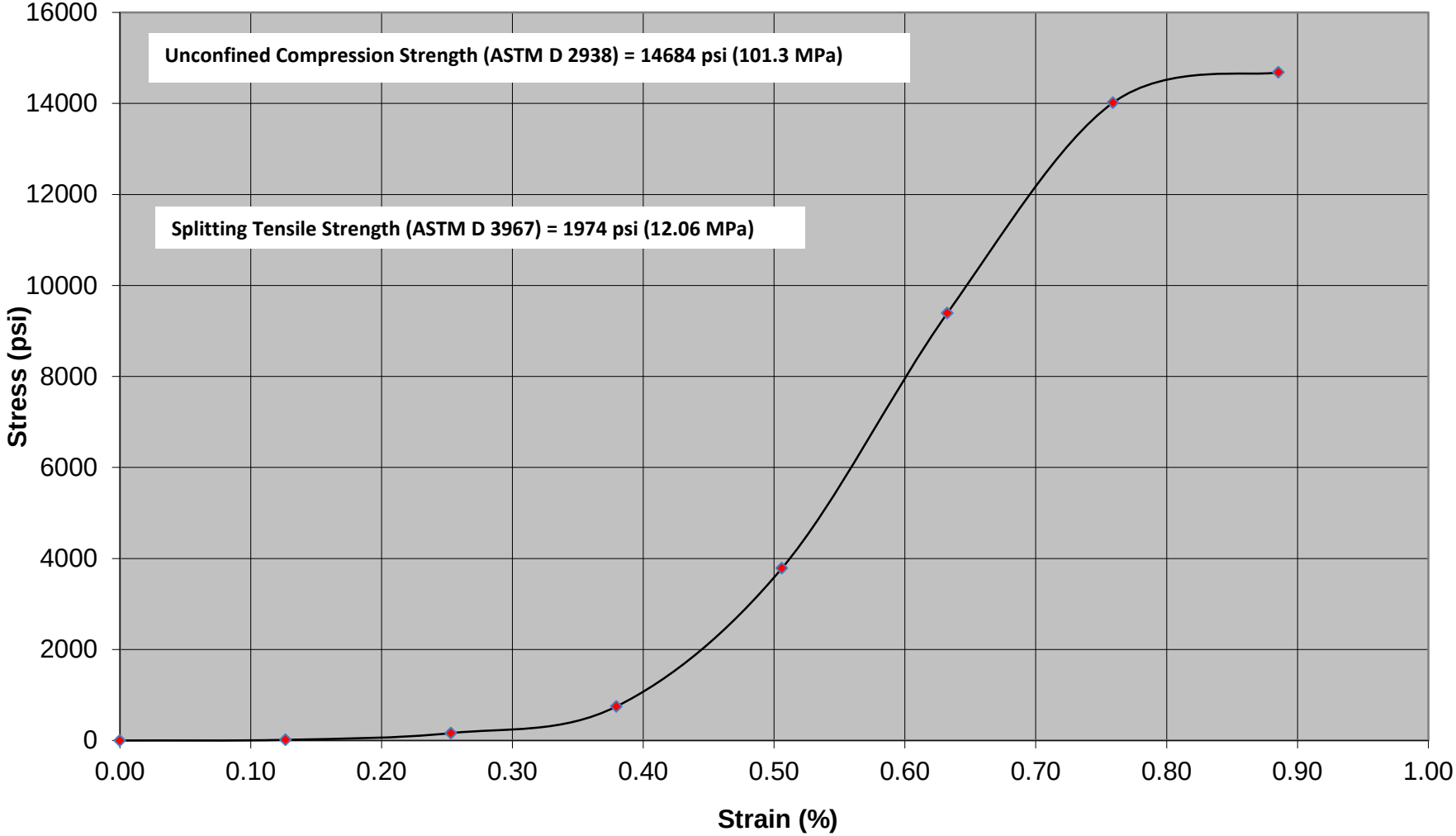
COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification	Classification	LL	PL	PI	Cc	Cu
●	**B-1 (13.5-15 ft)**	**Brown SILT with M to F sand (slightly micaceous) (ML)**	**37**	**31**	**6**	**0.93**	**9.95**
⊠	**B-2 (8.5-10 ft)**	**Brown, Reddish brown fat CLAY (CH)**	**52**	**27**	**25**		
▲	**B-6 (3.5-5 ft)**	**White, brown M to F sandy SILT (micaceous) (ML)**	**38**	**27**	**11**	**1.31**	**30.35**
★	**B-9 (8.5-10 ft)**	**Orange, brown, gray SILT with M to F sand (micaceous) (ML)**	**39**	**28**	**11**	**0.85**	**7.57**

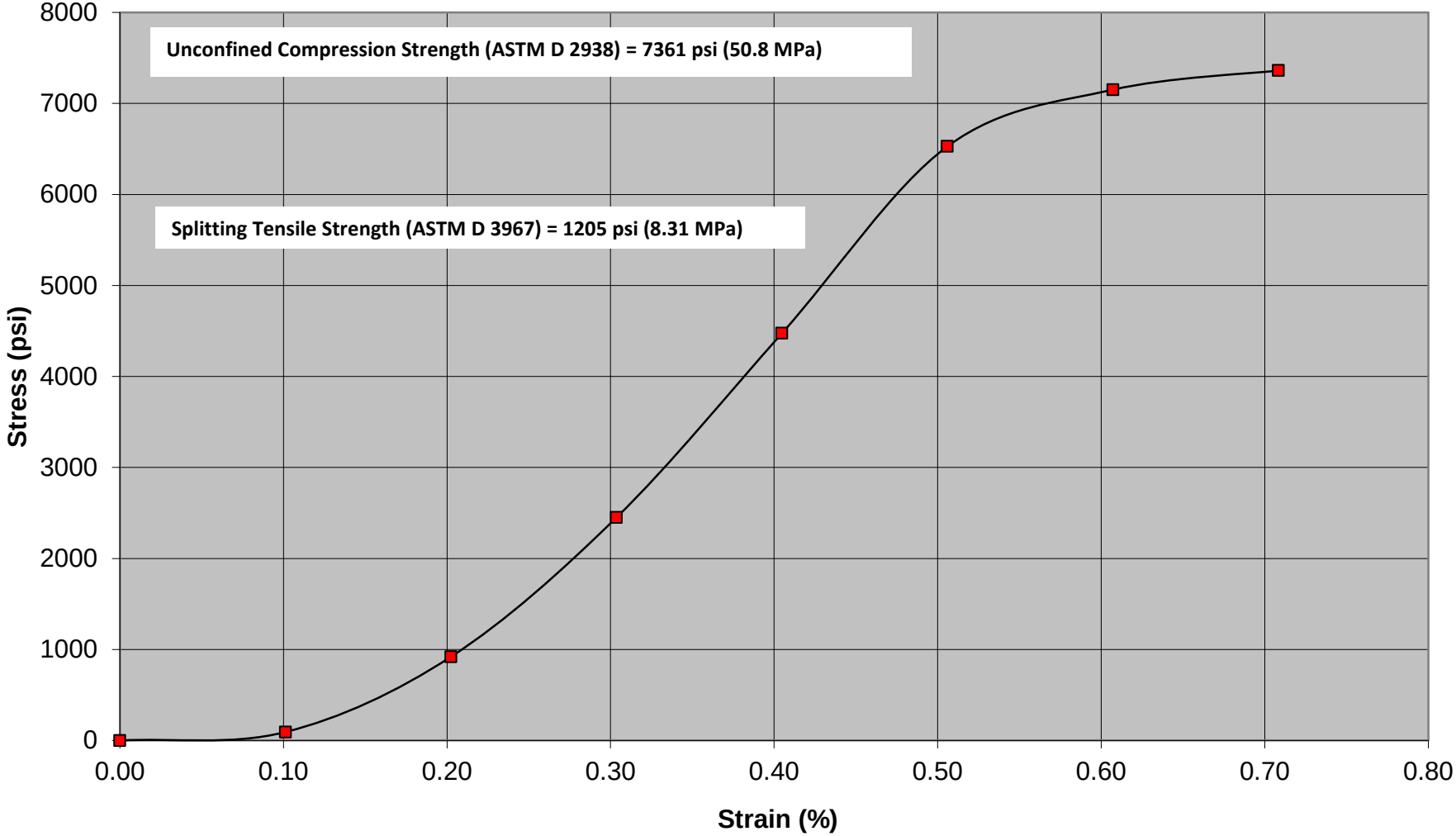
	Specimen Identification	D100	D60	D30	D10	NMC	%Gravel	%Sand	%Silt	%Clay
●	**B-1 (13.5-15 ft)**	**9.5**	**0.046**	**0.014**	**0.005**	**18.5**	**0.3**	**26.0**	**62.7**	**11.0**
⊠	**B-2 (8.5-10 ft)**	**9.5**	**0.021**	**0.001**		**24.6**	**1.1**	**13.8**	**46.2**	**38.9**
▲	**B-6 (3.5-5 ft)**	**9.5**	**0.054**	**0.011**	**0.002**	**22.1**	**3.4**	**29.4**	**50.1**	**17.1**
★	**B-9 (8.5-10 ft)**	**9.5**	**0.049**	**0.017**	**0.007**	**30.6**	**0.5**	**27.1**	**65.5**	**7.0**

GRAIN SIZE MULTI FOR GDOT - GINT STD US LAB.GDT - 4/1/15 18:25 - Z:\PROP AND RPTS\ATL\ATL 14 PRJS\A091417.098 RM CLAYTON GEO\GRESHAM & BVLAB TEST\LABORATORY TEST.GPJ

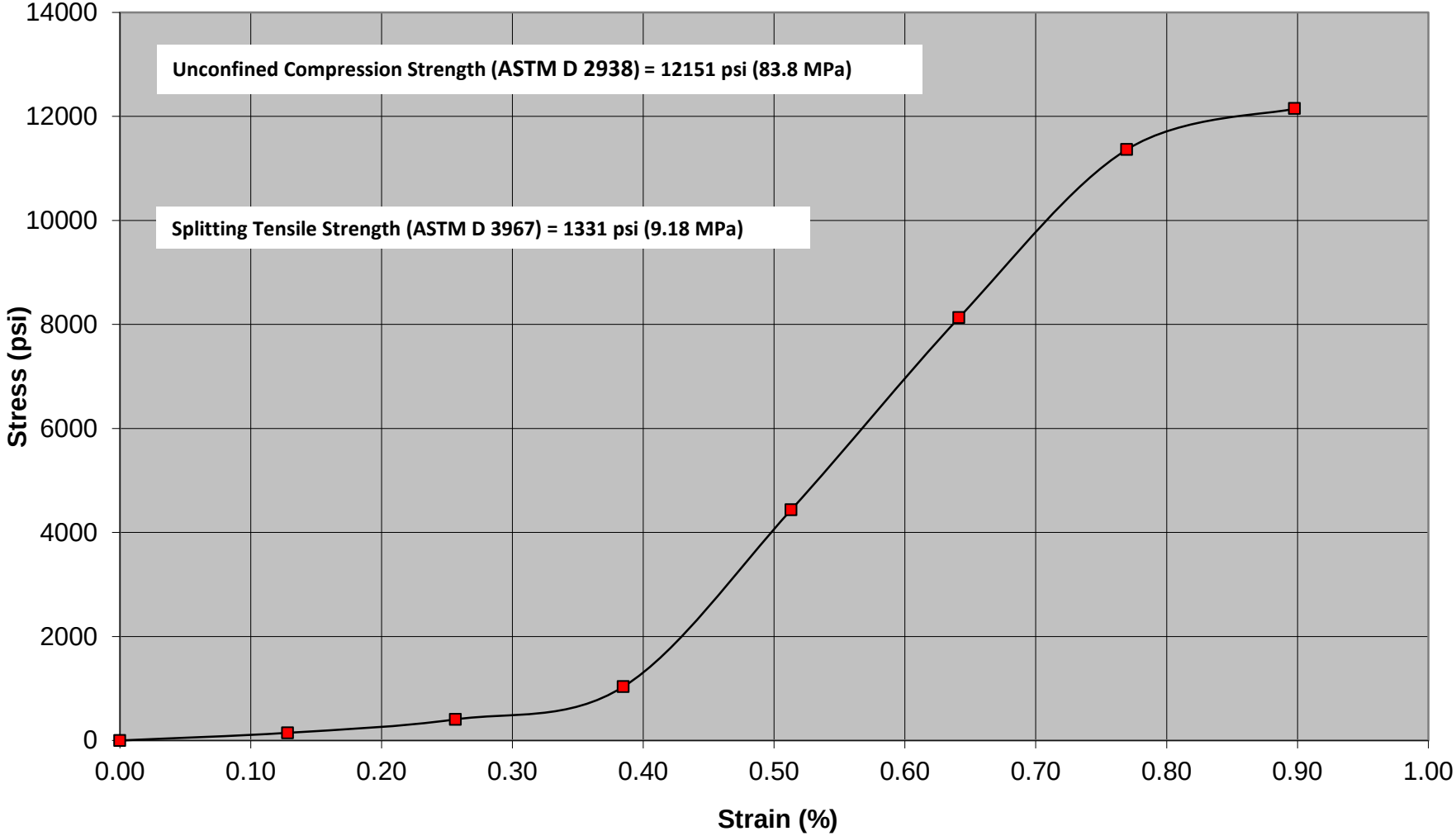
Unconfined Compressive Strength (ASTM D 2938)
RM Clayton Water Reclamation Center Expansion
Atlanta, GA
MC² Project No. A091417.098
Boring B-1, Elevation 798.9' - 798.5'



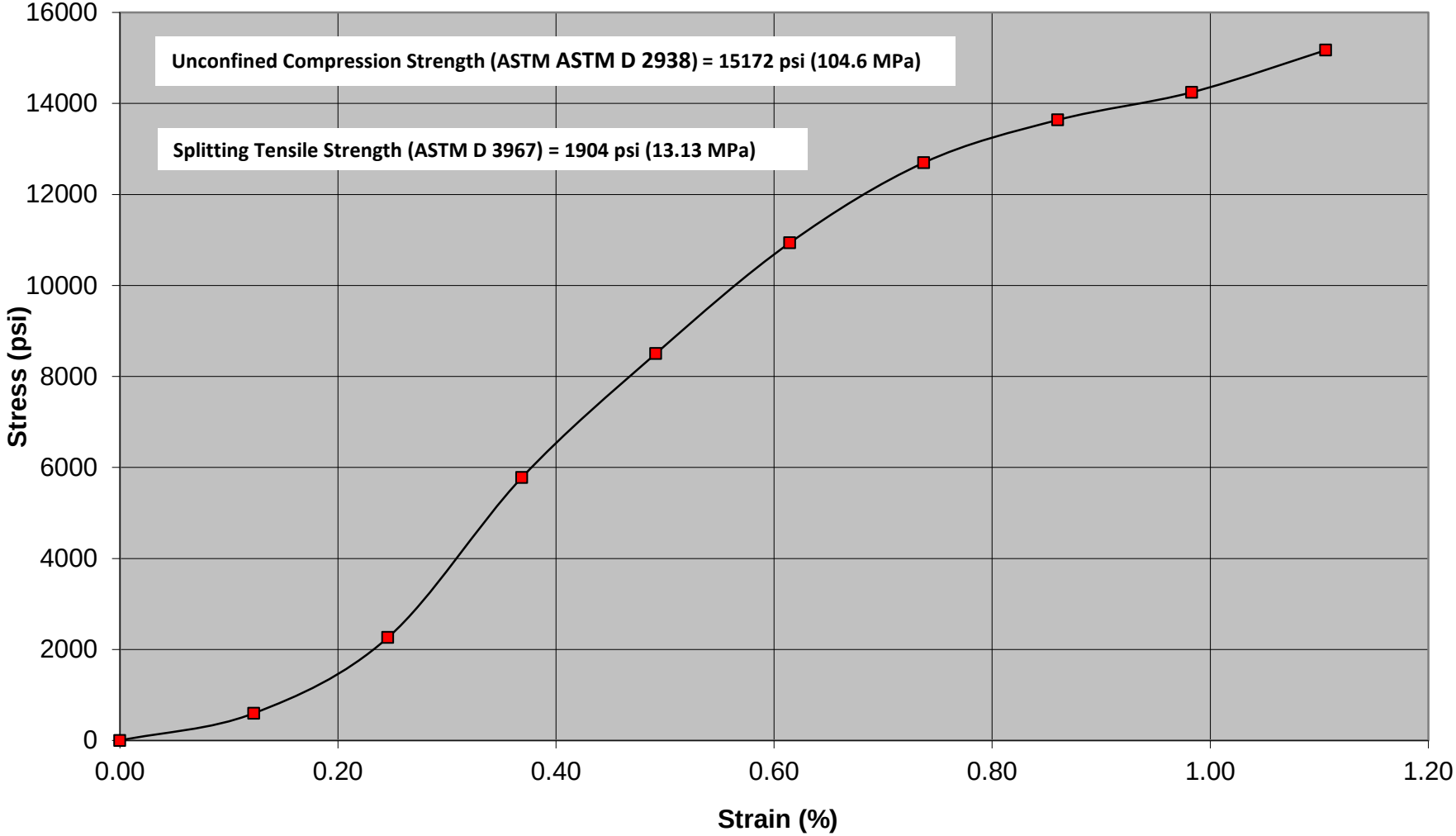
Unconfined Compressive Strength (ASTM D 2938)
RM Clayton Water Reclamation Center Expansion
Atlanta, GA
MC² Project No. A091417.098
Boring B-1, Elevation 771.5' - 771.1'



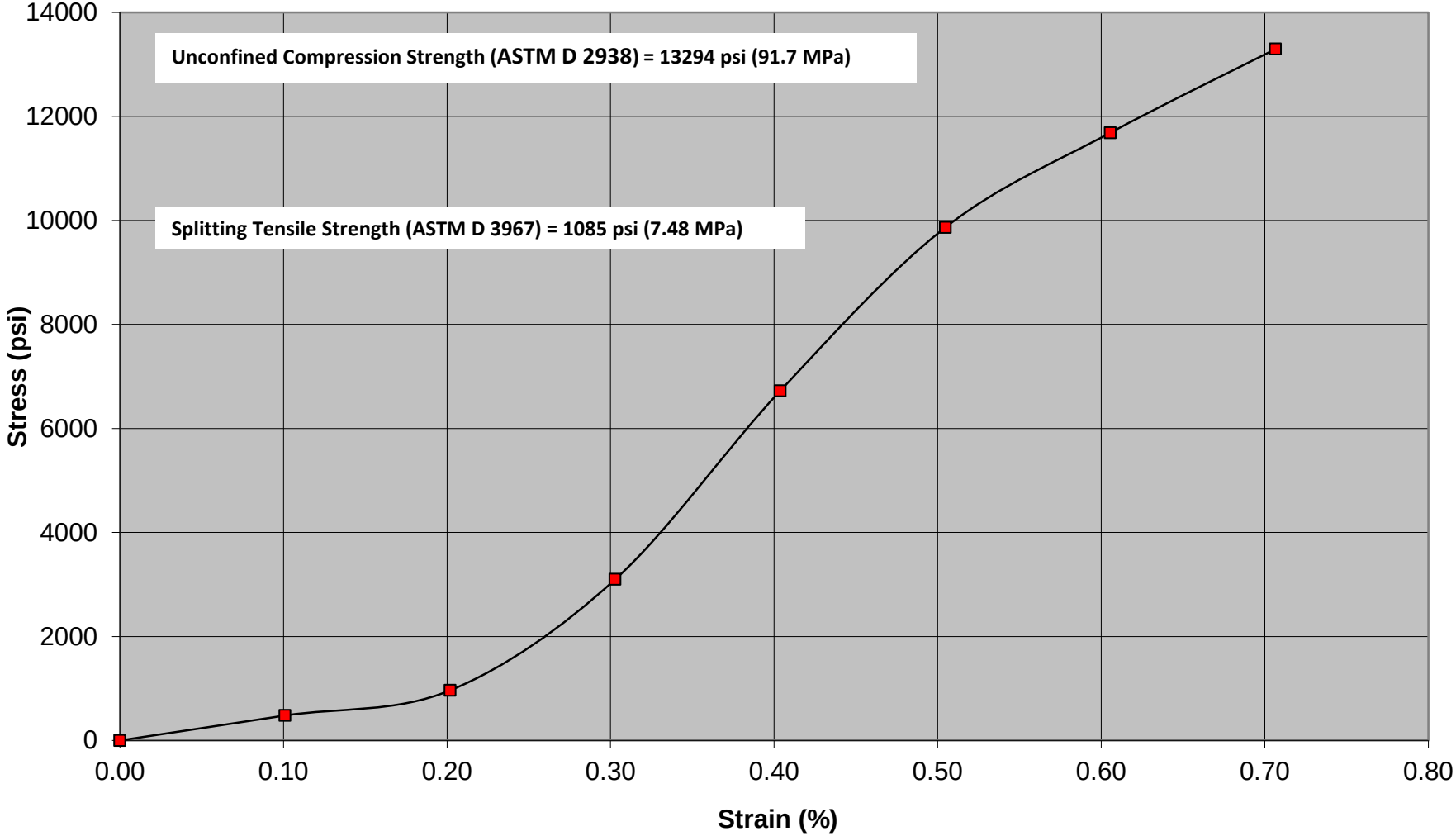
Unconfined Compressive Strength (ASTM D 2938)
RM Clayton Water Reclamation Center Expansion
Atlanta, GA
MC² Project No. A091417.098
Boring B-2, Elevation 803.9' - 803.5'



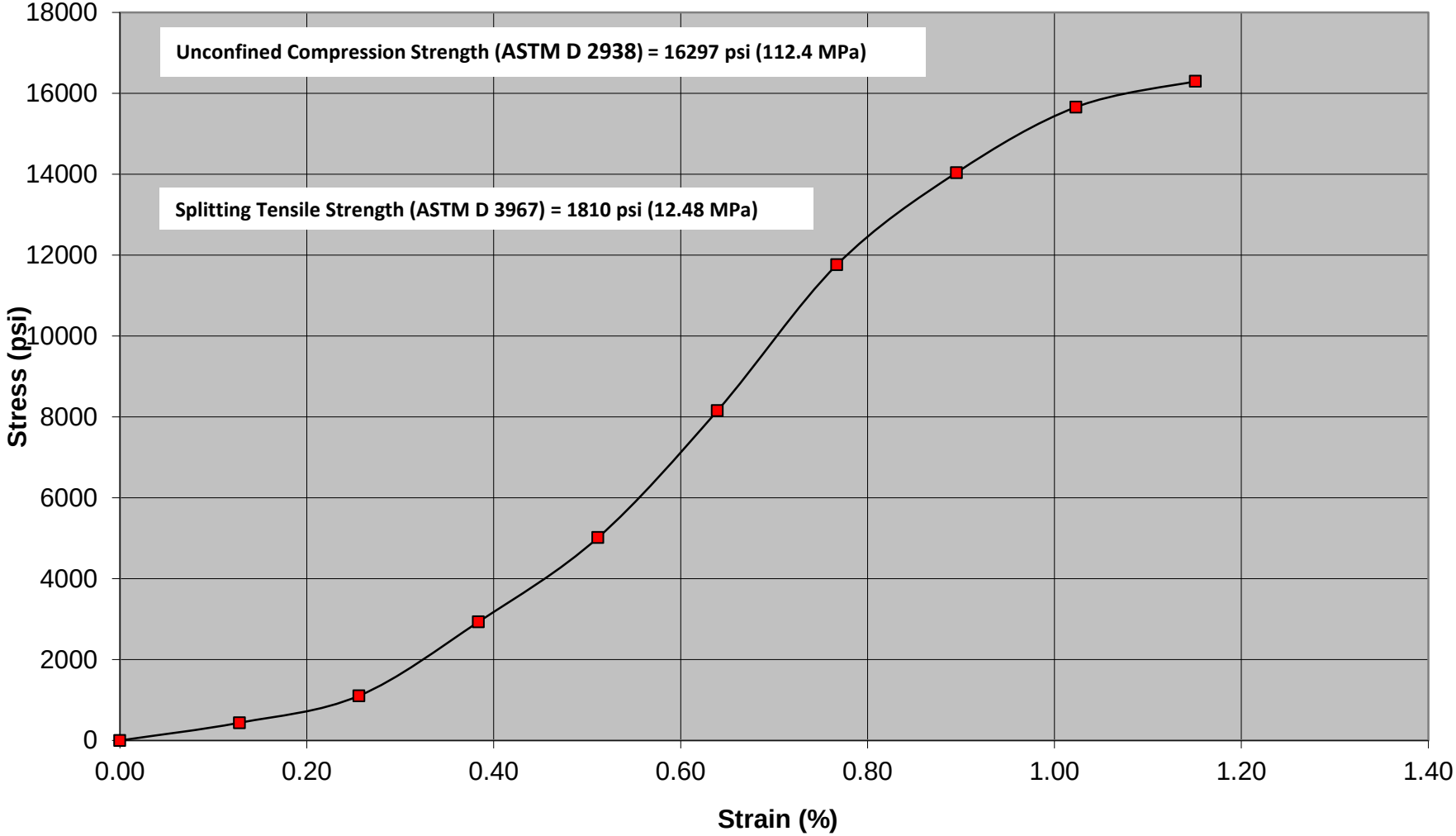
Unconfined Compressive Strength (ASTM D 2938)
RM Clayton Water Reclamation Center Expansion
Atlanta, GA
MC² Project No. A091417.098
Boring B-2, Elevation 773.8' - 773.4'



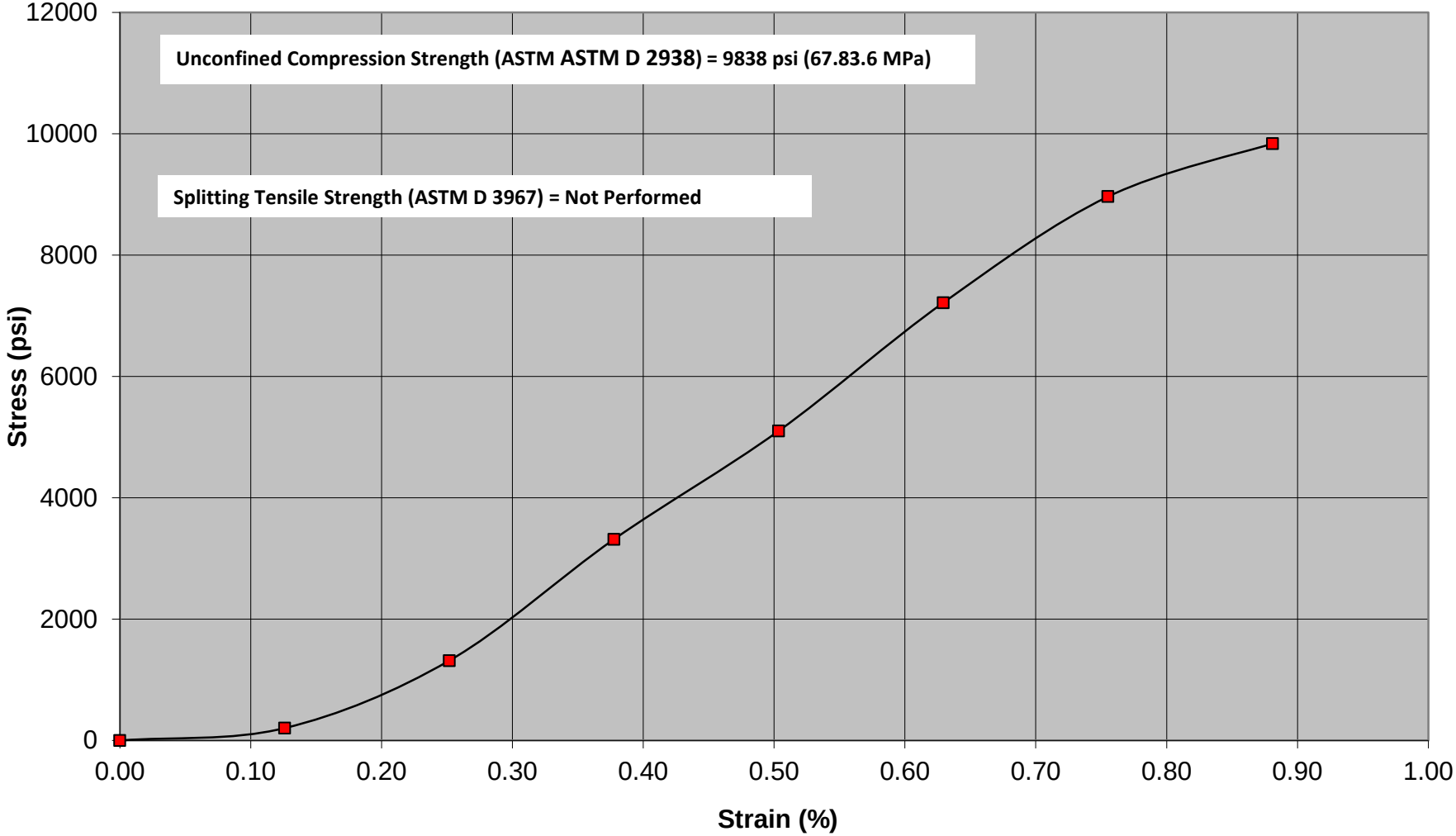
Unconfined Compressive Strength (ASTM D 2938)
RM Clayton Water Reclamation Center Expansion
Atlanta, GA
MC² Project No. A091417.098
Boring B-3, Elevation 776.0' - 775.6'



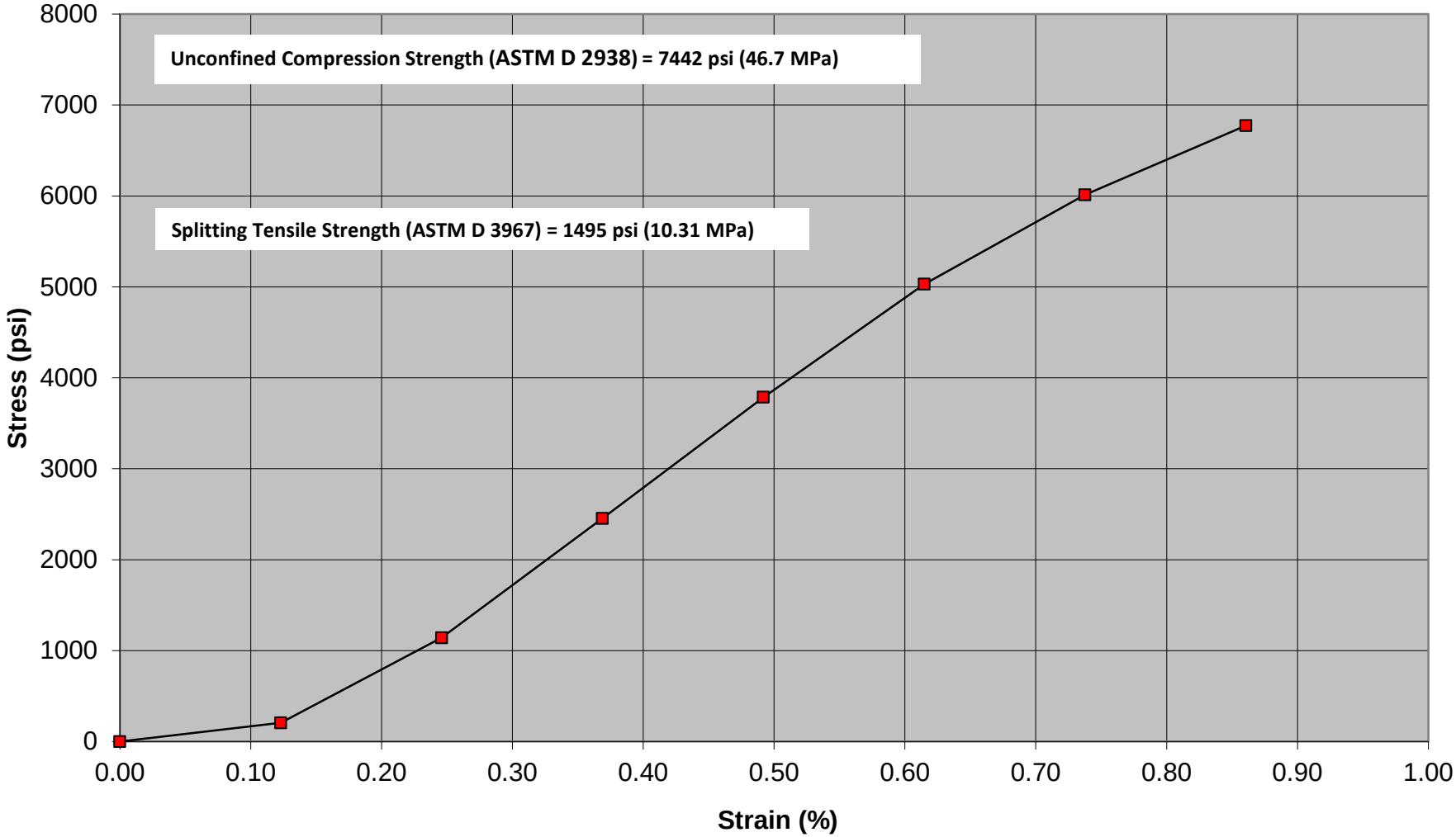
Unconfined Compressive Strength (ASTM D 2938)
RM Clayton Water Reclamation Center Expansion
Atlanta, GA
MC² Project No. A091417.098
Boring B-3, Elevation 775.6' - 775.2'



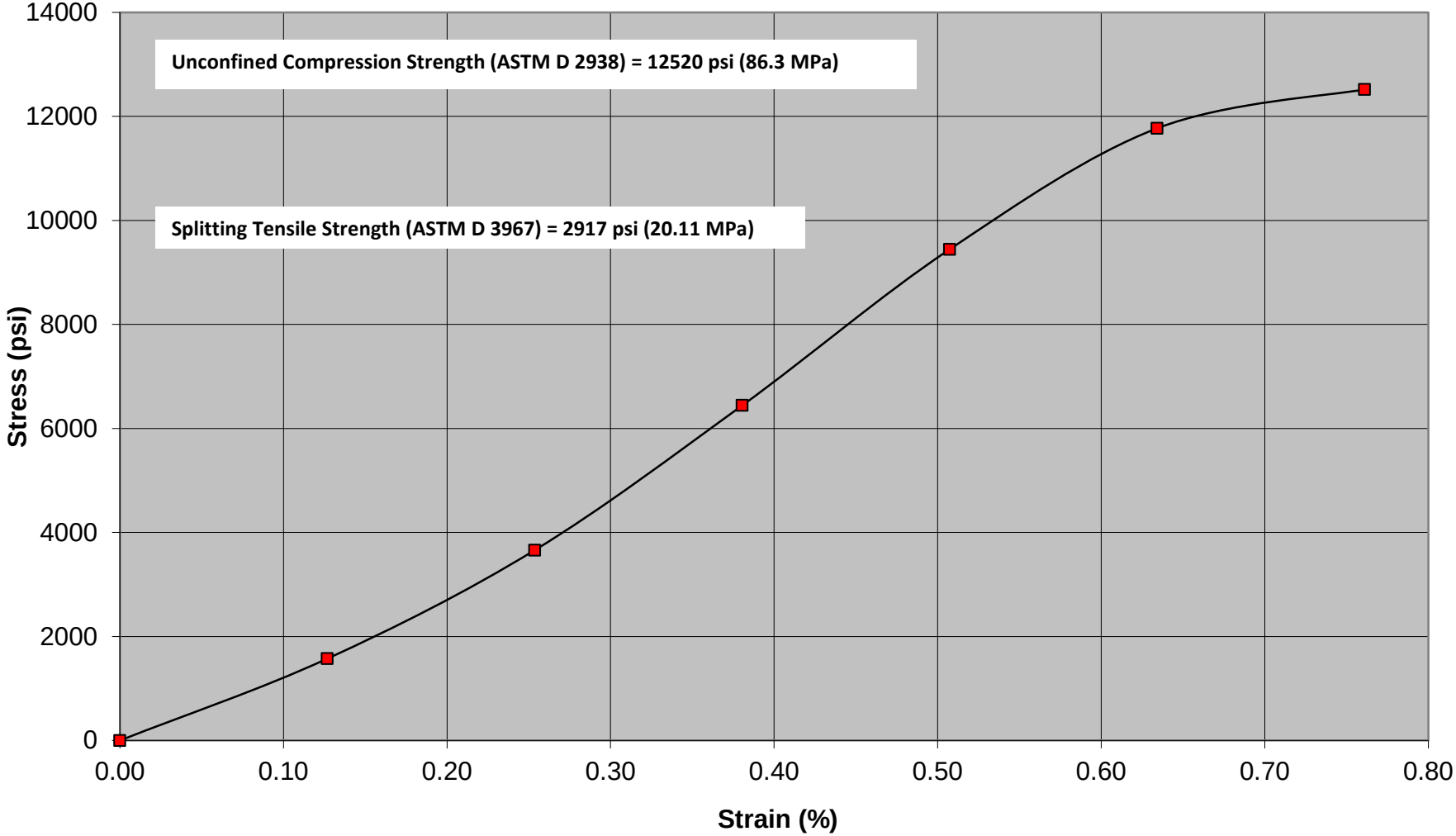
Unconfined Compressive Strength (ASTM D 2938)
RM Clayton Water Reclamation Center Expansion
Atlanta, GA
MC² Project No. A091417.098
Boring B-4, Elevation 781.6' - 781.2'

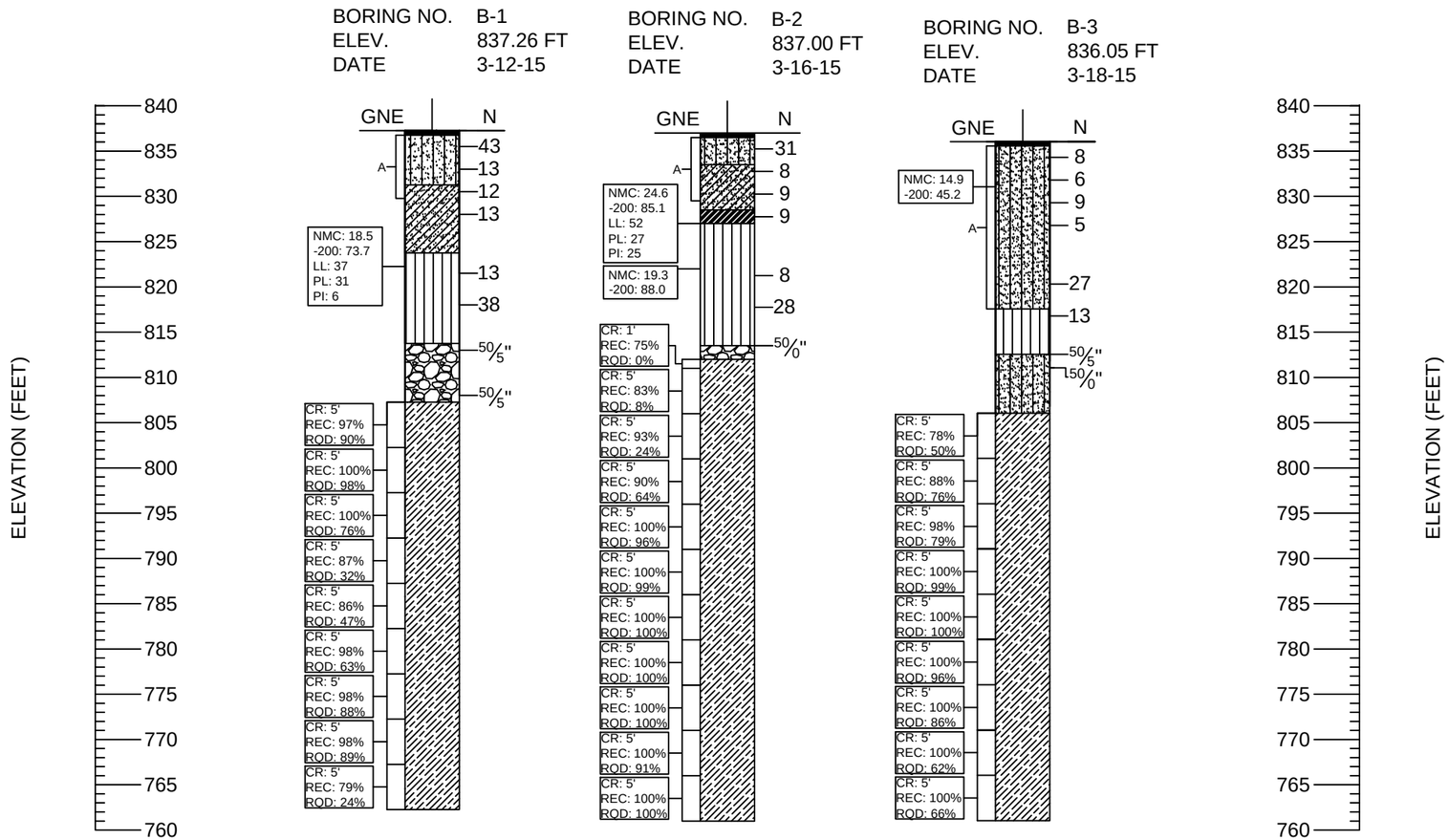


Unconfined Compressive Strength (ASTM D 2938)
RM Clayton Water Reclamation Center Expansion
Atlanta, GA
MC² Project No. A091417.098
Boring B-5, Elevation 759.6' - 759.2'



Unconfined Compressive Strength (ASTM D 2938)
RM Clayton Water Reclamation Center Expansion
Atlanta, GA
MC² Project No. A091417.098
Boring B-6, Elevation 739.4' - 739.0'





VERTICAL SCALE: 1"=16' APPROX.

LEGEND

- Topsoil or Graded Aggregate Base
- (ML) **Soft** to **Very Hard**, Brown to Dark-Brown, Orange, White, Red, Micaceous, Medium to Fine, Sandy-SILT
- (PWR) Partially Weathered Rock
- (SP) Brown, Medium to Fine SAND
- Mylonite
- (SM) **Loose** to **Very Dense**, Brown to Dark-Brown, Orange, Gray, White, Micaceous, Silty, Medium to Fine, SAND, some with Gravel
- (SC) **Very Dense**, Brown, White, Orange, Micaceous, Clayey, Medium to Fine, SAND
- (CL) **Firm** to **Stiff**, Brown to Dark-Brown, Red, Micaceous, Sandy-CLAY
- (CH) **Stiff**, Gray, Brown, Micaceous, CLAY

NOTES:

- WATER TABLE
- WATER LEVEL AFTER 3 DAYS
- GNE GROUNDWATER NOT ENCOUNTERED
- N SPT N-VALUE
- NMC NATURAL MOISTURE CONTENT (%)
- -200 FINES PASSING A NO. 200 SIEVE (%)
- LL LIQUID LIMIT
- PL PLASTIC LIMIT
- PI PLASTIC INDEX
- A FILL

GRANULAR MATERIALS- RELATIVE DENSITY	SPT (BLOWS/FT)
VERY LOOSE	LESS THAN 4
LOOSE	5-10
MEDIUM	11-30
DENSE	31-50
VERY DENSE	GREATER THAN 50

SILTS AND CLAYS CONSISTENCY	SPT (BLOWS/FT)
VERY SOFT	LESS THAN 2
SOFT	3-4
FIRM	5-8
STIFF	9-15
VERY STIFF	16-30
HARD	30-50
VERY HARD	GREATER THAN 50

RFP PKG #14-28
P.I. NO. 0012603

DATE	NAME	REVISION	APPROVED BY:

MC SQUARED, INC.
Geotechnical Consultants
1275 Shiloh Road NW
Suite 2620
Kennesaw, GA 30144
Ph:770-650-0873 Fax:770-650-7825
GEOTECHNICAL • ENVIRONMENTAL MATERIALS TESTING
GEORGIA ENGINEERING CERTIFICATE OF AUTHORIZATION No. PEF004822
Jodonna J. Jimenez, P.E.
GEORGIA LICENSE No. PE 031327

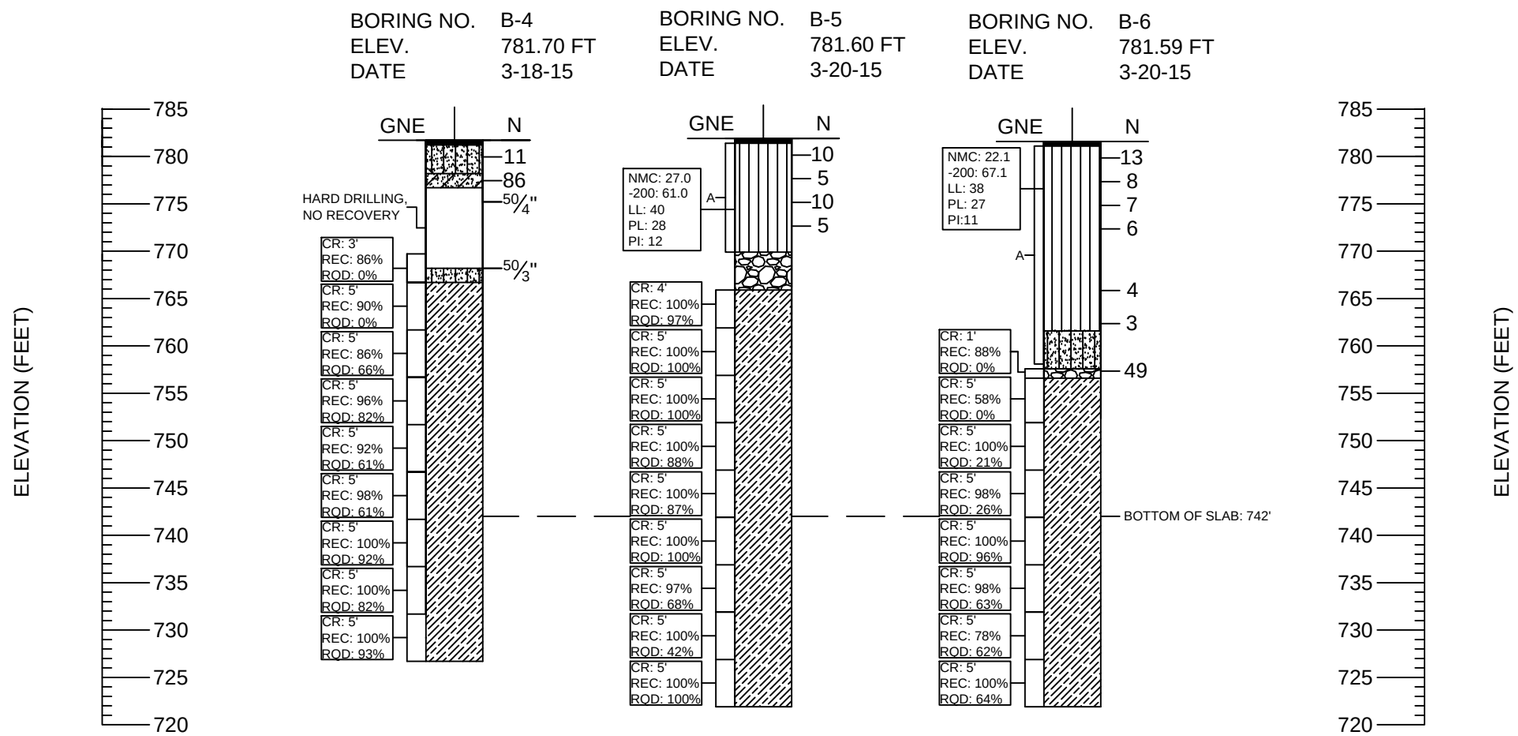
	NAME	DATE
DESIGNED BY:	LC	3/24/15
DRAWN BY:	LC	3/24/15
CHECKED BY:	JJ	3/24/15
SUPERVISED BY:		

SOIL BORING PROFILES

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia 30318

MC2 PROJ. NO. A091417.098

SHEET NO. 3



VERTICAL SCALE: 1"=16' APPROX.

LEGEND

- Topsoil or Graded Aggregate Base
- (ML) **Soft** to **Very Hard**, Brown to Dark-Brown, Orange, White, Red, Micaceous, Medium to Fine, Sandy-SILT
- (PWR) Partially Weathered Rock
- (SP) Brown, Medium to Fine SAND
- Mylonite
- (SM) **Loose** to **Very Dense**, Brown to Dark-Brown, Orange, Gray, White, Micaceous, Silty, Medium to Fine, SAND, some with Gravel
- (SC) **Very Dense**, Brown, White, Orange, Micaceous, Clayey, Medium to Fine, SAND
- (CL) **Firm** to **Stiff**, Brown to Dark-Brown, Red, Micaceous, Sandy-CLAY
- (CH) **Stiff**, Gray, Brown, Micaceous, CLAY

NOTES:

- WATER TABLE
- WATER LEVEL AFTER 3 DAYS
- GNE GROUNDWATER NOT ENCOUNTERED
- N SPT N-VALUE
- NMC NATURAL MOISTURE CONTENT (%)
- -200 FINES PASSING A NO. 200 SIEVE (%)
- LL LIQUID LIMIT
- PL PLASTIC LIMIT
- PI PLASTIC INDEX
- A FILL

GRANULAR MATERIALS- RELATIVE DENSITY	SPT (BLOWS/FT)
VERY LOOSE	LESS THAN 4
LOOSE	5-10
MEDIUM	11-30
DENSE	31-50
VERY DENSE	GREATER THAN 50

SILTS AND CLAYS CONSISTENCY	SPT (BLOWS/FT)
VERY SOFT	LESS THAN 2
SOFT	3-4
FIRM	5-8
STIFF	9-15
VERY STIFF	16-30
HARD	30-50
VERY HARD	GREATER THAN 50

RFP PKG #14-28
P.I. NO. 0012603

DATE	NAME	REVISION	APPROVED BY:

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Geotechnical Consultants
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Suite 2620
Kennesaw, GA 30144
Ph:770-650-0873 Fax:770-650-7825
GEOTECHNICAL • ENVIRONMENTAL MATERIALS TESTING

GEORGIA ENGINEERING CERTIFICATE OF AUTHORIZATION No. PEF004822
Jodonna J. Jimenez, P.E.
GEORGIA LICENSE No. PE 031327

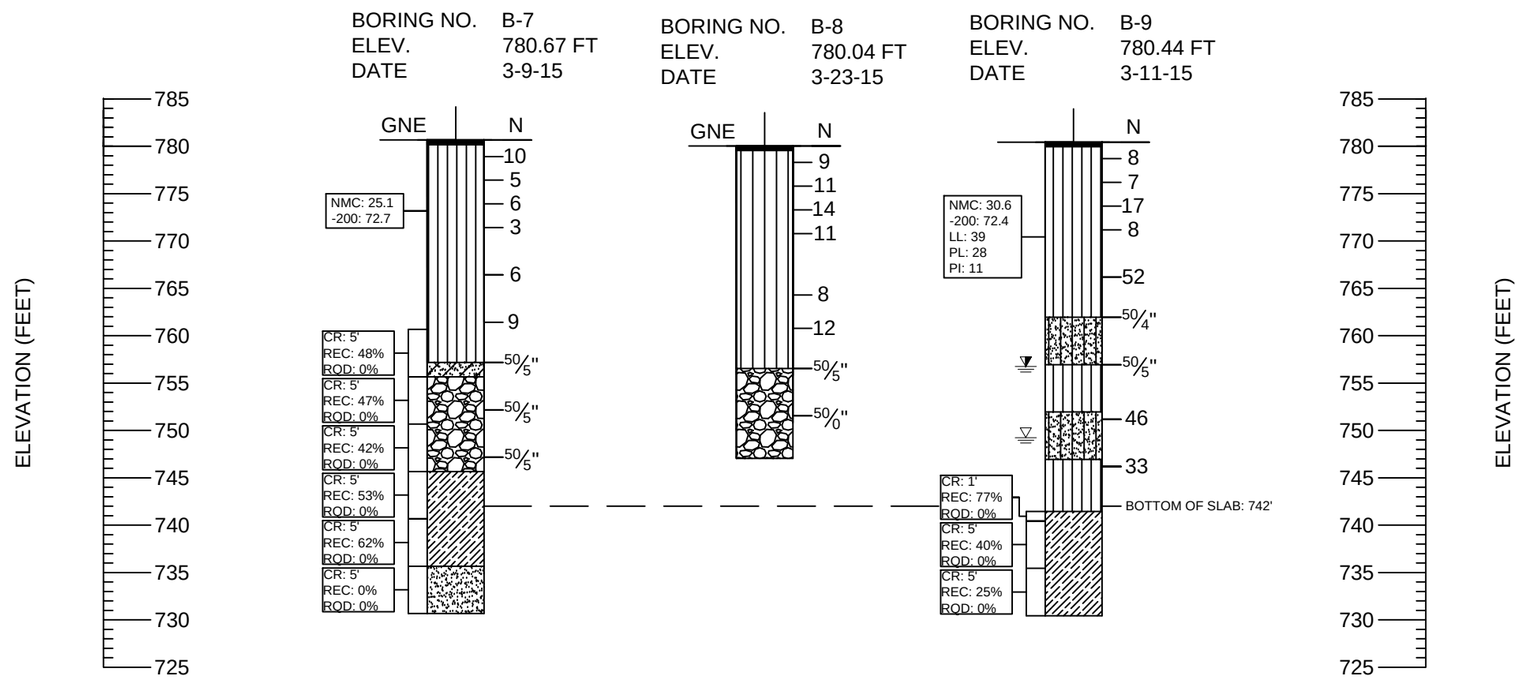
	NAME	DATE
DESIGNED BY:	LC	3/24/15
DRAWN BY:	LC	3/24/15
CHECKED BY:	JJ	3/24/15
SUPERVISED BY:		

SOIL BORING PROFILES

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia 30318

MC2 PROJ. NO. A091417.098

SHEET NO. 4



VERTICAL SCALE: 1"=16' APPROX.

LEGEND

- Topsoil or Graded Aggregate Base
- (ML) **Soft** to **Very Hard**, Brown to Dark-Brown, Orange, White, Red, Micaceous, Medium to Fine, Sandy-SILT
- (PWR) Partially Weathered Rock
- (SP) Brown, Medium to Fine SAND
- Mylonite
- (SM) **Loose** to **Very Dense**, Brown to Dark-Brown, Orange, Gray, White, Micaceous, Silty, Medium to Fine, SAND, some with Gravel
- (SC) **Very Dense**, Brown, White, Orange, Micaceous, Clayey, Medium to Fine, SAND
- (CL) **Firm** to **Stiff**, Brown to Dark-Brown, Red, Micaceous, Sandy-CLAY
- (CH) **Stiff**, Gray, Brown, Micaceous, CLAY

NOTES:

- WATER TABLE
- WATER LEVEL AFTER 3 DAYS
- GNE GROUNDWATER NOT ENCOUNTERED
- N SPT N-VALUE
- NMC NATURAL MOISTURE CONTENT (%)
- -200 FINES PASSING A NO. 200 SIEVE (%)
- LL LIQUID LIMIT
- PL PLASTIC LIMIT
- PI PLASTIC INDEX
- A FILL

GRANULAR MATERIALS- RELATIVE DENSITY	SPT (BLOWS/FT)
VERY LOOSE	LESS THAN 4
LOOSE	5-10
MEDIUM	11-30
DENSE	31-50
VERY DENSE	GREATER THAN 50

SILTS AND CLAYS CONSISTENCY	SPT (BLOWS/FT)
VERY SOFT	LESS THAN 2
SOFT	3-4
FIRM	5-8
STIFF	9-15
VERY STIFF	16-30
HARD	30-50
VERY HARD	GREATER THAN 50

RFP PKG #14-28
P.I. NO. 0012603

DATE	NAME	REVISION	APPROVED BY:

MC SQUARED, INC.
Geotechnical Consultants
1275 Shiloh Road NW
Suite 2620
Kennesaw, GA 30144
Ph:770-650-0873 Fax:770-650-7825
GEOTECHNICAL • ENVIRONMENTAL MATERIALS TESTING

GEORGIA ENGINEERING CERTIFICATE OF AUTHORIZATION No. PEF004822
Jodonna J. Jimenez, P.E.
GEORGIA LICENSE No. PE 031327

	NAME	DATE
DESIGNED BY:	LC	3/24/15
DRAWN BY:	LC	3/24/15
CHECKED BY:	JJ	3/24/15
SUPERVISED BY:		

SOIL BORING PROFILES

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia 30318

MC2 PROJ. NO. A091417.098

SHEET NO. 5

Soil Profile

BORING ID: B-1

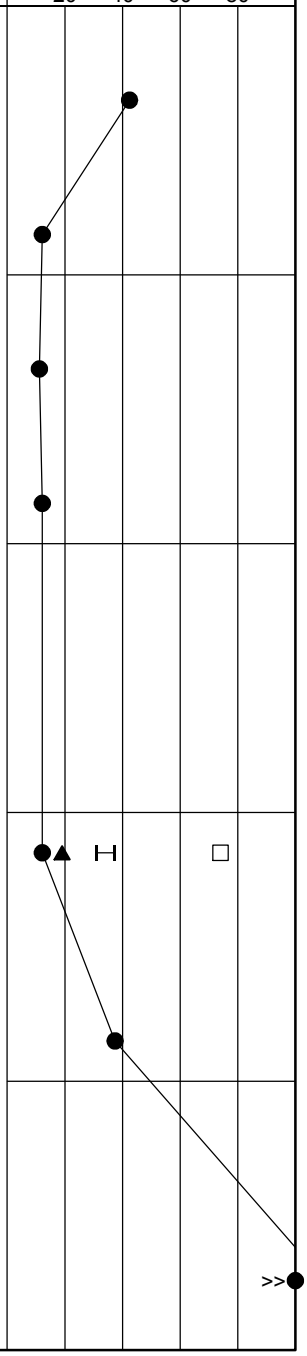
MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR
PROJECT NAME RM Clayton Water Reclamation Center Expansion
PROJECT NUMBER A091417.098
PROJECT LOCATION Atlanta, Georgia
DATE STARTED 3/9/15 **COMPLETED** 3/12/15
GROUND ELEVATION 837.26 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Kilman Bros.
GROUND WATER LEVELS:
DRILLING METHOD Split Spoon/Rock Core
AT TIME OF DRILLING Not Encountered
LOGGED BY BN **CHECKED BY** JJ
AT END OF DRILLING Not Encountered
NOTES
AFTER DRILLING Not Encountered

DEPTH (ft)	ELEV. (ft)	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
0			Topsoil.		
	836	SM	Medium dense to dense brown to dark brown, orange, gray micaceous silty medium to fine SAND with gravel. (FILL)	SS 1	4-15-28 (43)
	834			SS 2	6-6-7 (13)
5	832				
	830	CL	Stiff brown to dark brown, red, micaceous sandy CLAY with roots at 7.5 ft. (FILL to 7.5 ft)	SS 3	3-5-7 (12)
	828			SS 4	4-5-8 (13)
10					
	826				
	824				
		ML	Stiff to hard white, brown to dark brown, orange micaceous medium to fine sandy SILT.		
15	822			SS 5	5-6-7 (13)
	820				
	818			SS 6	4-5-33 (38)
20					
	816				
	814				
25			Partially Weathered Rock	SS 7	50/5"

RECOVERY % (RQD)

● SPT N VALUE ●
⊕ ORGANIC CONTENT % ⊕
PL MC LL
□ FINES CONTENT (%) □
20 40 60 80



MC2 REPORT W ELEV. RM CLAYTON.GPJ MC2.GDT 4/9/15

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Soil Profile

BORING ID: B-1

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR **PROJECT NAME** RM Clayton Water Reclamation Center Expansion

PROJECT NUMBER A091417.098 **PROJECT LOCATION** Atlanta, Georgia

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ● / ⊕ ORGANIC CONTENT % ⊕ / PL MC LL / ☐ FINES CONTENT (%) ☐ (20 40 60 80)
25				Partially Weathered Rock				
	810							
	808			auger refusal at 31 ft	SS 8	50/5"		>>●
30								
	806			(30.0' - 35.0') MYLONITE (Black) dark gray to black, hard, fresh to moderately weathered, 20 to 25 degree foliation, fine grained. (30.0' - 30.4') many fractures, 20 to 30 degrees, planar to irregular, rough, slightly to moderately weathered, FeOx staining present (33.25') 25 degrees, irregular, rough, slightly weathered	RC 1		97 (90)	
	804							
35								
	802			(35.0' - 40.0') MYLONITE (Black) dark gray to black, hard, fresh to highly weathered from 37.9' to 38.1', 25 to 45 degree foliation, fine grained. (35.85') 25 degree, planar, smooth, slightly weathered, FeOx staining present (37.9' - 38.1') many fractures, 20 degrees, non-planar, rough, highly weathered, FeOx staining present	RC 2		100 (98)	
	800							
	798							
40								
	796			(40.0' - 45.0') MYLONITE (Black interelayered with White) dark gray to black, white to light gray, hard, fresh, fine grained, 30 to 50 degree foliation. (42.2') 20 degrees, non-planar, rough, fresh to slightly weathered (42.65') 45 degrees, planar, smooth, slightly weathered (43.0') horizontal, non-planar, rough, slightly weathered (43.85' - 44.2') many fractures, 35 to 40 degrees, planar, smooth to rough, slightly weathered (44.55' - 45.0') same	RC 3		100 (76)	
	794							
45								
	792			(45.0' - 50.0') MYLONITE (Black interlayered with White) dark gray to black, white to light gray, hard to soft at highly weathered zones, slightly to highly weathered from 49.35' to 49.85', fine grained, 30 to 50 degree foliation. (45.3' - 46.45') many fractures, horizontal, irregular, rough, slightly weathered (47.0' - 47.8') many fractures, horizontal to 35 degrees, irregular, rough, slightly to moderately weathered (49.35' - 49.85') many fractures, horizontal to 25 degrees, irregular, rough, moderately to highly weathered, FeOx staining present	RC 4		87 (32)	
	790							
	788							
50								
	786			(50.0' - 55.0') MYLONITE (Black) dark gray to black, hard, fresh to moderately weathered, 30 - 60 degree foliation, fine grained. (50.0' - 51.8') many fractures, horizontal to 30 degrees, planar to irregular, rough, fresh to slightly weathered, FeOx staining present	RC 5		86 (47)	
	784							

(Continued Next Page)

Soil Profile

BORING ID: B-1

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR **PROJECT NAME** RM Clayton Water Reclamation Center Expansion

PROJECT NUMBER A091417.098 **PROJECT LOCATION** Atlanta, Georgia

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ● / ⊕ ORGANIC CONTENT % ⊕ / PL MC LL / ☐ FINES CONTENT (%) ☐ (20 40 60 80)
55	782							
				(55.0' - 59.3') MYLONITE (Black) dark gray to black, hard, fresh, fine grained, 55 degree foliation. (59.3' - 60.0') MYLONITE (White) white to light gray, hard, fresh, fine grained, 45 degree foliation. (55.2') 55 degrees, planar, smooth, fresh (56.1') same (56.45') same (56.55') same (57.75') same (58.9' - 60.0') 4 fractures, 45 to 55 degrees, planar, fresh	RC 6		98 (63)	
	780							
	778							
60								
	776			(60.0' - 65.0') MYLONITE (White interlayered with Black) white to light gray, dark gray to black, hard, fresh, 50 - 55 degree foliation, fine grained. (64.25') 50 degree, planar, smooth, fresh (64.8) horizontal to 50 degrees, non-planar, rough, slightly weathered	RC 7		98 (88)	
	774							
65	772							
				(65.0' - 70.0') MYLONITE (Black interlayered with White) white to light gray, dark gray to black, hard, fresh, fine grained, 55 to 65 degree foliation. (65.2') horizontal, irregular, rough, fresh (66.5') 55 degree, planar, rough, fresh (66.65') same	RC 8		98 (89)	
	770							
	768							
70								
	766			(70.0' - 75.0') MYLONITE (Black interlayered with White) dark gray to black, white to light gray, hard to soft in highly weathered zones, fresh to highly weathered from 71.2' to 75.0', strongly contorted horizontal to 65 degree foliation, fine grained. (71.2' - 75.0') many fractures, horizontal to 65 degrees, non-planar to irregular, rough, moderately to highly weathered, FeOx staining present	RC 9		79 (24)	
	764							
75	762			Bottom of hole at 75.0 feet.				
	760							
	758							
	756							

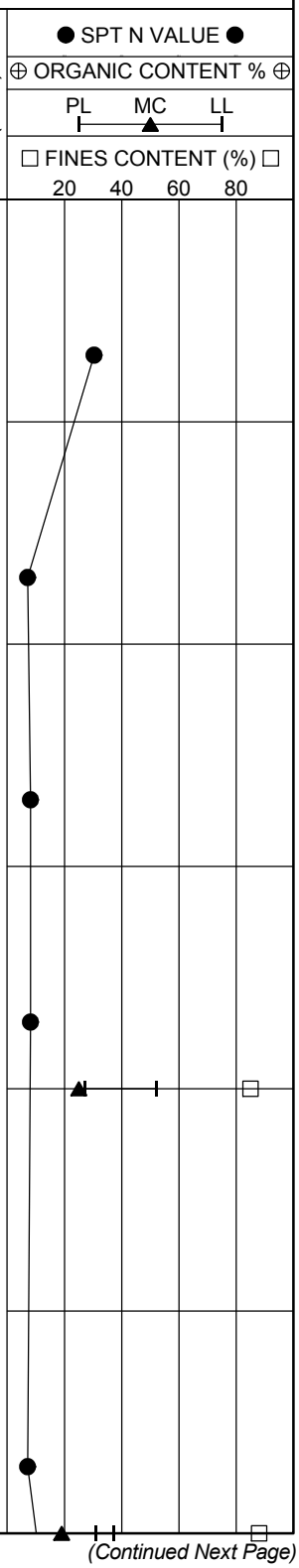
Soil Profile

BORING ID: B-2

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR
PROJECT NAME RM Clayton Water Reclamation Center Expansion
PROJECT NUMBER A091417.098
PROJECT LOCATION Atlanta, Georgia
DATE STARTED 3/10/15 **COMPLETED** 3/16/15
GROUND ELEVATION 837.00 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Kilman Bros.
GROUND WATER LEVELS:
DRILLING METHOD Split Spoon/Rock Core
AT TIME OF DRILLING Not Encountered
LOGGED BY BN **CHECKED BY** JJ
AT END OF DRILLING Not Encountered
NOTES
AFTER DRILLING Not Encountered

DEPTH (ft)	ELEV. (ft)	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
0.0			Topsoil.		
	836	SM	Dense gray micaceous silty SAND with gravel. (FILL)	SS 1	10-17-14 (31)
2.5	834				
		CL	Firm to stiff gray, brown to reddish brown micaceous medium to fine sandy lean CLAY with gravel. (FILL)	SS 2	3-4-4 (8)
5.0	832				
	830			SS 3	5-4-5 (9)
7.5					
	828	CH	Stiff gray brown micaceous heavy CLAY.	SS 4	2-4-5 (9)
10.0		ML	Firm to very stiff brown micaceous medium to fine sandy SILT.		
	826				
12.5	824				
				SS 5	2-4-4 (8)
15.0	822				



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Soil Profile

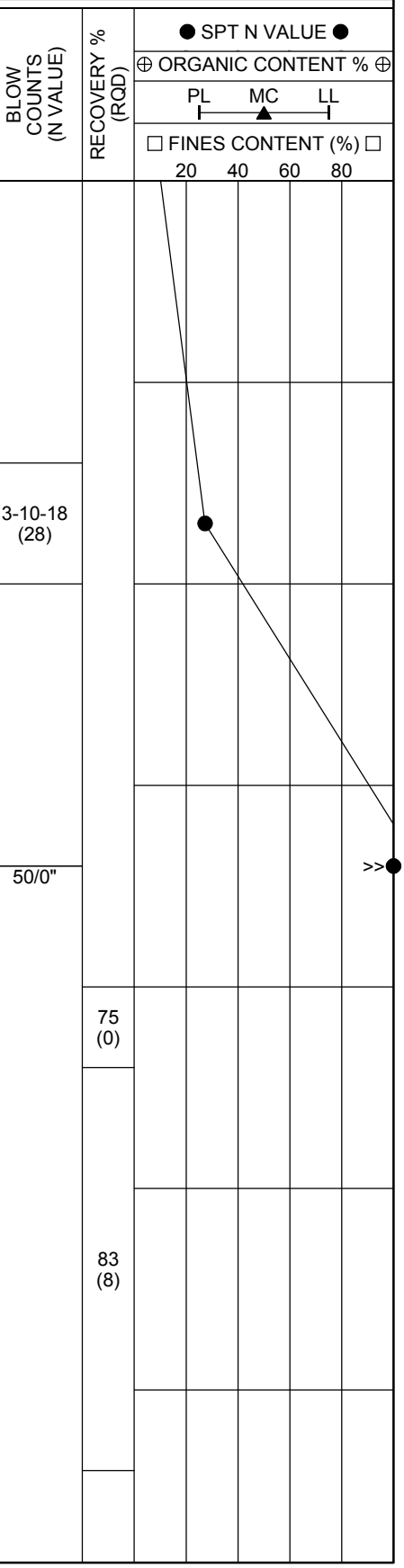
BORING ID: B-2

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR **PROJECT NAME** RM Clayton Water Reclamation Center Expansion

PROJECT NUMBER A091417.098 **PROJECT LOCATION** Atlanta, Georgia

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
15.0				Firm to very stiff brown micaceous medium to fine sandy SILT.			
	820						
17.5							
	818		ML		SS 6	3-10-18 (28)	
20.0							
	816						
22.5							
	814						
				Partially Weathered Rock. auger refusal at 26 ft	SS 7	50/0"	
25.0	812			(25.0' - 26.0') MYLONITE (Black) dark gray to black, hard, slightly weathered, 40 to 65 degree foliation, fine grained, FeOx staining present.	RC 1		75 (0)
				(25.0' - 25.75') many fractures, 35 to 60 degrees, non-planar to irregular, rough, FeOx staining present			
	810			(26.0' - 27.2') MYLONITE (Black) dark gray to black, hard, slightly weathered, 20 to 60 degree foliation, fine grained, FeOx staining present. (27.2' - 30.0') Partially Weathered Rock			
27.5				(26.0' - 27.2') many fractures, horizontal to 30 degrees, irregular, rough, FeOx staining present	RC 2		83 (8)
	808						
30.0							
	806						



MC2 REPORT W ELEV. RM CLAYTON.GPJ MC2.GDT 4/9/15

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Soil Profile

BORING ID: B-2

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR **PROJECT NAME** RM Clayton Water Reclamation Center Expansion

PROJECT NUMBER A091417.098 **PROJECT LOCATION** Atlanta, Georgia

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ● / ⊕ ORGANIC CONTENT % ⊕ / PL MC LL / ☐ FINES CONTENT (%) ☐ (20 40 60 80)
32.5				(31.0' - 32.6') Partially Weathered Rock (32.6' - 36.0') MYLONITE (Black), dark gray to black, brown, hard, slightly to completely weathered, 25 degree foliation, fine grained, FeOx staining present. (32.6' - 36) Intensely to Moderately fractured, horizontal to 25 degrees, planar to non-planar, rough, moderately to completely weathered	RC 3		93 (24)	
	804							
35.0	802							
	800			(36.0' - 39.85') MYLONITE (Black), dark gray to black, hard to soft in completely weathered zones, slightly to completely weathered at 36.0' and 37.8', 20 to 40 degree contorted foliation, fine grained FeOx staining present. (39.85' - 41') MYLONITE (White), white to light gray, hard, slightly weathered, 20 to 40 degree foliation, fine grained, FeOx staining present. (36.0' - 36.15') Intensely fractured, horizontal to 10 degrees, non-planar, rough, moderately to highly weathered, FeOx staining present (37.1' - 37.75') Intensely fractured, 10 to 45 degrees, planar to non-planar, rough, moderately to highly weathered, FeOx staining present (38.1') 40 degrees, non-planar, rough, slightly weathered, FeOx staining present (38.45') horizontal, non-planar, rough, slightly weathered, FeOx staining present (40.0') same (40.4') 10 degrees, non-planar, rough, slightly weathered, FeOx staining present (40.5') same	RC 4		90 (64)	
37.5								
	798							
40.0								
	796							
42.5				(41.0' - 46.0') MYLONITE (Black interlayered with White) dark gray to black, white to light gray, hard, fresh to slightly weathered, contorted horizontal to 35 degree foliation, fine grained. (41.55') 10 degrees, non-planar, rough, slightly weathered, FeOx staining present (42.45') horizontal, non-planar, rough, slightly weathered, FeOx staining present (42.6') 35 degrees, irregular, rough, slightly weathered	RC 5		100 (96)	
	794							
45.0	792							
	790			(46.0' - 51.0') MYLONITE (Black) dark gray to black, hard to very hard, fresh to slightly weathered, 20 to 40 degree foliation, fine grained. (46.1') 35 degrees, irregular, rough, slightly weathered				
47.5					RC 6		100 (99)	
	788							

(Continued Next Page)

Soil Profile

BORING ID: B-2

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR **PROJECT NAME** RM Clayton Water Reclamation Center Expansion

PROJECT NUMBER A091417.098 **PROJECT LOCATION** Atlanta, Georgia

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ● / ⊕ ORGANIC CONTENT % ⊕ / PL MC LL / ☐ FINES CONTENT (%) ☐ (20 40 60 80)
50.0	786			(46.0' - 51.0') MYLONITE (Black) dark gray to black, hard to very hard, fresh to slightly weathered, 20 to 40 degree foliation, fine grained. (46.1') 35 degrees, irregular, rough, slightly weathered				
52.5	784			(51.0' - 56.0') MYLONITE (Black interlayered with White) dark gray to black, white to light gray, hard to very hard, fresh to slightly weathered, strongly contorted 30 to 45 degree foliation, fine grained.	RC 7		100 (100)	
55.0	782							
57.5	780			(56.0' - 61.0') MYLONITE (Black interlayered with White) dark gray to black, white to light gray, hard to very hard, fresh to slightly weathered, strongly contorted 30 to 35 degree foliation, fine grained.	RC 8		100 (100)	
60.0	778							
62.5	776			(61.0' - 66.0') MYLONITE (Black interlayered with White) dark gray to black, white to light gray, hard to very hard, fresh to slightly weathered, strongly contorted 35 to 45 degree foliation, fine grained.	RC 9		100 (100)	
65.0	774							
	772							

(Continued Next Page)

Soil Profile

BORING ID: B-2

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR **PROJECT NAME** RM Clayton Water Reclamation Center Expansion

PROJECT NUMBER A091417.098 **PROJECT LOCATION** Atlanta, Georgia

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
	770			(66.0' - 71.0') MYLONITE (Black) dark gray to black, hard to very hard, fresh to slightly weathered, strongly contorted 30 to 60 degree foliation, fine grained.			
67.5							
	768				RC 10		100 (91)
70.0							
	766						
				(66.0' - 71.0') MYLONITE (Black interlayered with White) dark gray to black, white to light gray, hard to very hard, fresh to slightly weathered, strongly contorted 30 degree foliation, fine grained.			
72.5							
	764				RC 11		100 (100)
75.0	762						
				Bottom of hole at 76.0 feet.			
	760						
	758						
	756						
	754						

● SPT N VALUE ●
⊕ ORGANIC CONTENT % ⊕
PL MC LL
☐ FINES CONTENT (%) ☐
20 40 60 80

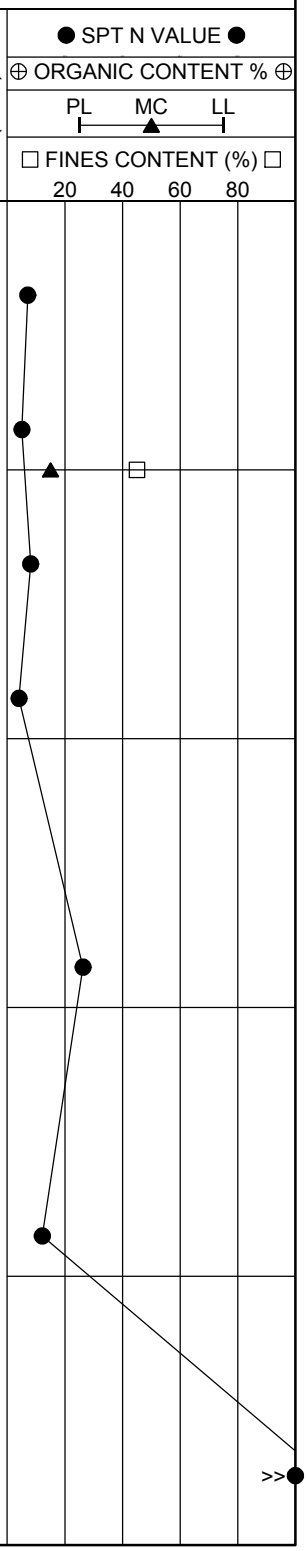
Soil Profile

BORING ID: B-3

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR
PROJECT NAME RM Clayton Water Reclamation Center Expansion
PROJECT NUMBER A091417.098
PROJECT LOCATION Atlanta, Georgia
DATE STARTED 3/10/15 **COMPLETED** 3/18/15
GROUND ELEVATION 836.05 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Kilman Bros.
GROUND WATER LEVELS:
DRILLING METHOD Split Spoon/Rock Core
AT TIME OF DRILLING Not Encountered
LOGGED BY BN **CHECKED BY** JJ
AT END OF DRILLING Not Encountered
NOTES
AFTER DRILLING Not Encountered

DEPTH (ft)	ELEV. (ft)	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
0			Topsoil.			
		SM	Loose to medium dense dark brown, gray micaceous silty medium to fine SAND with gravel and roots. (FILL)			
	834			SS 1	3-3-5 (8)	
	832			SS 2	3-3-3 (6)	
5						
	830			SS 3	3-5-4 (9)	
	828					
10	826			SS 4	1-2-3 (5)	
	824					
	822			SS 5	6-6-21 (27)	
15						
	820					
	818					
		ML	Stiff brown, white micaceous medium to fine sandy SILT.	SS 6	5-5-8 (13)	
20	816					
	814					
	812	SM	Very dense brown micaceous silty medium to fine SAND.	SS 7	50/5"	
25						



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Soil Profile

BORING ID: B-3

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR **PROJECT NAME** RM Clayton Water Reclamation Center Expansion

PROJECT NUMBER A091417.098 **PROJECT LOCATION** Atlanta, Georgia

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ● / ⊕ ORGANIC CONTENT % ⊕ / PL MC LL / ☐ FINES CONTENT (%) ☐ (20 40 60 80)
25								
	810		SM	Very dense brown micaceous silty medium to fine SAND.				
	808							
				auger refusal at 31 ft.	SS 8	39-29-50/0"		>>●
30	806			(30.0' - 35.0') MYLONITE (Black) dark gray to black, hard, slightly weathered, horizontal to 30 degree foliation, fine grained.				
	804			(30.0' - 30.65') many fractures, horizontal, non-planar, rough, slightly weathered, FeOx staining present (31.2' - 32.0') many fractures, horizontal to 20 degrees, non-planar, rough, slightly weathered, FeOx staining present (32.35') horizontal, non-planar, rough, slightly weathered (32.55') 10 degrees, non-planar, rough, slightly weathered	RC 1		78 (50)	
	802							
35				(35.0' - 40.0') MYLONITE (Black) dark gray to black, hard to soft at highly weathered zones, fresh to highly weathered from 35.4' - 36.0', horizontal to 30 degree foliation, fine grained, FeOx staining in weathered zones.				
	800							
	798			(35.4' - 36.0') Intensely fractured, horizontal to 10 degrees, non-planar, rough, highly weathered	RC 2		88 (76)	
40	796			(40.0' - 45.0') MYLONITE (Black interlayered with White) dark gray to black, white to light gray, hard, fresh to slightly weathered, strongly contorted 20 to 30 degree foliation, fine grained.				
	794			(41.3') horizontal, non-planar, rough, slightly weathered, FeOx staining present (41.55' - 41.75') 60 degrees, non-planar, rough, slightly weathered, FeOx staining present	RC 3		98 (79)	
	792							
45				(45.0' - 50.0') MYLONITE (Black interlayered with White) dark gray to black, white to light gray, hard, fresh, strongly contorted 25 to 55 degree foliation, fine grained.				
	790							
	788			(46.2') 20 degrees, non-planar, rough, slightly weathered, FeOx staining present	RC 4		100 (99)	
50	786			(50.0' - 52.3') MYLONITE (White) white to light gray, hard, fresh, 35 to 45 degree foliation, fine grained. (52.3' - 55.0') MYLONITE (Black) dark gray to black, hard, fresh, 25 to 35 degree foliation, fine grained.				
	784				RC 5		100 (100)	

(Continued Next Page)

Soil Profile

BORING ID: B-3

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR **PROJECT NAME** RM Clayton Water Reclamation Center Expansion

PROJECT NUMBER A091417.098 **PROJECT LOCATION** Atlanta, Georgia

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ● / ⊕ ORGANIC CONTENT % ⊕ / PL MC LL / ☐ FINES CONTENT (%) ☐ (20 40 60 80)
	782							
55				(55.0' - 60.0') MYLONITE (Black) dark gray to black, hard, fresh, strongly contorted horizontal to 35 degree foliation, fine grained. (57.15' - 57.35') 45 degrees, irregular, rough, fresh	RC 6		100 (96)	
	780							
	778							
60	776			(60.0' - 65.0') MYLONITE (Black) dark gray to black, hard, fresh, strongly contorted 30 to 40 degree foliation, fine grained. (63.7') 25 degrees, non-planar, rough, fresh (64.4' - 65.0') many fractures, 15 to 35 degrees, non-planar to irregular, rough, slightly weathered	RC 7		100 (86)	
	774							
	772							
65				(65.0' - 70.0') MYLONITE (Black) dark gray to black, hard, fresh, strongly contorted 30 to 45 degree foliation, fine grained. (65.7' - 66.75') many fractures, 15 to 60 degrees, non-planar to irregular, fresh (69.6) 35 degrees, planar, rough, fresh (69.85) 15 degrees, non-planar, rough, fresh	RC 8		100 (62)	
	770							
	768							
70	766			(70.0' 75.0') MYLONITE (Black interlayered with White) dark gray to black, white to light gray, hard, fresh, strongly contorted 40 to 45 degree foliation, fine grained. (72.7' - 72.95') many fractures, 15 to 50 degrees, non-planar, rough, fresh (73.45') horizontal, non-planar, rough, fresh (73.9' - 74.6') many fractures, 25 to 45 degrees, rough, fresh	RC 9		100 (66)	
	764							
	762							
75				Bottom of hole at 75.0 feet.				
	760							
	758							
	756							
	754							

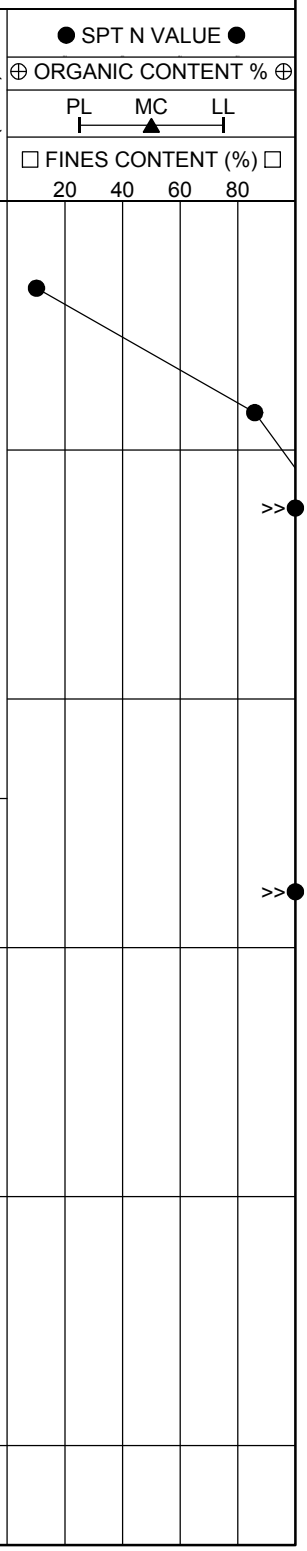
Soil Profile

BORING ID: B-4

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR		**PROJECT NAME** RM Clayton Water Reclamation Center Expansion	
PROJECT NUMBER A091417.098		**PROJECT LOCATION** Atlanta, Georgia	
DATE STARTED 3/6/15	**COMPLETED** 3/18/15	**GROUND ELEVATION** 781.70 ft	**HOLE SIZE** 6"
DRILLING CONTRACTOR Kilman Bros.		**GROUND WATER LEVELS:**	
DRILLING METHOD Split Spoon/Rock Core		**AT TIME OF DRILLING** Not Encountered	
LOGGED BY BN	**CHECKED BY** JJ	**AT END OF DRILLING** Not Encountered	
NOTES		**AFTER DRILLING** Not Encountered	

DEPTH (ft)	ELEV. (ft)	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
0			Graded Aggregate Base.			
	780	ML	Stiff brown, white, orange micaceous medium to fine sandy SILT with gravel.	SS 1	6-6-5 (11)	
5	778	SC	Very dense brown, white, orange micaceous clayey medium to fine SAND.	SS 2	6-36-50 (86)	
	776		Hard drilling, no sample.	SS 3	50/4"	
10	774					
	772					
	770					
	768		(12.0'-15.0') MYLONITE (Black) dark gray to black, brown, moderately soft to hard, moderately to highly weathered, strongly contorted 40 degree foliation, fine grained, FeOx staining present throughout.	RC 1	13-50/3"	86 (0)
15	766		(12.0'-15.0') Very Intensely to Intensely fractured, horizontal to 45 degrees, planar to irregular, rough, moderately to highly weathered, FeOx staining present auger refusal at 15 ft.	SS 4		
	764		(15.0'-20.0') MYLONITE (Black) dark gray black, brown, moderately soft to hard, moderately to highly weathered, strongly contorted 30 to 50 degree foliation, fine grained, FeOx staining present throughout.	RC 2		90 (0)
20	762		(15.0'-20.0') Very Intensely to Intensely fractured, horinzontal to vertical, planar to irregular, rough, moderately to highly weathered, FeOx staining present			
	760		(20.0'-21.8') MYLONITE (Black) dark gray to black, brown, moderately soft to hard, moderately weathered, strongly contorted 30 to 35 degree foliation, fine grained, FeOx staining present throughout.	RC 3		86 (66)
	758		(21.8'-25.0') MYLONITE (White) white to light gray, brown, hard, slightly weathered, 25 to 30 degree foliation, fine grained, FeOx staining present. (20.0'-20.9') many fractures, horizontal to 20 degrees, planar to non-planar, rough, slightly weathered, FeOx staining present			
25	756		(22.45'-25.0') many fractures, 20 to 70 degrees, planar to non-planar, rough, slightly weathered, FeOx staining present			



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Soil Profile

BORING ID: B-4

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR **PROJECT NAME** RM Clayton Water Reclamation Center Expansion

PROJECT NUMBER A091417.098 **PROJECT LOCATION** Atlanta, Georgia

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ● / ⊕ ORGANIC CONTENT % ⊕ / PL MC LL / ☐ FINES CONTENT (%) ☐ (20 40 60 80)
	754			(25.0'-30.0') MYLONITE (White) white to light gray, brown, soft to hard, slightly to completely weathered from 25.8'-26.5', 10 to 30 degree foliation, fine grained, FeOx staining present throughout. (25.0'-30.0') Intensely to Moderately fractured, 10 to 30 degrees, planar to non-planar, rough, FeOx staining present.	RC 4		96 (82)	
30	752							
	750			(30.0'-33.65') MYLONITE (White) white to light gray, brown, hard, slightly weathered, 25 to 45 degree foliation, FeOx staining present. (33.65'-35.0') MYLONITE (Black) dark gray to black, hard, fresh to slightly weathered, 35 degree foliation, fine grained, FeOx staining present. (30.0'-35.0') Intensely to Moderately fractured, 35 to 40 degrees, planar to irregular, slightly weathered, rough, FeOx staining present	RC 5		92 (61)	
	748							
35								
	746			(35.0'-40.0') MYLONITE (Black) dark gray to black, hard, slightly weathered, strongly contorted 20 to 40 degree foliation, fine grained, slight FeOx staining present. (35.0'-38.5') Intensely to Moderately fractured, 30 to 45 degrees, planar to irregular, slightly weathered, rough, FeOx staining present	RC 6		98 (61)	
	744							
40	742							
	740			(40.0'-45.0') MYLONITE (White interlayered with Black) white to light gray, dark gray to black, hard, fresh to slightly weathered, 35 degree foliation, fine grained, FeOx staining present. (41.7') 30 degrees, planar, rough, slightly weathered, FeOx staining present (42.1') 35 degrees, planar, rough, slightly weathered, FeOx staining present (44.3') Same (44.45') Same	RC 7		100 (92)	
	738							
45								
	736			(45.0'-50.0') MYLONITE (White interlayered with Black) white to light gray, dark gray to black, hard, fresh to slightly weathered, 35 degree foliation, fine grained, FeOx staining present. (46.25') two fractures, 25 degrees, planar, rough, slightly weathered (46.6'-46.3') many fractures, 20 to 45 degrees, planar to non planar, rough, slightly weathered, FeOx staining present (47.3') 30 degrees, planar, rough, slightly weathered (47.35') Same	RC 8		100 (82)	
	734							
50	732							
	730			(50.0'-55.0') MYLONITE (White interlayered with Black) white to light gray, dark gray to black, hard, fresh to slightly weathered, 35 degree foliation, fine grained, FeOx staining present. (53.9') 40 degrees, planar, rough, slightly weathered (54.15') Same (54.75') 25 degrees, planar, rough, slightly weathered	RC 9		100 (93)	
	728							
55								
	726			Bottom of hole at 55.0 feet.				
	724							

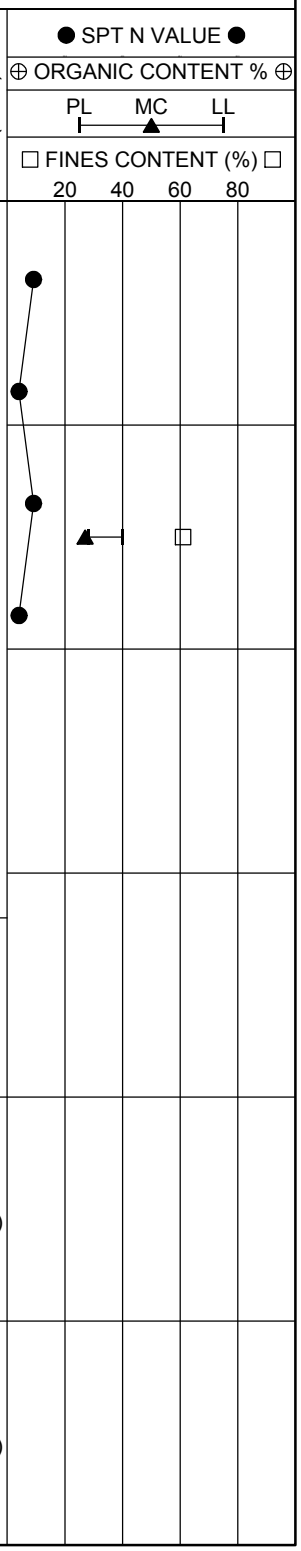
Soil Profile

BORING ID: B-5

MC² Geotechnical • Environmental Materials Testing

CLIENT BGR
PROJECT NAME RM Clayton Water Reclamation Center Expansion
PROJECT NUMBER A091417.098
PROJECT LOCATION Atlanta, Georgia
DATE STARTED 3/6/15 **COMPLETED** 3/20/15
GROUND ELEVATION 781.6 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Kilman Bros.
GROUND WATER LEVELS:
DRILLING METHOD Split Spoon/Rock Core
AT TIME OF DRILLING Not Encountered
LOGGED BY BN **CHECKED BY** JJ
AT END OF DRILLING Not Encountered
NOTES
AFTER DRILLING Not Encountered

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
0				Graded Aggregate Base.			
	780		ML	Firm to stiff reddish brown to brown, white, orange micaceous medium fine to fine sandy SILT with gravel. (FILL)	SS 1	7-5-5 (10)	
	778				SS 2	4-4-1 (5)	
5	776						
	774				SS 3	2-5-5 (10)	
10	772				SS 4	1-2-3 (5)	
	770						
	768			Partially Weathered Rock.			
15	766			auger refusal at 16 ft.			
	764			(16.0'-20.0') MYLONITE (Black) dark gray to black, hard, fresh, 25 degree foliation, fine grained. (16.0'-16.2') 75 degrees, non-planar, rough, slightly weathered, FeOx staining present	RC 1		100 (97)
20	762						
	760			(20.0'-25.0') MYLONITE (Black) dark gray to black, hard, fresh, 25 to 45 degree foliation, fine grained.	RC 2		100 (100)
	758						
25	756			(25.0'-30.0') MYLONITE (Black) dark gray to black, hard, fresh, 25 to 40 degree foliation, fine grained.	RC 3		100 (100)
	754						
30	752						



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Soil Profile

BORING ID: B-5

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR **PROJECT NAME** RM Clayton Water Reclamation Center Expansion

PROJECT NUMBER A091417.098 **PROJECT LOCATION** Atlanta, Georgia

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ● / ⊕ ORGANIC CONTENT % ⊕ / PL MC LL / ☐ FINES CONTENT (%) ☐ (20 40 60 80)
30								
	750			(30.0' - 35.0') MYLONITE (Black) dark gray to black, hard, fresh, 30 to 40 degree foliation, fine grained. (37.6' - 38.15') Vertical fracture truncating into 20 degree cross core fracture, non-planar, rough, FeOx staining present	RC 4		100 (88)	
	748							
35								
	746			(35.0' - 40.0') MYLONITE (Black interlayered with White) dark gray to black, white to light gray, hard, fresh, 20 to 30 degree foliation, fine grained. (38.6') 35 degrees, planar, rough, fresh (39.4') 20 degrees, planar, rough, fresh (39.2') 35 degrees, planar, rough, fresh	RC 5		100 (87)	
	744							
	742							
40								
	740			(40.0' - 45.0') MYLONITE (Black interlayered with White) dark gray to black, white to light gray, hard, fresh, 20 to 30 degree foliation, fine grained.	RC 6		100 (100)	
	738							
45								
	736			(45.0' - 50.0') MYLONITE (White) white to light gray, hard, slightly weathered, 25 to 45 degree foliation, fine grained, FeOx staining present. (45.6' - 46.1') many fractures, 25 degrees, planar, rough, slightly weathered, FeOx staining present (48.5') 25 degrees, planar, rough, slightly weathered, FeOx staining present (49.0') 45 degrees, planar, rough, slightly weathered (49.75') 25 degrees, planar, rough, slightly weathered	RC 7		97 (68)	
	734							
	732							
50								
	730			(50.0' - 55.0') MYLONITE (White interlayered with Black) white to light gray, dark gray to black, hard, fresh to slightly weathered, 25 to 35 degree foliation, fine grained, FeOx staining present. (50.2') 25 degrees, planar, rough, slightly weathered, FeOx staining present (51.95') 35 degrees, planar, rough, slightly weathered (52.35') same (52.6') same (53.1') same (53.5' - 55.0') many fractures, 20 degrees to vertical, planar to irregular, rough, slightly weathered, FeOx staining present	RC 8		100 (42)	
	728							
55								
	726			(55.0' - 60.0') MYLONITE (Black) dark gray to black, hard, fresh, 15 to 30 degree foliation, fine grained.	RC 9		100 (100)	
	724							
	722							
60								
	720			Bottom of hole at 60.0 feet.				
	718							

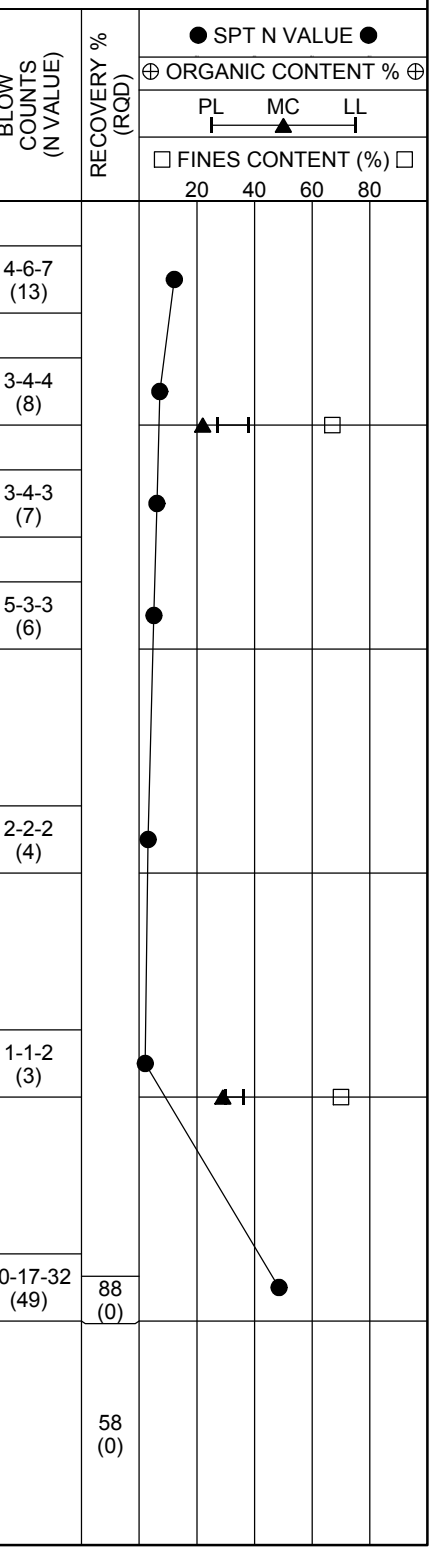
Soil Profile

BORING ID: B-6

MC² Geotechnical • Environmental Materials Testing

CLIENT BGR
PROJECT NAME RM Clayton Water Reclamation Center Expansion
PROJECT NUMBER A091417.098
PROJECT LOCATION Atlanta, Georgia
DATE STARTED 3/6/15 **COMPLETED** 3/20/15
GROUND ELEVATION 781.59 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Kilman Bros.
GROUND WATER LEVELS:
DRILLING METHOD Split Spoon/Rock Core
AT TIME OF DRILLING Not Encountered
LOGGED BY BN **CHECKED BY** JJ
AT END OF DRILLING Not Encountered
NOTES
AFTER DRILLING Not Encountered

DEPTH (ft)	ELEV. (ft)	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
0			Graded Aggregate Base.			
	780	ML	Soft to stiff red, brown to dark brown, white micaceous medium to fine sandy SILT with rock in sample from 8.5 to 15 ft. (FILL)	SS 1	4-6-7 (13)	
	778			SS 2	3-4-4 (8)	
5	776					
	774			SS 3	3-4-3 (7)	
	772			SS 4	5-3-3 (6)	
10						
	770					
	768			SS 5	2-2-2 (4)	
15	766					
	764					
	762			SS 6	1-1-2 (3)	
20		SM	Dense brown to dark brown micaceous medium to fine silty SAND.			
	760					
	758		auger refusal at 28'			
25			(24.0'-25.0') Partially Weathered Rock.	SS 7	20-17-32 (49)	88 (0)
	756		(25'-30') MYLONITE (White interlayered with black) white to light gray, dark gray to black, soft to hard, moderately to completely weathered, strongly contorted 35 to 60 degree foliation, fine grained, FeOx staining present throughout.	RC 1		
	754		(25.0'-30.0') Intensely fractured, 20 to 50 degrees, planar to irregular, moderately to completely weathered, FeOx staining present	RC 2		58 (0)
30	752					



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Soil Profile

BORING ID: B-6

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR **PROJECT NAME** RM Clayton Water Reclamation Center Expansion

PROJECT NUMBER A091417.098 **PROJECT LOCATION** Atlanta, Georgia

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ● / ⊕ ORGANIC CONTENT % ⊕ / PL MC LL / ☐ FINES CONTENT (%) ☐ (20 40 60 80)
30								
	750			(30.0'-35.0') MYLONITE (Black interlayered with white) dark gray to black, white, brown, soft to hard, moderately to highly weathered, strongly contorted 45 to 60 degree foliation, fine grained, FeOx staining present. (30.0'-35.0') Intense to Moderately fractured, 30 to 60 degrees, non-planar to irregular, moderately weathered, FeOx staining present throughout	RC 3		100 (21)	
	748							
35								
	746			(35.0'-40.0') MYLONITE (Black) black to dark gray, hard, slightly to moderately weathered, 45 degree contorted foliation, fine grained FeOx staining present. (35.0'-40.0') Intense to moderately fractured, 20 to 60 degrees, planar to irregular, rough, slightly to moderately weathered, FeOx staining present	RC 4		98 (26)	
	744							
	742							
40								
	740			(40.0'-45.0') MYLONITE (Black) dark gray to black, hard, fresh to slightly weathered, 40 to 45 degree foliation, fine grained., FeOx staining present. (43.45'-43.65') 50 degrees truncating into 20 degree cross core fracture, non-planar to planar, rough, slightly weathered, FeOx staining present	RC 5		100 (96)	
	738							
45								
	736			(45.0'-50.0') MYLONITE (Black) dark gray to black, hard, fresh, 45 degree foliation, fine grained. (57.9'-59.0') many fractures, horizontal to 80 degrees, non-planar, rough, FeOx staining present (49.4') 20 degrees, non-planar, rough, slightly weathered (49.7') 30 degrees, non-planar, rough, slightly weathered	RC 6		98 (63)	
	734							
	732							
50								
	730			(50.0'-55.0') MYLONITE (Black) black to dark gray, hard, fresh to slightly weathered, 60 degree contorted foliation, FeOx staining present. (51.3'-52.2') Vertical with two 30 degree cross core fractures, non-planar, rough, slightly weathered, FeOx staining present	RC 7		78 (62)	
	728							
55								
	726			(55.0'-60.0') MYLONITE (Black) dark gray to black, hard, fresh to slightly weathered, 15 to 40 degree foliation, FeOx staining present. (55.0'-57.8') Intensely fractured, 20 to 45 degrees, non-planar to irregular, rough, slightly weathered, FeOx staining present	RC 8		100 (64)	
	724							
	722							
60								
	720			Bottom of hole at 60.0 feet.				
	718							

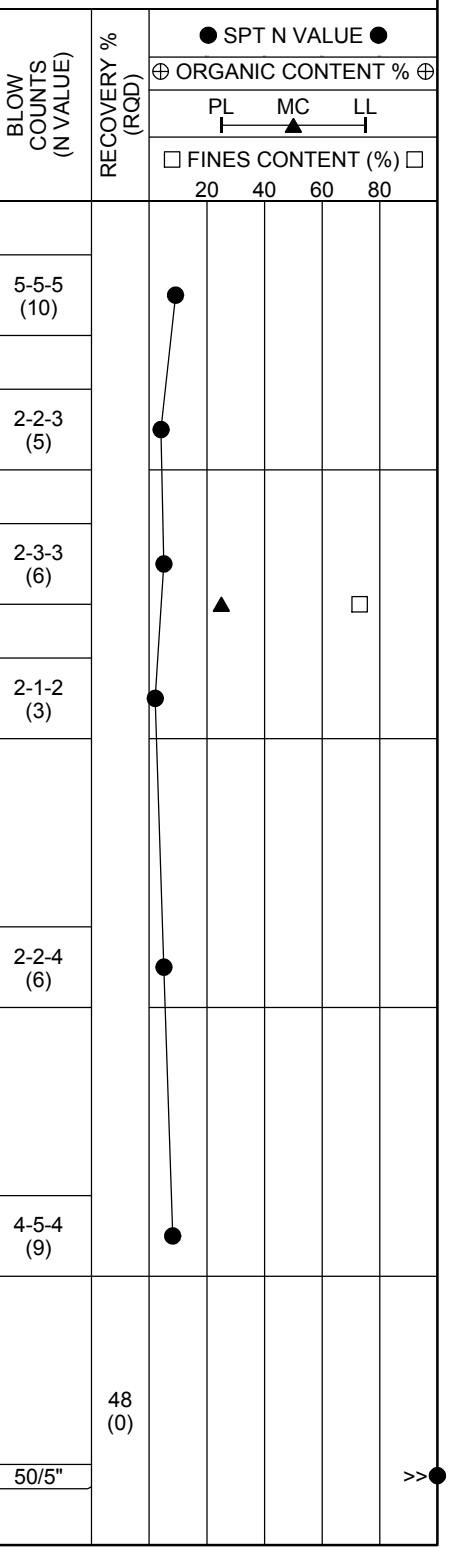
Soil Profile

BORING ID: B-7

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR
PROJECT NAME RM Clayton Water Reclamation Center Expansion
PROJECT NUMBER A091417.098
PROJECT LOCATION Atlanta, Georgia
DATE STARTED 3/9/15 **COMPLETED** 3/9/15
GROUND ELEVATION 780.67 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Kilman Bros.
GROUND WATER LEVELS:
DRILLING METHOD Split Spoon/Rock Core
AT TIME OF DRILLING Not Encountered
LOGGED BY BN **CHECKED BY** JJ
AT END OF DRILLING Not Encountered
NOTES
AFTER DRILLING Not Encountered

DEPTH (ft)	ELEV. (ft)	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
0	780		Topsoil.			
		ML	Soft to stiff brown to dark brown, orange, gray, white micaceous medium to fine sandy SILT.	SS 1	5-5-5 (10)	
	778					
5	776			SS 2	2-2-3 (5)	
	774			SS 3	2-3-3 (6)	
	772			SS 4	2-1-2 (3)	
10	770					
	768					
15	766			SS 5	2-2-4 (6)	
	764					
	762			SS 6	4-5-4 (9)	
20	760		Highly Weathered Rock, MYLONITE (White).			
	758			RC 1		48 (0)
25	756	SC	Very dense brown micaceous clayey medium to fine SAND, Highly Weathered Rock, MYLONITE (White).	SS 7	50/5"	



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Soil Profile

BORING ID: B-7

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR **PROJECT NAME** RM Clayton Water Reclamation Center Expansion

PROJECT NUMBER A091417.098 **PROJECT LOCATION** Atlanta, Georgia

DEPTH (ft)	ELEV. (ft)	GRAPHIC LOG	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	● SPT N VALUE ● / ⊕ ORGANIC CONTENT % ⊕ / PL MC LL / ☐ FINES CONTENT (%) ☐ (20 40 60 80)
25				MYLONITE (White) white, brown, soft to very soft, moderately to completely weathered throughout, strongly contorted 10 to 45 degree foliation, fine grained, FeOx staining throughout.	RC 2		47 (0)	
	754							
	752				SS 8	50/5"		>>●
30				Partially Weathered Rock, MYLONITE (White).				
	750							
	748				RC 3		42 (0)	
					SS 9	50/5"		>>●
	746							
35				Partially Weathered Rock, MYLONITE (White).				
	744			auger refusal at 37 ft	RC 4		53 (0)	
	742							
40				Partially Weathered Rock, MYLONITE (White).				
	740							
	738				RC 5		62 (0)	
	736							
45				brown, medium to fine grained micaceous SAND.				
	734		SP		RC 6		0 (0)	
	732							
50				Bottom of hole at 50.0 feet.				
	730							
	728							

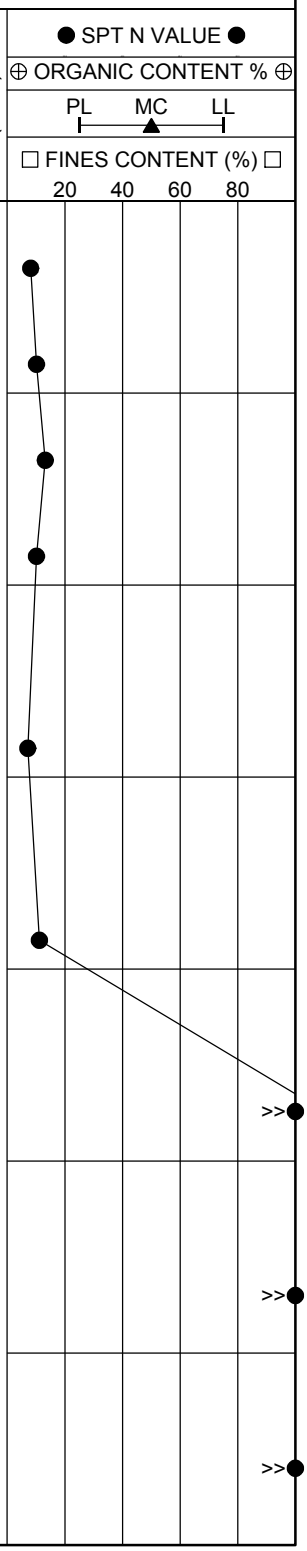
Soil Profile

BORING ID: B-8

MC² Geotechnical • Environmental Materials Testing

CLIENT BGR
PROJECT NAME RM Clayton Water Reclamation Center Expansion
PROJECT NUMBER A091417.098
PROJECT LOCATION Atlanta, Georgia
DATE STARTED 3/9/15 **COMPLETED** 3/23/15
GROUND ELEVATION 780.04 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Kilman Bros.
GROUND WATER LEVELS:
DRILLING METHOD Split Spoon/Rock Core
AT TIME OF DRILLING Not Encountered
LOGGED BY BN **CHECKED BY** JJ
AT END OF DRILLING Not Encountered
NOTES
AFTER DRILLING Not Encountered

DEPTH (ft)	ELEV. (ft)	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
0			Topsoil.			
	778	ML	Firm to stiff white, orange micaceous medium to fine sandy SILT.	SS 1	3-4-5 (9)	
	776			SS 2	4-6-5 (11)	
5						
	774			SS 3	5-5-9 (14)	
	772					
10	770			SS 4	3-6-5 (11)	
	768					
	766			SS 5	4-3-5 (8)	
15						
	764					
	762			SS 6	3-4-8 (12)	
20	760					
	758					
	756		Partially Weathered Rock.	SS 7	50/5"	
25						
	754					
	752			SS 8	50/0"	
30	750					
	748		auger refusal at 33 ft.			
	746		Bottom of hole at 33.0 feet.	SS 9	50/0"	



Soil Profile

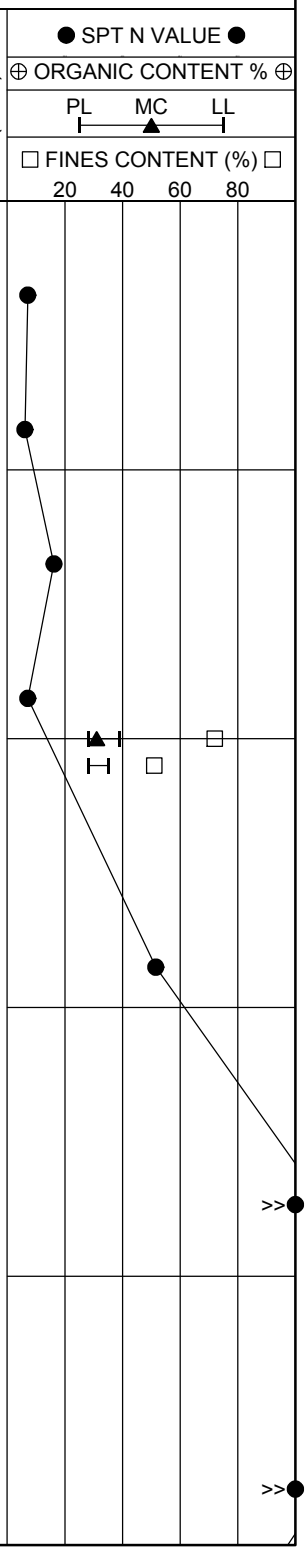
BORING ID: B-9

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR
PROJECT NAME RM Clayton Water Reclamation Center Expansion
PROJECT NUMBER A091417.098
PROJECT LOCATION Atlanta, Georgia
DATE STARTED 3/6/15 **COMPLETED** 3/11/15
GROUND ELEVATION 780.44 ft **HOLE SIZE** 6"
DRILLING CONTRACTOR Kilman Bros.
GROUND WATER LEVELS:
DRILLING METHOD Split Spoon/Rock Core
AT TIME OF DRILLING Not Measured
LOGGED BY BN **CHECKED BY** JJ
AT END OF DRILLING 31.2 ft / Elev 749.2 ft
NOTES
168hrs AFTER DRILLING 23.7 ft / Elev 756.7 ft

DEPTH (ft)	ELEV. (ft)	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)
0	780		Topsoil.		
		ML	Firm to very hard brown to dark brown, red, orange, gray, white micaceous medium to fine sandy SILT.	SS 1	4-4-4 (8)
	778				
	776			SS 2	2-2-5 (7)
5					
	774			SS 3	7-9-8 (17)
	772				
10				SS 4	3-4-4 (8)
	770				
	768				
	766			SS 5	3-8-44 (52)
15					
	764				
	762	SM	Very dense white micaceous silty medium to fine SAND.	SS 6	50/4"
20	760				
	758				
	756	ML	Very hard brown to dark brown, white micaceous sandy SILT.	SS 7	13-50/5"
25					

RECOVERY % (RQD)



MC2 REPORT W ELEV. RM CLAYTON.GPJ MC2.GDT 4/9/15

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Soil Profile

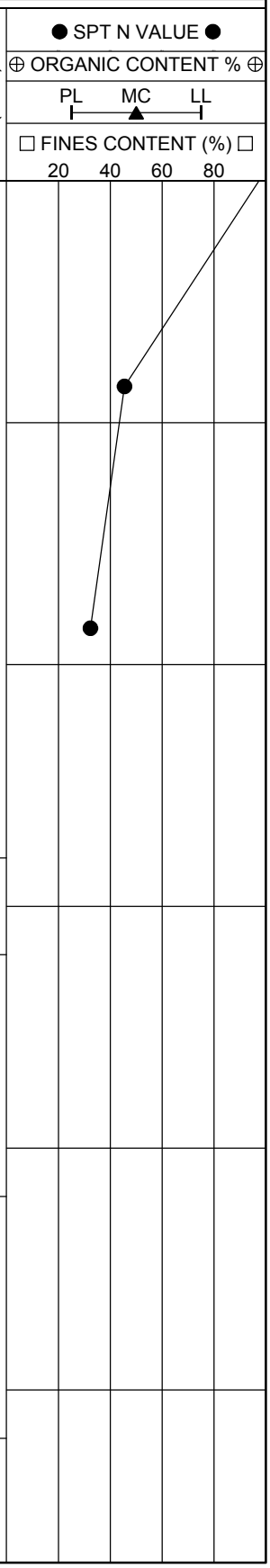
BORING ID: B-9

MC2 Geotechnical • Environmental Materials Testing

CLIENT BGR **PROJECT NAME** RM Clayton Water Reclamation Center Expansion

PROJECT NUMBER A091417.098 **PROJECT LOCATION** Atlanta, Georgia

DEPTH (ft)	ELEV. (ft)	USCS Group Symbol	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)
25	754	ML	Very hard brown to dark brown, white micaceous sandy SILT.			
30	752	SM	Dense brown to dark brown, white, damp silty medium to fine SAND.	SS 8	7-20-26 (46)	
	750					
	748					
35	746	ML	Hard brown to dark brown, gray, red micaceous medium to fine sandy SILT.	SS 9	8-15-18 (33)	
	744					
	742		auger refusal at 39 ft.			
40	740		(39.0' - 41.0') MYLONITE (White) white, yellow, brown, moderately hard to soft, moderately weathered to completely weathered, strongly contorted 37 degree foliation, fine grained, FeOx staining present throughout.	RC 1		77 (0)
			(39.0' - 41.0') Intensely fractured, irregular, rough, moderately weathered, FeOx staining present			
	738		(41.0' - 46.0') MYLONITE (White) white, yellow, brown, moderately hard to soft, moderately to completely weathered, strongly contorted 50 degree foliation, fine grained, FeOx staining present throughout.	RC 2		40 (0)
45	736		(41.0' - 46.0') Very Intensely fractured, irregular, rough, moderately to highly weathered, FeOx staining present			
	734		(46.0' - 51.0') MYLONITE (White) white, yellow, brown, moderately soft to soft, highly weathered, strongly contorted 20 degree foliation, fine grained, FeOx staining present.	RC 3		25 (0)
50	732		(46.0' - 51.0') Very Intensely fractured, irregular, rough, moderately to highly weathered, FeOx staining present			
	730					
			Bottom of hole at 51.0 feet.			
	728					



TEST PROCEDURES

The general field procedures employed by MC Squared, Inc. (**MC$^{2)}$** are summarized in the American Society for Testing and Materials (ASTM) Standard D420 which is entitled "Investigating and Sampling Soil and Rock". This recommended practice lists recognized methods for determining soil and rock distribution and groundwater conditions. These methods include geophysical and in-situ methods as well as borings.

STANDARD DRILLING TECHNIQUES

To obtain subsurface samples, borings are drilled using one of several alternate techniques depending upon the subsurface conditions. Some of these techniques are:

In Soils:

a) Continuous hollow stem augers.
b) Rotary borings using roller cone bits or drag bits, and water or drilling mud to flush the hole.
c) "Hand" augers.

In Rock:

a) Core drilling with diamond-faced, double or triple tube core barrels.
b) Core boring with roller cone bits.

The drilling method used during this exploration is presented in the following paragraph.

Hollow Stem Augering: A hollow stem augers consists of a hollow steel tube with a continuous exterior spiral flange termed a flight. The auger is turned into the ground, returning the cuttings along the flights. The hollow center permits a variety of sampling and testing tools to be used without removing the auger.

Core Drilling: Soil drilling methods are not normally capable of penetrating through hard cemented soil, weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound, continuous rock. Material which cannot be penetrated by auger or rotary soil-drilling methods at a reasonable rate is designated as “refusal material”. Core drilling procedures are required to penetrate and sample refusal materials.

Prior to coring, casing may be set in the drilled hole through the overburden soils, to keep the hole from caving and to prevent excessive water loss. The refusal materials are then cored according to ASTM D-2113 using a diamond-studded bit fastened to the end of a hollow, double or triple tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel-mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovery is measured, and the core is placed, in sequence, in boxes for storage and transported to our laboratory.

SAMPLING AND TESTING IN BOREHOLES

Several techniques are used to obtain samples and data in soils in the field; however the most common methods in this area are:

a) Standard Penetrating Testing
b) Undisturbed Sampling
c) Dynamic Cone Penetrometer Testing
d) Water Level Readings

The procedures utilized for this project are presented below.

Standard Penetration Testing: At regular intervals, the drilling tools are removed and soil samples obtained with a standard 2 inch diameter split tube sampler connected to an A or N-size rod. The sampler is first seated 6 inches to penetrate any loose cuttings, and then driven an additional 12 inches with blows of a 140 pound safety hammer falling 30 inches. Generally, the number of hammer blows required to drive the sampler the final 12 inches is designated the "penetration resistance" or "N" value, in blows per foot (bpf). The split barrel sampler is designed to retain the soil penetrated, so that it may be returned to the surface for observation. Representative portions of the soil samples obtained from each split barrel sample are placed in jars, sealed and transported to our laboratory.

The standard penetration test, when properly evaluated, provides an indication of the soil strength and compressibility. The tests are conducted according to ASTM Standard D1586. The depths and N-values of standard penetration tests are shown on the Boring Logs. Split barrel samples are suitable for visual observation and classification tests but are not sufficiently intact for quantitative laboratory testing.

Water Level Readings: Water level readings are normally taken in the borings and are recorded on the Boring Records. In sandy soils, these readings indicate the approximate location of the hydrostatic water level at the time of our field exploration. In clayey soils, the rate of water seepage into the borings is low and it is generally not possible to establish the location of the hydrostatic water level through short-term water level readings. Also, fluctuation in the water level should be expected with variations in precipitation, surface run-off, evaporation, and other factors. For long-term monitoring of water levels, it is necessary to install piezometers.

The water levels reported on the Boring Logs are determined by field crews immediately after the drilling tools are removed, and several hours after the borings are completed, if possible. The time lag is intended to permit stabilization of the groundwater level that may have been disrupted by the drilling operation.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the cave-in zone.

BORING LOGS

The subsurface conditions encountered during drilling are reported on a field boring log prepared by the Driller. The log contains information concerning the boring method, samples attempted and recovered, indications of the presence of coarse gravel, cobbles, etc., and observations of groundwater. It also contains the driller's interpretation of the soil conditions between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are kept on file in our office.

After the drilling is completed a geotechnical professional classifies the soil samples and prepares the final Boring Logs, which are the basis for our evaluations and recommendations.

SOIL CLASSIFICATION

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply his past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our Boring Logs.

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary; grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties are presented in this report.

The following table presents criteria that are typically utilized in the classification and description of soil and rock samples for preparation of the Boring Logs.

Relative Density of Cohesionless Soils From Standard Penetration Test		**Consistency of Cohesive Soils**	
Very Loose	≤ 4 bpf	Very Soft	≤ 2 bpf
Loose	5 - 10 bpf	Soft	3 - 4 bpf
Medium Dense	11 - 30 bpf	Firm	5 - 8 bpf
Dense	31 - 50 bpf	Stiff	9 - 15 bpf
Very Dense	> 50 bpf	Very Stiff	16 - 30 bpf
		Hard	30 – 50 bpf
(bpf = blows per foot, ASTM D 1586)		Very Hard	> 50 bpf

Relative Hardness of Rock		**Particle Size Identification**	
Very Soft	Hard Rock disintegrates or easily compresses to touch; can be hard to very hard soil.	Boulders	Larger than 12"
		Cobbles	3" - 12"
Soft	May be broken with fingers.	Gravel	
		Coarse	3/4" - 3"
Moderately Soft	May be scratched with a nail, corners and edges may be broken with fingers.	Fine	4.76mm - 3/4"
		Sand	
		Coarse	2.0 - 4.76 mm
Moderately Hard	Light blow of hammer required to break samples.	Medium	0.42 - 2.00 mm
		Fine	0.42 - 0.074 mm
Hard	Hard blow of hammer required to break sample.	Fines (Silt or Clay)	Smaller than 0.074 mm

Rock Continuity	**Relative Quality of Rocks**
RECOVERY = $\frac{\text{Total Length of Core}}{\text{Length of Core Run}} \times 100\ \%$	**RQD** = $\frac{\text{Total core, counting only pieces > 4" long}}{\text{Length of Core Run}} \times 100\ \%$

Description Core Recovery %		Description RQD %	
Incompetent	Less than 40	Very Poor	0 - 25 %
Competent	40 - 70	Poor	25 - 50 %
Fairly Continuous	71 - 90	Fair	50 - 75 %
Continuous	91 - 100	Good	75 - 90 %
		Excellent	90 - 100 %

APPENDIX C

Figure 1 – Seismic Refraction Traverse (Line 1)

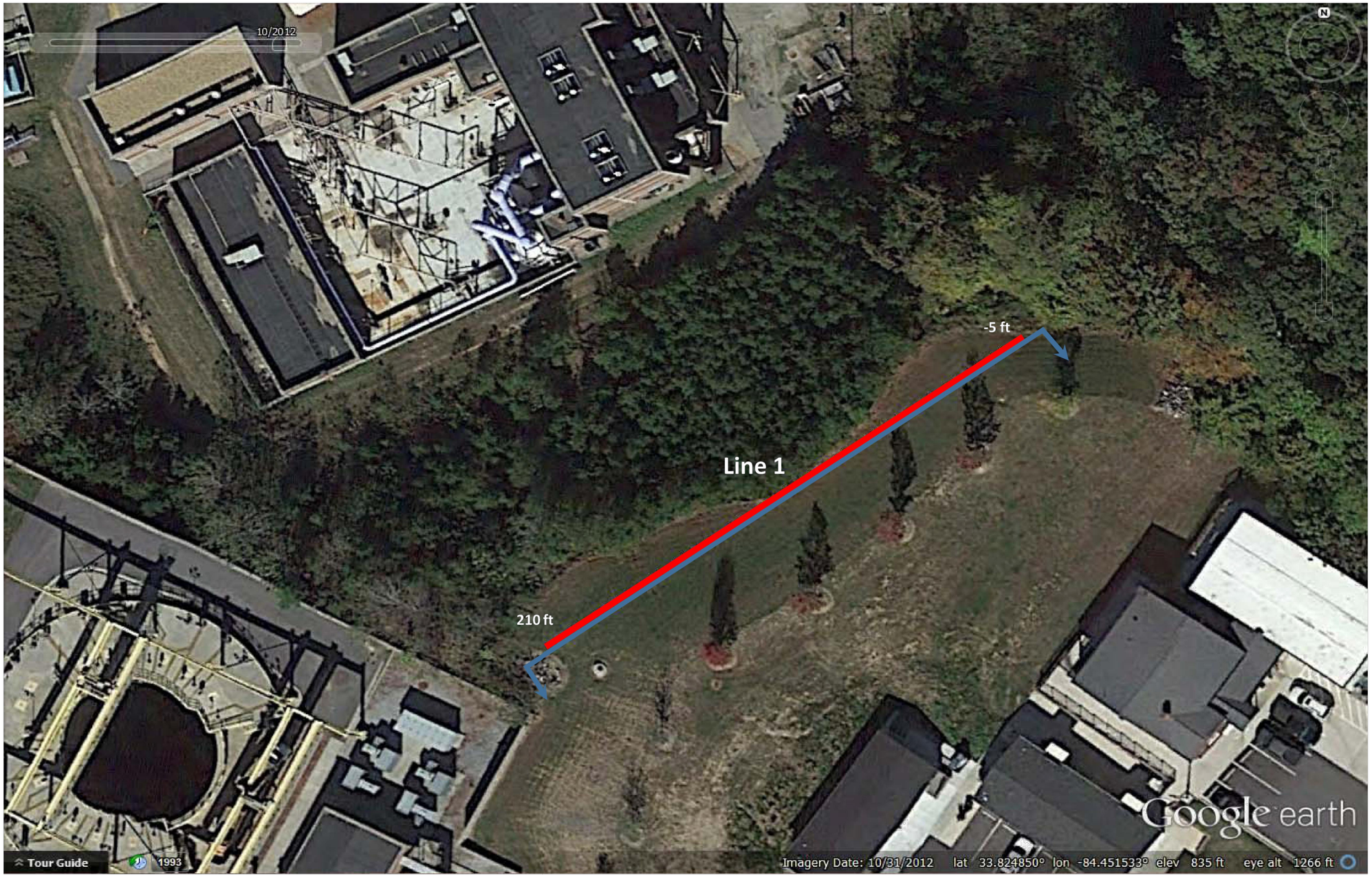
Figure 2 – Seismic Refraction Compressional (P-Wave) Profile

Figure 3 – Shear Wave Velocity Determination Approximate Location, Grit Removal Facility (Line 2)

Figure 4 – 1-D Shear Wave Velocity Model, Grit Removal Facility (Line 2)

Figure 5 – Shear Wave Velocity Determination Approximate Location, Headworks Structure (Line 3)

Figure 6 – 1-D Shear Wave Velocity Model, Headworks Structure (Line 3)



*Data courtesy of Matrix Engineering Group, Inc.

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Jodonna J. Jimenez, P.E.
GEORGIA LICENSE No. PE 031327

	NAME	DATE
DESIGNED BY:	LC	3/24/15
DRAWN BY:	LC	3/24/15
CHECKED BY:	JJ	3/24/15
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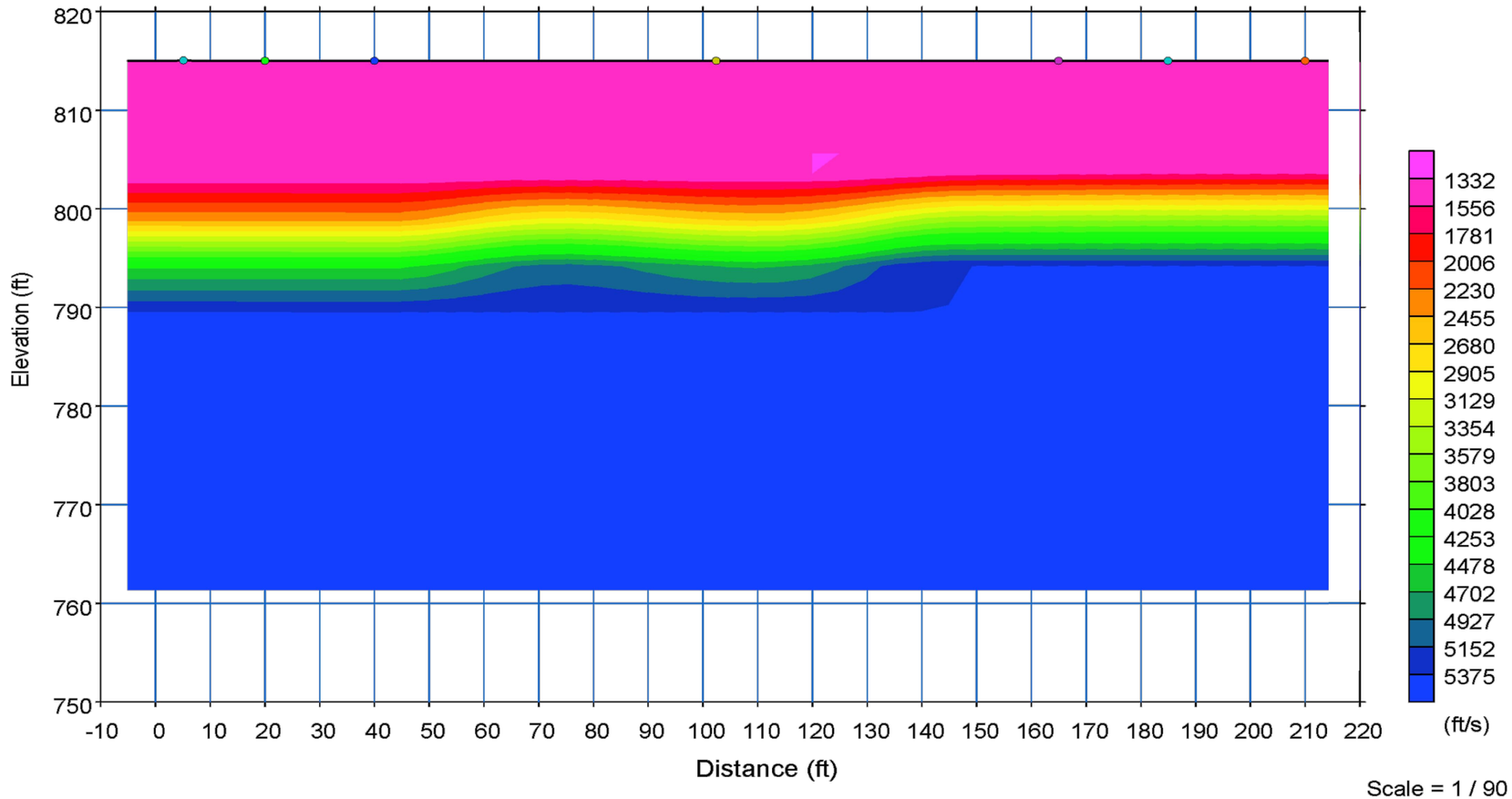
Seismic Refraction Traverse Along Slope (Line 1)

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia 30318

MC2 PROJ. NO.: A091417.098

FIGURE NO.: 1



Scale = 1 / 90

Refraction Depth Model Line 1.vs

*Data courtesy of Matrix Engineering Group, Inc.

P-Wave Velocity (ft/sec)	*Interpretation of Material Composition*
0 – 2000	*Softer materials generally consisting of soils & Saprolites which can be excavated using backhoes and scrapers.*
2000 – 5000	*Partially Weathered and Fractured Rock which can usually be ripped using large earth moving equipment in mass excavations. Trench excavation may require blasting for removal.*
>5000	*Competent Rock normally requiring blasting in trench or mass excavations*

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Seismic Refraction Compressional (P-Wave) Profile

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia 30318

MC2 PROJ. NO.: A091417.098

FIGURE NO.: 2

*Data courtesy of Matrix Engineering Group, Inc.

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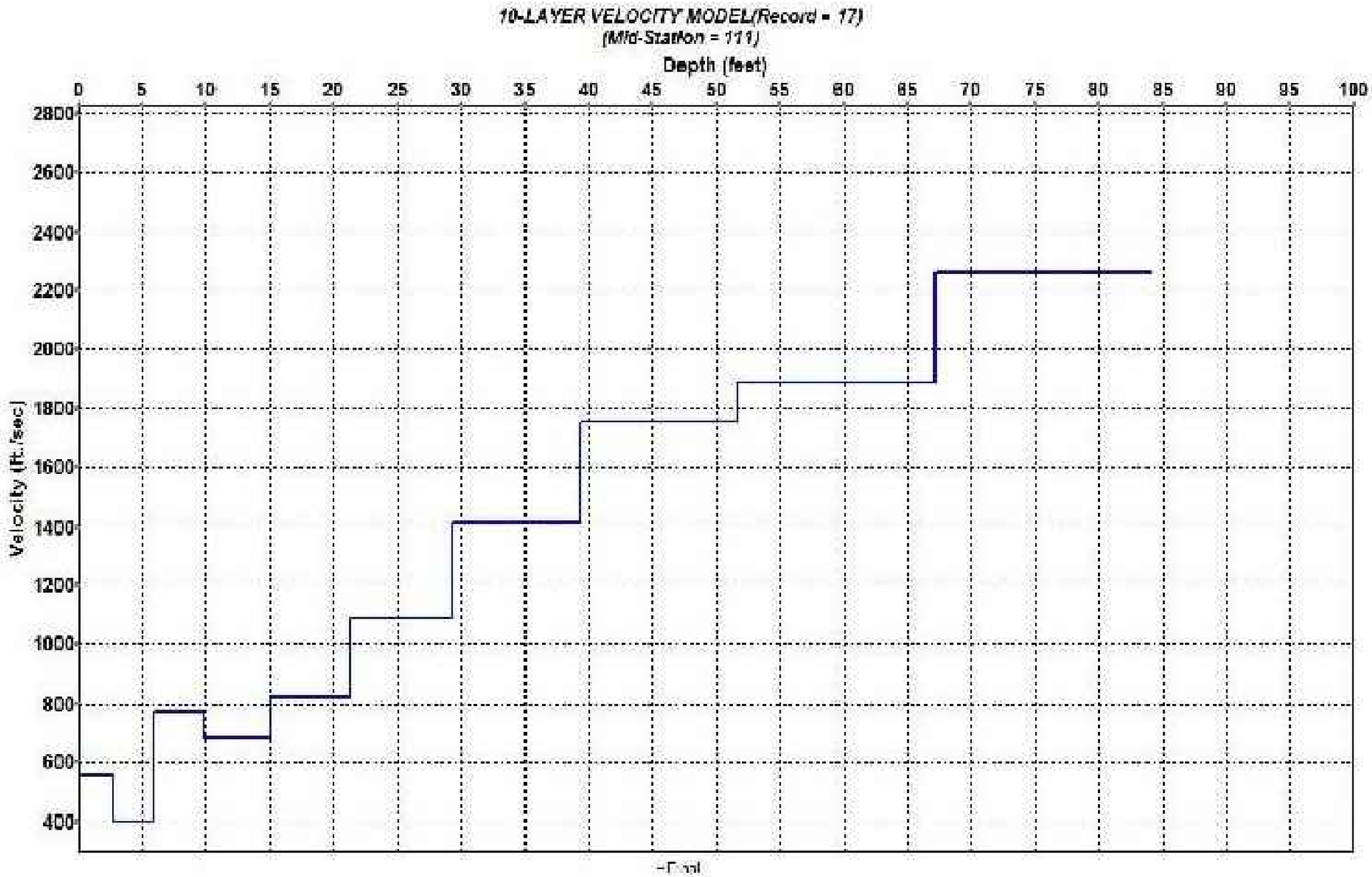
Shear Wave Velocity Determination (Line 2-Grit Removal Structure)

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia 30318

MC2 PROJ. NO.: A091417.098

FIGURE NO.: 3



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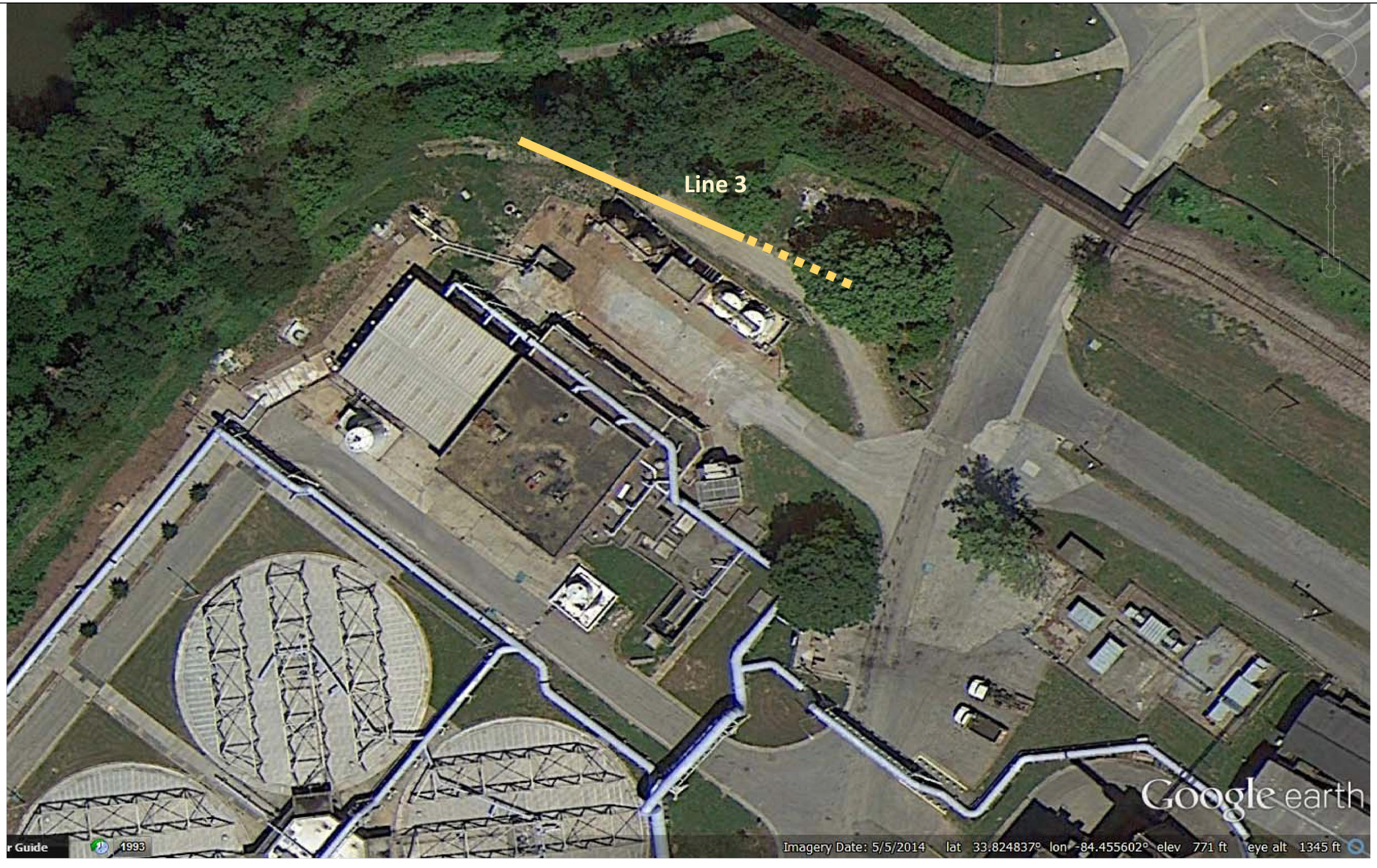
10-Layer Velocity Model, Shear Wave Velocity (Grit Removal Structure)

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia 30318

MC2 PROJ. NO.: A091417.098

FIGURE NO.: 4



*Data courtesy of Matrix Engineering Group, Inc.

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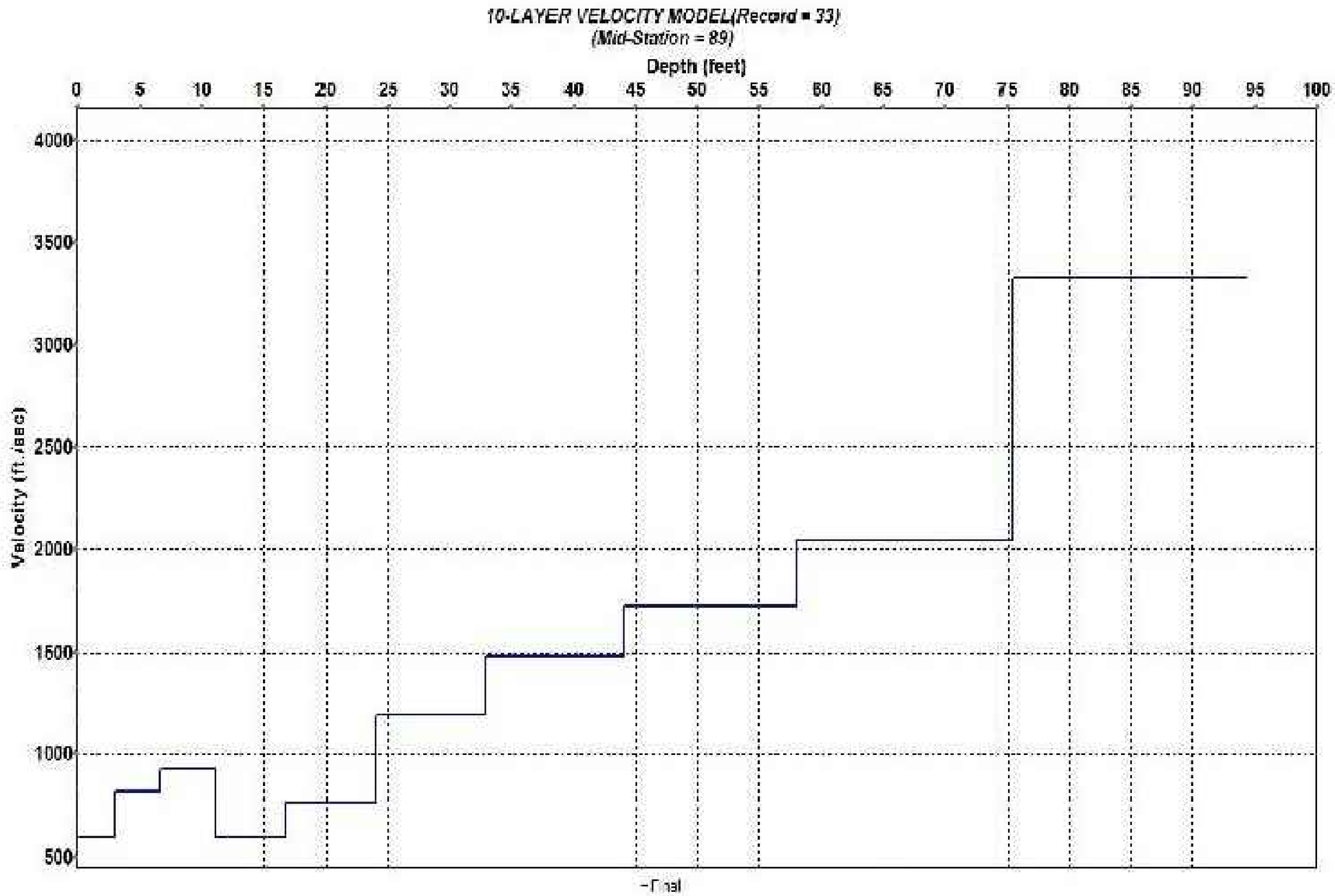
Shear Wave Velocity Determination (Line 3-Headworks Facility)

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia 30318

MC2 PROJ. NO.: A091417.098

FIGURE NO.: 5



*Data courtesy of Matrix Engineering Group, Inc.

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10-Layer Velocity Model, Shear Wave Velocity (Headworks Facility)

RM Clayton Water Reclamation Center Expansion
Atlanta, Georgia 30318

MC2 PROJ. NO.: A091417.098

FIGURE NO.: 6

APPENDIX D

Core Photographs - Pages 1 through 66

Core Test Photographs - Pages 1 through 17

B-1
Run 1: 30 – 35 ft, REC = 97 %, RQD = 90%
Run 2: 35 – 40 ft, REC = 100%, RQD = 98%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-1
Run 1: 30 – 35 ft, REC = 97 %, RQD = 90%
Run 2: 35 – 40 ft, REC = 100%, RQD = 98%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-1
Run 3: 40-45 ft, REC = 100 %, RQD = 76%
Run 4: 45-50 ft, REC = 87%, RQD = 32%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-1
Run 3: 40-45 ft, REC = 100 %, RQD = 76%
Run 4: 45-50 ft, REC = 87 %, RQD = 32%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-1
Run 5: 50-55 ft, REC = 86 %, RQD = 47%
Run 6: 55-60 ft, REC = 98%, RQD= 63%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-1
Run 5: 50-55 ft, REC = 86 %, RQD = 47%
Run 6: 55-60 ft, REC = 98%, RQD= 63%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
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	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-1
Run 7: 60-65 ft, REC = 98 %, RQD = 88%
Run 8: 65-70 ft, REC = 98%, RQD = 89%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-1
Run 7: 60-65 ft, REC = 98 %, RQD = 88%
Run 8: 65-70 ft, REC = 98%, RQD = 89%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
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	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-1
Run 9: 70-75 ft, REC = 79 %, RQD = 24%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
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	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-1
Run 9: 70-75 ft, REC = 79 %, RQD = 24%

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	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-2
Run 1: 25-26 ft, REC = 75 %, RQD = 0%
Run 2: 26-31 ft, REC = 83%, RQD = 8%
Run 3: 31-36 ft, REC = 93%, RQD = 24%

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		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-2
Run 1: 25-26 ft, REC = 75 %, RQD = 0%
Run 2: 26-31 ft, REC = 83%, RQD = 8%
Run 3: 31-36 ft, REC = 93%, RQD = 24%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-2
Run 4: 36-41 ft, REC = 90 %, RQD = 64%
Run 5: 41-46 ft, REC = 100%, RQD = 96%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-2
Run 4: 36-41 ft, REC = 90 %, RQD = 64%
Run 5: 41-46 ft, REC = 100%, RQD = 96%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
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	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-2
Run 6: 46-51 ft, REC = 100%, RQD = 99%
Run 7: 51-56 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-2
Run 6: 46-51 ft, REC = 100%, RQD = 99%
Run 7: 51-56 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-2
Run 8: 56-61 ft, REC = 100%, RQD = 100%
Run 9: 61-66 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-2
Run 8: 56-61 ft, REC = 100%, RQD = 100%
Run 9: 61-66 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-2
Run 10: 66-71 ft, REC = 100%, RQD = 91%
Run 11: 71-76 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-2
Run 10: 66-71 ft, REC = 100%, RQD = 91%
Run 11: 71-76 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-2
Run 11: 71-76 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-2
Run 11: 71-76 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-3
Run 1: 30-35 ft, REC = 78%, RQD = 50%
Run 2: 35-40 ft, REC = 88%, RQD = 76%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-3
Run 1: 30-35 ft, REC = 78%, RQD = 50%
Run 2: 35-40 ft, REC = 88%, RQD = 76%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-3
Run 3: 40-45 ft, REC = 98%, RQD = 79%
Run 4: 45-50 ft, REC = 100%, RQD = 99%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-3
Run 3: 40-45 ft, REC = 98%, RQD = 79%
Run 4: 45-50 ft, REC = 100%, RQD= 99%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-3
Run 5: 50-55 ft, REC = 100%, RQD = 100%
Run 6: 55-60 ft, REC = 100%, RQD = 96%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-3
Run 5: 50-55 ft, REC = 100%, RQD = 100%
Run 6: 55-60 ft, REC = 100%, RQD = 96%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-3
Run 7: 60-65 ft, REC = 100%, RQD = 86%
Run 8: 65-70 ft, REC = 100%, RQD = 62%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-3
Run 7: 60-65 ft, REC = 100%, RQD = 86%
Run 8: 65-70 ft, REC = 100%, RQD = 62%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
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	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-3
Run 9: 70-75 ft, REC = 100%, RQD = 66%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-3
Run 9: 70-75 ft, REC = 100%, RQD = 66%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-4
Run 1: 12-15 ft, REC = 86%, RQD = 0%
Run 2: 15-20 ft, REC = 90%, RQD = 0%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-4
Run 1: 12-15 ft, REC = 86%, RQD = 0%
Run 2: 15-20 ft, REC = 90%, RQD = 0%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-4
Run 3: 20-25 ft, REC = 86%, RQD = 66%
Run 4: 25-30 ft, REC = 96%, RQD = 82%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-4
Run 3: 20-25 ft, REC = 86%, RQD = 66%
Run 4: 25-30 ft, REC = 96%, RQD = 82%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
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	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-4
Run 5: 30-35 ft, REC = 92%, RQD = 61%
Run 6: 35-40 ft, REC = 98%, RQD = 61%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-4
Run 5: 30-35 ft, REC = 92%, RQD = 61%
Run 6: 35-40 ft, REC = 98%, RQD = 61%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-4
Run 7: 40-45 ft, REC = 100%, RQD = 92%
Run 8: 45-50 ft, REC = 100%, RQD = 82%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-4
Run 7: 40-45 ft, REC = 100%, RQD = 92%
Run 8: 45-50 ft, REC = 100%, RQD = 82%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-4
Run 9: 50-55 ft, REC = 100%, RQD = 93%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-4
Run 9: 50-55 ft, REC = 100%, RQD = 93%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
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	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-5
Run 1: 16-20 ft, REC = 100%, RQD = 97%
Run 2: 20-25 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-5
Run 1: 16-20 ft, REC = 100%, RQD = 97%
Run 2: 20-25 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-5
Run 3: 25-30 ft, REC = 100%, RQD = 100%
Run 4: 30-35 ft, REC = 100%, RQD = 88%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-5
Run 3: 25-30 ft, REC = 100%, RQD = 100%
Run 4: 30-35 ft, REC = 100%, RQD = 88%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
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	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-5
Run 5: 35-40 ft, REC = 100%, RQD = 87%
Run 6: 40-45 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-5
Run 5: 35-40 ft, REC = 100%, RQD = 87%
Run 6: 40-45 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-5
Run 7: 45-50 ft, REC = 97%, RQD = 68%
Run 8: 50-55 ft, REC = 100%, RQD = 42%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-5
Run 7: 45-50 ft, REC = 97%, RQD = 68%
Run 8: 50-55 ft, REC = 100%, RQD = 42%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-5
Run 9: 55-60 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-5
Run 9: 55-60 ft, REC = 100%, RQD = 100%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
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	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-6
Run 1: 24-25 ft, REC = 88%, RQD = 0%
Run 2: 25-30 ft, REC = 58%, RQD = 0%
Run 3: 30-35 ft, REC = 100%, RQD = 21%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-6
Run 1: 24-25 ft, REC = 88%, RQD = 0%
Run 2: 25-30 ft, REC = 58%, RQD = 0%
Run 3: 30-35 ft, REC = 100%, RQD = 21%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-6
Run 4: 35-40 ft, REC = 98%, RQD = 26%
Run 5: 40-45 ft, REC = 100%, RQD = 96%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-6
Run 4: 35-40 ft, REC = 98%, RQD = 26%
Run 5: 40-45 ft, REC = 100%, RQD = 96%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-6
Run 6: 45-50 ft, REC = 98%, RQD = 63%
Run 7: 50-55 ft, REC = 78%, RQD = 62%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-6
Run 6: 45-50 ft, REC = 98%, RQD = 63%
Run 7: 50-55 ft, REC = 78%, RQD = 62%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-6
Run 8: 55-60 ft, REC = 100%, RQD = 64%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-6
Run 8: 55-60 ft, REC = 100%, RQD = 64%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-7
Run 1: 20-25 ft, REC = 48%, RQD = 0%
Run 2: 25-30 ft, REC = 47%, RQD = 0%
Run 3: 30-35 ft, REC = 42%, RQD = 0%
Run 4: 35-40 ft, REC = 53%, RQD = 0%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-7
Run 1: 20-25 ft, REC = 48%, RQD = 0%
Run 2: 25-30 ft, REC = 47%, RQD = 0%
Run 3: 30-35 ft, REC = 42%, RQD = 0%
Run 4: 35-40 ft, REC = 53%, RQD = 0%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-7
Run 5: 40-45 ft, REC = 62%, RQD = 0%
Run 6: 45-50 ft, REC = 0%, RQD = 0%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-7
Run 5: 40-45 ft, REC = 62%, RQD = 0%
Run 6: 45-50 ft, REC = 0%, RQD = 0%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

B-9
Run 1: 39-40 ft, REC = 77%, RQD = 0%
Run 2: 40-45 ft, REC = 40%, RQD = 0%
Run 3: 45-51 ft, REC = 25%, RQD = 0%

MC² Geotechnical • Environmental Materials Testing	**Geotechnical Investigation** **RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** **BGR**
		Project No. A091417.098
	ROCK CORE PHOTOGRAPHS	**Date:** 3/24/15

Tensile Before
B-1, Elev. 798.5', Depth 38'9"- 38'10"

Tensile After
B-1, Elev. 798.5', Depth 38'9"- 38'10"

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion Atlanta, Fulton County, Georgia**	**For:** BGR
		Project No. A091417.098
	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Compression Before
B-1, Elev. 798.9'-798.5', Depth 38'5"- 38'9"

Compression After
B-1, Elev. 798.9'-798.5', Depth 38'5"- 38'9"

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion Atlanta, Fulton County, Georgia**	**For:** BGR
		Project No. A091417.098
	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Tensile Before
B-1, Elev. 771.1', Depth 66'2"-66'3"

Tensile After
B-1, Elev. 771.1', Depth 66'2"-66'3"

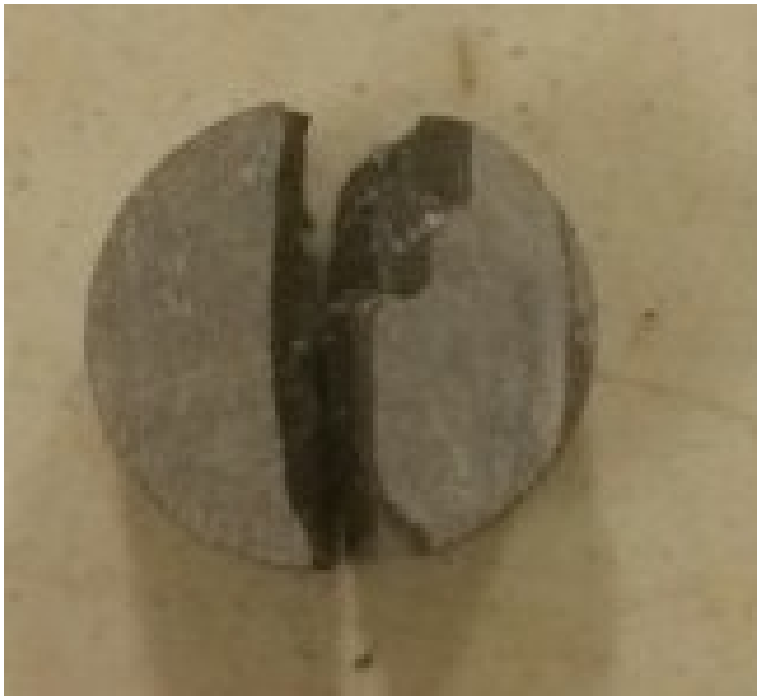
MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** BGR
		Project No. A091417.098
	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Compression Before
B-1, Elev. 771.5’-771.1’, Depth 65’10”-66’2”

Compression After
B-1, Elev. 771.5’-771.1’, Depth 65’10”-66’2”

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion Atlanta, Fulton County, Georgia**	**For:** BGR
		Project No. A091417.098
	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Tensile Before
B-2, Elev. 803.5’, Depth 33’5”-33’6”



Tensile After
B-2, Elev. 803.5’, Depth 33’5”-33’6”

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** BGR
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	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Compression Before
B-2, Elev. 803.9'-803.5', Depth 33'1"-33'5"

Compression After
B-2, Elev. 803.9'-803.5', Depth 33'1"-33'5"

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion Atlanta, Fulton County, Georgia**	**For:** BGR
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	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Tensile Before
B-2, Elev. 773.4', Depth 63'6"-63'7"

Tensile After
B-2, Elev. 773.4', Depth 63'6"-63'7"

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion Atlanta, Fulton County, Georgia**	**For:** BGR
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	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Compression Before
B-2, elev. 773.8'-773.4', depth 63'2"-63'6"

Compression After
B-2, Elev. 773.8'-773.4', Depth 63'2"-63'6"

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion Atlanta, Fulton County, Georgia**	**For:** BGR
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	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Tensile Before
B-3, elev. 775.6', depth 60'5"-60'6"

Tensile After
B-3, Elev. 775.6', Depth 60'5"-60'6"

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion Atlanta, Fulton County, Georgia**	**For:** BGR
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	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Compression Before
B-3, Elev. 776.0'-775.6', Depth 60'1"-60'5"

Compression After
B-3, Elev. 776.0'-775.6', Depth 60'1"-60'5"

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion Atlanta, Fulton County, Georgia**	**For:** BGR
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	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Tensile Before
B-3, Elev. 775.2', Depth 60'10"-60'11"

Tensile After
B-3, Elev. 775.2', Depth 60'10"-60'11"

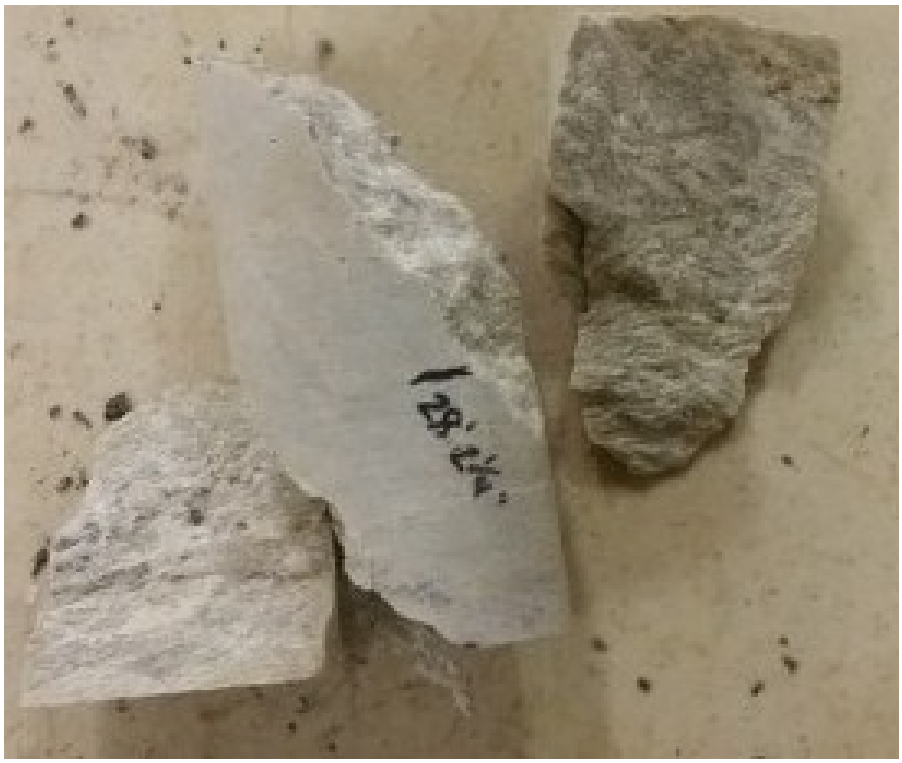
MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion Atlanta, Fulton County, Georgia**	**For:** BGR
		Project No. A091417.098
	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Compression Before
B-3, Elev. 775.6’-775.2’, Depth 60’6”-60’10”

Compression After
B-3, Elev. 775.6’-775.2’, Depth 60’6”-60’10”

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion Atlanta, Fulton County, Georgia**	**For:** BGR
		Project No. A091417.098
	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Compression Before
B-4, Elev. 753.6'-753.2', Depth 28'1"-28'5"



Compression After
B-4, Elev. 753.6'-753.2', Depth 28'1"-28'5"

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion Atlanta, Fulton County, Georgia**	**For:** BGR
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	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Tensile Before
B-5, Elev. 759.2', Depth 22'4"-22'5"

Tensile After
B-5, Elev. 759.2', Depth 22'4"-22'5"

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** BGR
		Project No. A091417.098
	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Compression Before
B-5, Elev. 759.6'-759.2', Depth 22'0"-22'4"

Compression After
B-5, Elev. 759.6'-759.2', Depth 22'0"-22'4"

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion** **Atlanta, Fulton County, Georgia**	**For:** BGR
		Project No. A091417.098
	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Tensile Before
B-6, Elev. 739.0', Depth 42'6"-42'7"

Tensile After
B-6, Elev. 739.0', Depth 42'6"-42'7"

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion Atlanta, Fulton County, Georgia**	**For:** BGR
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	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

Compression Before
B-6, Elev. 739.4'-739.0', Depth 42'2"-42'6"

Compression After
B-6, Elev. 739.4'-739.0', Depth 42'2"-42'6"

MC² Geotechnical • Environmental Materials Testing	**RM Clayton Water Reclamation Facility Expansion Atlanta, Fulton County, Georgia**	**For:** BGR
		Project No. A091417.098
	ROCK CORE TESTING PHOTOGRAPHS	**Date:** 4/2/15

ATTACHMENT NO. 2

Technical Memorandum, City of Atlanta, Water Resources Management Plan: Wastewater Component Process Modeling, BGR, March 11, 2013

TECHNICAL MEMORANDUM

Issued: March 11, 2013

City of Atlanta | Department of Watershed Management
Water Resource Management Plan: Wastewater Component
Task 5.02 - Wastewater Collection System Modeling

To: Distribution

From: Michael Friedlander

OVERVIEW

Wastewater collection system modeling, originally envisioned to be performed by the City to support this water resources management plan update, required a level of effort which could not be accommodated within the timeframe of completing this round of planning. The modeling, which was to consist of performing future scenario run using the Department of Watershed Management's (DWM's) calibrated wastewater collection system model had the following objectives:

- Incorporate revised wastewater service area flow forecast projections to ensure that planned projects adequately meet conditions anticipated through the planning horizon (year 2060);
- Provide recommendations for additional projects in areas found to be capacity limited; and
- Provide revised phasing or deferment recommendations due to slower growth projections.

In lieu of updated modeling, wastewater flow estimates/projections used from previous planning scenarios were compared to the revised forecast data set developed for this management plan. The previous modeling work, performed as part of DWM's continued compliance with the Consent Decree and First Amended Consent Decree programs, resulted in the generation of a list of capital improvement projects (CIPs) to address sewer replacement and rehabilitation as well as upsizing lines found to be capacity limited. Capacity enhancement CIPs for year 2000 and projected year 2050 flows were developed through that effort. Comparisons of forecast flows indicate that the previous data set used for modeling is within a range close enough to the updated forecast to validate that previous CIP recommendations will meet near-term capacity needs. A future scenario wastewater collection system model update is recommended prior to the next master plan update to reassess capacity enhancement projects based upon observed growth trends and updated forecasts. This will potentially enable revised phasing or deferment of capital projects to reduce costs.

CIP's generated from previous analysis as well as those not previously identified in DWM's CIP are summarized in this technical memorandum. An overview of existing wastewater collection system assets, summary of the rehabilitation/replacement work performed to date as part of the City's compliance schedule for the Consent Decree and First Amended Consent Decree programs, and comparative analysis of updated and previous wastewater flow forecasts are also presented.

WASTEWATER COLLECTION SYSTEM SUMMARY

The City's four wastewater service areas cover an area of approximately 257 square miles and include the City, northwest DeKalb County, a small portion of Clayton County, and parts of north and south Fulton County. Conveyance and treatment of flows from areas outside the City are managed through interjurisdictional agreements[1], which allocate capital and operational cost-sharing based upon reserved treatment capacity and flows entering City collection, conveyance, pumping, and treatment infrastructure. Wastewater from areas in northeast and southwest Atlanta are treated at Cobb County Water System's R.L. Sutton Water Reclamation Facility and Fulton County's Camp Creek Water Reclamation Facility, respectively.

Critical infrastructure located within the City's Wastewater Service Areas includes approximately 1,574 miles[2] of combined and separate sanitary sewers; 17 collection system pump stations; four tunnels; four tunnel pump stations; a diversion structure; 14 force mains; five combined sewer overflow (CSO) facilities; two CSO treatment plants; and one CSO regulator. Figures 1 through 3 provide simplified schematic representations of the City's four wastewater reclamation center service areas (RM Clayton, Utoy Creek, Intrenchment Creek, and South River). Table 1 provides a summary of wastewater collection system characteristics.

[1] The City has the following interjurisdictional partners: Cobb County, DeKalb County, Fulton County, and the cities of College Park, East Point, and Hapeville.
[2] An updated asset inventory summary has been requested from the City.

Figure 1. RM Clayton WRC Service Area Schematic

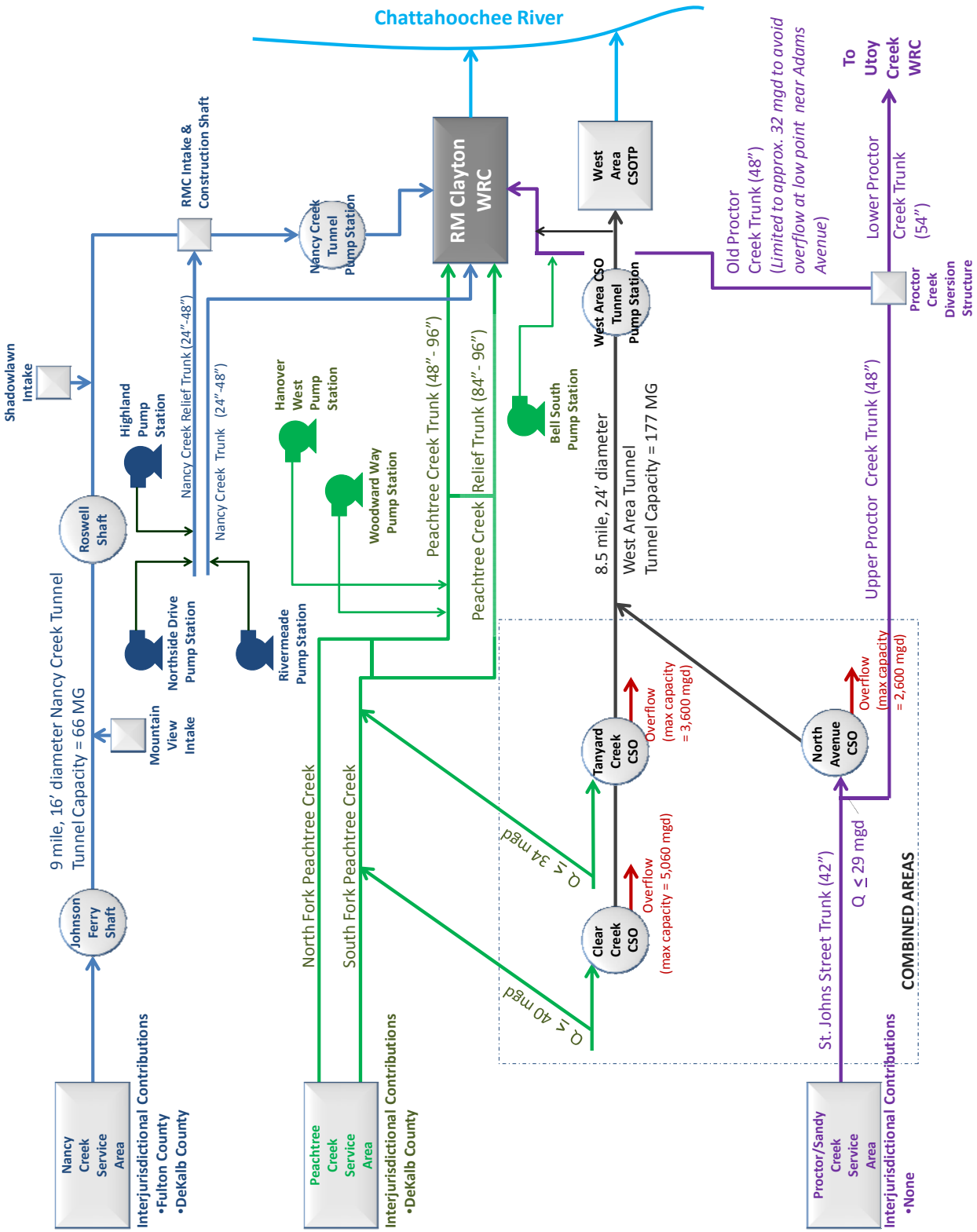

Figure 2. Utoy Creek WRC Service Area Schematic

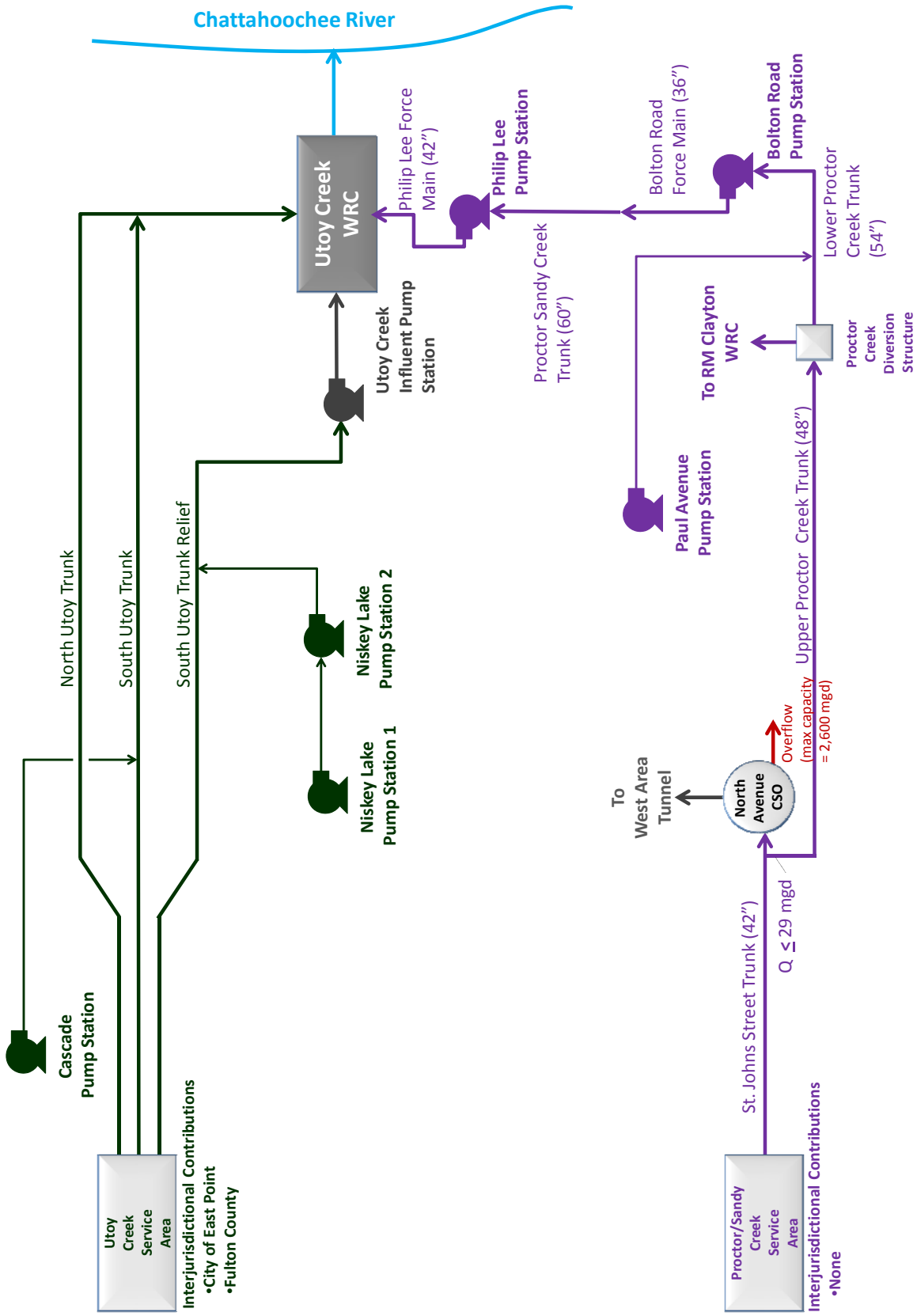

Figure 3. Intrenchment Creek and South River WRC Service Area Schematic

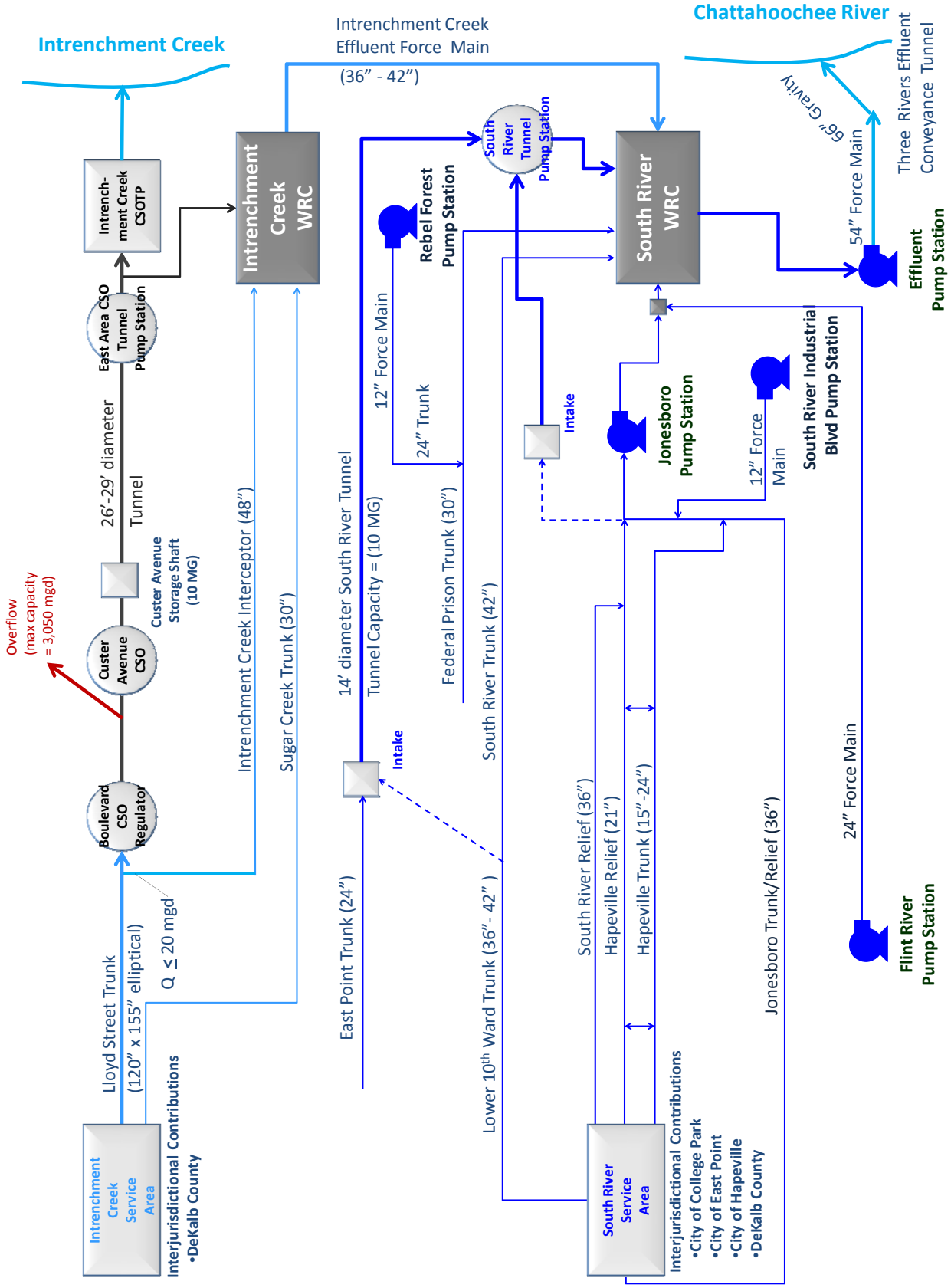

Table 1. Wastewater Collection System Inventory (all values are approximate)

Service Area	Sewer Basins	Area (acres)[1]	No. Sewer-sheds[2]	IJ Imports / Exports	Miles of Sewer[3]	Pump Stations	CSO Facilities
R.M. Clayton WRC	Nancy Creek	24,078	24	DeKalb, Fulton		Rivermeade PS Highland PS Northside Drive PS Nancy Creek Tunnel PS	None
	Peachtree Creek	57,252	70	DeKalb		Hanover West PS Woodward Way PS Bell South PS	Clear Creek CSO Facility Tanyard CSO Facility West Area CSO Tunnel PS West Area CSOTP
Proctor Creek	Proctor Creek	10,749	38	None		Paul Avenue PS Bolton Road PS Phillip Lee PS	North Avenue CSO Facility
Utoy Creek WRC	Utoy Creek	24,986	37	East Point		Cascade PS Niskey Lake PS 1 Niskey Lake PS 2 Utoy Creek Influent PS	None
	Sandy Creek	4,097	10	Fulton		None	None
South River WRC	South River	13,834	33	College Park, DeKalb, East Point, Hapeville		South River Industrial PS Jonesboro PS Flint River PS Rebel Forest PS South River Tunnel PS	None
Intrenchment Creek WRC	Intrenchment Creek	20,403	24	DeKalb		None	Boulevard CSO Regulator Custer Avenue CSO Facility East Area CSO Tunnel PS Intrenchment Creek CSOTP
	Sugar Creek	3,031	14	DeKalb		None	None
Camp Creek WRF	Camp Creek	3,865	6	to Fulton		None	None
R.L. Sutton WRF	Long Island Creek	2,168	4	to Cobb		None	None
TOTALS	**10**	**164,462**	**260**	**-**	**1,574**	**-**	**-**

Notes:
1. Contributing area represents sewer basin total with the exception of Camp Creek and RL Sutton, which are reflective of the City of Atlanta contributing area only.
2. Sewershed values reported are reflective for the City of Atlanta only. Interjurisdictional partner contributing areas are not subdivided or included in the tabulation.
3. An updated asset inventory has been requested from the City. Miles of sewer reflected in this table may not reflect updated information.

WASTEWATER COLLECTION SYSTEM MODEL BACKGROUND

The City's wastewater collection system model utilizes Innovyze InfoWorks™ CS software. The model is utilized to prioritize system improvements to reduce water quality violations and to evaluate capacity implications of new development permits. The City currently collects data from 195 permanent flow meters, over 60 temporary flow meters, and 28 rain gauges. Model calibration is typically performed to match observed conditions within at least 20% of the peak-to-peak flows under diurnal wet-weather conditions and at least 10% of the peak-to-peak flows under dry-weather diurnal conditions. City staff continuously update the model as improvements and development projects are implemented. Model calibration reflecting the latest maintenance, rehabilitation, and flow records is performed by the City every six months for use by the DWM's Capacity Certification Group.

The development of the City's wastewater collection system model was a requirement under the First Amended Consent Decree (May 1999) as part of a multi-phased program, which included: flow and rainfall monitoring, hydraulic modeling, and system-wide prioritization of rehabilitation efforts. Macro-models were developed to describe and organize trunk and outfall sewers and became the basis for delineating the 260 sewersheds located within City of Atlanta limits. Sewer rehabilitation efforts were prioritized through grouping multiple sewersheds into a total of six "Sewer Groups". Micro-models for each sewershed within a Sewer Group were also developed to assist in identifying capacity-limited areas and relief projects. Data from flow meters, rainfall gages, and information obtained through the Sewer System Evaluation Survey (SSES) are incorporated into the model for calibration and accuracy in representing actual conditions.

2004-2009 REHABILITATION SUMMARY

The City has completed SSES activities and model calibration for all six Sewer Groups. Rehabilitation actions for the first two Sewer Groups (SG-1 and SG-2) and the portion of SG-3 falling within the South River sewer basin have been completed. These efforts included a combination of techniques including: cured-in-place piping, pipe bursting, external point repairs, pipe replacement, and pipe clean-out. Table 2 provides a summary of total rehabilitation performed between years 2004-2009.

Table 2. Sewer Rehabilitation Summary (2004-2009)

Basin	2004	2005	2006	2007	2008	2009	TOTAL
	Miles of Sewer Rehabilitation						
Camp Creek	2.82	1.37	-	-	0.36	0.28	4.83
Intrenchment Creek	-	-	-	0.04	0.07	0.16	0.27
Long Island Creek	-	-	0.12	-	-	3.32	3.44
Nancy Creek	3.49	0.83	0.32	0.90	0.11	6.83	12.48
Peachtree Creek	0.29	8.04	23.48	11.34	25.83	4.56	73.54
Proctor Creek	4.89	1.49	1.65	-	17.11	2.19	27.33
Sandy Creek	-	1.65	-	0.99	0.18	0.81	3.63
South River	4.08	4.72	2.77	9.89	3.51	13.81	38.78
Sugar Creek	6.53	3.54	-	-	0.92	1.22	12.21
Utoy Creek	0.19	1.52	1.20	17.90	4.95	13.52	39.28
TOTAL	**22.29**	**23.16**	**29.54**	**41.06**	**53.04**	**46.70**	**215.79**

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Combined sewer separation has been completed in portions of the Proctor Creek (Greensferry combined sewer separation), South River (McDaniel Street combined sewer separation), and Intrenchment Creek (Stockade combined sewer separation) service areas.

PLANNED CAPITAL IMPROVEMENTS

The timeline for completing sanitary sewer improvements, originally mandated in the First Amended Consent Decree by 2014, was granted a 13-year compliance extension (completion by 2027) due to program costs. This compliance timeline is applicable for the remaining Sewer Groups (SG-3 through SG-6). A capital improvement plan for complying with this timeline has been formulated by the City. Under the First Amended Consent Decree, the City agreed to a target of zero surcharge above the crown of the pipe for sanitary sewers during the 2-year, 3-hour design storm event. City staff perform model runs upsizing sewer lines as necessary to achieve this target and also run the model over a simulated 40-year rainfall record to analyze overflow event frequency. This sequence is performed iteratively for design storms larger than the mandated 2-year, 3-hour event to derive a financially and technically viable list of capital improvement projects. The active collection system CIP list of projects is summarized in Table 3.

Several additional projects not previously listed that will be considered for inclusion in the CIP update developed for this wastewater management plan are summarized in Table 4.

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Table 3. Planned Collection System Capital Improvement Projects

CIP	Description	Start Date	Finish Date
W.01.01.0181 Sewer Cleaning and Pipeline Assessment: Annual Contract [2011-2019]	Post SSES contract providing for ongoing routine sewer maintenance including: cleaning, root treatment, replacement of clean-out covers and CCTV monitoring, including any necessary remedial action. [No escalation assessed]	FY 2012	Annual Renewal
W.01.01.0182 Sanitary Sewer Repairs: Annual Contract [2011-2016]	This is a sewer repair and replacement contract with an undefined scope and fixed unit prices with open cut pipe replacement as the primary construction method. [No escalation assessed]	FY 2012	Annual Renewal
W.01.01.0186 Asphaltic Concrete Pavement, Milling and Resurfacing: Annual Contract [2010-2027]	Annual contract to provide for milling and overlay of asphalt to provide continuously smooth roadway surface at locations where sewer rehabilitation work has disturbed existing pavement. [No escalation assessed \ FY13 includes $2M for Renewal #2 of current contract and $2M for new contract]	FY 2012	Annual Renewal
W.01.01.0178 Sewer Rehabilitation Contract	SSES-based on-call rehabilitation services contract.	FY 2012	FY2013
W.01.01.0003 Sewer Asset Management	A program to continue inspection and maintenance based on condition criticality that ensures rehabilitation and/or replacement of sewer assets as appropriate. The average footage inspected and rehabilitated per year could reach 250,000 feet of pipe. It is estimated that half of this pipe will need rehabilitation at a cost of $200 per foot. This is the basis for an asset management improvement program targeting 30 million dollars a year to maintain assets in good operating condition.	FY 2016	Annual Renewal

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CIP	Description	Start Date	Finish Date
W.01.01.0092 Sewer Group (2R) - Sandy Creek Outfall Replacement Project	Sandy Creek Sewer Replacement Phase I and Sandy Creek Sewer Replacement Phase II. Sandy Creek Sewer Replacement Phase I consists of the installation of approximately 2,860 LF of 30 and 36 inch gravity sewer line with manholes located in land lot 17 & 14 in the 14th District, in Fulton County, Georgia. The project is located on an unimproved part of Charlie Brown Airport property. Sandy Creek Sewer Replacement Phase II consists of the installation of approximately 1,020 LF of 30 inch and approximately 360 LF of 8 inch gravity sewer line located in land lot 241, in the 14th District, in Fulton County, Georgia. The project is located between residential areas with segments adjacent to a power transmission line.	FY 2012	FY 2012
W.01.01.0056 Sewer Group 3 - Rehabilitation - Contract A	Project closeout for this project is underway. Project included rehabilitatation (cured-in-place lining, pipe bursting, horizontal directional drilling, & excavation) of small diameter sewer identified during SSES for areas of the South River sewer basin located in Sewer Group 3. Manhole and sewer cleaning included. "Contract A" completion in FY 2012.	FY 2012	FY 2012
W.01.01.0055 Sewer Group 3 - Rehabilitation Projects	This project is to rehabilitate the sanitary sewers in SG3 which have been identified under the SSES as needing work. Under this project small diameter sewers will be rehabilitated by cured-in-place pipe lining techniques, pipe bursting, horizontal directional drilling and conventional excavation. In addition to the rehabilitation of manholes, the work under this contract also includes pre-cleaning of manholes and sewers.	FY 2013	FY 2016
04.23.165 Sewer Group (3R) - South River Basin/East Point Trunk Replacement	This project consist of the full replacement of the East Point Trunk sewer and two major tributary outfalls; South Camp Hapeville Outfall and the South River Outfall. The East Point Trunk replacement will consist of replacing the existing sewer with approx 11,240 ft of sewer ranging from 36-inch to 48-inch diameter. The South Camp Hapeville sewer will be replaced with approx 940 ft of 18-inch pipe. The South River Outfall will be replaced with approximately 870 ft of 24-inch pipe. Construction is underway.	FY 2012	FY 2012

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CIP	Description	Start Date	Finish Date
W.01.01.0100 Sewer Group (3R) - South River Basin North Capacity Relief Projects	Replacing various trunk and outfall sewers including: McDaniel trunk 24" and 60" replaced with 5,800 linear feet of new 42"; Lower Tenth Ward Trunk existing 36" replaced with 42" and 2,900 linear feet of new 36" relief sewer; Lakewood Outfall upgrades including flow transfer negative slope correction; [GEFA Funded - Construction]	FY 2012	FY 2012
W.01.01.0192 Sewer Group (3R) - South River Basin South Capacity Relief Projects	Replacement of various trunk and outfall sewers within the South River Basin. These projects are located physically south of the South River. The primary projects include the Jonesboro Trunk and Trunk Relief, and the Forest Park Outfall. [GEFA Funded - Construction]	FY 2013	FY 2013
W.01.01.0122 Sewer Group (5R) - Peachtree Trunk Stabilization [Peachtree Creek Basin]	The 96-inch Peachtree Trunk requires major repair to ensure its structural integrity is retained under varying conveyance conditions. This project is a phased continuation of the ongoing project occurring under an emergency repair project. At completion, 8900 linear feet of the large diameter trunk will be cleaned and structurally sound. This project involves the use of specialized cleaning techniques to remove large accumulations of debris. Upon completion of the cleaning process, a spiral wound structural liner will be installed. This phase of the trunk stabilization will address approximately 5700 linear feet.	FY 2013	FY 2013
W.01.01.0073 Sewer Group 4 - Rehabilitation Projects	Rehabilitate (cured-in-place lining, pipe bursting, horizontal directional drilling, & excavation) of small diameter sewer identified during SSES. Manhole and sewer cleaning included.	FY 2016	FY 2020
W.01.01.0107 Sewer Group (4R) - East Lake Trunk & Outfall System Capacity Relief Projects [Sugar Creek Basin]	East Lake Outfall (east and west) and trunk will be upsized largely through use of pipebursting. ~10,915 linear feet of 12"-30" pipe will be affected.	FY 2017	FY 2019

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CIP	Description	Start Date	Finish Date
W.01.01.0110 Sewer Group (4R) - Sugar Creek Basin Trunk Replacement	Replacement of the Sugar Creek Trunk through large diameter pipebursting technology. Approximately 5,350 linear feet of 24 to 30 inch sewer will be replaced with sewer ranging from 30 to 36 inches. Field observations have determined that a combination of static and pneumatic pipebursting technologies are suitable as the replacement method.	FY 2020	FY 2020
W.01.01.0112 Sewer Group (5R) - Westminster Outfall Replacement [Nancy Creek Basin]	Replacement of the Westminster Outfall in the Nancy Creek Basin. ~7,565 linear feet of 8-10 inch diameter sewer will be replaced with 10-15 inch diameter sewer. The Outfall parallels a creek for a significant portion of its length and in some instances manholes encroach the creek bed. Coupled with the alignment location is the presence of acute angles. Both of these factors contribute to the potential of reduced capacity under wet-weather conditions. Replacement including realignment will enhance flow capacity and reduce instances of creek inflow.	FY 2018	FY 2020
W.01.01.0113 Sewer Group (5R) - Valley Road Outfall Replacement [Nancy Creek Basin]	Replacement and realignment of the Valley Road Outfall located in the Nancy Creek Basin. Approximately 5,950 LF of 8-12 inch diameter sewer is proposed to be replaced with 12-18 inch diameter sewer. The outfall traverses an area creek and is in close proximity to residential and commercial businesses. The downstream alignment is conducive for accumulating solids and debris thus reducing available capacity.	FY 2021	FY 2022
W.01.01.0121 Sewer Group (5R) - Buckhead Trunk Replacement [Peachtree Creek Basin]	This project is the replacement of the Buckhead Trunk from Lindbergh Drive to its termination to the Peachtree Creek Trunk, approximately 3,900 linear feet. The existing sewer is proposed for upsizing from a 21-inch diameter to a 30-inch diameter. The proposed replacement will include realignment of some segments due to their proximity to other building structures.	FY 2021	FY 2022

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CIP	Description	Start Date	Finish Date
W.01.01.0131 Sewer Group (6R) - Landrum Drive Outfall Replacement [Utoy Creek Basin]	This project is a full realignment of the Landurm-Campbelton Outfall to ensure conveyance capacity. The existing 8-inch sewer is aligned along a creek and privately owned lake embankment. Typical pipebursting or other rehabilitation method could not be supported due to the current alignment. A new alignment is proposed to construct 1,600 linear feet of 12-inch diameter pipe along Adams Drive to the South Utoy Trunk Relief.	FY 2021	FY 2022
W.01.01.0138 Sewer Group (6R) - South Utoy Creek Trunk System Replacement by Pipebursting [Utoy Creek Basin]	Replacement of various trunks and outfalls within the South Utoy Trunk system using trenchless technology - pipebursting as the predominant replacement method. Through hydraulic modeling, approximately 22,729 linear feet of 8-15 inch diameter sewer has been identified for replacement with 10-18 inch sewer. Replacement will be field verified and cross-checked with SSES data.	FY 2023	FY 2023
W.01.01.LL01 Sewer Group (6R) - Mineral Springs Trunk	This project includes the replacement of an elliptical pipe with approximately 2,000 LF of 10 foot diameter sewer. Alignment includes tie in to an existing sewer trunk below the Georgia World Congress Center "Blue Lot" running west through the Vine City area. Project description, cost, and phasing should be updated after completion of sewer model calibration updates for the North Avenue CSO basin.	FY 2024	FY 2024
W.04.99.00BA Various Storm Water Emergency Projects		FY 2013	FY 2013
W.01.01.LL02 Custer CSO Basin Infiltration Project (Peoplestown)	Project still being defined.	FY 2013	FY 2015

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Table 4. Additional Collection System Capital Improvement Projects

CIP	Description	Start Date	Finish Date
Butler Street Trunk	Project still being defined, but will include features to mitigate flooding in areas below the "Grady Curve" on the downtown I75/I85 connector and areas along the Georgia Power/Civic Center corridor. This project could include a combination of capacity relief, trunk replacement, and/or a new storage vault located in the Civic Center parking area.	TBD	TBD
Paces Ferry Outfall Replacement	Frequent spills occur at several manholes in the Dawn View Lane residential area as a result of significant debris and suspected degraded condition of the Paces Ferry Outfall. The implementation of the Peachtree Creek Trunk Storage and Pump Station is anticipated to alleviate some backwater effects in this area. Preliminary analysis suggested replacement of ~8,805 LF of 8-12 inch diameter sewer with 10-18 inch diameter sewer. This will be reevaluated at the completion of the storage projects. The outfall includes two creek crossings and the alignment follows along at close proximity to residential lots for a significant portion of its length.	TBD	TBD
Hartsfield-Jackson Sewer Trunk Alternatives	Multiple gravity lines running underneath the flight line of Hartsfield-Jackson International Airport are aging. The condition and construction details of these sewer lines needs further definition. These lines feed the Flint River Pump Station.	TBD	TBD
MultiModal Passenger Terminal Related Projects	This project may include various realignments and improvements to accommodate the proposed new transportation hub. DWM is working with developers to define utility locations and provide design coordination assistance. In-kind replacement of DWM managed buried infrastructure should be funded by the developing authorities. Project construction may begin as soon as 2014.	TBD	TBD
Proposed Atlanta Falcons Stadium Related Projects	Any work associated with the new stadium would require coordination with Mineral Springs Trunk project and impacts to the North Avenue CSO sewer basin.	TBD	TBD

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COLLECTION SYSTEM MODELING COMPARISON

Collection system modeling generated the capacity relief projects in Table 3 through a previous planning scenario that utilized a year 2050 flow forecast. The previous dry-weather flow forecast work has been compared to the revised forecasts through year 2060 and is summarized in Table 5. Revised dry-weather wastewater flow forecasts were distributed proportionally to sewer basins based upon the population and employment allocation associated with the Atlanta Regional Commission's (ARCs) Plan 2040 Geographic Information System (GIS) data. Densification of population and employment at the census tract level was intersected and used as a surrogate for distributing forecasted residential and non-residential sanitary wastewater flows. Estimates for groundwater infiltration were distributed to census tracts based upon aerial weighting. City staff utilized this geographic distribution to compare the previous forecast to the revised.

Table 5. Average Dry-Weather Wastewater Flow Forecast Comparison

	Previous (2000) Forecast, mgd		Updated Wastewater Management Plan Forecast, mgd		Percent Difference: Previous 2050 to Updated 2060, %
Sewer Basin	**2000**	**2050**	**2012**	**2060**	
Peachtree Creek	63	96	63	87	– 9.8 %
Utoy Creek	10	16	15	21	+ 27.0 %
Sugar Creek	4	5	8	10	+ 66.7 %
Nancy Creek	36	39	26	34	– 13.7 %
Intrenchment Creek	7	12	11	18	+ 40.0 %
Proctor Creek	22	32	18	33	+ 3.1 %
Camp Creek	2	6	3	3	– 66.7 %
Long Island Creek	2	4	6	7	+ 54.5 %
Sandy Creek	3	6	9	15	+ 85.7 %
South River	16	26	26	35	+ 29.5 %
Total	**2,164**	**2,292**	**2,197**	**2,323**	**+ 1.3 %**

Comparisons of dry-weather flows are sufficiently close, suggesting that the CIPs developed from previous modeling efforts should be adequate. Furthermore, when wet-weather inflows are added they exert a more significant demand on collection system capacity than the dry-weather components, which effectively dampens observed differences summarized in Table 5.

RECOMMENDATIONS

The existing CIP project improvements are currently envisioned to be constructed over the next 13 years to meet the First Amended Consent Decree deadline. This provides time for those project definitions to be refined with the next master plan update to most efficiently match improvements with needs. Therefore, utilization of this list of projects as a base is recommended for development of CIP recommendations for the ongoing wastewater management plan. However, future planning scenario model updates are recommended during DWMs next round of wastewater master planning to verify phasing requirements and sizing benchmarked to observed trends. Over time, continued rehabilitation and conservation efforts may converge and result in reduced flows and allow for later implementation dates and/or deferral of some capital improvement projects.

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ATTACHMENT NO. 3

As-Built Documents

PRIMARY TREATMENT STRUCTURES

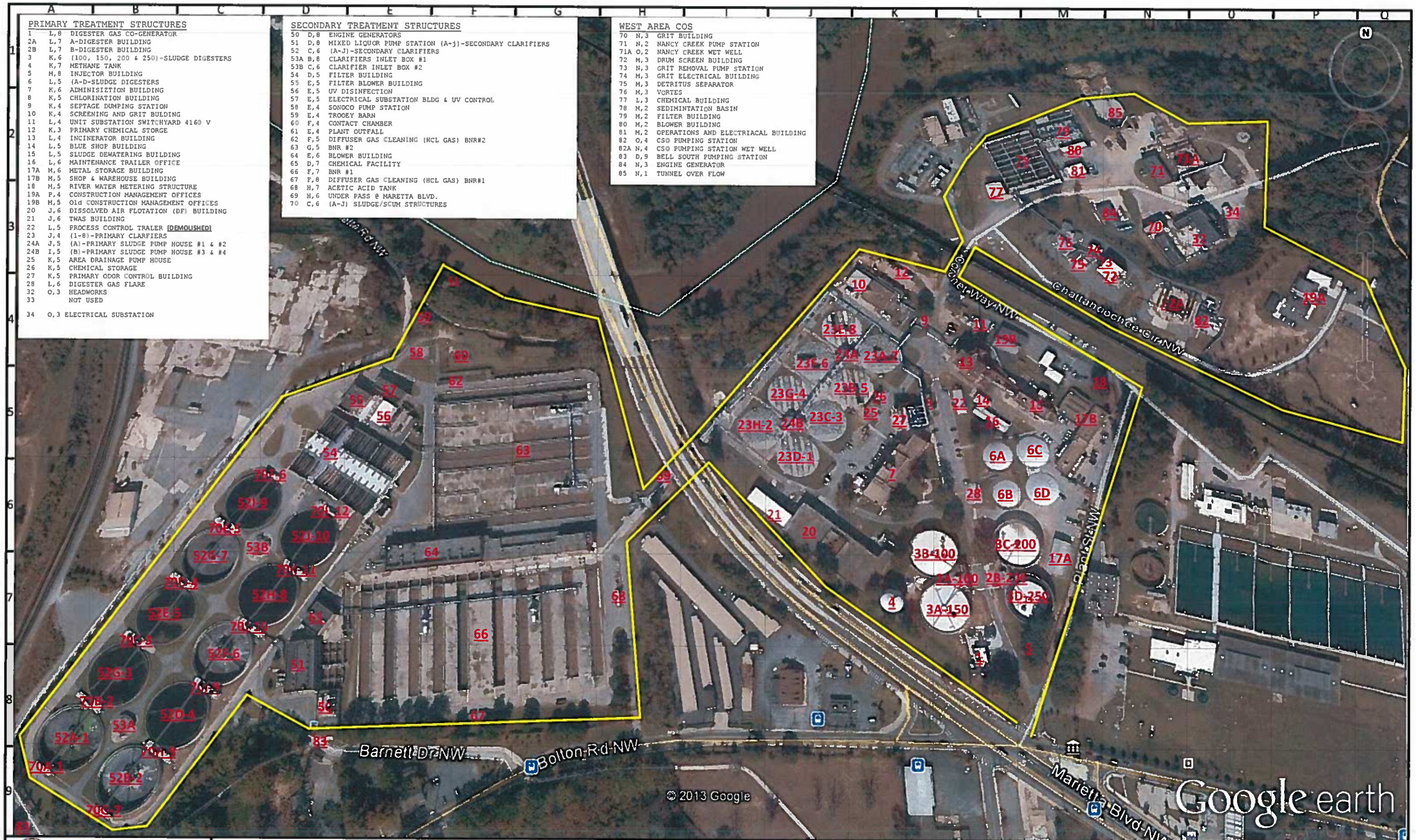
1	L,8	DIGESTER GAS CO-GENERATOR
2A	L,7	A-DIGESTER BUILDING
2B	L,7	B-DIGESTER BUILDING
3	K,6	(100, 150, 200 & 250)-SLUDGE DIGESTERS
4	K,7	METHANE TANK
5	M,8	INJECTOR BUILDING
6	L,5	(A-D-SLUDGE DIGESTERS
7	K,6	ADMINISIZTION BUILDING
8	K,5	CHLORINATION BUILDING
9	K,4	SEPTAGE DUMPING STATION
10	K,4	SCREENING AND GRIT BULDING
11	L,4	UNIT SUBSTATION SWITCHYARD 4160 V
12	K,3	PRIMARY CHEMICAL STORGE
13	L,4	INCINERATOR BUILDING
14	L,5	BLUE SHOP BUILDING
15	L,5	SLUDGE DEWATERING BUILDING
16	L,6	MAINTENANCE TRAILER OFFICE
17A	M,6	METAL STORAGE BUILDING
17B	M,5	SHOP & WAREHOUSE BUILDING
18	M,5	RIVER WATER METERING STRUCTURE
19A	P,4	CONSTRUCTION MANAGEMENT OFFICES
19B	M,5	Old CONSTRUCTION MANAGEMENT OFFICES
20	J,6	DISSOLVED AIR FLOTATION (DF) BUILDING
21	J,6	TWAS BUILDING
22	L,5	PROCESS CONTROL TRALER (DEMOLISHED)
23	J,4	(1-8)-PRIMARY CLARFIERS
24A	J,5	(A)-PRIMARY SLUDGE PUMP HOUSE #1 & #2
24B	I,5	(B)-PRIMARY SLUDGE PUMP HOUSE #3 & #4
25	K,5	AREA DRAINAGE PUMP HOUSE
26	K,5	CHEMICAL STORAGE
27	K,5	PRIMARY ODOR CONTROL BUILDING
28	L,6	DIGESTER GAS FLARE
32	O,3	HEADWORKS
33		NOT USED
34	O,3	ELECTRICAL SUBSTATION

SECONDARY TREATMENT STRUCTURES

50	D,8	ENGINE GENERATORS
51	D,8	MIXED LIQUOR PUMP STATION (A-j)-SECONDARY CLARIFIERS
52	C,6	(A-J)-SECONDARY CLARIFIERS
53A	B,8	CLARIFIERS INLET BOX #1
53B	C,6	CLARIFIER INLET BOX #2
54	D,5	FILTER BUILDING
55	E,5	FILTER BLOWER BUILDING
56	E,5	UV DISINFECTION
57	E,5	ELECTRICAL SUBSTATION BLDG & UV CONTROL
58	E,4	SONOCO PUMP STATION
59	E,4	TROOEY BARN
60	F,4	CONTACT CHAMBER
61	E,4	PLANT OUTFALL
62	F,5	DIFFUSER GAS CLEANING (HCL GAS) BNR#2
63	G,5	BNR #2
64	E,6	BLOWER BUILDING
65	D,7	CHEMICAL FACILITY
66	F,7	BNR #1
67	F,8	DIFFUSER GAS CLEANING (HCL GAS) BNR#1
68	H,7	ACETIC ACID TANK
69	H,6	UNDER PASS @ MARETTA BLVD.
70	C,6	(A-J) SLUDGE/SCUM STRUCTURES

WEST AREA COS

70	N,3	GRIT BUILDING
71	N,2	NANCY CREEK PUMP STATION
71A	O,2	NANCY CREEK WET WELL
72	M,3	DRUM SCREEN BUILDING
73	N,3	GRIT REMOVAL PUMP STATION
74	M,3	GRIT ELECTRICAL BUILDING
75	M,3	DETRITUS SEPARATOR
76	M,3	VORTES
77	L,3	CHEMICAL BUILDING
78	M,2	SEDIMINTATION BASIN
79	M,2	FILTER BUILDING
80	M,2	BLOWER BUILDING
81	M,2	OPERATIONS AND ELECTRIACAL BUILDING
82	O,4	CSO PUMPING STATION
82A	N,4	CSO PUMPING STATION WET WELL
83	D,9	BELL SOUTH PUMPING STATION
84	N,3	ENGINE GENERATOR
85	N,1	TUNNEL OVER FLOW



CITY OF ATLANTA
DEPARTMENT OF WATERSHED MANAGEMENT
RM CLAYTON WCR
2440 BOLTON ROAD, NW
ATLANTA GA 30318

RM CLAYTON WCR SITE MAP

COA ENGINEER: J Bentley	PROJECT: Foxboro Network		
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DATE: 9/4/2014	DRAWING NUMBER:		SHEET: 03 of 14

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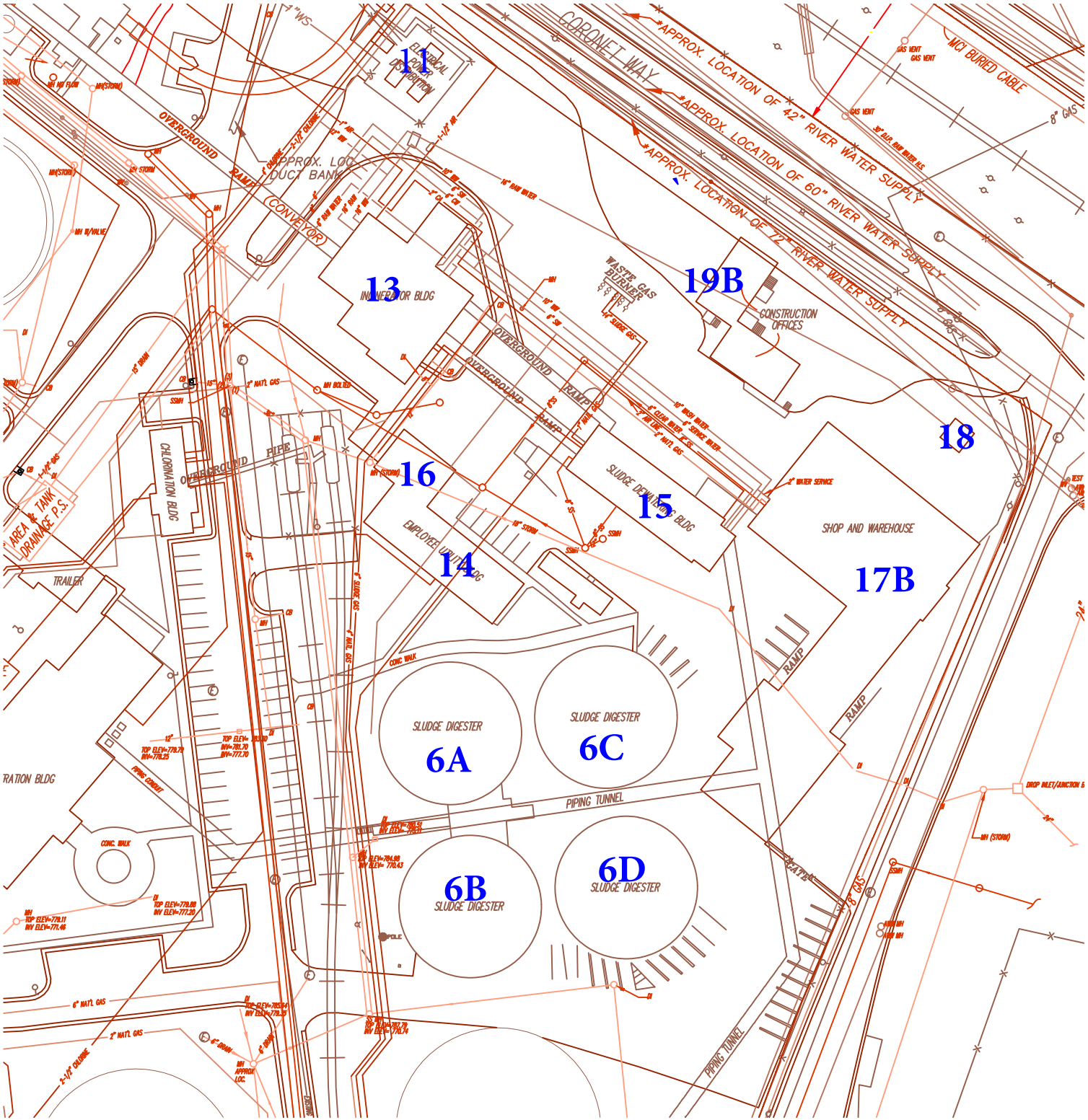
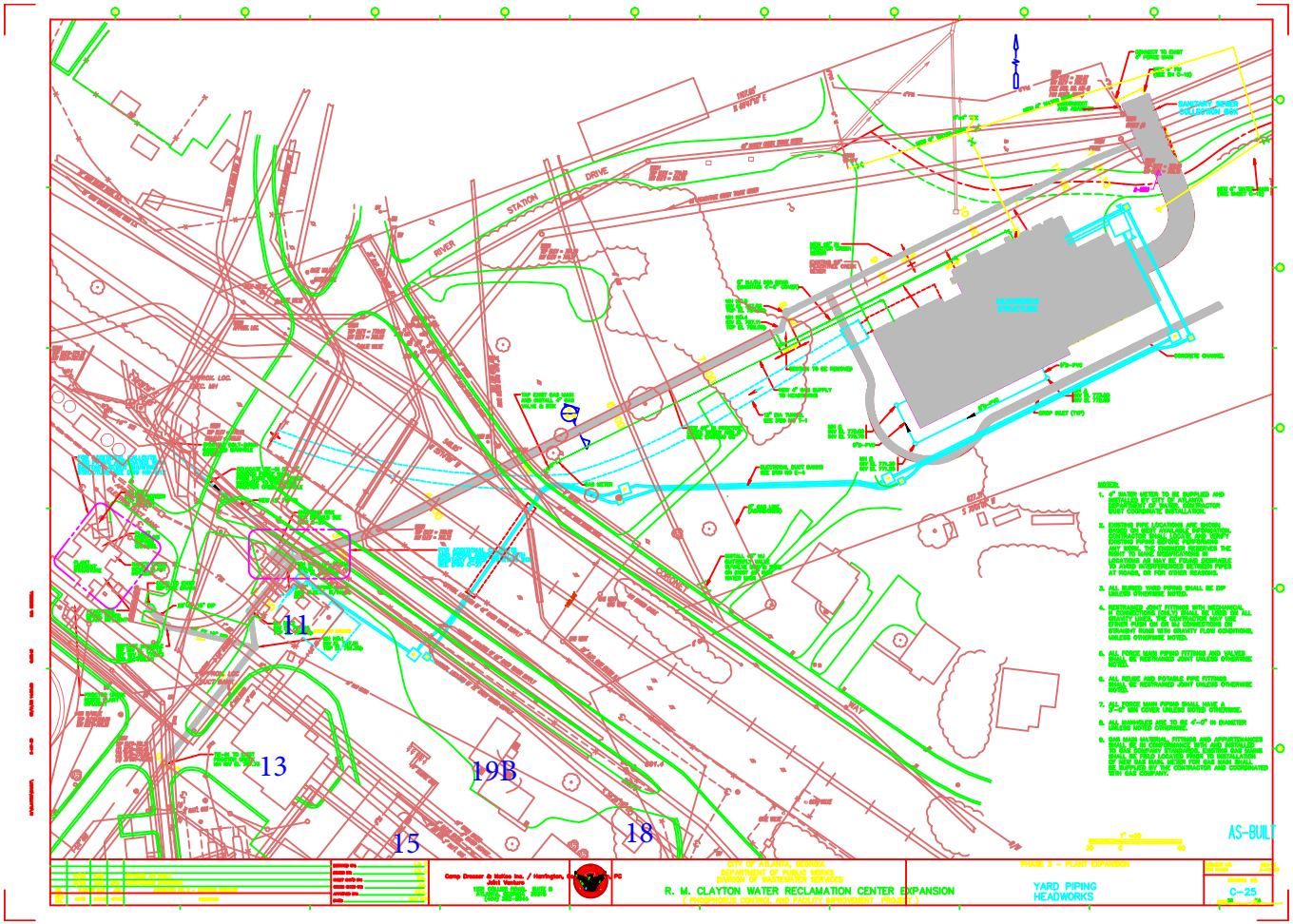
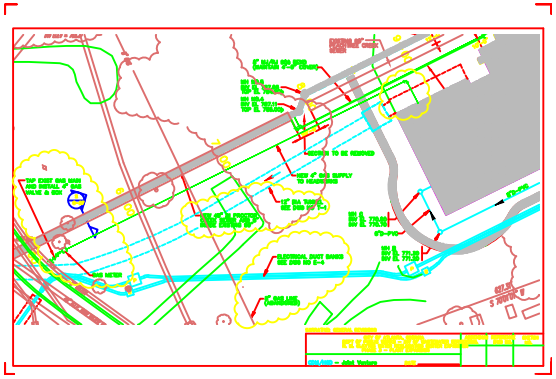
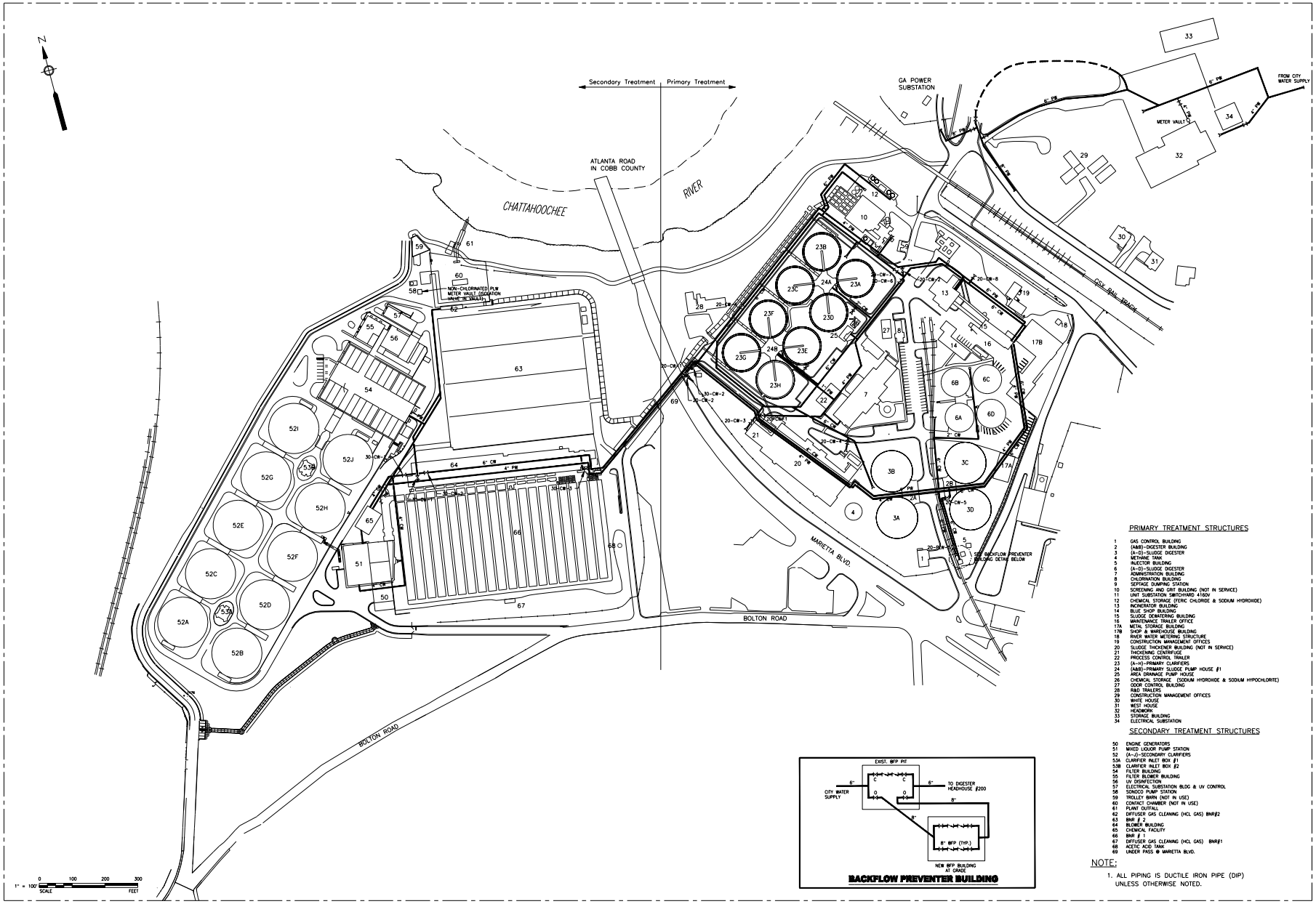

11
13
INCINERATOR BLDG
19B
CONSTRUCTION OFFICES
18
16
14
15
SLUDGE DEWATERING BLDG
SHOP AND WAREHOUSE
17B
CHLORINATION BLDG
TRAILER
SLUDGE DIGESTER
6A
SLUDGE DIGESTER
6C
PIPING TUNNEL
6B
SLUDGE DIGESTER
6D
SLUDGE DIGESTER
CORONET WAY
APPROX. LOCATION OF 42" RIVER WATER SUPPLY
APPROX. LOCATION OF 60" RIVER WATER SUPPLY
APPROX. LOCATION OF 72" RIVER WATER SUPPLY
MCI BURIED CABLE
OVERGROUND RAMP
CONVEYOR
WASTE GAS BURNER
RAMP
CONC. WALK
PIPING TUNNEL


11
13
15
19B
18
AS-BUILT
CITY OF ATLANTA, GEORGIA
DEPARTMENT OF PUBLIC WORKS
DIVISION OF WASTEWATER SERVICES
R. M. CLAYTON WATER RECLAMATION CENTER EXPANSION
(PHOSPHORUS CONTROL AND FACILITY IMPROVEMENT PROJECT)
PHASE 3 – PLANT EXPANSION
YARD PIPING
HEADWORKS
C-25





PRIMARY TREATMENT STRUCTURES

1 GAS CONTROL BUILDING
2 (AABR)-DIGESTER BUILDING
3 (A-D)-SLUDGE DIGESTER
4 METHANE TANK
5 INJECTOR BUILDING
6 (A-D)-SLUDGE DIGESTER
7 ADMINISTRATION BUILDING
8 CHLORINATION BUILDING
9 SEPTAGE DUMPING STATION
10 SCREENING AND GRIT BUILDING (NOT IN SERVICE)
11 UNIT SUBSTATION SWITCHYARD 4160V
12 CHEMICAL STORAGE (FERIC CHLORIDE & SODIUM HYDROXIDE)
13 INCINERATOR BUILDING
14 BLUE SHOP BUILDING
15 SLUDGE DEWATERING BUILDING
16 MAINTENANCE TRAILER OFFICE
17A METAL STORAGE BUILDING
17B SHOP & WAREHOUSE BUILDING
18 RIVER WATER METERING STRUCTURE
19 CONSTRUCTION MANAGEMENT OFFICES
20 SLUDGE THICKENER BUILDING (NOT IN SERVICE)
21 THICKENING CENTRIFUGE
22 PROCESS CONTROL TRAILER
23 (A-H)-PRIMARY CLARIFIERS
24 (AABB)-PRIMARY SLUDGE PUMP HOUSE #1
25 AREA DRAINAGE PUMP HOUSE
26 CHEMICAL STORAGE (SODIUM HYDROXIDE & SODIUM HYPOCHLORITE)
27 ODOR CONTROL BUILDING
28 R&D TRAILERS
29 CONSTRUCTION MANAGEMENT OFFICES
30 WHITE HOUSE
31 WEST HOUSE
32 HEADWORK
33 STORAGE BUILDING
34 ELECTRICAL SUBSTATION

SECONDARY TREATMENT STRUCTURES

50 ENGINE GENERATORS
51 MIXED LIQUOR PUMP STATION
52 (A-J)-SECONDARY CLARIFIERS
53A CLARIFIER INLET BOX #1
53B CLARIFIER INLET BOX #2
54 FILTER BUILDING
55 FILTER BLOWER BUILDING
56 UV DISINFECTION
57 ELECTRICAL SUBSTATION BLDG & UV CONTROL
58 SONDCO PUMP STATION
59 TROLLEY BARN (NOT IN USE)
60 CONTACT CHAMBER (NOT IN USE)
61 PLANT OUTFALL
62 DIFFUSER GAS CLEANING (HCL GAS) BNRF#2
63 BNR # 2
64 BLOWER BUILDING
65 CHEMICAL FACILITY
66 BNR # 1
67 DIFFUSER GAS CLEANING (HCL GAS) BNRF#1
68 ACETIC ACID TANK
69 UNDER PASS @ MARIETTA BLVD.

NOTE:

1. ALL PIPING IS DUCTILE IRON PIPE (DIP) UNLESS OTHERWISE NOTED.

AGB

D. ATKINSON

AUGUST, 2002

PLANT WATER LINE

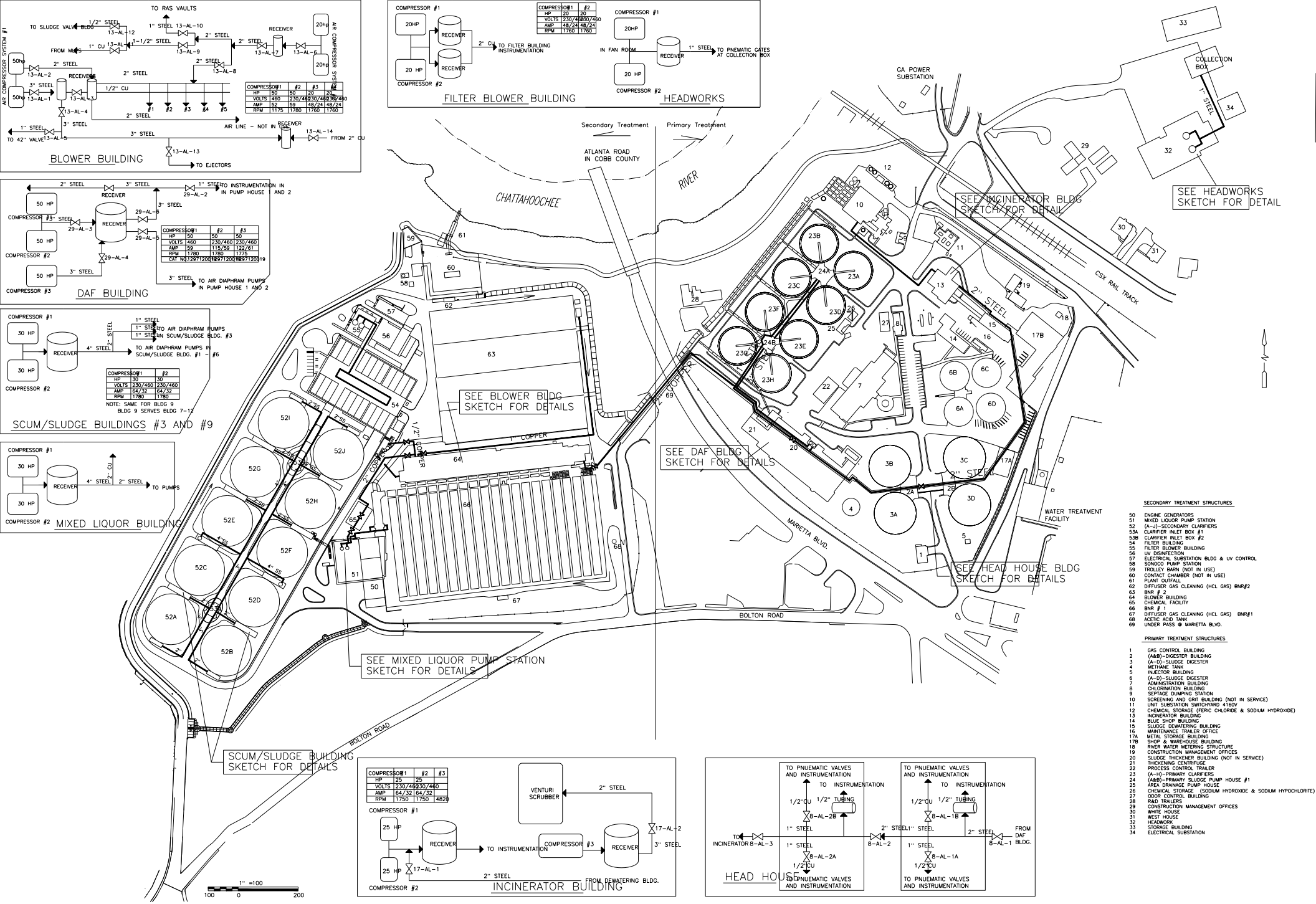
1" = 100'
0 100 200 300
SCALE FEET

AGB

D. ATKINSON

AUGUST, 2002

PLANT GAS LINE



COMPRESSOR	#1	#2	#3	#4
HP	50	50	20	20
VOLTS	460	230/460	230/460	230/460
AMP	52	59	48/24	48/24
RPM	1175	1780	1760	1760

COMPRESSOR	#1	#2
HP	20	20
VOLTS	230/460	230/460
AMP	48/24	48/24
RPM	1760	1760

COMPRESSOR	#1	#2	#3
HP	50	50	50
VOLTS	460	230/460	230/460
AMP	59	115/59	122/61
RPM	1780	1780	1775
CAT NO	1297120019	1297120019	1297120019

COMPRESSOR	#1	#2
HP	30	30
VOLTS	230/460	230/460
AMP	64/32	64/32
RPM	1780	1780

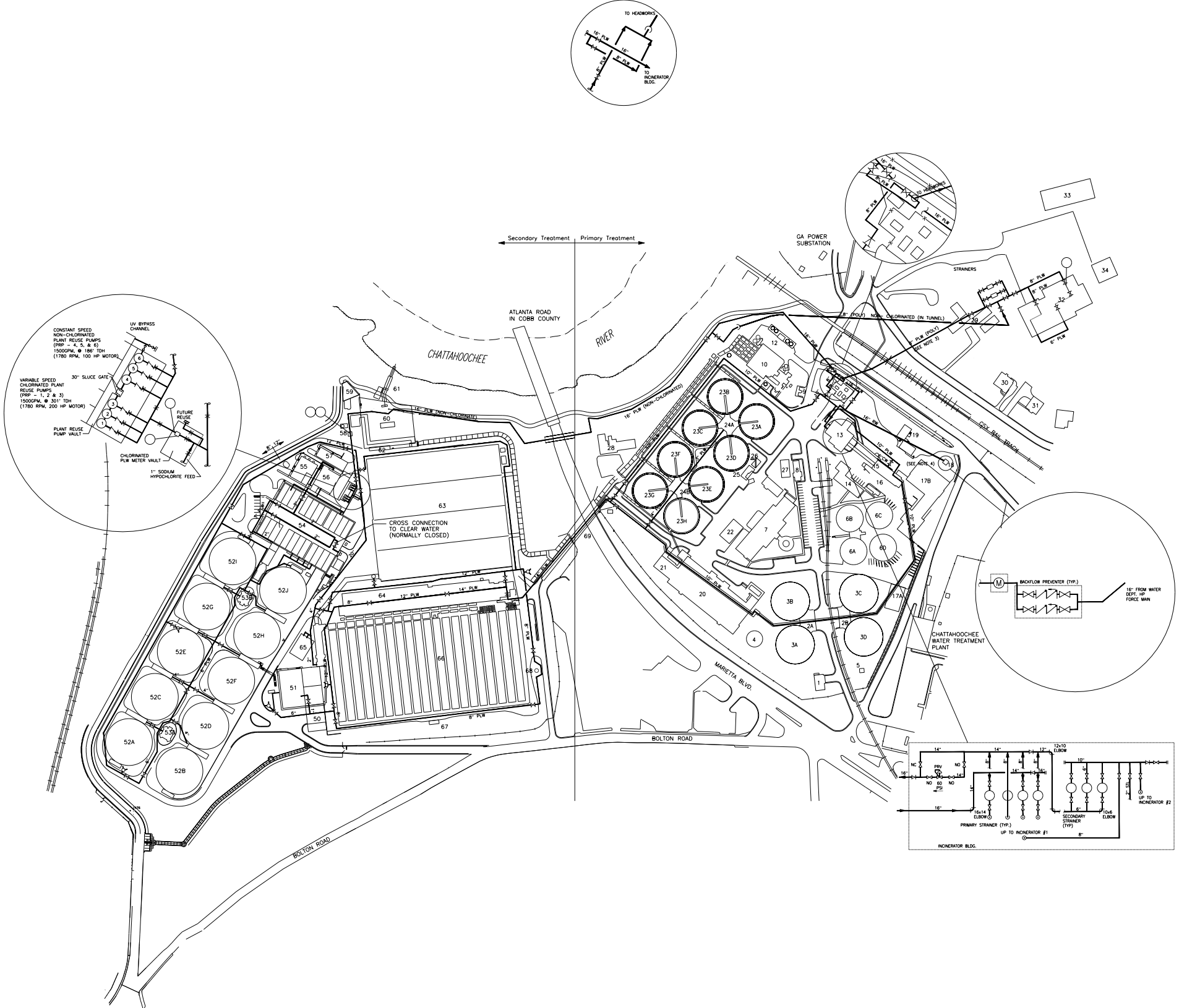
COMPRESSOR	#1	#2	#3
HP	25	25	
VOLTS	230/460	230/460	
AMP	64/32	64/32	
RPM	1750	1750	4820

SECONDARY TREATMENT STRUCTURES

50 ENGINE GENERATORS
51 MIXED LIQUOR PUMP STATION
52 (A-J)-SECONDARY CLARIFIERS
53A CLARIFIER INLET BOX #1
53B CLARIFIER INLET BOX #2
54 FILTER BUILDING
55 FILTER BLOWER BUILDING
56 UV DISINFECTION
57 ELECTRICAL SUBSTATION BLDG & UV CONTROL
58 SONOCO PUMP STATION
59 TROLLEY BARN (NOT IN USE)
60 CONTACT CHAMBER (NOT IN USE)
61 PLANT OUTFALL
62 DIFFUSER GAS CLEANING (HCL GAS) BNR#2
63 BNR # 2
64 BLOWER BUILDING
65 CHEMICAL FACILITY
66 BNR # 1
67 DIFFUSER GAS CLEANING (HCL GAS) BNR#1
68 ACETIC ACID TANK
69 UNDER PASS @ MARIETTA BLVD.

PRIMARY TREATMENT STRUCTURES

1 GAS CONTROL BUILDING
2 (A&B)-DIGESTER BUILDING
3 (A-D)-SLUDGE DIGESTER
4 METHANE TANK
5 INJECTOR BUILDING
6 (A-D)-SLUDGE DIGESTER
7 ADMINISTRATION BUILDING
8 CHLORINATION BUILDING
9 SEPTAGE DUMPING STATION
10 SCREENING AND GRIT BUILDING (NOT IN SERVICE)
11 UNIT SUBSTATION SWITCHYARD 4160V
12 CHEMICAL STORAGE (FERIC CHLORIDE & SODIUM HYDROXIDE)
13 INCINERATOR BUILDING
14 BLUE SHOP BUILDING
15 SLUDGE DEWATERING BUILDING
16 MAINTENANCE TRAILER OFFICE
17A METAL STORAGE BUILDING
17B SHOP & WAREHOUSE BUILDING
18 RIVER WATER METERING STRUCTURE
19 CONSTRUCTION MANAGEMENT OFFICES
20 SLUDGE THICKENER BUILDING (NOT IN SERVICE)
21 THICKENING CENTRIFUGE
22 PROCESS CONTROL TRAILER
23 (A-H)-PRIMARY CLARIFIERS
24 (A&B)-PRIMARY SLUDGE PUMP HOUSE #1
25 AREA DRAINAGE PUMP HOUSE
26 CHEMICAL STORAGE (SODIUM HYDROXIDE & SODIUM HYPOCHLORITE)
27 ODOR CONTROL BUILDING
28 R&D TRAILERS
29 CONSTRUCTION MANAGEMENT OFFICES
30 WHITE HOUSE
31 WEST HOUSE
32 HEADWORK
33 STORAGE BUILDING
34 ELECTRICAL SUBSTATION


TO HEADWORKS
16" PLW
TO INCINERATOR BLDG.
Secondary Treatment
Primary Treatment
CHATTAHOOCHEE
RIVER
ATLANTA ROAD IN COBB COUNTY
GA POWER SUBSTATION
STRAINERS
8" (POLY) NON-CHLORINATED (IN TUNNEL)
8" PLW (POLY) (SEE NOTE 5)
16" PLW (NON-CHLORINATED)
CSX RAIL TRACK
(SEE NOTE 4)
CROSS CONNECTION TO CLEAR WATER (NORMALLY CLOSED)
CHATTAHOOCHEE WATER TREATMENT PLANT
MARIETTA BLVD.
BOLTON ROAD
CONSTANT SPEED NON-CHLORINATED PLANT REUSE PUMPS (PRP - 4, 5, & 6) 1500GPM, @ 186' TDH (1780 RPM, 100 HP MOTOR)
UV BYPASS CHANNEL
30" SLUICE GATE
VARIABLE SPEED CHLORINATED PLANT REUSE PUMPS (PRP - 1, 2 & 3) 1500GPM, @ 301' TDH (1780 RPM, 200 HP MOTOR)
FUTURE REUSE
PLANT REUSE PUMP VAULT
CHLORINATED PLW METER VAULT
1" SODIUM HYPOCHLORITE FEED
BACKFLOW PREVENTER (TYP.)
16" FROM WATER DEPT. HP FORCE MAIN
PRV
60 PSI
16x14 ELBOW
PRIMARY STRAINER (TYP.)
SECONDARY STRAINER (TYP)
10x6 ELBOW
UP TO INCINERATOR #2
UP TO INCINERATOR #1
INCINERATOR BLDG.

ATTACHMENT NO. 4

Cost Proposal Form

(Revised 10-28-15)

COST PROPOSAL FORM

FROM:
Proponent's Name: _____
Proponent's Address: _____
_____

FOR:
Project Name: FC-8188, RM Clayton WRC Nutrient Harvesting Design-Build Project

ITEMS:

No.	DESCRIPTION	TOTAL
1	Lump Sum Proposed Price[1]	$
2	Lump Sum Maintenance Price[2]	$
3	Extended Warranty Price	$
4	Owners Allowance[3]	$ 2,500,000.00
	TOTAL OF 1-4:	**$**

TOTAL ITEMS 1 THROUGH 4, INCLUSIVE, THE AMOUNT OF:

(Total Proposal Amount in Words)_____

_____ DOLLARS ($_____).

*Lump Sum Prices shall include all business expenses (e.g., personnel, administrative, training, quality control, etc.) that will be assumed by Proponent for the Work.

[1] Lump Sum Bid Price includes cost of Design and Construction of a Nutrient Harvesting System – as described in Exhibit D-1 " Scope of Work".
[2] Lump Sum Maintenance Price is inclusive of a base term of five (5) years.
[3] Owner controlled allowance for unforeseen conditions.

ATTACHMENT NO. 5

Specification 01350

(Revised 10-28-15)

SECTION 01350
PROJECT DOCUMENT TRACKING AND CONTROL SYSTEM

1.01 SCOPE

A. The Contractor shall utilize the City of Atlanta's Project Document Tracking and Control System (DTCS). The primary function of the system is to facilitate timely processing and approval of all contract documentation in coordination with the overall Project Schedule established by these Specifications and the Contractor. This system will utilize Primavera Unifier for document tracking and control and Lynx Photo Management software. The Primavera Unifier software will:

1. Facilitate communication among the Owner, Engineer and Contractor;
2. Facilitate turn-around time with regard to responses and approvals;
3. Provide a central location for all Project information to facilitate all Project participants in performing their tasks based on the latest Project data;
4. Provide a standard system of project administration with accountability.

B. The Contractor shall be required to utilize the web-based DTCS system that resides on the Department of Watershed Management server to generate documents in the proper format for submission to the City. The Contractor shall access the system through the internet using a compatible web browser from the Contractor's administrative field office location, and/or other locations where work associated with the Project is being performed.

C. The Contractor shall be required to generate Project documents and records utilizing the aforementioned system. The Contractor shall be required to transmit and submit the Project documents within the system to the City.

D. The Contractor shall utilize a high capacity scanner capable of scanning 11 x 17 documents, double sided, on site for the entire duration of the Project. All documents must be scanned in and attached to the appropriate Primavera Unifier document, including submittals, shop drawings, O&M's and all other documents requested by the Engineer.

E. The Contractor shall utilize the DTCS to create and maintain Project documents, including, but not limited to the following:

1. Company Directory: Addresses, Phone Numbers, Personnel Contacts, etc.;
2. Drawings Log: Current Drawing revision log;
3. Submittals (Integrated with Project Schedule through Activity codes);
4. Transmittals;
5. Requests for Information and Answers (RFIs) ;

6. Change Documents, Including:
   a. Work Authorizations (WAs);
   b. Change Order Requests (CORs);
   c. Change Orders (CO).
7. Daily Reports (Daily Diaries);
8. Field Decisions & Clarification Memos;
9. Notice of Non-Compliance;
10. Construction Issue Memos;
11. Punch lists;
12. Meeting Minutes & Agendas;
13. Correspondence;
14. Work Plans;
15. Start-up Plans;
16. Equipment Operation and Maintenance Training; and
17. Spare Parts.

F. The Contractor shall utilize the complete capabilities of the DTCS to meet the requirements of this Section. The Contractor shall provide a highly trained and experienced construction project controls person knowledgeable in construction work sequencing, productivity, scheduling and application of the Primavera Unifier Software system. This person, along with the Contractor's management team, shall work closely with the City to deliver the documents outlined in this Section.

G. Software Support
   1. The Contractor is to provide for a one day training class in the base bid for the Lynx PM software for ten (10) personnel, seven (7) for City of Atlanta and three (3) for the Contractor. Type of class to be determined by the City. The Contractor may contact Lynx PM Representative at 1-877-955-7711.
   2. The contractor shall purchase five (5) additional licenses of the Primavera Unifier software on behalf of the City for use during the project. At project close, the licenses will remain City property.
   3. The Contractor shall be required to establish an internet connection using DSL or better to connect to the DTCS to permit the forwarding and receipt of documents.
      a. The Primavera Unifier software supports the following Email programs, and the Contractor is to utilize:
         (1) Microsoft Outlook 2003
         (2) Microsoft Outlook 2007

b. The Contractor shall also provide two (2) days of consulting services in the base bid for troubleshooting and maintenance of the DTCS at any location designated by the City or at the Contractor's administrative field office (if authorized by the City). Troubleshooting, maintenance, upgrade, configuration, and set up shall be performed by DWM contractor or other contractor approved by DWM in writing, based on a scope pre-defined by the City of Atlanta. The Contractor shall utilize the custom data fields, dictionaries, and coding systems as required by the City of Atlanta.

H. The Contractor shall be required to attend a two (2)-day training session on the operation of the City's DTCS, provided by a Primavera Authorized Trainer. The Contractor shall provide the training session for ten (10) participants (fee for the Primavera Authorized Trainer). The training session shall be attended by the Contractor (limited to three (3) participants) as well as representatives of the Owner (seven (7) participants). The Contractor shall be responsible for the cost of training for additional members of their firm or future retraining, as may be deemed necessary by the Contractor.

I. The Contractor shall meet with the City within fifteen (15) days after the Contract is awarded to discuss access requirements and the Contractor's plan to utilize DTCS and execute the document control functions herein.

J. Access through the internet to the DTCS shall be operational within thirty (30) days following the pre-construction meeting date. This must be operational from the Contractor's administrative field office location.

1.02 COMPANY DIRECTORY

The Contractor and the City will monitor and manage the company directory. The directory must include company name, company abbreviation, contact names, address, phone numbers and e-mail addresses.

1.03 DRAWING LOG

The City will maintain a log of initial "issued for construction" drawings in the DTCS. Information shall include drawing number, title and revision number. In addition to logging the initial project drawing list, the City will maintain a log on the DTCS of all subsequent revisions to these drawings and any sketches resulting from clarification memos, RFIs, field orders and Change Orders. It is the Contractor's responsibility to utilize the latest drawings and sketches in the performance of the Work.

1.04 SUBMITTALS/SHOP DRAWINGS

A. Requirements: This section specifies supplemental requirements related to the processing of submittals and shop drawings. The Contractor will utilize the DTCS to log and track submittals, as well as generate associated transmittal letters.

B. Submittals & Product Data: A list of all required submittals will be entered into the DTCS by the Contractor. Submittals shall be incorporated into packages, with numbering to be provided by the COA's engineer. The Contractor will log and track all submittals utilizing the DTCS. Each review cycle shall be entered into the DTCS. The Contractor shall identify as activities in the CPM schedule, specified in SC-16, to include all data submittals, as well as those involving complex reviews and long lead deliveries, and all procurement items required for construction activities Submittal schedule information shall be updated monthly with the Contractor's updated project CPM schedule, as specified in SC-16.

C. Samples: A list of all required sample submittals will be entered into the DTCS by the Contractor. Sample submittals shall be identified as individual submittals within the submittal packages with numbering as specified above.

D. Guarantees/Warranties: A list of all required Guarantee/Warranty submittals will be entered into the DTCS by the Contractor. These submittals shall be identified as individual submittals within the submittal packages with numbering as specified above.

E. Work Plans, Start-up Plans, O&M Submittals and Spare Parts: All testing, Start-up and O&M submittals will be entered into the DTCS by the Contractor. These submittals shall be identified as individual submittals within the submittal packages identified with numbering as specified above.

F. Submittal Procedures: The Contractor shall prepare all submittal packages utilizing the submittal numbering system, description and packaging conventions described above. Submittals prepared by the Contractor, which fail to follow the conventions described above, will be returned "amend and resubmit". Should the Contractor determine that a submittal is required and is not covered by the listing within the DTCS, consultation with the City to determine the submittal number, description and packaging will be required.

1.05 CORRESPONDENCE

The City shall monitor and manage the correspondence, Non-Compliance Notices, Field Decisions & Clarification Memos and Construction Issue Memo logs. The Contractor is responsible for generating Project correspondence within the DTCS, and forwarding the correspondence to the City.

1.06 TRANSMITTAL LOG

The Contractor and the City will monitor and manage the transmittal log. All Project transmittals shall be created electronically, automatically sequentially numbered and logged into the DTCS system as they are created. The Contractor is responsible for utilizing the system to create transmittals for items transmitted to the Owner, Engineer, Resident Inspection Staff and other Contractors.

1.07 REQUEST FOR INFORMATION & ANSWERS

The Contractor shall be responsible for generating RFIs on the DTCS system. The Contractor shall notify the City when an RFI is submitted. The City will monitor and manage the RFI log. The City will generate an Answer document in response to each RFI and forward them to the Contractor. The DTCS will track "Ball in Court" for all RFIs and Answers, as well as date of original generation and response date. In addition the RFIs will reference the relative Specification Section and Drawings. The DTCS will identify the date of the request and the originator, responsible party for a response and the date of the response.

1.08 CHANGE DOCUMENTS

NOT USED

1.09 DAILY REPORTS

The Contractor is responsible for creating daily reports (daily diaries) utilizing the DTCS. The Contractor is required to enter the Daily Reports into the DTCS by 10:00 a.m. of the subsequent day that the Contractor or any subcontractor performs work. All daily reports shall be logged into the DTCS by the Contractor. The Contractor shall also provide one (1) signed hard copy of all daily reports on a weekly basis. Required information shall include Contractor, Date, Day, Temperature, Precipitation, Sky, Wind, Work Activity, Equipment, Field Force, Visitors, Materials, and Scheduled Activities utilizing the schedule activity codes. Daily reports which fail to link work activities to the active schedule will not be acceptable.

1.10 PUNCHLISTS

The City will monitor and manage punch lists, and will create Punch lists to be forwarded to the Contractor. The Contractor shall address the Punch list items that have been assigned to the Contractor and forward updates to the City. Once accepted as complete, the City will access the punch list in the DTCS and close it out.

1.11 MEETING MINUTES AND AGENDA

The City shall monitor and manage the meeting minute process. The City will forward meeting minutes to the Contractor electronically. The City will log the meeting minute items into the DTCS within three (3) days of the meeting date.

1.12 PROGRESS PAYMENTS /REQUISITIONS FOR PAYMENT

The Contractor is responsible for creating progress payment applications directly from the **Primavera** Unifier software and then forwarding them to the City electronically along with hard copies by 4:00 p.m. at the end of each update/billing period. The Contractor shall also simultaneously provide a separate submittal of the updated progress schedule (P6 or latest version at the time of purchase), as specified in SC-16. All Progress Payments and schedule of values shall be developed as defined in the Special Conditions. Required information within the Pay Application shall be coordinated with the City's Project Manager. Maintenance of the "As Built" record documents by the Contractor shall be verified before processing will be approved. Failure of a Contractor to maintain project record documents, maintain current and properly prepared daily reports or to submit the project schedule update per SC-16 will be just cause for withholding of the monthly or final payment.

1.13 LYNX PHOTO MANAGEMENT SOFTWARE

The Lynx PM software shall be utilized by the City and the Contractor for the duration of the project. The daily construction photographs will be the permanent visual record of the pre-construction conditions, daily construction site activities, and the completion of construction work. The Contractor must submit to the City no less than four (4) record photos for each activity ID listed in the project schedule per the last schedule update. Applicable photos must accompany each Pay Application.

+++ END OF SECTION 01350 +++

ATTACHMENT NO. 6

Response to Questions (34)

ATTACHMENT NO. 6
Response to Questions (34 Questions)

1. **Question**
   To provide enough time to prepare a thorough set of documents and engage the local subcontracting community, we are requesting that the city extend the due date for proposal submission by two weeks to November 18, 2015.

   Answer
   The due date will be extended to December 2, 2015. See Addendum No. 2, Item No. 1.

2. **Question**
   In order for Proponent to prepare a qualitative and competitive response to this RFP, we request the deadline be extended a minimum of three (3) weeks, from November 4, 2015 to November 25, 2015.

   Answer
   Refer to Question No. 1 above.

3. **Question**
   RFP Part 2, 3.2.4.1 (page 4 of 11) states, "Proponent Design-Build Team shall have successfully completed at least five (5) design/build contracts involving design and construction or refurbishment of Nutrient Recovery equipment, side stream treatment equipment, or similar design-build projects at wastewater treatment facilities. At least two (2) of the five (5) shall involve Nutrient Recovery Systems. These projects are also to demonstrate and document experience with piping, installation of mechanical equipment, electrical and instrumentation systems in an operating system in coordination with ongoing operations. The projects shall have a construction value of not less than Ten Million Dollars ($10,000,000) each." This language as currently written may minimize or eliminate all competition on this project as there are only a handful of Nutrient Recovery Systems currently in operation throughout all of North America, and we are not aware of any team that can meet this requirement as written. Proponent suggests the following modified language –

   > "Proponent Design-Build Team shall have successfully completed at least five (5) design/build contracts involving design and construction or refurbishment of similar design-build projects at wastewater treatment facilities. At least two (2) of the five (5) shall involve Nutrient Recovery equipment or side stream treatment equipment. These projects are also to demonstrate and document experience with piping, installation of mechanical equipment, electrical and instrumentation systems in an operating system in coordination with ongoing operations. The projects shall have a construction value of not less than Ten Million Dollars ($10,000,000) each."

   Answer
   See Addendum No. 2, Item No. 8.

4. **Question**

RFP Part 2, 3.2.4.2 (page 4 of 11) is calling for each of the Key Personnel as listed in 3.2.3.1 to have a minimum of five (5) references at municipal water reclamation facilities for which Proponent's proposed Manufacturer's equipment has been installed and has been in operation at least two (2) years. This language as currently written may minimize or eliminate all competition on this project as there are only a handful of Nutrient Recovery Systems currently in operation throughout all of North America, and we are not aware of any team that can meet this requirement as written.

Please confirm this Section shall only pertain to the Manufacturer's Representative/ Project Manager.

Answer

Confirmed as stated. See Addendum No. 2, Item No. 8.

5. **Question**

RFP Part 2, 3.2.4.3 (page 5 of 11) is calling for each Proponent to provide names and addresses of five (5) references at municipal water reclamation facilities for which Proponent has a Service Agreement for By-Product Management, Equipment Maintenance, or both. This language as currently written may minimize or eliminate all competition on this project as there are only a handful of Nutrient Recovery Systems currently in operation throughout all of North America, and we are not aware of any team that can meet this requirement as written.

Please confirm this Section shall only pertain to the experience of the Nutrient Recovery System Manufacturer/Supplier.

Answer

Confirmed as stated. See Addendum No. 2, Item No. 2.

6. **Question**

RFP Part 1, 4.4 (page 2 of 11) states Proponent shall provide the City with an extended five (5) year warranty for the Nutrient Recovery System equipment upon final acceptance of the Nutrient Recovery System.

RFP Part 2, 3.2.10 (page 11 of 11) states the Warranty shall extend for a period of five (5) years from the date of Substantial Completion.

a. Does the date of this 5-year extended warranty begin upon Final Acceptance or Substantial Completion?

b. Please confirm this 5-year extended warranty does only apply to the Nutrient Recovery System equipment and all other work remains at the 1-year warranty per 2.10 of the General Conditions of Contract between Owner and Design-Builder.

Answer

a. The five (5) year extended warranty will begin upon Final Acceptance.

b. The five (5) year extended warranty is to apply to the Nutrient Harvesting equipment and any other significant equipment necessary for the operation of the

system (e.g. pumps, etc.). If the proponent needs to clarify, they can do so listing any exceptions in their proposal.

7. **Question**
We do not find where the RFP has provided the Proponents with an existing site utility plan or geotechnical report. Please advise if these are available and will be provided.

Answer
The most recent geotechnical data currently available is provided in Addendum No. 2, Attachment No. 1. Attachment No. 1 should not be used as a guarantee of the existing site utilities. Additionally, the Attachment does not represent soil tested in the area being contemplated for the Nutrient Harvesting project. All future geotechnical testing will take place post Agreement execution.

8. **Question**
Exhibit C, Division 01 Specifications, 01640-1.07.F states the Owner will provide audio/video taping of all training sessions. 01664-2.05 states the Contractor will retain the services of a commercial video-taping service to record each training session. Please confirm this will be provided by the Owner per 01640-1.07.F.

Answer
If audio/video taping of training sessions is determined to be necessary, it will be provided by the Owner per Specification 01640-1.07F.

9. **Question**
Exhibit D – Basis of Design Documents, Exhibit D-1 – Scope of Work, 1.8 Nutrient Recovery Process Design Description and Loadings. There is a Footnote 1 at the bottom of page 6 of 10 that reads, "Based on the Technical Memorandum, City of Atlanta, Water Resources Management Plan: Wastewater Component Process Modeling, BGR, March 11, 2013." We do not find where this Technical Memorandum prepared by Black & Veatch/Gresham Smith & Partners/ROHADFOX is included in the RFP. Is this report available to the Proponents?

Answer
Yes. See Addendum No. 2, Attachment No. 4.

10. **Question**
RFP Part 1, 26. – Agreement Terms (page 8 of 11), states Contractor shall substantially complete the Work within twenty-three (23) months from NTP, and shall fully complete the Work within fourteen (14) days of Substantial Completion. RFP Part 2, 3.2.5.1 Overall Project Approach (page 6 of 11), and RFP Part 5, Standard Form of Agreement Between Owner and Design-Builder, Article 5.2.2 (page 3), includes a Milestone Schedule calling for a Substantial Completion (Milestone 4) of 21-months from NTP, and a Final Completion (Final Milestone) of 23-months from NTP. Which is correct?

Answer
RFP Part 2, 3.2.5.1 Overall Project Approach, is correct. See Addendum No. 2, Item No. 5.

11. <u>Question</u>

RFP Part 5, 5.5 (page 4) states, "Design Builder understands that if Final Completion is not achieved within fourteen (14) days of the Substantial Completion Date, Owner will suffer damages…" we believe both uses of "Substantial Completion" in this paragraph should be changed to "Final Completion". Please confirm or clarify (coordinate with Question #10 above).

<u>Answer</u>

Refer to Question 10 above. Also, see Addendum No. 2 Item No. 7.

12. <u>Question</u>

We have had numerous conversations with our selected nutrient recovery process equipment provider, and have concerns about the ability of *any* contractor or engineer to meet the project requirements. Pursuit costs and commitments for a design-build project are tremendous. There is a high cost risk to win this project and we are concerned that the City will not get any proposers if requirements can't be met.

At this time, there are only six (6) operational facilities in the **United States** that have incorporated the Ostara nutrient recovery process equipment and only two (2) of these six facilities are located in the Southeast. Of these six (6) facilities, only one (1) has been operational for two (2) or more years and only 2 or 3 of these facilities are $10 million or more. The other Ostara facilities either have been in operation less than two years, or are currently under construction. Each facility was constructed by a different contractor and only one (1) of these projects was delivered using design-build.

Therefore, we suggest the following revisions be made:

3.2.4 Overall Experience, Qualifications and Performance on Previous Projects

a. 3.2.4.1 Proponent Design-Build Team shall have successfully completed at least five (5) design-build contracts involving design and construction of treatment plants (noting any projects that included nutrient recovery/removal) with ongoing operations, and the Design-Build Team must have designed at least two (2) nutrient recovery projects with the selected nutrient recovery process equipment. These projects are to also demonstrate and document experience with piping, installation of mechanical equipment, electrical and instrumentation systems in an operating system in coordination with ongoing operations. The projects shall have a construction value of not less than Five Million Dollars ($5,000,000) each.

b. 3.2.4.2 Proponent Design-Build Team shall provide the names, addresses, and current phone numbers of a minimum of five (5) references at water/wastewater treatment plants where the projects were delivered using the design-build delivery methodology, and at least two (2) references at water reclamation facilities for which the Design-Build Team has designed Proponent's proposed Manufacturer's equipment, and which has been installed and is currently operational. Indicate which projects the Key Personnel identified in Paragraph 3.2.3.1 above were involved with and their position during the design/construction of the project. Provide a complete listing of operating installations and installations under

contract but not completed. This will serve as references for the proposed manufacturer of the Nutrient Recovery System.

c. 3.2.4.3 Design-Build Team shall provide names and addresses of five (5) references at municipal water reclamation facilities for which Nutrient Recovery process equipment provider has a service agreement for By-Product Management, Equipment Maintenance, or both (use Form 7). Information shall be provided for each reference as to what type of agreement is in place, how long it has been in place, how many renewals have occurred, and if the agreement is current. Proponent may use same reference(s) provided above, if they meet both requirements.

Answer

a. See Addendum No. 2, Item No. 8.

b. See Addendum No. 2, Item No. 8.

c. See response to Question 5.

13. Question

Please provide copies and/or make available any as-built documents and subsurface exploration data that the City may have for the following areas @ the RM Clayton WRC Facility:

- Sludge Dewatering Building – area 15 of RM Clayton WRC site map.
- Incinerator Building – area 13.
- Blue Shop Building – area 14.
- Sludge Digesters (below grade) – area 6A-6D.
- Shop & Warehouse Building – area 17B.
- Unit Substation Switchyard – area 11.
- Maintenance Trailer Office – area 16.
- Construction Management Offices – area 19.

Answer

See Response to Question 7. Additional data is provided in Attachment No. 3; however, the City makes no claim to the accuracy of the data provided as it relates to this project.

14. Question

To allow sufficient time for preparation of our response to the RFP and optimize participation for the City's EBO objectives on this project, we respectfully request your consideration to extend the due date for proposals two (2) weeks, to November 18, 2015.

Answer

See response to Question 1.

15. Question

The City is requesting that the Information Proposals be segmented into two Volumes:

- Volume I-Information drafted and provided by proponent
- Volume II-Information Provided by a proponent on Forms provided by the City

However, information requested to be included in Volume (1) is requested to be presented on forms; i.e., Section 3.2.3.2 Key Personnel; and in Section 3.2.4.2 Overall Experience, as well as additional sections. Does the City require information to be presented in each both volumes, separate, etc.? In order to be compliant with the City's Request for Proposal, we would like clarification.

Answer
If information requested in Volumes 1 and 2 is duplicative, the City requests that a copy of the information be placed in both Volumes.

16. Question
Can we replicate some of the required forms in the PDF of the RFP? They are easier to fill in if I replicate the form in Word.

Answer
Yes, however it is not recommended. Replication of documents introduces the risk of unintentional altering of the documents, in which case, the Proponent may be deemed non-responsive.

17. Question
We request copies of and/or access to any process studies/plans that the City may have related to both the liquid and solids processes @ the RM Clayton WRC facility for the past five (5) years.

Answer
A considerable amount of information has been provided in Addendum No. 2 of this RFP. However, if Proponent is aware of specific (above request is excessively broad), relevant, data which would be beneficial in the development of a Proposal, please submit request in writing.

18. Question
We request the following information:

a. Drawings for the buildings numbered 1-4 below.

b. The most recent site plans showing buried pipes and duct banks in the vicinity of those buildings. Those should include the locations of utilities needed for the proposed nutrient recovery facility, such as potable water, reclaimed water, sanitary sewer, natural gas, and electric power.

c. Drawings of the retaining wall that is located between the office trailers and the electrical substation.

Answer

a. There are no drawings available, except as noted in "b" below.

b. See response to Questions 7 and 13.

c. No drawing is available.

19. Question

To provide enough time to prepare a thorough set of documents and engage the local subcontracting community, we are again requesting that the city extend the due date for proposal submission by a minimum of two weeks.

Answer

See response to Question 1.

20. Question

In Section 01600-2.05, Electrical Equipment enclosure specifications are referenced but are not included in the package. Can the City provide this information as part of an Addendum?

Answer

Electrical Equipment enclosure specifications will be dependent upon project design and will therefore be provided by the Design/Builder.

21. <u>Question</u>

In Section 01640-1.07, (Page 210), the RFP states that training will be taped by Owner, however in Section 01640-2.05 (Page 233), the RFP says that training will be taped by Contractor. Can the City provide clarity on this item?

<u>Answer</u>

See response to Question 8.

22. <u>Question</u>

Section 2 of Exhibit D-1 sets out the Nutrient Recovery System requirements. These requirements are presented absent any influent criteria. As a matter of chemistry, removal efficiency will depend heavily on the characteristics of any influent stream, and so to guarantee any particular removal efficiency will require criteria in respect of the influent stream. Please provide influent criteria.

<u>Answer</u>

See Part 5, Exhibit D-1, Scope of Work, Tables 1, 2 and 3.

23. <u>Question</u>

There are IP provisions set forth in Article 4 of the Standard Form of Agreement Between Owner and Design-Builder and Article 12 of the Services Agreement which talk about "work product" being owned by the City. While this may be ok for the Design-Builder, the City should be aware that this concept will be somewhat problematic in respect of any agreements with Ostara (ie. Services Agreement and Offtake Agreement). Because of its arrangements with its third- party licensors, Ostara will need to license certain IP to the Design-Builder to allow them to construct a facility and to the City to allow it to operate the system, and is not in a position to allow the City to take any kind of ownership position in this IP or in any improvements thereto conceived during the course of the work."

<u>Answer</u>

No question posed, however, the issue raised will only become relevant if the winning proponent choses to use the Ostara product. The City will address this issue if and when it becomes relevant.

24. <u>Question</u>

In Section 2.12 (Page 197) the RFP states that equipment manufacturers need to certify equipment installations and perform functional testing on their equipment onsite. Ostara provides their technology as a package and this is an integrated mix of some Ostara manufactured equipment (e.g reactors), stock supplied equipment (e.g. pumps and valves) and equipment that has been manufactured by third-party vendors customized for Ostara (e.g. dryer, bagging system, silos etc.). We would bring in key players from the vendor list at our discretion but ultimately Ostara will sign off on the install. Having 20+ vendors to site would mean a significant amount of extra cost. Are we to interpret that Ostara would be named as the manufacturer of Pearl as a whole thus making them responsible for certifying installation and functional commissioning of all parts?

Answer
Yes.

25. Question
In Part 2, Section 3.2.7 (Page 26), the Byproduct Management plan term is suggested to be 5 years. Is there any latitude on term? Our company does not enter into byproduct offtake arrangements that are shorter than 10 years (and would prefer arrangements of 20 years or more). Is this a statutory/ requirement or simply a desire on the part of the City to revisit the terms every five years?

Answer
This is not a statutory requirement; it is the City's desire to revisit the terms every five (5) years.

26. Question
In Part 1, on Page 8 and 9 – Proposal Cost Form referenced is not in the package:

> **12. Preparation of Proposals:** All Proposals must be submitted on forms supplied by the City and shall be subject to all requirements of the Agreement Documents. All Proposals must be regular in every respect and no interlineations, excisions, or special conditions shall be made or included in the Proposal by the Proponent.
>
> 12.1 Lump sum, unit price, and extensions of unit prices must be entered in the appropriate spaces provided on the Proposal Cost Form.

Answer
See Addendum No. 2, Item No. 9.

27. Question
On Page 28 and 82, there is no line for the Services Agreement cost in the form on page 82:

> **4. Cost Proposal**. Each Proponent must submit a Lump Sum Amount for the design-build of the Nutrient Recovery System, plus, Pricing for the Extended Warranty; and Pricing for the Services Agreement. Can the City please modify the form as necessary so that this requirement can be met?

Answer
The Services Agreement is synonymous with the Maintenance Agreement. See Addendum No. 2, Attachment No. 4.

28. Question
There is language in the RFP (particularly *Section* 3.2.8 of Part 2) that suggests that a byproduct management and maintenance plan should be included as part of the Services Agreement. We would like to clarify how this fits with bids containing an Ostara system. The management plan, as we understand, is an explanation to the City of how the proponent plans to deal with the byproduct of the nutrient recovery system. In the

case of each bidder that submits an Ostara system, they will be offering to the City a standalone agreement with Ostara to purchase 100% of the byproduct produced by the system. This agreement cannot be simply wrapped into the standard form Services Agreement, as that agreement is designed more for the simple provision of maintenance and other services, and is not designed for a long-term procurement relationship. Accordingly, bids containing Ostara equipment will include a Services Agreement which addresses the City's need for maintenance services at the facility and a separate Offtake Agreement which addresses the purchase of the product and sets out the operational support services that Ostara provides to each of its operating customers.

a. *Is our understanding correct? If not, please explain.*

b. *Is this approach acceptable?*

Answer

a. Yes.

b. Proponent may include alternate approaches in their proposal, insuring that requested approach is also provided.

29. Question

Can the city provide all of the required forms of the proposal in either word or excel for use by the proponents?

Answer

No.

30. Question

Due to the nature of design-build, scope of work certainty is difficult to define early enough to list all subcontractors including contract dollar amounts for this type of delivery. We request that the design-builder commit to the overall project percentage goals but be allowed to submit the listing of subcontractors, including dollar amounts, at the time design certainty is complete.

Answer

Proponents must list their certified M/FBE subcontractors on form EBO-3 in Appendix A of the solicitation document. This submittal MUST include the type of work to be performed by ALL subcontractors, as well as the dollar amount and percentage amount of work for each of them. Form 3 is required to be submitted with the Proposal.

31. Question

Section 3.2.4.2 requires that the proponent, as well as each of the key personnel, each provide 5 references at facilities for which the Proponent's proposed manufacturer's equipment has been installed and in operation for at least two years. Our proposed manufacturer's equipment is a relatively new solution, the manufacturer believes all proponents are unable to meet the requirement for both the Proponent and each of the key personnel. Can this section be modified to require references from similar projects, thus removing the requirement for the manufacturer's equipment?

Answer
See response to Question 3.

32. Question
If the plant is unable to provide at any time, "side stream" flow to this nutrient recovery plant, due to no fault of this proponent, what are the financial risks associated with lack of being able to produce the product?

Answer
The City does not foresee a financial risk associated with lack of a centrate flow.

33. Question
In the Pre-Bid Conference it was stated the one original and five copies of the proposal should be submitted. Page 4 and 5 of 11 of the Instructions to Proponents indicates one original, seven copies and two digital (CDs). Please confirm which is correct.

Answer
The RFP is correct.

34. Question
Please furnish any and all soils information you have in the area of the existing Incinerator Building and the Dewatering Building.

Answer
No current site specific geotechnical information is available. See information provided in Attachments 1-3 of Addendum No. 2.