

## **7. GROUNDWATER MONITORING PLAN**

# GROUNDWATER MONITORING PLAN

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## PLANT HAMMOND – HUFFAKER ROAD LANDFILL FLOYD COUNTY, GEORGIA

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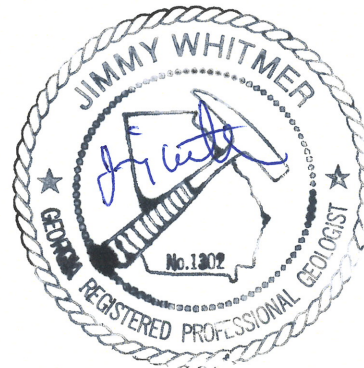


# Georgia Power

NOVEMBER 2018



*Nov 12, 2018*



*11-12-2018*

**Geosyntec**   
consultants

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## I. CERTIFICATION

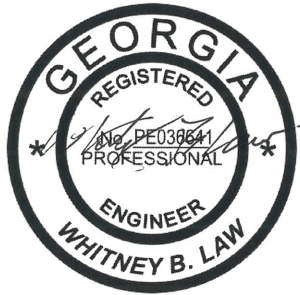
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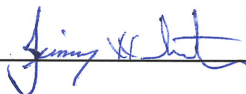
This *Groundwater Monitoring Plan, Georgia Power Company - Plant Hammond Huffaker Road Landfill* has been prepared by a qualified groundwater scientist or engineer with Geosyntec Consultants, Inc. (Geosyntec) to meet the requirements contained in Chapter 391-3-4-.10 of the Georgia Environmental Protection 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 the Georgia Environmental Protection Division (EPD) Rules of Solid Waste Management, Chapter 391-3-4.10(6).

Signature: 

Date: Nov 12, 2018



Signature: 

Date: 11-12-2018



## 1. INTRODUCTION

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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 monitoring program for the Huffaker Road Landfill (Landfill) 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 and underdrain sample locations are presented on Figure A-1 of **Appendix A** and well construction details on Table A-1 of **Appendix A**.

The Landfill is located on GPC-owned property located approximately five miles northeast of Plant Hammond. It was built between 2005 and 2007 over a closed surface clay mine, previously owned by Boral Bricks, Inc. The Landfill is approximately 205 acres and has an estimated total storage capacity of 4,346,000 cubic yards. It is comprised of active Parcels A & B, active Parcel E, and future Parcels C & D. Disposal operations commenced on May 5, 2008. GPC plans to close the Landfill in place and will install a final cover system in accordance with the EPD regulations (391-3-4-.10[7]) regarding landfill closures.

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 the Landfill 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

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The following section summarizes the geologic and hydrogeologic conditions for the Landfill as described in the *Plant Hammond Proposed Huffaker Road Coal Combustion By-Products Storage Facility Site Acceptability Report (SAR)* dated December 2002. The SAR was prepared by Southern Company Services, Inc. (SCS) on behalf of GPC. For reference, the SAR is included in Section 2 of Part B of this permit application.

### 2.1 SITE GEOLOGY

The Huffaker Road Landfill is located in the Valley and Ridge Physiographic Province of 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. The Landfill is located in the Floyd Shale member of the Judy Mountain syncline. The Floyd Shale is Mississippian in age and ranges from 200 to 1,200 feet thick in Floyd County. The unit is composed of clay and shale, transitioning to limestone at its base.

Boring logs presented in the SAR indicate sandy clayey silt and silty clay with rock fragments described as shale extending to depths of up to approximately 30 feet below ground surface. Underlying this material is a medium gray to dark gray and dark olive gray, heavily to moderately weathered shale. Rock cores collected at the Landfill are described as slightly weathered to unweathered, thinly bedded shale. Descriptions provided in the boring logs are representative of recorded observations on the Floyd Shale.

### 2.2 SITE HYDROGEOLOGY

The Landfill is underlain by a regional unconfined groundwater aquifer that occurs within the overburden and heavily to moderately weathered shale layers. Prior field investigations indicate groundwater flows predominantly through the weathered shale layer. Groundwater recharge is from infiltration of precipitation. Groundwater occurring in the bedrock below the Landfill is controlled by the degree of enhanced secondary permeability. In general, groundwater occurring in the bedrock is a result of water infiltrating through areas in the overburden and weathered shale where enhanced permeability exists. Review of the available boring logs does not identify a confined aquifer beneath the Landfill.

Groundwater flow direction beneath the Landfill is generally to the southeast in vicinity of Parcels A and B, and then south-southwest beneath both Parcel E. Groundwater flow direction beneath the area proposed for Parcels C and D is generally south-southwest. These groundwater flow directions are depicted on the potentiometric surface map provided in **Appendix A**. The potentiometric surface map represents data recorded in September 2003, collected from a series of temporary piezometers installed in support of the SAR.

The average hydraulic conductivity for the heavily to moderately weathered shale layer is  $8.74 \times 10^{-5}$  cm/sec [0.248 feet per day (ft/day)], as computed from slug test data derived from five locations across the Landfill property. The hydraulic gradient beneath the Landfill was calculated using the September 2003 water level data, and between well pairs located within each existing or proposed parcel areas to account for the changing groundwater flow direction in each area. The calculated hydraulic gradient beneath Parcels A and B equals 0.019 ft/ft; the hydraulic gradient beneath Parcel E equals 0.018 ft/ft; the hydraulic gradient beneath the area proposed for Parcels C and D equals 0.0075 ft/ft.

### 3. SELECTION OF WELL LOCATIONS

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Groundwater monitoring wells were installed to monitor the uppermost occurrence of groundwater beneath Landfill Parcels A, B, and E. Locations were selected based on the Landfill footprint and geologic and hydrogeologic considerations. GPC follows the recommendation as stated in Chapter 2 of the Manual for Groundwater Monitoring (1991) to determine well spacing based on site-specific conditions. A map depicting the current monitoring well network for Landfill Parcels A, B, and E is included in **Appendix A**, Monitoring System Details.

The groundwater monitoring network locations were chosen to monitor upgradient (GWA) and downgradient (GWC) conditions at constructed Landfill Parcels A, B, and E based on groundwater flow direction determined by potentiometric evaluation. A potentiometric surface map is provided in **Appendix A** on Figure A-2. Five wells are designated for monitoring of upgradient conditions (i.e., GWA-1, GWA-2, GWA-3, GWA-4, and GWA-11) and twelve wells are designated for monitoring of downgradient conditions (i.e., GWC-5, GWC-6, GWC-7, GWC-8, GWC-9, GWC-10, GWC-18, GWC-19, GWC-20, GWC-21, GWC-22, and GWC-23). Wells are positioned to provide adequate coverage to detect potential impacts from the CCR unit. Both upgradient and downgradient wells are screened in the weathered shale layer above bedrock.

Figure A-3 in Appendix A shows the proposed monitoring wells identified for unconstructed landfill Parcels C and D that have not been installed. Following the installation of these monitoring wells, a well installation report documenting the actual well locations as well as construction details, well logs, and abandonment forms will be submitted to EPD.

Monitoring wells will generally be 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 currently installed at the Landfill. 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 & REPORTING

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The Huffaker monitoring well network described in this plan is already in place. The existing monitoring wells were installed in general accordance with applicable USEPA and/or EPD guidance documents available at that time. The monitoring wells were installed by SCS in 2006 and 2007; the boring and well construction logs associated with these field efforts 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 Region 4 Science and Ecosystem Support Division (SESD) *Operating Procedure for Design and Installation of Monitoring Wells* (USEPA, 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 future landfill expansion will be over-drilled prior to abandonment.

### **4.4 DOCUMENTATION**

The following information documenting the construction and development of each new groundwater well for Huffaker will be submitted to EPD by a qualified groundwater scientist within 30 days after completing all planned well installations.

- 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
- Dates of drilling and initial well emplacement
- Drilling method and drilling fluid if used
- Well location ( $\pm 0.5$  feet)
- Borehole diameter and well casing diameter
- Well depth ( $\pm 0.1$  feet)
- Lithologic logs
- Well casing materials
- Screen materials and design
- Screen length
- Screen slot size
- Filter pack material/size and volume
- Sealant materials and volume
- Documentation of ground surface elevation ( $\pm 0.01$  feet)
- Documentation of top of casing elevation ( $\pm 0.01$  feet)
- Schematic of the well with dimensions

## 5. MONITORING PARAMETERS AND FREQUENCY

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The following describes groundwater and underdrain 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**, Monitoring Parameters and Frequency, presents the groundwater and underdrain monitoring parameters and sampling frequency. A minimum of eight independent samples from each groundwater well were collected between March 2016 and March 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 the active life of the facility and the post-closure care period. If required, assessment monitoring will be performed per 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 and underdrain 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 0.2 Standard Units (S.U.).

**TABLE 1  
 MONITORING PARAMETERS & FREQUENCY**

MONITORING PARAMETER		GROUNDWATER MONITORING	
		Background	Semi-Annual Events
<b>Field Parameters</b>	Temperature	X	X
	pH	X	X
	ORP	X	X
	Turbidity	X	X
	Specific Conductance	X	X
	Dissolved Oxygen	X	X
<b>Appendix III (Detection)</b>	Boron	X	X
	Calcium	X	X
	Chloride	X	X
	Fluoride	X	X
	pH	X	X
	Sulfate	X	X
	Total Dissolved Solids	X	X
<b>Appendix IV (Assessment)</b>	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	150.1field
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

Note:

1. If any parameters contained in Appendix I or II of 40 CFR 258, Subpart E, as amended, 56 Fed. Reg. 51032 - 51039 (October 9, 1991) have been detected previously at statistically significant levels above background concentrations, these parameters will continue to be monitored.

## 6. SAMPLE COLLECTION

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During each sampling event, samples will be collected and handled in accordance with the procedures specified in **Appendix C**, Groundwater Sampling Procedure and **Appendix D**, Underdrain Sampling Procedure. Sampling procedures were developed using standard industry practice and EPA 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.

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.

Groundwater wells that are determined to be dry for two consecutive sampling events should be replaced, unless an alternate schedule has been approved by EPD.

For underdrain sampling, dedicated, non-dedicated, or disposable sampling equipment may be used.

## 7. CHAIN-OF-CUSTODY

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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

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 must 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 must 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**

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

## 9. REPORTING RESULTS

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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. Documentation of non-functioning wells and dry underdrain sampling locations.

16. Table of current analytical results for each well, highlighting statistically significant increases and concentrations above maximum contaminant level (MCL).
17. Statistical analyses.
18. Certification by a qualified groundwater scientist.

## 10. STATISTICAL ANALYSIS

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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.

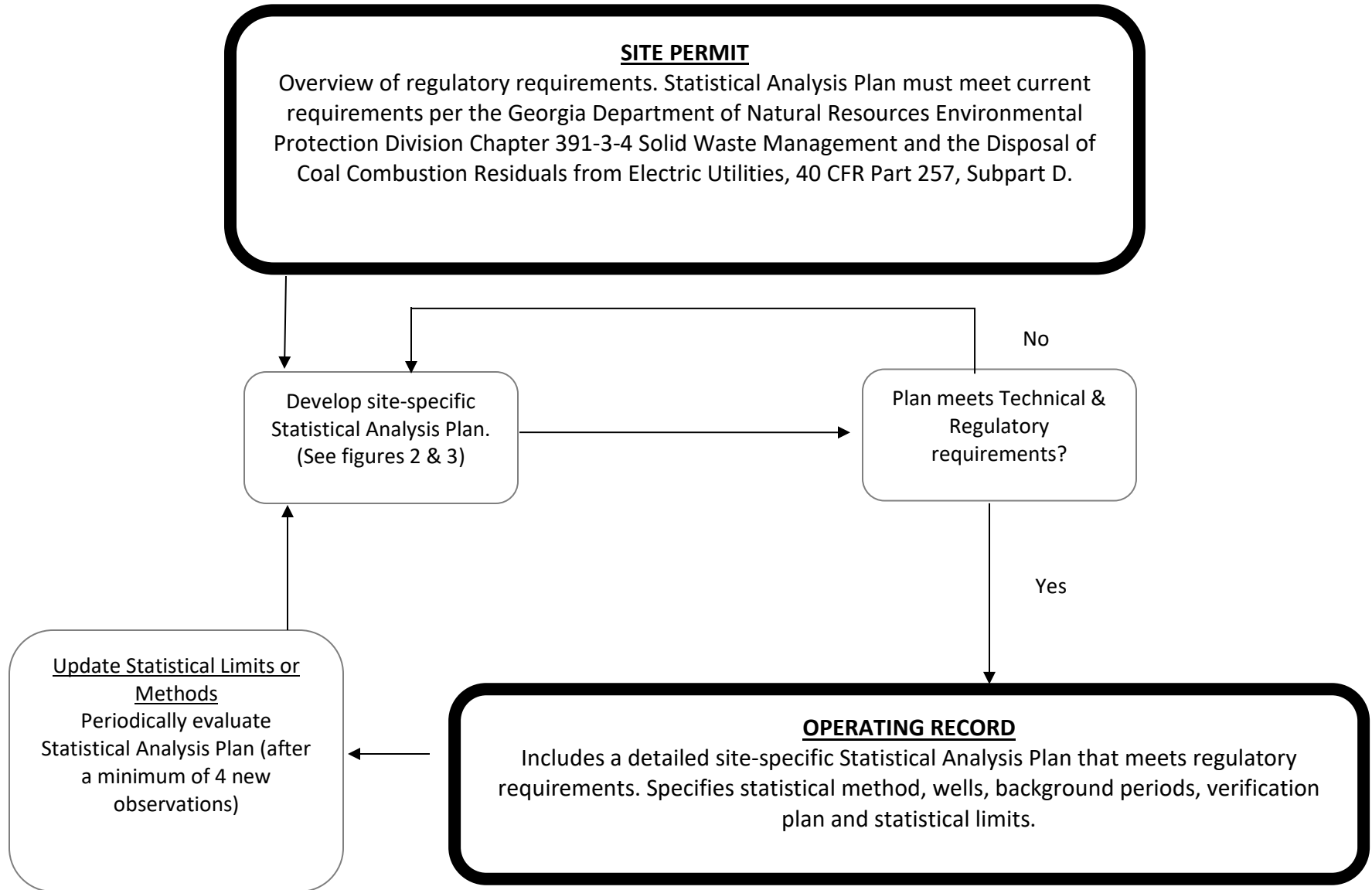
According to EPD rules 391-3-4-.10(6)(a), which incorporates the statistical analysis requirements of 40 CFR 257.93 by reference, the Landfill must specify in the operating record the statistical methods to be used in evaluating groundwater monitoring data for each hazardous constituent. The statistical 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 tolerance or 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 tolerance or prediction limit. [Section (§) 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 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).

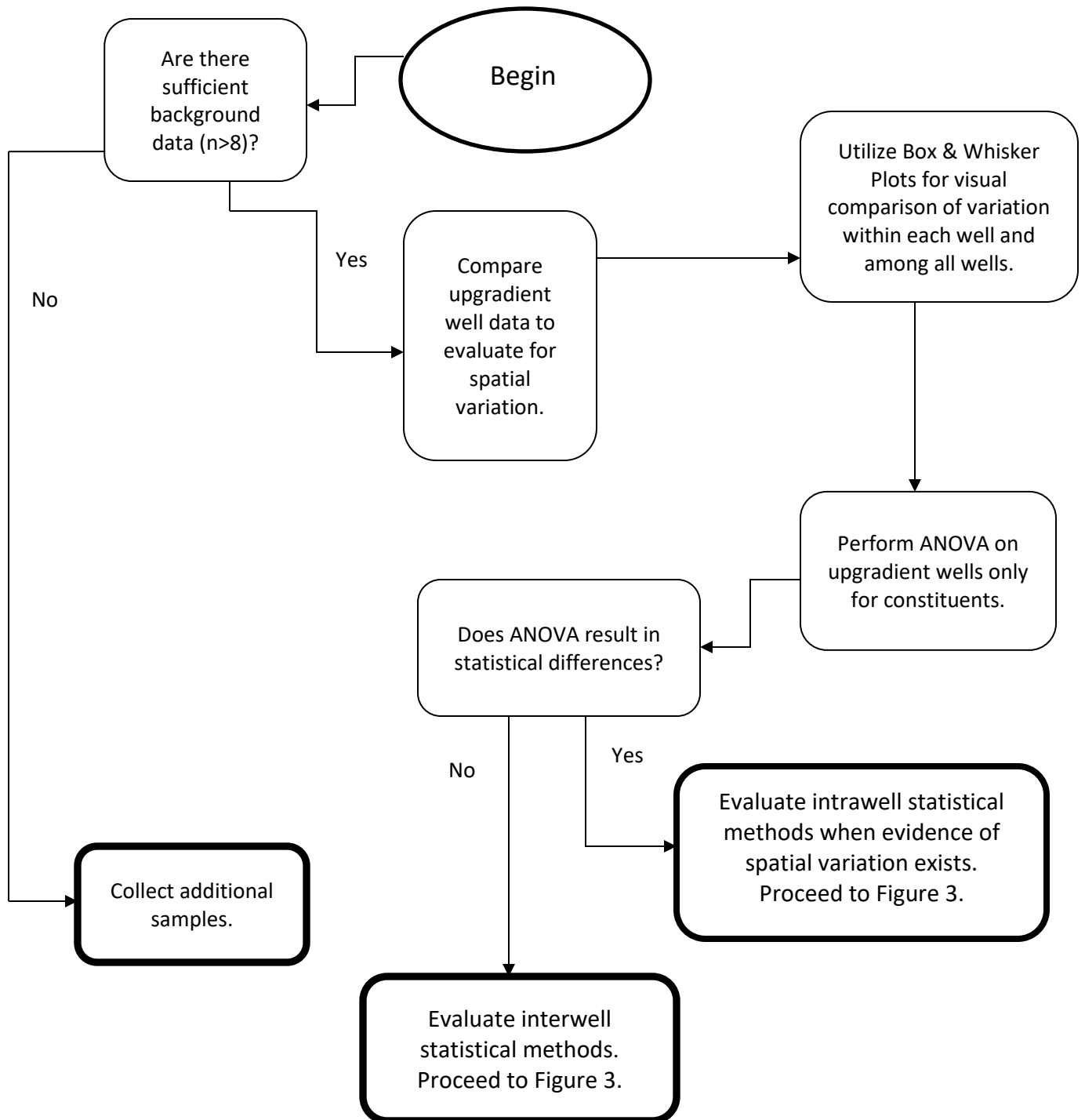
Based on site-specific conditions, statistical methods may be intra-well, inter-well, or combination of both.

A site-specific statistical analysis plan that provides details regarding the statistical methods to be used will be placed in the Landfill's operating record pursuant to 391-3-4-.10(6). **Figure 1**, Statistical Analysis Plan Overview, presents a flowchart that depicts the process followed to develop the site-specific plan. **Figure 2**, Decision Logic for Determining Appropriate Statistical Method, depicts the decision logic used to determine the appropriate method as required by 391-3-4-.10(6). **Figure 3**, Decision Logic for Computing Tolerance or Prediction Intervals, presents the logic used to calculate site-specific statistical limits and test compliance results against those limits.

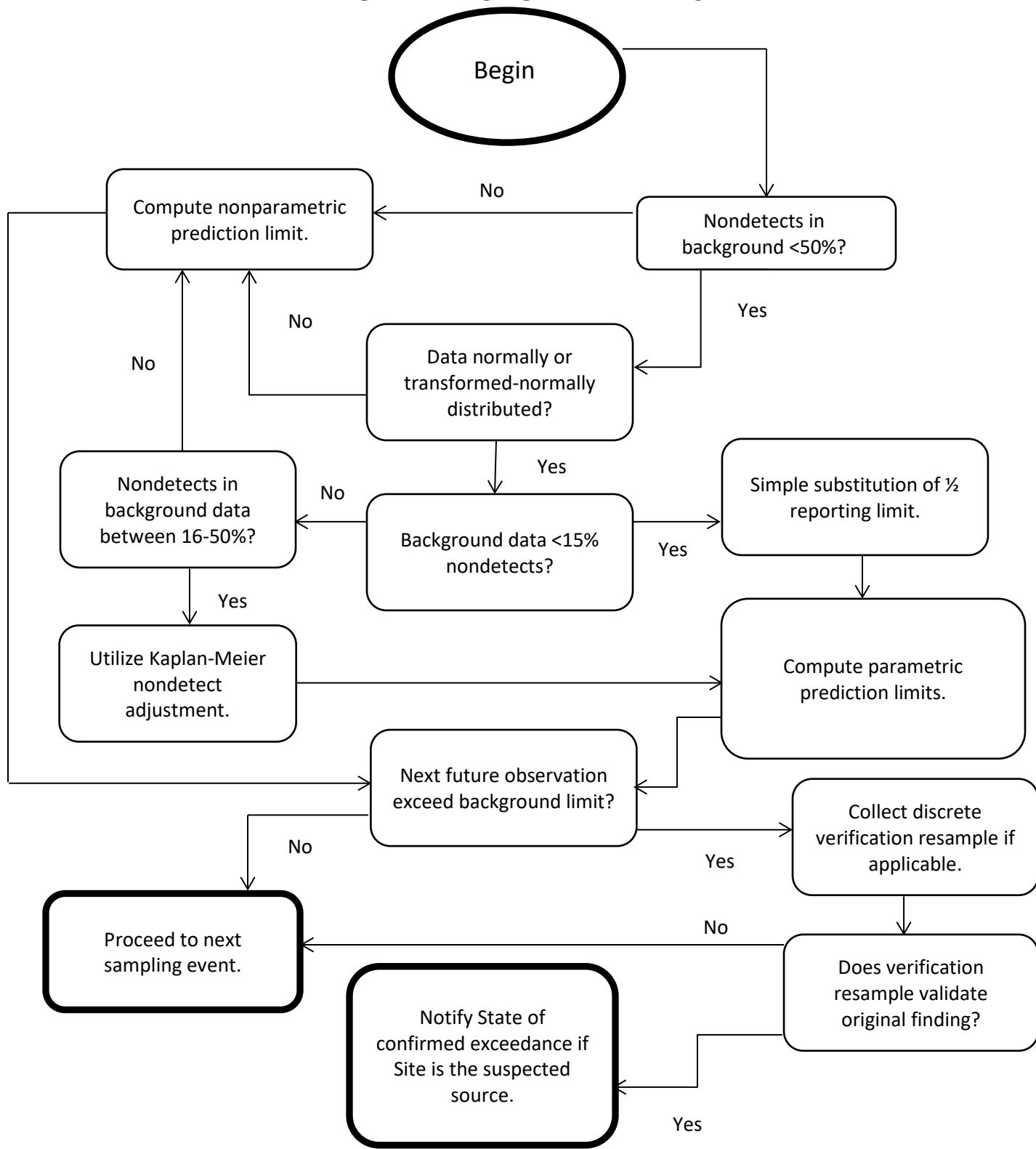
**FIGURE 1. STATISTICAL ANALYSIS PLAN OVERVIEW**



**FIGURE 2. DECISION LOGIC FOR DETERMINING APPROPRIATE STATISTICAL METHOD**



**FIGURE 3. DECISION LOGIC FOR COMPUTING TOLERANCE OR PREDICTION INTERVALS**



## 11. REFERENCES

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- Environmental Resources Management, 2018. *2017 Annual Groundwater Monitoring and Corrective Action Report – Plant Hammond Huffaker Road Landfill*.
- Georgia Environmental Protection Division, 1991. *Manual for Groundwater Monitoring*. (PP. 38).
- Georgia Power Company. *Initial Written Closure Plan. 40 CFR 257.102. Huffaker Road (Plant Hammond) Private Industrial Landfill. Georgia Power Company*. Retrieved from:  
<https://www.georgiapower.com/company/environmental-compliance/ccr-rule-compliance-data/ccr-rule-compliance-plant-list/plant-hammond.html>
- Georgia Rules and Regulations, 2018. *Rule Subject 391-3-4, Solid Waste Management*. Revised March 28, 2018.
- Geosyntec Consultants, 2018. *First 2018 Semi-Annual Groundwater Monitoring Report – Plant Hammond Huffaker Road Landfill*.
- Official Code of Georgia Annotated, 1985. *O.C.G.A. § 12-5-120. Water Well Standards Act of 1985*.
- United States Environmental Protection Agency, Region 4 Science and Ecosystem Support Division, 2013. *Operating Procedure for Design and Installation of Monitoring Wells*. SESDGUID-101-R# (use most current version available).
- United States Environmental Protection Agency, Region 4 Science and Ecosystem Support Division, 2015. *Operating Procedure for Field Equipment Cleaning and Decontamination*. SESDPROC-205-R# (use most current version available).
- United States Environmental Protection Agency, Region 4 Science and Ecosystem Support Division, 2017. *Operating Procedure for Groundwater Sampling*. SESDPROC-304-R4.
- United States Environmental Protection Agency, 2015. *40 CFR Parts 257 and 261. Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule*.



## APPENDIX

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

## **A. MONITORING SYSTEM DETAILS**

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FIGURE A-1 COMPLIANCE MONITORING NETWORK

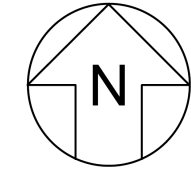
FIGURE A-2 POTENTIOMETRIC SURFACE MAP – SEPTEMBER 2003

FIGURE A-3 PROPOSED MONITORING NETWORK EXPANSION



TABLE A-1 HUFFAKER ROAD LANDFILL MONITORING NETWORK WELL DETAILS

HUFFAKER ROAD LANDFILL BORING AND WELL CONSTRUCTION LOGS

N:\GA Power\Plant Hammond GW Services\2018\GIS\mxd\Huffaker\GWMPI\Figure A-1 ComplianceMap\_Huff\_11.09.18.mxd 11/12/2018 11:14:17 AM



**LEGEND**

-  Landfill Monitoring Well
-  Landfill Underdrain Sample Point



SCALE IN FEET

**COMPLIANCE MONITORING NETWORK  
HUFFAKER ROAD LANDFILL  
GROUNDWATER MONITORING PLAN**

GEORGIA POWER COMPANY  
PLANT HAMMOND HUFFAKER ROAD LANDFILL  
ROME, FLOYD COUNTY, GEORGIA

Prepared For:  Georgia Power

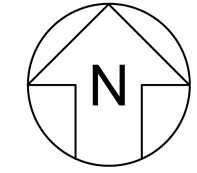
Prepared By: 

**FIGURE  
A-1**

KENNESAW, GA

NOVEMBER 2018

N:\GA Power\Plant Hammond GW Services\2018\GIS\mxd\Huffaker\GWMPI\Figure A-2 Potentiometric Surface Map\_Sep2003\_Huff\_11.09.18.mxd 11/9/2018 4:38:17 PM



**LEGEND**

- Temporary Piezometer (Groundwater elevation, ft AMSL)
- Groundwater Elevation Iso-Contour (ft, AMSL)
- Approximate Groundwater Flow Direction



Note:  
 1. Water level elevation recorded on September 17, 2003.  
 Elevation provided in feet above mean sea level (ft AMSL) in North American Vertical Datum (NAVD) 88.



SCALE IN FEET

**POTENTIOMETRIC SURFACE MAP  
 (SEPTEMBER 2003)  
 HUFFAKER ROAD LANDFILL  
 GROUNDWATER MONITORING PLAN**  
 GEORGIA POWER COMPANY  
 PLANT HAMMOND HUFFAKER ROAD LANDFILL  
 ROME, FLOYD COUNTY, GEORGIA

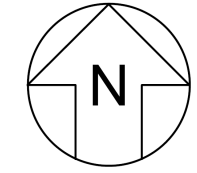
Prepared For: Georgia Power

Prepared By: Geosyntec  
 consultants




**FIGURE  
 A-2**

KENNESAW, GA NOVEMBER 2018

N:\GA Power\Plant Hammond GW Services\2018\GIS\mxd\Huffaker\GWMPI\Figure A-3 PropCDWellMap\_Huff\_11.09.18.mxd 11/12/2018 11:26:35 AM



**LEGEND**

-  Proposed Landfill Monitoring Well
-  Landfill Monitoring Well
-  Landfill Underdrain Sample Point



SCALE IN FEET

**PROPOSED MONITORING NETWORK EXPANSION  
HUFFAKER ROAD LANDFILL  
GROUNDWATER MONITORING PLAN**

GEORGIA POWER COMPANY  
PLANT HAMMOND HUFFAKER ROAD LANDFILL  
ROME, FLOYD COUNTY, GEORGIA

Prepared For:  Georgia Power

Prepared By:  Geosyntec  
consultants

**FIGURE  
A-3**

KENNESAW, GA    NOVEMBER 2018

**Table A-1**  
Huffaker Road Landfill Monitoring Network Well Details  
Plant Hammond, Floyd County, Georgia

Well ID	Purpose	Northing <sup>(1)</sup>	Easting <sup>(1)</sup>	Ground Surface Elevation (ft AMSL)	Top of Casing Elevation (ft AMSL)	Well Depth <sup>(2)</sup> (ft BTOC)	Top of Screen Elevation (ft AMSL)	Bottom of Screen Elevation (ft AMSL)	Screened Media
GWA-1	Monitoring, upgradient	1565643.23	1952068.06	698.21	702.05	39.83	672.52	662.52	Weathered shale
GWA-2	Monitoring, upgradient	1565589.74	1952641.00	678.80	681.46	25.92	665.84	655.84	Weathered shale
GWA-3	Monitoring, upgradient	1565519.19	1953199.71	656.00	659.25	21.45	648.10	638.10	Weathered shale
GWA-4	Monitoring, upgradient	1565518.65	1953686.93	653.80	656.87	21.51	645.66	635.66	Weathered shale
GWA-11	Monitoring, upgradient	1564945.85	1952008.14	679.38	682.48	36.21	656.57	646.57	Weathered shale
GWC-5	Monitoring, downgradient	1565158.40	1953566.09	646.35	649.46	21.54	638.22	628.22	Weathered shale
GWC-6	Monitoring, downgradient	1564396.99	1953919.43	653.56	656.37	42.90	623.77	613.77	Weathered shale
GWC-7	Monitoring, downgradient	1564078.74	1953595.62	653.92	657.05	32.12	635.23	625.23	Weathered shale
GWC-8	Monitoring, downgradient	1564000.11	1953095.59	653.68	656.63	27.40	639.53	629.53	Weathered shale
GWC-9	Monitoring, downgradient	1563875.99	1952393.22	656.66	659.41	52.35	617.36	607.36	Weathered shale
GWC-10	Monitoring, downgradient	1564307.60	1951975.60	663.71	667.52	34.29	643.53	633.53	Weathered shale
GWC-18	Monitoring, downgradient	1563319.48	1953391.01	638.51	641.30	56.95	594.65	584.65	Weathered shale
GWC-19	Monitoring, downgradient	1562842.42	1952979.50	640.18	642.93	57.51	595.72	585.72	Weathered shale
GWC-20	Monitoring, downgradient	1562472.09	1952332.09	622.80	625.65	34.36	601.59	591.59	Weathered shale
GWC-21	Monitoring, downgradient	1562098.80	1951612.93	614.04	618.36	18.23	610.43	600.43	Weathered shale
GWC-22	Monitoring, downgradient	1562778.11	1951618.87	621.60	624.92	42.05	593.17	583.17	Weathered shale
GWC-23	Monitoring, downgradient	1563557.96	1951605.45	651.86	654.87	50.02	615.15	605.15	Weathered shale

Notes:

ft = feet

AMSL = above mean sea level

BTOC = below top of casing

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

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



# DRILLING LOG

## GEOLOGICAL SERVICES

Hole No GWA-1 (HUF-5)

Sheet 1 of 2

SITE Plant Hammond, Huffaker Road Landfill HOLE DEPTH 35.9 SURF. ELEV. 698.21

LOCATION ~10 miles west of Rome, Georgia COORDINATES 1565643.23 E 1952068.06

ANGL NA BEARING NA CONTRACT SCS RILL NO. CME 550

DRILLING METHOD H S A NO. SAMPLES 5 NO. U.D. SAMPLES 0

CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZ \_\_\_\_\_ TOTAL % REC. \_\_\_\_\_

WATER TABLE DEPTH \_\_\_\_\_ ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_

TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ DRILLING START DATE 9/11/2001

DRILLER \_\_\_\_\_ RECORDER \_\_\_\_\_ APPROVED NA DRILLING COMP. DATE 9/11/2001

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	698.21	Ground Surface							
1	697.21								
2	696.21	NOTE: HUF-5 was installed in September 2001. Changes were made to the well, except the name, to become upgradient well GWA-1.							
3	695.21								
4	694.21								
5	693.21								
6	692.21								
7	691.21								
8	690.21								
9	689.21								
10	688.21								
11	687.21								
12	686.21								
13	685.21								
14	684.21								
15	683.21								
16	682.21								
17	681.21	Soft, moderately weathered SHALE		17-26.5					
18	680.21								
19	679.21								
20	678.21								
21	677.21								
22	676.21								
23	675.21								
24	674.21								



# DRILLING LOG

## GEOLOGICAL SERVICES

Hole No. GWA-1 (HUF-5)  
Sheet 2 of 2

SITE **Plant Hammond, Huffaker Road Landfill** TOTAL DEPTH **35.9** SURF.ELEV. **698.21**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From	To	Blows			
25	#####	Soft weathered to unweathered SHALE							
26	#####		26.5-35.9						
27	#####								
28	#####								
29	#####								
30	#####								
31	#####								
32	#####								
33	#####								
34	#####								
35	#####								
36		Bottom of boring							
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
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53									
54									
55									
56									





## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWA-2

Sheet 1 of 1

SITE Plant Hammond, Huffaker Road Landfill HOLE DEPTH 24 SURF. ELEV. 678.80  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1565519.19 E 1953199.71  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. CME 550  
 DRILLING METHOD H S A NO. SAMPLES 5 NO. U.D. SAMPLES 0  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZ \_\_\_\_\_ TOTAL % REC. \_\_\_\_\_  
 WATER TABLE DEPTH 13.5' ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT bentonite QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ RILLING START DATE 2/5/2007  
 DRILLER B. Filipovich RECORDER K. Hobbs APPROVED NA RILLING COMP. DATE 2/5/2007

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	678.80	Ground Surface							
1	677.80	Yellow orange SILT, moist, with mica	1	3.5-5.0	4-4-3	7			
2	676.80								
3	675.80								
4	674.80								
5	673.80	Charcoal gray SHALE, very soft, weathered	2	8.5-10	1-5-15	20			
6	672.80								
7	671.80								
8	670.80								
9	669.80								
10	668.80	Charcoal gray SHALE, wet, very soft, weathered	3	13.5-15	21-37-50	87			
11	667.80								
12	666.80								
13	665.80								
14	664.80								
15	663.80	Same as above	4	18.5-20	50/3	R			
16	662.80								
17	661.80								
18	660.80								
19	659.80	Same as above	5	23.5-25	50/3	R			
20	658.80								
21	657.80								
22	656.80								
23	655.80	Same as above							
24	654.80								Bottom of boring



## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWA-3

Sheet 1 of 1

SITE Plant Hammond, Huffaker Road Landfill HOLE DEPTH 22 SURF. ELEV. 656.00  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1565519.19 E 1953199.71  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. CME 550  
 DRILLING METHOD H S A NO. SAMPLES 4 NO. U.D. SAMPLES 0  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZ \_\_\_\_\_ TOTAL % REC. \_\_\_\_\_  
 WATER TABLE DEPTH 8.5' ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ RILLING START DATE 2/6/2007  
 DRILLER B. Filipovich RECORDER K. Hobbs APPROVED NA RILLING COMP. DATE 2/6/2007

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	656.00	Ground Surface							
1	655.00	Dark gray SHALE, highly fractured, dry, with	1	3.5-5.0	13-21-31	52			
2	654.00								
3	653.00								
4	652.00								
5	651.00	Dark gray SHALE, highly fractured, wet, with	2	8.5-10	20-50/5	R			
6	650.00								
7	649.00								
8	648.00								
9	647.00								
10	646.00								
11	645.00	Same as above	3	13.5-15	50/3	R			
12	644.00								
13	643.00								
14	642.00								
15	641.00	Same as above	4	18.5-20	50/3	R			
16	640.00								
17	639.00								
18	638.00								
19	637.00	Bottom of boring							
20	636.00								
21	635.00								
22	634.00								
23									
24									



## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWA-4

Sheet 1 of 1

SITE Plant Hammond, Huffaker Road Landfill HOLE DEPTH 22 SURF. ELEV. 653.80  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1565518.65 E 1953686.93  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. CME 550  
 DRILLING METHOD H S A NO. SAMPLES 4 NO. U.D. SAMPLES 0  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZ \_\_\_\_\_ TOTAL % REC. \_\_\_\_\_  
 WATER TABLE DEPTH 7.8' ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ RILLING START DATE 2/6/2007  
 DRILLER B. Filipovich RECORDER K. Hobbs APPROVED NA RILLING COMP. DATE 2/6/2007

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	653.80	Ground Surface							
1	652.80	Brown and orange weathered SHALE, flakey	1	3.5-5.0	5-13-33	46			
2	651.80								
3	650.80								
4	649.80								
5	648.80								
6	647.80	Gray SHALE, crumbly, wet, fractured	2	8.5-10	31-50/5	R			
7	646.80								
8	645.80								
9	644.80								
10	643.80								
11	642.80								
12	641.80								
13	640.80	Same as above	3	13.5-15	50/3	R			
14	639.80								
15	638.80								
16	637.80								
17	636.80	Same as above	4	18.5-20	50/4	R			
18	635.80								
19	634.80								
20	633.80								
21	632.80								
22	631.80								
23		Bottom of boring							
24									



## DRILLING LOG GEOLOGICAL SERVICES

Hole No. GWA-11

Sheet 1 of 2

SITE Plant Hammond's Huffaker Road Landfill HOLE DEPTH 33.5 SURF. ELEV. 679.38  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1564945.85 E 1952008.14  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. CME550  
 DRILLING METHOD ISA/HQ Rock core with water NO. SAMPLES 5 NO. U.D. SAMPLES 0  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZE \_\_\_\_\_ TOTAL % REC. 80%  
 WATER TABLE DEPT 18' ELEV. \_\_\_\_\_ TIME AFTER COMP. 4 days DATE TAKEN 7/24/2006  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ RILLING START DATE 7/20/2006  
 DRILLER S. Milam RECORDER Grissom/Bearce APPROVED NA RILLING COMP. DATE 7/21/2006

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	#####	Ground Surface							
1	#####	Dark yellowish brown silty CLAY, hard	1	4.5-6	15-17-22	39			
2	#####								
3	#####								
4	#####								
5	#####								
6	#####	As above, very stiff	2	9.5-11	15-20-25	45			
7	#####								
8	#####								
9	#####								
10	#####								
11	#####	Dark grey CLAY, hard, weathered shale one vertical joint through 1/2 of recovered core	3	14.5-16	16-22-31	53			
12	#####								
13	#####								
14	#####								
15	#####								
16	#####	Same as above	4	19.5-21	26-50/4	R			
17	#####								
18	#####								
19	#####								
20	#####								
21	#####								
22	#####								
23	#####								
24	#####								



**DRILLING LOG**  
**GEOLOGICAL SERVICES**

Hole No. GWA-11

Sheet 2 of 2

SITE **Plant Hammond's Huffaker Road Landfill** TOTAL DEPTH **33.5** SURF. ELEV. **679.38**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
25	#####	Same as above	5	24.5-26	21-26-45	71			
26	#####								
27	#####								
28	#####								
29	#####	Auger refusal @ 28.5'							
30	#####	Dark grey SHALE, highly fissile, fractured		28.5-33.5			4.0/5.0	80	
31	#####								
32	#####								
33	#####								
34	#####	Bottom of boring							
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
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52									
53									
54									
55									
56									



## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWC-5

Sheet 1 of 1

SITE Plant Hammond, Huffaker Road Landfill HOLE DEPTH 22 SURF.ELEV. 646.35  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1565158.40 E 1953566.09  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. CME 550  
 DRILLING METHOD H S A NO. SAMPLES 4 NO. U.D. SAMPLES 0  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZ \_\_\_\_\_ TOTAL % REC. \_\_\_\_\_  
 WATER TABLE DEPTH 8.5' ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ RILLING START DATE 2/7/2007  
 DRILLER B. Filipovic RECORDER K. Hobbs APPROVED NA RILLING COMP. DATE 2/7/2007

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec.	RQD
				From	To	Blows			
0	#####	Ground Surface							
1	#####	Gray SHALE, crumbly, some mica flakes and	1	3.5-5.0	24-33-47	80			
2	#####								
3	#####								
4	#####								
5	#####	Gray SHALE, wet, crumbly	2	8.5-10	23-42-50/4	R			
6	#####								
7	#####								
8	#####								
9	#####	Same as above	3	13.5-15	42-50/4	R			
10	#####								
11	#####								
12	#####								
13	#####	Same as above	4	18.5-20	50/3	R			
14	#####								
15	#####								
16	#####								
17	#####	Bottom of boring							
18	#####								
19	#####								
20	#####								
21	#####								
22	#####								
23									
24									



## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWC-6

Sheet 1 of 2

SITE Plant Hammond, Huffaker Road Landfill HOLE DEPTH 40.2 SURF.ELEV. 653.56  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1564396.99 E 1953919.43  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. CME 550  
 DRILLING METHOD ISA/HQ rock core with water NO. SAMPLES 6 NO. U.D. SAMPLES 0  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZE \_\_\_\_\_ TOTAL % REC. 20%  
 WATER TABLE DEPTH \_\_\_\_\_ ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ RILLING START DATE 7/19/2006  
 DRILLER B. Filipovic RECORDER A. Grissom APPROVED NA RILLING COMP. DATE 7/20/2006

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec.	RQD
				From To	Blows	N			
0	#####	Ground Surface							
1	#####	Light brown to gray, dry, slightly sandy CLAY with shale fragments	1	3.5-5	2-3-5	8			
2	#####								
3	#####								
4	#####								
5	#####	Same as above	2	8.5-10	2-2-4	6			
6	#####								
7	#####								
8	#####	Same as above	3	13.5-15	3-4-5	9			
9	#####								
10	#####								
11	#####								
12	#####	Dark gray to black, highly weathered SHALE with iron staining	4	18.5-20	9-15-19	34			
13	#####								
14	#####								
15	#####								
16	#####	Dark gray, wet, highly weathered SHALE with	5	23.5-25	11-19-28	47			
17	#####								
18	#####								
19	#####								
20	#####								
21	#####								
22	#####								
23	#####								
24	#####								



## DRILLING LOG GEOLOGICAL SERVICES

Hole No. GWC-6

Sheet 2 of 2

SITE **Plant Hammond, Huffaker Road Landfill** TOTAL DEPTH **40.2** SURF.ELEV. **653.56**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From	To	Blows			
25	#####	Same as above	6	28.5-30	45-50/2	R			
26	#####								
27	#####								
28	#####								
29	#####								
30	#####								
31	#####								
32	#####	Auger refusal @ 32.0'							
33	#####	Dark gray to black weathered SHALE		34.2-40.2			6.0/1.2	20	
34	#####								
35	#####								
36	#####								
37	#####								
38	#####								
39	#####								
40	#####								
41		Bottom of boring							
42									
43									
44									
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									





## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWC-7

Sheet 1 of 1

SITE <b>Plant Hammond, Huffaker Road Landfill</b>	HOLE DEPTH <b>29.0'</b>	SURF. ELEV. <b>653.92</b>
LOCATION <b>~10 miles west of Rome, Georgia</b>	COORDINATES <b>1564078.74</b> E <b>1953595.62</b>	
ANGL <b>NA</b> BEARING <b>NA</b>	CONTRACT <b>SCS</b>	RILL NO. <b>CME 550</b>
DRILLING METHOD <b>ISA/HQ Rock core with water</b>	NO. SAMPLES <b>3</b>	NO. U.D. SAMPLES <b>0</b>
CASING SIZE _____ LENGTH _____	CORE SIZE _____	TOTAL % REC. <b>58%</b>
WATER TABLE DEPTH _____ ELEV. _____	TIME AFTER COMP. _____	DATE TAKEN _____
TYPE GROUT _____ QUANTITY _____	MIX _____	RILLING START DATE <b>7/18/2006</b>
DRILLER <b>B. Filipovich</b>	RECORDER <b>A. Grissom</b>	APPROVED <b>NA</b>
		RILLING COMP. DATE <b>7/19/2006</b>

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	#####	Ground Surface							
1	#####	Yellow to light brown, slightly sandy silty CLAY	1	3.5'-5.0'	3-3-4	7			
2	#####								
3	#####								
4	#####								
5	#####								
6	#####	Same as above	2	8.5-10	2-2-4	6			
7	#####								
8	#####								
9	#####	Light brown, silty plastic CLAY, moist	3	13.5-15	2-1-3	4			
10	#####								
11	#####								
12	#####								
13	#####								
14	#####	Auger refusal @ 17.7'							
15	#####								
16	#####								
17	#####								
18	#####	Begin coring @ 1		18-19			1.0/0.3	33%	
19	#####								
20	#####								
21	#####								
22	#####	Dark gray to black highly weathered SHALE		19-24			5.0/4.0	80	
23	#####								
24	#####								



**DRILLING LOG**  
**GEOLOGICAL SERVICES**

Hole No. GWC-7

Sheet 2 of 2

SITE **Plant Hammond, Huffaker Road Landfill** TOTAL DEPTH **29.0** SURF. ELEV. **653.92**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From	To	Blows			
25	#####	Same as above		24	29		5.0/3.0	60	
26	#####								
27	#####								
28	#####								
29	#####								
30		Bottom of boring							
31									
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									



## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWC-8  
Sheet 1 of 1

SITE Plant Hammond, Huffaker Road Landfill HOLE DEPTH 24.8' SURF. ELEV. 653.68  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1564000.11 E 1953095.59  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. CME 550  
 DRILLING METHOD SA/HQ Rock core with wat NO. SAMPLES 3 NO. U.D. SAMPLES 0  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZ \_\_\_\_\_ TOTAL % REC. 98%  
 WATER TABLE DEPTH \_\_\_\_\_ ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ RILLING START DATE 7/18/2006  
 DRILLER B. Filipovic RECORDER A. Grissom APPROVED NA RILLING COMP. DATE 7/18/2006

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	#####	Ground Surface							
1	#####	Dark brown silty CLAY, dry	1	3.5-5	3-4-7	11			
2	#####								
3	#####								
4	#####								
5	#####	SAA with trace weathered shale	2	8.5-10	2-2-5	7			
6	#####								
7	#####								
8	#####								
9	#####	Dark brown to dark gray weathered SHALE with some clay	3	13.5-15	50/1	R			
10	#####								
11	#####								
12	#####								
13	#####	Auger refusal @ 15.5' Begin coring 15.6'		5.6'-19.8	4.2/4.0'		4.2/4.0	95	
14	#####								
15	#####								
16	#####								
17	#####	Dark gray, hard SHALE with rust-stained fractures from 16.4-18.8		19.8'-24.8			5.0/5.0	100	
18	#####								
19	#####								
20	#####								
21	#####								
22	#####								
23	#####								
24	#####								Bottom of boring 24.8



**DRILLING LOG**  
**GEOLOGICAL SERVICES**

Hole No GWC-9  
Sheet 1 of 2

SITE Plant Hammond Huffaker Road Landfill HOLE DEPTH 51.5' SURF. ELEV. 656.66  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1563875.99 E 1952393.22  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. CME550  
 DRILLING METHOD H S A NO. SAMPLES 9 NO. U.D. SAMPLES 0  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZ \_\_\_\_\_ TOTAL % REC. 0%  
 WATER TABLE DEPTH \_\_\_\_\_ ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ RILLING START DATE 7/17/2006  
 DRILLER S. Milam RECORDER A. Grissom APPROVED NA RILLING COMP. DATE 7/18/2006

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	#####	Ground Surface							
1	#####	Stiff, light brown to orange, dry, sandy silty C	1	4.5-6	6-7-8	15			
2	#####								
3	#####								
4	#####								
5	#####								
6	#####	Same as above	2	9.5-11	6-7-9	16			
7	#####								
8	#####								
9	#####								
10	#####								
11	#####	Same as above (6") then dark gray weathered SHALE with clay, dry	3	14.5-16	6-9-13	22			
12	#####								
13	#####								
14	#####								
15	#####								
16	#####	Dark gray weathered SHALE, with clay, dry	4	19.5-21	9-11-13	24			
17	#####								
18	#####								
19	#####								
20	#####								
21	#####								
22	#####								
23	#####								
24	#####								

**DRILLING LOG  
GEOLOGICAL SERVICES**

Hole No. GWC-9

Sheet 2 of 2

SITE **Plant Hammond Huffaker Road Landfill** TOTAL DEPTH **51.5** SURF. ELEV. **656.66**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
25	#####	Dark gray to black weathered SHALE, dry	5	24.5-26	15-33-50/4	R			
26	#####								
27	#####								
28	#####								
29	#####								
30	#####	Dark gray to black, clayey weathered SHALE	6	29.5-31	50/3	R			
31	#####								
32	#####								
33	#####								
34	#####	Stiff, light brown to orange, dry, sandy silty CLAY							
35	#####	Black, dry, weathered SHALE with little clay	7	34.5-36	50/3	R			
36	#####								
37	#####								
38	#####								
39	#####								
40	#####	No recovery	8	39.5'-41.0'					
41	#####								
42	#####								
43	#####								
44	#####	Same as above (6") then dark gray weathered							
45	#####	Black, dry, weathered SHALE with some clay	9	44.5-46	50/3	R			
46	#####	Auger refusal @ 46.2'							
47	#####								
48	#####	Begin coring 46.5'		46.5-51.5			5.0/0.0	0	
49	#####								
50	#####								
51	#####	No core recovery							
52		Bottom of boring							
53									
54									
55									
56									



## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWC-10

Sheet 1 of 2

SITE Plant Hammond's Huffaker Road Landfill HOLE DEPTH 30.5' SURF. ELEV. 663.71  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1564307.60 E 1951975.60  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. CME550  
 DRILLING METHOD SA/HQ Rock core with wat NO. SAMPLES 4 NO. U.D. SAMPLES 0  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZ \_\_\_\_\_ TOTAL % REC. 82%  
 WATER TABLE DEPTH \_\_\_\_\_ ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ RILLING START DATE 7/19/2006  
 DRILLER S. Milam RECORDER A. Grissom APPROVED NA RILLING COMP. DATE 7/20/2006

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	#####	Ground Surface							
1	#####	Light brown, dry, clayey SILT	1	4.5-6	35-7-5	12			
2	#####								
3	#####								
4	#####								
5	#####								
6	#####	Light gray to orange brown, dry, silty CLAY	2	9.5-11	3-8-12	20			
7	#####								
8	#####								
9	#####								
10	#####								
11	#####	Dark gray, dry, clayey weathered SHALE	3	14.5-16	14-28-34	62			
12	#####								
13	#####								
14	#####								
15	#####								
16	#####	Same as above	4	19.5-21	17-11-15	26			
17	#####								
18	#####								
19	#####								
20	#####								
21	#####	Auger refusal 22.0'							
22	#####								
23	#####								
24	#####	Begin coring 22.5'							



# DRILLING LOG

## GEOLOGICAL SERVICES

Hole No. GWC-10

Sheet 2 of 2

SITE **Plant Hammond's Huffaker Road Landfill** TOTAL DEPTH **30.5** SURF. ELEV. **663.71**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
25	#####	Light to dark gray SHALE							
26	#####		22.5-27.5			5.0/5.0	100		
27	#####								
28	#####								
29	#####								
30	#####			27.5-30.5		3.0/1.9	63		
31	#####	Bottom of boring							
32									
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									



## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWC-18  
Sheet 1 of 2

SITE Plant Hammond's Huffaker Road Landfill HOLE DEPTH 54.1' SURF. ELEV. 638.51  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1563319.48 E 1953391.01  
 ANGL NA BEARING NA CONTRACT                      RILL NO.                       
 DRILLING METHOD ISA/HQ rock core with water NO. SAMPLES 9 NO. U.D. SAMPLES                       
 CASING SIZE                      LENGTH                      CORE SIZE                      TOTAL % REC. 100%  
 WATER TABLE DEPTH                      ELEV.                      TIME AFTER COMP.                      DATE TAKEN                       
 TYPE GROUT                      QUANTITY                      MIX                      RILLING START DATE 7/11/2006  
 DRILLER B. Filipovic RECORDER L. Millet APPROVED NA RILLING COMP. DATE 7/12/2006

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	#####	Ground Surface							
1	#####	Gray and brown silty CLAY, dry	1	3.5-5	1-2-3	5			
2	#####								
3	#####								
4	#####								
5	#####	Weathered dark gray SHALE with clay, dry	2	8.5-10	7-15-27	42			
6	#####								
7	#####								
8	#####								
9	#####								
10	#####								
11	#####	Weathered black SHALE, dry	3	13.5-15	50/4	R			
12	#####								
13	#####								
14	#####								
15	#####	Same as above	4	18.5-20	50/5	R			
16	#####								
17	#####								
18	#####								
19	#####								
20	#####								
21	#####	Same as above, saturated	5	23.5-25	50/4	R			
22	#####								
23	#####								
24	#####								





## DRILLING LOG GEOLOGICAL SERVICES

Hole No. GWC-18

Sheet 2 of 2

SITE **Plant Hammond's Huffaker Road Landfill** OTAL DEPTH **54.1'** SURF.ELEV. **638.51**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From	To	Blows			
25	#####								
26	#####								
27	#####								
28	#####								
29	#####								
30	#####	Weathered black SHALE, more intact than above, saturated	6	28.5	30	50/4	R		
31	#####								
32	#####								
33	#####								
34	#####	Same as above	7	33.5	35	50/5	R		
35	#####								
36	#####								
37	#####								
38	#####								
39	#####								
40	#####	Same as above	8	38.5	40	50/1	R		
41	#####								
42	#####								
43	#####								
44	#####								
45	#####		9	43.5	45.0	50/1	R		
46	#####								
47	#####	47.1 - Auger refusal							
48	#####			48	54				
49	#####	Highly fractured slate/shale bedrock, some secondary mineralization, no regularly oriented fracture sets, some conchoidal fracturing				6.0/6.0	100		
50	#####								
51	#####								
52	#####								
53	#####								
54	#####								
55		Bottom of boring							
56									



## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWC-19  
Sheet 1 of 2

SITE Plant Hammond, Huffaker Road Landfill HOLE DEPTH 55 SURF. ELEV. 640.18  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1562842.42 E 1952979.50  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. CME 550  
 DRILLING METHOD ISA/HQ rock core with water NO. SAMPLES 9 NO. U.D. SAMPLES \_\_\_\_\_  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZE \_\_\_\_\_ TOTAL % REC. 50%  
 WATER TABLE DEPTH \_\_\_\_\_ ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ RILLING START DATE 7/11/2006  
 DRILLER S. Milam RECORDER L. Millet APPROVED NA RILLING COMP. DATE 7/11/2006

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	#####	Ground Surface							
1	#####	Tan and orange silty CLAY, dry	1	4.5-6	3-2-3	5			
2	#####								
3	#####								
4	#####								
5	#####								
6	#####	Same as above with occasional pebbles	2	9.5-11	3-4-6	10			
7	#####								
8	#####								
9	#####								
10	#####								
11	#####	Tan and orange silty CLAY, dry, occasional c	3	14.5-16	2-3-4	7			
12	#####								
13	#####								
14	#####								
15	#####								
16	#####	Dark gray weathered SHALE, dry	4	19.5-21	16-13-15	28			
17	#####								
18	#####								
19	#####								
20	#####								
21	#####								
22	#####								
23	#####								
24	#####								

SITE **Plant Hammond, Huffaker Road Landfill** TOTAL DEPTH **55** SURF. ELEV. **640.18**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
25	#####	Same as above	5	24.5-26	50/3	R			
26	#####								
27	#####								
28	#####								
29	#####								
30	#####	Same as above, black	6	29.5-31	50/4	R			
31	#####								
32	#####								
33	#####								
34	#####								
35	#####	Same as above, moist	7	34.5-36	50/3	R			
36	#####								
37	#####								
38	#####								
39	#####								
40	#####	Same as above, saturated	8	39.5-41	50/3	R			
41	#####								
42	#####								
43	#####								
44	#####								
45	#####	Same as above	9	44.5-46	50/2	R			
46	#####								
47	#####	46' - Auger Refusal							
48	#####								
49	#####								
50	#####								
51	#####								
52	#####	Weathered & fractured SHALE/SLATE bedro		47-55			8.0/4.0	50	
53	#####								
54	#####								
55	#####								
56									Bottom of boring



## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWC-20

Sheet 1 of 2

SITE Plant Hammond, Huffaker Road Landfill HOLE DEPTH 31.5 SURF. ELEV. 622.80  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1562472.09 E 1952332.09  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. CME 550  
 DRILLING METHOD ISA/HQ rock core with water NO. SAMPLES 4 NO. U.D. SAMPLES \_\_\_\_\_  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZ \_\_\_\_\_ TOTAL % REC. 53%  
 WATER TABLE DEPTH \_\_\_\_\_ ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ RILLING START DATE 7/13/2006  
 DRILLER B. Filipovic RECORDER M. Hughes APPROVED NA RILLING COMP. DATE 7/17/2006

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	#####	Ground Surface.							
1	#####	weathered SHALE w/ clay, dark gray & brown	1	5	7-12-15	27			
2	#####								
3	#####								
4	#####								
5	#####								
6	#####								
7	#####								
8	#####	Same as above	2	10	17-40-50/3	R			
9	#####								
10	#####								
11	#####								
12	#####	Same as above	3	15	50/4	R			
13	#####								
14	#####								
15	#####								
16	#####	Same as above	4	20	50/3	R			
17	#####								
18	#####								
19	#####								
20	#####	Auger refusal at 23.5'	5	25					
21	#####								
22	#####	Auger refusal at 23.5'							
23	#####								
24	#####								



**DRILLING LOG**  
**GEOLOGICAL SERVICES**

Hole No. GWC-20

Sheet 2 of 2

SITE Plant Hammond, Huffaker Road Landfill OTAL DEPTH 31.5 SURF.ELEV. 622.8

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From	To	Blows			
25	#####	No recovery		23.5	25		1.5/0.0	0	
26	#####								
27	#####								
28	#####	Dark gray to black SHALE, slightly weathered		25	30		5.0/3.0	60	
29	#####								
30	#####	Same as above with many polished faces, brittle		30	31.5		1.5/1.5	100	
31	#####								
32	#####	Bottom of boring							
33									
34									
35									
36									
37									
38									
39									
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									
51									
52		Auger refusal at 23.5'							
53		Begin coring at 23.5'							
54									
55									
56									



## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWC-21  
Sheet 1 of 1

SITE Plant Hammond, Huffaker Road Landfill HOLE DEPTH 14.4 SURF. ELEV. 614.04  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1562098.80 E 1951612.93  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. \_\_\_\_\_  
 DRILLING METHOD ISA/HQ rock core with water NO. SAMPLES 1 NO. U.D. SAMPLES 0  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZE \_\_\_\_\_ TOTAL % REC. \_\_\_\_\_  
 WATER TABLE DEPTH \_\_\_\_\_ ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ RILLING START DATE 7/12/2006  
 DRILLER B. Filipovic RECORDER L. Millet APPROVED NA RILLING COMP. DATE 7/12/2006

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	#####	Ground Surface							
1	#####	Dark gray weathered SHALE, high clay content 6.2' - Auger refusal	1	6.2-14.4					
2	#####								
3	#####								
4	#####								
5	#####								
6	#####								
7	#####	Dark gray to black fractured SHALE, with secondary mineralization in smaller fractures		6.2-14.4					
8	#####								
9	#####								
10	#####								
11	#####								
12	#####								
13	#####								
14	#####								
15	#####	Bottom of boring							
16	#####								
17	#####								
18	#####								
19	#####								
20	#####								
21	#####								
22	#####								
23	#####								
24	#####								



## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWC-22  
Sheet 1 of 2

SITE Plant Hammond, Huffaker Road Landfill HOLE DEPTH 38.8' SURF. ELEV. 621.60  
 LOCATION ~10 miles west of Rome, Georgia COORDINATES 1562778.11 E 1951618.87  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. \_\_\_\_\_  
 DRILLING METHOD ISA/HQ rock core with water NO. SAMPLES 6 NO. U.D. SAMPLES \_\_\_\_\_  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZ \_\_\_\_\_ TOTAL % REC. 30%  
 WATER TABLE DEPTH \_\_\_\_\_ ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ RILLING START DATE 7/12/2006  
 DRILLER S. Milam RECORDER L. Millet APPROVED NA RILLING COMP. DATE 7/13/2006

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	#####	Ground Surface							
1	#####	Tan silty clay, dry to 6", then dark gray black weathered SHALE with clay, dry, occasional and light gray mottling	1	4.5-6	9-16-34	50			
2	#####								
3	#####								
4	#####								
5	#####								
6	#####	Same as above	2	9.5-11	28-44-50/3	R			
7	#####								
8	#####								
9	#####								
10	#####	Same as above, moist	3	14.5-16	50/3	R			
11	#####								
12	#####								
13	#####	Light gray SHALE, weathered, wet	4	19.5-21	50/4	R			
14	#####								
15	#####								
16	#####								
17	#####								
18	#####								
19	#####								
20	#####								
21	#####								
22	#####								
23	#####								
24	#####								



**DRILLING LOG**  
**GEOLOGICAL SERVICES**

Hole No. GWC-22

Sheet 2 of 2

SITE **Plant Hammond, Huffaker Road Landfill** TOTAL DEPTH **38.8'** SURF. ELEV. **621.6**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
25	#####	Very highly weathered dark gray SHALE, saturated, high clay content	5	24.5-26	50/4	R			
26	#####								
27	#####								
28	#####								
29	#####								
30	#####	Weathered SHALE, high clay content, saturated	6	29.5-31	50/2	R			
31	#####								
32	#####	Auger refusal							
33	#####	Weathered SHALE							
34	#####								
35	#####								
36	#####								
37	#####								
38	#####			32-34			2.0/1.0	50	
				34-38.8			4.8/0.5	10	
39		Bottom of boring							
40									
41									
42									
43									
44									
45									
46									
47									
48									
49									
50									
51									
52									
53									
54									
55									
56									





## DRILLING LOG GEOLOGICAL SERVICES

Hole No GWC-23

Sheet 1 of 2

SITE Plant Hammond Huffaker Road Landfill HOLE DEPTH 47 SURF. ELEV. 651.86  
 LOCATION 10 MILES WEST OF ROME, GA COORDINATES 1563557.96 E 1951605.45  
 ANGL NA BEARING NA CONTRACT SCS RILL NO. CME 550  
 DRILLING METHOD ISA/HQ rock core with water NO. SAMPLES 7 NO. U.D. SAMPLES 0  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZE \_\_\_\_\_ TOTAL % REC. 76  
 WATER TABLE DEPTH 29' ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT NA QUANTITY NA MIX NA RILLING START DATE 7/18/2006  
 DRILLER S. Milam RECORDER A. Grissom APPROVED NA RILLING COMP. DATE 7/19/2006

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	#####	Ground Surface							
1	#####	Yellow to orange brown, dry, silty CLAY with trace pebbles	1	4.5-6.0	3-4-4	8			
2	#####								
3	#####								
4	#####								
5	#####								
6	#####	Orange brown, dry, slightly sandy silty CLAY	2	9.5-11	7-13-15	28			
7	#####								
8	#####								
9	#####								
10	#####								
11	#####	Dark gray, highly weathered SHALE	3	14.5-16	17-39-50/1	R			
12	#####								
13	#####								
14	#####								
15	#####								
16	#####	Same as above	4	19.5-21	25-33-36	69			
17	#####								
18	#####								
19	#####								
20	#####								
21	#####								
22	#####								
23	#####								
24	#####								



**DRILLING LOG**  
**GEOLOGICAL SERVICES**

Hole No. GWC-23

Sheet 2 of 2

SITE **Plant Hammond Huffaker Road Landfill** TOTAL DEPTH **47** SURF. ELEV. **651.86**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
25	#####	Dark gray, highly weathered SHALE	5	24.5-26	23-39-50/3	R			
26	#####								
27	#####								
28	#####								
29	#####								
30	#####	Same as above	6	29.5-31	28-50/4	R			
31	#####								
32	#####								
33	#####								
34	#####	Same as above	7	34.5-36	50/4	R			
35	#####								
36	#####								
37	#####								
38	#####	Auger refusal @ 39.5'							
39	#####								
40	#####								
41	#####	Begin coring @ 41'							
42	#####								
43	#####								
44	#####	Dark gray to black highly weathered SHALE		41-46			5.0/3.8	76	
45	#####								
46	#####								
47	#####								
48		Bottom of boring							
49									
50									
51									
52									
53									
54									
55									
56									

WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Hammond Gyp	DRILLING CO.: SCS	WELL NAME
Storage Facility	DRILLER:	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER:	DRILLING METHODS: HSA/HQ rock core	GWA-1
DATE CONSTRUCTED: 9/11/2001		(HUF-5)

	DEPTH	ELEVATION
	FEET	FT, MSL
Hinged locking top 2" Threaded riser-cap	TOP OF RISER	3.84 702.05
1/4-inch Weep Hole 6-ft DIA concrete pad	GROUND SURFACE	0.00 698.21
1/4-inch vent <b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel	BOTTOM OF PROTECTIVE CASING	
Well Development: Pump/surge until clear <b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME 6.1 cf <b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded	TOP OF SEAL	19.00 679.21
<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: Unknown PLACEMENT: Tremie	TOP OF FILTER PACK	22.00 676.21
<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: Unknown PLACEMENT: Tremie; wash with water	BOTTOM OF RISER / TOP OF SCREEN	25.69 672.52
<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5"	BOTTOM OF SCREEN	35.69 662.52
	BOTTOM OF CASING	35.99 662.22
	BOTTOM OF HOLE	35.99 662.22
HOLE DIA: 8"		

WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Hammond Gyps DRILLING CO.: SCS		WELL NAME
Storage Facility	DRILLER: Filipovich	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER: Hobbs	DRILLING METHODS: H S A	GWA-2
DATE CONSTRUCTED: 2/5/2007 - 16:00		
	DEPTH FEET	ELEVATION FT, MSL
Hinged locking top 2" Threaded riser cap	TOP OF RISER	2.66 681.46
1/4-inch Weep Hole 6-ft DIA concrete pad	GROUND SURFACE	0.00 678.80
1/4-inch vent		
<b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel		
BOTTOM OF PROTECTIVE CASING		
Well Development: Pump/surge until clear		
<b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME 2.2 cf		
<b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded		
TOP OF SEAL	9.80	669.00
<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: 5 gallons PLACEMENT: Tremie		
TOP OF FILTER PACK	11.80	667.00
<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: 8 bags; 50 lb bags PLACEMENT: Tremie; wash with water		
BOTTOM OF RISER / TOP OF SCREEN	12.96	665.84
<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5"		
BOTTOM OF SCREEN	22.96	655.84
BOTTOM OF CASING	23.26	655.54
BOTTOM OF HOLE	24.00	654.80
HOLE DIA: 6-5/8"		



WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Hammond Gypsur DRILLING CO.: SCS		WELL NAME	
Storage Facility	DRILLER: Filipovich		
LOCATION: Huffaker Rd.	RIG TYPE: CME 550		
LOGGER: Hobbs	DRILLING METHODS: H S A	GWA-4	
DATE CONSTRUCTED: 2/6/2007 - 17:00			
		DEPTH	ELEVATION
		FEET	FT, MSL
Hinged locking top 2" Threaded riser cap	TOP OF RISER	3.07	656.87
1/4-inch Weep Hole 6-ft DIA concrete pad	GROUND SURFACE	0.00	653.80
	<b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel		
	BOTTOM OF PROTECTIVE CASING		
Well Development: Pump/surge until clear	<b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME: 0.9 cf		
	<b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded		
	TOP OF SEAL	4.20	649.60
	<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: 5 gallons PLACEMENT: Tremie		
	TOP OF FILTER PACK	6.80	647.00
	<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: 7 bags; 50 lb bags PLACEMENT: Tremie; wash with water		
	BOTTOM OF RISER / TOP OF SCREEN	8.14	645.66
	<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5"		
	BOTTOM OF SCREEN	18.14	635.66
	BOTTOM OF CASING	18.44	635.36
	BOTTOM OF HOLE	22.00	631.80
HOLE DIA: 6-5/8"			

WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Hammond Gypsum	DRILLING CO.: SCS	WELL NAME
Storage Facility	DRILLER: Milam	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER: Grissom/Bearce	DRILLING METHODS: HSA/HQ Rock Core w/	GWA-11
DATE CONSTRUCTED: 7/21/06 - 9:00		

		DEPTH	ELEVATION
		FEET	FT, MSL
Hinged locking top 2" Threaded riser cap	TOP OF RISER	3.10	682.48
1/4-inch Weep Hole 6-ft DIA concrete pad	GROUND SURFACE	0.00	679.38
1/4-inch vent	<b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel		
	BOTTOM OF PROTECTIVE CASING		
Well Development: Pump/surge until clear	<b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME: 5.6 cf		
	<b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded		
	TOP OF SEAL	20.00	659.38
	<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: 5 gallons PLACEMENT: Tremie		
	TOP OF FILTER PACK	22.00	657.38
	<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: 2 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water		
	BOTTOM OF RISER / TOP OF SCREEN	22.81	656.57
	<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5"		
	BOTTOM OF SCREEN	32.81	646.57
	BOTTOM OF CASING	33.11	646.27
	BOTTOM OF HOLE	33.50	645.88
HOLE DIA: 7-1/2"			





WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Hammond Gypsur	DRILLING CO.: SCS	WELL NAME
Storage Facility	DRILLER: Filipovich	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER: Grissom	DRILLING METHODS: HSA/HQ Rock Core w/V	GWC-6
DATE CONSTRUCTED: 7/20/06 - 9:00		

	DEPTH FEET	ELEVATION FT, MSL
Hinged locking top 2" Threaded riser cap	TOP OF RISER	2.81 656.37
1/4-inch Weep Hole 6-ft DIA concrete pad	GROUND SURFACE	0.00 653.56
1/4-inch vent		
<b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel	BOTTOM OF PROTECTIVE CASING	
Well Development: Pump/surge until clear		
<b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME: 5.5 cf		
<b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded	TOP OF SEAL	25.00 628.56
<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: 5 gallons PLACEMENT: Tremie	TOP OF FILTER PACK	27.00 626.56
<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: 2 1/4 bags; 50 lb bags PLACEMENT: Tremie; wash with water	BOTTOM OF RISER / TOP OF SCREEN	29.79 623.77
<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5"	BOTTOM OF SCREEN	39.79 613.77
	BOTTOM OF CASING	40.09 613.47
	BOTTOM OF HOLE	40.20 613.36
HOLE DIA: 6-5/8"		

WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Hammond Gypsur	DRILLING CO.: SCS	WELL NAME
Storage Facility	DRILLER: Filipovich	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER: Grissom	DRILLING METHODS: HSA/HQ Rock Core w/V	GWC-7
DATE CONSTRUCTED: 7/19/06 - 9:00		

	DEPTH FEET	ELEVATION FT, MSL
Hinged locking top 2" Threaded riser cap	TOP OF RISER	3.13 657.05
1/4-inch Weep Hole 6-ft DIA concrete pad	GROUND SURFACE	0.00 653.92
1/4-inch vent		
<b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel	BOTTOM OF PROTECTIVE CASING	
Well Development: Pump/surge until clear		
<b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME: 3.3 cf		
<b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded	TOP OF SEAL	15.00 638.92
<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: 5 gallons PLACEMENT: Tremie	TOP OF FILTER PACK	17.40 636.52
<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: 2 bags; 50 lb bags PLACEMENT: Tremie; wash with water	BOTTOM OF RISER / TOP OF SCREEN	18.69 635.23
<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5"	BOTTOM OF SCREEN	28.69 625.23
	BOTTOM OF CASING	28.99 624.93
	BOTTOM OF HOLE	29.00 624.92
HOLE DIA: 6-5/8"		

WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Hammond Gypsum	DRILLING CO.: SCS	WELL NAME
Storage Facility	DRILLER: Filipovich	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER: Grissom	DRILLING METHODS: HSA/HQ Rock Core w/V	GWC-8
DATE CONSTRUCTED: 7/18/06 - 16:00		

	DEPTH FEET	ELEVATION FT, MSL
Hinged locking top 2" Threaded riser cap	TOP OF RISER	2.95 656.63
1/4-inch Weep Hole 6-ft DIA concrete pad	GROUND SURFACE	0.00 653.68
<b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel BOTTOM OF PROTECTIVE CASING		
Well Development: Pump/surge until clear  Note: GWA-1 was originally installed as HUF-5 in 2001. Only the name was changed to make this well GWA-1.		
<b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME: 2.4 cf  <b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded  TOP OF SEAL	10.80	642.88
<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: 3.75 gallons PLACEMENT: Tremie TOP OF FILTER PACK	12.80	640.88
<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: 2 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water  BOTTOM OF RISER / TOP OF SCREEN	14.15	639.53
<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5" BOTTOM OF SCREEN	24.15	629.53
	BOTTOM OF CASING	24.45 629.23
	BOTTOM OF HOLE	24.80 628.88
HOLE DIA: 6-5/8"		

WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Hammond Gypsum	DRILLING CO.: SCS	WELL NAME
Storage Facility	DRILLER: Milam	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER: Grissom	DRILLING METHODS: HSA/HQ Rock Core w/V	GWC-9
DATE CONSTRUCTED: 7/18/06 - 9:00		

		DEPTH FEET	ELEVATION FT, MSL
		TOP OF RISER	2.75 659.41
Well Development: Pump/surge until clear		GROUND SURFACE	0.00 656.66
BOTTOM OF PROTECTIVE CASING			
TOP OF SEAL		36.00	620.66
TOP OF FILTER PACK		38.50	618.16
BOTTOM OF RISER / TOP OF SCREEN		39.30	617.36
BOTTOM OF SCREEN		49.30	607.36
BOTTOM OF CASING		49.60	607.06
BOTTOM OF HOLE		51.50	605.16
HOLE DIA: 7-1/2"			

WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Hammond Gypsum	DRILLING CO.: SCS	WELL NAME
Storage Facility	DRILLER: Milam	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER: A. Grissom	DRILLING METHODS: HSA/HQ Rock Core w/	GWC-10
DATE CONSTRUCTED: 7/20/06 - 16:00		

		DEPTH	ELEVATION
		FEET	FT, MSL
Hinged locking top 2" Threaded riser cap	TOP OF RISER	3.81	667.52
1/4-inch Weep Hole 6-ft DIA concrete pad	GROUND SURFACE	0.00	663.71
1/4-inch vent	<b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel		
	BOTTOM OF PROTECTIVE CASING		
Well Development: Pump/surge until clear	<b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME: 4.6 cf		
	<b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded		
	TOP OF SEAL	16.50	647.21
	<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: 3.75 gallons PLACEMENT: Tremie		
	TOP OF FILTER PACK	18.50	645.21
	<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: 2 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water		
	BOTTOM OF RISER / TOP OF SCREEN	20.18	643.53
	<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5"		
	BOTTOM OF SCREEN	30.18	633.53
	BOTTOM OF CASING	30.48	633.23
	BOTTOM OF HOLE	30.50	633.21
HOLE DIA: 7-1/2"			

WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Hammond Gypsur	DRILLING CO.: SCS	WELL NAME
Storage Facility	DRILLER: Filipovich	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER: Millet	DRILLING METHODS: HSA/HQ Rock Core w/V	GWC-18
DATE CONSTRUCTED: 7/12/06 - 9:00		

	DEPTH FEET	ELEVATION FT, MSL
Hinged locking top 2" Threaded riser cap TOP OF RISER	2.79	641.30
1/4-inch Weep Hole 6-ft DIA concrete pad GROUND SURFACE	0.00	638.51
1/4-inch vent <b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel BOTTOM OF PROTECTIVE CASING		
Well Development: Pump/surge until clear <b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME: 8.3 cf <b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded TOP OF SEAL	37.70	600.81
<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: 2.5 gallons PLACEMENT: Tremie TOP OF FILTER PACK	42.00	596.51
<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: 1 bag; 50 lbs/bag PLACEMENT: Tremie; wash with water BOTTOM OF RISER / TOP OF SCREEN	43.86	594.65
<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5" BOTTOM OF SCREEN	53.86	584.65
BOTTOM OF CASING	54.16	584.35
BOTTOM OF HOLE	55.00	583.51
HOLE DIA: 6-5/8"		

WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Hammond Gypsum	DRILLING CO.: SCS	WELL NAME
Storage Facility	DRILLER: Milam	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER: Millet	DRILLING METHODS: HSA/HQ Rock Core w/	GWC-19
DATE CONSTRUCTED: 7/11/06 - 16:00		

	DEPTH FEET	ELEVATION FT, MSL
Hinged locking top 2" Threaded riser cap	TOP OF RISER	2.75 642.93
1/4-inch Weep Hole 6-ft DIA concrete pad	GROUND SURFACE	0.00 640.18
1/4-inch vent		
<b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel	BOTTOM OF PROTECTIVE CASING	
Well Development: Pump/surge until clear		
<b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME: 10.6 cf		
<b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded	TOP OF SEAL	38.00 602.18
<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: 3.75 gallons PLACEMENT: Tremie	TOP OF FILTER PACK	41.00 599.18
<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: 2-1/2 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water	BOTTOM OF RISER / TOP OF SCREEN	44.46 595.72
<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5"	BOTTOM OF SCREEN	54.46 585.72
	BOTTOM OF CASING	54.76 585.42
	BOTTOM OF HOLE	55.00 585.18
HOLE DIA: 7-1/2"		

WELL CONSTRUCTION LOG

Southern Company Generation

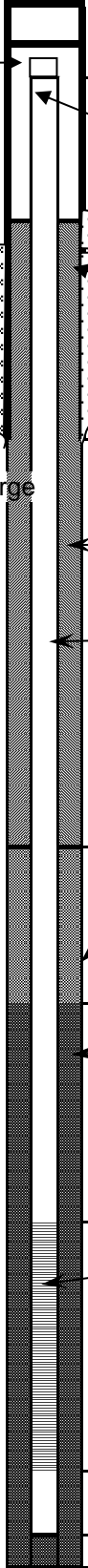
PROJECT: Plant Hammond Gypsur	DRILLING CO.: SCS	WELL NAME
Storage Facility	DRILLER: Filipovich	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER: M. Hughes	DRILLING METHODS: HSA/HQ Rock Core w/	GWC-20
DATE CONSTRUCTED: 7/17/06 - 9:00		

	DEPTH FEET	ELEVATION FT, MSL
Hinged locking top 2" Threaded riser cap	TOP OF RISER	2.85 625.65
1/4-inch Weep Hole 6-ft DIA concrete pad	GROUND SURFACE	0.00 622.80
<b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel	BOTTOM OF PROTECTIVE CASING	
<b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME: 3.7 cf		
<b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded	TOP OF SEAL	17.00 605.80
<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: 3.75 gallons PLACEMENT: Tremie	TOP OF FILTER PACK	19.60 603.20
<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: 1-1/2 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water	BOTTOM OF RISER / TOP OF SCREEN	21.21 601.59
<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5"	BOTTOM OF SCREEN	31.21 591.59
	BOTTOM OF CASING	31.51 591.29
	BOTTOM OF HOLE	31.51 591.29
HOLE DIA: 6-5/8"		

Hinged locking top  
2" Threaded riser cap

1/4-inch Weep Hole  
6-ft DIA concrete pad

Well Development: Pump/surge  
until clear



TOP OF RISER

GROUND SURFACE

**PROTECTIVE CASING**  
DIA: 4.5 x 4.5-inch  
TYPE: Steel

BOTTOM OF PROTECTIVE CASING

**BACKFILL MATERIAL**  
TYPE: Portland Cement  
VOLUME: 3.7 cf

**RISER CASING**  
DIA: 2-inch  
TYPE: Schedule 40 PVC  
JOINT TYPE: Flush Threaded

TOP OF SEAL

**ANNULAR SEAL**  
TYPE: 1/4-inch coated bentonite pellets  
AMOUNT: 3.75 gallons  
PLACEMENT: Tremie

TOP OF FILTER PACK

**FILTER PACK**  
TYPE: Sand - 1A - ANSI/NSF 61  
Drillers Services, Inc.  
AMOUNT: 1-1/2 bags; 50 lbs/bag  
PLACEMENT: Tremie; wash with water

BOTTOM OF RISER / TOP OF SCREEN

**SCREEN**  
DIA: 2-inch  
TYPE: Schedule 40 PVC  
OPENING WIDTH: 0.01-inch  
OPENING TYPE: Slotted  
SLOT LENGTH: 1.5"

BOTTOM OF SCREEN

BOTTOM OF CASING

BOTTOM OF HOLE

HOLE DIA: 6-5/8"



WELL CONSTRUCTION LOG

Southern Company Generation

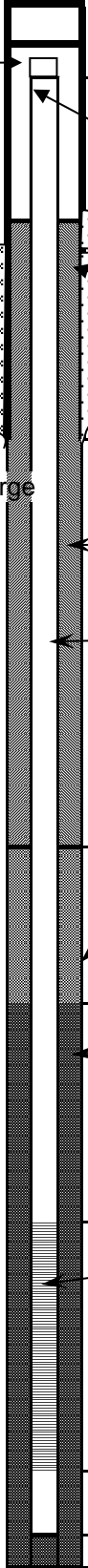
PROJECT: Plant Hammond Gypsur	DRILLING CO.: SCS	WELL NAME
Storage Facility	DRILLER: Filipovich	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER: Millet	DRILLING METHODS: HSA/HQ Rock Core w/	GWC-21
DATE CONSTRUCTED: 7/12/06 - 16:00		

	DEPTH FEET	ELEVATION FT, MSL
Hinged locking top 2" Threaded riser cap	TOP OF RISER	4.32 618.36
1/4-inch Weep Hole 6-ft DIA concrete pad	GROUND SURFACE	0.00 614.04
<b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel	BOTTOM OF PROTECTIVE CASING	
<b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME: 0.42 cf		
<b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded	TOP OF SEAL	1.50 612.54
<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: 2.5 gallons PLACEMENT: Tremie	TOP OF FILTER PACK	3.00 611.04
<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: 1-1/2 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water	BOTTOM OF RISER / TOP OF SCREEN	3.61 610.43
<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5"	BOTTOM OF SCREEN	13.61 600.43
	BOTTOM OF CASING	13.91 600.13
	BOTTOM OF HOLE	14.40 599.64
HOLE DIA: 7 1/2"		

Hinged locking top  
2" Threaded riser cap

1/4-inch Weep Hole  
6-ft DIA concrete pad

Well Development: Pump/surge  
until clear



TOP OF RISER

GROUND SURFACE

**PROTECTIVE CASING**  
DIA: 4.5 x 4.5-inch  
TYPE: Steel

BOTTOM OF PROTECTIVE CASING

**BACKFILL MATERIAL**  
TYPE: Portland Cement  
VOLUME: 0.42 cf

**RISER CASING**  
DIA: 2-inch  
TYPE: Schedule 40 PVC  
JOINT TYPE: Flush Threaded

TOP OF SEAL

**ANNULAR SEAL**  
TYPE: 1/4-inch coated bentonite pellets  
AMOUNT: 2.5 gallons  
PLACEMENT: Tremie

TOP OF FILTER PACK

**FILTER PACK**  
TYPE: Sand - 1A - ANSI/NSF 61  
Drillers Services, Inc.  
AMOUNT: 1-1/2 bags; 50 lbs/bag  
PLACEMENT: Tremie; wash with water

BOTTOM OF RISER / TOP OF SCREEN

**SCREEN**  
DIA: 2-inch  
TYPE: Schedule 40 PVC  
OPENING WIDTH: 0.01-inch  
OPENING TYPE: Slotted  
SLOT LENGTH: 1.5"

BOTTOM OF SCREEN

BOTTOM OF CASING

BOTTOM OF HOLE

HOLE DIA: 7 1/2"

WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Hammond Gypsum	DRILLING CO.: SCS	WELL NAME
Storage Facility	DRILLER: Milam	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER: Millet	DRILLING METHODS: HSA/HQ Rock Core w/	GWC-22
DATE CONSTRUCTED: 7/13/06 - 9:00		

	DEPTH FEET	ELEVATION FT, MSL
Hinged locking top 2" Threaded riser cap	TOP OF RISER	3.32 624.92
1/4-inch Weep Hole 6-ft DIA concrete pad	GROUND SURFACE	0.00 621.60
1/4-inch vent		
<b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel	BOTTOM OF PROTECTIVE CASING	
Well Development: Pump/surge until clear		
<b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME: 6.9 cf		
<b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded	TOP OF SEAL	24.50 597.10
<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: 5 gallons PLACEMENT: Tremie	TOP OF FILTER PACK	27.00 594.60
<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: 4 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water	BOTTOM OF RISER / TOP OF SCREEN	28.43 593.17
<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5"	BOTTOM OF SCREEN	38.43 583.17
	BOTTOM OF CASING	38.73 582.87
	BOTTOM OF HOLE	38.80 582.80
HOLE DIA: 7-1/2"		

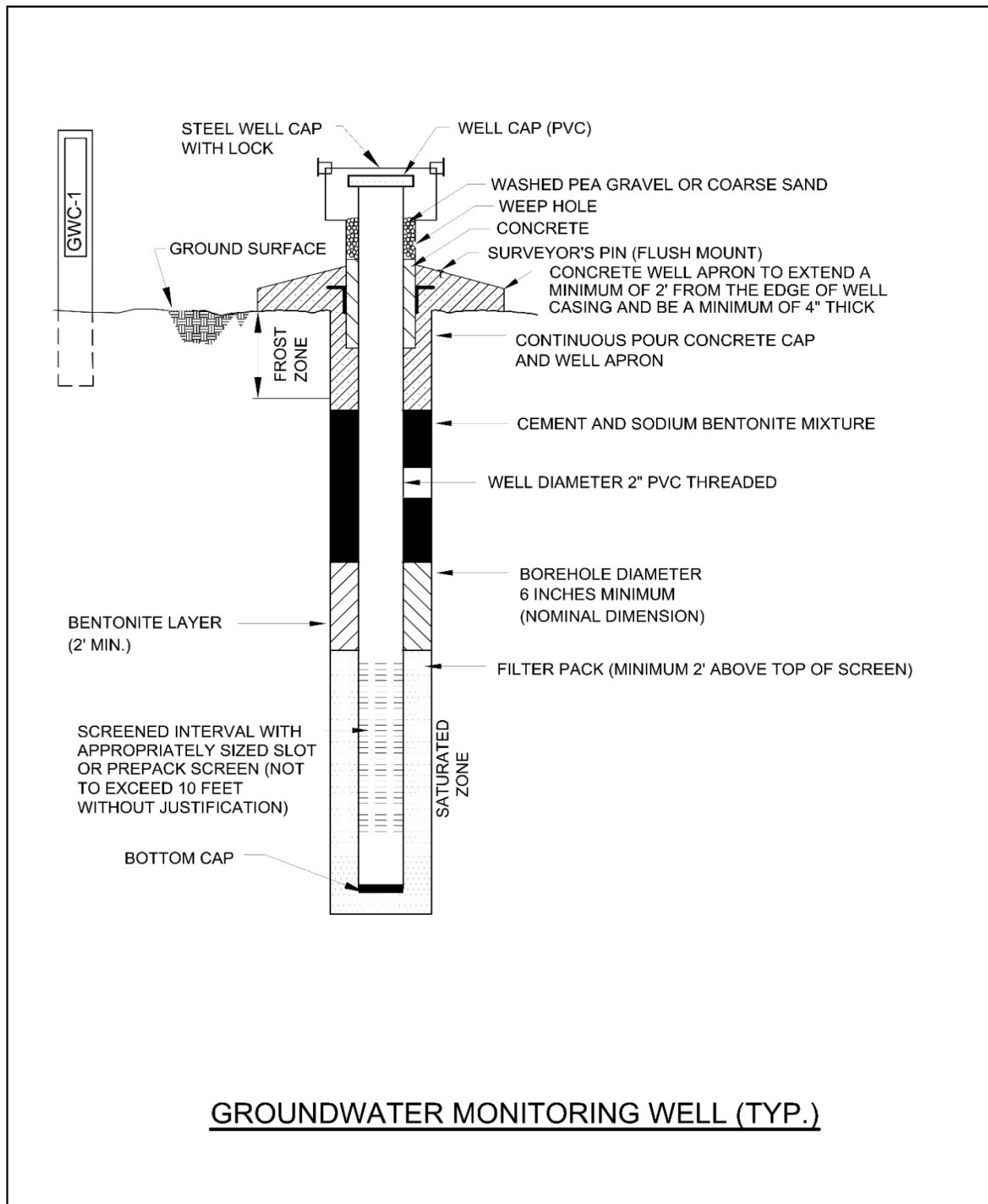
WELL CONSTRUCTION LOG

Southern Company Generation

PROJECT: Plant Hammond Gypsur	DRILLING CO.: SCS	WELL NAME
Storage Facility	DRILLER: Milam	
LOCATION: Huffaker Rd.	RIG TYPE: CME 550	
LOGGER: Grissom	DRILLING METHODS: HSA/HQ Rock Core w/W	GWC-23
DATE CONSTRUCTED: 7/19/06 - 9:00		

	DEPTH FEET	ELEVATION FT, MSL
Hinged locking top 2" Threaded riser cap	TOP OF RISER	3.01 654.87
1/4-inch Weep Hole 6-ft DIA concrete pad	GROUND SURFACE	0.00 651.86
<b>PROTECTIVE CASING</b> DIA: 4.5 x 4.5-inch TYPE: Steel BOTTOM OF PROTECTIVE CASING		
Well Development: Pump/surge until clear		
<b>BACKFILL MATERIAL</b> TYPE: Portland Cement VOLUME: 8.8 cf <b>RISER CASING</b> DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded TOP OF SEAL	31.50	620.36
<b>ANNULAR SEAL</b> TYPE: 1/4-inch coated bentonite pellets AMOUNT: 5 gallons PLACEMENT: Tremie TOP OF FILTER PACK	34.00	617.86
<b>FILTER PACK</b> TYPE: Sand - 1A - ANSI/NSF 61 Drillers Services, Inc. AMOUNT: 3 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water BOTTOM OF RISER / TOP OF SCREEN	36.71	615.15
<b>SCREEN</b> DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT LENGTH: 1.5" BOTTOM OF SCREEN	46.71	605.15
	BOTTOM OF CASING	47.01 604.85
	BOTTOM OF HOLE	47.00 604.86
HOLE DIA: 7-1/2"		

## B. GROUNDWATER MONITORING WELL DETAIL



## C. GROUNDWATER SAMPLING PROCEDURE

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Groundwater sampling will be conducted using the most current applicable *EPA 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 Landfill. 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. 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 (2) 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 pumps and wiring will be decontaminated before use and between well locations using procedures described in the latest version of the EPA Region 4 SESD guidance document, *Operating Procedure - Field Equipment Cleaning and Decontamination* (EPA, SESDGUID-205-R3) as a guide.
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 ft. 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 EPA Region 4 SESD guidance document, *Operating Procedure – Groundwater Sampling* (EPA, SESDPROC-301-R4), 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.

## D. UNDERDRAIN SAMPLING PROCEDURE

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Underdrain samples will be collected in accordance with the general procedures outlined below. These procedures were developed using field sampling guidelines described in the USEPA Region 4 Field Branches Quality System and Technical Procedures (<https://www.epa.gov/quality/quality-system-and-technical-procedures-sesd-field-branches>). Surface water samples will be analyzed for the parameters contained in Table D-1, Surface Water Analytical Parameters.

Underdrain samples will be collected from the underdrain pipe outlet and not from ponded water around the pipe outlet. If a dipper or other transfer vessel other than the sample container is used, it must be composed of a non-porous inert material such as glass, PVC, polyethylene, or stainless steel. The following procedures will be used to collect surface water and underdrain samples:

- a. Hold the bottle near the base with one hand, and with the other, remove the cap.
- b. Rinse the sample container with the water to be sampled prior to filling the container, unless the sample containers are pre-preserved. Pre-preserved sample containers should not be rinsed prior to sampling.
- c. Hold the container underneath the outfall and allow the container to be filled with water. Remove the container from underneath the outfall and place the cap back on the container.
- d. Label the sample container to, at a minimum, include: Sample Number, Name of Collector, Date and Time of Collection, and Place/Point of Collection.
- e. Place the samples in a cooler containing water-ice, if required, for courier or hand delivery to the laboratory within the sample hold times.
- f. Follow COC and temperature protocols.