GROUNDWATER MONITORING PLAN

PLANT HAMMOND – ASH POND 2 (AP-2)
FLOYD COUNTY, GEORGIA

FOR

Georgia Power

SUBMITTED NOVEMBER 2018
REVISED JANUARY 2020

Geosyntec consultants

Geosyntec Consultants, 1255 Roberts Boulevard, Suite 200, Kennesaw, Georgia 30144
Phone: 678-202-9500, Fax: 678-202-9501

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I. CERTIFICATION

This *Groundwater Monitoring Plan, Georgia Power Company - Plant Hammond Ash Pond 2 (AP-2)* has been prepared by a qualified groundwater scientist or engineer with Geosyntec Consultants, Inc. (Geosyntec) to meet the requirements contained in Chapter 391-3-4-.10 of the Georgia Environmental Protection Division Rules of Georgia, Solid Waste Management, Coal Combustion Residuals (i.e., State CCR Rule). References to the appropriate sections of the State CCR Rule are incorporated throughout this document.

I hereby certify that this Groundwater Monitoring Plan was prepared by, or under the direct supervision of, a "Qualified Groundwater Scientist," in accordance with the State of Georgia Rules of Solid Waste Management. According to 391-3-4-.01(57), a Qualified Groundwater Scientist is "a professional engineer or geologist registered to practice in Georgia who has received a baccalaureate or post-graduate degree in the natural sciences or engineering and has sufficient training and experience in groundwater hydrology and related fields that enable individuals to make sound professional judgments regarding groundwater monitoring, contaminant fate and transport, and corrective action." The design of the groundwater monitoring system was developed in compliance with Georgia Environmental Protection Division (EPD) Rules of Solid Waste Management, Chapter 391-3-4.10(6).

Signature: _____

Date: Jan 16, 2020

GEORGIA REGISTERED No. PE036641 PROFESSIONAL ENGINEER WHITNEY B. LAW

Signature: _____

Date: 1-16-2020

JOSEPH M. IVANOWSKI GEORGIA REGISTERED PROFESSIONAL GEOLOGIST No. 002140

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1. INTRODUCTION

Groundwater monitoring is required by the Georgia Environmental Protection Division (EPD) to detect and quantify potential changes in groundwater chemistry. This Groundwater Monitoring Plan (plan) describes the groundwater monitoring program for Ash Pond 2 (AP-2 or Site) at Georgia Power Company's (GPC's) Plant Hammond. This plan meets the requirements of EPD rules and uses EPD's Manual for Ground Water Monitoring dated September 1991 as a guide. Groundwater monitoring well locations are presented on Figure A-1 of **Appendix A** and well construction details on Table A-1 of **Appendix A**.

Groundwater monitoring will occur in accordance with 391-3-4-.10 of the Georgia Solid Waste Management Rules. If the monitoring requirements specified in this plan conflict with EPD rules (391-3-4), the EPD rules will take precedent.

In accordance with the United States Environmental Protection Agency (USEPA) Coal Combustion Rule (§257.90), which is incorporated by Georgia State CCR Rule by reference, a detection monitoring well network for AP-2 has been installed and certified by a qualified professional engineer. This certification has been placed in the facility's operating record and is included in Part B of the permit application. The existing monitoring wells were installed following the guidelines presented herein. Additionally, this plan documents the methods for future monitoring well installation and/or replacement, and procedures for well abandonment. As required by 391-3-4.10(6)(g), a minor modification will be submitted to the EPD prior to the unscheduled installation or abandonment of monitoring wells. Well installation and/or abandonment must be directed by a qualified groundwater scientist.

2. GEOLOGIC AND HYDROGEOLOGIC CONDITIONS

The following section presents the geologic and hydrogeologic conditions for the Site as described in the "*Hydrogeologic Assessment Report (Revision 1)"* (HAR) (Geosyntec, 2019) tab in Section 2 of Part B of this permit application.

2.1 SITE GEOLOGY

AP-2 is located within the Great Valley and Ridge Physiographic Province (Valley and Ridge) in northwest Georgia, which is characterized by Paleozoic sedimentary rocks that have been folded and faulted into the ridges and valleys that gave this region its name. Geologic mapping performed at the Site by Petrologic Solutions, Inc. (Golder, 2018) indicates that the Site is underlain by the lower units of the Cambrian age Conasauga Formation (Ccsl), consisting of mostly calcareous shale. Based on review of subsurface investigations at the Site, the bedrock was identified as predominantly calcareous shale and fissile black shale. AP-2 is underlain primarily by five lithologic units; (i) terrace alluvium, (ii) colluvium, (iii) residuum, (iv) partially weathered shale bedrock, and (v) unweathered shale bedrock.

Based on subsurface investigations, the alluvial deposits generally grade from a silt and silty clay to a clayey sand and silty sand to a sand and gravelly sand at depth. The colluvium consists of silty sand, silty clay with angular and sub-rounded chert fragments, and dolomite, sandstone, and shale fragments. Residual or native soils have been derived from the in-place weathering of the shale bedrock. The residuum is generally described as brown to yellow brown firm clayey silt with weathered shale fragments. The partially weathered shale zone occurs as an intermediate weathering stage between the residuum and the unweathered shale bedrock. The weathered material is described as black to dark gray to dark red hard, fissile shale and claystone. Limited rock was encountered within 20 feet of the water table during previous investigations. The unweathered shale bedrock was not encountered or directly observed in the historical borings advanced at the Site. However, based on geologic conditions in the region, weathering, fracturing and jointing decreases with depth and the weathered rock material grades into competent bedrock.

2.2 SITE HYDROGEOLOGY

The uppermost aquifer at AP-2 is a regional groundwater aquifer that occurs primarily in the residuum and within the weathered and fractured bedrock. Under natural conditions the water table surface would be expected to be a subdued reflection of the topography. Recharge is by precipitation falling on bedrock outcrop areas and through alluvial, colluvial, and residual soils to the bedrock. Based on observations of residuum soil types and horizontal conductivity values, the movement of groundwater in the soil can be characterized as low-to moderate permeability, porous media flow. The groundwater flow in the shallow underlying bedrock is characterized as fracture flow, and due to the preponderance of shale beneath the Site, is expected to be very low permeability. The regional groundwater flow direction is expected to be from north to south; however, the local flow direction beneath the Site is predominantly east to west with an additional southwesterly component. The flow direction is shown in the potentiometric surface map in **Appendix A**. The potentiometric surface map represents data recorded in June 2018.

The representative groundwater hydraulic gradient for AP-2, based on June 2018 water level data, is approximately 0.011 feet/foot (ft/ft). Horizontal hydraulic conductivity (K_h) measurements were calculated from slug test data collected in a subset of AP-2 wells and piezometers. Results were broadly

grouped based on the lithology in which the wells or piezometers were screened. At AP-2, hydraulic conductivities for wells and piezometers screened in the alluvium, colluvium, and residuum/partially weathered rock ranged from 4.8 x 10^{-4} centimeters per second (cm/sec) to 1.3 x 10^{-3} cm/sec with a geometric mean K_h of 5.2 x 10^{-4} cm/sec.

3. SELECTION OF WELL LOCATIONS

Groundwater monitoring wells were installed to monitor the uppermost occurrence of groundwater beneath the Site. Locations were selected based on the AP-2 footprint and geologic and hydrogeologic considerations. GPC follows the recommendation as stated in Chapter 2 of the *Manual for Groundwater Monitoring* (EPD, 1991) to establish well spacings based on site-specific conditions. A map depicting the monitoring well network for AP-2 is included in **Appendix A**, Monitoring System Details. A more detailed discussion of the hydrogeological investigation conducted in support of monitoring well placement is provided in the HAR (Geosyntec, 2019).

The groundwater monitoring network locations were chosen to monitor upgradient (HGWA), and downgradient (HGWC) conditions at the Site based on groundwater flow direction determined by potentiometric evaluation. The potentiometric surface map in **Appendix A** depicts the groundwater flow direction beneath AP-2, based on June 2018 conditions. Six wells (i.e., HGWA-1, HGWA-2, HGWA-3, HGWA-4, HGWA-5, and HGWA-6) are designated for monitoring of upgradient conditions and five wells (i.e., HGWC-14, HGWC-15, HGWC-16, HGWC-17, and HGWC-18) are designated for monitoring of downgradient conditions. Wells are positioned to provide adequate coverage to detect potential impacts from the CCR impoundment. The wells, both upgradient and downgradient of AP-2, are screened in the uppermost aquifer, in the alluvium, colluvium, and/or residuum/weathered shale above the more competent shale bedrock.

Monitoring wells are generally located outside of areas with frequent auto traffic; however, wells may be installed in heavily trafficked areas when necessary to meet the groundwater monitoring objectives of the EPD rules. In addition to the potentiometric surface map, **Appendix A** also includes a tabulated list of location coordinates for the individual monitoring wells. Additional well construction details (i.e., top-of-casing elevation, well depths and screened intervals) are also provided on this table.

4. MONITORING WELL DRILLING, CONSTRUCTION, ABANDONMENT AND REPORTING

The AP-2 monitoring well network described in this plan is already in place. The existing monitoring wells were installed following USEPA Region 4 Science and Ecosystem Support Division (SESD) *Operating Procedure for Design and Installation of Monitoring Wells* (USEPA, SESDGUID-101-R1) as a general guide for best practices. Details regarding the installation of compliance wells are described in the *Wells Design, Installation, and Development Report* (ERM, 2017). The boring and well construction logs associated with the report are included in **Appendix A**. Additional monitoring wells, if necessary, will be installed in accordance with the following procedures.

4.1 DRILLING

A variety of well drilling methods are available for the purpose of installing groundwater monitoring wells. Drilling methodologies include but are not limited to: hollow stem augers, direct push, air rotary, mud rotary, and rotosonic techniques. The drilling method will be selected to minimize the disturbance of subsurface materials and not cause impacts to groundwater. Borings will be advanced using an appropriate drilling technology capable of drilling and installing a well in the site-specific geology. Monitoring wells will be installed using the most current version of the USEPA SESD SESDGUID-101-R# as a general guide for best practices. Also, drilling equipment will be decontaminated before use and between borehole locations using the procedures described in the most current version of USEPA SESD *Operating Procedure for Field Equipment Cleaning and Decontamination* (EPA, SESDGUID-205-R#). Well installation will be directed by a qualified groundwater scientist.

Sampling and/or coring may be used to help determine the stratigraphy and geology at the well location. Samples and cores will be logged by a qualified groundwater scientist. Screen depths will be chosen based on the depth to the uppermost aquifer.

All drilling for any subsurface hydrologic investigation, or for installation or abandonment of groundwater monitoring wells, will be performed by a driller that has, at the time of installation, a performance bond on file with the Water Well Standards Advisory Council.

4.2 DESIGN AND CONSTRUCTION

Well construction materials will be sufficiently durable to resist chemical and physical degradation and will not interfere with the quality of groundwater samples.

WELL CASINGS AND SCREENS

American Society for Testing and Materials (ASTM), National Science Foundation (NSF) rated, Schedule 40, 2-inch diameter polyvinyl chloride (PVC) pipe with flush threaded connections will be used for the well riser and screens. Compounds that can cause PVC to deteriorate (e.g., organic compounds) are not expected at this facility. If conditions warrant, other appropriate materials may be used for construction with prior written approval from the EPD.

WELL INTAKE DESIGN

Intake for groundwater monitoring wells will be designed and constructed to: (1) allow sufficient groundwater flow to the well for sampling; (2) minimize the passage of formation materials (turbidity) into the well; and (3) ensure sufficient structural integrity to prevent the collapse of the intake structure.

Each groundwater monitoring well will include a well screen designed to limit the amount of formation material passing into the well when it is purged and sampled. Screens with 0.010-inch slots have proven effective for the earth materials at the Site and will be used unless geologic conditions discovered at the time of installation dictate a different size. Screen length will not exceed 10 feet without justification as to why a longer screen is necessary (e.g., significant variation in groundwater level). If these specifications prove ineffective for developing a well with sufficient yield or acceptable turbidity, further steps will be taken to assure that the well screen is appropriately sized for the formation material. This may include performing sieve analysis of the formation material and determining well screen slot size based on the grain size distribution.

Pre-packed dual-wall well screens may be used for well construction. Pre-packed well screens combine a centralized inner well screen, a developed filter sand pack, and an outer conductor screen in one integrated unit composed of inert materials. If utilized, pre-packed well screens will be installed following general industry standards and using the current version of USEPA SESDGUID-101-R# as a general guide. If the dual-wall pre-packed-screened wells do not yield sufficient water or are excessively turbid after development, further steps will be taken to assure that the well screen is appropriately sized for the formation material. This may include performing sieve analysis of the formation material and determining well screen slot size based on the grain size distribution.

FILTER PACK AND ANNULAR SEAL

The materials used to construct the filter pack will be clean quartz sand of a size that is appropriate for the screened formation. Fabric filters will not be used as filter pack material. Sufficient filter material will be placed in the boring and measurements taken to ensure that no bridging occurs. Upon placement of the filter pack, the well may be pumped to assure settlement of the pack. If pumping is performed, the top elevation of filter pack depth will be monitored, and additional sand added if necessary. The filter pack will extend approximately one to two feet above the top of the well screen.

The materials used to seal the annular space in the boring above the well pack must prevent hydraulic communication between strata and prevent migration from overlying areas into the well screen interval. A minimum of two feet of bentonite (chips, pellets, or slurry) will be placed immediately above the filter pack. The bentonite seal will extend up to the base of any overlying confining zone or the top of the water-bearing zone to prevent cementitious grout from entering the water-bearing or screened zones. If dry bentonite is used, the bentonite must be hydrated with potable water prior to grouting the remaining annulus.

The annulus above the bentonite seal will be grouted with a cement and bentonite mixture (approximately 94 pounds cement / 3 to 5 pounds bentonite / 6.5 gallons of potable water) placed via tremie pipe from the top of the bentonite seal. During grouting, care will be taken to assure that the bentonite seal is not disturbed by locating the base of the tremie pipe approximately two feet above the bentonite seal and injecting grout at low pressure/velocity.

PROTECTIVE CASING AND WELL COMPLETION

After allowing the grout to settle, the well will be finished by installing a flush-mount or above-ground protective casing as appropriate, and building a surface cap. The use of flush-mount wells will generally be limited to paved surfaces unless Site operations warrant otherwise. The surface cap will extend from the top of the cementitious grout to ground surface, where it will become a concrete apron extending outward with a radius of at least 2 feet from the edge of the well casing and sloped to drain water away from the well.

Each well will be fitted with a cap that contains a hole or opening to allow the air pressure in the well to equalize with atmospheric pressure. In wells with above-ground protection, the space between the well casing and the protective casing will be filled with coarse sand or pea-gravel to within approximately 6 inches of the top of the well casing. A small weep hole will be drilled at the base of the metal casing for the drainage of moisture from the casing. Above ground protective covers will be locked.

Protective bollards will be installed around each above-grade groundwater monitoring well. Well construction in high traffic areas will generally be limited unless Site conditions warrant otherwise.

The groundwater monitoring well detail attached in **Appendix B**, Groundwater Monitoring Well Detail, illustrates the general design and construction details for a monitoring well.

WELL DEVELOPMENT

After well construction is completed, wells will be developed by alternately purging and surging until relatively clear discharge water with little turbidity is observed. The goal will be to achieve a turbidity of less than 5 nephelometric turbidity units (NTUs); however, formation-specific conditions may not allow this target to be accomplished. Additionally, the stabilization criteria contained in **Appendix C** should be met. A variety of techniques may be used to develop Site groundwater monitoring wells. The method used must create reversals or surges in flow to eliminate bridging by particles around the well screen. These reversals or surges can be created by using surge blocks, bailers, or pumps. The wells will be developed using a pump capable of inducing the stress necessary to achieve the development goals. All development equipment will be decontaminated prior to first use and between wells.

In low-yielding wells, potable water may be added to the well to facilitate surging of the well screen interval and removal of fine-grained sediment. If water is added, the volume will be documented and at minimum, an equal volume purged from the well.

Many geologic formations contain clay and silt particles that are small enough to work their way through a well's filter pack over time. Therefore, the turbidity of the groundwater from the monitoring wells may gradually increase over time after initial well development. As a result, monitoring wells may need to be redeveloped periodically to remove the silt and clay that has worked its way into the filter packs of the wells. Each monitoring well should be redeveloped when sample turbidity values have significantly increased since initial development or since prior redevelopment. The redevelopment should be performed as described above.

4.3 ABANDONMENT

Monitoring wells will be abandoned using industry-accepted practices and using the EPD Manual for Groundwater Monitoring (1991) and Georgia's Well Water Standards Act of 1985 [Official Code of Georgia Annotated (O.C.G.A.) § 12-5-120, 1985] as guides. The wells will be abandoned under the direction of a professional geologist (P.G.) or engineer (P.E.) registered in Georgia. Neat Portland cement or bentonite will be used as appropriate to complete abandonment and seal the well borehole. Any piezometers or groundwater wells located within the footprint of AP-2 will be over-drilled prior to abandonment.

4.4 DOCUMENTATION

Within 60 days of the construction, development or abandonment of each new groundwater monitoring well completed under the direction of a qualified groundwater scientist or engineer, a well installation/abandonment report will be submitted to the EPD. The following information will be documented in this report.

- Well identification
- Name of drilling contractor and type of drill rig
- Documentation that the driller, at the time the monitoring wells were installed, had a bond on file with the Water Well Advisory Council
- Narrative of drilling technique applied, well construction details, and well development procedures, including dates, drilling fluids used (if applicable), well casing and screen materials, screen slot size, and joint type
- Details of filter pack material/size, emplacement method (narrative), and volume
- Seal emplacement method and type/volume of sealant
- Borehole diameter and well casing diameter
- Type of protective well cap
- Surface seal and volumes/mix of annular seal material
- Screen length and interval reported in feet below ground surface and elevation
- Well location given to within an accuracy of 0.5 feet based upon survey from acceptable survey point
- Well depth given to within an accuracy of 0.01 feet based upon survey from acceptable survey point
- Lithologic logs
- Documentation that water quality field parameters meet well development criteria (Section 4.2)
- Documentation of ground surface elevation (±0.01 feet)
- Documentation of top of casing elevation (±0.01 feet)
- Schematic of the well with dimensions for all components (e.g., casing, screen, sump, well pad)

5. GROUNDWATER MONITORING PARAMETERS AND FREQUENCY

The following describes groundwater sampling requirements with respect to parameters for analysis, sampling frequency, sample preservation and shipment, and analytical methods. Groundwater samples used to provide compliance monitoring data will not be filtered prior to collection.

Table 1, Groundwater Monitoring Parameters and Frequency, presents the groundwater monitoring parameters and sampling frequency. A minimum of eight independent samples from each groundwater well were collected between May 2016 and May 2017 and analyzed for 40 CFR 257, Subpart D, Appendix III and Appendix IV test parameters to establish a background statistical dataset. Subsequently, in accordance with 391-3-4-.10(6), the monitoring frequency for the Appendix III parameters will be at least semi-annual during closure activities and the post-CCR removal monitoring period. Pursuant to 391-3-4-.10(6), an assessment monitoring program was established for AP-2 based on statistically significant increases documented in the *2017 Annual Groundwater Monitoring and Corrective Action Report* (dated January 31, 2018) (ERM, 2018). Georgia Power will complete assessment monitoring activities as required in Georgia Chapter 391-3-4-.10(6), Rules for Solid Waste Management.

When referenced throughout this plan, Appendix III and Appendix IV parameters refer to the parameters contained in Appendix III and Appendix IV of 40 CFR 257, Subpart D, 80 Fed. Reg. 21468 (April 17, 2015).

As shown on **Table 2**, Analytical Methods, the groundwater samples will be analyzed using methods specified in EPA Manual SW-846, EPA 600/4-79-020, Standard Methods for the Examination of Water and Wastewater (SM18-20), EPA Methods for the Chemical Analysis of Water and Wastes (MCAWW), ASTM, or other suitable analytical methods approved by EPD. The method used will be able to reach a suitable practical quantification limit to detect natural background conditions at the facility. The groundwater samples will be analyzed by licensed and accredited laboratories through the National Environmental Laboratory Accreditation Conference (NELAC). Field instruments used to measure pH must be accurate and reproducible to within 0.1 Standard Units (S.U.).

TABLE 1
GROUNDWATER MONITORING PARAMETERS & FREQUENCY

MONITORING PARAMETER		GROUNDWATER MONITORING	
		Background	Semi-Annual Events
Field Parameters	Temperature	X	X
	pH	X	X
	ORP	X	X
	Turbidity	X	X
	Specific Conductance	X	X
	Dissolved Oxygen	X	X
Appendix III (Detection)	Boron	X	X
	Calcium	X	X
	Chloride	X	X
	Fluoride	X	X
	pH	X	X
	Sulfate	X	X
	Total Dissolved Solids	X	X
Appendix IV (Assessment)	Antimony	X	Assessment sampling frequency and parameter list determined in accordance with Georgia Chapter 391-3-4.10(6).
	Arsenic	X	
	Barium	X	
	Beryllium	X	
	Cadmium	X	
	Chromium	X	
	Cobalt	X	
	Fluoride	X	
	Lead	X	
	Lithium	X	
	Mercury	X	
	Molybdenum	X	
	Selenium	X	
	Thallium	X	
	Radium 226 & 228	X	

TABLE 2
ANALYTICAL METHODS

Parameters	USEPA Method Number
Boron	6010B/6020B
Calcium	6010B/6020B
Chloride	300.0/300.1/9250/9251/9253/9056A
Fluoride	300.0/300.1/9214/9056A
pH	150.1 field
Sulfate	9035/9036/9038/300.0/300.1/9056A
Total Dissolved Solids (TDS)	160/2540C
Antimony	EPA 7040/7041/6010B/6020B
Arsenic	EPA 7060A/7061A/6010B/6020B
Barium	EPA 7080A/7081/6010B/6020B
Beryllium	EPA 7090/7091/6010B/6020B
Cadmium	EPA 7130/7131A/6020B
Chromium	EPA 7190/7191/6010B/6020B
Cobalt	EPA 7200/7201/6010B/6020B
Fluoride	300.0/300.1/9214/9056A
Lead	EPA 7420/7421/6010B/6020B
Lithium	6010/6020B
Mercury	7470
Molybdenum	6010/6020B
Selenium	EPA 7740/7741A/6010B/6020B
Thallium	EPA 7840/7841/6010/6020B
Radium 226 and 228 combined	EPA 903/9320/9315

6. SAMPLE COLLECTION

During each sampling event, samples will be collected and handled in accordance with the procedures specified in **Appendix C**, Groundwater Sampling Procedure. Sampling procedures were developed using standard industry practice and USEPA Region 4 *Field Branches Quality System and Technical Procedures* as a guide. Low-flow sampling methodology will be utilized for sample collection. Alternative industry accepted sampling techniques may be used when appropriate with prior EPD approval. The applied groundwater purging and sampling methodologies will be discussed in the groundwater semi-annual monitoring reports submitted to EPD.

For groundwater sampling, positive gas displacement Teflon or stainless-steel bladder pumps will be used for purging. If dedicated bladder pumps are not used, portable bladder pumps or peristaltic pumps (with dedicated or disposable tubing) may be used. When non-dedicated equipment is used, it will be decontaminated prior to use and between wells.

Per Georgia Rule 391-3-4-.10(6)(g) monitoring wells require replacement after two consecutive dry sampling events. Well installation must be directed by a qualified groundwater scientist. A minor modification shall be submitted in accordance with Rule 391-3-4-.02(3)(b)(6) prior to the installation or decommissioning of monitoring wells.

7. CHAIN-OF-CUSTODY

All samples will be handled under chain-of-custody (COC) procedures beginning in the field. The COC record will contain the following information:

- Sample identification numbers
- Signature of collector
- Date and time of collection
- Sample type
- Sample point identification
- Number of sample containers
- Signature of person(s) involved in the chain of possession
- Dates of possession by each individual
- Notated date(s) and time(s) of sample transfer between individuals

The samples will remain in the custody of assigned personnel, an assigned agent, or the laboratory. If the samples are transferred to other employees for delivery or transport, the sampler or possessor will relinquish possession and the samples must be received by the new owner.

If the samples are being shipped, a hard copy COC will be signed and enclosed within the shipping container.

Samplers will use COC forms provided by the analytical laboratory or use a COC form similarly formatted and containing the information listed above.

8. FIELD QUALITY ASSURANCE / QUALITY CONTROL

All field quality control samples will be prepared the same as compliance samples with regard to sample volume, containers, and preservation. The following quality control samples will be collected during each sampling event:

Field Equipment Rinsate Blanks - Where sampling equipment is not new or dedicated, an equipment rinsate blank will be collected at a rate of one blank per 10 samples using non-dedicated equipment.

Field Duplicates - Field duplicates are collected by filling additional containers at the same location, and the field duplicate is assigned a unique sample identification number. One blind field duplicate will be collected for every 20 samples.

Field Blanks - Field blanks are collected in the field using the same water source that is used for decontamination. The water is poured directly into the supplied sample containers in the field and submitted to the laboratory for analysis of target constituents. One field blank will be collected for every 20 samples.

The groundwater samples will be analyzed by licensed and accredited laboratories through the National Environmental Laboratory Accreditation Program (NELAP).

Calibration of field instruments will occur daily and follow the recommended (specific) instrument calibration procedures provided by the manufacturer and/or equipment manual specific to each instrument. Daily calibration will be documented on field forms and these field forms will be included in all groundwater monitoring reports. Instruments will be recalibrated as necessary (e.g., when calibration checks indicate significant variability), and all checks and recalibration steps will be documented on field calibration forms. Calibration of the instruments will also be checked if any readings during sampling activities are suspect. Replacement probes and meters will be obtained as a corrective action in the event that recalibration does not improve instrument function. Calibration field forms will be provided with the semi-annual groundwater monitoring reports.

9. REPORTING RESULTS

A semi-annual groundwater report that documents the results of sampling and analysis will be submitted to EPD. Semi-annual groundwater monitoring reports will be submitted to the EPD within 90 days of receipt of the groundwater analytical data from the laboratory. At a minimum, semi-annual reports will include:

1. A narrative describing sampling activities and findings including a summary of the number of samples collected, the dates the samples were collected and whether the samples were required by the detection or assessment monitoring programs.

2. A brief overview of purging/sampling methodologies.

3. Discussion of results.

4. Recommendations for the future monitoring consistent with the Rules.

5. Potentiometric surface contour map for the aquifer(s) being monitored, signed and sealed by a Georgia-registered P.G. or P.E.

6. Table of as-built information for groundwater monitoring wells including top of casing elevations, ground elevations, screened elevations, current groundwater elevations and depth to water measurements.

7. Groundwater flow rate and direction calculations.

8. Identification of any groundwater wells that were installed or abandoned during the preceding year, along with a narrative description of why these actions were taken.

9. A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase over background levels).

10. If applicable, semi-annual assessment monitoring results.

11. Any alternate source demonstration completed during the previous monitoring period, if applicable.

12. Laboratory Reports.

13. COC documentation.

14. Field sampling logs including field instrument calibration, indicator parameters and parameter stabilization data.

15. Field logs and forms for each sampling event to include, but not limited to, well signage, well access, sampling and purging equipment condition, and any site conditions that may affect sampling

16. Documentation of non-functioning wells.

17. Table of current analytical results for each well, highlighting statistically significant increases and concentrations above maximum contaminant level (MCL).

18. Statistical analyses.

19. Certification by a qualified groundwater scientist.

10. STATISTICAL ANALYSIS

Groundwater quality data from each sampling event will be statistically evaluated to determine if there has been a statistically significant change in groundwater chemistry. Historical background data will be used to determine statistical limits. Statistical analysis techniques are consistent with the USEPA document *Statistical Analysis of Groundwater Data at RCRA Facilities Unified Guidance* (Unified Guidance) (USEPA, 2009).

According to EPD rules (391-3-4-.10(6)(a)), the Site must specify in the operating record the statistical methods to be used in evaluating groundwater monitoring data for each hazardous constituent. The statistical test chosen shall be conducted separately for each hazardous constituent in each well. As authorized by the rule, statistical tests that will be used include:

1. A prediction interval procedure in which an interval for each constituent is established from the distribution of the background data, and the level of each constituent in each compliance well is compared to the upper prediction limit. [§257.93(f)(3)].

2. A control chart approach that gives control limits for each constituent. [§257.93(f)(4)].

3. Another statistical test method (such as prediction limits or control charts) that meets the performance standards of §257.93(g) [§257.93(f)(5)]. A justification for an alternative method will be placed in the operating record and the Director notified of the use of an alternative test. The justification will demonstrate that the alternative method meets the performance standards of §257.93(g).

An interwell statistical method will be used to compare Appendix III groundwater monitoring data to background conditions. Confidence intervals will be constructed for each downgrardient well and used to compare Appendix IV groundwater monitoring data to groundwater protection standards.

A site-specific statistical analysis plan that provides details regarding the statistical methods to be used will be placed in the Site's operating record pursuant to 391-3-4-.10(6). **Figure 1**, Statistical Analysis Plan Overview, includes a flowchart that depicts the process that will be followed to develop the site-specific plan. **Figure 2**, Decision Logic for Computing Prediction Limits, presents the logic that will be used to calculate site-specific statistical limits and test compliance results against those limits.

FIGURE 1. STATISTICAL ANALYSIS PLAN OVERVIEW

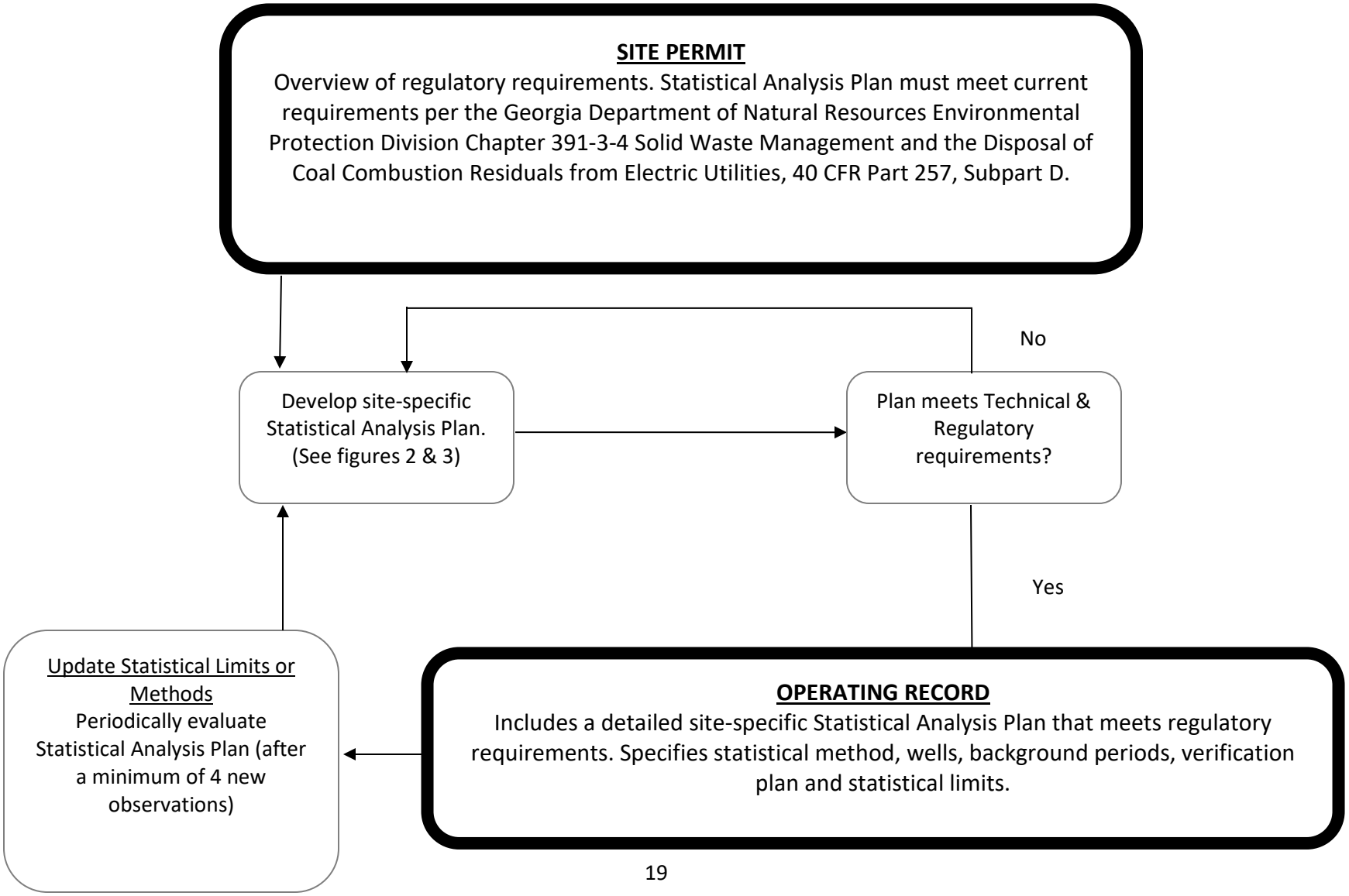
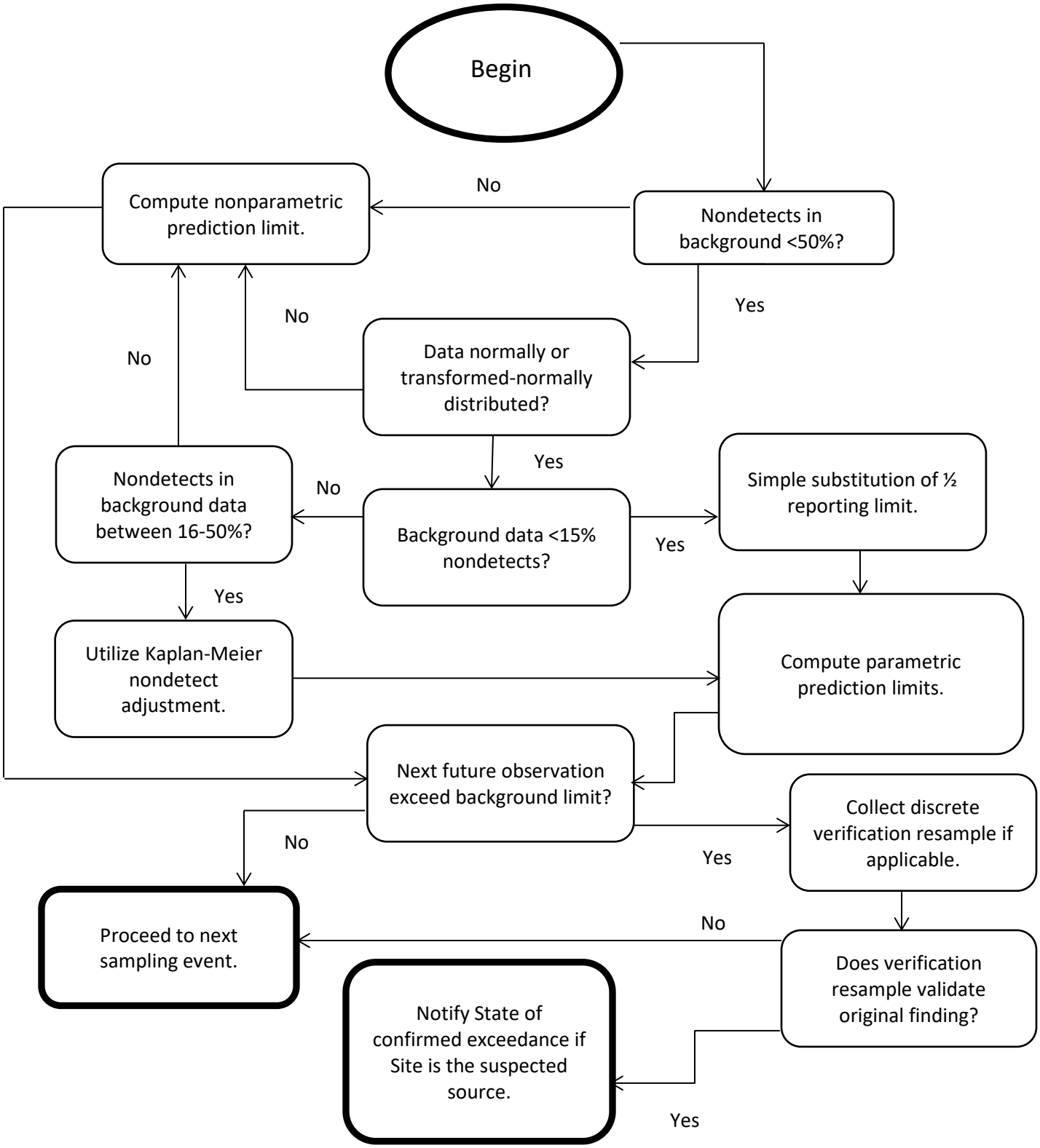


FIGURE 2. DECISION LOGIC FOR COMPUTING PREDICTION INTERVALS



11. REFERENCES

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APPENDIX

A. MONITORING SYSTEM DETAILS
B. GROUNDWATER MONITORING WELL DETAIL
C. GROUNDWATER SAMPLING PROCEDURE

A. MONITORING SYSTEM DETAILS

N

LEGEND

- Compliance Monitoring Well
- Groundwater Level Monitoring Piezometer

Note:
1. Aerial photograph source: Google Earth Pro, February 2018.

0 150 300 600

SCALE IN FEET

MONITORING WELL NETWORK MAP

GEORGIA POWER COMPANY
PLANT HAMMOND AP-2
ROME, FLOYD COUNTY, GEORGIA

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

KENNESAW, GA | JANUARY 2020

FIGURE A-1

N:\GA Power\Plant Hammond GW Services\GIS\mxd\Hammond\2019\GWMP\AP2\A1_WellMap.mxd 1/23/2020 1:03:41 PM

N:\GA Power\Plant Hammond GW Services\GIS\mxd\Hammond\2019\GWMP\AP2\A2 POTMap_June 2018_AP2.mxd 1/23/2020 2:06:53 PM

N

LEGEND

- Compliance Monitoring Well
- Groundwater Level Monitoring Piezometer
- Groundwater Elevation Iso-Contour
- Approximate Groundwater Flow Direction

Note:
1. Water level elevation recorded on June 4, 2018. Elevation provided in feet above mean sea level (ft AMSL) in North American Vertical Datum (NAVD) 88.

0 150 300 600

SCALE IN FEET

POTENTIOMETRIC SURFACE MAP (JUNE 2018)

GEORGIA POWER COMPANY
PLANT HAMMOND AP-2
ROME, FLOYD COUNTY, GEORGIA

Prepared For: Georgia Power

Prepared By: Geosyntec consultants

KENNESAW, GA | JANUARY 2020

FIGURE A-2

Table A-1
AP-2 Monitoring Network Well Details
Plant Hammond, Floyd County, Georgia

Well ID	Boring ID	Purpose	Northing [1]	Easting [1]	Ground Surface Elevation [2] (ft MSL)	Top of Casing Elevation [2] (ft MSL)	Well Depth [3] (ft BTOC)	Top of Screen Elevation [2] (ft MSL)	Bottom of Screen Elevation [2] (ft MSL)	June 2018 Groundwater Elevation [4] (ft MSL)	Screened Media
HGWA-1	APA-2/MW-20	Monitoring, upgradient	1550423.69	1940773.31	592.60	595.50	32.50	573.40	563.40	579.16	Highly weathered shaley limestone, Competent shaley limestone
HGWA-2	APA-3S	Monitoring, upgradient	1549796.40	1939845.20	585.23	588.18	27.95	570.23	560.23	581.76	Terrace alluvium
HGWA-3	APA-3D	Monitoring, upgradient	1549793.93	1939833.46	585.19	588.06	44.87	553.19	543.19	581.81	Highly weathered shaley limestone
HGWA-4	APA-4/MW-19	Monitoring, upgradient	1549932.76	1939386.17	585.60	588.30	25.80	572.90	562.90	581.70	Terrace alluvium, Residuum
HGWA-5	APA-5S	Monitoring, upgradient	1548632.65	1937183.80	580.37	583.52	27.95	565.57	555.57	577.52	Colluvium, Residuum
HGWA-6	APA-5D	Monitoring, upgradient	1548635.66	1937177.39	580.50	583.72	50.52	543.20	533.20	578.11	Partially weathered shale
HGWC-14	AP2-C1/MW-10	Monitoring, downgradient	1548005.66	1938402.95	595.50	598.10	43.00	565.50	555.50	574.26	Residuum
HGWC-15	AP2-C2/MW-11	Monitoring, downgradient	1547882.88	1937851.74	579.70	582.50	38.00	554.90	544.90	568.65	Residuum
HGWC-16	AP2-C3/MW-13	Monitoring, downgradient	1548217.01	1937539.49	578.40	581.10	33.10	558.40	548.40	571.61	Terrace alluvium, Colluvium
HGWC-17	AP2-C4/MW-14	Monitoring, downgradient	1548457.24	1937538.67	582.60	585.40	27.80	568.00	558.00	569.68	Residuum
HGWC-18	AP2-C5/MW-15	Monitoring, downgradient	1548827.89	1937559.01	582.50	585.30	27.80	568.00	558.00	569.25	Residuum, Partially weathered shale

Notes:
ft BTOC = feet below top of casing
ft MSL = feet mean sea level
(1) Coordinates in North American Datum (NAD) 1983, State Plane, Georgia-West, feet.
(2) Vertical elevations are in North American Vertical Datum (NAVD) 1988.
(3) Total well depth accounts for sump if data provided on well construction logs.
(4) Groundwater elevations calculated from data recorded by Geosyntec Consultants on June 4, 2018.

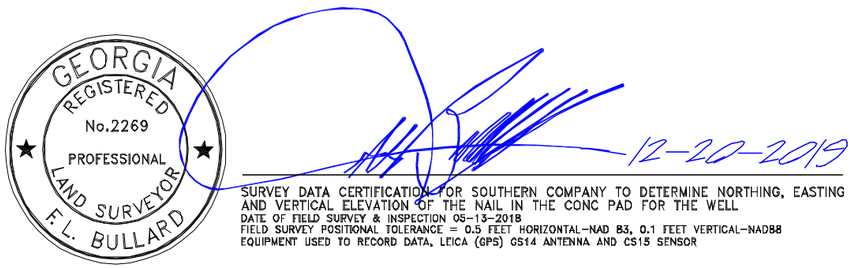


Table A-2

AP-2 Water Level Monitoring Network Piezometer Details

Plant Hammond, Floyd County, Georgia

Well ID [1]	Boring ID	Northing [1]	Easting [1]	Ground Surface Elevation [2] (ft MSL)	Top of Casing Elevation [2] (ft MSL)	Well Depth [3] (ft BTOC)	Top of Screen Elevation [2] (ft MSL)	Bottom of Screen Elevation [2] (ft MSL)	June 2018 Groundwater Elevation [4] (ft MSL)	Screened Media
MW-8	MW08	1548174.39	1940014.36	584.70	587.37	32.27	565.50	555.50	569.53	Terrace alluvium, Residuum
MW-9	AP02-MW09	1548136.52	1938918.59	589.20	591.67	32.17	569.90	559.90	579.70	Residuum
MW-12	AP02-MW12	1547862.70	1937521.75	581.70	584.33	37.83	556.90	546.90	568.58	Terrace alluvium
MW-16	AP02-MW16	1549110.61	1937941.31	572.70	575.22	22.42	563.20	553.20	569.35	Partially weathered shale, Competent shale
MW-17	AP02-MW17	1549168.15	1938344.56	584.60	587.67	28.17	569.90	559.90	578.43	Residuum, Partially weathered shale
MW-18	AP02-MW18	1548988.42	1938713.61	590.60	593.07	31.57	571.90	561.90	583.59	Residuum, Partially weathered shale

Notes:

ft BTOC = feet below top of casing

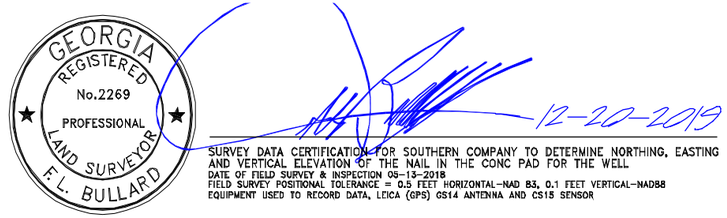
ft MSL = feet mean sea level

(1) Coordinates in North American Datum (NAD) 1983, State Plane, Georgia-West, feet.

(2) Vertical elevations are in North American Vertical Datum (NAVD) 1988.

(3) Total well depth accounts for sump if data provided on well construction logs.

(4) Groundwater elevations calculated from data recorded by Geosyntec Consultants on June 4, 2018.



SOUTHERN COMPANY

LOG OF TEST BORING

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DATE STARTED 12/3/2014 **COMPLETED** 12/3/2014 **SURF. ELEV.** 592.6 **COORDINATES:** N:34.256407 E:-85.344210
CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** Hollow Stem Auger; HQ Rock Core
DRILLED BY T. Milam **LOGGED BY** W. Shaughnessy **CHECKED BY** L. Millet **ANGLE** _____ **BEARING** _____
BORING DEPTH 29.7 ft. **GROUND WATER DEPTH: DURING** _____ **COMP.** _____ **DELAYED** 17.1 ft. after 24 hrs.
NOTES Well installed. Refer to well data sheet.

DEPTH (ft)	GRAPHIC LOG	STRATA DESCRIPTION	ELEV.	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N-VALUE) / PERCENT RECOVERY (RQD)	COMMENTS
5		**Clayey Gravel (GC)**					
		- brown and light brown, dry, dense		SS -1	3.5-5.0	7-13-18 (**31**)	
			586.6				
10		**Silty Clay (CL)**					
		- pale gray-brown, dry, very stiff, with red and yellow-brown mottling		SS -2	8.5-10.0	7-10-12 (**22**)	
15		- brown, dry, stiff, with gray mottling		SS -3	13.5-15.0	6-6-6 (**12**)	
			574.1				
20		**SHALEY LIMESTONE**					Auger refusal at 18.5 ft.
		- gray and dark gray, not to highly weathered, shale seams less than 1/2 inch, shear/fracture zone fabric, near vertical bedding, water staining		RC -1	18.7-25.2	**95** (23)	
25				RC -2	25.2-29.7	**98** (9)	
			562.9				

Bottom of borehole at 29.7 feet.

SOUTHERN COMPANY

RECORD OF WELL CONSTRUCTION

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DATE STARTED 12/3/2014 **COMPLETED** 12/3/2014 **SURF. ELEV.** 592.6 **COORDINATES:** N:34.256407 E:-85.344210
CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** Hollow Stem Auger; HQ Rock Core
DRILLED BY T. Milam **LOGGED BY** W. Shaughnessy **CHECKED BY** L. Millet **ANGLE** **BEARING**
BORING DEPTH 29.7 ft. **GROUND WATER DEPTH: DURING** **COMP.** **DELAYED** 17.1 ft. after 24 hrs.
NOTES Well installed. Refer to well data sheet.

BOREHOLE DATA — ELEV. / Strata; DEPTH (ft)

WELL DATA

Surface:
protective aluminum cover with bollards; 4-foot square concrete pad

ELEV. (DEPTH)	
	Surface Seal: concrete
590.6 (2.0)	
	Well: 2" OD PVC (SCH 40)
586.6	Annular Fill: Cement-Bentonite Grout (2 - 94lbs. bags, 22 gal.)
582.7 (9.9)	
	Annular Seal: 3/8 bentonite pellets (1 - 50lbs. bucket)
578.0 (14.6)	
	Filter: #1A silica filter sand (2 - 50lbs. bags)
574.1	
573.4 (19.2)	
	Screen: 10 ft. 0.010" slot pre-pack
563.4	
562.9	Sump:0.40 ft.
563.0	Backfill:Silica Sand

COMMENTS

RECORD OF BOREHOLE HGWA-2/ APA-3S

SHEET 1 of 1

PROJECT: SCS Hammond
PROJECT NUMBER: 1545812
DRILLED DEPTH: 27.00 ft
LOCATION: Rome, GA

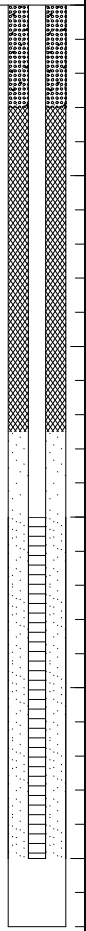
DRILL RIG: Pro Sonic 150
DATE STARTED: 12/2/15
DATE COMPLETED: 12/2/15

NORTHING: 1,549,796.40
EASTING: 1,939,845.20
GS ELEVATION: 585.23
TOC ELEVATION: 588.18 ft

DEPTH W.L.: 8.19 (bgs)
ELEVATION W.L.: (amsl)
DATE W.L.: 12/2/15
TIME W.L.: 11:10

DEPTH (ft)	ELEVATION (ft)	DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLE NO.	TYPE	REC
0	585	0.00 - 3.00 CLAY; light brown/grey silty clay, trace organic material, soft	CL		582.23			
		3.00 - 7.00 SILTY CLAY; grey/orange/light brown silty clay, mottled, stiff to very stiff, some black streaking from 3'-4', moist	CL		3.00 578.23			
5	580	7.00 - 8.00 CLAY; light brown/orange/grey sandy, gravelly clay, mottled, moist	CL		7.00 577.23			
		8.00 - 12.00 SANDY GRAVEL; orange/light brown sandy gravel, coarse grained, sub-angular gravel,	GP		8.00 573.23			
10	575	12.00 - 17.00 light brown/orange sandy gravel, coarse grain, loosely compacted, moist			12.00 568.23			
		17.00 - 18.00 GRAVELLY CLAY; orange/light brown gravelly clay, sub-angular gravel, moist	CLG		17.00 567.23			
15	570	18.00 - 24.00 SANDY GRAVEL; orange/light brown sandy gravel, coarse grained, trace clay lenses, wet	GP		18.00 561.23			
		24.00 - 26.00 SILT; orange/light brown layered silt, soft, wet	ML		24.00 559.23			
20	565	26.00 - 27.00 grey silt with trace limestone shale and clay, foliated, soft, wet			26.00 558.23			
		Boring completed at 27.00 ft						
25	560							
30	555							
35	550							
40	545							
45								

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval: -3'-15'
Material: Schedule 40 PVC
Diameter: 6"
Joint Type: Screw/Flush

WELL SCREEN
Interval: 15'-25'
Material: Schedule 40 PVC
Diameter: 2'
Slot Size: 0.010"
End Cap: Schedule 40 PVC

FILTER PACK
Interval: 12.5'-25'
Type: #1 sand/ Prepack Filter

FILTER PACK SEAL
Interval: 3'-12.5'
Type: 3/8" Bentonite Pellets

ANNULUS SEAL
Interval: 0'-3'
Type: Portland Type I/Type II/Gel Mix

WELL COMPLETION
Pad: 4'x4'x4"
Protective Casing: Anodized Aluminum

DRILLING METHODS
Soil Drill: 6-inch diameter Sonic
Rock Drill: 6-inch diameter Sonic

LOG SCALE: 1 in = 5.5 ft
DRILLING COMPANY: Cascade
DRILLER: Tom Ardito

GA INSPECTOR: James Mullooly
CHECKED BY: Rachel P. Kirkman, P.G.
DATE: 9/29/17

Golder Associates

BOREHOLE RECORD HAMMOND BORING LOGS.GPJ PIEDMONT.GDT 9/29/17

RECORD OF BOREHOLE HGWA-3/ APA-3D

SHEET 1 of 1

PROJECT: SCS Hammond
PROJECT NUMBER: 1545812
DRILLED DEPTH: 42.00 ft
LOCATION: Rome, GA

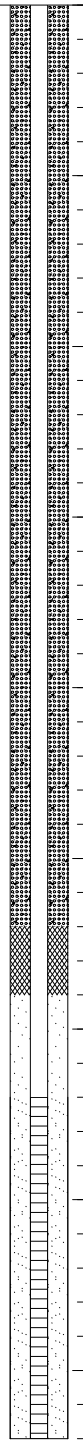
DRILL RIG: Pro Sonic 150
DATE STARTED: 12/1/15
DATE COMPLETED: 12/2/15

NORTHING: 1,549,793.93
EASTING: 1,939,833.46
GS ELEVATION: 585.19
TOC ELEVATION: 588.06 ft

DEPTH W.L.: 2.68 (bgs)
ELEVATION W.L.: (amsl)
DATE W.L.: 12/2/15
TIME W.L.: 07:30

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES SAMPLE NO.	SAMPLES TYPE	SAMPLES REC
0	585	0.00 - 5.00 SANDY CLAY; grey/brown/orange mottled sandy clay, fine grained, medium density, stiff, moist	CLS		580.19			
5	580	5.00 - 13.00 CLAYEY GRAVEL; orange/brown clayey gravel with some sand, poorly sorted and angular pieces, gravel becomes more rounded at 9 feet, medium density compaction	GC		5.00 572.19			
10	575	13.00 - 14.00 wet around 13.5 feet	GC		13.00 571.19			
15	570	14.00 - 17.00 SANDY GRAVEL; brown/grey poorly sorted, well rounded sandy gravel, wet	GP		14.00 568.19			
20	565	17.00 - 25.00 orange/brown sandy gravel, well rounded, poorly sorted, wet			17.00 560.19			
25	560	25.00 - 26.00 some larger rock fragments and coarse grained sand			25.00 559.19			
		26.00 - 31.00 CLAY; brown/grey sandy gravel, changes to grey weathered limestone and clay, medium density, firm, moist	CL		26.00 554.19			
30	555	31.00 - 37.00 TRANSITIONALLY WEATHERED ROCK; transitionally weathered limestone and trace clay, angular rock fragments, clay is mottled light and dark grey, wet	TWR		31.00 548.19			
35	550	37.00 - 42.00 transitionally weathered dark grey shaly limestone, poorly sorted and angular, some gravel, bottom 3 inches are solid limestone, wet (saturated)			37.00 543.19			
40	545	Boring completed at 42.00 ft						
45								

MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES



WELL CONSTRUCTION DETAILS

WELL CASING
Interval:
Material: Schedule 40 PVC
Diameter: 6"
Joint Type: Screw/Flush

WELL SCREEN
Interval: 32'-42'
Material: Schedule 40 PVC
Diameter: 2'
Slot Size: 0.010"
End Cap: Schedule 40 PVC

FILTER PACK
Interval: 29'-42'
Type: #1 sand/ Prepack Filter

FILTER PACK SEAL
Interval: 27'-29'
Type: 3/8" Bentonite Pellets

ANNULUS SEAL
Interval: 0'-27'
Type: Portland Type I/Type II/Gel Mix

WELL COMPLETION
Pad: 4'x4'x4"
Protective Casing: Anodized Aluminum

DRILLING METHODS
Soil Drill: 6-inch diameter Sonic
Rock Drill: 6-inch diameter Sonic

LOG SCALE: 1 in = 5.5 ft
DRILLING COMPANY: Cascade
DRILLER: Tom Ardito

GA INSPECTOR: James Mullooly
CHECKED BY: Rachel P. Kirkman, P.G.
DATE: 9/29/17

Golder Associates

BOREHOLE RECORD HAMMOND BORING LOGS.GPJ PIEDMONT.GDT 9/29/17

SOUTHERN COMPANY

LOG OF TEST BORING

HGWA-4 **BORING MW19**

ECS37736

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DATE STARTED 12/3/2014 **COMPLETED** 12/3/2014 **SURF. ELEV.** 585.6 **COORDINATES:** N:34.255014 E:-85.348781
CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** Hollow Stem Auger; Hollow Stem Auger
DRILLED BY T. Milam **LOGGED BY** W. Shaughnessy **CHECKED BY** L. Millet **ANGLE** **BEARING**
BORING DEPTH 24 ft. **GROUND WATER DEPTH: DURING** 15 ft. **COMP.** **DELAYED** 4.5 ft. after 24 hrs.
NOTES Well installed. Refer to well data sheet.

DEPTH (ft)	GRAPHIC LOG	STRATA DESCRIPTION	ELEV.	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N-VALUE) / PERCENT RECOVERY (RQD)	COMMENTS
		Lean Clay (CL)					
		- pale brown-gray, damp, stiff, with red and yellow-brown mottling		SS -1	3.5-5.0	4-6-9 (**15**)	
5							
		- pale brown-gray, damp, stiff, sandy, with red and yellow-brown mottling		SS -2	8.5-10.0	4-5-6 (**11**)	
10			573.6				
		Silty Gravel (GM)					
		- yellow-brown, wet, medium dense, sandy, coarse well-rounded quartz gravel, some clay		SS -3	13.5-15.0	7-12-14 (**26**)	
15							
		- yellow-brown, wet, very loose, sandy, coarse well-rounded quartz gravel, some clay		SS -4	18.5-20.0	2-2-2 (**4**)	
20			563.6				
		Clayey Sand (SC)					
		- pale brown, wet, very dense, some partially weathered bedrock (angular gravel)	561.6	SS -5	23.5-23.6	50/1" (**100+**)	Auger refusal at 24 ft.
		Bottom of borehole at 24.0 feet.					

SOUTHERN COMPANY

RECORD OF WELL CONSTRUCTION

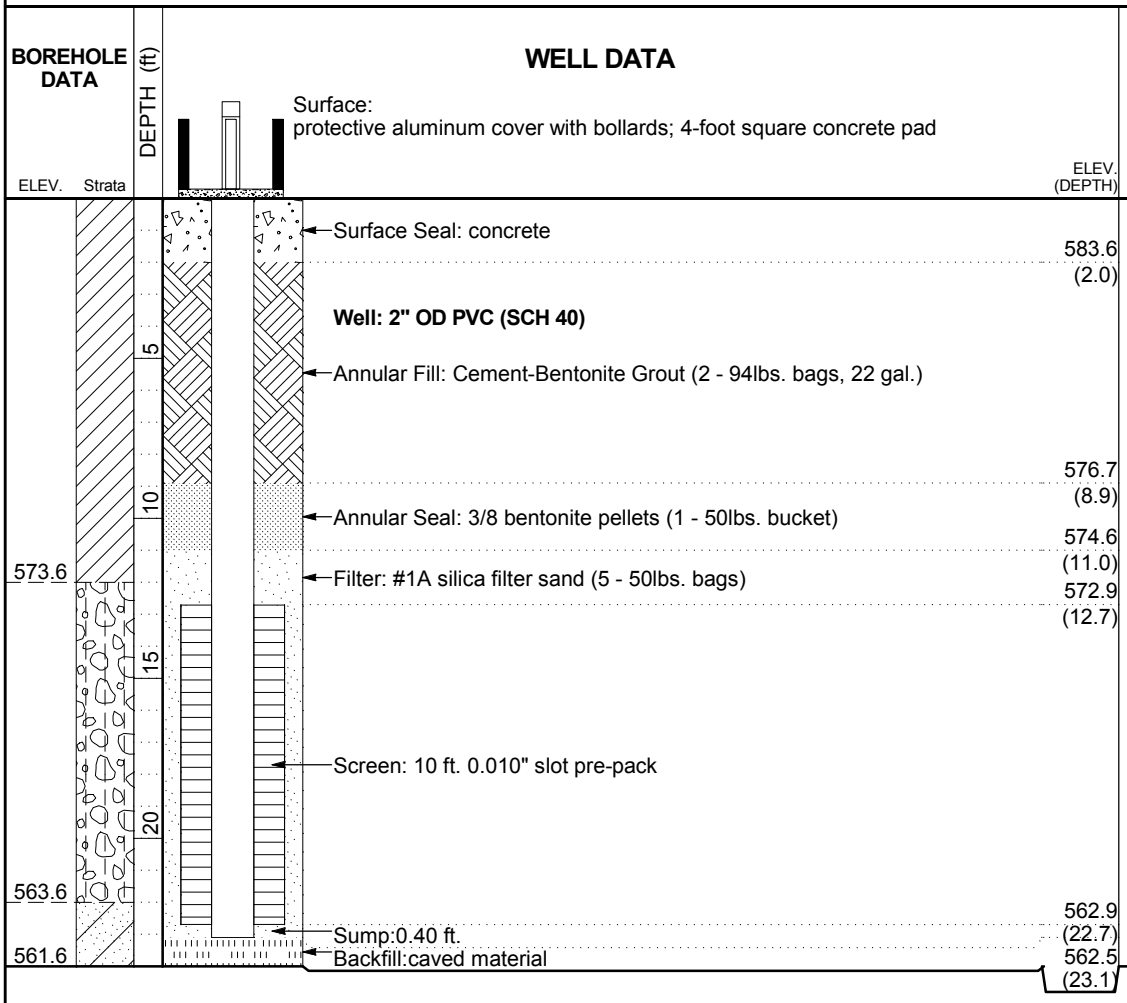
HGWA-4

WELL: MW19
PAGE 1 OF 1
ECS37736

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DATE STARTED 12/3/2014 **COMPLETED** 12/3/2014 **SURF. ELEV.** 585.6 **COORDINATES:** N:34.255014 E:-85.348781
CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** Hollow Stem Auger; Hollow Stem Auger
DRILLED BY T. Milam **LOGGED BY** W. Shaughnessy **CHECKED BY** L. Millet **ANGLE** **BEARING**
BORING DEPTH 24 ft. **GROUND WATER DEPTH: DURING** 15 ft. **COMP.** **DELAYED** 4.5 ft. after 24 hrs.
NOTES Well installed. Refer to well data sheet.



RECORD OF BOREHOLE HGWA-5/ APA-5S

SHEET 1 of 1

PROJECT: SCS Hammond
PROJECT NUMBER: 1545812
DRILLED DEPTH: 26.00 ft
LOCATION: Rome, GA

DRILL RIG: Pro Sonic 150
DATE STARTED: 12/10/15
DATE COMPLETED: 12/10/15

NORTHING: 1,548,632.65
EASTING: 1,937,183.80
GS ELEVATION: 580.37
TOC ELEVATION: 583.52 ft

DEPTH W.L.: 2.3' (bgs)
ELEVATION W.L.: (amsl)
DATE W.L.: 12/10/15
TIME W.L.: 13:05

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: SAMPLE NO.	TYPE	REC	MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
0	580	0.00 - 2.00 CLAY; dark brown/grey clay with some fine to medium sand, trace organic material, trace gravel, non-plastic, very soft, moist W>PL	CL		578.37					
		2.00 - 7.00 yellow orangish red clay, trace fine sand, moderate plasticity, soft to firm, moist, W=PL			2.00					
5	575				573.37				Portland Type I/ Type II/ Gel mix	
		7.00 - 16.50 reddish orange and blue grey mottled clay with trace fine sand and gravel, non to low plasticity, very stiff to hard, dry to moist			7.00					
10	570								3/8" Bentonite Pellets	
15	565				563.87					
		16.50 - 17.00 SILTY SAND; orange brown silty sand, sandy silt, non-plastic, loose, soft, uniform grading, moist	SM		563.37 17.00		SH	2.00		
		17.00 - 19.00 SILTY CLAY; orange/yellow/dark grey silt and clay, trace gravel, non-plastic, very soft, wet, W>PL SHELBY TUBE: 17'-19'	CL-ML		561.37		SH	2.00		
20	560	19.00 - 22.50 SAND; alluvium, dark grey sand with some pebbles and cobbles, rounded to sub-rounded, loose, soft, moist to wet	SP		19.00 557.87				#1 sand 0.010" slot screen	
		22.50 - 23.00 CLAY; hard, dark grey clay, non-plastic, dry to moist, W<PL	CL		557.37					
		23.00 - 26.00 SILT; dark grey to black shale with trace fine sand, very stiff to hard, rock fragments contain pyrite, dry, W<PL	ML		23.00 554.37					
25	555	Boring completed at 26.00 ft								
30	550									
35	545									
40	540									
45										

WELL CASING
Interval: -3'-15'
Material: Schedule 40 PVC
Diameter: 6"
Joint Type: Screw/Flush

WELL SCREEN
Interval: 14.8'-24.8'
Material: Schedule 40 PVC
Diameter: 2'
Slot Size: 0.010"
End Cap: Schedule 40 PVC

FILTER PACK
Interval: 11.5'-26'
Type: #1 sand/ Prepack Filter

FILTER PACK SEAL
Interval: 9.5'-11.5'
Type: 3/8" Bentonite Pellets

ANNULUS SEAL
Interval: 0'-9.5'
Type: Portland Type I/Type II/Gel Mix

WELL COMPLETION
Pad: 4'x4'x4"
Protective Casing: Anodized Aluminum

DRILLING METHODS
Soil Drill: 6-inch diameter Sonic
Rock Drill: 6-inch diameter Sonic

LOG SCALE: 1 in = 5.5 ft
DRILLING COMPANY: Cascade
DRILLER: Tom Ardito

GA INSPECTOR: Michael Boatman
CHECKED BY: Rachel P. Kirkman, P.G.
DATE: 9/29/17

Golder Associates

BOREHOLE RECORD HAMMOND BORING LOGS.GPJ PIEDMONT.GDT 9/29/17

RECORD OF BOREHOLE HGWA-6/ APA-5D

PROJECT: SCS Hammond
PROJECT NUMBER: 1545812
DRILLED DEPTH: 47.30 ft
LOCATION: Rome, GA

DRILL RIG: Pro Sonic 150
DATE STARTED: 12/10/15
DATE COMPLETED: 12/11/15

NORTHING: 1,548,635.66
EASTING: 1,937,177.39
GS ELEVATION: 580.50
TOC ELEVATION: 583.72 ft

DEPTH W.L.: 3.10' (bgs)
ELEVATION W.L.: (amsl)
DATE W.L.: 12/11/15
TIME W.L.: 07:50

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: SAMPLE NO.	TYPE	REC	MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
0	580	0.00 - 2.00 CLAY; dark brown/grey clay with some fine to medium sand, trace organic material, trace gravel, very soft, non-plastic, moist, W>PL	CL		578.5				Portland Type I/ Type II/ Gel mix	**WELL CASING** Interval: -3'-37' Material: Schedule 40 PVC Diameter: 6" Joint Type: Screw/Flush
		2.00 - 7.00 yellow/orange/red clay, trace fine sand, moderate plasticity, soft to firm, moist, W=PL			2.00					
5	575				573.5					**WELL SCREEN** Interval: 37.3'-47.3' Material: Schedule 40 PVC Diameter: 2' Slot Size: 0.010" End Cap: Schedule 40 PVC
		7.00 - 16.50 reddish orange and blue grey mottled clay, trace fine sand and gravel, non to low plasticity, very stiff to hard, dry to moist, W<PL			7.00					**FILTER PACK** Interval: 34'-47.3' Type: #1 sand/ Prepack Filter
10	570									**FILTER PACK SEAL** Interval: 32'-34' Type: 3/8" Bentonite Pellets
										ANNULUS SEAL Interval: 0'-3' Type: Portland Type I/Type II/Gel Mix
15	565				564					**WELL COMPLETION** Pad: 4'x4'x4" Protective Casing: Anodized Aluminum
		16.50 - 17.00 SILTY SAND; orange brown silty sand, non-plastic, loose soft, uniform grading, moist	SM		563.5				3/8" Bentonite Pellets	**DRILLING METHODS** Soil Drill: 6-inch diameter Sonic Rock Drill: 6-inch diameter Sonic
		17.00 - 19.00 SAND and CLAY; orange/yellow/dark grey sand and clay, trace gravel, non plastic, very soft, wet, W>PL	CLS		17.00 561.5					
20	560	19.00 - 22.50 SANDY GRAVEL; alluvium, dark grey sand with some pebbles and cobbles, rounded to sub-rounded, loose, soft, moist to wet	GPS		19.00 558					
		22.50 - 23.00 CLAY; dark grey clay, hard, dry to moist, W<PL	CL		557.5 23.00					
25	555	23.00 - 27.00 SILT and GRAVEL; dark grey to black silt with trace fine sand and gravel, some shale, very stiff to hard, contains rock fragments with pyrite, dry, W<PL	GP-GM		553.5					
		27.00 - 31.00 TRANSITIONALLY WEATHERED ROCK; broken shale, dark grey to black silt with trace fine sand, dry, non-plastic, loose, W<PL	TWR		27.00					
30	550				549.5					
		31.00 - 37.00 broken shale, dark grey to black silt with trace fine sand, dry, non-plastic, loose, W<PL			31.00				3/8" Bentonite Pellets	
35	545				543.5					
		37.00 - 47.00 broken shale, dark grey to black silt with trace fine sand, more rock fragments (30-40%), dry, non-plastic, loose, W<PL			37.00					
40	540								#1 sand 0.010" slot screen	
45		Log continued on next page								

LOG SCALE: 1 in = 5.5 ft
DRILLING COMPANY: Cascade
DRILLER: Tom Ardito

GA INSPECTOR: Michael Boatman
CHECKED BY: Rachel P. Kirkman, P.G.
DATE: 9/29/17

Golder Associates

RECORD OF BOREHOLE HGWA-6/ APA-5D

PROJECT: SCS Hammond
PROJECT NUMBER: 1545812
DRILLED DEPTH: 47.30 ft
LOCATION: Rome, GA

DRILL RIG: Pro Sonic 150
DATE STARTED: 12/10/15
DATE COMPLETED: 12/11/15

NORTHING: 1,548,635.66
EASTING: 1,937,177.39
GS ELEVATION: 580.50
TOC ELEVATION: 583.72 ft

DEPTH W.L.: 3.10' (bgs)
ELEVATION W.L.: (amsl)
DATE W.L.: 12/11/15
TIME W.L.: 07:50

DEPTH (ft)	ELEVATION (ft)	SOIL PROFILE: DESCRIPTION	USCS	GRAPHIC LOG	ELEV. / DEPTH (ft)	SAMPLES: SAMPLE NO.	TYPE	REC	MONITORING WELL/ PIEZOMETER DIAGRAM and NOTES	WELL CONSTRUCTION DETAILS
45	535	37.00 - 47.00 broken shale, dark grey to black silt with trace fine sand, more rock fragments (30-40%), dry, non-plastic, loose, W<PL *(Continued)*			533.5 / 47.00					
		Boring completed at 47.30 ft								
50	530									
55	525									
60	520									
65	515									
70	510									
75	505									
80	500									
85	495									
90										

WELL CASING
Interval: -3'-37'
Material: Schedule 40 PVC
Diameter: 6"
Joint Type: Screw/Flush

WELL SCREEN
Interval: 37.3'-47.3'
Material: Schedule 40 PVC
Diameter: 2'
Slot Size: 0.010"
End Cap: Schedule 40 PVC

FILTER PACK
Interval: 34'-47.3'
Type: #1 sand/ Prepack Filter

FILTER PACK SEAL
Interval: 32'-34'
Type: 3/8" Bentonite Pellets

ANNULUS SEAL
Interval: 0'-3'
Type: Portland Type I/Type II/Gel Mix

WELL COMPLETION
Pad: 4'x4'x4"
Protective Casing: Anodized Aluminum

DRILLING METHODS
Soil Drill: 6-inch diameter Sonic
Rock Drill: 6-inch diameter Sonic

LOG SCALE: 1 in = 5.5 ft
DRILLING COMPANY: Cascade
DRILLER: Tom Ardito

GA INSPECTOR: Michael Boatman
CHECKED BY: Rachel P. Kirkman, P.G.
DATE: 9/29/17

Golder Associates

SOUTHERN COMPANY

LOG OF TEST BORING

HGWC-14 **BORING AP02-MW10**

ECS37736

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DATE STARTED 10/16/2014 **COMPLETED** 10/16/2014 **SURF. ELEV.** 595.5 **COORDINATES:** N:34.249688 E:-85.351960
CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** Hollow Stem Auger; Hollow Stem Auger
DRILLED BY T. Milam **LOGGED BY** W. Shaughnessy **CHECKED BY** L. Millet **ANGLE** **BEARING**
BORING DEPTH 40.4 ft. **GROUND WATER DEPTH: DURING** 30 ft. **COMP.** **DELAYED** 23.2 ft. after 96 hrs.
NOTES Well installed. Refer to well data sheet.

DEPTH (ft)	GRAPHIC LOG	STRATA DESCRIPTION	ELEV.	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N-VALUE) / PERCENT RECOVERY (RQD)	COMMENTS
		Fill (CL)					
		- dark brown and brown, dry, hard, clay and gravel		SS -1	3.5-5.0	2-13-21 (**34**)	
		- dry, stiff, gravel, low recovery		SS -2	8.5-10.0	7-6-8 (**14**)	
		- brown, very moist, very hard, clay with gravel, some sand		SS -3	13.5-14.6	42-50 (**100+**)	
			578.5				
		Silt (ML)					
		- dark green and gray, damp, stiff, clayey, with black mottles		SS -4	18.5-20.0	6-5-7 (**12**)	
			573.5				
		Fat Clay (CH)					
		- brown, damp, medium stiff, medium to high plasticity, some silt		SS -5	23.5-25.0	3-3-5 (**8**)	

(Continued Next Page)

SOUTHERN COMPANY

LOG OF TEST BORING

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DEPTH (ft)	GRAPHIC LOG	STRATA DESCRIPTION	ELEV.	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N-VALUE) / PERCENT RECOVERY (RQD)	COMMENTS
30		**Fat Clay (CH)***(Con't)* - brown, wet, very stiff, medium to high plasticity, some silt, free water present		SS -6	28.5-30.0	10-15-13 (**28**)	
35		- brown-yellow, wet, stiff, with pale gray-brown mottles, free water present		SS -7	33.5-35.0	3-4-5 (**9**)	
40		- brown-yellow, very moist, very stiff, pale gray-brown mottles	556.5	SS -8	38.5-40.0	4-7-10 (**17**)	
		Clayey Sand (SC) - gray, very moist to wet, fine grain	555.1				
		Bottom of borehole at 40.4 feet.					

SOUTHERN COMPANY

RECORD OF WELL CONSTRUCTION

HGWC-14 **WELL: AP02-MW10**

ECS37736

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DATE STARTED 10/16/2014 **COMPLETED** 10/16/2014 **SURF. ELEV.** 595.5 **COORDINATES:** N:34.249688 E:-85.351960
CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** Hollow Stem Auger; Hollow Stem Auger
DRILLED BY T. Milam **LOGGED BY** W. Shaughnessy **CHECKED BY** L. Millet **ANGLE** **BEARING**
BORING DEPTH 40.4 ft. **GROUND WATER DEPTH: DURING** 30 ft. **COMP.** **DELAYED** 23.2 ft. after 96 hrs.
NOTES Well installed. Refer to well data sheet.

BOREHOLE DATA ELEV.	Strata	DEPTH (ft)	WELL DATA	ELEV. (DEPTH)	COMMENTS
			Surface: protective aluminum cover with bollards; 4-foot square concrete pad		
			Surface Seal: concrete	593.5 (2.0)	
		5			
		10	**Well: 2" OD PVC (SCH 40)**		
		15	Annular Fill: Cement-Bentonite Grout (4 - 94lbs. bags, 44 gal.)		
578.5		20			
573.5		25		569.6 (25.9)	
			Annular Seal: 3/8 bentonite pellets (1 - 50lbs. bucket)	567.4 (28.1)	
		30	Filter: #1A silica filter sand (5.5 - 50lbs. bags)	565.5 (30.0)	
		35	Screen: 10 ft. 0.010" slot pre-pack		
556.5					
555.1		40	Sump:0.40 ft.	555.5	

SOUTHERN COMPANY

LOG OF TEST BORING

HGWC-15 **BORING AP02-MW11**
PAGE 1 OF 1
ECS37736

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DATE STARTED 10/20/2014 **COMPLETED** 10/20/2014 **SURF. ELEV.** 579.7 **COORDINATES:** N:34.249333 E:-85.353779
CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** Hollow Stem Auger; Hollow Stem Auger
DRILLED BY T. Milam **LOGGED BY** W. Shaughnessy **CHECKED BY** L. Millet **ANGLE** **BEARING**
BORING DEPTH 35.2 ft. **GROUND WATER DEPTH: DURING** 15 ft. **COMP.** **DELAYED** 14 ft. after 24 hrs.
NOTES Well installed. Refer to well data sheet.

DEPTH (ft)	GRAPHIC LOG	STRATA DESCRIPTION	ELEV.	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N-VALUE) / PERCENT RECOVERY (RQD)	COMMENTS
		Silty Clay (CL)					
5		- brown, dry, stiff		SS -1	3.5-5.0	3-5-7 (**12**)	
10		- brown, dry, medium stiff		SS -2	8.5-10.0	3-4-4 (**8**)	
15		▼ - brown, very moist, soft ▽		SS -3	13.5-15.0	2-2-2 (**4**)	
			563.7				
		Fat Clay (CH)					
20		- brown, very moist, stiff, medium to high plasticity, silty		SS -4	18.5-20.0	2-5-5 (**10**)	
25		- brown, wet, medium stiff, medium to high plasticity, silty, free water present		SS -5	23.5-25.0	1-2-3 (**5**)	
30		- brown, very moist to wet, medium stiff, medium to high plasticity		SS -6	28.5-30.0	2-3-3 (**6**)	
			547.7				
		Elastic Silt (MH)					
35		- gray, wet, medium stiff, medium to high plasticity, clayey	544.5	SS -7	33.5-35.0	WH-4-4 (**8**)	

Bottom of borehole at 35.2 feet.

SOUTHERN COMPANY

RECORD OF WELL CONSTRUCTION

HGWC-15 **WELL: AP02-MW11**

ECS37736

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DATE STARTED 10/20/2014 **COMPLETED** 10/20/2014 **SURF. ELEV.** 579.7 **COORDINATES:** N:34.249333 E:-85.353779
CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** Hollow Stem Auger; Hollow Stem Auger
DRILLED BY T. Milam **LOGGED BY** W. Shaughnessy **CHECKED BY** L. Millet **ANGLE** **BEARING**
BORING DEPTH 35.2 ft. **GROUND WATER DEPTH: DURING** 15 ft. **COMP.** **DELAYED** 14 ft. after 24 hrs.
NOTES Well installed. Refer to well data sheet.

BOREHOLE DATA ELEV.	Strata	DEPTH (ft)	WELL DATA	ELEV. (DEPTH)	COMMENTS
			Surface: protective aluminum cover with bollards; 4-foot square concrete pad		
			Surface Seal: concrete	577.7 (2.0)	
		5	**Well: 2" OD PVC (SCH 40)**		
		10	Annular Fill: Cement-Bentonite Grout (3 - 94lbs. bags, 33 gal.)		
563.7		15			
		20		559.9 (19.8)	
			Annular Seal: 3/8 bentonite pellets (1 - 50lbs. bucket)	557.8 (21.9)	
		25	Filter: #1A silica filter sand (5.5 - 50lbs. bags)	554.9 (24.8)	
		30	Screen: 10 ft. 0.010" slot pre-pack		
547.7					
544.5		35		544.9	
			Sump:0.40 ft.		

SOUTHERN COMPANY

LOG OF TEST BORING

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DATE STARTED 10/21/2014 **COMPLETED** 10/21/2014 **SURF. ELEV.** 578.4 **COORDINATES:** N:34.250241 E:-85.354825
CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** Hollow Stem Auger; Hollow Stem Auger
DRILLED BY T. Milam **LOGGED BY** W. Shaughnessy **CHECKED BY** L. Millet **ANGLE** _____ **BEARING** _____
BORING DEPTH 35 ft. **GROUND WATER DEPTH: DURING** 15 ft. **COMP.** _____ **DELAYED** 7.7 ft. after 24 hrs.
NOTES Well installed. Refer to well data sheet.

DEPTH (ft)	GRAPHIC LOG	STRATA DESCRIPTION	ELEV.	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N-VALUE) / PERCENT RECOVERY (RQD)	COMMENTS
5		**Fill (CL)**					
		- red-brown, damp, medium stiff, with pale brown mottles, some gravel		SS -1	3.5-5.0	2-2-3 (**5**)	
10		- red-brown, damp, soft, with pale brown mottles, some gravel, low recovery		SS -2	8.5-10.0	2-2-2 (**4**)	
			566.4				
15		**Clayey Sand (SC)**					
		- brown-gray, very moist, very loose, fine to coarse grain, sticky		SS -3	13.5-15.0	WH-1-1 (**2**)	
			560.4				
20		**Lean Clay (CL)**					
		- gray, damp, medium stiff, low to medium plasticity		SS -4	18.5-20.0	3-3-5 (**8**)	
25		- gray-brown, damp, stiff, interbedded with clayey SAND (SC), wet, fine to coarse grained, some well rounded fine gravel		SS -5	23.5-25.0	5-6-4 (**10**)	
			550.4				
30		**Elastic Silt (MH)**					
		- dark gray to black, wet, very stiff, clayey, weathered shale (boulder), dry, gray, strong HCl reaction (carbonate) at bottom of sample		SS -6	28.5-30.0	9-6-14 (**20**)	
			545.4				
35		**Clayey Gravel (GC)**					
		- dark brown and gray, very moist to wet, very dense, with sand and gravel (well rounded), strong HCl reaction (carbonate gravel)	543.4	SS -7	33.5-34.3	17-50/4" (**100+**)	
		Bottom of borehole at 35.0 feet.					

SOUTHERN COMPANY

RECORD OF WELL CONSTRUCTION

HGWC-16 **WELL: AP02-MW13**

ECS37736

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DATE STARTED 10/21/2014 **COMPLETED** 10/21/2014 **SURF. ELEV.** 578.4 **COORDINATES:** N:34.250241 E:-85.354825
CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** Hollow Stem Auger; Hollow Stem Auger
DRILLED BY T. Milam **LOGGED BY** W. Shaughnessy **CHECKED BY** L. Millet **ANGLE** **BEARING**
BORING DEPTH 35 ft. **GROUND WATER DEPTH: DURING** 15 ft. **COMP.** **DELAYED** 7.7 ft. after 24 hrs.
NOTES Well installed. Refer to well data sheet.

BOREHOLE DATA — ELEV. / Strata; DEPTH (ft)

WELL DATA

Surface:
protective aluminum cover with bollards; 4-foot square concrete pad

ELEV.	DEPTH (ft)		ELEV. (DEPTH)
		Surface Seal: concrete	576.4 (2.0)
	5	**Well: 2" OD PVC (SCH 40)**	
	10	Annular Fill: Cement-Bentonite Grout (2 - 94lbs. bags, 22 gal.)	
566.4			
	15		562.9 (15.5)
		Annular Seal: 3/8 bentonite pellets (1 - 50lbs. bucket)	
560.4			560.8 (17.6)
	20	Filter: #1A silica filter sand (6 - 50lbs. bags)	
			558.4 (20.0)
554.4			
	25	Screen: 10 ft. 0.010" slot pre-pack	
550.4			
	30		548.4 (30.0)
		Sump:0.40 ft.	548.0 (30.4)
545.4		Backfill:caved material	
543.4	35		

COMMENTS

SOUTHERN COMPANY

LOG OF TEST BORING

HGWC-17 **BORING AP02-MW14**

ECS37736

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DATE STARTED 10/22/2014 **COMPLETED** 10/22/2014 **SURF. ELEV.** 582.6 **COORDINATES:** N:34.250901 E:-85.354837
CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** Hollow Stem Auger; Hollow Stem Auger
DRILLED BY T. Milam **LOGGED BY** W. Shaughnessy **CHECKED BY** L. Millet **ANGLE** **BEARING**
BORING DEPTH 25 ft. **GROUND WATER DEPTH: DURING** 15 ft. **COMP.** **DELAYED** 13.9 ft. after 24 hrs.
NOTES Well installed. Refer to well data sheet.

DEPTH (ft)	GRAPHIC LOG	STRATA DESCRIPTION	ELEV.	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N-VALUE) / PERCENT RECOVERY (RQD)	COMMENTS
		Lean Clay (CL)					
		- pale gray-brown, dry, stiff, with red and yellow-brown mottling (fill)		SS -1	3.5-5.0	5-6-9 (**15**)	
		- red-yellow, dry, stiff, low to medium plasticity, with distinct gray mottling		SS -2	8.5-10.0	3-5-8 (**13**)	
			571.6				
		Clayey Sand (SC)					
		- pale brown, very moist to wet, medium dense, fine grain, with gray mottling		SS -3	13.5-15.0	3-5-5 (**10**)	
		- pale brown, wet, medium dense, with red-yellow mottling		SS -4	18.5-20.0	6-10-13 (**23**)	
		- pale brown, wet, very dense, fine to coarse grain, with red-yellow mottling, coarse well-rounded gravel	558.6	SS -5	23.5-24.3	17-50/4" (**100+**)	
		Partially Weathered Rock (PWR) - dark gray and dark red, claystone and shale, no HCl reaction, possible boulder	557.6				
		Bottom of borehole at 25.0 feet.					

SOUTHERN COMPANY

RECORD OF WELL CONSTRUCTION

HGWC-17 **WELL: AP02-MW14**

ECS37736

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DATE STARTED 10/22/2014 **COMPLETED** 10/22/2014 **SURF. ELEV.** 582.6 **COORDINATES:** N:34.250901 E:-85.354837
CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** Hollow Stem Auger; Hollow Stem Auger
DRILLED BY T. Milam **LOGGED BY** W. Shaughnessy **CHECKED BY** L. Millet **ANGLE** **BEARING**
BORING DEPTH 25 ft. **GROUND WATER DEPTH: DURING** 15 ft. **COMP.** **DELAYED** 13.9 ft. after 24 hrs.
NOTES Well installed. Refer to well data sheet.

BOREHOLE DATA ELEV.	Strata	DEPTH (ft)	WELL DATA	ELEV. (DEPTH)	COMMENTS
			Surface: protective aluminum cover with bollards; 4-foot square concrete pad		
			Surface Seal: concrete	580.6 (2.0)	
			Well: 2" OD PVC (SCH 40)		
		5	Annular Fill: Cement-Bentonite Grout (2 - 94lbs. bags, 22 gal.)		
				573.6 (9.0)	
571.6		10	Annular Seal: 3/8 bentonite pellets (1 - 50lbs. bucket)		
				570.5 (12.1)	
		15	Filter: #1A silica filter sand (6 - 50lbs. bags)		
				568.0 (14.6)	
		20	Screen: 10 ft. 0.010" slot pre-pack		
558.6					
557.6		25	Sump:0.40 ft.	558.0	

SOUTHERN COMPANY

LOG OF TEST BORING

HGWC-18 **BORING AP02-MW15**

ECS37736

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Ash Pond Piezometers
LOCATION Plant Hammond

DATE STARTED 10/22/2014 **COMPLETED** 10/22/2014 **SURF. ELEV.** 582.5 **COORDINATES:** N:34.251920 E:-85.354784
CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** Hollow Stem Auger; Hollow Stem Auger
DRILLED BY T. Milam **LOGGED BY** W. Shaughnessy **CHECKED BY** L. Millet **ANGLE** **BEARING**
BORING DEPTH 25 ft. **GROUND WATER DEPTH: DURING** 15 ft. **COMP.** **DELAYED** 11.5 ft. after 24 hrs.
NOTES Well installed. Refer to well data sheet.

DEPTH (ft)	GRAPHIC LOG	STRATA DESCRIPTION	ELEV.	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N-VALUE) / PERCENT RECOVERY (RQD)	COMMENTS
		Gravelly Lean Clay (CL)					
5		- yellow-brown, dry, stiff, with red mottling		SS -1	3.5-5.0	4-5-5 (**10**)	
			574.5				
10		**Silt (ML)** - yellow-brown, dry, hard, low recovery		SS -2	8.5-10.0	13-19-31 (**50**)	
			571.5				
15		**Well-graded Gravelly Sand (SW)** - yellow-brown, very moist, dense, fine to coarse grain, with red-yellow mottling, coarse well-rounded gravel		SS -3	13.5-15.0	14-19-19 (**38**)	
			564.5				
20		**Partially Weathered Rock (PWR)** - black to dark gray, very hard, shale, fissle, irregular and inclined bedding, no HCl reaction		SS -4	18.5-20.0	23-41-43 (**84**)	
25		- black to dark gray, very hard, shale, fissle, irregular and inclined bedding, no HCl reaction	557.5	SS -5	23.5-24.8	19-31-54/4" (**100+**)	

Bottom of borehole at 25.0 feet.

SOUTHERN COMPANY

RECORD OF WELL CONSTRUCTION

HGWC-18 **WELL: AP02-MW15**

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BORING DEPTH 25 ft. **GROUND WATER DEPTH: DURING** 15 ft. **COMP.** **DELAYED** 11.5 ft. after 24 hrs.
NOTES Well installed. Refer to well data sheet.

BOREHOLE DATA — ELEV. / Strata; DEPTH (ft)

WELL DATA

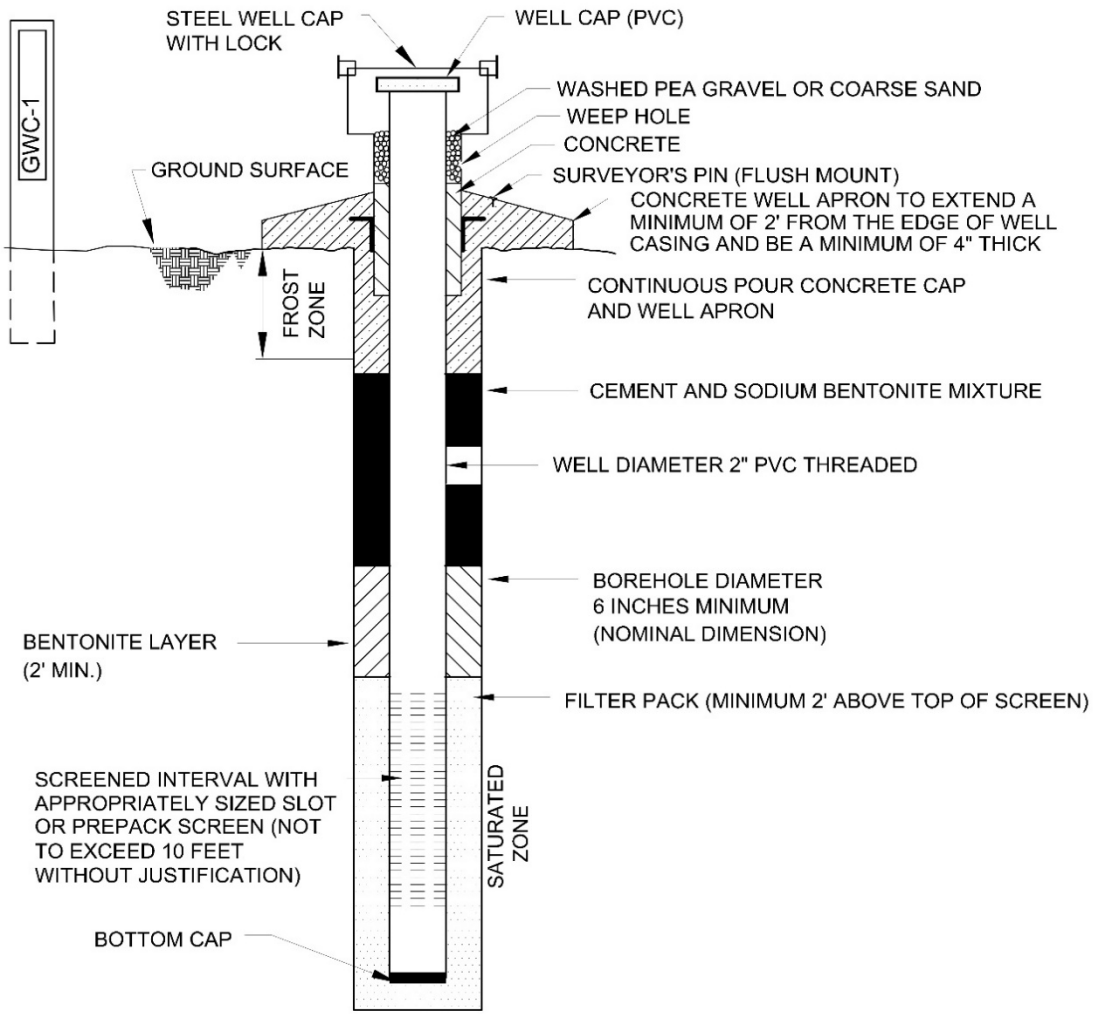
Surface:
protective aluminum cover with bollards; 4-foot square concrete pad

ELEV. (DEPTH)	
580.5 (2.0)	Surface Seal: concrete
	Well: 2" OD PVC (SCH 40)
	Annular Fill: Cement-Bentonite Grout (3 - 94lbs. bags, 33 gal.)
572.2 (10.3)	Annular Seal: 3/8 bentonite pellets (1 - 50lbs. bucket)
570.1 (12.4)	Filter: #1A silica filter sand (5.5 - 50lbs. bags)
568.0 (14.5)	Screen: 10 ft. 0.010" slot pre-pack
558.0 557.6	Sump:0.40 ft.
	Backfill:Silica Sand

DEPTH (ft): 5, 10, 15, 20, 25
ELEV.: 574.5, 571.5, 564.5, 557.5

COMMENTS

B. GROUNDWATER MONITORING WELL DETAIL



GROUNDWATER MONITORING WELL (TYP.)

C. GROUNDWATER SAMPLING PROCEDURE

Groundwater sampling will be conducted using the most current applicable USEPA Region 4 SESD Field Branches Quality System and Technical Procedures as a guide (https://www.epa.gov/quality/quality-system-and-technical-procedures-sesd-field-branches). The following procedures describe the general methods associated with groundwater sampling at the Site. Prior to sampling, the well must be evacuated (purged) to ensure that representative groundwater is obtained. Any item coming in contact with the inside of the well casing or the well water will be kept in a clean container and handled only with gloved hands.

GPC will follow the procedures below at each well to ensure that a representative sample is collected:

1. Check the well, the lock, and the locking cap for damage or evidence of tampering. Record observations and notify GPC if it appears that the well has been compromised.

2. Measure and record the depth to water in all wells to be sampled prior to purging using a water measuring device consisting of probe and measuring tape capable of measuring water levels with accuracy to 0.1 foot Static water levels will be measured from each well, within a 24-hour period. The water level measuring device will be decontaminated prior to lowering in each well.

3. Install Pump: If a dedicated pump is not present, slowly lower the pump into the well to the midpoint of the well screen or a depth otherwise approved by the hydrogeologist or project scientist. The pump intake must be kept at least two feet above the bottom of the well to prevent disturbance and suspension of any sediment present in the bottom of the well. Record the depth to which the pump is lowered. All non-dedicated equipment will be decontaminated before use and between well locations in general accordance with USEPA Region 4 SESD guidance document, *Operating Procedure - Field Equipment Cleaning and Decontamination* (EPA, SESDGUID-205-R3), or the latest version of the document.

4. Measure Water Level: Immediately prior to purging, measure the water level again with the pump in the well. Leave the water level measuring device in the well.

5. Purge Well: Begin pumping the well at approximately 100 to 500 milliliters per minute (mL/min). Monitor the water level continually. Maintain a steady flow rate that results in a stabilized water level with 0.3 feet or less of variability. Avoid entraining air in the tubing. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment.

6. Monitor Indicator Parameters: Monitor and record the field indicator parameters [turbidity, temperature, specific conductance, pH, oxidation-reduction potential (ORP), and dissolved oxygen (DO)] approximately every three to five minutes. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings at a minimum:

   ±0.1 for pH

   ±5% for specific conductance (conductivity)

±10% or ±0.2 mg/L (whichever is greater) for DO where DO>0.5mg/L. If DO<0.5mg/L no stabilization criteria apply

<5 NTU for turbidity

Temperature – Record only, not used for stabilization criteria

ORP – Record only, not used for stabilization criteria.

7. Collect samples at a flow rate between 100 and 200 mL/min according to the most current version of USEPA Region 4 SESD guidance document, *Operating Procedure – Groundwater Sampling* (EPA, SESDPROC-301-R#), and such that drawdown of the water level within the well is stable. Flow rate must be reduced if excessive drawdown is observed during sampling. All sample containers should be filled with minimal turbulence by allowing the groundwater to flow from the tubing gently down the inside of the container.

8. Compliance samples will be unfiltered; however, to determine if turbidity is affecting sample results (i.e., >10 NTU), duplicate samples may be filtered in the field prior to being placed in a sample container, clearly marked as filtered and preserved. Filtering will be accomplished by the use of 0.45-micron filters on the sampling line. At least two filter volumes of sample will pass through before filling sample containers. A new filter must be used for each well and each sampling event. Filtered samples are not considered compliance samples and are only used to evaluate the effects of turbidity. Additional details related to managing for elevated turbidity is discussed below.

9. All sample bottles will be filled, capped, and placed in an ice containing cooler immediately after sampling where temperature control is required. Samples that do not require temperature control will be placed in a clean and secure container.

10. Sample containers and preservative will be appropriate for the analytical method being used.

11. Information contained on sample container labels will include:

    a. Name of facility

    b. Date and time of sampling

    c. Sample description (well number)

    d. Sampler's initials

    e. Preservatives

    f. Analytical method(s)

12. After samples are collected, samplers will remove all non-dedicated equipment. Upon completion of all activity the well will be closed and locked.

13. Samples will be delivered to the laboratory following appropriate COC and temperature control requirements. The goal for sample delivery will be within 48 hours of collection; however, at no time will samples be analyzed after the method-prescribed hold time.

Throughout the sampling process new latex or nitrile gloves will be worn by the sampling personnel. A clean pair of new, disposable gloves will be worn each time a different location is sampled, and new gloves donned prior to filling sample bottles. Gloves will be discarded after sampling each well and before sampling the next well.

The goal when sampling is to attain a turbidity of less than 5 NTU; however, samples may be collected where turbidity is less than 10 NTU and the stabilization criteria described above are met.

If sample turbidity is greater than 5 NTU and all other stabilization criteria have been met, samplers will continue purging for 3 additional hours in order to reduce the turbidity to 5 NTU or less.

- If turbidity remains above 5 NTU but is less than 10 NTU, and all other parameters are stabilized, the well can be sampled.
- Where turbidity remains above 10 NTU, an unfiltered sample will be collected followed by a filtered sample that has passed through an in-line 0.45-micron filter attached to the discharge (sample collection) tube. Data from filtered samples will only be used to quantify the effects of turbidity on sample results.

Samplers will identify the sample bottle as containing a filtered sample on the sample bottle label and on the COC form.