FULTON COUNTY

October 27, 2016

Re: **#16ITB090716K-EC, Little River WRF Expansion**

Dear Bidders:

Attached is one (1) copy of Addendum No. 1, hereby made a part of the above-referenced Invitation to Bid (ITB) #16ITB090716K-EC, Little River WRF Expansion.

Except as provided herein, all terms and conditions in the ITB referenced above remain unchanged and in full force and effect.

Sincerely,

Elsa D. Castro

Elsa D. Castro
Assistant Purchasing Agent

This Addendum forms a part of the contract documents and **modifies** the original ITB documents as noted below:

Bid Document Changes:

The Following changes to the contract documents are made by the addendum:

1. Drawing 20-S-107, Intermediate Level Plan—West. At drawing location D4, revise dimension of 103'-0" to 119'-3".
2. Drawing 20-A-601 On the room finish schedule. For the floor in the chemical storage area change "SC" to "CONC*"
3. Specification 02250 Section 3.01 delete the second paragraph and replace it with the following: **"The pile length shall be to the depth of Auger refusal as shown on Detail A of Drawing 00-S-004" For bidding purposes, contractors are to assume an average depth of 40 ft. The bid form includes a cost / credit number for additional or reduced depth of the piles compared to the assumed 40 ft. "**
4. Specification 2200, make the following revisions:
    a. Section 1.03 replace paragraphs 8 and 9 with the following:
    "**Suitable material from grading and excavation may be used insofar as practicable in fills, embankments, subgrades, slopes, and shoulders to achieve elevations shown on the drawings.**
    All excess soil and unsuitable material and rock from grading and excavations shall be disposed of offsite by the contractor."
    b. Section 3.05 add the following statement:
    " Bidders shall assume the removal and disposal of 50 CY of Mass Rock and 50 CY of Trench Rock within their base bids. Rock encountered beyond these amounts will be compensated out of an allowance Item based on the unit rate provided on the Bid Form. If less rock than these quantities is encountered, then a credit shall be issued back to the County at the same defined unit rate."
5. Specification 2211, Section 1.01, Delete B and replace with the following:
    "B. BIDDERS ASSUPTIONS AND COMPENSATION FOR ROCK
    Bidders shall assume the removal and disposal of 50 CY of Mass Rock and 50 CY of Trench Rock within their base bids. Rock encountered beyond these amounts will be compensated out of an allowance Item based on the unit rate provided on the Bid Form. If less rock than these quantities is encountered, then a credit shall be issued back to the County at the same defined unit rate. See Section 02200 3.05 Rock Excavation for measurement and determination of rock classification."
6. Specification 9670 page 4. Section 2.1 A add Key Mortar STD "Green" as an acceptable manufacturer.
7. Specification 11128, make the following revisions:
    a. Section 1.01.E In the Operation Requirement table Delete peak operating flow of 6.5 mgd and replace with a peak operating flow of 4 mgd.
    b. Section 2.01 add CleanTek (RotoSieve) to list of candidate manufacturers.

8. Specification 11236 section 2.01 delete Invent from list of Candidate suppliers.
9. Specification 11737 section 2.01 replace the second paragraph with:

   "LPHO UV disinfection equipment for this project shall be manufactured by Trojan Technologies or WEDECO, inc. or equal."
10. Specification 15050 Page 6 Section 2.0. Add the following sentence to the end of the paragraph.

    "All buried and exposed MJ valves shall be restrained.
11. Specification 16000 1.01A add the following paragraph:

    "The electrical installation shall comply with the current adopted version of the National Electrical Code (NEC) in Georgia; all state and local codes. This includes the requirements for equipment, installation, labeling and identification of the electrical systems."
12. Specification 16231 2.04D, add the following:

    "Item 8. Breaker shall be lockable in the open position.

    Item 9. Provide energy-reducing maintenance switching with local status indicator."
13. Specification 16310, make the following revisions:
    a. 2.01: Add General Electric to candidate manufacturer's list.
    b. 2.04: Delete the following sentence in the second paragraph: "Electrically operated circuit breakers shall be capable of operating on 24 to 125VDC control power."; and replace with the following: **"Electrically operated circuit breakers shall be capable of operating on 120VAC control power. All breakers shall be lockable in the open position."**
    c. 2.04: Add the following paragraph: **"All switchgear breaker trip units shall utilize zone selective interlocking (ZSI) technology. This method shall be used to reduce arc energy downstream of the main breakers and all feeder breakers in the switchgear lineup. The trip units shall provide zone interlocking for the short-time delay and ground fault delay trip function for improved system protection. The zone interlocking system shall allow an upstream breaker to trip with no intentional time delay in the event a downstream breaker does not see the fault. If the downstream breaker does see the fault, it shall provide a restraining signal to the upstream breaker to maintain its normal time delay settings. Factory shall wire for zone interlocking for the power circuit breakers within the switchgear."**
    d. 2.05: Add the following paragraphs: "**A remote OIT shall be provided as remote mounted, integral part of the switchgear master control panel. This OIT will be used for monitoring and for changing control parameters. The OIT shall be panel mounted in a NEMA 1A wall-mounted cabinet and shall be provided complete with 24VDC power termination and an uninterruptible power supply (UPS). OIT shall be min. 15" color HMI touchscreen graphic terminal with alarm and event logging. The power rating of the UPS shall be determined by this Manufacturer. Communication link between the switchgear mounted OIT and the remote OIT shall be by Ethernet cable (Cat5) via the switchgear Ethernet switch. Communications shall be Ethernet/IP. Miscellaneous electrical devices (switches, pushbuttons, indicators) shall be as specified in accordance with Section 16145. Contractor shall provide all conduit and cable required for the OIT installation.**"

14. Specification 16364, make the following changes:
    a. Add the following paragraph to 1.01: "**Item 7. The switchgear manufacturer shall provide all software and programming for the switchgear and generator control systems without exception. This shall include operator interface panels' HMI graphics and programmable logic controllers as specified. All control and monitoring of the generator and switchgear systems shall be provided as specified.**"
    b. Add the following sentence to 2.09: A2: "**Control power shall be provided as part of the SWGR. This power supply shall be redundant 120VAC or 24VDC, one from 120VAC utility (via ac/dc converter) and one from 24VDC best power selector switch**."
15. Specification 16431 make the following changed::
    a. 1.01A: Add " **Item 4. Harmonics analysis."**
    b. 2.01: Add "**Item 8. Harmonics analysis based on submittal information for the various equipment. Verification of harmonic voltage distortion levels and recommendations for mitigating any potential issues."**
    c. 3.01: Add the following paragraph: "**The Contractor shall provide the final SKM files and report to the Owner in digital form**."
    d. Add:
    "**3.07 HARMONICS ANALYSIS**
    A. Evaluate the estimated harmonic distortion levels for the power distribution system.

    B. Variable frequency drives, uninterruptible power supplies and other significant harmonic generating equipment shall be used to model the system. Including VFDs installed in Motor Control Centers and vendor supplied control panels.

    C. Provide simulation results, including individual harmonic levels, bus voltage distortion levels, and current distortion levels. Results shall be evaluated based on the recommended limits outlined in IEEE Standard 519.

    D. Simulations shall be used to verify proposed equipment and to develop solutions to any potential harmonic issues. Provide recommendations for solutions to eliminate any problems associated with harmonics to bring the system into compliance with the harmonic distortion limits recommended in IEEE-519.

    E. Compare field measurements with final model and simulation results."

16. Remove Specification 16440 in its entirety and replace with the attached updated version of Section 16440.
17. Specification 16470: 2.01(2); delete "AD" and replace with "AE".
18. Remove Specification 16500 in its entirety and replace with the attached updated version of Section 16500.
19. Specification 16920, make the following revisions:
    a. Add the following paragraph to 1.03: "**Item 9. This project includes equipment control by MCC mounted VFDs. A significant portion of the equipment is mounted remotely (hundreds of feet) away from the MCC's location. Contractor and supplier shall review**

the contract drawings for locations of electrical equipment and process equipment and provide input and output devices as needed to meet these specifications and to provide equipment protection from harmonics associated with VFDs. This protection will be verified as described by Section 16431."

b. Add the following paragraph to 2.08(A): "**All breakers with 1200 amp and larger frames shall be provided with trip units equipped with arc flash reduction maintenance system technology capability. The arc flash reduction maintenance system shall allow the operator to enable a maintenance mode which enables a preset accelerated instantaneous override trip to reduce arc flash energy. A blue LED on the trip unit shall indicate the trip unit is in the maintenance mode. Provide 30.5 mm switch and indicator mounted at the breaker/enclosure**."

c. Add the following to 2.14: "**Item 16. Drives and starters for submersible pump motors shall be furnished with circuitry to interface with the motor leak and temperature protection modules (such as the Flygt Mini-CAS or MAS modules). Coordinate with pump supplier and obtain the pump/motor protection devices for mounting in the equipment structure as required. See the pump motor schematic diagram shown on the drawings for additional information.**"

20. Bid Form, Page 7, delete "One Thousand Twenty (1020)" and replace with One Thousand Ninety Five (1095)".
21. Table of Contents, Section 5, Purchasing Forms, Form C, delete "(not applicable)" and replace with "(applicable)".
22. Purchasing Forms & Instructions, Section 5, Page 1, "Form C3 – Georgia Professional License" not applicable.
23. Purchasing Forms & Instructions, Section 5, Page 7, (not applicable).
24. Remove Section 4 Insurance and Risk Management Provisions in its entirety and replace with the attached updated version of Section 4 Insurance and Risk Management,

Questions:

The Following questions have been received and responses have been provided for all bidders.

1. **Question**: Is this project going to involve sludge treatment and what technologies are you considering? What percentage of dryness are you looking for?
   Answer: **No, the project will include membrane thickening however the County will continue to truck thickened sludge from the Little River WRF to the Big Creek WRF for dewatering.**

2. **Question**: Refer to the Bid Form. The Blower System bid item description for each of the Base Bid and Alternate Bid systems indicates that "penalty shall be for any performance below that listed based on the observed factory test results". Please specify the penalty amounts for each blower system.
   Answer: **As indicated in the Bid form, not achieving the guaranteed power consumption number listed will result in the blower manufacturer "to provide an upgrade or replacement with an engineering system to the guaranteed power consumption Hp at no additional cost to the Owner."**

3. **Question**: Section 01500, Article 2.04 indicates that the Contractor is responsible for providing all water for construction. Please clarify whether the Contractor will be allowed to use plant effluent water for pipe and structure leakage testing.
   Answer: **Use of plant effluent water for pipe and structure leakage testing will be allowed. The contractor will be responsible for pumping of the water. Potable water piping and plant water piping will not be allowed to use plant effluent.**

4. **Question**: Section 02100, Article 3.8 says to remove surplus soil and waste materials from the property. Section 02200, Article 1.3 says: use all suitable material "insofar as practicable…as directed by the Architect"; "all unsuitable material…shall be stored onsite as designated by the Owner"; and "disposal cost is covered via the Owner's allowance". Please clarify whether excess and/or unsuitable soil can be disposed of onsite.
   Answer: **For bidding purposes, contractor shall assume removing all excess soil and waste materials from the site as part of their lump sum bid (section 02200 has been revised per this addendum).**

5. **Question**: If the Contractor is allowed to dispose of excess and/or unsuitable soil on the project site, please specify the disposal location.
   Answer: **Refer to the answer of question 4 above.**

6. **Question**: Please clarify whether a disposal allowance amount should be included in the bid? If so, please specify the amount and provide a measurement and payment description.
   Answer: **A disposal allowance is not necessary – removal and disposal of all areas to be demolished is part of the lump sum bid price.**

7. **Question**: Section 11300 Immersed Hollow Fiber Membrane Bioreactor Systems, Article 2.01 says to provide "a cost for the base bid GE system" with the option of providing alternate pricing for a different system and a list of "acceptations/impacts to the base bid design". The Bid Form includes Section 11300 equipment in the Major Equipment Selection entries on Page 3 with additional manufacturers listed.
   Answer: **See revised bid form issues with Addendum 1.**

8. **Question**: Please clarify the manufacturer(s) allowed for base bid equipment supplied under Section 11300.
   Answer: **See revised bid form issues with Addendum 1.**

9. **Question**: Will the bid form be modified to include a form for the information requested in Section 11300 Article 2.01? Please clarify how this information should be submitted.
   Answer: **See revised bid form issues with Addendum 1. Any information for the alternative suppliers shall accompany the bid.**

10. **Question**: I would like to request that Control Instruments Inc. be added to the approved list of integrators for this project.
    Answer: **Fulton County has listed integrators that they feel are qualified and have the capability to deliver this project. Specification 17000 1.02 B.2.b. provides a procedure for Contractors to submit Contractor-proposed System Integrators along with their bid for consideration.**

11. **Question**: Southern Flow, Inc requests that our name be added as an approved system integrator in specification section 17000.

Answer: **Fulton County has listed integrators that they feel are qualified and have the capability to deliver this project. Specification 17000 1.02 B.2.b. provides a procedure for Contractors to submit Contractor-proposed System Integrators along with their bid for consideration.**

12. **Question**: Southern Flow, Inc requests that our name be added as an approved system integrator in specification section 17000.
    Answer: **Fulton County has listed integrators that they feel are qualified and has the capability to deliver this project. Specification 17000 1.02 B.2.b. provides a procedure for Contractors to submit Contractor-proposed System Integrators along with their bid for consideration.**

13. **Question**: Would you be willing to approve Key Epoxy Resinous Flooring Systems that are equivalent to the systems specified for the above referenced project? The Key equivalents for this project are: Stonclad GR with Stonkote GS4 = Key Mortar STD "Green" with Key #625 (1/4" system).
    Answer: **The Architect has confirmed that the proposed system is equal and can be used in locations specified (EP-1 for restrooms as shown on the Room Finish Schedule). This product has not been compared to Epoxies for coating of containment areas and other systems specified in section 9900.**

14. **Question**: Will field cut restrained joint pipe closures be allowed at fittings restrained with US Pipe's TR FLEX gripper ring or will a factory cut restrained joint closure be allowed?
    Answer: **No, provide piping as specified. Gripper Rings may be allowed on a case by case basis where constructability issues arise but this will be the exception and not the rule and shall be approved on a case by case basis by the Engineer.**

15. **Question**: Will Megalug or equal type MJ restraint be allowed at buried valves & MJ fittings?
    Answer: **No, provide piping as specified. Megalugs may be allowed on a case by case basis where constructability issues arise but this will be the exception and not the rule and shall be approved on a case by case basis by the Engineer.**

16. **Question**: If Megalug & MJ fittings are not allowed, are you requiring buried restrained joint fittings to be proprietary push-on restrained joint fittings such as "TRFLEX from US Pipe?
    Answer: **Yes. Megalugs and Gripper rings may be allowed on a case by case basis where constructability issues arise but this will be the exception and not the rule and shall be approved on a case by case basis by the Engineer.**

17. **Question**: Will you require positive MJ restraint such as US Pipe's "BOLT-LOK" or equal to restrain buried MJ valves?
    Answer: **Yes. Per the addendum section 15050 clarifies that all buried and exposed MJ valves shall be restrained.**

18. **Question**: Will U.S. Pipe's TR Flex gripper ring and field cut pipe be allowed for buried restraint.
    Answer: **No, provide piping as specified. Gripper Rings may be allowed on a case by case basis where constructability issues arise but this will be the exception and not the rule and shall be approved on a case by case basis by the Engineer.**

19. **Question**: Will handrail be required for the retaining wall shown on Drawing 10-C-508? If so please provide details.
    Answer: **Handrail will not be required for the retaining wall. The difference in grade will not trigger this requirement.**

20. **Question**: Are there any domestic requirements on the iron and steel such as AIS for this project?
    Answer: **No**

21. **Question**: Will Megalug or equal be allowed for restraining buried DI MJ fittings or will DI pipe manufacturer's positive MJ restraint end be required?
    Answer: **No, provide piping as specified. Megalugs may be allowed on a case by case basis where constructability issues arise but this will be the exception and not the rule and shall be approved on a case by case basis by the Engineer.**

22. **Question**: Will Megalug or equal be allowed for restraining buried MJ valves or will DI pipe manufacturer's positive MJ restraint end be required?
    Answer: **No, provide piping as specified. Megalugs may be allowed on a case by case basis where constructability issues arise but this will be the exception and not the rule and shall be approved on a case by case basis by the Engineer.**

23. **Question**: Can you provide us with an electronic copy of the record drawings for the existing facilities?
    Answer: **The electronic copies of the 1975, 1985, and 1999 record drawings for the existing facilities in addition to the 2000 diversion junction box are on the CD available for purchase.**

24. **Question**: Bid Form page 7 states the Contract Time is 1,020 days, Instructions to Bidders Article 27 states the Contract Time is 1,095 days. Please confirm.
    Answer: **Page 7 of the Bid Form is revised to One Thousand Ninety Five (1,095) calendar days.**

25. **Question**: The Bid Documents state to include Form C-3 which is the GA Professional License Certification. Since this is not a Design / Build project, no "Professional" services (i.e. Engineering) will be provided by the General Contractor. Please confirm that only Form C1 – Georgia Utility Contractor License Certification and Form C2 – Georgia General Contractors License Certification are required. Similarly, the Insurance requirements call for the Contractor to provide Professional Liability insurance which is applicable to professional engineers, surveyors etc. As this is not a Design / Build project, please confirm Professional Liability insurance is not required
    Answer: **Form C-3 will be required for the Electricians, Plumbers, Conditioned Air Contractors, and Low voltage Contractors and is a required submittal. No Professional Liability Insurance will be required. Section 4 Insurance and Risk Management Provisions is replaced to remove the requirements for Professional Liability Insurance.**

26. **Question**: It was mentioned at the site walk through yesterday by multiple contractors the challenges of bidding a project on a Monday, particularly at 11:00 am. The general consensus was that it not only placed an extreme burden among the prime and subcontractors bidding, but also resulted in less competitive pricing to the Owner. Please consider changing to a Tuesday, Wednesday or Thursday bid date at 2:00 PM
    Answer: **The Bid due date is changed to Tuesday, December 13, 2016 @ 11:00 A.M.**

27. **Question**: The bid form lists acceptable equipment manufacturers and for the Contactor to indicate which manufacturer their bid is based upon. The bid form is currently set up to where the Contractor has to write out the name of the manufacturer. Please change the bid form to where the Contractor simply circles the name of the manufacturer instead of writing it out. While on the surface this request may seem inconsequential, at crunch time of the bid, the time required to write out the names is a big deal.
    Answer: **The bid form has been revised as requested.**

28. **Question**: Please provide a copy of the soils report.
    Answer: **A copy of the Geotechnical Report is attached to this addendum.**

29. **Question**: Please confirm the length of the auger cast piles are to be 40'. Several places in the Bid Documents alluded to that length but nowhere we could find specifically required 40'.
    Answer: **Piles shall be run to a point of refusal per Detail A1 on drawing 00-s-004. Per this addendum, Auger cast piles should be assumed to terminate at Auger Refusal at a depth of 40 ft., however the contractor is to provide a cost / credit for additional or reduced depth of the piles compared to the assumed 40 ft. per the bid form.**

30. **Question**: Spec section 01046 requires that the demolition work be accomplished by a specialty demolition subcontractor. Many times heavy contractors performing plant work self-perform the demolition work and often are more proficient at the work than a "demolition sub". Please confirm that the work may be either performed with their own forces or utilize a demolition subcontractor.
    Answer: **Confirmed, the requirement is that the work is done by a company that has performed work similar in material and extent to that indicated for this Project if the bidding prime contractor has that experience that will be acceptable.**

31. **Question**: The Bid Documents require all exiting utility lines that are to be abandoned to be completely removed. In consideration of costs, please consider allowing the utility lines to be plugged / capped at each end and abandoned in place.
    Answer: **An alternate bid item is included in the revised bid form with the option of abandoning existing utility lines in place.**

32. **Question**: We would like to request that KSB be added to specification section 11347 and 11355.
    Answer: **The specifications allow for submission of equal products by manufacturers with equivalent products capable of meeting the specified performance and producing products for the application which will fully comply with the specified features.**

33. **Question**: We would like to request that Whipps be added to specification section 11109 and 11100.
    Answer: **The specifications allow for submission of equal products by manufacturers with equivalent products capable of meeting the specified performance and producing products for the application which will fully comply with the specified features.**

34. **Question:** Invitation to Bid / Section 1-Instruction To Bidders / Item 2 – Bid Preparation, instructs us to submit one original bid form plus two (2) copies. This will be difficult to prepare during bid day as prices start coming in at the last minute and we are passing those numbers to our bid runner over the phone. Would the County consider amending this to allow for only one bid form submission and delete the requirement for the two extra copies?
    Answer: **No.**

35. **Question**: Section 5, "Purchasing Forms & Instructions" lists the following forms that appear to be labeled inconsistently with the forms provided in this section. For example:
Section 5, Page 1 lists Form (A) "Georgia Security and Immigration Contractor Affidavit and Agreement" however the Form (A) attached is the "Non-Collusion Affidavit of Bidder/Offeror" and Form (F) is the "Georgia Security and Immigration Contractor Affidavit and Agreement". Please clarify whether Form (A) and Form (F) should be included with our bid.
Section 5, Page 1 lists Form (B) "Georgia Security and Immigration Subcontractor Affidavit" however the Form (B) attached is the "Fulton County Certificate of Acceptance of Bid/Proposal Requirements" and Form (G) is the "Georgia Security and Immigration Subcontractor Affidavit". Please clarify whether Form (B) and Form (G) should be included with our bid.
Section 5, Page 1 lists Form (D) "Disclosure Form and Questionnaire" however Form (D) attached is the "Certification Regarding Debarment" and Form (E) is the "Disclosure Form and Questionnaire". Please clarify whether Form (D) and Form (E) should be included with our bid.
Answer: **Corrected List of PURCHASING FORMS**

- **Form A: Non-Collusion Affidavit of Prime Bidder/Offeror**
- **Form B: Certificate of Acceptance of Request for Bid/Proposal Requirements**
- **Form C: Professional License Certifications**
- **Form C1 – Georgia Utility License Contractor License**
- **Form C2 – Georgia General Contractors License**
- **Form C3 – Georgia Professional License**
- **Form D: Certification Regarding Debarment**
- **Form E: Disclosure Form and Questionnaire**
- **Form F: Georgia Security and Immigration Contractor Affidavit and Agreement**
- **Form G: Georgia Security and Immigration Subcontractor Affidavit**

36. **Question**: Referencing specification section 9 Special conditions, items 9 & 10. Our EMR ratings (item 9) are below one for the past three years and therefore meet the requirements. However, our recordable incidents and OSHA incidence rate exceed the requirements. It is our experience that to meet these rates a company's EMR would have to be around 0.5. This is virtually unheard of. Will failure to meet the requirements of item 10 preclude us from being awarded the project if we were the low bidder?
Answer: **No, the recordable incidents and OSHA incidence rate is just one of the criteria used in determining the winning bidder. Fulton County understands that there are minor incidents involved with construction but this will not affect the awarding of the contract.**

37. **Question**: Is the EBO plan centered mostly around subcontractors or are material suppliers to be part of the plan as well? Historically DBE programs have been centered around subcontracting opportunities.
Answer: **The EBO plan focus is for subcontractors and/or suppliers. Describe in detail the way in which you will be utilizing each.**

38. **Question**: Per our telephone conversation this afternoon regarding licensing on the reference project, please provide clarification on Item 34 – Submittals from the Instruction To Bidders, page 17. We have an active utility contractor's (facility) license with the State, UC301060, and have used this license on all projects we have built in the State without issue for many years. The referenced document for Little River refers not only to the Utility Contractor license but also to a General Contractor license and Professional License which we do not carry. Our line of work involves construction of water/wastewater

plants and pump stations which fall under the utility licensing requirements…not the GC or Professional requirements. I did verify with the GUCA that we carry the correct license type for the work we perform. Are we to carry all license types on this project. Please clarify.
Answer: **The requirement for a General Contractors License will be deleted. Professional Licenses will still be required for the Electricians, Plumbers, Conditioned Air Contractors, and Low voltage Contractors. The requirement for Professional Liability Insurance will be deleted.**

39. **Question**: Please provide "as-built" drawings for the structures to be demolished to help define the scope of work of the demo but also to quantify the amount of dirt required to fill the demolished areas.
Answer: **The design drawings for the existing facility has been provided on the CD available for purchase. This includes the 1975 As-builts of the facility, the 1988 Design plans and the 1999 upgrades to the facility. The revision to the influent line at the entrance of the facility is also included. The Bid Set is also included on the CD showing the proposed improvements to the facility. These are the only plans that are available for the facility.**

40. **Note**: **An additional Mandatory site visit is scheduled for November 7, 2016 @ 11:00 A.M. If you previously attended you DO NOT have to attend again. This will be the last opportunity to tour the facility.**

Attachments:

- Attachment A: Copy of Pre-bid meeting presentation
- Attachment B: Specification 16440
- Attachment C: Specification 16500
- Attachment D: Geotechnical Report
- Attachment E: Revised BID FORM
- Attachment F: Revised Insurance and Risk Management Provisions
- Attachment G: Scope of Work and Technical Specifications Table of Contents

ACKNOWLEDGEMENT OF ADDENDUM NO. 1

The undersigned Proposer acknowledges receipt of this Addendum by returning one (1) copy of this form with the proposal submittal package to the Department of Purchasing & Contract Compliance, Fulton County Public Safety Building, 130 Peachtree Street, S.W., Suite 1168, Atlanta, Georgia 30303 by the ITB due date and time **Tuesday, December 13, 2016 @ 11:00 a.m.**

This is to acknowledge receipt of Addendum No. 1, _____day of _____**,** **2016.**

_____
Legal Name of Bidder

_____
Signature of Authorized Representative

_____
Title

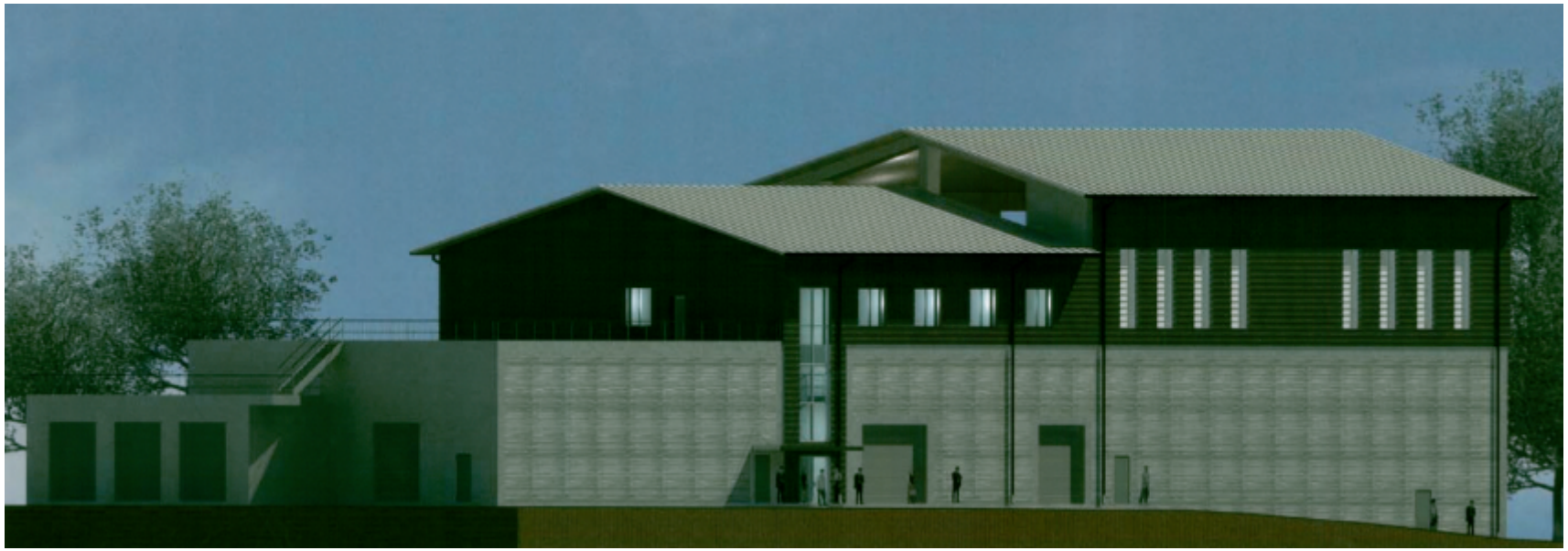
Attachment A
Copy of Pre-bid meeting presentation

Scope for the Little River WRF Expansion

Fulton County ITB #16ITB090716K-EC

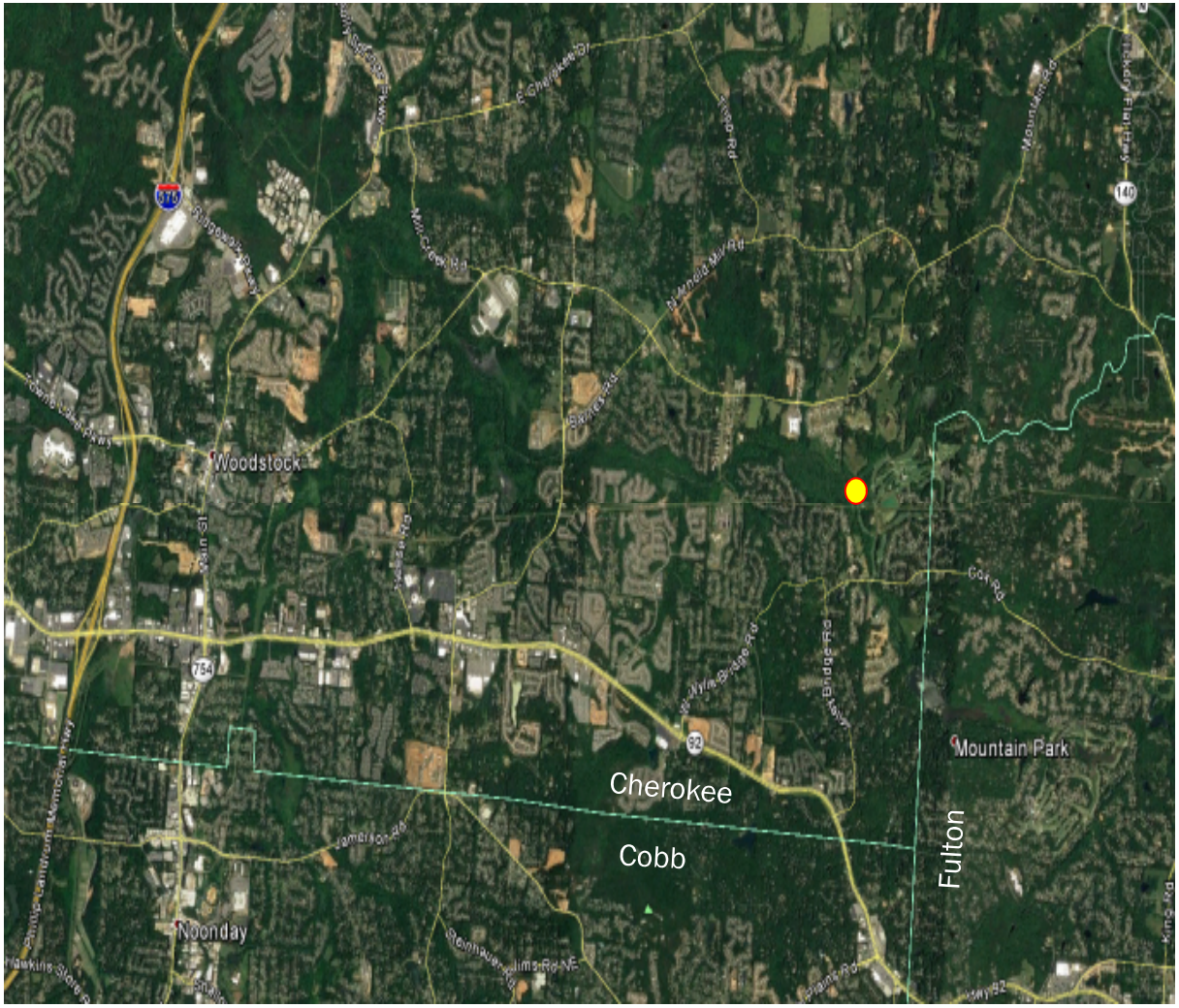
Pre-Bid Meeting

October 17, 2016

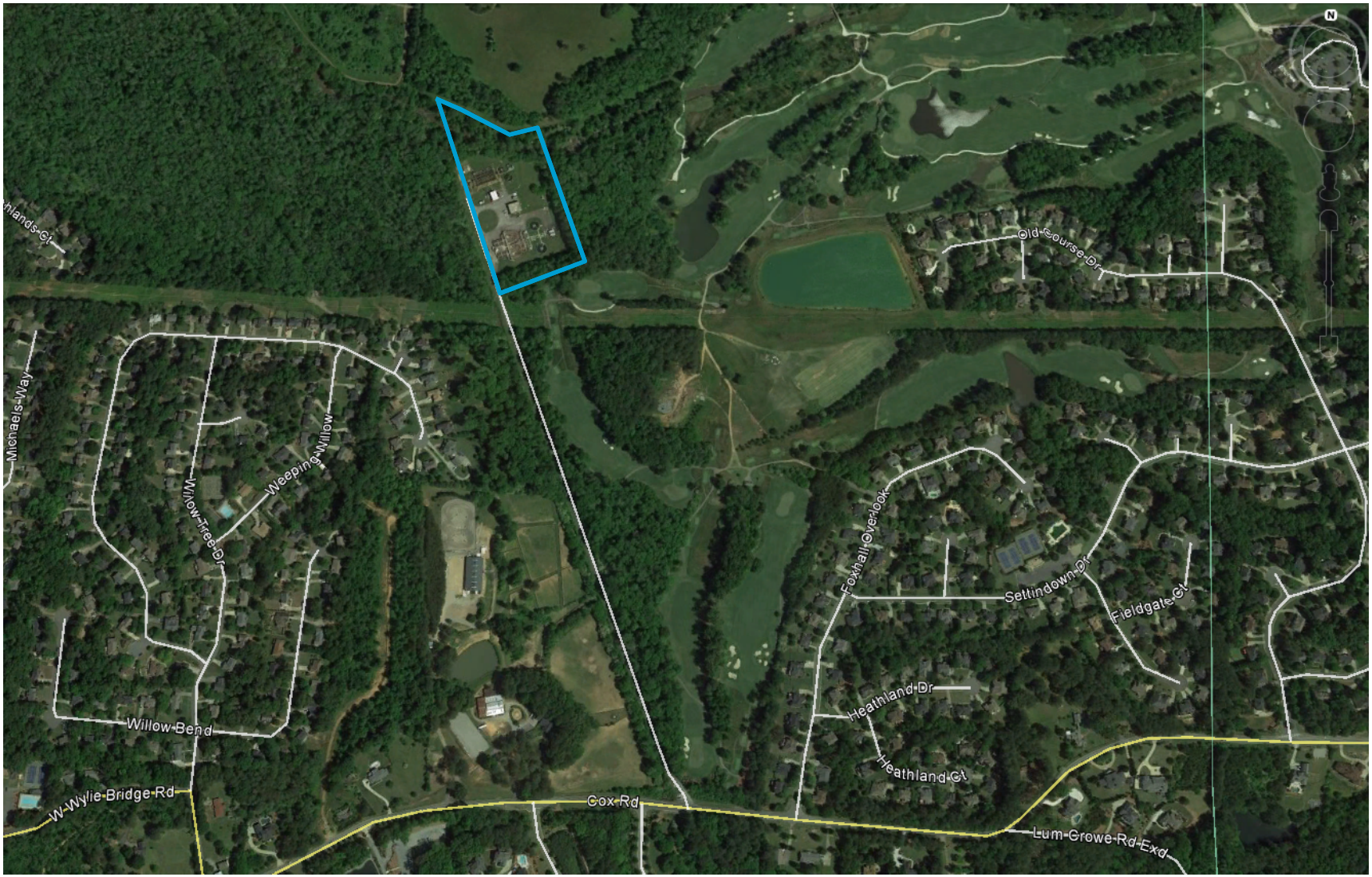


Existing Little River Facility

- Located in Cherokee County
- Serves North Fulton
- 0.95 mgd Capacity
- Provides Reuse water to adjacent golf course



Site Location



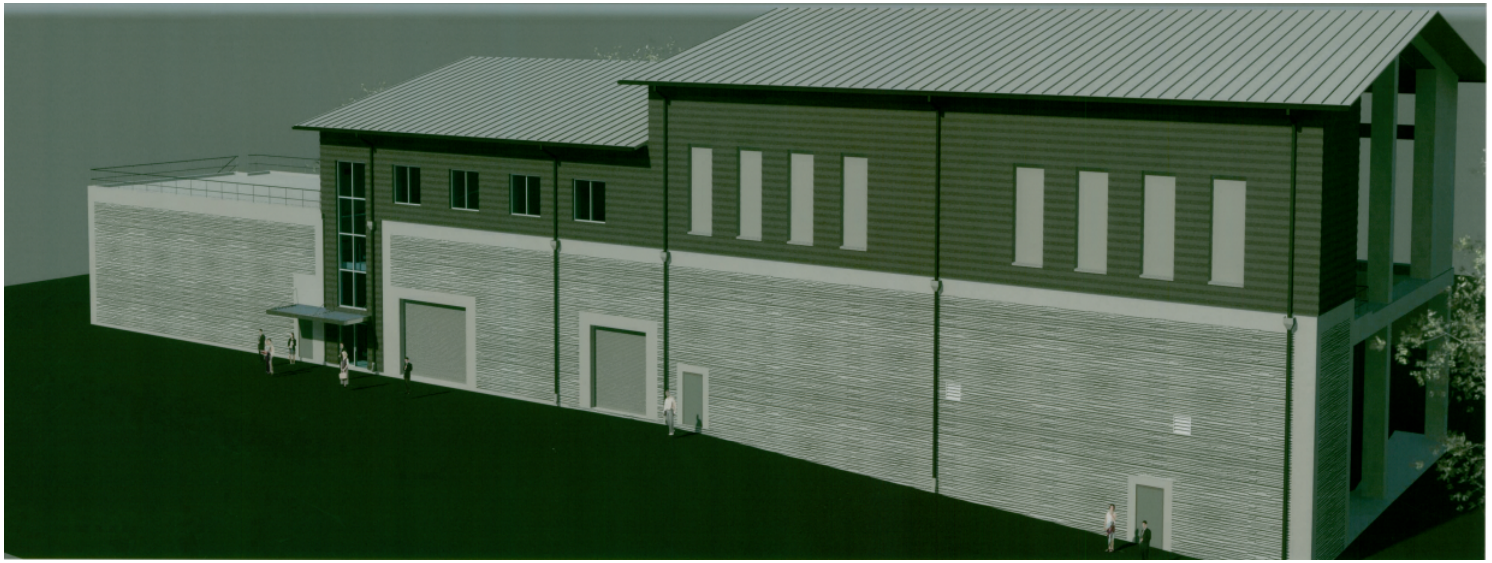
General Summary of Scope

The Project consists of the following major elements:

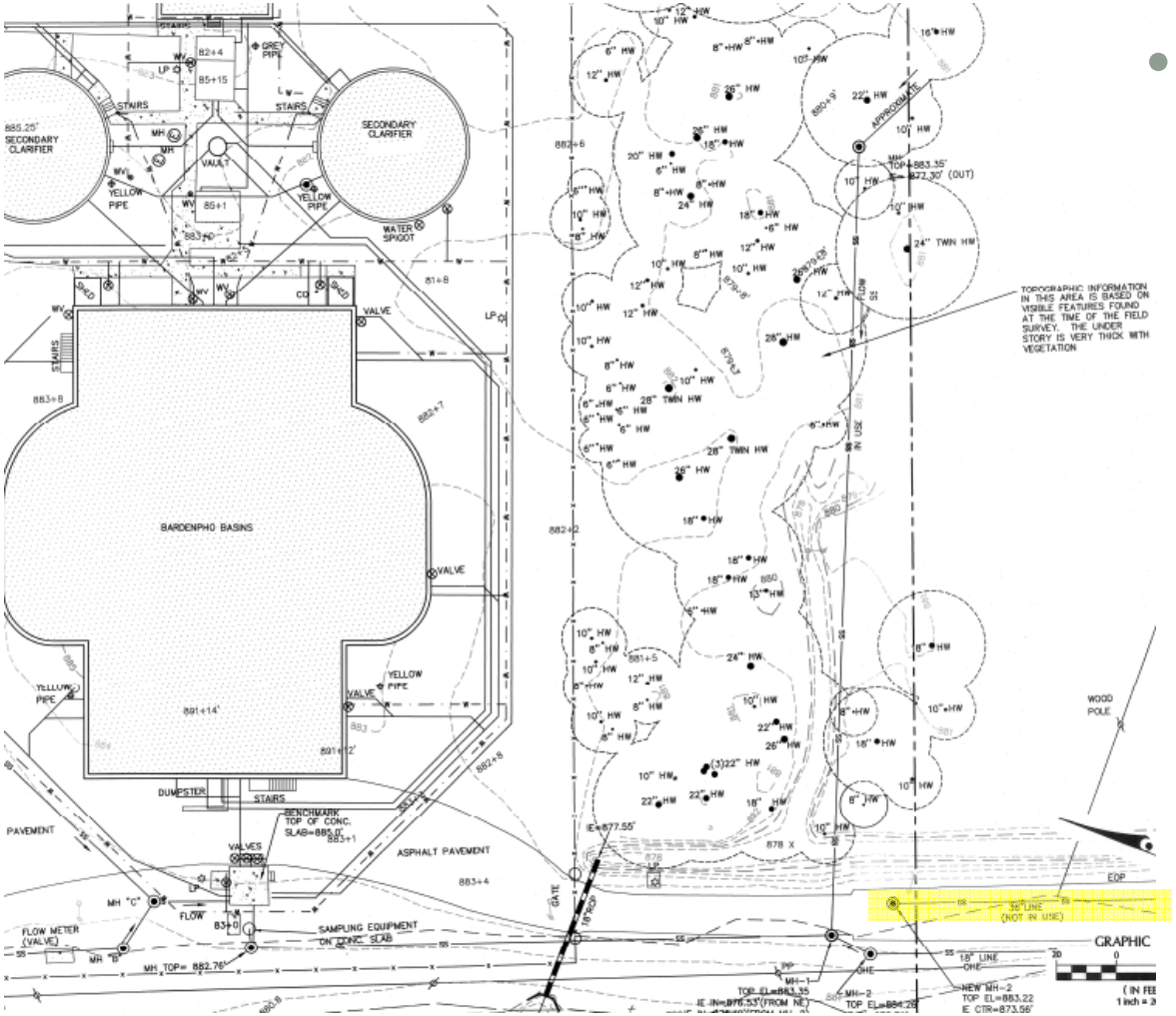
- Demolition and removal of existing unused buildings and structures;
- Construction of a new 2.6-mgd (on a maximum month basis) MBR wastewater treatment plant:
  - Influent piping,
  - Influent pumping,
  - Preliminary treatment including screening and grit removal,
  - Modification to existing biological treatment basins
  - New administration area
  - Chemical storage and feed area
  - Membrane Bio-reactors (MBRs),
  - Ultraviolet light disinfection,
  - Plant and reuse water pumping,
  - Effluent gravity sewer piping,
  - Also included is all associated civil, structural, mechanical, electrical, and instrumentation work necessary to meet the requirements of the project specifications and drawings.

Refer to Drawings and Specifications for a full understanding of work

General Configuration

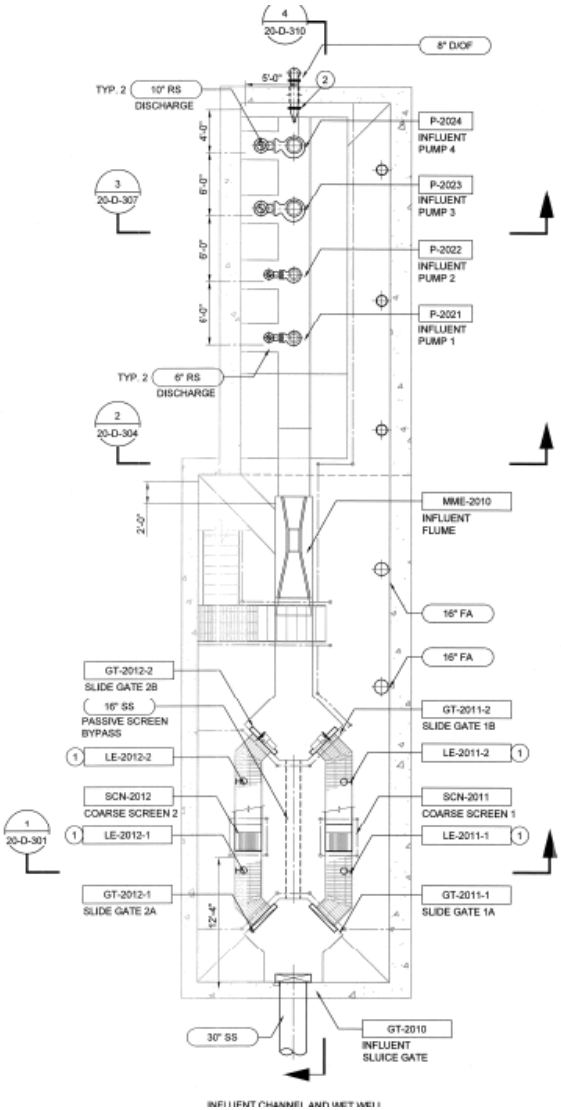


Influent Piping



- Existing unused 36” line can be tied into without interrupting flow on existing 16” influent line

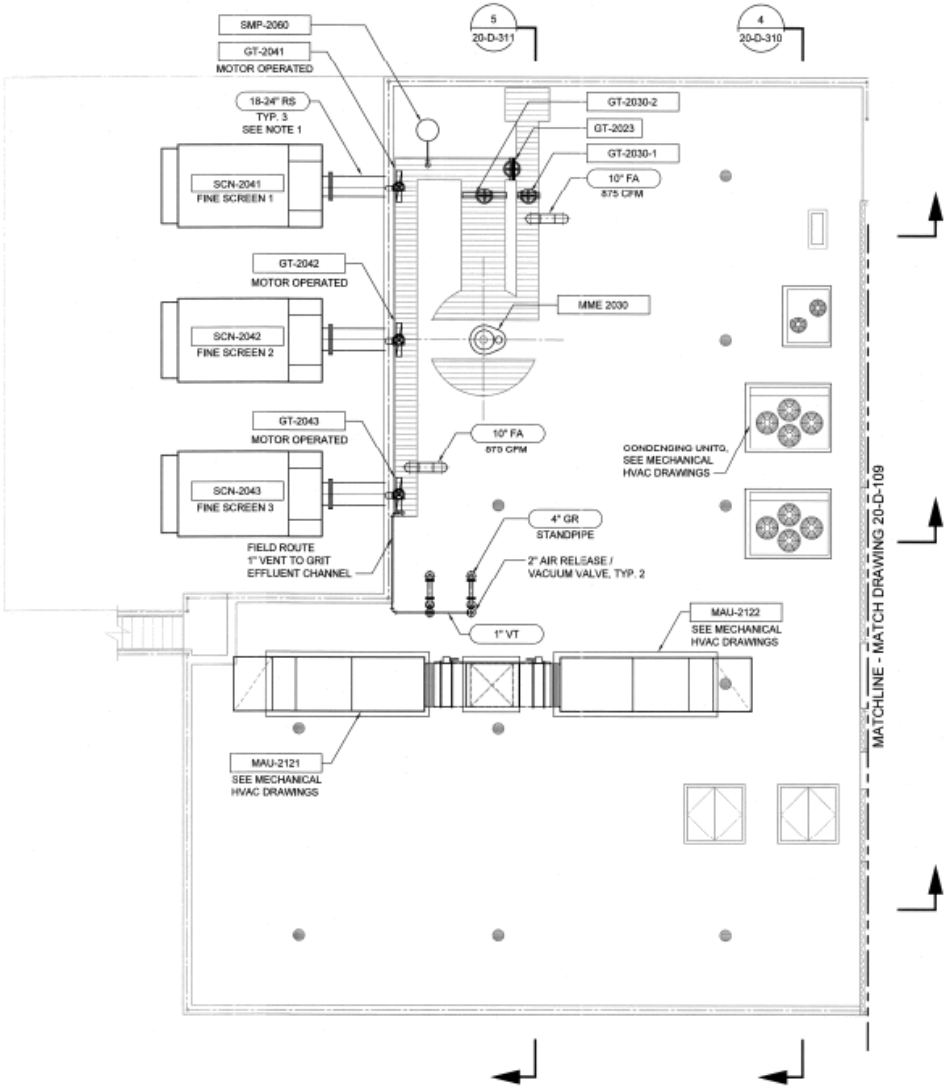
Influent Coarse Screen and Pumping



- 2 – 7.5 mgd 6mm mechanically-cleaned multi-rake type bar screens
- Influent flume
- 2 - 1750 gpm submersible pumps
- 2 – 560 gpm submersible pumps

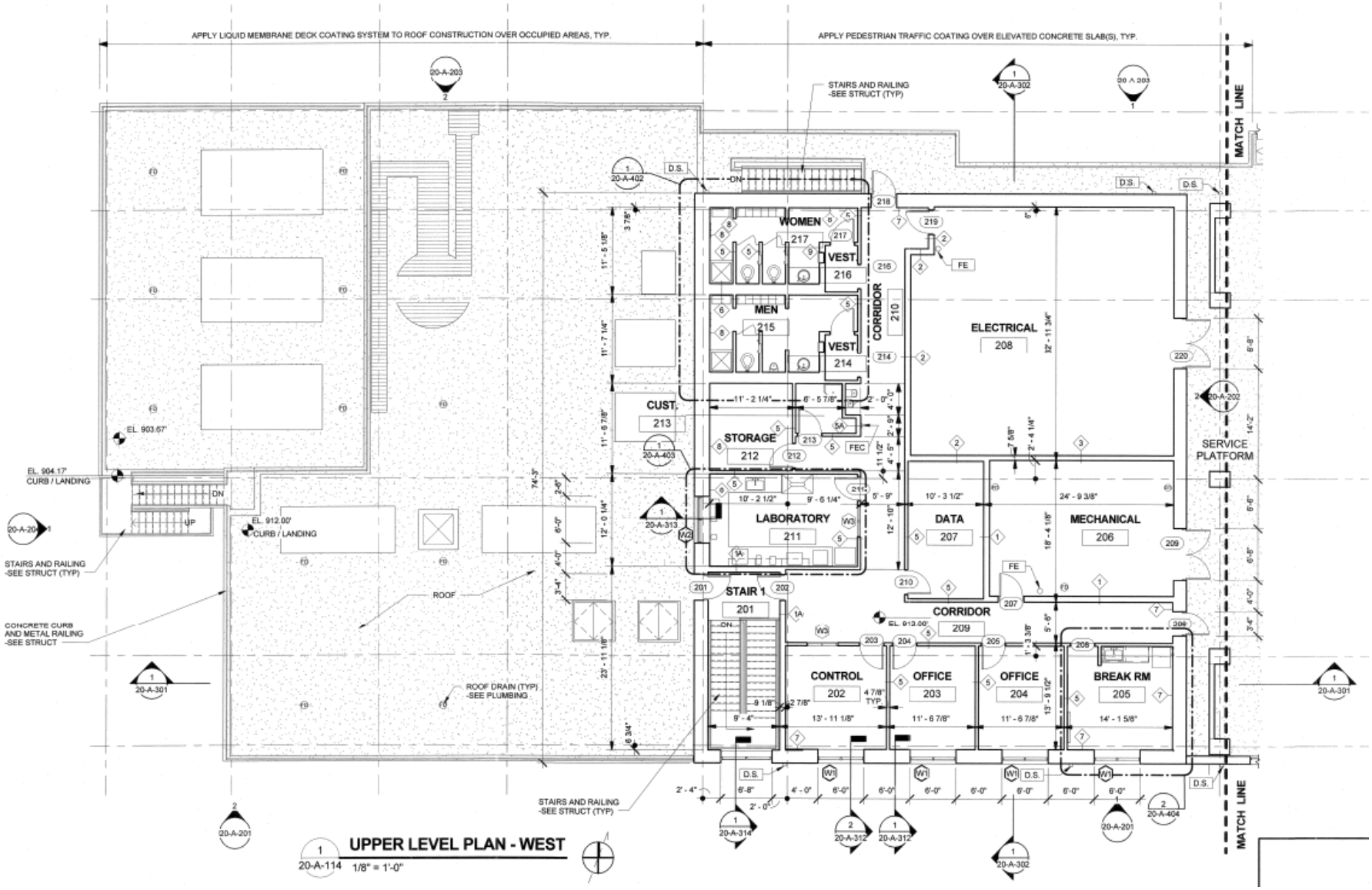
v

Fine Screening and Grit Removal (Upper Level)

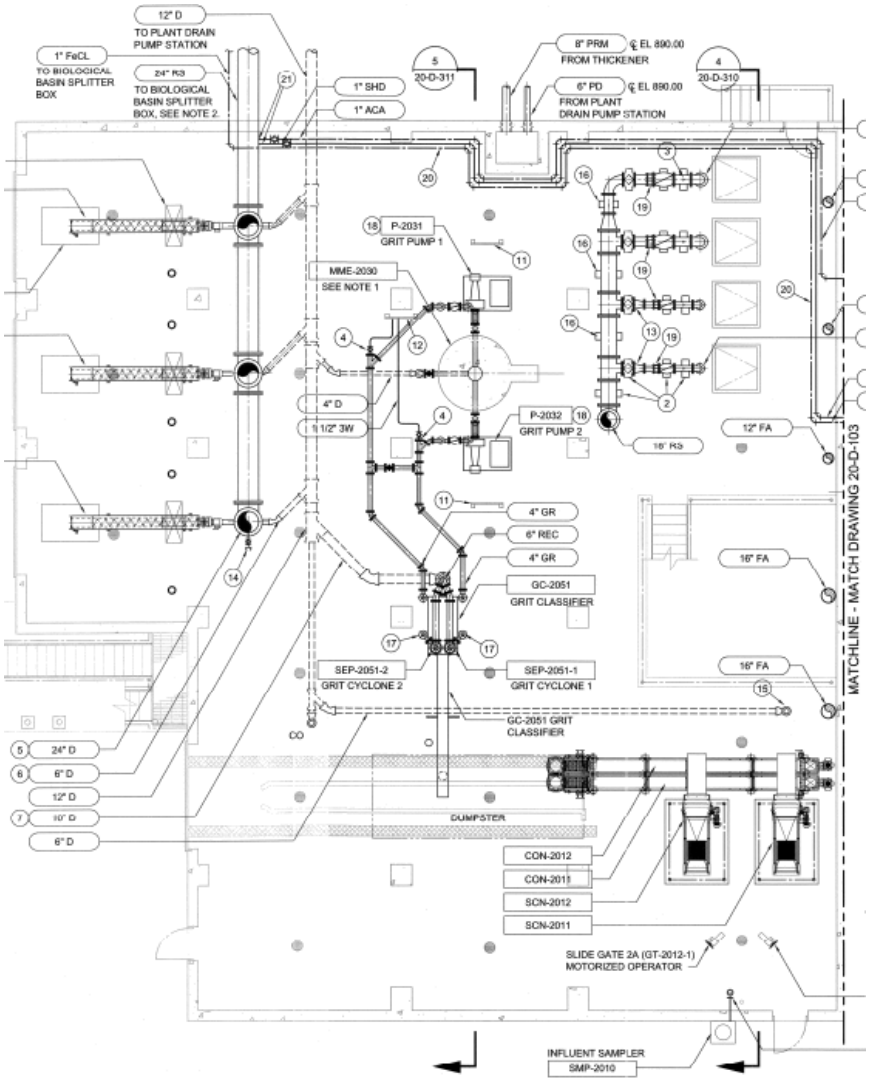


- 3 – 4 mgd 1mm rotary drum screens
- 1 - 7.5 mgd vortexing grit removal system

Administration Area (Upper Level)

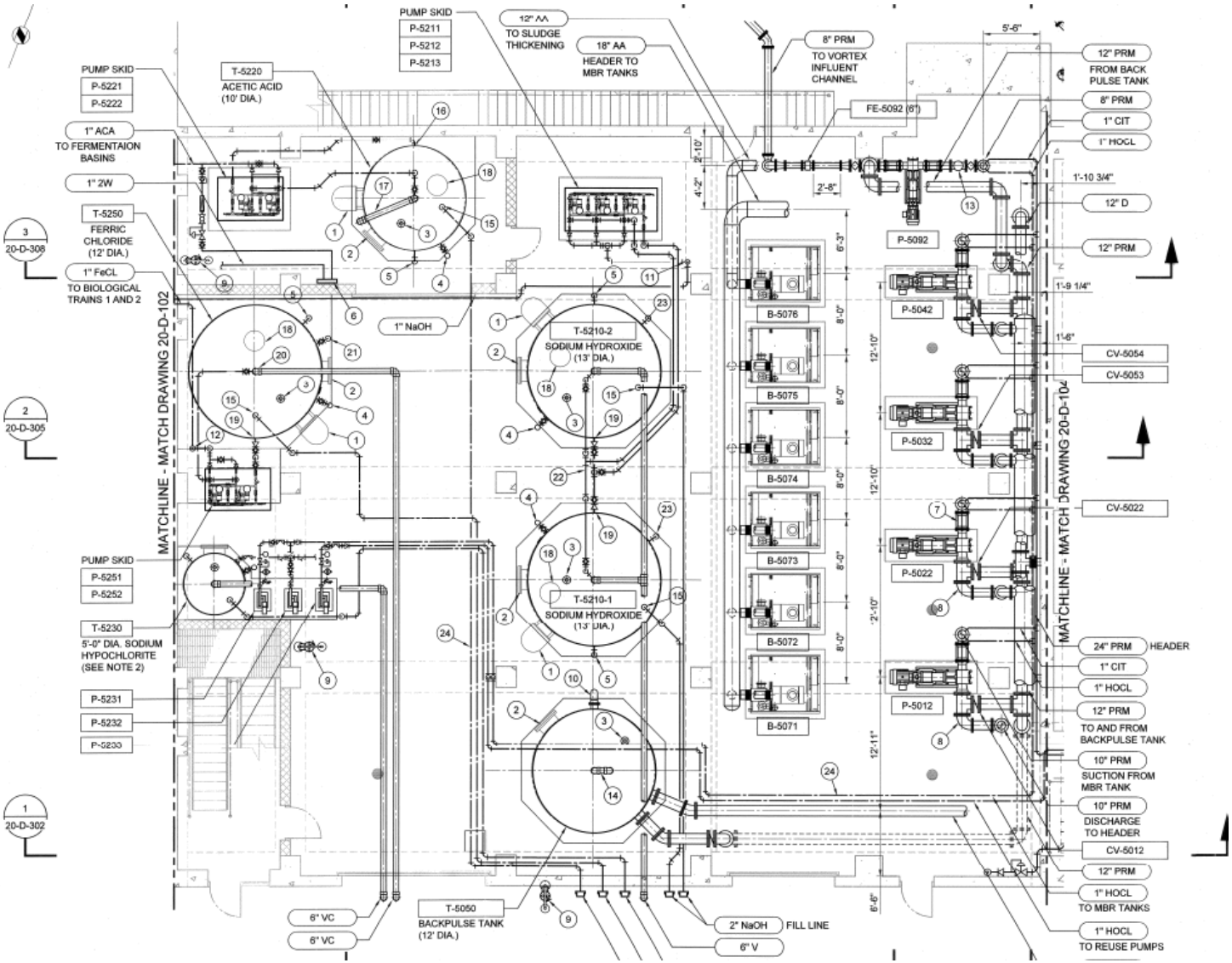


Screening and Grit Removal (Lower Level)



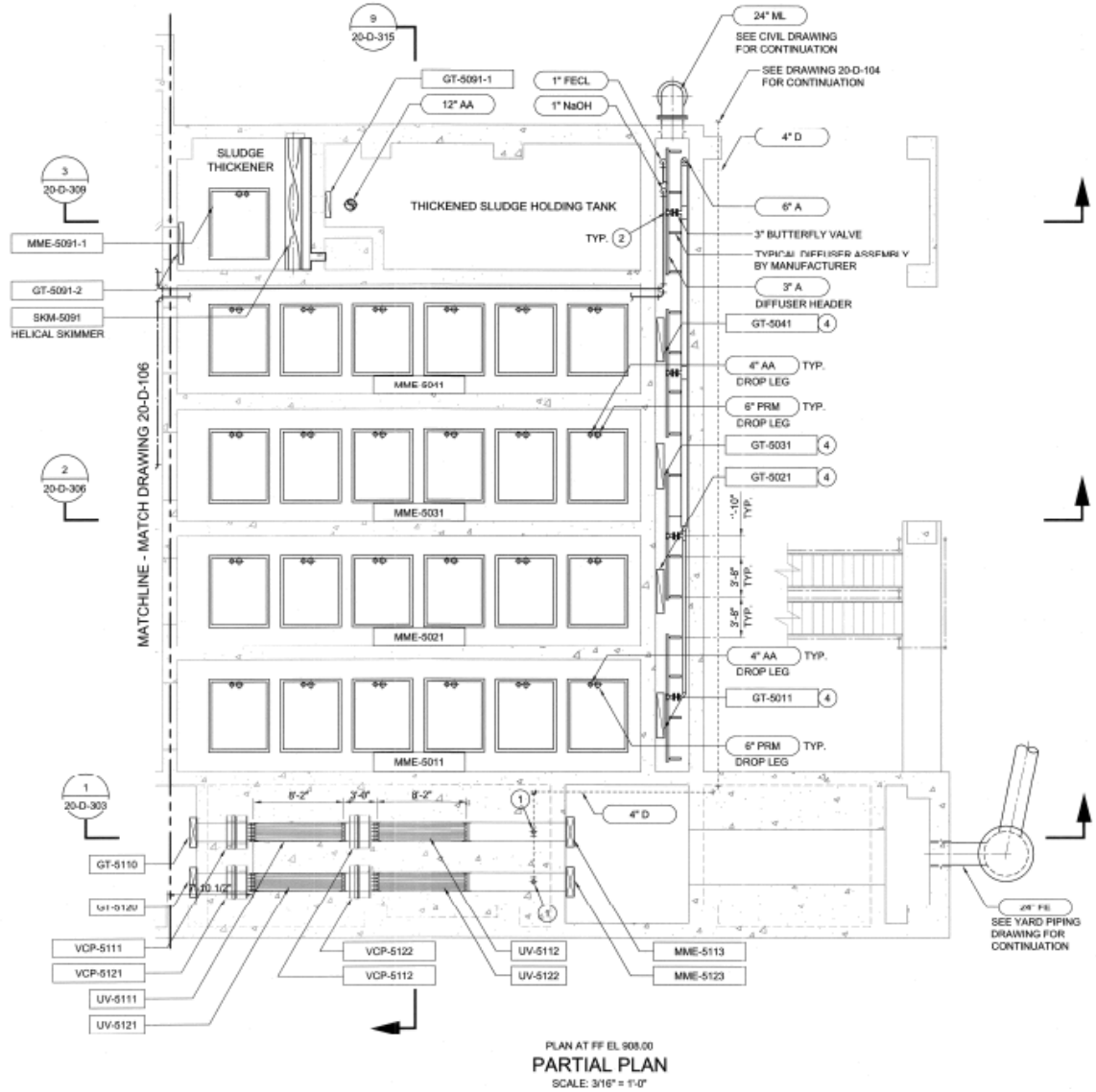
- 2 – conveyors for coarse screens
- 3 – conveyors for fine screens
- 2 – grit classifiers
- 2 – grit pumps

Chemical Storage and Feed (Lower Level)



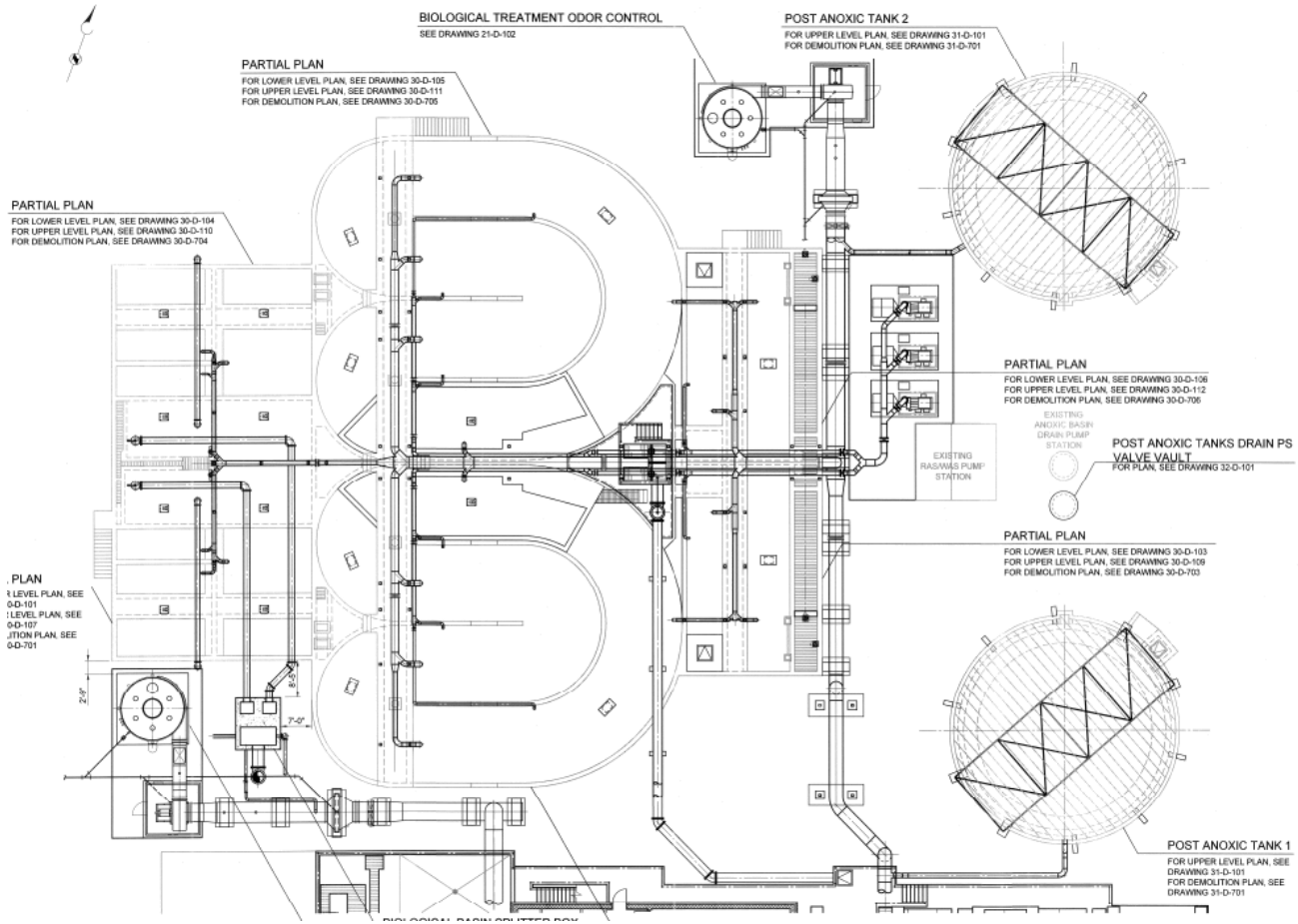
Membrane and UV Area

- MBR Basis of Design is GE (Must be submitted) – Selection made on this price
- Ovivo and Koch can be submitted as an additive / deductive alternate (County will decide)



Conversion of Existing Biological Basins

- New mixers
- Fine bubble diffusion
- Odor control
- Covers



Sequence of Construction

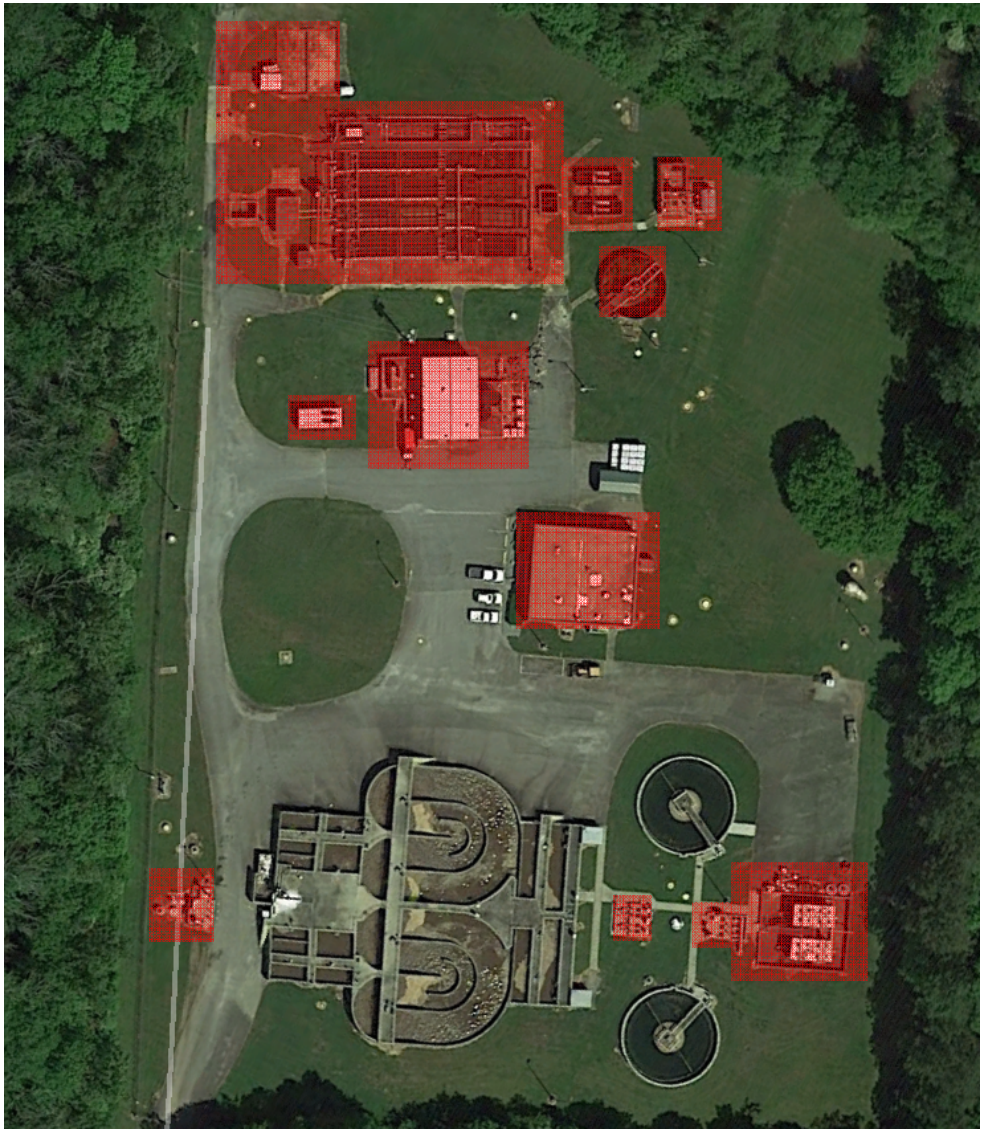
1. Provide construction of new treatment building including headworks, membrane building administration building, membrane pump station etc. Route drains / utilities to maintain operation of existing facilities.
2. Energize and provide complete check out of all new systems.

The items above can be completed without interfering with current plant operation.

3. Tie in one of the two existing biological trains to the membrane pump station.
4. Connect influent line RAS piping to allow one biological train to operate with new facility
5. Complete work in the offline biological train. This work may need to take place during a low flow period.
6. Switch over and Divert flow to the retrofitted biological train, and complete work on the other side.
7. Complete demolition work at existing basins and buildings.
8. Final Sitework.

Demolition of Existing Structures

- All demolition shall take place following the successful start up and transfer of flow to the new facilities
- Refer to Drawings 10-C-131 through 10-C-134 for detailed demolition scope
- Potential Resource Recovery



Questions

Attachment B
Specification 16440

SECTION 16440

INSTRUMENT TRANSFORMERS, METERS, SWITCHES AND ACCESSORIES

PART 1 – GENERAL

1.01 DESCRIPTION

This section specifies instrument transformers, meters, test switches and accessories for electrical distribution equipment assemblies.

1.02 REFERENCES

This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
ANSI C37.20	Switchgear Assemblies Including Metal-Enclosed Bus
ANSI C39.1	Requirements for Electrical Analog Indicating Instruments
ANSI C57.13	Requirements for Instrument Transformers

PART 2 – PRODUCTS

2.01 INSTRUMENT TRANSFORMERS

A. GENERAL

Instrument transformers shall be molded dry-type in accordance with ANSI C57.13. Transformer volt-ampere rating shall be suitable for carrying the specified load without overheating or exceeding the permissible accuracy for the transformer.

B. POTENTIAL TRANSFORMERS

Potential transformers shall have an ANSI accuracy class of 0.3. They shall be equipped with current limiting fuses.

C. CURRENT TRANSFORMERS

Current transformers shall be furnished with the specified ratios. The accuracies shall conform to ANSI C37.20.

2.02 PANEL METERS AND POWER MONITORS

A. Power Monitors are required as shown on the drawings on electrical equipment:

1. Switchgear, switchboard, motor control center, automatic transfer switch to provide electrical parameter information about the electrical equipment for any voltage class. Two power monitors are required for double-ended and dual feed electrical equipment.

B. All setup parameters required by the meter shall be stored in nonvolatile memory and retained in the event of a control power interruption. Provide onboard data logging; including alarms, events and waveforms.

C. Microprocessor-based monitoring device shall provide complete electrical metering in one package. Metering package shall include a back lit LCD display and be programmable via face mounted keypad. Display shall be anti-glare and scratch resistant.

D. Provide a separate metering compartment with front hinged door as needed. Include associated instrument transformers. Mount monitoring device on the compartment door to allow operator access to meter menu and display.

E. Provide current transformers (CT) for each meter as required. Current transformers shall be wired to shorting-type terminal blocks before connecting to any other device.

F. Potential transformers (PT) including primary and secondary fuses with disconnecting means shall be provided for metering as shown on the drawings.

G. Setup for system requirements shall be from power meter display and shall include: CT rating, PT rating, and system type. Ratios shall be programmable; DIP switches or other fixed ratios shall not be acceptable.

H. Include voltage and current test block and plug.

I. Meter shall include trend analysis, event logging, and recording. 128 samples/cycle waveform recording.

J. Meter shall provide user configured fixed window or rolling window demand to allow user to set up the utility demand profile.

K. Meter shall provide the following, true RMS, real time metered quantities (per phase and 3 phase total):

1. Voltage
    a. L-L per phase
    b. L-N per phase
    c. 3 phase average
    d. Percent unbalanced voltage
2. Current Per phase
    a. Neutral current
    b. Percent unbalanced current
3. Watts, VARs and VA
4. Power Factor
5. Frequency
6. Watt, and VA Hours
7. VAR Hours
8. Present, running average, and peak demand:
    a. Current
    b. Watts
    c. VARs

d. VA

9. Average Power Factor Calculations

10. Power Analysis:

a. THD – Voltage, Current (3-Phase, Per-Phase, Neutral)

b. Displacement Power Factor (Per-Phase, 3-Phase)

c. Fundamental Voltage, Magnitude and Angle (Per-Phase)

d. Fundamental Currents, Magnitude and Angle (Per-Phase)

e. Fundamental Real Power (Per-Phase, 3-Phase)

f. Fundamental Reactive Power (Per-Phase)

g. Harmonic Power (Per-Phase, 3-Phase)

h. Phase Rotation

i. Unbalance (Current and Voltage)

j. Harmonic magnitudes and angles for current and voltages (Per Phase) up to the 40th order harmonic.

k. Metering device shall have the following:

1) Trend analysis that shall display minimum and maximum values for each metered parameter with date and time of each occurrence.

2) Input range of device shall accommodate external current transformers with ranges from 100/5 to 5000/5 and potential transformers from a ratio of 120:120 to 500,000:120.

3) Provide the ability to alarm based on the following: (Alarm contacts rated 5 A at 120 VAC):

a) Current imbalance

b) Voltage imbalance

c) Current and voltage phase loss

d) Phase reversal

4) Three (3) analog outputs programmable to reflect each metered parameter, except kW-hours and kilovar-hours.

5) Communications: Provide a gateway protocol converter that allows communication between the Main Metering Device communications network and the remote monitoring system via Ethernet communications using Ethernet/IP.

6) Accuracy:

   a) The Power Meter shall comply with ANSI C12.20 Class 0.2% and IEC 62053-22 Class 0.5S for Active Energy and revenue meters.

   b) The Power Meter shall be accurate to 0.15% of reading + 0.015% of full scale for power. Voltage and current shall be accurate to 0.075% of reading plus 0.025% of full scale. Power factor metering shall be accurate to ±0.002 from 0.5 leading to 0.5 lagging. Frequency metering shall be accurate ±0.01 Hz at 45-67 Hz and 350-450Hz.

   c) These accuracies shall be maintained for both light and full loads.

   d) No annual calibration shall be required to maintain this accuracy.

7) Power meter shall comply with the following min. standards:

   a) UL listed

   b) ANSI/IEEE C37.90.1 – surge withstand capability

   c) ANSI C12.20

   d) Meter shall be as manufacturer by one of the following or approved alternate (all meter options shall be added to model number in order to meet the requirements of this section):

      (1) Schneider Electric Model PM850

      (2) Eaton Model PXM2280

      (3) General Electric EPM7000

2.03 INSTRUMENT SWITCHES

Instrument switches shall be provided with contact blocks and positions specified. Switches shall be of the rotary-cam type and contacts shall have positive wiping action of silver-to-silver contact buttons. Switches shall be provided with escutcheon plates and pistol-grip handles. Switches shall be General Electric, SBM; Siemens, ABB equal.

Voltmeter and ammeter switches, pushbuttons or that like to allow four positions with the escutcheon legend as follows:

Voltmeter	OFF	1-2	2-3	3-1
Ammeter	OFF	Phase A	Phase B	Phase C

2.04 KEY INTERLOCK

Where specified, the key interlock shall consist of two or more identically keyed brass bolt locks. The bolt on the lock shall prevent the operation of the electrical equipment. One brass key shall be provided for each group of identical locks. The key shall be held captive when the lock is positioned to allow equipment operation.

2.05 INDICATING LIGHTS

Indicating lights shall be resistor type of the voltage specified.

2.06 NAMEPLATES

Nameplates shall be provided in accordance with Section 16000.

2.07 PRODUCT DATA

The following information shall be provided in accordance with Section 01300:

1. Operation and maintenance items as specified in Section 01730.
2. Manufacturer's product data with features and dimensions of devices.
3. Burden, accuracy class, and ratio data for instrument transformers.

PART 3 – EXECUTION

Accessories and devices shall be installed per the electrical distribution equipment manufacturer's instructions.

END OF SECTION

Attachment C
Specification 16500

SECTION 16500

LUMINAIRES

PART 1 – GENERAL

1.01 DESCRIPTION

This section specifies luminaires (lighting fixtures) features and installation.

1.02 REFERENCES

This section contains references to the following documents. They are a part of this section as specified and modified. Where a referenced document contains references to other standards, those documents are included as references under this section as if referenced directly. In the event of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

Unless otherwise specified, references to documents shall mean the documents in effect at the time of Advertisement for Bids or Invitation to Bid (or on the effective date of the Agreement if there were no Bids). If referenced documents have been discontinued by the issuing organization, references to those documents shall mean the replacement documents issued or otherwise identified by that organization or, if there are no replacement documents, the last version of the document before it was discontinued. Where document dates are given in the following listing, references to those documents shall mean the specific document version associated with that date, regardless of whether the document has been superseded by a version with a later date, discontinued or replaced.

Reference	Title
NFPA 70	National Electrical Code (NEC)

1.03 WARRANTY

A. EMERGENCY LIGHTING UNIT BATTERIES WARRANTY

Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period: Two years from date of Substantial Completion. Provide full warranty for first year and prorated warranty for the remaining warranty period.

B. FLUORESCENT BALLASTS WARRANTY

Manufacturer's standard form in which ballast manufacturer agrees to repair or replace ballasts that fail in materials or workmanship within specified warranty period for Electronic or Electromagnetic Ballasts: Two years from date of Substantial Completion.

C. T5 AND T8 FLUORESCENT LAMPS WARRANTY

Manufacturer's standard form, made out to Owner, and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period: Two years from date of Substantial Completion.

D. LED WARRANTY: Warranty shall include as a minimum the following:

A written 5-year on-site replacement material, fixture finish and workmanship. On-site replacement includes transportation, removal, and installation of new products. Finish warranty must include warranty against failure or substantial deterioration such as blistering, cracking, peeling, chalking or fading.

A written 5-year replacement material warranty for defective or non-starting LED source assemblies.

A written 5-year replacement material warranty on all power supply units (PSU).

A written 5-year replacement warranty for luminaires producing inadequately maintained illuminance levels at the end of the warranty period, as prorated from levels expected at end of useful life.

The Owner may request an optional 10-year replacement warranty for inadequately maintained illuminance levels, finish of luminaire, PSU, or defective LED source assemblies. The terms of the extended warranty will be negotiated by the Owner and the luminaire manufacturer for an additional cost.

The warranty period shall begin on the date of Substantial Completion. The Contractor shall provide the Owner with appropriate signed warranty certificates. The Owner shall have received these certificates prior to final payment.

1.04 EXTRA MATERIALS

Provide extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents. Provide at least one of each type.

1. Lamps: Ten for every 100 of each type and rating installed.

2. Plastic Diffusers and Lenses: One for every 100 of each type and rating installed.

3. Battery and Charger: One for every 10 emergency lighting units installed.

4. Ballasts: One for every 100 of each type and rating installed.

5. Globes and Guards: One for every 20 of each type and rating installed.

1.05 SUBMITTALS

Provide submittal information in accordance with Section 16000. Luminaire model numbers are provided on the drawings in the lighting schedule. The Contractor may propose an alternate luminaire for approval; however, sufficient information shall be provided as a part of the submittal for the Engineer and the Owner to review and compare the listed luminaire and the proposed alternate. Contractor and luminaire supplier shall provide a photometric, energy usage (efficiency), approvals/listings and materials comparison between the two fixtures. If an alternate luminaire layout is required, the Contractor and luminaire supplier shall provide all illuminance calculations as part of the submittal to verify minimum illuminance levels are met by the proposed revisions. Proposed alternates shall be shown to be equivalent or superior to the luminaire listed. It shall be the Contractor's responsibility to provide sufficient information to the Engineer and the Owner to verify and approve alternates.

PART 2 – PRODUCTS

2.01 LIGHTING MATERIALS

Lighting materials, including luminaires, lamps, accessories, and hardware, shall conform to the detailed requirements specified. Lighting fixtures shall be provided where specified on the drawings. The drawing's light fixture placement is diagrammatical in nature. The actual installation and fixture layout shall be coordinated with the various trades and equipment.

2.02 INTERIOR LUMINAIRES AND COMPONENTS

1. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility.

2. Incandescent, Fluorescent and HID Fixtures: Comply with UL 1598.

3. Sheet Metal Components: Steel, unless otherwise indicated. Formed and supported to prevent warping and sagging.

4. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

5. Diffusers, Covers, and Globes:

   a. Acrylic Lighting Diffusers and Other Products: Provide 100 percent virgin acrylic plastic with high resistance to yellowing and physical changes due to aging, exposure to heat and UV radiation.

      1) Lens Thickness: At least 0.125 inch minimum.

      2) UV stabilized.

   b. Glass Lighting Diffusers and Other Products: Provide annealed crystal glass, unless otherwise indicated.

2.03 EXTERIOR LUMINAIRES

Complying with UL 1598 and listed for installation in wet locations.

A. SHEET METAL COMPONENTS

Corrosion-resistant aluminum, unless otherwise indicated. Formed and supported to prevent warping and sagging.

B. HOUSINGS

Housings shall not warp, sag, or deform in use and shall be rigidly formed, weather- and light-tight enclosures. Provide filter/breather for enclosed luminaires.

C. DOORS, FRAMES, AND INTERNAL ACCESS

Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Removable doors for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

D. EXPOSED HARDWARE MATERIAL

Stainless steel.

E. PLASTIC PARTS

High resistance to yellowing and physical changes due to aging, exposure to heat, and UV radiation.

F. LENSES AND REFRACTORS GASKETS

Provide heat-resistant and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminary doors.

2.04 FLUORESCENT ELECTRONIC BALLASTS

Ballasts for F32T8 lamps shall be:

1. High frequency solid state electronic.
2. Instant start, parallel operation.
3. Minimum starting temperature: 50 degrees F.
4. Minimum 0.87 ballast factor.
5. Maximum total harmonic distortion (THD): 10%.

6. Power factor: 95% minimum.

7. Sound rated: A.

8. Ballast case temperature not to exceed 90 degrees Centigrade during normal operation in 30 degrees Centigrade ambient temperature.

9. Certified Ballast Manufacturers' Certification.

Built-in self-resetting thermal actuated device shall remove ballast from line when excessive ballast temperature is reached. UL Class P, CBM certified 100% output.

The conductors between ballasts and lamp holders shall have 1,000 volts insulation includes conductors to and from remote ballasts.

Provide ballasts with voltage characteristics to match that of the circuitry shown on the Drawings. No extra compensation will be allowed for failure to properly coordinate ballast voltage with circuitry.

Lamp current crest factor less than 1.7 and ballast factor over 0.85 for T8 lamps.

Ballasts shall comply with ANSI C62.41 – "Guide for Surge Voltages in Low-Voltage AC Power Circuits, Category A" for resistance to normal and common mode transient voltage surges. Comply with FCC Regulations Part 18 Class A for electromagnet interference.

Manufacturers: Advance, MagneTek, Motorola, or equal.

2.05 HIGH-INTENSITY-DISCHARGE LAMP BALLASTS

Comply with NEMA C82.4 and UL 1029. Shall include the following features, unless otherwise indicated.

1. Type: Constant-wattage autotransformer or regulating high-power-factor type.

2. Minimum Starting Temperature: Minus 22 degrees F (Minus 30 degrees C) for single-lamp ballasts.

3. Normal Ambient Operating Temperature: 104 degrees F (40 degrees C).

4. Open-circuit operation: Shall not reduce average life.

5. Ballast Fuses: One fuse in each ungrounded power supply conductor, size per manufacturer recommendations.

A. INSTANT-ON QUARTZ SYSTEM

Automatically switches quartz lamp on when fixture is initially energized and when momentary power outages occur. Automatically turns quartz lamp off when high-intensity-discharge lamp reaches approximately 60 percent light output.

B. LOW-NOISE BALLASTS

Epoxy-encapsulated models designed to minimize audible fixture noise.

C. HIGH-PRESSURE-SODIUM BALLASTS

Solid-state igniter/starter with an average life in pulsing mode of 10,000 hours at an igniter/starter-case temperature of 90 degrees C.

D. METAL HALIDE BALLASTS

Pulse start ballasts for lamps of 175 watt or for lamps with larger wattage with constant wattage auto transformer with a crest factor of 1.8 maximum. Provide regulated lag ballast with a crest factor or 1.5 with long life requirements.

2.06 EXIT SIGNS

Comply with UL 924 for sign colors and lettering size.

2.07 EMERGENCY LIGHTING UNITS

A. GENERAL

Self-contained units complying with UL 924 with the following features:

1. Battery: Sealed, maintenance-free, with minimum 10-year nominal life.

2. Charger: Fully automatic, solid-state type with sealed transfer relay.

3. Wire Guard: Where specified or scheduled, heavy-chrome-plated wire guard.

4. Integral Time-Delay Relay: Holds unit on for fixed interval when power is restored after an outage; permits high-intensity-discharge lamps to restrike.

5. Operation: Turns lamp on when circuit voltage drops to 80 percent of nominal voltage. Lamp disconnects from battery when voltage approaches deep-discharge level. Disconnect lamps from battery, battery recharges, and floats on charger when normal voltage is restored.

2.08 EMERGENCY FLUORESCENT LIGHTING FIXTURES

A. INTERNAL TYPE

Self-contained, modular, battery-inverter unit factory mounted within fixture body complying with UL 924 with the following features:

1. Emergency Connection: Operate one fluorescent lamp continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.

2. Night Light Connection: Operate one fluorescent lamp continuously.

3. Test Switch and Light-Emitting-Diode Indicator Light: Visible and accessible without opening fixture or entering ceiling space.

4. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum seven-year nominal life.

5. Charger: Fully automatic, solid-state, constant-current type.

B. MANUFACTURERS

Holophane, Lithonia, Bodine, Daybrite, Guth, Siltron, or equal.

2.09 LAMPS

A. GENERAL

Lamps shall be as specified on the applicable Fixtures Schedule.

Unless otherwise specified, fluorescent lamps shall be Day Light white (4,100K - 6,500K).

Unless otherwise specified, LED lamp shall have a color temperature of 4,000 CCT.

B. MANUFACTURERS

Lamps shall be General Electric, North American Philips (Norelco), Sylvania, Venture Lighting International, or equal.

C. FLUORESCENT LAMPS

1. T8 RAPID-START LAMPS: CRI of 75 minimum, color temperature of 3500 K, and average rated life of 20,000 hours, unless otherwise indicated.

2. COMPACT FLUORESCENT LAMPS: CRI 80 minimum, color temperature 3500 K, average rated life of 10,000 hours at 3 hours operation per start, unless otherwise indicated.

D. HIGH-INTENSITY-DISCHARGE (HID) LAMPS

1. HIGH-PRESSURE-SODIUM LAMPS: NEMA C78.42, wattage and burning position as scheduled, CRI 65 minimum, color temperature 1900 K minimum and average rated life of 24,000 hours.

2. METAL-HALIDE LAMPS: ANSI C78.1372, Type-O, wattage and burning position as scheduled, CRI 70 minimum, and color temperature 4000 K minimum.

E. INCANDESCENT LAMPS

Rated 130Vac, standard A or PS shape, and frosted inside.

2.10 EXTERIOR LIGHTING POLES

A. GENERAL

Provide lighting poles with pole cap and the necessary fixture mounting hardware. Provide light switch and power outlet as shown on the drawings. Light poles and foundations shall be rated for windload as defined by specification Section 01900. Provide calculations and Georgia PE seal to confirm foundation, anchor and pole ratings.

B. FIBERGLASS POLE

Fiberglass pole finish shall be impregnated in the resin. Submit available colors for selection. Color shall selected and approved by Owner, Architect or Engineer from manufacturer's standard finishes.

Manufacturer: Cem-Tec, W. J. Whatley, or equal.

C. CONCRETE POLE

Concrete pole finish shall be natural mold concrete grey.

Manufacturer: Centrecon; Union Metal – Marbelite; or equal.

D. ALUMINUM POLES

Provide tapered round, brown aluminum poles. See schedule for requirements. Color shall be selected and approved by Owner, Architect or Engineer from manufacturer's standard finishes.

E. STANCHION POLES

1. In Class I, Div. 1 areas provide pole as detailed or specified on the drawings.

2. In all Class I, Div. 2 and unclassified areas provide a telescoping light pole. Pole shall meet the sub-sequent requirements.

3. Construction:

a. Telescoping; factory sealed and pre-wired

b. Adjustable 360 deg. pole rotation

c. Adjustable height

d. Spring assist for controlled lowering and assist to raise

4. Height: As shown; adjustable raised height

5. Certifications:

   a. UL 1598

   b. CSA C22.2 No. 250.0-08

   c. Suitable for use in Class I, Division 2 and Class I, Zone 2 areas

6. Wind Rating: AASHTO standard; 310 mph aluminum; 230 mph stainless steel

7. Vibration: IEC 60068-2-6

8. Material: Aluminum T6061 or Stainless Steel 316 grade as specified

9. Hardware: Xylan 1400 coated for corrosion protection

10. Cable:

    a. 12/3 AWG UL/CSA Listed

    b. 600V, -40degC to 105degC

    c. Sun and oil resistant

    d. ROHS II Reach

    e. Internal conduit for cable protection

11. System shall be factory assembled and wired

12. Coordinate with fixture mounting requirements

13. Poles are not to be handrail mounted; see details

14. Pole shall be Eaton/Crouse Hinds V-Spring system or approved equal. Model V65BA –A; top hat and fitting mounts shall be provided as required for fixtures; provide optional “J” bolts as required for wind requirements in the area.

2.11 SITE JUNCTION BOXES

Junction boxes for the distribution of outdoor lighting circuits shall be precast concrete and set flush with the ground. Nominal size shall be approximately 10.5 x 17.25 x 12 inches deep. Lid shall be cast iron with cast inscription: "LIGHTING".

Boxes manufacture: Brooks Products, Christy Concrete Products, Forni Corporation, Utility Vault Company or equal. Example: Brooks catalog No. 3-1/2PB.

2.12 FIXTURE FINISHES

1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.

2. Metallic Finish: Corrosion resistant.

3. Color shall be selected and approved by Owner, Architect or Engineer from manufacturer's standard finishes.

2.13 PHOTOELECTRIC RELAYS

A. PHOTO-CELLS

1. Provide UL 773 or UL 773A listed units. Factory mount units to the luminaires.

2. Provide time-delay relays that fail in the on-position, factory set to turn light unit on at 1.5 to 3 foot candles (16 to 32 lux) and off at 4.5 to 10 foot candles (48 to 108 lux) with 15-second minimum time delay. Provide directional lens in front of photocell to prevent fixed light sources to cause turnoff.

3. Provide a cadmium sulfide cell housed in a plug receptacle assembly, three-prong, polarized, locking type. Provide assembly for outdoor mounting and rated for 1800 VA at 120V maximum capacity.

    a. Relay with locking-type receptacle shall comply with NEMA C136.10.

    b. Adjustable window slide for adjusting on-off set points.

2.14 PRODUCT DATA

The following information shall be provided in accordance with Section 01300:

1. Operation and maintenance items as specified in Section 01730.

2. Polar plots on 8-1/2 x 11 inch paper providing candlepower vs. angle and foot-lamberts (brightness) vs. angle for longitudinal and transverse axis.

3. Table of utilization factors for calculation of illumination levels by the zonal cavity method.

4. Catalog information describing fixture and lamp make, materials, and dimensions.

5. Manufacturers' warranties as specified in paragraph 16500-1.03.

6. Standard color selection chart.

2.15 LED LUMINAIRES (LED)

A. LED luminaires shall be a complete functioning unit with all components including light source, lamps, power supply, control interface and any additional components needed for operation and shall be assembled by the luminaire manufacturer.

B. Luminaires shall comply with ANSI chromaticity standard for classifications of color temperature. See Lighting Schedule for specified LED lamp color and color temperature. Luminaire shall be UL or ETL listed and labeled.

C. Luminaire testing shall be per IESNA LM-79 AND LM-80 procedures.

D. Provide shop drawings showing illumination levels with LED systems based on lumen output at 70 percent lumen depreciation for white LEDs and 50 percent for colored LEDs. Initial lumen output for all LEDs shall be listed individually.

E. LED drivers shall have reversed polarity protection, open circuit protection and require no minimum load. Drivers shall operate at a minimum 80 percent efficiency and have a class A noise rating.

F. Where LED systems are required to be dimmable, the LED system shall be capable of full and continuous dimming.

G. Color Rendering Index (CRI): >70

H. Minimum luminaire efficacies: 85 lumens per watt. Nominal input wattage shall account for nominal applied voltage and any reduction in driver efficiency due to sub-optimal driver loading.

I. Fully enclosed wiring and LED diodes enclosed to prevent penetration of dust, insects, and other debris into the lamp and driver compartment.

J. Outdoor fixtures capable of reliable operation in temperature range of -30 degrees C to +40 degrees C minimum.

PART 3 – EXECUTION

3.01 GENERAL

The location and type of luminaires, associated poles, fixtures, and receptacles are as shown on the drawings.

Labels and marks, except the UL label, shall be removed from exposed parts of the fixtures. Fixtures shall be cleaned when the project is ready for acceptance. Photoelectric cells shall be oriented toward the north.

Raceways, wire, or cable shall be provided in accordance with Division 16. Raceways and wire shall be provided from the fixtures, switches and receptacles to the lighting panel in accordance with the NEC. Underground and outdoor wire splices shall be in accordance with Section 16120.

Fixtures labeled to require conductors with a temperature rating exceeding 75 degrees C shall be spliced to circuit conductors in a separately mounted junction box. Fixture wire shall meet UL and NEC requirements. Fixture shall be connected to junction box using flexible conduit with a temperature rating equal to that of the fixture.

Recessed fixtures shall be provided with mounting hardware for the ceiling system specified. A concealed latch and hinge mechanism shall be provided to permit access to the lamps and ballasts and for removal and replacement of the diffuser without removing the fixture from ceiling panels. Fixtures recessed in concrete shall have protective coating of bituminous paint.

Fixtures shall be aligned and directed to illuminate an area as specified. Fixtures shall be directly and rigidly mounted on their supporting structures. The conduit system shall not be used to support fixtures.

Fixture supports that are welded to steel members shall be treated with rust-resistant primer and finish paint where brackets or supports for lighting fixtures.

Provide manufacturer recommended mounting hardware and brackets.

3.02 WIRE CONNECTIONS

Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values or use torque values specified in UL 486A and UL 486B.

3.03 FIELD QUALITY CONTROL

Inspect each installed fixture for damage then replace damaged fixtures and components. Verify normal operation of each fixture after installation.

Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.

Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. Retest to demonstrate compliance with specification requirements where adjustments are made. Replace fixtures with damage or corrosion during warranty period.

END OF SECTION

Attachment D
Geotechnical Report

SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING EVALUATION
Little River Water Reclamation Facility Expansion
Cherokee County, Georgia

WILLMER ENGINEERING INC.
Willmer Project No. 71.3838

Prepared for

Brown and Caldwell
Atlanta, Georgia

Prepared By

WILLMER ENGINEERING INC.
3772 Pleasantdale Road
Suite 165
Atlanta, Georgia 30340

770.939.0089

WILLMER ENGINEERING INC. | WE

October 2, 2012

VIA EMAIL / HAND DELIVERY

Kelly K. Comstock, PE, BCEE
Vice President
Brown and Caldwell
990 Hammond Drive, Suite 400
Atlanta, GA 30328

SUBJECT: Subsurface Exploration and Geotechnical Engineering Evaluation
Little River Water Reclamation Facility Expansion
Cherokee County, Georgia
Willmer Project No. 71.3838

Dear Mr. Comstock:

Willmer Engineering Inc. (Willmer) is pleased to provide this report of subsurface exploration and geotechnical engineering evaluation for the proposed Little River Water Reclamation Facility (WRF) Expansion in Cherokee County, Georgia. This work was performed for Brown and Caldwell in general accordance with our Subcontract for Geotechnical Services dated July 9, 2012.

This report presents our understanding of the proposed expansion, the results of our geotechnical exploration, analyses, and evaluation, and our recommendations for the design and construction of the proposed expansion.

We greatly appreciate the opportunity to be of service to you on this project. Please contact us if you have any questions concerning this report or require further assistance.

Sincerely,

WILLMER ENGINEERING INC.

Bradford Drew, EIT
Staff Geotechnical Engineer

James L. Willmer, PE
Executive Vice President/Principal Consultant

Sujit K. Bhowmik, PhD, PE
Chief Engineer

The original of this document was signed and sealed by James L. Willmer, PE, Registration No. 10780 on October 2, 2012
THIS REPRODUCTION IS NOT A CERTIFIED DOCUMENT

BD/SKB/JLW: bw

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Executive Summary

The following summary highlights significant aspects of the project and our conclusions and recommendations. The reader is referred to the report text for detailed descriptions of our geotechnical investigation, analyses, and recommendations.

- The proposed expansion will consist of adding a new influent pump station, a two-story structure with membrane gallery, MBR tanks, a digester, and a sludge holding tank at the ground level and administration facilities at the upper level, emergency generators, and an access roadway. The structural loads are not available at this time.
- The existing ground surface elevations range from approximately 881 to 883 feet. The lowest bottom elevation of the influent pump station will be about 860 feet, and the finished ground floor elevation of the administration building will be 884 feet.
- The subsurface profile consists of fill underlain by alluvial soils (soft clay and loose sand), residual soils, partially weathered rock, and parent bedrock. Groundwater was encountered at elevations between 874.5 and 875.5 feet, i.e., about 15 feet above the bottom of the influent pump station. Dewatering will be required during installation of the pump station.
- The maximum primary consolidation settlement due to new fill (maximum 2 feet) placement is estimated to be about 1 inch, and the maximum long-term settlement due to secondary compression is estimated to be about 0.5 inch over a period of 20 years. We recommend a minimum waiting period of 90 days between fill placement and pavement/slab/footing construction to minimize differential settlement.
- The project site is susceptible to liquefaction during earthquake shaking. The settlement of the ground surface during the design earthquake is estimated to be about 2 to 3 inches.
- Because of liquefaction susceptibility and the presence of a soft clay layer, we recommend that the administration building and MBR tanks be supported by auger-cast piles. An allowable capacity of 125 tons can be achieved with 16-inch diameter auger-cast piles installed to rock.
- We recommend that the upper 12 inches of soil under the entire slab-on-grade be comprised of a suitable engineered fill. This will require undercutting and replacement of up to 12 inches of soil in the cut and at-grade area.
- Soil-supported slabs will undergo settlement due to liquefaction during earthquake shaking. This settlement can be avoided by framing the slabs on grade beams supported on auger-cast piles.
- Based on the SPT N-value and undrained shear strength versus depth profiles, the seismic classification for the site is Site Class ‘E’, in accordance with IBC 2006.
- We recommend that Willmer Engineering be retained to provide geotechnical engineering oversight during construction of the facilities to confirm that the subsurface conditions encountered during construction are consistent with our interpretation based on the results of our geotechnical investigation and that the recommendations provided herein are properly interpreted and implemented.

1.0 Introduction

1.1 Site Location and Project Description

The Fulton County Department of Water Resources plans to expand the existing Little River Water Reclamation Facility (WRF) by converting it from the conventional treatment facility to a 2.6 million gallons per day (MGD) Membrane Bio-Reactor (MBR) facility. The Little River WRF is located at 2415 Cox Road in Cherokee County, Georgia. A site location map is presented in Figure 1, a drawing showing the proposed expansion area relative to the existing facilities is presented in Figure 2, and photographs showing the current site conditions are presented in Appendix III.

1.2 Description of Proposed Expansion

The proposed Little River WRF expansion will consist of adding: (i) a new influent pump station, (ii) a two-story structure with membrane gallery, MBR tanks, a digester, and a sludge holding tank at the ground level and administration facilities at the upper level, (iii) emergency generators, and (iv) an access roadway. The influent pump station is planned to be installed at approximately 23 feet below the existing grade, and the ground level additions listed above will be constructed approximately at grade. The administration offices will be housed in the second floor above the membrane gallery, and the footprint area of the administration building is approximately 4,000 square feet. The design of the proposed additions is currently in progress, and detailed information on the structures and loads are not available at this time. The new access roadway will run along the south and southeast perimeters of the facility and connect the main entrance driveway at the southwest corner to the southeastern parts of the facility. A number of displays and drawings showing the preliminary layout of various structures/features are included in Appendix IV.

1.3 Existing Site Conditions and Proposed Grading

Currently, the area of the proposed expansion is mostly grassed except the south end, which is located in a wooded area with moderate to heavy undergrowth. The existing ground surface within the expansion area is relatively flat with elevations ranging from approximately 881 feet near the east end to 883 feet near the west end of the site. The lowest bottom elevation of the proposed influent pump station will be about 860 feet (i.e., approximately 23 feet below the existing ground surface), and the finished ground floor elevation of the administration building will be 884 feet (i.e., approximately at grade with possibly up to 2 feet of fill in some parts of the footprint). The MBR tanks and other associated structures will likely be constructed over a mat-type foundation; some of these structures will be raised above the floor elevation using walls or columns. The access road will be constructed approximately at grade.

1.4 Objectives and Scope of Present Work

The primary objectives of the study reported herein were to obtain geotechnical information and provide recommendations for pavements, foundations, and other design elements associated with the proposed expansion. To achieve these objectives, Willmer performed the following major tasks:

- Review and compilation of topographic maps, aerial photographs, and geologic literature pertaining to the subject site.

- Planning and performance of a field exploration program consisting of: (i) visual inspection of the site to document topography and land use, above-ground utilities, accessibility for drilling equipment, and other features relevant to the field exploration work, (ii) coordination with Georgia Utilities Protection Center and a private utility locator for subsurface utility clearance at boring locations, (iii) drilling four Standard Penetration Test (SPT) borings and three auger borings within the proposed expansion limits, (iv) obtaining undisturbed and bulk samples from selected soil layers for use in laboratory testing, (v) obtaining groundwater level measurements at the boring locations, and (vi) performing three hand-auger borings near the exterior walls of existing steel tanks to determine the types of their foundation bearing materials.

- Performance of a laboratory testing program consisting of classification and engineering property tests on representative soil samples.

- Compilation and evaluation of the collected field and laboratory test data and selection of engineering properties for use in geotechnical analyses.

- Performance of geotechnical analyses including determination of foundation types and capacities, evaluation of liquefaction potential and mitigation measures, estimation of new fill and liquefaction-induced settlement, seismic site classification, and determination of design response spectrum.

- Preparation of this report summarizing all relevant field and laboratory test data, the results of our analyses and evaluation, and our recommendations for earth pressures and design of foundations and pavements.

This engineering report is divided into five sections. The present section (Section 1) contains the project background information and provides a summary of the objectives and scope of our work. Summaries of the field exploration and laboratory testing programs are provided in Sections 2 and 3, respectively. Section 4 presents a description of the site and regional geologic conditions based on available geologic literature, and a description of the subsurface conditions based on the results of the field exploration and laboratory testing programs. The results of our geotechnical engineering evaluations and our recommendations are provided in Section 5.

2.0 Field Exploration Program

2.1 General

A field exploration program was conducted by Willmer to determine the type, strength, and deformation characteristics of *in situ* soils and to assess the depth to rock and groundwater conditions at the site of the proposed expansion. The field exploration consisted of drilling SPT borings, hand-auger borings, bulk soil sampling, undisturbed soil sampling, and groundwater table measurements.

The boring locations were selected by Willmer based on the locations of the proposed expansion structures. Subsurface utility clearance at the boring locations was provided by the subscribers of Georgia Utilities Protection Center and a private utility locator retained by Willmer. Upon completion of drilling and obtaining groundwater table measurements, the boreholes were backfilled using soil cuttings from the drilling operation.

2.2 Standard Penetration Test Boring

Four SPT borings (B-1 through B-4) were drilled to explore the subsurface soil conditions within the expansion footprint. Borings B-1, B-2, and B-4 were extended to auger refusal at 56, 37, and 35 feet, respectively, and boring B-3 was extended to a depth of 25 feet. Approximate locations of these borings are shown in Figure 2 – Sheet 1.

The borings were drilled using an all-terrain vehicle (ATV)-mounted rotary drill rig to advance continuous hollow-stem augers. All work was performed under the observation of one of our geotechnical engineers. The SPT borings were performed in general accordance with ASTM Standard D 1586. The Standard Penetration Test is a widely accepted method for *in situ* testing of soils. A 2-foot long, 2-inch outside-diameter split-barrel sampler attached to the end of a string of drilling rods is driven 18 inches into the ground by successive blows of a 140-pound hammer freely dropping 30 inches. The number of blows needed for each 6 inches of penetration is recorded. The blows required for the first 6 inches of penetration are allowed for seating the sampler into any loose cuttings, and the sum of the blows required for penetration of the second and third 6-inch increments constitutes the penetration resistance or N-value. After the test, the sampler is extracted from the ground and opened to allow visual examination and classification of the retained soil sample. The N-value has been empirically correlated with various soil properties including consistency, relative density, strength, compressibility, and potential for difficult excavation. Correlations between the N-value and the relative density of cohesionless soils (sands) and consistency of cohesive soils (clays/silts) are included in Appendix I.

Classification of the soil samples collected was performed in general accordance with ASTM D 2487/D 2488 procedures. Detailed descriptions of the materials encountered in each soil test boring, along with graphic representations of the standard penetration test blow counts (N-values), are presented on the soil boring logs included in Appendix I. A summary of the subsurface conditions based on the boring data is presented in Table 1.

2.3 Hand-Auger Borings for Access Road

In addition to the SPT borings, three hand-auger borings (B-5 through B-7) were performed within the alignment of the proposed access roadway. The hand-auger borings were extended to 7 feet below the existing ground surface. Approximate locations of the hand-auger borings are shown in Figure 2 – Sheet 1 and results of the hand-auger borings are presented in Table 2.

2.4 Hand-Auger Borings to Locate Existing Tank Foundations

Three additional hand-auger borings (A-1 through A-3) were performed near the exterior walls of existing steel tanks to determine their foundation bearing materials and depths. These borings were performed in three tank areas (designated as Area 1 through Area 3). Area 1 contains ten rectangular steel tanks and a concrete vault, Area 2 contains two rectangular steel tanks, and Area 3 contains one circular steel tank. The hand-auger borings were performed at about 12 inches away from the exterior tank wall. The locations of these borings relative to the existing steel tanks are shown in Figure 2 - Sheet 2.

Before the hand-auger borings were performed, the approximate depth to the tank bottom below the existing ground surface was determined by measuring the total inside depth of the tank and subtracting the tank height above the ground surface. Results of these hand-auger borings are summarized in Table 3.

2.5 Soil Sampling

Soil samples (split-spoon and bulk samples) obtained during the field exploration program were classified by our geotechnical engineer. The split-spoon samples were obtained from all SPT borings and placed in plastic jars. The samples were transported to our laboratory for further classification and characterization. Soil classification was performed in general accordance with ASTM D 2487/D 2488 classification system.

During SPT boring, undisturbed Shelby tube samples were also obtained from selected soil layers for use in laboratory consolidation testing. Locations of the undisturbed samples are shown on the individual boring logs in Appendix I. A total of three undisturbed samples were obtained from potentially compressible layers at boring locations B-1, B-2, and B-3. A composite bulk sample was obtained from a depth of 0 to 3 feet at hand-auger borings B-5 and B-6 for use in Standard Proctor Compaction and California Bearing Ratio (CBR) testing.

2.6 Groundwater Level Measurement

Depth to groundwater was recorded where encountered upon completion of drilling. The groundwater levels are listed in Tables 1 and 2 and shown on the individual boring logs in Appendix I and soil profiles in Figures 3A and 3B. It should be noted that groundwater levels are expected to fluctuate with seasonal variations in rainfall and temperature.

3.0 Laboratory Testing

3.1 General

A laboratory testing program was conducted by Willmer to determine the engineering properties of soils for use in our analyses and recommendations for the proposed WRF expansion. The laboratory testing program consisted of: (i) classification and index tests on selected soil samples, (ii) one-dimensional consolidation tests on undisturbed soil samples, and (ii) Standard Proctor compaction and California Bearing Ratio (CBR) tests on remolded bulk soil samples. All laboratory tests were performed in general accordance with appropriate ASTM standards.

3.2 Classification and Index Tests

Classification and index tests were performed to aid in the characterization of the undisturbed soil sample and composite bulk soil sample. The tests included visual classification in the laboratory, grain size distribution analyses (ASTM D 422), fines content (i.e., percent by dry weight of materials passing the US #200 sieve) determination (ASTM D 1140), moisture content determination (ASTM D 2216), and Atterberg Limits (Liquid Limit, Plastic Limit, and Plasticity Index) determination (ASTM D 4318). Results of these tests are summarized in Tables 4 and 5, and individual test results are included in Appendix II. As shown in Table 4, the composite bulk soil sample (used in Standard Proctor Compaction and CBR tests) is a fat clay with a Liquid Limit (LL) of 58%, Plasticity Index (PI) of 28%, fines content of 89.8%, and natural moisture content of 37.7%. As shown in Table 5, the undisturbed Shelby tube sample (used in consolidation test) is a sandy lean clay with a Liquid Limit (LL) of 42%, Plasticity Index (PI) of 18%, fines content of 69.8%, and natural moisture content of 35.8%.

3.3 Standard Proctor Compaction and CBR Tests

The composite bulk sample obtained from borings B-5 and B-6 was used in a Standard Proctor Compaction test to determine the compaction characteristics of on-site soils. Results of this test are summarized in Table 4, and the individual test results are included in Appendix II. The Standard Proctor maximum dry density for the sample is 86.7 pounds per cubic feet (pcf), and the optimum moisture content is 28.0 percent. The natural moisture content for the sample is 37.7 percent. Thus, the natural moisture content is 9.7% higher than the optimum moisture content.

A CBR test was also performed on the same soil to determine the subgrade-support characteristics of the soil. The CBR test was performed on a specimen molded to 98 percent of the Standard Proctor maximum dry density at a moisture content approximately equal to the optimum moisture content. As shown in Table 4, a CBR value of 4.6 was obtained.

3.4 Consolidation Tests

A one-dimensional consolidation test (ASTM D 2435) was performed on an undisturbed Shelby tube soil sample obtained from a selected soil layer from boring B-3 to assess the compressibility characteristics of these soils and to estimate settlements. Results of the consolidation tests are summarized in Table 5, and the individual test results are presented in the form of void ratio and coefficient of consolidation versus effective vertical stress plots in Appendix II. As shown in Table 5, the compression index of the sample is 0.11, and the recompression index is 0.02. Since the void ratio versus effective vertical stress (log scale) plot

did not exhibit any distinct bi-linear shape, the preconsolidation pressure could not be discerned from this test. The coefficient of consolidation for the sample for the applicable stress level is 0.4 ft^2/day.

4.0 Area Geology and Subsurface Conditions

4.1 Area Geology

Based on the USGS Database for the 'Geologic Units of Georgia', the project site is within the Central Uplands Group and is underlain by the Biotitic Hornblende Gneiss/Amphibolite Formation, located within the Piedmont Physiographic Province of Georgia.

The Piedmont is composed of metamorphic rocks with localized igneous intrusions. The residual overburden soils encountered in the Piedmont are the product of in-situ chemical and physical weathering of the underlying parent rock. Typically, weathering is most advanced near the surface and decreases with depth. Below the residual soils, partially weathered rock is usually encountered as a transition zone to the underlying bedrock. Partially weathered rock (PWR) is locally defined as a material with a Standard Penetration Resistance in excess of 50 blows per 6 inches of penetration.

An important aspect of the Piedmont subsurface profile is that highly variable conditions may exist over relatively short horizontal distances. This is caused by variation in mineral composition of the parent rock and the intensity of fractures and joints within the rock. Zones of PWR may be encountered within residual soils, and lenses of soil may occur in the rock mass. The subsurface profile may be altered by man, by excavating or filling, or by effects of water through the process of erosion or alluvial deposition.

4.2 Subsurface Conditions

Results of the SPT borings are presented in the form of individual boring logs in Appendix I, and subsurface profiles obtained from the boring logs are presented in Figures 3A and 3B. The stratification lines shown on the boring logs represent our interpretation of the field logs and laboratory test results, in accordance with generally accepted geotechnical engineering practice. The stratification lines represent approximate boundaries between soil types; actual transitions between soil types are expected to be gradual. Although individual test borings are representative of the subsurface conditions at the precise boring locations on the dates shown, they are not necessarily indicative of the subsurface conditions at other locations or at other times. Also, in the absence of foreign substances, it is difficult to distinguish between virgin (undisturbed) residual soils and clean soil fill; the soil was classified as fill only at locations and depths where the fill material was visually distinguishable from residual soils.

The subsurface profile at the site can be generally characterized as a surficial layer of topsoil underlain by fill soils, alluvial soils, residual soils, PWR, and parent bedrock. A generalized discussion of the soil types encountered at the site is presented in the following paragraphs. For the purpose of this discussion, PWR is characterized for engineering purposes as residual soils exhibiting N-values in excess of 50 blows for 6 inches of penetration. Auger refusal is indicative of the top of parent bedrock.

4.2.1 Fill Soil

Fill soil consisting of sandy clay with root fragments (and rock fragments at one location) was encountered at all boring locations. The thickness of the fill soil ranged from 6 to 7 feet. The consistency of the fill material varied from soft to stiff with SPT N-values ranging from 3 to 12 blows per foot (bpf).

4.2.2 Alluvium

Alluvial soils were encountered at all boring locations, consisting of lean/fat clay (CL/CH) underlain by clayey/silty sand (SC/SM) and/or sand (SP). The thickness of alluvial soil ranged from 14 to 17 feet. The consistency of the upper cohesive soils ranged from very soft to soft with SPT N-values ranging from 0 (weight of hammer) to 4 bpf. The relative density of the lower cohesionless soils ranged from very loose to medium dense with SPT N-values ranging from 1 to 20 bpf.

4.2.3 Residuum

Residual soils were encountered at all boring locations, consisting of silty sand (SM). Relic banding/structure from the parent rock material was clearly visible in many of the soil samples. The thickness of residual soils ranged from 2.5 to 30 feet. The relative density of residual soils ranged from medium dense to very dense with SPT N-values ranging from 19 bpf to 50 blows for 5 inches of penetration. PWR lenses were encountered within the residual soils at borings B-1 and B-4.

4.2.4 Partially Weathered Rock

Partially weathered rock (PWR) directly overlying parent bedrock was encountered at all boring locations. The thickness of PWR ranged from 0.5 to 5 feet. The SPT N-values ranged from 50 blows for 4 inches of penetration to 50 blows for 6 inches of penetration.

4.2.5 Auger Refusal Material

Auger refusal was encountered in borings B-1, B-2, and B-4. Auger refusal is generally indicative of the top of bedrock. The depth to auger refusal ranged from 35 to 56 feet below the existing ground surface, corresponding to elevations of 847 and 827 feet, respectively.

4.2.6 Groundwater

Groundwater was encountered at all boring locations. The groundwater elevations at the boring locations are shown on the individual boring logs in Appendix I and on the subsurface profiles in Figures 3A and 3B. The depth to groundwater ranged from 7 to 7.5 feet below the existing ground surface, corresponding to elevations of 875.5 to 874.5 feet, respectively. It should be noted that groundwater levels are expected to fluctuate with seasonal variations in rainfall and temperature.

5.0 Geotechnical Engineering Evaluations and Recommendations

5.1 General

The geotechnical engineering evaluations and recommendations presented herein are based on the soil boring and laboratory test data gathered during this investigation, our understanding of the proposed construction, and our experience with similar site and subsurface conditions. These recommendations were prepared in accordance with generally accepted geotechnical engineering practice for the exclusive use of Brown and Caldwell and their designated consultants for use in the design of the proposed Littler River WRF Expansion in Cherokee County, Georgia. No other warranty, expressed or implied, is made.

We request that we be advised of any significant changes in the proposed expansion from that described in this report so that we may amend our recommendations accordingly. In addition, we request the opportunity to review the portions of the project specifications that relate to geotechnical engineering to ensure that our recommendations are properly incorporated.

5.2 Site and Subgrade Preparation

As indicated earlier, up to about 23 feet of excavation will be required for construction of the proposed influent pump station, and the administration building and various tanks will be approximately at grade with possibly up to 2 feet of fill in some parts of the footprint. Site and subgrade preparation for this project will require significant attention. The quality of the final subgrade will depend on all stages of the site and subgrade preparation work. Careful field control during placement of any required engineered fill will help minimize settlement within the fill.

Site and subgrade preparation should begin with the removal of all trees, surface vegetation, organic-laden soils, topsoil, and any other deleterious materials within the proposed construction area. Any old foundations, walls, slabs, above-grade utilities, etc. must be removed from the new construction area to expose subgrade soils. Any underground structures (e.g., utilities, tanks, etc.) must be removed or filled with granular material under engineering control.

After stripping, site preparation, and any necessary excavation, the newly exposed subgrade should be evaluated by the project geotechnical engineer. This evaluation will confirm that all soft, unstable, or undesirable materials have been removed. During this evaluation, we recommend that all proposed pavement, foundations, and slab-on-grade areas and areas that are to receive structural fill be proof-rolled using a loaded tandem-axle dump truck (20-ton minimum) or similar rubber-tired vehicle. Proof-rolling will help identify areas of low-strength soils. If areas exhibiting excessive deflection or pumping are detected during proof-rolling, an appropriate remedial measure would be recommended by the project geotechnical engineer. Remedial measures may include undercutting of the soft soil to firm material and replacement with structural fill or stone, in-place stabilization of the soil by mechanical manipulation and compaction, and in-situ stabilization using lime or cement. Proof-rolling should not be attempted within several days after a heavy rain as the equipment will rut and damage the subgrade. The upper 12 inches of subgrade for all slab-on-grade, foundations, and pavements should be compacted to at least 98 percent of the Standard Proctor maximum dry density at a moisture content equal to the optimum moisture content plus or minus 3 percent.

Care must be exercised during grading and fill placement operations. The combination of heavy construction equipment traffic and excess surface moisture can cause pumping and deterioration of the near-surface soils. Once wet, these soils hold moisture and are difficult to dry. The severity of this potential problem depends to a great extent on the weather conditions prevailing during construction. The contractor must exercise discretion when selecting equipment sizes and make a concerted effort to control surface water while the subgrade soils are exposed. If such problems do arise, the operations in the affected area must be halted and the geotechnical engineer contacted to evaluate the condition.

5.3 Drainage and Ground Water Management

The proposed construction areas must be provided with adequate drainage measures to maintain the integrity of the subgrade soils, especially during wet-weather conditions. When free water is allowed to stand on a stable subgrade, the soils can absorb water, soften, swell and experience a reduction in their support capability. Without adequate drainage provisions, site preparation activities during wet-weather periods may result in subgrade conditions that will necessitate undercutting or other subgrade stabilization measures. Therefore, we recommend that the site be graded to provide positive drainage away from the proposed pavement, slab, and foundation subgrade areas, and toward suitable drainage handling areas such as a perimeter ditch, french drain, or culvert.

Proper drainage of the finished pavements, parking areas, and ground surfaces is also important to maintain the integrity of the subgrade soils after construction is completed. When free water is allowed to infiltrate into a stable subgrade, the soils will absorb water, swell, and experience a reduction in their support capability. Therefore, all finished grades must be sloped to prevent any ponding of surface water adjacent to structures and pavements.

Groundwater was not encountered above the proposed site grade in the building areas. However, groundwater was encountered at approximately 15 feet above the proposed bottom of the influent pump station. At the time of drilling, groundwater was encountered at elevations ranging between 874.5 and 875.5 feet, and the proposed bottom elevation of the influent pump station is 860 feet. It should also be noted that groundwater elevations fluctuate with seasonal and climatic variations and may be different at other times. The groundwater will need to be lowered to allow for excavation/construction of the influent pump station to be performed in dry conditions. We recommend that the groundwater be maintained a minimum of three feet below the bottom of excavation during construction of the influent pump station.

Dewatering may be accomplished by pumping from sumps installed within the excavation or a system of well points installed around the outside perimeter of the excavation. Three different types of soils were encountered in our borings below the water table and above the bottom of the influent pump station. In descending order, these soils are fat clay, silty/clayey sand, and sand (see borings logs for B-1 and B-2). Permeability tests were not included in our scope of work for this project. We recommend that the dewatering contractor perform permeability tests in these soils for use in design of the dewatering system.

Dewatering during excavation/construction will result in drawdown of the groundwater, which may cause settlement and possible damage to adjacent structures and underground utilities.

The effect of the drawdown will need to be evaluated to determine potential impacts to adjacent structures and buried utilities.

5.4 Temporary Excavation Shoring

Temporary shoring will be required during excavation/construction of the influent pump station. All temporary excavations should be in accordance with OSHA regulations for Occupational Safety and Health Standards – Excavations (29 CFR Part 1926).

5.5 Lateral Earth Pressures for Temporary Shoring

The temporary bracing system for the influent pump station excavation will need to be designed for lateral earth pressure. The earth pressure distribution will depend on the type of wall and the bracing or tie-back anchors used. Active earth pressure distribution should be used for sheet pile walls. As indicated earlier, groundwater was encountered at approximately 15 feet above the proposed bottom of the influent pump station. However, if the groundwater is drawn down using a dewatering system, there will be no lateral pressure due to groundwater.

Based on the soil types encountered at this project, the following soil parameters are recommended for design of bracing system:

Soil Parameter	Unit	Depth below Ground Surface (feet)			
		0 – 7	7 – 14	14 – 24	>24
Unit Weight	pcf	115	110	115	125
Friction Angle	degrees	0	0	26	32
Cohesion	psf	500	250	0	0
Coefficient of Sliding Friction	--	NA	NA	0.3	0.4

In addition to the lateral earth pressure from the soil behind the bracing system, a uniform surcharge pressure of 500 psf should be added to account for construction equipment loading and/or surcharge due to stockpiled soil near the top of the braced excavation.

5.6 Engineered Soil Fill

As indicated earlier, up to about two feet of fill will possibly be required for site grading. Engineered fill must be placed on a subgrade that has been properly prepared and evaluated by the project geotechnical engineer, as previously discussed.

5.6.1 Acceptable Soil Fill Materials

Engineered soil fill material must be free of significant organic matter or debris and rock fragments greater than 3 inches in diameter, have a low to moderate plasticity, and have a uniform composition. Frozen soils must not be placed as engineered fill. Soils selected for use as engineered fill should have a Plasticity Index (PI) less than 30 percent, and a Standard Proctor (ASTM D 698) maximum dry density of at least 90 pcf. Any on-site soil not meeting these criteria should only be used as fill material in non-structural areas. It is particularly

important to minimize the amount and size of rock fragments allowed in the fill so as not to inhibit the installation of underground utilities through the fill

Results of laboratory tests performed on a composite bulk soil sample obtained from a depth of 0 to 3 feet at B-5 and B-6 indicate that this soil is not suitable for use as engineered fill. However, the sandy soils to be excavated from a depth of about 14 to 23 feet during installation of the influent pump station are likely to be suitable for use as engineered fill. Testing of this soil is not included in our present scope of work. We recommend that this soil be tested during construction to verify conformance with the criteria for acceptable fill materials stipulated above. This soil is expected to be saturated, and significant drying effort will be required before using it as engineered fill.

5.6.2 Placement Procedures

The engineered fill must be brought up to the proposed subgrade elevation by placing and compacting approved fill materials upon a prepared surface approved by the project geotechnical engineer. Fill material must not be placed over frozen or saturated materials, either natural or filled. All new fill material must be placed in horizontal lifts. If engineered fill is compacted on slopes steeper than 5H to 1V, extra care must be taken to bench the compacted fill into the existing natural soil slope so that a potential sliding surface is not left between the new engineered fill and the existing natural soil subgrade. However, this condition is not expected at the Little River WRF expansion project.

The maximum allowable lift thickness for engineered fill depends upon the soil type, moisture content, specified compaction, and compaction equipment. It is recommended that uniform lifts with a maximum loose thickness of 8 inches be used for engineered fill placement. In confined areas, such as utility trenches and behind retaining walls where large compaction equipment cannot be used, a thinner lift (i.e., 4 inches of loose thickness) may be required to achieve the specified level of compaction.

5.6.3 Compaction Requirements

The engineered fill must be placed by mechanically compacting each horizontal lift of fill material to a minimum dry density corresponding to 95 percent of the Standard Proctor (ASTM D 698) maximum dry density. The upper 12 inches of fill beneath slab-on-grade, foundations, and pavement areas should be compacted to at least 98 percent of the Standard Proctor maximum dry density. Scarification and re-compaction of the upper fill soils immediately prior to slab and/or pavement construction should be specified to account for disturbance due to inclement weather and/or construction traffic since fill completion. The backfill placed in excavations for new or removed utility lines should also be considered as engineered fill, and be uniformly compacted to at least 95 percent of the Standard Proctor maximum dry density.

In addition to meeting the minimum dry density requirements specified above, engineered fill must be placed at a moisture content equal to the Standard Proctor optimum moisture content plus or minus 3 percent. This tight moisture content requirement will minimize the magnitude and time for settlement of the fill due to its self-weight. In general, during wet/rainy periods, aeration may be necessary to adjust the fill materials to the required moisture condition. During dry periods, water may need to be added to achieve the required moisture content for compaction. Consideration should be given to creating a staging area for ‘wet’ soils to be moisture conditioned, i.e., ‘dried’ prior to their placement. Depending on the time of year when

construction operations are performed, discing the 'wet' soils and allowing them to air-dry may be all that is needed to achieve the required moisture content. Other options that can be used for 'drying' and stabilizing 'wet' fill soils include mixing the soils with dryer soil, or with cement or lime. The effectiveness of lime or cement in drying and stabilizing wet soils should be evaluated prior to their use. Generally, lime-stabilization is not effective for highly micaceous soils, but may work for soils with little or no mica.

Care must be exercised by the contractor after fill soils have been placed and compacted. If water is allowed to stand on the surface, these soils will become saturated. Movement of construction traffic on saturated subgrades causes rutting that can destroy the compaction integrity of the fill. Once the integrity of the subgrade is affected, mobility of construction traffic becomes difficult or impossible. Therefore, the fill surface should be sloped to achieve positive drainage and to minimize water from ponding on the fill surface. If the surface of the fill becomes excessively wet, filling operations should be halted and the project geotechnical engineer consulted for guidance.

Construction traffic should not be allowed on prepared subgrade. It is recommended that temporary roads surfaced with compacted crusher run material be constructed alongside the prepared subgrade for use by construction traffic.

5.6.4 Monitoring

Engineered fill placement and compaction operations must be monitored by the project geotechnical engineer or his representative. We strongly recommend that the placement and compaction of engineered fill be monitored on a full-time basis by a NICET-certified Soil Technician working under the supervision of the project geotechnical engineer. The technician should observe each lift of engineered fill placed and compacted to confirm the project specifications are met.

5.7 Settlement of Fill Soils Used in Site Grading

As indicated earlier, up to about two feet of fill will be required to establish the proposed final grades. Because of the presence of a soft to very soft clay layer, significant settlement is expected under the weight of the fill. The settlement in the area of the maximum fill due to primary consolidation is estimated to be about one inch. The maximum long-term settlement due to secondary compression is estimated to be about an additional 0.5 inch over a period of 20 years.

5.8 Waiting Period for Completion of Primary Consolidation

Because of the low permeability of the compressible clay layer, significant time will be required for the completion of primary consolidation settlement. We recommend a minimum waiting period of 90 days between the completion of fill placement and the beginning of any pavement, slab, or footing construction to minimize post-construction differential settlement due to primary consolidation. Settlement plates should be installed to monitor the progress of settlement with time. The length of the waiting period may be increased or decreased based on the results of the settlement monitoring data, at the discretion of the project geotechnical engineer.

5.9 Site Liquefaction Potential

Soil liquefaction is a phenomenon in which there is a sudden loss of soil strength due to pore water pressure build-up caused by cyclic shear stresses typically induced by ground motions during an earthquake. The sudden increase in pore water pressure causes saturated, loose, cohesionless soils to behave as a fluid. Soils that are most susceptible to liquefaction are loose, saturated sands with low fines content (i.e., with less than five percent passing the U.S. #200 sieve) below ground water table. In general, the higher the fines contents and/or greater the SPT N-value, the greater will be the cyclic shear stress (i.e., the stronger will be the ground motion) required to initiate liquefaction. Liquefaction potential for sandy soils can be evaluated using the procedure outlined in *Liquefaction of Soils during Earthquakes* by the Committee on Earthquake Engineering, Commission on Engineering and Technical Systems, National Research Council, National Academy Press, Washington, D.C., 1985.

For the Little River WRF, the design peak ground acceleration with 2% probability of exceedance in 50 years is about 0.09 g. As shown on the boring logs presented in Appendix I, a layer of very loose to loose silty sand was encountered between depths of about 9 and 24 feet below the existing ground surface. Based on laboratory tests (Table 4), the fines content of this material is as low as 3 percent. Our analysis indicates that this very loose to loose sand layer is susceptible to liquefaction under the design peak ground acceleration.

5.10 Liquefaction-induced Site Settlement

The very loose to loose silty sand layer is expected to densify when subjected to earthquake shaking, and this densification will result in settlement of the ground surface. The earthquake-induced settlement may cause distress to structures supported on shallow foundations. The settlement of the ground surface due to shaking during the design earthquake is estimated to be about 2 to 3 inches.

5.11 Mitigation of Liquefaction Susceptibility

The liquefaction susceptibility of the site can be mitigated using a number of ground improvement techniques. Methods of liquefaction mitigation that were evaluated for this project include: (i) *in situ* densification of the liquefiable soils by compaction with vibratory probes or blasting, (ii) grouting of the liquefiable soil to improve liquefaction resistance, and (ii) installation of earthquake drains to minimize pore water pressure build-up and provide *in situ* densification. We assess that blasting cannot be used at this site because of its proximity to existing structures. Blasting will not only densify the soils under the proposed structures, it will also likely densify the soils below the existing structures, resulting in settlement of those structures. Use of earthquakes drains, densification with vibratory probes, or grouting would likely be effective at this site. The advantage of earthquake drains over grouting or vibratory probes is that grouting and vibratory probes provide soil densification only, whereas earthquake drains provide soil densification during installation and pore pressure dissipation during an earthquake event.

Although liquefaction susceptibility can be mitigated using one of the methods discussed above, shallow foundations cannot be used at this site because of a soft to very soft clay layer that was encountered in our borings. Therefore, deep foundations are recommended to support the proposed at-grade structures at this site. Use of deep foundations extending below the liquefiable soils will eliminate any liquefaction-induced settlement of these structures. It should

be noted that any soil-supported slabs will also undergo settlement due to liquefaction, which can be avoided by placing the slabs on grade beams supported on deep foundations. Only about one foot of liquefiable soil was encountered below the proposed bottom of the influent pump station. Liquefaction susceptibility of the pump station can be mitigated by over excavating and replacing this soil with compacted No. 57 stone.

5.12 Foundations Recommendations

5.12.1 Influent Pump Station

As indicated earlier, the lowest bottom elevation of the influent pump station will be about 860 feet, which is about 23 feet below the existing ground surface. Based on Borings B-1 and B-2, the liquefiable loose to very loose sand layer extends to a maximum depth of about 24 feet below the existing ground surface in the area of the pump station. Thus, there is only about one foot of liquefiable soil below the proposed bottom of the pump station. We recommend that the loose sand material be excavated from the footprint area of the pump station and replaced with compacted No. 57 stone. Upon removal and replacement of the liquefiable soils, an allowable bearing pressure of 5,000 psf will be available at the bottom level of the influent pump station.

5.12.2 Administration Building and MBR Tanks

The administration building and the mat-type foundation for MBR tanks and other associated structures will be constructed at grade. Because of the presence of liquefiable soils and a layer of soft to very soft clay, we recommend that these structures be supported on deep foundations. The deep foundation options for this project include driven steel H-piles and auger-cast piles.

Steel H-piles driven into PWR or to rock will provide adequate capacity for this project. No boulders or PWR lenses were encountered in the borings located within the footprint area of the proposed structures; therefore, piles can be driven to PWR/rock without difficulty. However, significant noise and vibration will be generated during driving of H-piles. Also, densification of the liquefiable soils during driving may induce settlement of the adjacent existing structures. Therefore, we do not recommend using H-piles for this project.

Auger-cast piles will be a suitable deep foundation type for this project as these piles can be installed without any significant vibration. An allowable capacity of 125 tons can be achieved with 16-inch diameter auger-cast piles installed to rock (i.e., drilling refusal). Smaller diameter piles with lower capacities and larger diameter piles with higher capacities can also be used. However, friction auger-cast piles are not recommended for this project because the pile tips need to be extended below the liquefiable very loose to loose sand layer, which is not possible on this site because no significant PWR was encountered above the rock at any of the boring locations.

Auger-cast piles can be advanced through soil and PWR with similar levels of effort. Therefore, to ensure adequate capacity, the auger should be advanced through the overburden soils and PWR until practical refusal is encountered. To achieve the design capacity, the tip elevations of the auger cast piles are expected to range from about 827 to 847 feet. The lengths of the auger-cast piles are expected to range between 34 and 54 feet. The estimated tip elevations and lengths of auger-cast piles at the boring locations are summarized in Table 6.

Contiguous piles should not be installed before initial set of the first pile to avoid any possible connection of wet grout between the piles. For locations with long piles, there is a risk of piles being closer at the tip level than the minimum design spacing at the cap level. Therefore, special attention should be directed towards spacing and plumbness of the drill rig leads during pile installation.

Auger-cast piles require continuous removal of soil spoils excavated by the pile rig. This will result in some additional overall cost to the project. Because auger-cast piles can be monitored only by indirect means, a very “tight” set of specifications are generally required.

It should be noted that borings were not performed at any specific column location. Recommendations for pile lengths and tip elevations are provided at the borings locations; approximate pile lengths and tip elevations at the column locations may be estimated by interpolation of data from the boring locations.

Formed concrete caps will be required on top of the auger-cast piles, and the pile cutoff depth is expected to be several feet below the final grade. Construction of each cap will require excavation around the piles to accommodate the cap form. Once the cap is formed and concrete placed, several days will need to be allowed for the concrete to cure. If inclement weather occurs during this process, rain water must not be allowed to accumulate around the cap, and immediate pumping should begin to prevent saturation and softening of the surrounding soils. Any soft soils remaining outside the form should be removed and replaced with engineered fill properly compacted around the sides of the concrete cap to maintain passive resistance and lateral pile capacity. If the backfill material is too wet, properly compacted GAB could be used to expedite construction, but may be at the contractor’s expense if rain water is not properly controlled.

5.13 Pavement Recommendations

The design of a pavement is dependent on the traffic volume, type and weight of vehicles, and the soil subgrade strength which is related to the Soil Support Value (determined using CBR tests). A CBR value of 4.6 was obtained from a composite bulk sample (from borings B-5 and B-6) compacted to 98 percent of the Standard Proctor maximum dry density. The default CBR and subgrade reaction modulus values (for pavements on compacted subgrade) recommended by Georgia Department of Transportation for Cherokee County are about 4.0 and 130 pounds per cubic inch (pci), respectively. Since variability in the subgrade soil is expected across the site, we recommend that the above default values be used in pavement design.

As recommended in the ‘Site and Subgrade Preparation’ sections of this report, the upper 12 inches of subgrade for all pavements should be compacted to at least 98 percent of the Standard Proctor maximum dry density at a moisture content equal to the optimum moisture content plus or minus 3 percent.

5.14 Slab-on-Grade Recommendations

As indicated earlier, the proposed final grade of the administration building and membrane tank areas will be approximately at the existing site grade with a maximum of 2 feet of fill in some areas. Because of the presence of unsuitable clayey soils at the site, we recommend that the upper 12 inches of soil under the entire slab be comprised of a suitable engineered fill. This will

require undercutting and replacement of up to 12 inches of soil in the cut and at-grade areas. As recommended in the 'Site and Subgrade Preparation' section of this report, and the upper 12 inches of soil subgrade beneath the floor slab should be compacted to at least 98 percent of the Standard Proctor maximum dry density at a moisture content equal to the optimum moisture content plus or minus 3 percent.

We recommend that all slabs-on-grade be underlain by a 6-inch thick layer of graded aggregate base (GAB) to provide uniform support throughout. The GAB should be compacted to 100 percent of the Standard Proctor maximum dry density. A plastic vapor barrier is recommended to be placed on top of the GAB layer to prevent capillary rise of any groundwater or infiltrated water that could dampen the slab. A CBR value of 4 and a Subgrade Reaction Modulus (k) value of 130 pci are recommended for use in design of the slabs.

As indicated earlier, soil-supported slabs will undergo settlement due to liquefaction during earthquake shaking. The settlement can be avoided by framing the slabs on grade beams supported on auger-cast piles.

5.15 Lateral Earth Pressure for Influent Pump Station

The walls of the influent pump station will need to be designed for lateral earth pressures from the backfill materials and existing soils behind the walls. The design earth pressure will be a combination of static earth pressure, hydrostatic pressure, and seismic earth pressure.

5.15.1 Static Earth Pressure and Hydrostatic Pressure

Since the pump station will be a rigid structure, active earth pressure condition will likely not develop in the backfill materials behind the walls; therefore, at-rest earth pressures should be used for design of the pump station walls. An effective static earth pressure diagram for use in the design of the influent pump station is presented in Figure 4.

Groundwater was encountered at the time of drilling at about 15.5 feet above the bottom of the influent pump station. It should also be noted that groundwater levels are subject to seasonal and climatic changes. Therefore, hydrostatic pressures must be added to the effective earth pressures (presented in Figure 4) to obtain the total lateral pressure on the pump station walls under static conditions.

It is recommended that granular soils with a minimum fiction angle of 32 degrees be used as backfill behind the walls, and the granular backfill should be compacted to at least 95 percent of the Standard Proctor (ASTM D 698) maximum dry density.

5.15.2 Seismic Earth Pressure

In addition to the static lateral earth pressures and hydrostatic pressures due to groundwater, dynamic earth pressures will be imposed on the pump station wall during a seismic event. Therefore, the pump station wall must be designed for both static and dynamic loads.

The dynamic soil pressures imposed on a wall during an earthquake depends on the characteristics of the backfill material behind the wall and the soil underlying the wall, the inertial and flexural response of the wall itself, and the nature and magnitude of the earthquake motion.

Thus, the response mechanism is quite complex, and a simplified approach is commonly used in determination of the dynamic thrust for use in design. We recommend that the dynamic thrust on the pump station wall be calculated using the following relationship:

$$\Delta P_d = (a/g) * \gamma * H^2$$

Where,

ΔP_d	=	dynamic thrust per foot length of wall during a seismic event		
a	=	peak ground acceleration with 2% probability of occurrence in 50 years	=	0.09 g
g	=	acceleration due to gravity	=	32.2 ft/sec^2
γ	=	total unit weight of soil placed against wall	=	125 pcf
H	=	total height of soil placed against wall	=	24 feet

The point of application of the dynamic thrust (ΔP_d) is at a height of 0.6*H above the base of the pump station. The total lateral forces and moments used in design of the pump station wall should be calculated as the combined effect of the computed dynamic thrust, static earth pressures, and hydrostatic pressures on the wall.

5.16 Seismic Site Classification and Design Response Spectrum

The seismic site class for the proposed building was determined in accordance with the procedures outlined in Section 1613 of the 2006 International Building Code (IBC). The classification is based on soil/rock properties within the top 100 feet below the proposed final grade at the site. The soil/rock properties that can be used in this classification are SPT N-value, shear wave velocity, and/or undrained shear strength. Use of shear wave velocity and undrained shear strength are the most accurate determination for site class, but involve additional costs. Since SPT N-values can be obtained as part of the standard geotechnical investigation with no significant additional cost, these values are commonly used for seismic site classification. This method was used for seismic classification of the Little River WRF site.

5.16.1 Seismic Site Class

As indicated earlier, a layer of liquefiable, loose to very loose silty sand was encountered at this site between depths of about 9 and 24 feet below the existing ground surface. For seismic classification of sites with liquefiable soils, Section 1613.5 of IBC refers to the provisions in Sections 11.4.7 of the American Society of Civil Engineers Standard 7-05 (ASCE 7). As specified in Section 11.4.7 of ASCE 7, since the fundamental period of vibration of the administration building is expected to be less than 0.5 seconds, the ‘exception’ provided under Section 20.3.1 of ASCE 7 applies. The ‘exception’ stipulates that the seismic site class for this structure is permitted to be determined using Table 20.3-1 of ASCE 7 (which is the same as Table 1613.5.2 of IBC) in spite of the presence of liquefiable soils. Hence, based on SPT N-values of the sandy soils and estimated undrained shear strength of the clayey soils, the site was classified as Site Class ‘E’, in accordance with the guidelines in Table 1613.5.2 of IBC.

5.16.2 Design Response Spectrum

As outlined in Section 1613.5.1 of IBC, the design spectral response acceleration parameters for short periods and 1-second period were determined based on the site class described above, the contour maps of maximum considered earthquake ground motion in Figures 1613.5(1) and 1613.5(2), and the procedures outlined in Sections 1613.5.3 and 1613.5.4 of IBC. Based on Site Class 'E', the design spectral response accelerations were computed as follows:

Short Period Acceleration, S_{DS}	= 0.449 g
1-second Period Acceleration, S_{D1}	= 0.222 g

A design response spectrum curve constructed using the above acceleration values is presented in Figure 5 for use in seismic design of the building

5.17 Foundation Materials Under Existing Tanks

The results of hand-auger borings performed to determine the foundation material types (e.g., soil, GAB, concrete, etc.) under the existing tanks are summarized in Table 3. One boring was performed for each of the three tank areas designated as Area 1, Area 2, and Area 3 in Figure 2 - Sheet 2. As shown in Table 3, the tanks in Area 1 and Area 3 are underlain by GAB. Soil consisting of fat clay was encountered at the foundation level in the boring performed for the tanks in Area 2. No GAB or any other foundation material was encountered at this location.

5.18 Geotechnical Engineering Oversight during Construction

The recommendations provided herein are based on the geotechnical information gathered for the site, our interpretation of the available data, and our experience with similar soils and similar projects in Cherokee County. Geotechnical recommendations cannot be considered complete until the geotechnical engineer has the opportunity to confirm the subsurface conditions by performing actual field observations during construction. It is critical that our engineering staff provide inspection during site preparation/compaction and foundation installation. We recommend that Willmer be retained to provide geotechnical engineering oversight during construction to confirm that the recommendations provided herein are properly interpreted and implemented. We look forward to providing these services as well as special inspection, monitoring, and material testing during construction of the project.

TABLES

Table 1

Summary of Subsurface Conditions
Little River WRF Expansion
Cherokee County, Georgia
Willmer Project No. 71.3838

Boring Number	Ground Surface Elev. (ft)	Ground Water Depth and Elevation (ft)		Depths and Elevations to Top of Layer (ft)										Layer Thickness (ft)			
				Fill		Alluvium		Residuum		PWR[1]		Auger Refusal		Fill	Alluvium	Residuum	PWR[1]
		Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation	Depth	Elevation				
B-1	883	7.5	875.5	0	883	7	876	22	861	52	831	56	827	7	15	30	4
B-2	882.5	7.5	875	0	882.5	7	875.5	24	858.5	32	850.5	37	845.5	7	17	8	5
B-3	882	7.5	874.5	0	882	6	876	22	860	24.5	857.5	--	--	6	16	2.5	>0.5
B-4	882	7	875	0	882	7	875	21	861	34	848	35	847	7	14	13	1

Notes:

1) PWR - Partially Weathered Rock

Table 2

Summary of Auger Borings for Access Road
Little River WRF Expansion
Cherokee County, Georgia
Willmer Project No. 71.3838

Boring No.	Depth	Soil Description	Water Table Depth (feet)
B-5	0 – 3”	Topsoil	6.5
	3” – 4’	Brown fat CLAY	
	4’ – 7’	Gray fat CLAY	
		Boring terminated at 7 feet below the existing ground surface.	
B-6	0 – 3”	Topsoil	6.5
	3” – 5.5’	Brown fat CLAY	
	5.5’ – 7’	Gray fat CLAY	
		Boring terminated at 7 feet below the existing ground surface.	
B-7	0 – 3”	Topsoil	---
	3” – 5’	Brown fat CLAY	
	5’– 7’	Gray fat CLAY	
		Boring terminated at 7 feet below the existing ground surface.	

Table 3

Summary of Auger Borings at Existing Tank Foundations
Little River WRF Expansion
Cherokee County, Georgia
Willmer Project No. 71.3838

Boring No.	Location	Depth	Soil Description	Measured Depth Below Ground Surface to Inside Tank Bottom (feet)	Tank Foundation Material*
A-1	Area 1	0 – 3”	Topsoil	6.0	GAB
		3” – 1.5’	Brown silty medium to fine SAND with gravel		
		1.5’– 7’	Reddish brown clayey medium to fine SAND		
		7’ – 7.5’	GAB		
			Hand auger refusal at 7.5 feet below the existing ground surface.		
A-2	Area 2	0 – 3”	Topsoil	4.5	Soil (fat clay)
		3” – 4’	Reddish brown clayey medium to fine SAND (micaceous)		
		4’ – 8’	Gray fat CLAY		
			Boring terminated at 8 feet below the existing ground surface.		
A-3	Area 3	0 – 3”	Topsoil	6.5	GAB
		3” – 6.5’	Reddish brown clayey medium to fine SAND (micaceous)		
		6.5’ – 7’	GAB		
			Hand auger refusal at 7 feet below the existing ground surface.		

Abbreviations: GAB – Graded Aggregate Base

* Note: The tank foundation material types were surmised based on the materials encountered in the auger borings at the level of tank bottoms estimated by measuring the bottom depth inside the tanks.

Table 4

Summary of Standard Proctor, CBR, and Grain Size Test Results
Little River WRF Expansion
Cherokee County, Georgia
Willmer Project No. 71.3838

Sample Number	Sample Depth (feet)	Soil Description	Natural Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Fines Content (%)	Standard Proctor Compaction Test		CBR (%)
							Maximum Dry Density (pcf)	Optimum Moisture Content (%)	
B-5/B-6	0 – 3	Brown fat CLAY	37.7	58	28	89.8	86.7	28.0	4.6
B-2	20	Gray coarse to fine SAND (micaceous)	25.1	--	--	3.1	--	--	--
B-3	15	Gray coarse to fine SAND (slightly micaceous)	22.0	--	--	4.0	--	--	--
B-3	20	Gray coarse to fine SAND (slightly micaceous)	20.6	--	--	5.9	--	--	--
B-4	15	Gray coarse to fine SAND (micaceous)	21.9	--	--	3.1	--	--	--

Abbreviation: CBR - California Bearing Ratio

Table 5

Summary of Consolidation Test Results
Little River WRF Expansion
Cherokee County, Georgia
Willmer Project No. 71.3838

Sample Number	Sample Depth (feet)	Soil Description	Natural Moisture Content (%)	Liquid Limit (%)	Plasticity Index (%)	Fines Content (%)	Void Ratio	σ_p' (psf)	C_c	C_r	C_v (ft^2/day)
B-3	7.5	Brown sandy lean CLAY (micaceous)	35.8	42	18	69.8	1.0	*	0.11	0.02	0.4

Abbreviations: σ_p' - Preconsolidation Pressure
C_c - Compression Index
C_r - Recompression Index
C_v - Coefficient of Consolidation

*Note: Preconsolidation pressure could not be discerned from this consolidation test.

Table 6

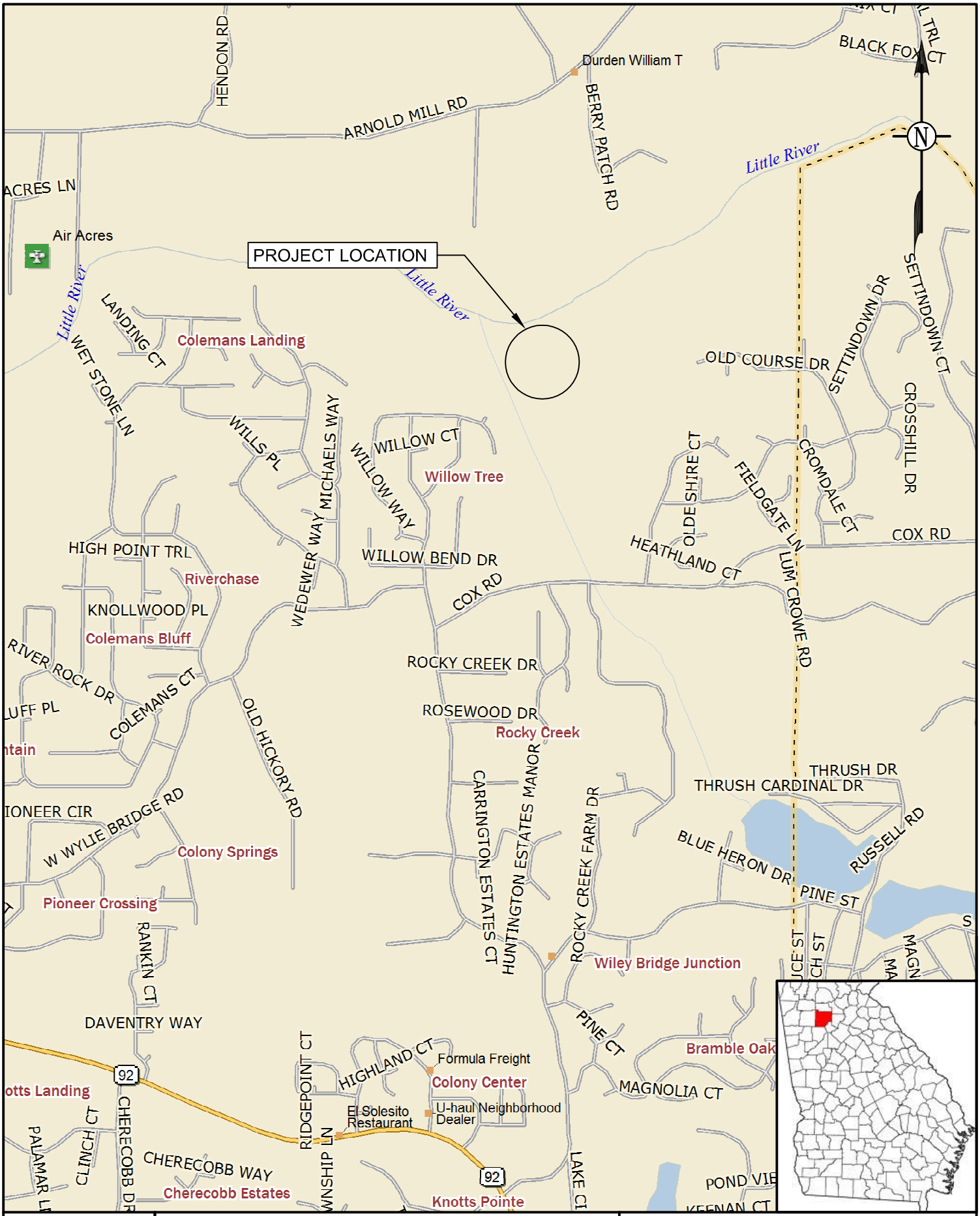
Estimated Tip Elevations and Lengths of Auger-cast Piles
Little River WRF Expansion
Cherokee County, Georgia
Willmer Project No. 71.3838

Boring No.	Existing Ground Surface Elevation (ft)	Estimated Top of Pile Elevation (ft)[2]	Auger Cast Pile Tip Elevation and Length (ft)	
			Tip Elevation	Length
B-1[1]	883	881	827	54
B-2	882.5	881	845	36
B-3	882	881	< 857[3]	> 24[3]
B-4	882	881	847	34

Notes:

1) Boring B-1 is located outside the footprint area of the administration building. The pile tip elevation and length at this location are presented only to show the possible variability.
2) The top of pile elevation was assumed to be 3 feet below the proposed final grade of 884 feet.
3) Boring B-3 was not extended to auger refusal; therefore, the pile tip elevation/length could not be estimated at this location.

FIGURES



SCALE: 1" = 1000'	
DATE: 9/5/2012	
DRAWN BY: KAS	
REVIEWED BY: BD	

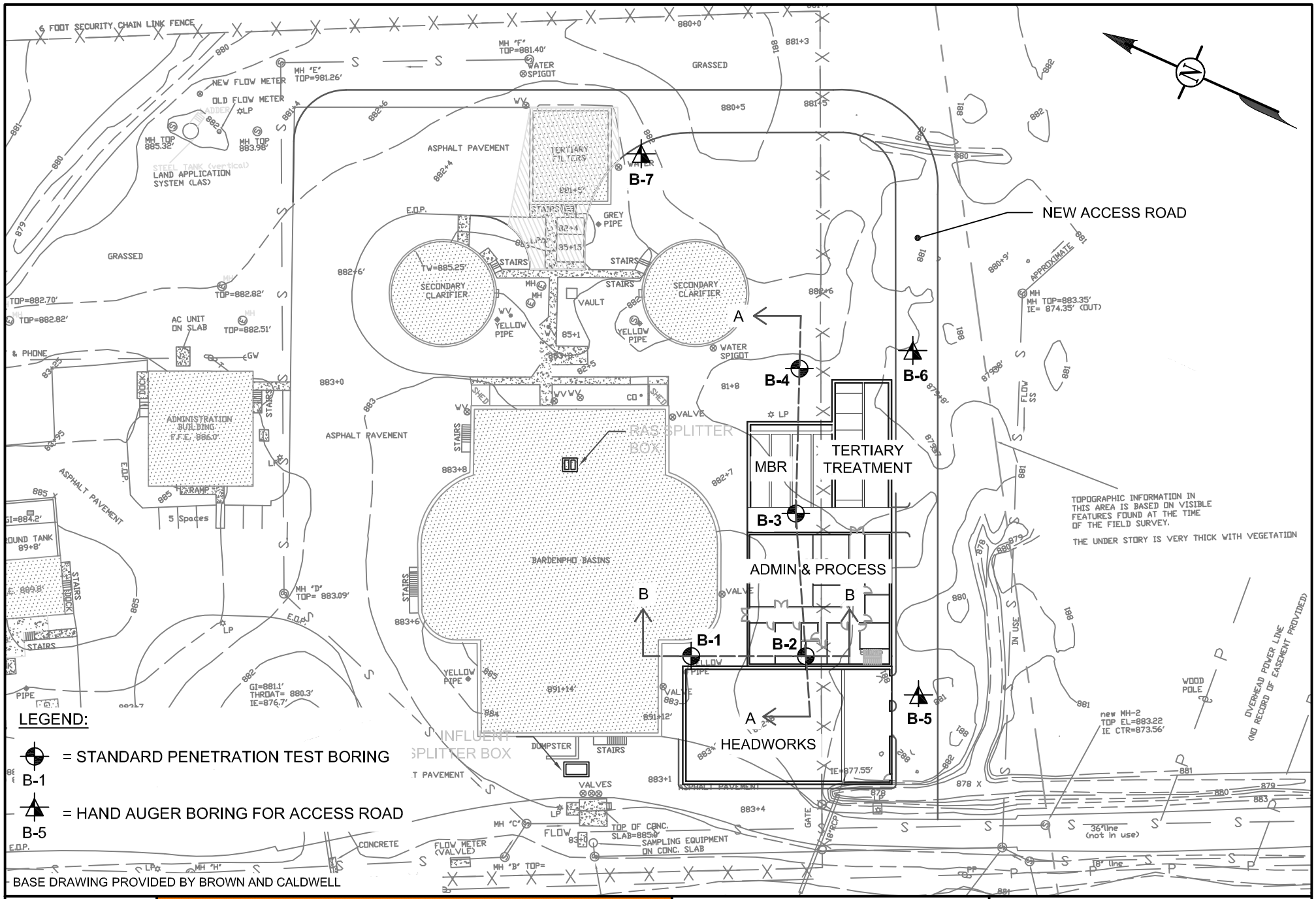
WILLMER ENGINEERING INC. WE

GEOTECHNICAL ENGINEERING
CONSTRUCTION SERVICES
ENVIRONMENTAL SERVICES AND ENGINEERING
3772 PLEASANTDALE ROAD - SUITE 165
ATLANTA, GA 30340-4270

FIGURE 1

PROJECT LOCATION MAP
LITTLE RIVER WRF EXPANSION
CHEROKEE COUNTY, GEORGIA
WILLMER PROJECT No. 71.3838

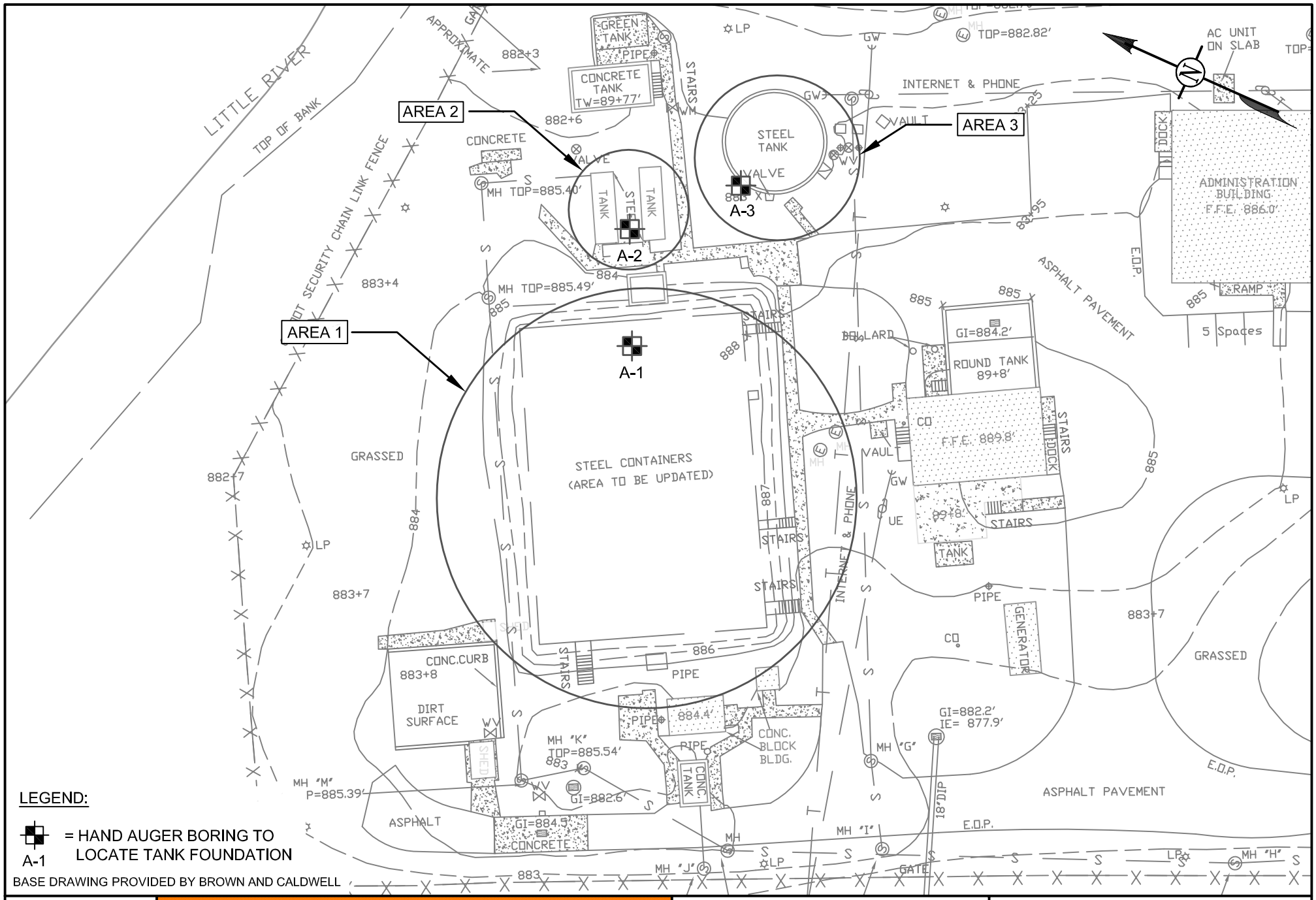
P:\3838 Little River Water Reclamation Facility Expansion\CADD\Figure 1 Project Location Map.dwg



BASE DRAWING PROVIDED BY BROWN AND CALDWELL

SCALE: 1" = 60'	WILLMER ENGINEERING INC. WE	GEOTECHNICAL ENGINEERING ¤ CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270	FIGURE 2
DATE: 9/7/2012			BORING LOCATION PLAN - SHEET 1 OF 2 LITTLE RIVER WRF EXPANSION CHEROKEE COUNTY, GEORGIA WILLMER PROJECT No. 71.3838
DRAWN BY: KAS			
REVIEWED BY: BD			

P:\3838 Little River Water Reclamation Facility Expansion\CADD\Boring Location Plan.dwg



LEGEND:

A-1 = HAND AUGER BORING TO LOCATE TANK FOUNDATION

BASE DRAWING PROVIDED BY BROWN AND CALDWELL

SCALE: 1" = 40'	WILLMER ENGINEERING INC. WE	GEOTECHNICAL ENGINEERING ¤ CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270	FIGURE 2
DATE: 9/7/2012			BORING LOCATION PLAN - SHEET 2 OF 2 LITTLE RIVER WRF EXPANSION CHEROKEE COUNTY, GEORGIA WILLMER PROJECT No. 71.3838
DRAWN BY: KAS			
REVIEWED BY: BD			

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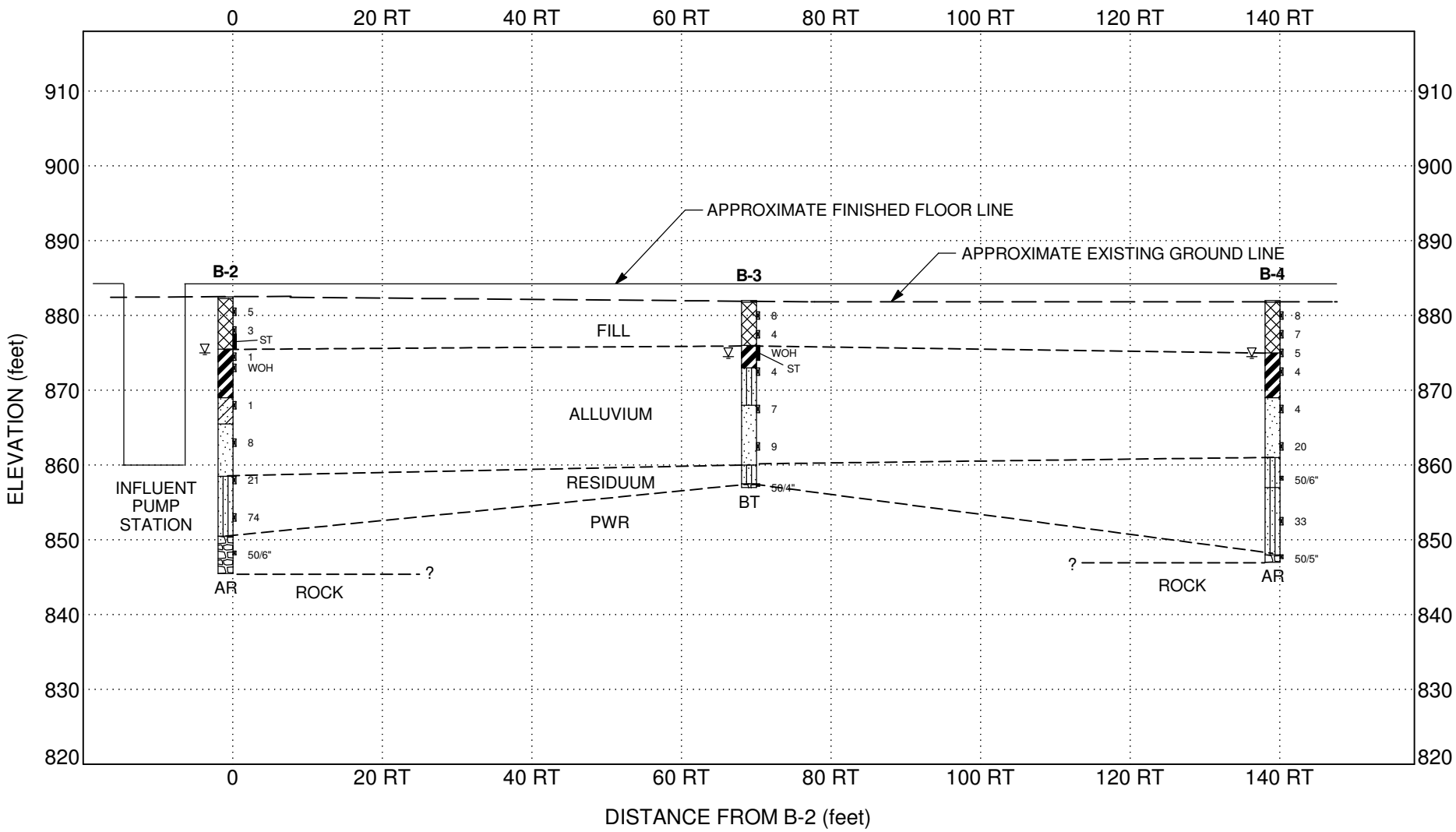
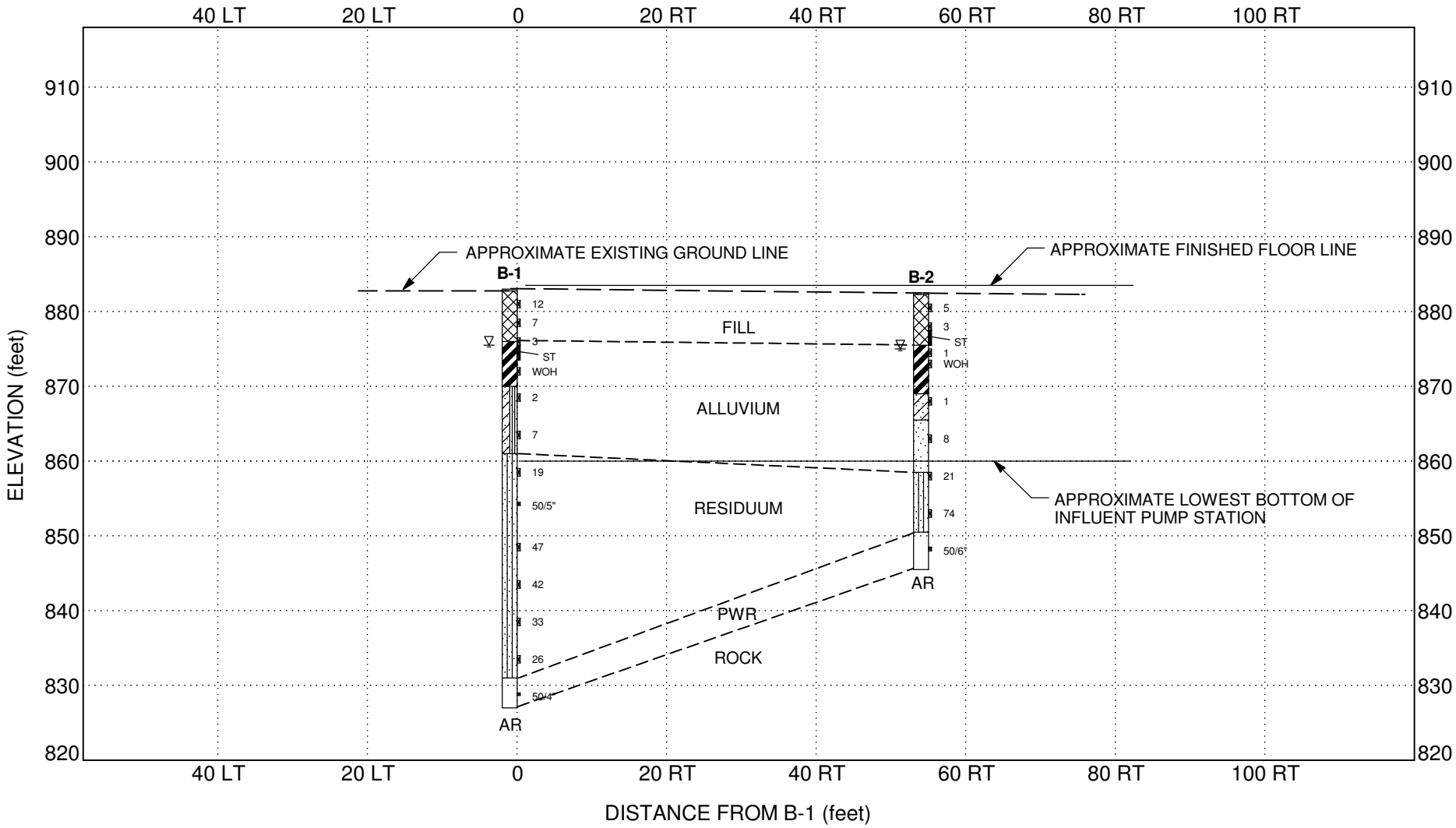


LEGEND:

- ∇ - Groundwater Table @ Time of Boring
- ST - Shelby Tube
- BT - Boring Terminated
- AR - Auger Refusal

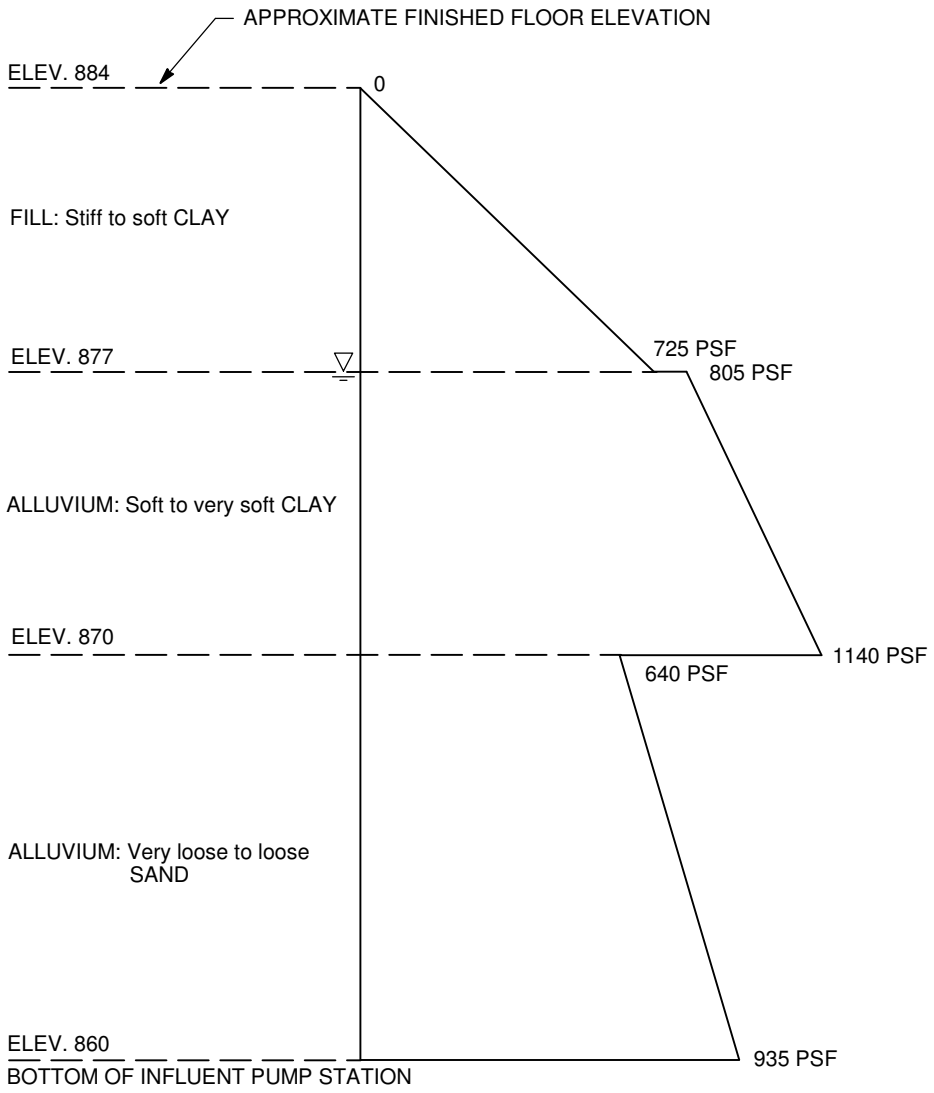
SCALE: 1" = 20'	WILLMER ENGINEERING INC. WE	GEOTECHNICAL ENGINEERING | CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270	FIGURE 3A
DATE: 08/24/2012			SUBSURFACE PROFILE A-A LITTLE RIVER WRF EXPANSION CHEROKEE COUNTY, GEORGIA WILLMER PROJECT No. 71.3838
DRAWN BY: BD			
REVIEWED BY: SKB			



LEGEND:

- ∇ - Groundwater Table @ Time of Boring
- ST - Shelby Tube
- BT - Boring Terminated
- AR - Auger Refusal

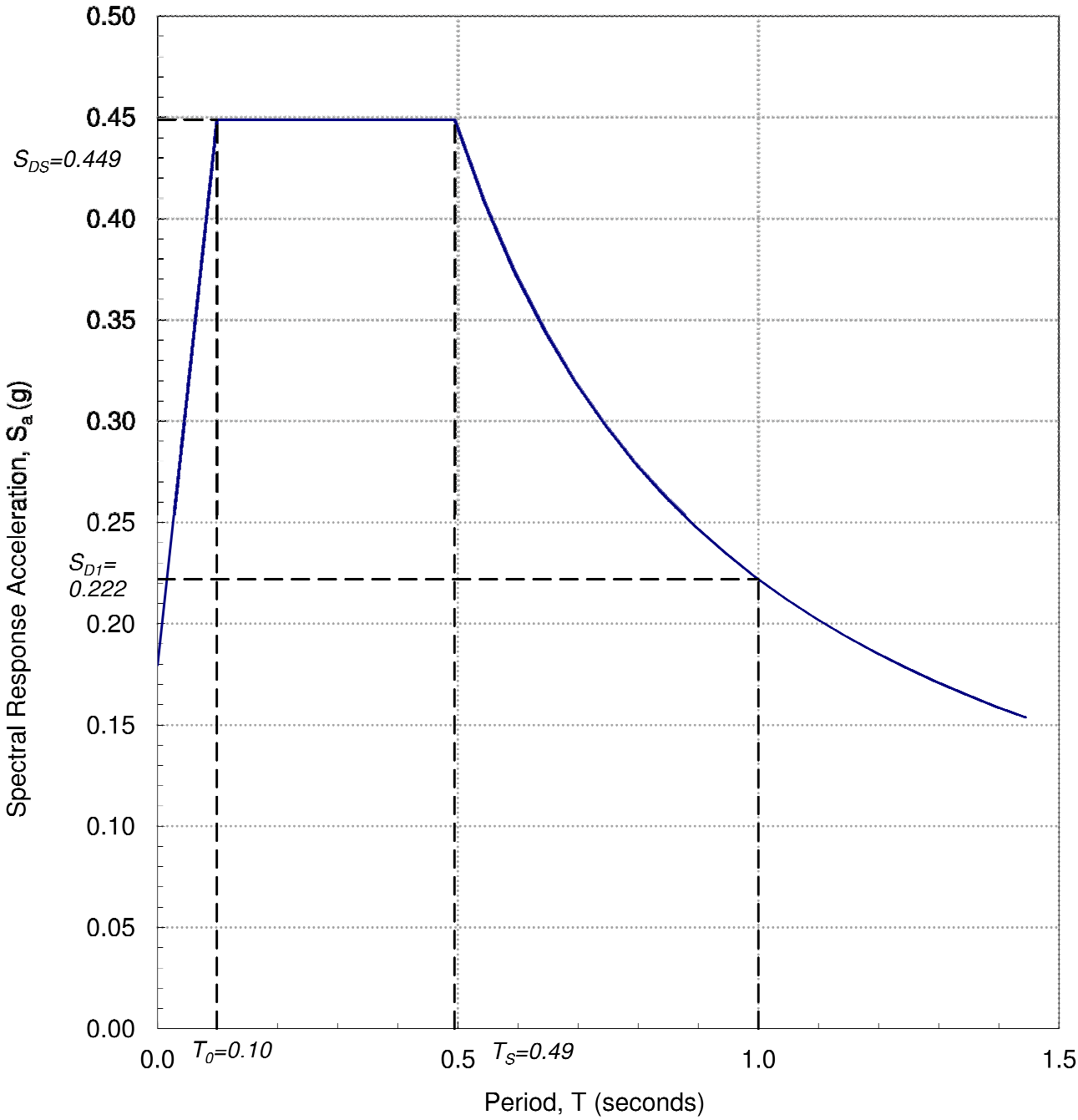
SCALE: 1" = 20'	WILLMER ENGINEERING INC. WE	GEOTECHNICAL ENGINEERING | CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270	FIGURE 3B
DATE: 08/24/2012			SUBSURFACE PROFILE B-B LITTLE RIVER WRF EXPANSION CHEROKEE COUNTY, GEORGIA WILLMER PROJECT No. 71.3838
DRAWN BY: BD			
REVIEWED BY: SKB			



Effective Static Lateral Earth Pressure Diagram for Design of Influent Pump Station

NOTE: THE TOTAL DESIGN EARTH PRESSURE SHOULD BE OBTAINED BY ADDING HYDROSTATIC PRESSURE AND SEISMIC EARTH PRESSURE TO THE STATIC EARTH PRESSURE CALCULATED FROM THIS DIAGRAM.

SCALE: NTS		FIGURE 4
DATE: 10/2/2012	WILLMER ENGINEERING INC. WE	EFFECTIVE LATERAL EARTH PRESSURE DIAGRAM
DRAWN BY: BD	GEOTECHNICAL ENGINEERING CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270	LITTLE RIVER WRF EXPANSION CHEROKEE COUNTY, GEORGIA
REVIEWED BY: SKB		WILLMER PROJECT No. 71.3838



SCALE: N/A	GEOTECHNICAL ENGINEERING CONSTRUCTION SERVICES ENVIRONMENTAL SERVICES AND ENGINEERING 3772 PLEASANTDALE ROAD - SUITE 165 ATLANTA, GA 30340-4270	FIGURE 5
DATE: 10/2/2012		DESIGN RESPONSE SPECTRUM LITTLE RIVER WRF EXPANSION CHEROKEE COUNTY, GEORGIA WILLMER PROJECT No. 71.3838
DRAWN BY: KAS		
REVIEWED BY: BD		

P:\3838 Little River Water Reclamation Facility Expansion\CADD\Spectral Response Accelerations.dwg

APPENDIX I

WILLMER ENGINEERING INC. | WE

BORING RECORD LEGEND

SM, CL, etc: - GROUP SYMBOL based on Unified Soil Classification System.
(Refer to ASTM D-2488 and Table 1 of D-2487)

N-VALUE: BLOWS PER FOOT- Standard Penetration Resistance (SPT) blow count , the sum of the second and third 6-inch increments of the SPT test.
(Refer to ASTM D-1586)

CONSISTENCY / RELATIVE DENSITY Correlated with SPT Blow Count, N:

SILTS AND CLAYS

N (blows per foot)	Consistency
0 - 2	Very Soft
3 - 4	Soft
5 - 8	Firm
9 - 15	Stiff
16 - 30	Very Stiff
31 - 50	Hard
> 50	Very Hard

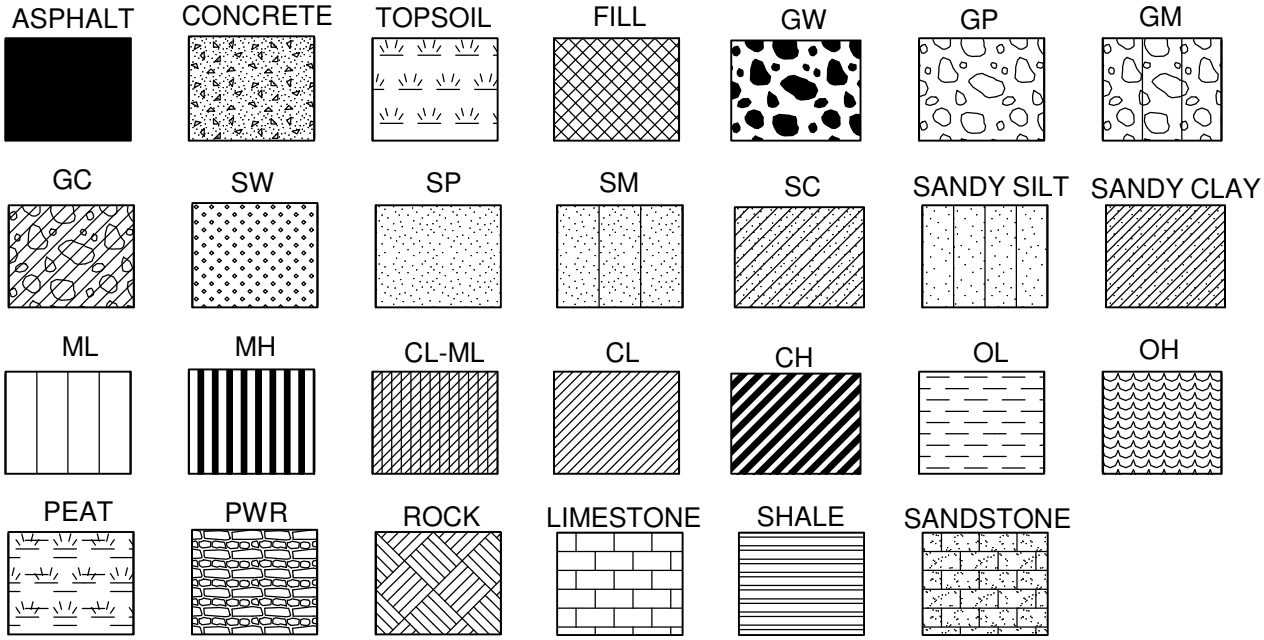
SANDS

N (blows per foot)	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
> 50	Very Dense

NOTES:

Groundwater Measurements:

- Water level at 24 hours
- Water level at time of boring
- Caved level at 24 hours



WILLMER ENGINEERING INC.

Willmer Engineering Inc.
3772 Pleasantdale Road, Suite 165
Atlanta, Georgia 30340

UNIFIED SOIL CLASSIFICATION SYSTEM REFERENCE SHEET

MAJOR DIVISIONS			LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN #200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED #4 SIEVE	CLEAN GRAVELS LITTLE OR NO FINES	**(GW)**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			(GP)	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES APPRECIABLE AMOUNT OF FINES	**(GM)**	SILTY GRAVELS and GRAVEL-SAND-SILT MIXTURES
			(GC)	CLAYEY GRAVELS and GRAVEL-SAND-CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING #4 SIEVE	CLEAN SAND LITTLE OR NO FINES	**(SW)**	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			(SP)	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES APPRECIABLE AMOUNT OF FINES	**(SM)**	SILTY SANDS and SAND-SILT MIXTURES
			(SC)	CLAYEY SANDS and SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN #200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		**(ML)**	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR VERY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			(CL)	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			(OL)	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		**(MH)**	INORGANIC ELASTIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS
			(CH)	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			(OH)	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			**(PT)**	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

WILLMER ENGINEERING INC. WE

Project: **Little River WRF Expansion**	**HOLE No. B-1**
Location: **Cherokee County, Georgia**	Sheet 1 of 2
Project Number: **71.3838**	Location: **See Figure 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **883.00** Station: **N/A**

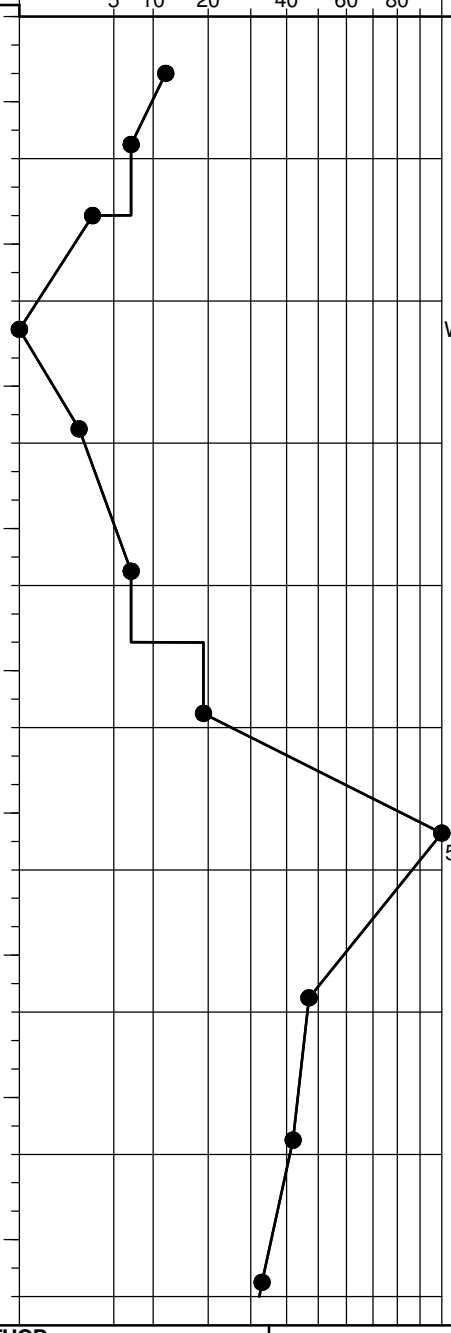
Drilling Equipment: **CME 550X** Drilling Method: **HSA Automatic Hammer**

Core Boxes: **N/A** Samples: **14** Overburden (ft): **N/A** Rock (ft): **N/A** Total Depth (ft): **56.0**

Logged By: **BD** Date Drilled: **7/30/12**

VERTICAL DEPTH (ft)	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	N-VALUE
				TOPSOIL = 3 inches	FILL	883.0	
	SS			FILL: Stiff to soft grayish brown medium to fine sandy **CLAY** with root and rock fragments		880	12
5	SS						7
	SS			ALLUVIUM: Soft to very soft gray fat **CLAY** (with rock fragments from 7 to 10 feet)	CH	875	3
	ST						
10	SS						WOH
				Very loose to loose gray clayey/silty coarse to fine **SAND** (slightly micaceous)	SC SM	870	
15	SS						2
						865	
20	SS						7
				RESIDUUM: Medium dense and dense black, gray, and tan silty medium to fine **SAND**	SM	860	
25	SS						19
	SS			- PWR lense		855	50/5"
30							
						850	
35	SS						47
				- becomes dark gray and white		845	
40	SS						42
						840	
45	SS						33

STANDARD PENETRATION TEST DATA (blows/foot)



Continued Next Page

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-1**

WILLMER ENGINEERING INC. WE

Project: **Little River WRF Expansion**
Location: **Cherokee County, Georgia**
Project Number: **71.3838**

HOLE No. B-1

Sheet 2 of 2

Location: **See Figure 2**

VERTICAL DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION (Continued)	ELEVATION (feet)	STANDARD PENETRATION TEST DATA (blows/foot) 5 10 20 40 60 80	N-VALUE
50		SS			Medium dense black, gray, and tan silty medium to fine **SAND**	835		26
55		SS			PARTIALLY WEATHERED ROCK: Sampled as very dense dark gray and white silty medium to fine **SAND** **PWR**	830		50/4"
					Auger refusal was encountered at 56 feet below the existing ground surface.			
					Groundwater was encountered at 7.5 feet below the existing ground surface at the time of boring completion.			

SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-1**

WILLMER ENGINEERING INC. WE

Project: **Little River WRF Expansion**	**HOLE No. B-2**
Location: **Cherokee County, Georgia**	Sheet 1 of 1
Project Number: **71.3838**	Location: **See Figure 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **882.50** Station: **N/A**

Drilling Equipment: **CME 550X** Drilling Method: **HSA Automatic Hammer**

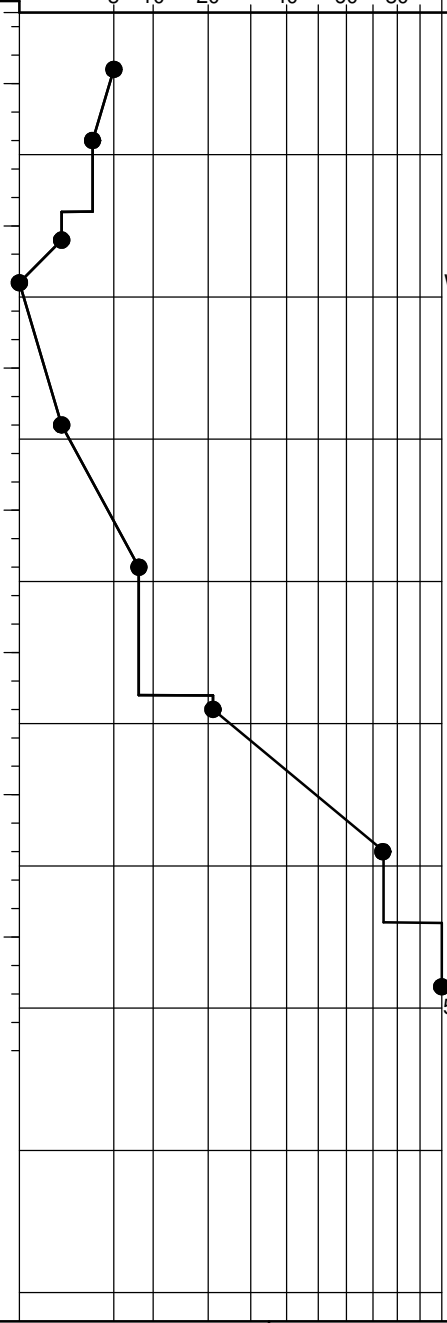
Core Boxes: **N/A** Samples: **10** Overburden (ft): **N/A** Rock (ft): **N/A** Total Depth (ft): **37.0**

Logged By: **BD** Date Drilled: **7/26/12**

VERTICAL DEPTH (ft)	SAMPLE TYPE	MATERIAL DESCRIPTION		ELEVATION (feet)	N-VALUE
		TOPSOIL = 3 inches	FILL	882.5	
	SS	FILL: Firm to soft brown fine sandy **CLAY** with root fragments		880	5
5	SS				3
	ST				
	SS	ALLUVIUM: Very soft gray (mottled red) fat **CLAY** with root fragments	CH	875	1
10	SS				WOH
				870	
15	SS	Very loose gray clayey medium to fine **SAND** with root fragments	SC		1
		Loose gray coarse to fine **SAND** (micaceous)	SP	865	
20	SS				8
				860	
25	SS	RESIDUUM: Medium dense to very dense black, gray, and tan silty medium to fine **SAND**	SM		21
				855	
30	SS				74
		PARTIALLY WEATHERED ROCK: Sampled as very dense black, gray, and tan silty medium to fine **SAND**	PWR	850	
35	SS				50/6"

Auger refusal was encountered at 37 feet below the existing ground surface.

Groundwater was encountered at 7.5 feet below the existing ground surface at the time of boring completion.



SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-2**

SPTN LITTLE RIVER WRF EXPANSION.GPJ 8/22/12

WILLMER ENGINEERING INC. WE

Project: **Little River WRF Expansion**	**HOLE No. B-3**
Location: **Cherokee County, Georgia**	Sheet 1 of 1
Project Number: **71.3838**	Location: **See Figure 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **882.00** Station: **N/A**

Drilling Equipment: **CME 550X** Drilling Method: **HSA Automatic Hammer**

Core Boxes: **N/A** Samples: **8** Overburden (ft): **N/A** Rock (ft): **N/A** Total Depth (ft): **25.0**

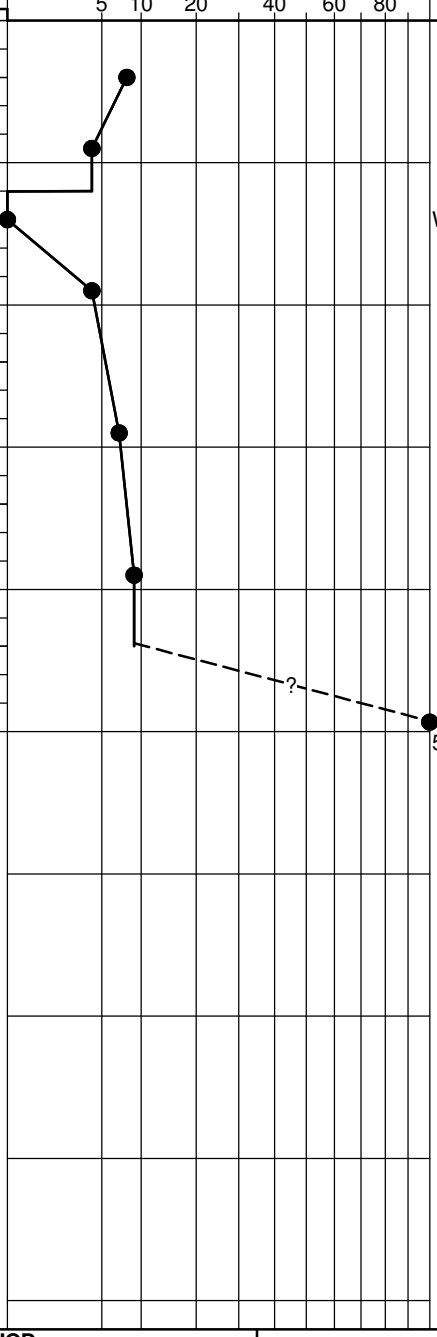
Logged By: **BD** Date Drilled: **7/26/12**

VERTICAL DEPTH (ft)	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	N-VALUE
				TOPSOIL = 3 inches	FILL	882.0	
	SS			FILL: Firm to soft grayish brown **CLAY** with root fragments		880	8
5	SS						4
	ST, SS			ALLUVIUM: Very soft gray (mottled red) lean **CLAY**	CL	875	WOH
10	SS			Very loose grayish brown silty medium to fine **SAND** (slightly micaceous)	SM	870	4
15	SS			Loose gray coarse to fine **SAND** with trace gravel (slightly micaceous)	SP	865	7
20	SS						9
				RESIDUUM: Dense black, gray, and tan silty medium to fine **SAND**	SM	860	
25	SS			PARTIALLY WEATHERED ROCK: Sampled as very dense black, gray, and tan silty medium to fine **SAND**	PWR		50/4"

Boring was terminated at 25 feet below the existing ground surface.

Groundwater was encountered at 7.5 feet below the existing ground surface at the time of boring completion.

STANDARD PENETRATION TEST DATA (blows/foot)



SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-3**

SPTN LITTLE RIVER WRF EXPANSION.GPJ 8/22/12

WILLMER ENGINEERING INC. | WE

Project: **Little River WRF Expansion**	**HOLE No. B-4**
Location: **Cherokee County, Georgia**	Sheet 1 of 1
Project Number: **71.3838**	Location: **See Figure 2**

Azimuth: **--** Angle from Horizontal: **90** Surface Elevation (ft): **882.00** Station: **N/A**

Drilling Equipment: **CME 550X** Drilling Method: **HSA Automatic Hammer**

Core Boxes: **N/A** Samples: **9** Overburden (ft): **N/A** Rock (ft): **N/A** Total Depth (ft): **35.0**

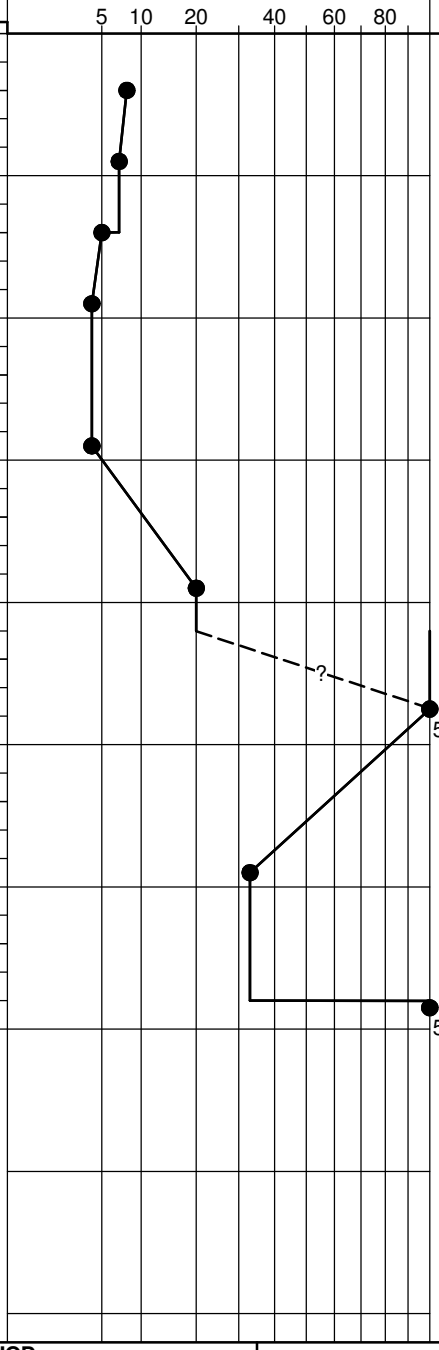
Logged By: **BD** Date Drilled: **7/30/12**

VERTICAL DEPTH (ft)	GRAPHIC LOG	SAMPLE TYPE	REC%	RQD %	MATERIAL DESCRIPTION		ELEVATION (feet)	N-VALUE
					TOPSOIL = 3 inches	FILL	882.0	
		SS			FILL: Firm brown sandy **CLAY** with root fragments		880	8
5		SS						7
		SS			ALLUVIUM: Firm to soft gray and brown fat **CLAY** with fine sand	CH	875	5
10		SS						4
							870	
					Very loose to medium dense gray coarse to fine **SAND** (micaceous)	SP		
15		SS						4
							865	
20		SS			- tan with trace gravel from 19 to 21 feet			20
					RESIDUUM: Very dense brown and red silty medium to fine **SAND**	SM	860	
		SS			-PWR lense			50/6"
25					Medium dense gray, white, and tan silty medium to fine **SAND**	SM	855	
30		SS						33
							850	
35		SS			PARTIALLY WEATHERED ROCK: Sampled as very dense dark gray and tan silty medium to fine **SAND**	PWR		50/5"

Auger refusal was encountered at 35 feet below the existing ground surface.

Groundwater was encountered at 7 feet below the existing ground surface at the time of boring completion.

STANDARD PENETRATION TEST DATA (blows/foot)



SAMPLER TYPE

SS - Split Spoon
ST - Shelby Tube
NQ - Rock Core, 1-7/8"
NX - Rock Core, 2-1/8"
CU - Cuttings
CT - Continuous Tube

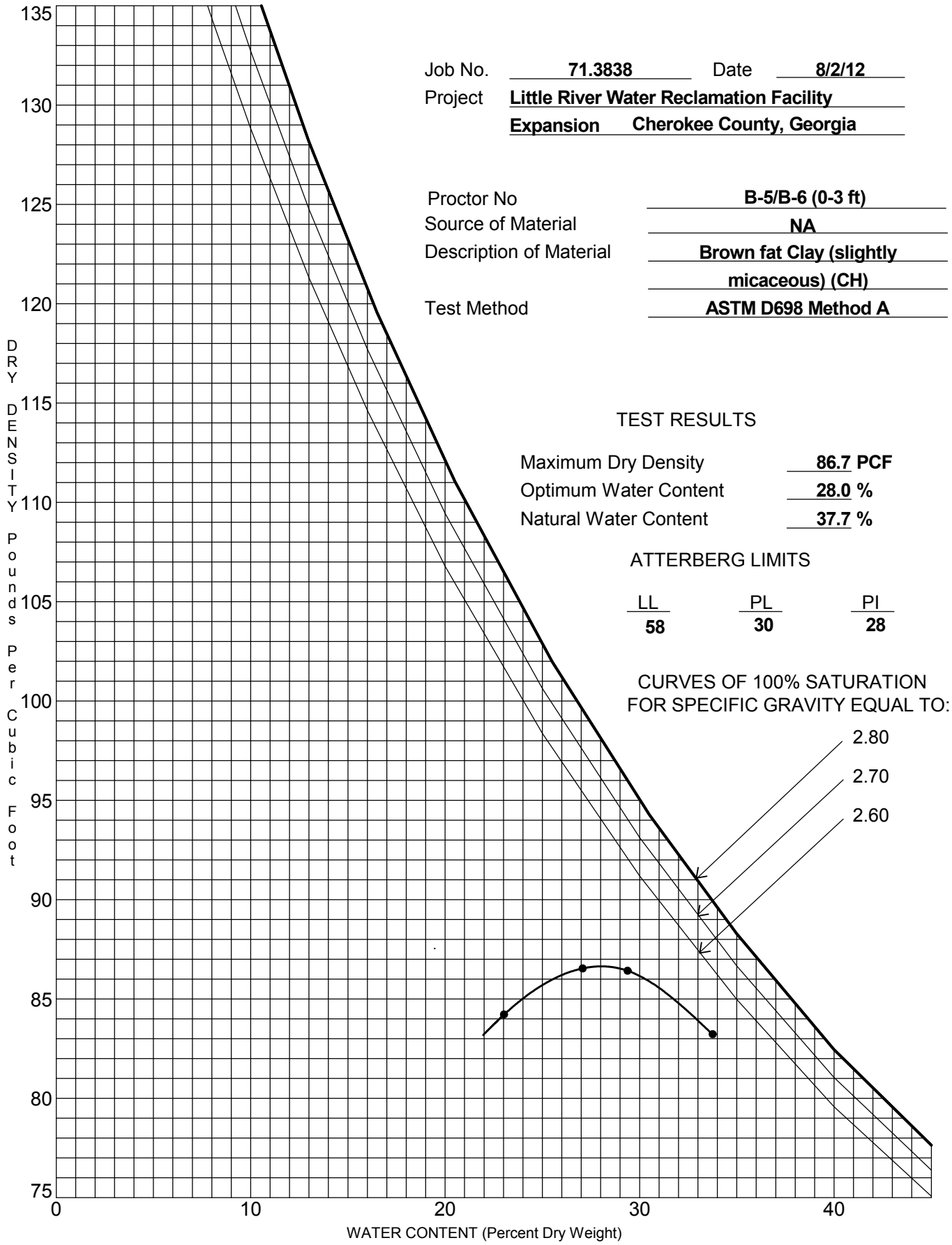
DRILLING METHOD

HSA - Hollow Stem Auger
CFA - Continuous Flight Augers
DC - Driving Casing
RW - Rotary Wash
RC - Rock Core

Hole No. **B-4**

SPTN LITTLE RIVER WRF EXPANSION.GPJ 8/22/12

APPENDIX II



Job No. **71.3838** Date **8/2/12**

Project **Little River Water Reclamation Facility Expansion Cherokee County, Georgia**

Proctor No **B-5/B-6 (0-3 ft)**

Source of Material **NA**

Description of Material **Brown fat Clay (slightly micaceous) (CH)**

Test Method **ASTM D698 Method A**

TEST RESULTS

Maximum Dry Density	**86.7**	**PCF**
Optimum Water Content	**28.0**	**%**
Natural Water Content	**37.7**	**%**

ATTERBERG LIMITS

LL	PL	PI
58	**30**	**28**

CURVES OF 100% SATURATION FOR SPECIFIC GRAVITY EQUAL TO:

WILLMER ENGINEERING INC. WE

MOISTURE-DENSITY RELATIONSHIP

WILLMER ENGINEERING INC. WE

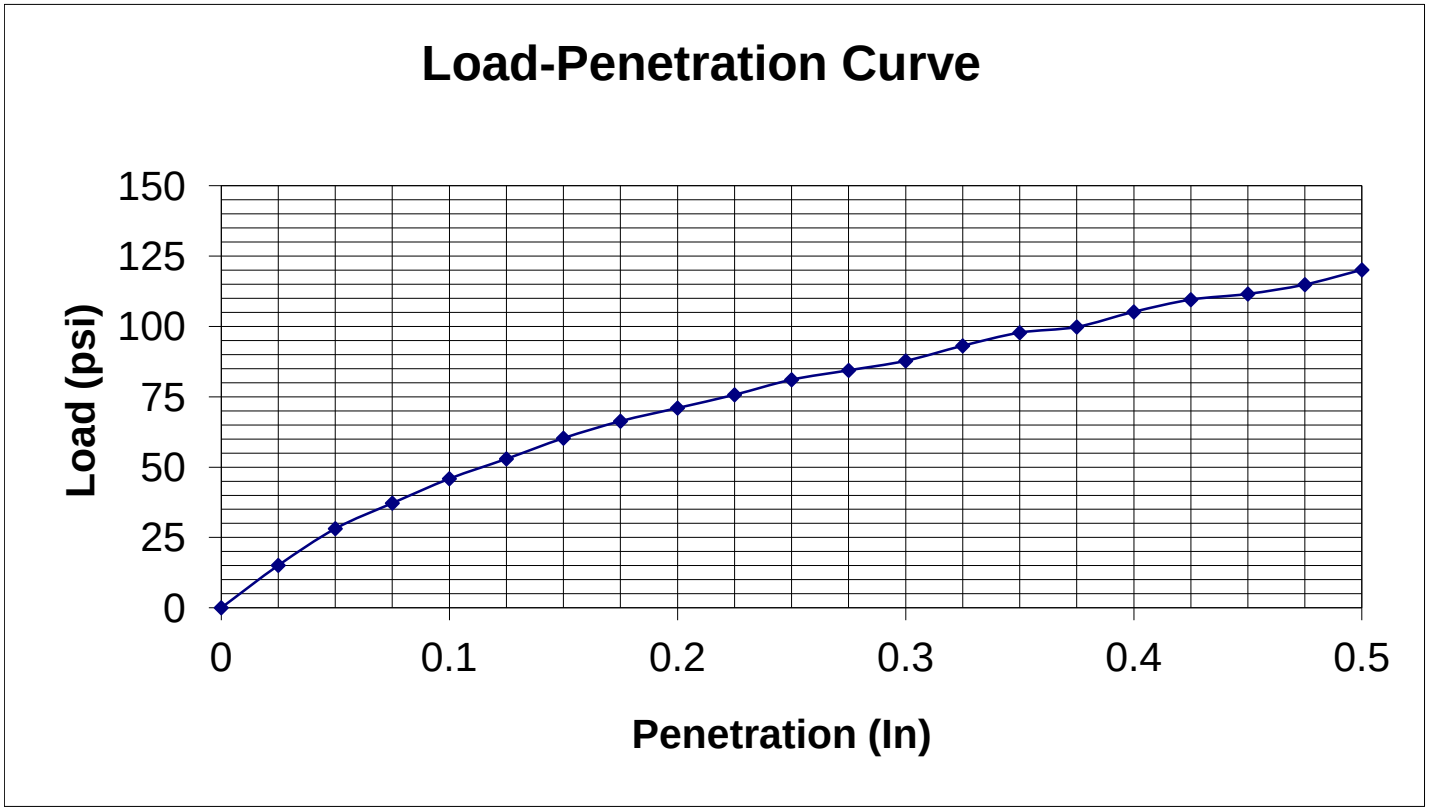
California Bearing Ratio Test Report

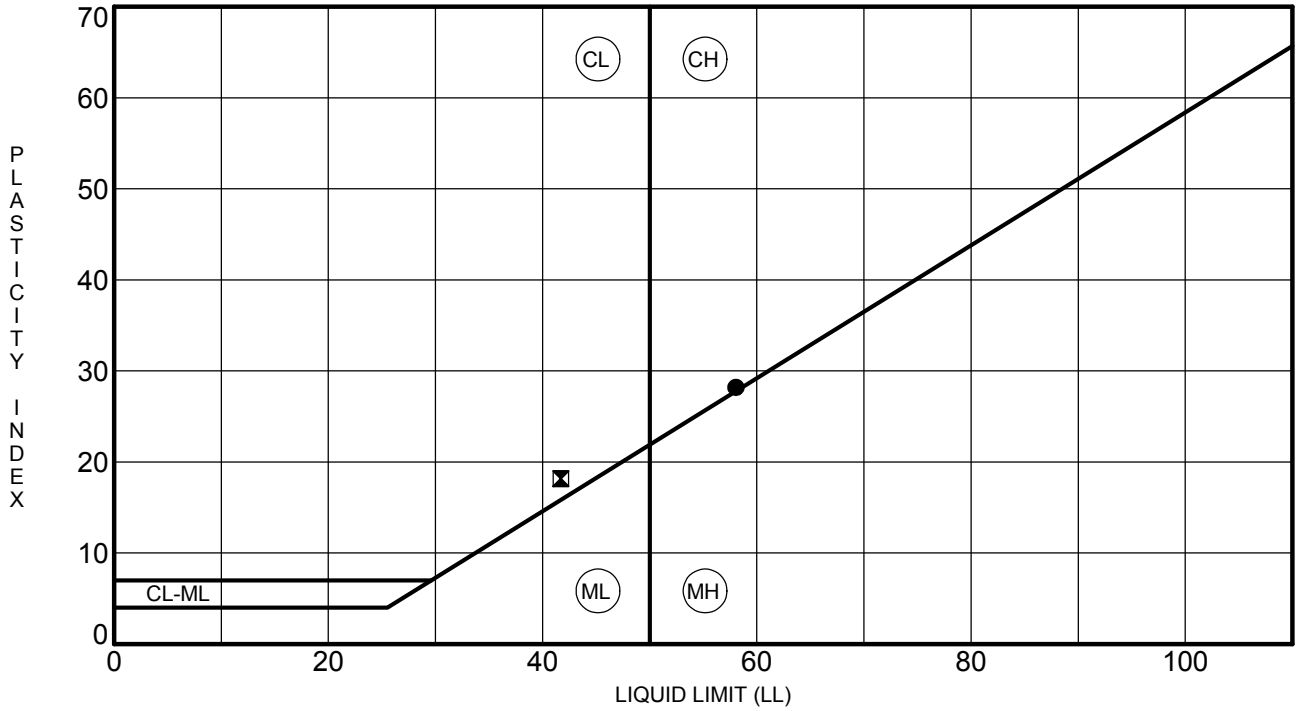
ASTM D1883-99

Project	Little River WRF Expansion	**Project Number**	71.3838	**Date**	8/14/2012
Lab Number	7109	**SAMPLE NO.**	B-5/B-6	**Elevation/Depth**	0'-3'
Proctor Procedure	ASTM D698 Method A	**Maximum Dry Density (pcf)**	86.7	**Optimum Water Content (%)**	28.0
Compacted Wet Density (pcf)	108.7	**Compacted Dry Density (pcf)**	85.0	**Soaked Dry Density (pcf)**	84.8
Soil Description	Brown fat CLAY (slightly micaceous) (CH)	**Compacted Water Content (%)**		**Soaked Water Content (%)**	
		Before Compaction	28.01	**Top 1"**	35.86
		After Compaction	27.74	**Average**	34.80
CBR Condition	Soaked	**Surcharge Weight**	25 Lbs	**Swell (in.)**	0.064
Index Properties	**Percent Fines**	10.2	G_S N/A	**Reviewed**	BD
	LL	58	**PI** 28		

CBR Value	4.6

COMPACTION		
	Required	Achieved
Dry Density	98%	98%
Moisture	opt	opt





	Specimen Identification	LL	PL	PI	Fines	Classification
●	**B-5/B-6 (0-3 ft)**	**58**	**30**	**28**	**89.8**	**Brown fat Clay (slightly micaceous) (CH)**
⧗	**B-3 (7.5 ft)**	**42**	**24**	**18**	**69.8**	**Brown sandy lean CLAY (micaceous) (CL)**

PROJECT **Little River Water Reclamation Facility Expansion**
Cherokee County, Georgia

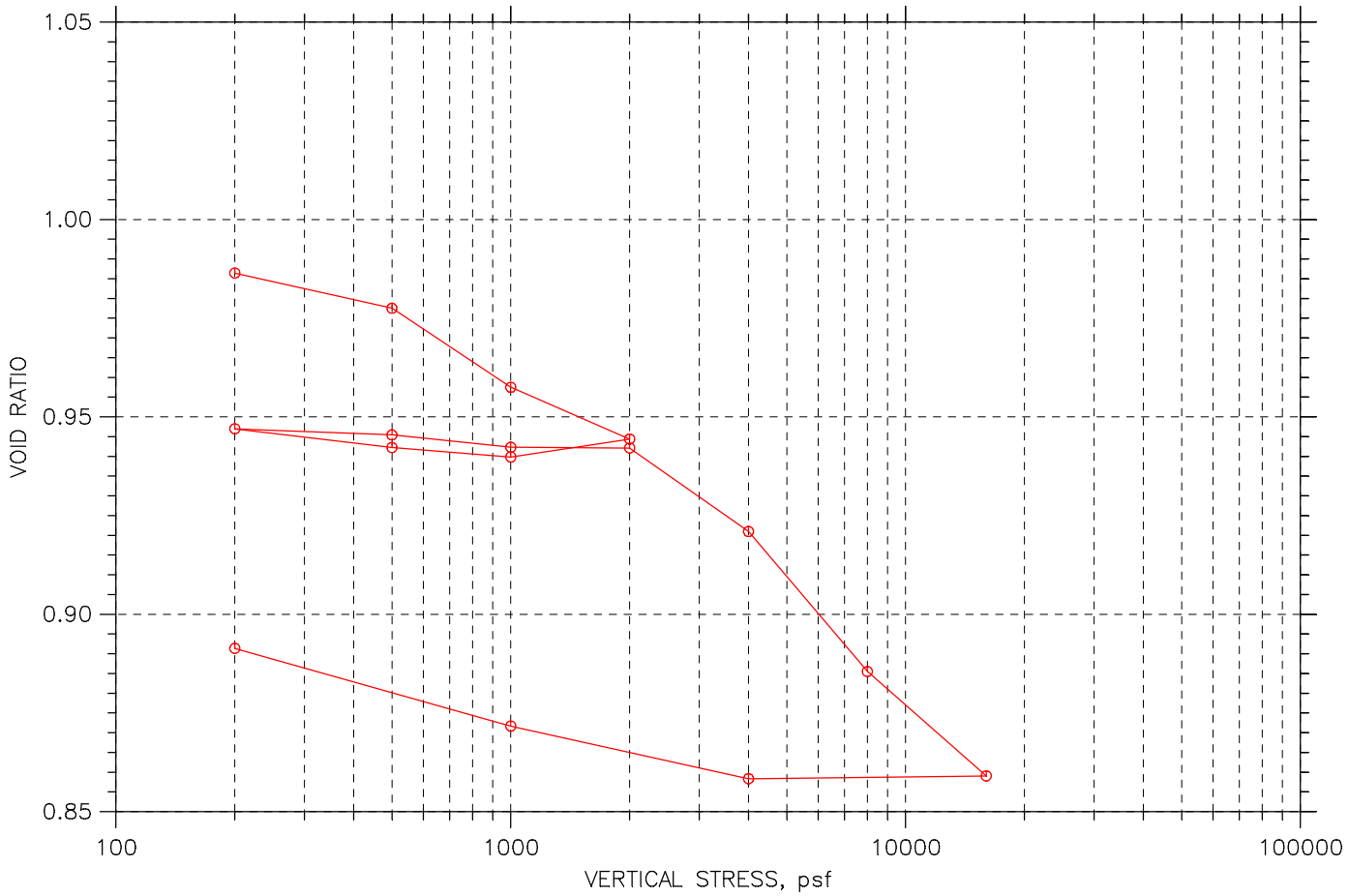
JOB NO. **71.3838**
DATE **9/5/12**

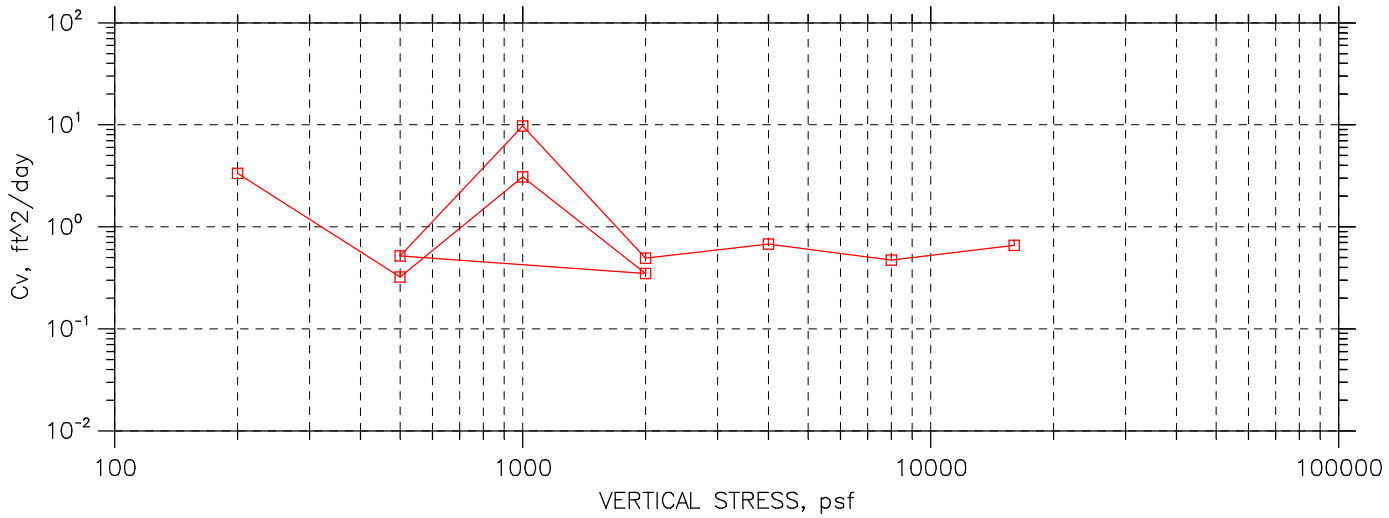
WILLMER ENGINEERING INC. WE

ATTERBERG LIMIT RESULTS

CONSOLIDATION TEST DATA

SUMMARY REPORT





	Project: Little River WRF Exp.	Location: Cherokee Co., Georgia	Project No.: 71.3838
	Boring No.: B-3	Tested By: Kulin	Checked By: BD
	Sample No.: 4	Test Date: 08-03-2012	Depth: 7.5
	Test No.: 7110	Sample Type: UD	Elevation: 874.5
	Description: Brown sandy lean CLAY (micaceous)		
	Remarks: ASTM D2435		

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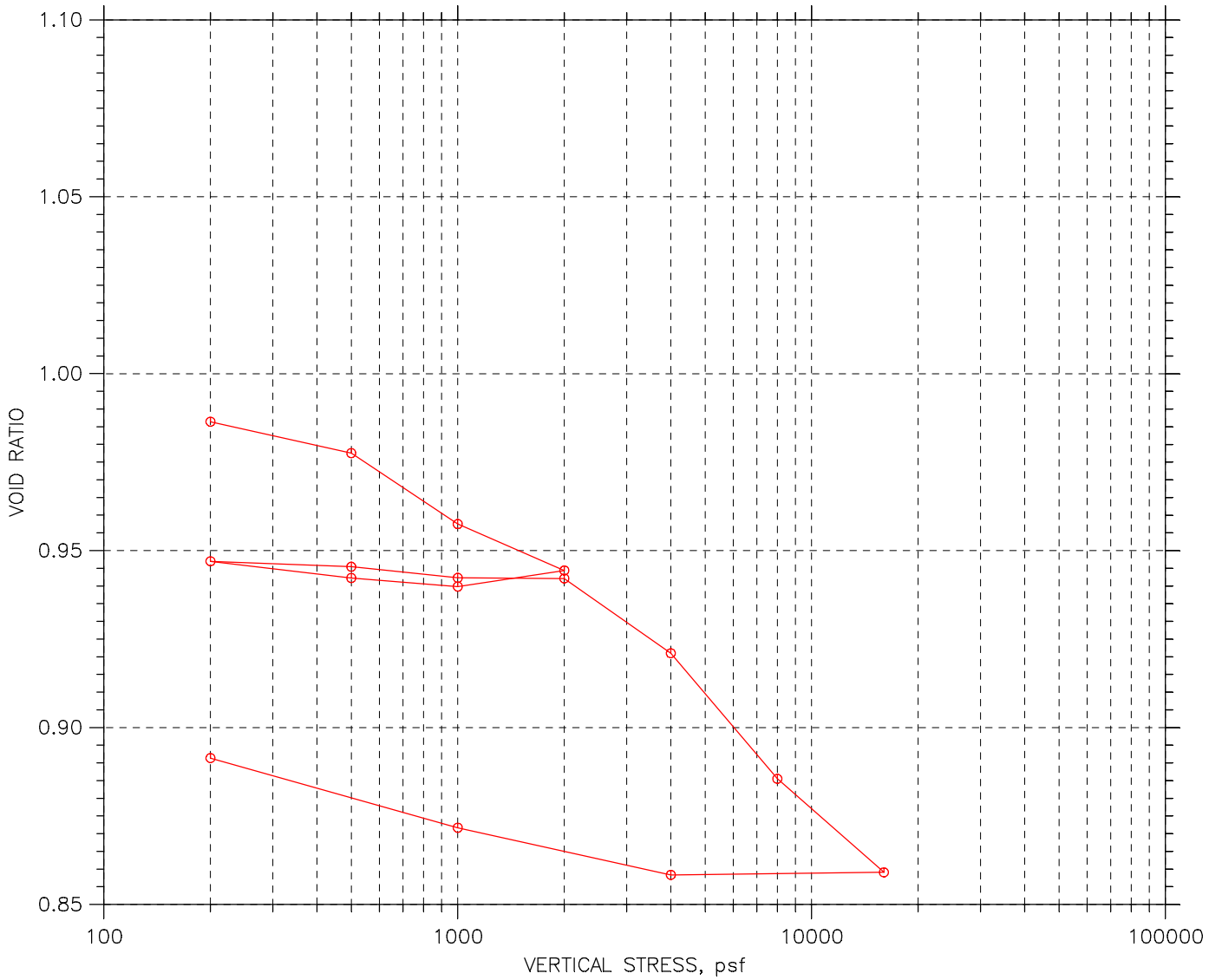
CONSOLIDATION TEST DATA

SUMMARY REPORT



					Before Test	After Test
Overburden Pressure: 825 psf				Water Content, %	35.81	32.40
Preconsolidation Pressure: N/A				Dry Unit Weight, pcf	83.89	88.79
Compression Index: 0.11				Saturation, %	96.15	97.78
Diameter: 2.5 in		Height: 1 in		Void Ratio	1.00	0.89
LL: 42	PL: 24	PI: 18	GS: 2.69			

	Project: Little River WRF Exp.	Location: Cherokee Co., Georgia	Project No.: 71.3838
	Boring No.: B-3	Tested By: Kulin	Checked By: BD
	Sample No.: 4	Test Date: 08-03-2012	Depth: 7.5
	Test No.: 7110	Sample Type: UD	Elevation: 874.5
	Description: Brown sandy lean CLAY (micaceous)		
	Remarks: ASTM D2435		

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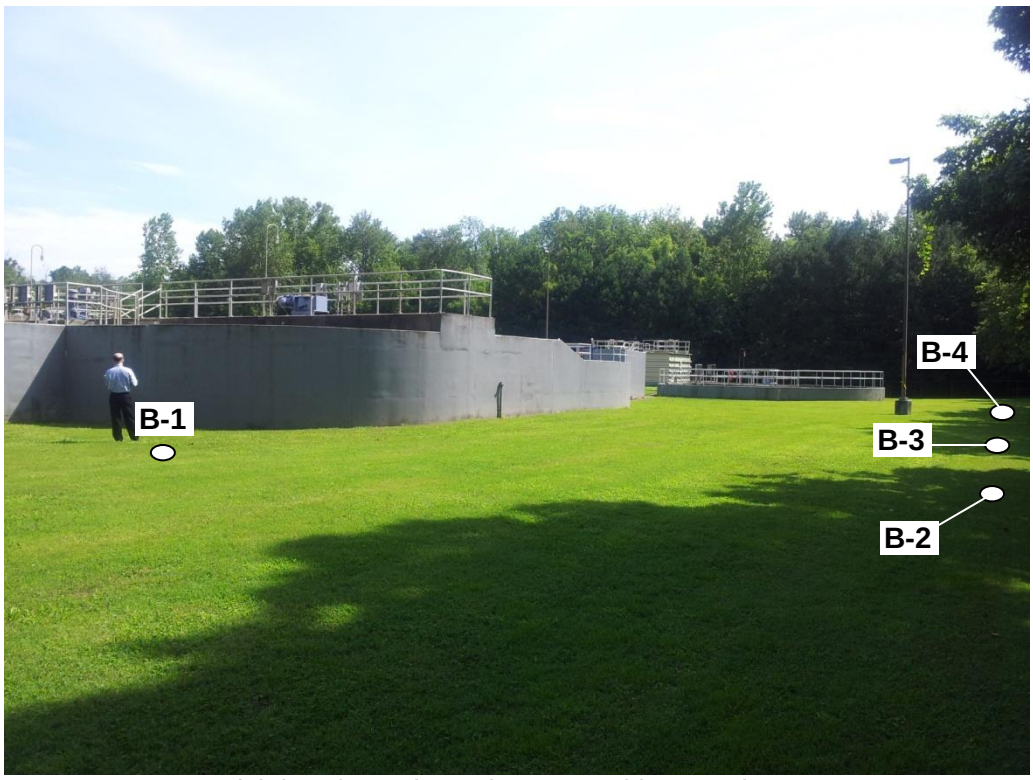
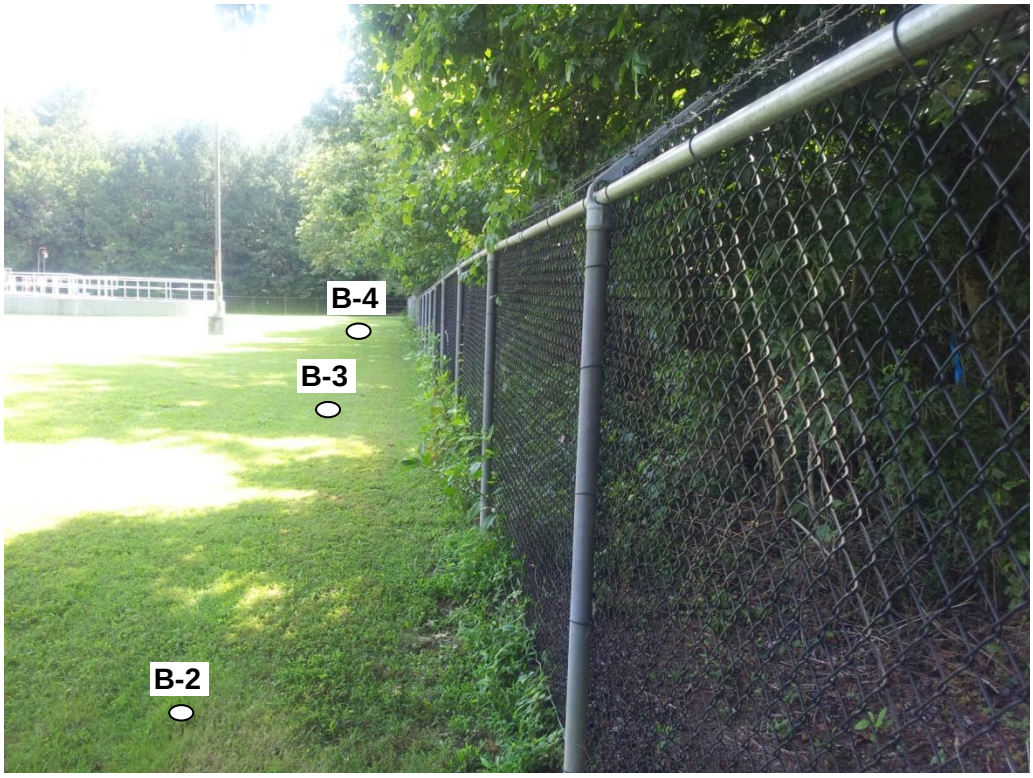
APPENDIX III

Vicinity of B-1; Looking North



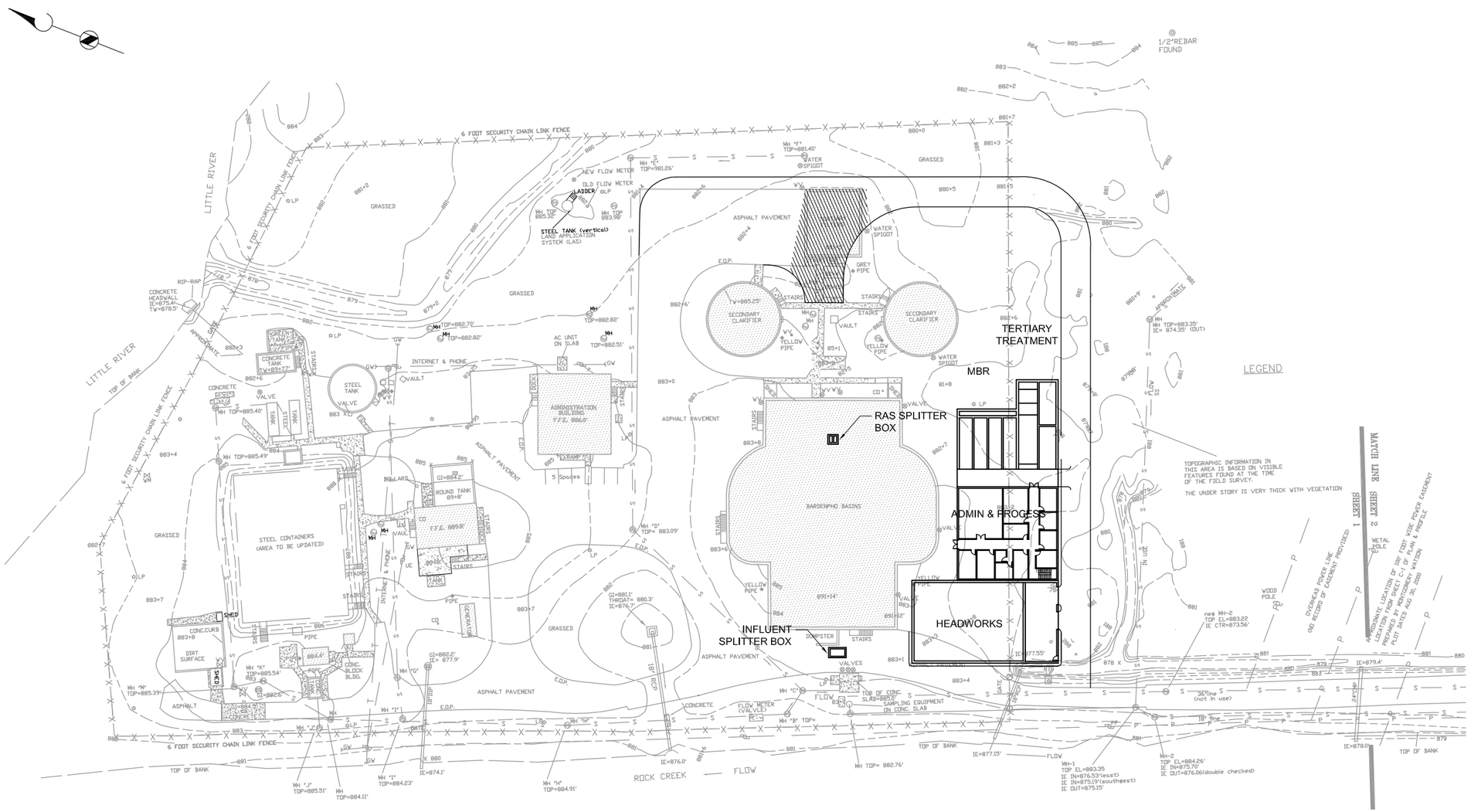
Vicinity of B-1 through B-4; Looking Northeast



Vicinity of B-2 through B-4; Looking East

Vicinity of B-5; Looking Northwest

APPENDIX IV



PRELIMINARY LAYOUT

PLAN

SCALE: 1" = 40'

Brown AND Caldwell

SUBMITTED: PROJECT MANAGER DATE:

APPROVED: BROWN AND CALDWELL DATE:

LINE IS 2 INCHES AT FULL SIZE (IF NOT 2" - SCALE ACCORDINGLY)

DESIGNED: J CHENG
DRAWN: J PORTER
CHECKED:
CHECKED:
APPROVED:

EXTERNAL REFERENCES
142530-Border.dwg
120165_xref.dwg

REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.

Department of Water Resources
Fulton County, Georgia

Little River WRF Expansion

PRELIMINARY LAYOUT

FILENAME 142530-C-SFP-01
BC PROJECT NUMBER 142530
CLIENT PROJECT NUMBER FC-7134-99
DRAWING NUMBER C-101

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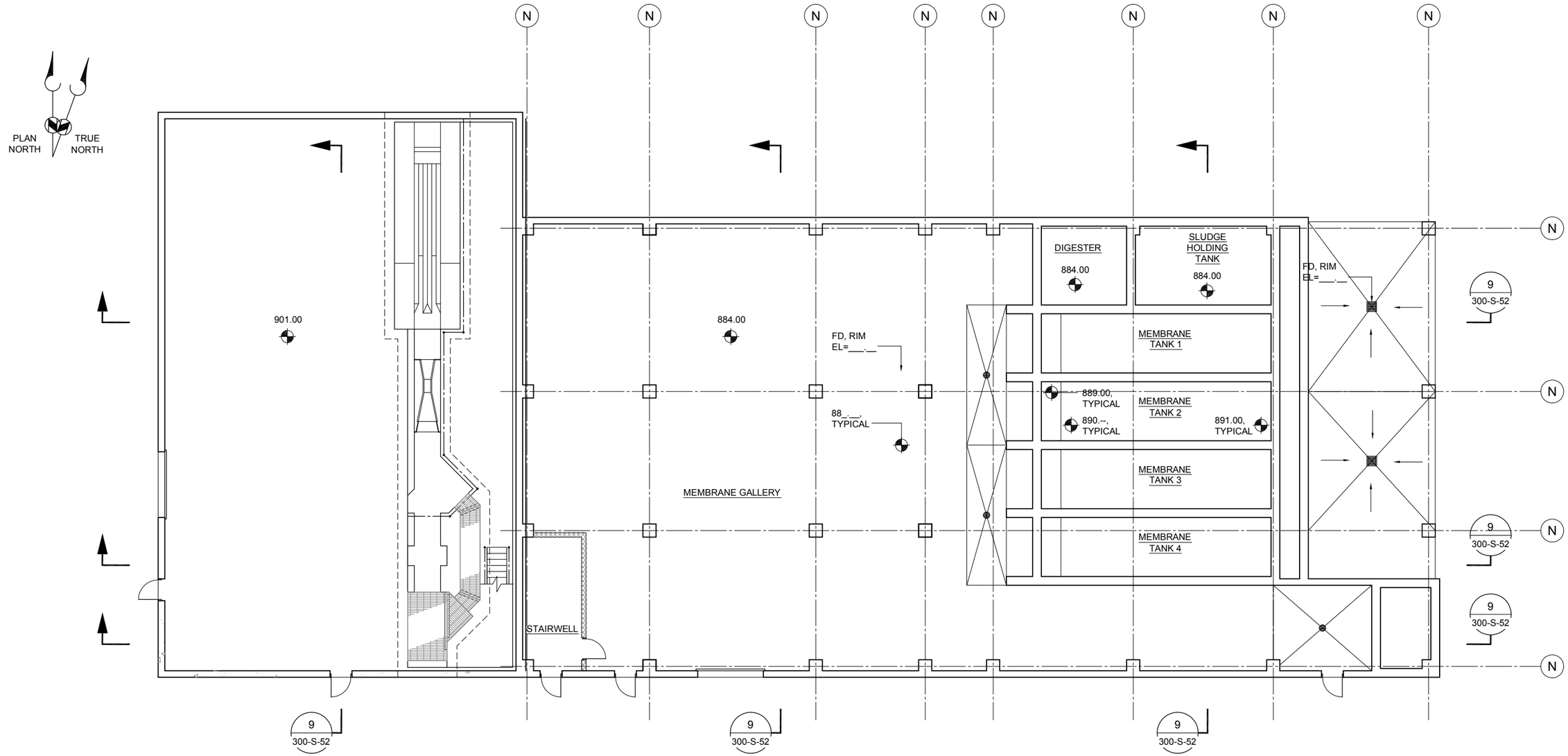

PROCESS BUILDING

GROUND LEVEL PLAN

SCALE: 1/8" = 1'-0"

Brown AND Caldwell

SUBMITTED: _____ DATE: _____
PROJECT MANAGER

APPROVED: _____ DATE: _____
BROWN AND CALDWELL

LINE IS 2 INCHES AT FULL SIZE (IF NOT 2" - SCALE ACCORDINGLY)

DESIGNED: R TOEBBEN
DRAWN: R TOEBBEN
CHECKED:
CHECKED:
APPROVED:

EXTERNAL REFERENCES
142530-Border.dwg
XLR-SP-01.dwg

REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.

Department of Water Resources
Fulton County, Georgia

Little River WRF Expansion

PROCESS BUILDING

GROUND LEVEL PLAN

FILENAME 142530-S-SFP-02
BC PROJECT NUMBER 142530
CLIENT PROJECT NUMBER FC-7134-99
DRAWING NUMBER S-00X

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rtoebben
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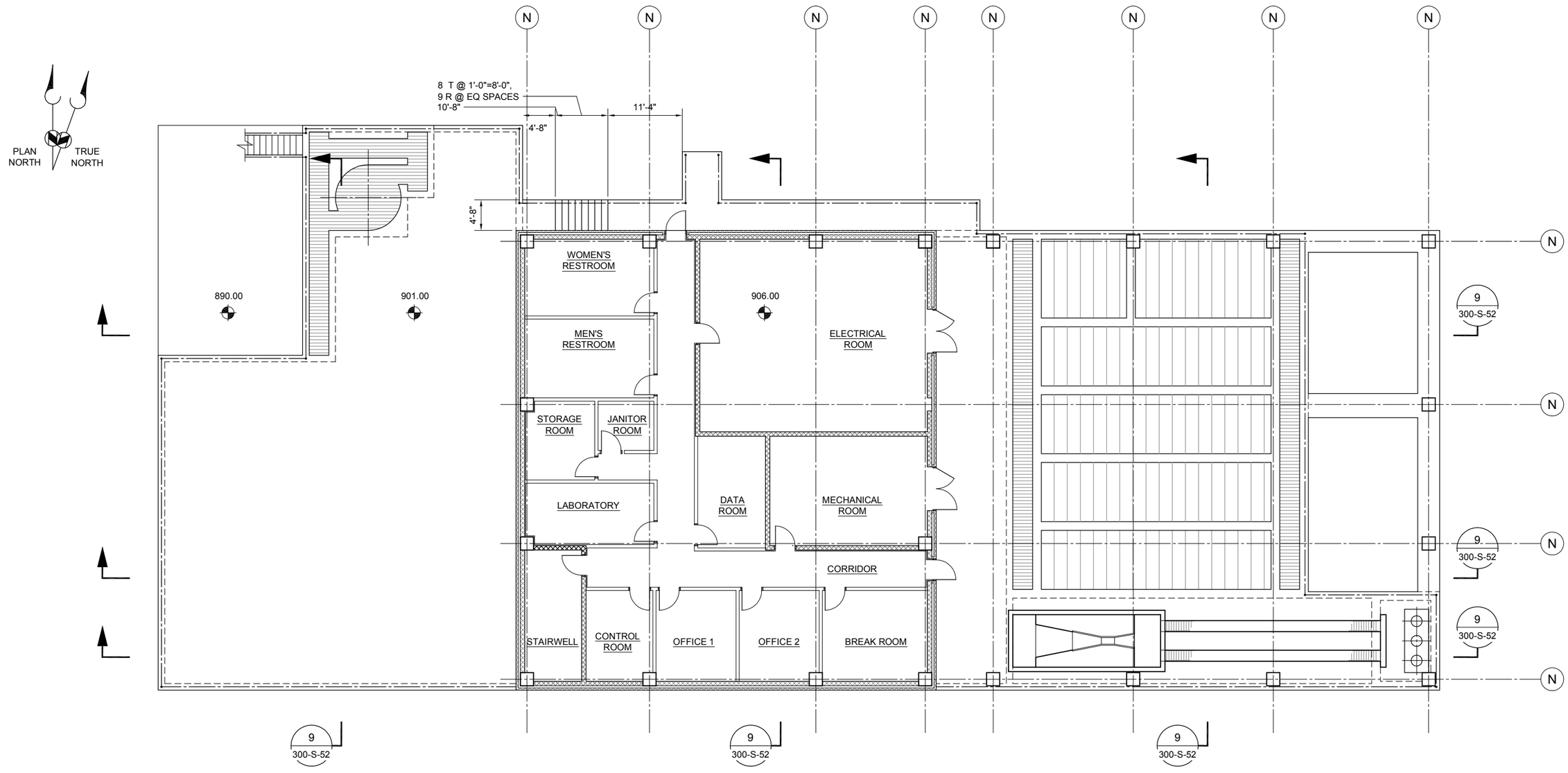
8-23-12



PROCESS BUILDING

UPPER LEVEL PLAN

SCALE: 1/8" = 1'-0"

Brown AND Caldwell

SUBMITTED: _____ DATE: _____
PROJECT MANAGER

APPROVED: _____ DATE: _____
BROWN AND CALDWELL

LINE IS 2 INCHES AT FULL SIZE (IF NOT 2" - SCALE ACCORDINGLY)

DESIGNED: R TOEBBEN
DRAWN: R TOEBBEN
CHECKED:
CHECKED:
APPROVED:

EXTERNAL REFERENCES
142530-Border.dwg
XLR-SP-01.dwg

REVISIONS

ZONE	REV.	DESCRIPTION	BY	DATE	APP.

Department of Water Resources
Fulton County, Georgia

Little River WRF Expansion

PROCESS BUILDING

UPPER LEVEL PLAN

FILENAME 142530-S-SFP-02
BC PROJECT NUMBER 142530
CLIENT PROJECT NUMBER FC-7134-99
DRAWING NUMBER S-00X

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8-23-12

Attachment E
Revised BID FORM

REVISED BID FORM

Submitted To: Fulton County Government

Submitted By: _____

For: **#16ITB090716K-EC, Little River WRF Expansion**

Submitted on _____, 20__.

The undersigned, as Bidder, hereby declares that the only person or persons interested in the Bid as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this Bid or in the Contract to be entered into; that this Bid is made without connection with any other person, company or parties making a Bid; and that it is in all respects fair and in good faith without collusion or fraud.

The Bidder further declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the place where the work is to be done; that he has examined the Drawings and Specifications for the work and contractual documents relative thereto, and has read all instructions to Bidders and General Conditions furnished prior to the openings of bids; that he has satisfied himself relative to the work to be performed.

The Bidder proposes and agrees, if this Bid is accepted, to contract with the Board of Commissioners of Fulton County, Atlanta, Georgia, in the form of contact specified, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary, and to complete the construction of the work in full and complete accordance with the shown, noted, and reasonably intended requirements of the Specifications and Contract Documents to the full and entire satisfaction of the Board of Commissioners of Fulton County, Atlanta, Georgia, with a definite understanding that no money will be allowed for extra work except as set forth in the attached General Conditions and Contract Documents for the following prices.

THE BASE BID IS THE AMOUNT UPON WHICH THE BIDDER WILL BE FORMALLY EVALUATED AND WHICH WILL BE USED TO DETERMINE THE LOWEST RESPONSIBLE BIDDER.

The base bid may not be withdrawn or modified for a period of sixty (60) days following the receipt of bids.

BASE BID AMOUNT (Do not include any Bid Alternates)

$_____

(Dollar Amount In Numbers)

_____

(Dollar Amount in Words)

The Bidder agrees hereby to commence work under this Contract, with adequate personnel and equipment, on a date to be specified in a written “Notice to Proceed” from the County.

The Bidder declares that he understands that the quantities shown for the unit prices items are subject to either increase or decrease, and that should the quantities of any of the items of work be increased, the Bidder proposes to do the additional work at the unit prices stated herein; and should the quantities be decreased, the Bidder also understands that payment will be made on the basis of actual quantities at the unit price bid and will make no claim for anticipated profits for any decrease in quantities; and that actual quantities will be determined upon completion of work, at which time adjustments will be made to the contract amount by direct increase or decrease.

Make sure that all line items below are accurately calculated and total up to the inclusive BASE BID TOTAL amount entered on Page 1.

Method of Bidding

The unit or lump sum price for each of the several items in the Bid of each Bidder shall include its pro rata share of overhead and profit so that the sum of the products, obtained by multiplying the quantity shown for each item by the unit price, represents the total Bid. Any Bid not conforming to this requirement may be rejected. Additionally, Unbalanced Bids or conditional Bids will be subject to rejection. The special attention of all Bidders is called to this provision, for should conditions make it necessary to revise the quantities, no limit will be fixed for such increased or decreased quantities nor extra compensation allowed.

BASE BID AMOUNT

ITEM NO.	DESCRIPTION	TOTAL PRICE
1.	Furnishing all products, materials and equipment and performing all labor necessary to complete and put into operation the Little River WRF Renovation, including all work shown on the Drawings and/or Specified, and not included in Items 2 through 6 below	
2.	Owner Controlled Rock and Pile Contingency Allowance	**200,000.00**
3.	General Owner Contingency Allowance	**300,000.00**
4.	Soils and Concrete Testing Allowance	**100,000.00**
5.	Hazardous Materials Allowance	**100,000.00**
6.	Furniture and Miscellaneous Laboratory Furnishings Allowance	**50,000.00**
	TOTAL BASE BID AMOUNT (lines 1-6)	

The lowest responsible bidder will be based on the base bid above. Final contract price will be established based upon the Alternative items selected by the County.

MAJOR EQUIPMENT SELECTION

The Bidder shall designate below by circling the selected manufacturer for each major equipment product to be furnished and installed if awarded the Work.

1. Specification Section 11121 Product:
   Circle Manufacturer Selected
   a. HydroDyne
   b. Kruger
   c. Duperon
   d. WesTech
   e. Huber

2. Specification Section 11128 Product:
   Circle Manufacturer Selected
   a. Parkson
   b. WesTech
   c. Huber
   d. CleanTek

3. Specification Section 11148 Product:
   Circle Manufacturer Selected
   a. Smith and Loveless
   b. John Meunier
   c. Jones and Atwood

4. Specification Section 11236 Product:
   Circle Manufacturer Selected
   a. Ovivo
   b. Sanitaire
   c. EDI

5. Specification Section 11347 Product:
   Circle Manufacturer Selected
   a. ABS
   b. Xylem
   c. Fairbanks Morse

6. Specification Section 11737 Product:
   Circle Manufacturer Selected
   a. Trojan
   b. Wedeco

7. Specification Section 13282 Product:
   Circle Manufacturer Selected
   a. Calgon Carbon
   b. ECS
   c. Daniel Company
   d. Siemens
   e. Pure Air
   f. Purafil

8. Specification Section 16231 Product:
   Circle Manufacturer Selected
   a. Cummins
   b. Caterpillar

UNIT PRICES

ROCK EXCAVATION

If any rock as defined in Section 02200, it shall be removed and disposed of as specified in Sections 02200 and 02211. Bidders shall assume 50 CY of Rock Excavation and 50 CY of Trench Rock Excavation in their Base Bid Price. Any amount encountered above these amounts will be paid for from Bid Item 2 – Owner Controlled Rock and Pile Contingency Allowance per the unit cost shown below by the contractor. Any unused quantities will be provided as a credit using the same rates.

DESCRIPTION	UNIT	UNIT COST
Mass Rock	CY	
Trench Rock	CY	

PILE DEPTH

Specifications indicate that the contractor is to assume an auger cast pile depth of 40 ft. Contractor shall be compensated or at the unit cost below from Bid Item 2 - Owner Controlled Rock and Pile Contingency Allowance for additional depth beyond 40 ft and shall also provide a credit in this amount for depth less than 40 ft.

DESCRIPTION	UNIT	UNIT COST
Cost / Credit for pile length	LF	

ADDITIVE / DEDUCTIVE ALTERNATE #1

ALTERNATE BLOWER SYSTEM:

The base bid is to includes single stage aeration blowers per specification 11485 and all of the associated services (electrical, etc.). These blowers have a higher cost but are more efficient than the alternate multi stage blowers. Based on the costs and efficiencies of these two systems, the County may elect to select the multistage blowers. All bidders must therefore include costs and efficiency information for both of these systems as indicated below to be considered a responsive Bid.

Single Stage Blower (Specification 11485)

Cost of providing Single Stage Aeration Blowers in Accordance with Specification 11485 (This cost shall be included in base bid)

DESCRIPTION	TOTAL COST
Single Stage Blowers	

SINGLE STAGE BLOWER GUARANTEED OPERATING PERFORMANCE: The blower manufacturer shall provide guaranteed power consumption values for each of the following operating points. Guaranteed power consumption shall include the variable frequency drive and motor losses. This information shall be provided with the contractor's bid for evaluation.

Design Point	Capacity %	Flow scfm	Discharge Pressure psig	Inlet Temp ºF	RH %	Guaranteed Power Consumption Hp*
1	100	2,000	6.4	106	90	
2	75	1,500	6.4	60	50	
3	60	1,200	6.4	60	50	
4	45	900	6.4	20	40	

* To be completed by Blower Manufacturer. If the blower does not achieve the guaranteed power consumption number listed, the blower manufacturer shall provide an upgrade or replacement with an engineering system to the guaranteed power consumption Hp at no additional cost to the Owner. Penalty shall be for any performance below that listed based on the observed factory test results.

Multi Stage Blower (Specification 11486)

Cost of providing Multi Stage Aeration Blowers in Accordance with Specification 11486 (The delta between this cost and the cost above will be provided as a reduction in contract price if elected by the County)

DESCRIPTION	TOTAL COST
Multi Stage Blower System (all blowers)	

MULTI STAGE BLOWER GUARANTEED OPERATING PERFORMANCE: The blower manufacturer shall provide guaranteed power consumption values for each of the following operating points. Guaranteed power consumption shall include the variable frequency drive and motor losses. This information shall be provided with the contractor's bid for evaluation.

Design Point	Capacity %	Flow scfm	Discharge Pressure psig	Inlet Temp ºF	RH %	Guaranteed Power Consumption Hp*
1	100	2,000	6.4	106	90	
2	75	1,500	6.4	60	50	
3	60	1,200	6.4	60	50	
4	45	900	6.4	20	40	

* To be completed by Blower Manufacturer. If the blower does not achieve the guaranteed power consumption number listed, the blower manufacturer shall provide an upgrade or replacement with an engineering system to the guaranteed power consumption Hp at no additional cost to the Owner. Penalty shall be for any performance below that listed based on the observed factory test results.

ADDITIVE / DEDUCTIVE ALTERNATE #2

ALTERNATE MEMBRANE SYSTEM Bid Item:

The base bid includes the Basis of Design for an Immersed Hollow Fiber Membrane System by GE Water & Process Technologies (LEAPmbr System). This Alternate bid item is to allow for consideration of other acceptable alternative membrane systems (Koch Membrane Systems, PURON, or OvivoMBR Flat Sheet system provided by Ovivo). The base bid shall include the cost for the base bid GE system and the Alternate Bid item shall include the additive / deductive price for one of the alternative membrane systems. Refer to specification 11300 section 2.01 for items that shall be included in this Alternative bid cost.

The price shall be the amount added/deducted to/from the Base Bid Price if the Owner elects to select this Additive/Deductive Alternate However, the Owner has the right to not implement any Alternates if he so chooses. Offeror agrees that if the Owner chooses this Additive/Deductive bid item based on the undersigned's own estimate of quantities and costs, the Contract Price shall be increased/decreased by the amount shown. Deductive values shall be entered in as a negative number. Additive values shall be entered as a positive number.

ALTERNATE MEMBRANE SYSTEM ADDITIVE / DEDUCTIVE COST	TOTAL COST
Supplier:	
Supplier:	

ADDITIVE / DEDUCTIVE ALTERNATE #3

LED TYPE LUMINARIES:

Includes providing LED type luminaires in-lieu of all indoor and outdoor HID (metal halide and high pressure sodium) luminaires as listed in the Lighting Fixture Schedule and as shown on the plans. LED fixtures shall be selected to meet the requirements of the Lighting Fixture Schedule and updated Section 16500 Luminaires; including, lumen output, optics, distribution, location, UL listing, mounting and voltage in place of the HID

fixtures. Contractor may propose to increase or decrease fixture quantity provided the approximate total lumen output for the area/room is met and illuminance levels and distribution is similar to the current design for rooms with multiple fixtures. LED submittal data shall include proposed fixture locations and lighting calculations for all areas to be reviewed and approved as a part of the detailed submittal review process. Price shall include complete installation of fixtures in accordance with manufacturer's requirements, plans and specifications; including all conduit, cable and panelboard requirements.

The price shall be the amount added/deducted to/from the Base Bid Price if the Owner elects to select this Additive/Deductive Alternate However, the Owner has the right to not implement any Alternates if he so chooses. Offeror agrees that if the Owner chooses this Additive/Deductive bid item based on the bidders own estimate of quantities and costs, the Contract Price shall be increased/decreased by the amount shown. Deductive values shall be entered in as a negative number. Additive values shall be entered as a positive number.

DESCRIPTION	TOTAL COST
LED type luminaires in-lieu of all indoor and outdoor HID luminaries	

ADDITIVE / DEDUCTIVE ALTERNATE #4

ALTERNATE FIBERGLASS COVER BID ITEM:

The base bid shall include the cost of providing aluminum covers per specification 13120. This alternate bid item shall be the change in price for providing Fiberglass Covers in Accordance with Specification 13240 in lieu of the aluminum covers.

The price shall be the amount added/deducted to/from the Base Bid Price if the Owner elects to select this Additive/Deductive Alternate However, the Owner has the right to not implement any Alternates if he so chooses. Offeror agrees that if the Owner chooses this Additive/Deductive bid item based on the bidders own estimate of quantities and costs, the Contract Price shall be increased/decreased by the amount shown. Deductive values shall be entered in as a negative number. Additive values shall be entered as a positive number.

DESCRIPTION	TOTAL COST
Fiberglass Cover in-lieu of Aluminum covers	

ADDITIVE / DEDUCTIVE ALTERNATE #5

ALTERNATE UNDERGROUND UTILITY ABANDON IN PLACE:

The base bid shall include the removal and disposal of all existing underground piping and utilities. This alternate bid item shall be for the cost savings to allow for utility lines to be plugged / capped at each end and abandoned in place.

The price shall be the amount added/deducted to/from the Base Bid Price if the Owner elects to select this Additive/Deductive Alternate However, the Owner has the right to not

implement any Alternates if he so chooses. Offeror agrees that if the Owner chooses this Additive/Deductive bid item based on the bidders own estimate of quantities and costs, the Contract Price shall be increased/decreased by the amount shown. Deductive values shall be entered in as a negative number. Additive values shall be entered as a positive number.

DESCRIPTION	TOTAL COST
Abandon Utilities in Place	

The Bidder agrees hereby to commence work under this Contract, with adequate personnel and equipment, on a date to be specified in a written order of the Construction Manager and to fully complete all work under this Contract within One Thousand Ninety Five (1095) calendar days from and including said date.

The Bidder declares that he understands that the quantities shown for the unit prices items are subject to either increase or decrease, and that should the quantities of any of the items of work be increased, the Bidder proposes to do the additional work at the unit prices stated herein; and should the quantities be decreased, the Bidder also understands that payment will be made on the basis of actual quantities at the unit price bid and will make no claim for anticipated profits for any decrease in quantities; and that actual quantities will be determined upon completion of work, at which time adjustments will be made to the contract amount by direct increase or decrease.

In case of discrepancies between the figures shown in the unit prices and the totals, the unit prices shall apply and the totals shall be corrected to agree with the unit prices. In case of discrepancies between written amounts and figures, written amounts shall take precedence over figures and the sum of all Bid extensions (of unit prices) plus lump sum items shall take precedence over BID TOTAL. The Bidder furthermore agrees that, in the case of a failure on his part to execute the Contract Agreement and Bonds within ten (10) days after receipt of conformed contract documents for execution, the Bid Bond accompanying his bid and the monies payable thereon shall be paid into the funds of the Owner as liquidated damages for such failure. Enclosed is a Bid Bond in the approved form, in the sum of:

_____Dollars

($_____) according to the conditions of “Instructions to Bidders” and provisions thereof.

The undersigned acknowledges receipt of the following addenda (list by the number and date appearing on each addendum) and thereby affirms that its Bid considers and incorporates any modifications to the originally issued Bidding Documents included therein.

ADDENDUM # _____ DATED _____

ADDENDUM # _____ DATED _____

ADDENDUM # _____ DATED _____

ADDENDUM # _____ DATED _____

ADDENDUM # _____ DATED _____

BIDDER: _____

Signed by: _____
[Type or Print Name]

Title: _____

Business Address: _____

_____

_____

Business Phone: _____

Note: If the Bidder is a corporation, the Bid shall be signed by an officer of the corporation; if a partnership, it shall be signed by a partner. If signed by others, authority for signature shall be attached.

The full name and addresses of persons or parties interested in the foregoing Bid, as principals, are as follows:

Name	Address

END OF SECTION

Attachment F
Revised Section 4: Insurance and Risk Management Provisions

Insurance and Risk Management Provisions
Little River WRF Expansion Project

The following is the minimum insurance and limits that the Contractor/Vendor must maintain. If the Contractor/Vendor maintains higher limits that the minimum shown below, Fulton County Government requires and shall be entitled to coverage for the higher limits maintained by the Contractor/Vendor.

It is Fulton County Government's practice to obtain Certificates of Insurance from our Contractors and Vendors. Insurance must be written by a licensed agent in a company licensed to write insurance in the State of Georgia, with an A.M. Best rating of at least A- VI, subject to final approval by Fulton County. Respondents shall submit with the bid/proposal evidence of insurability satisfactory to Fulton County Government as to form and content. Either of the following forms of evidence is acceptable:

- A letter from an insurance carrier stating that upon your firm/company being the successful Bidder/Respondent that a Certificate of Insurance shall be issued in compliance with the Insurance and Risk Management Provisions outlined below.
- A Certificate of Insurance complying with the Insurance and Risk Management Provisions outlined below (Request for Bid/Proposal number and Scope of Services must appear on the Certificate of Insurance).
- A combination of specific policies written with an umbrella policy covering liabilities in excess of the required limits is acceptable to achieve the applicable insurance coverage levels.

Any and all Insurance Coverage(s) and Bonds required under the terms and conditions of the contract shall be maintained during the entire length of the contract, including any extensions or renewals thereto, and until all work has been completed to the satisfaction of Fulton County Government.

<u>Accordingly the Respondent shall provide a certificate evidencing the following:</u>

1. **WORKERS COMPENSATION/EMPLOYER'S LIABILITY INSURANCE – STATUTORY (In compliance with the Georgia Workers Compensation Acts and any other State or Federal Acts or Provisions in which jurisdiction may be granted)**

Employer's Liability Insurance	BY ACCIDENT	EACH ACCIDENT	$1,000,000
Employer's Liability Insurance	BY DISEASE	POLICY LIMIT	$1,000,000
Employer's Liability Insurance	BY DISEASE	EACH EMPLOYEE	$1,000,000

2. **COMMERCIAL GENERAL LIABILITY INSURANCE (Including contractual Liability Insurance)**

Bodily Injury and Property Damage Liability	Each Occurrence	$1,000,000
(Other than Products/Completed Operations)	General Aggregate	$2,000,000
Products\Completed Operation	Aggregate Limit	$2,000,000
Personal and Advertising Injury	Limits	$1,000,000
Damage to Rented Premises	Limits	$100,000

*General Liability Policy to include the following:

- Policy to provide evidence of X, C, U coverage (Where applicable).
- Policy to have no exclusion for demolition work.

3. BUSINESS AUTOMOBILE LIABILITY INSURANCE
Bodily Injury & Property Damage Each Occurrence $1,000,000
(Including operation of non-owned, owned, and hired automobiles).

4. UMBRELLA LIABILITY Each Occurrence $5,000,000
(In excess of above noted coverages)

5. CONTRACTOR'S POLLUTION LIABILITY Each Occurrence $1,000,000

Certificates of Insurance

Contractor shall provide written notice to Fulton County Government immediately if it becomes aware of or receives notice from any insurance company that coverage afforded under such policy or policies shall expire, be cancelled or altered. Certificates of Insurance are to list Fulton County Government as an Additional Insured (except for Workers' Compensation and Professional Liability), using ISO Additional Insured Endorsement form CG 20 10 (11/85) version, its' equivalent or on a blanket basis.

This insurance shall apply as Primary Insurance before any other insurance or self-insurance, including any deductible, non-contributory, and Waiver of Subrogation provided in favor of Fulton County.

Additional Insured under the General Liability, Auto Liability, Umbrella Policies (with exception of Workers Compensation and Professional Liability), with no Cross Suits exclusion.

If Fulton County Government shall so request, the Respondent, Contractor or Vendor will furnish the County for its inspection and approval such policies of insurance with all endorsements, or confirmed specimens thereof certified by the insurance company to be true and correct copies.

Such certificates and notices **must** identify the "Certificate Holder" as follows:

Fulton County Government – Purchasing and Contract Compliance Department
130 Peachtree Street, S.W.
Suite 1168
Atlanta, Georgia 30303-3459

Certificates **must** list Project Name (where applicable).

Important:

It is understood that neither failure to comply nor full compliance with the foregoing insurance requirements shall limit or relieve the Contractor/Vendor from any liability incurred as a result of their activities/operations in conjunction with the Contract and/or Scope of Work.

USE OF PREMISES

Contractor/Vendor shall confine its apparatus, the storage of materials and the operations of its workers to limits/requirements indicated by law, ordinance, permits and any restrictions of Fulton County Government and shall not unreasonably encumber the premises with its materials (Where applicable).

PROTECTION OF PROPERTY

Contractor/Vendor will adequately protect its own work from damage, will protect Fulton County Government's property from damage or loss and will take all necessary precautions during the progress of the work to protect all persons and the property of others from damage or loss.

Contractor/Vendor shall take all necessary precautions for the safety of employees of the work and shall comply with all applicable provisions of the Federal, State and local safety laws and building codes to prevent accidents or injury to persons on, about, or adjacent to the premises where work is being performed.

Contractor/Vendor shall erect and properly maintain at all times as required by the conditions and progress of the work, all necessary safeguards for the protection of its employees, Fulton County Government employees and the public and shall post all applicable signage and other warning devices to protect against potential hazards for the work being performed (Where applicable).

CONTRACTOR/VENDOR ACKNOWLEDGES HAVING READ, UNDERSTANDING, AND AGREEING TO COMPLY WITH THE AFOREMENTIONED STATEMENTS, AND THE REPRESENTATIVE OF THE CONTRACTOR/VENDOR IDENTIFIED BELOW IS AUTHORIZED TO SIGN CONTRACTS ON BEHALF OF THE RESPONDING CONTRACTOR/VENDOR.

COMPANY: _____ SIGNATURE: _____

NAME: _____ TITLE: _____

DATE: _____

Attachment G
Scope of Work and Technical Specifications Table of Contents

LITTLE RIVER WRF EXPANSION

Technical Specification List

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