GROUNDWATER MONITORING PLAN FOR INACTIVE CCR LANDFILL

FORMER PLANT ARKWRIGHT – AP3 LANDFILL AND MONOFILL

MACON-BIBB COUNTY, GEORGIA

FOR

Georgia Power

November 2018

JACOBS

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1. CERTIFICATION

I hereby certify that I am a qualified groundwater scientist and professional geologist or engineer, registered to practice in the State of Georgia. I further certify that I am qualified by education, technical knowledge and experience to make the specific technical certifications required under 40 CFR 257, Subpart D. In accordance with Rule 391-3-4-.10(6) of the Georgia Environmental Protection Division (EPD) Rules of Solid Waste Management (rules), the design of the groundwater monitoring system meets the applicable requirements of 40 CFR 257.90 through 40 257.98.

Signature: BEMcClellan

Date: 11/14/18

Signature: MJ Feeney

Date: 11/14/18

2. INTRODUCTION

Groundwater and surface water monitoring is required by EPD to detect and quantify potential changes in groundwater chemistry. This Groundwater Monitoring Plan (plan) describes the groundwater monitoring program for the Former Plant Arkwright's AP3 Landfill and Monofill (site). This plan meets the requirements of EPD rules and uses EPD's Manual for Groundwater Monitoring dated September 1991 as a guide. Groundwater and surface water sampling locations for the site are presented in Figure A1 of Appendix A.

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.

Former Plant Arkwright's AP3 Landfill and Monofill are located in Bibb County, approximately six miles northwest of Macon, Georgia. The two CCR units are currently permitted under EPD solid waste handling permit number 011-025D(LI). The site currently has an existing EPD-approved groundwater monitoring network that consists of 13 groundwater monitoring wells. 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, the detection monitoring well network for the site was installed and certified by a qualified professional engineer. This certification has been placed in the facility's operating record. Per correspondence with Georgia Power, the existing monitoring wells were installed following the guidelines presented herein. 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.

AP3 Landfill and Monofill will be closed in-place and will utilize the existing 13-well groundwater monitoring network, plus three proposed surface water monitoring locations. This plan has been generated with consideration to these factors and in accordance with Solid Waste Management Rule 391-3-4-.10(6).

3. SITE CONDITIONS

Geologic conditions for this site are described in the "Limited Hydrogeologic Assessment Report, Former Plant Arkwright – AP3 Landfill and Monofill" provided in the November 2018 solid waste handling permit application. A summary of the site geology and hydrogeology is provided below.

Native soils beneath the site generally consist of silty and sandy clay in the upper 8 to 10 feet of the subsurface, underlain by sandy silt and silty sand with minor gravel at increasing depth. A silty sand saprolite typical of highly weathered piedmont crystalline rock underlies the silt, sand and gravel layers above. Borings from recent and historical site investigations indicate parent materials consisting of extremely weathered quartzofeldspathic gneiss, horneblende gneiss and schist.

Groundwater is generally encountered within the silty and sandy residual soils and saprolite layers above bedrock. Based on existing monitoring wells, the potentiometric surface ranges from approximately 356 – 327 feet above mean sea level (MSL) (17 – 27 feet below ground surface), respectively, in the northern and southern portions of the site. The uppermost aquifer occurs within the residual soils and saprolite. Groundwater monitoring wells are installed to monitor the uppermost occurrence of groundwater beneath the site.

The existing, EPD-approved groundwater monitoring network consists of 13 groundwater monitoring wells that have been sampled semi-annually since installation. Boring logs, well construction diagrams, and a summary table of monitoring well details for existing monitoring wells are provided in Appendix A of this plan. Note that the boring logs and well construction diagrams for GWA-5, GWC-7, GWC-8, GWC-9, and GWC-10 were found to be mislabeled as "GWC-5," "GWA-7," "GWA-8," "GWA-9," and "GWA-10," respectively, at the time of their installation. Based on a review of their surveyed locations, Jacobs has confirmed that the subsurface information in the boring logs and well diagrams for these wells is commensurate with the correct well designations shown on Figure A1 in Appendix A.

It is expected that the existing wells will continue to be utilized as the site's groundwater monitoring network. However, as required by 391-3-4.10(6)(g), a minor modification will be submitted to the EPD prior to the installation or decommissioning of monitoring wells. Well installation will be directed by a qualified groundwater scientist. Any changes to the monitoring network, as shown in Figure A1 of Appendix A, will be incorporated via a minor modification to Sheet 5 of the Closure Plan.

4. GROUNDWATER MONITORING WELL DESIGN AND CONSTRUCTION

The monitoring well network for AP3 Landfill and Monofill is in place. Per correspondence with Georgia Power, the existing monitoring wells were installed following USEPA Region 4 Science and Ecosystem Support Division Operating Procedure for Design and Installation of Monitoring Wells as a general guide for best practices.

Groundwater monitoring wells will be installed to monitor the uppermost occurrence of groundwater beneath the site. Proposed locations are selected based on site geologic and hydrogeologic considerations, following the recommendation as stated in Chapter 2 of the Manual for Groundwater Monitoring (1991) to determine well spacing based on site-specific conditions. Locations are chosen to serve as upgradient (GWA), lateral (GWB), or downgradient (GWC) based on groundwater flow direction determined by potentiometric evaluation. The well naming nomenclature is based on Georgia EPD's Industrial Waste Disposal Site Design and Operations Plan – Supplemental Data for Solid Waste Handling Permit (undated).

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 EPD rules.

5. DRILLING METHODS

A variety of well drilling methods are available for the purpose of installing groundwater wells. Drilling methodology may include, but not be limited to: hollow stem augers, direct push, air rotary, mud rotary, or rotosonic techniques. The drilling method shall minimize the disturbance of subsurface materials and shall not cause impact to the groundwater. Borings will be advanced using an appropriate drilling technology capable of drilling and installing a well in site-specific geology. Drilling equipment shall be decontaminated before use and between borehole locations using the procedures described in the latest version of the USEPA Region 4 Science and Ecosystem Support Division Operating Procedure for Field Equipment Cleaning and Decontamination as a guide.

Sampling and/or coring may be used to help determine the stratigraphy and geology. Samples will be logged under the direction of a qualified groundwater scientist. Screen depths will be chosen based on the depth of the uppermost aquifer.

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

Monitoring wells will be installed using the latest version of the USEPA Region 4 Science and Ecosystem Support Division Operating Procedure for Design and Installation of Monitoring Wells as a general guide for best practices.

6. MONITORING WELL CONSTRUCTION MATERIALS AND REPORTING

Well construction materials shall be sufficiently durable to resist chemical and physical degradation and will not interfere with the quality of groundwater samples collected. The groundwater monitoring well detail attached in Appendix B, Groundwater Well Detail, illustrates the general design and construction details for a monitoring well.

a) Well Casings and Screens

ASTM, NSF rated, Schedule 40, 2-inch 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.

b) Well Intake Design

The design and construction of the intake of the groundwater wells shall: (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 shall not exceed 10 feet without justification as to why a longer screen is necessary (e.g. significant variation in groundwater level). If the above 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. Pre-packed well screens will be installed following general industry standards and using the latest version of the Region 4 U.S. Environmental Protection Agency Science and Ecosystem Support Division Operating Procedure for Design and Installation of Monitoring Wells 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.

c) Filter Pack and Annular Sealant

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 hole 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 of filter pack depth will be measured 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 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 cementitous grout from entering the water-bearing or screened zone. 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 2 feet above the bentonite seal and injecting grout at low pressure/velocity.

d) 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 cementitous grout to ground surface, where it will become a concrete apron extending outward with a radius of at least 3 feet from the edge of the well casing and sloped to drain water away from the well.

A vent hole will be installed in each wells PVC casing (below the cap) to allow the 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.

e) 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 10 nephelometric turbidity units (NTUs); however, formation-specific conditions may not allow this target to be accomplished. Additionally, the stabilization criteria contained in Appendix D 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 the wells' filter packs over time. Therefore, the turbidity of the groundwater from the monitoring wells may gradually increase over time after initial well development. As a result, the monitoring wells may have to be redeveloped periodically to remove the silt and clay that has worked its way into the filter pack of the monitoring 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.

f) Documentation of Well Design and Construction

The following information, documenting the construction of each well, will be submitted in report form to EPD by a qualified groundwater scientist after well development.

- Name of driller and identification 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;
- Date/time of construction;
- Drilling method and drilling fluid if used;
- Well location (+0.5 ft.);
- Borehole diameter and well casing diameter;
- Well depth (+0.1 ft.);
- Drilling and lithologic logs;
- Casing materials;
- Screen materials and design;
- Casing and screen joint type;
- Screen slot size/length;
- Filter pack material/size;
- Filter pack volume;
- Filter pack placement method;
- Sealant materials;
- Sealant volume;
- Sealant placement method;
- Surface seal design/construction,
- Well development procedures;
- Type of protective well cap;

- Ground surface elevation (+0.01 ft.);
- Well cap elevation (+0.01 fl.);
- Top of casing elevation (0.01 fl.); and
- Detailed drawing of well (include dimensions).

g) Well Abandonment

Monitoring wells will be abandoned using industry-accepted practices and using the Manual for Groundwater Monitoring (1991) and Georgia Water Well Standards Act (1985) as guides. The wells will be abandoned under the direction of a geologist or engineer registered in Georgia. Neat Portland cement or bentonite will be used as appropriate to complete abandonment and seal the well borehole.

7. MONITORING PARAMETERS AND FREQUENCY

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

Groundwater monitoring parameters and sampling frequency are presented in Table 1, below. A minimum of eight independent samples from each groundwater well will be collected 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, Rules for Solid Waste Management. GPC may petition for an alternate monitoring schedule for the site pursuant to applicable rules.

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

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

TABLE 1. GROUNDWATER MONITORING PARAMETERS AND FREQUENCY

MONITORING PARAMETER		GROUNDWATER MONITORING		
		Background	1st Semi-Annual Event	2nd Semi-Annual Event
Field Parameters	Temperature	X	X	X
	pH	X	X	X
	Specific Conductance	X	X	X
	ORP	X	X	X
	Turbidity	X	X	X
	Dissolved Oxygen	X	X	X
Appendix III (Detection)	Boron	X	X	X
	Calcium	X	X	X
	Chloride	X	X	X
	Fluoride	X	X	X
	pH (field)	X	X	X
	Sulfate	X	X	X
	Total Dissolved Solids	X	X	X
Appendix IV (Assessment)	Antimony	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Arsenic	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Barium	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Beryllium	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Cadmium	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Chromium	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Cobalt	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Fluoride	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Lead	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Lithium	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Mercury	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Molybdenum	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Selenium	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Thallium	X	Annual if Assessment is Triggered	Only if Detected during Annual
	Radium 226 & 228	X	Annual if Assessment is Triggered	Only if Detected during Annual

Notes:

1) If the site is required to enter into Assessment Monitoring, an Assessment Monitoring Plan will be prepared, and sampling may include some or all Appendix III and Appendix IV parameters.
2) 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.
3) 90 days after assessment monitoring is triggered, Appendix IV parameters must be collected. Then 90 days later, the second semi-annual monitoring event will be initiated.

TABLE 2. ANALYTICAL METHODS

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

8. SAMPLE COLLECTION

During each sampling event, samples will be collected and handled in accordance with the procedures specified in Appendix D, Groundwater Sampling Procedure. Sampling procedures were developed using standard industry practice and USEPA Region 4 Field Branches Quality System and Technical Procedures as a guide. Low-flow sampling methodology will be utilized for sample collection. Alternative industry accepted sampling techniques may be used when appropriate with prior EPD approval.

For groundwater sampling, positive gas displacement Teflon or stainless steel bladder pumps with PVC intake screens 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.

9. CHAIN-OF-CUSTODY

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.

10. FIELD AND LABORATORY QUALITY ASSURANCE / QUALITY CONTROL

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

- Field Equipment Rinsate Blanks - Where sampling equipment is not new or dedicated, an equipment rinsate blank will be collected at a rate of one blank per 10 samples using non-dedicated equipment.
- Field Duplicates - Field duplicates are collected by filling additional containers at the same location, and the field duplicate is assigned a unique sample identification number. One blind field duplicate will be collected for every 20 samples.

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

A custody seal shall be placed on each shipping cooler or shipping container. Custody seals on sample containers serve two purposes: to prevent accidental opening of the shipping container and to provide visual evidence should the container be opened or tampered with. The use of custody seals controls the loss of samples and provides direct evidence whether sample containers have been opened and possibly compromised.

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

11. REPORTING RESULTS

A semi-annual groundwater report that documents the results of sampling and analysis will be submitted to EPD. Semi-annual groundwater monitoring reports will be submitted to 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 decommissioned 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 surface water 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.

12. STATISTICAL ANALYSIS

Groundwater quality data from each sampling event will be statistically evaluated to determine if there has been a statistically significant change in groundwater chemistry. Background data will be used to determine statistical limits.

According to EPD Rule 391-3-4-.10(6)(a), which incorporates the statistical analysis requirements of 40 CFR 257.93 by reference, the site must specify in the operating record the statistical methods to be used in evaluating groundwater monitoring data for each identified constituent. The statistical test chosen shall be conducted separately for each constituent in each well. As authorized by the rule, statistical tests that will be used include:

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

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

3) Another statistical test method (such as prediction limits or control charts) that meets the performance standards of §257.93(g). 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 site's operating record pursuant to 391-3-4-.10(6). An overview of the statistical analysis plan is provided in the following figures presented in Appendix E.

- Figure E1, Statistical Analysis Plan Overview, includes a flowchart that depicts the process that will be followed to develop the site-specific plan.
- Figure E2, Decision Logic for Determining Appropriate Statistical Methods, depicts the decision logic that will be used to determine the appropriate method as required by 391-3-4-.10(6).
- Figure E3, Decision Logic for Computing Prediction Limits, presents the logic that will be used to calculate site-specific statistical limits and test compliance results against those limits.

Appendix A. **Groundwater Monitoring Network Documentation**

Table A1 – Monitoring Well Details

Figure A1 – Site Monitoring Plan

Monitoring Well Boring Logs and Construction Diagrams

Table A1. Monitoring Well Details

Monitoring Well ID	Northing	Easting	Ground Elevation (ft MSL)	TOC Elevation (ft MSL)	Well Depth (ft BTOC)	Screened Interval (ft BTOC)	GW Elevation (ft MSL)
GWA-3	1066899.200	2437431.000	387.10	388.55	41.95	31.75 - 41.75	352.72
GWA-5	1066884.300	2437209.300	373.71	376.45	32.74	22.44 - 32.44	352.79
GWA-12	1067003.666	2436787.918	369.39	372.56	32.51	22.21 - 32.21	355.77
GWA-13	1065951.025	2438129.945	368.94	371.81	43.61	33.31 - 43.31	347.36
GWA-14	1066023.905	2438385.174	385.37	388.16	58.75	48.45 - 58.45	344.96
GWC-7	1064410.279	2438355.107	349.00	352.73	48.50	38.50 - 48.50	329.39
GWC-8	1064521.654	2437572.442	352.17	355.67	43.10	33.10 - 43.10	330.21
GWC-9	1065139.294	2437297.327	363.94	367.34	38.20	28.20 - 38.20	345.91
GWC-10	1065419.082	2437191.693	367.66	370.87	38.20	28.20 - 38.20	348.92
GWC-15	1065475.493	2438360.991	372.88	375.90	43.00	32.70 - 42.70	346.97
GWC-16	1065263.900	2438173.900	362.31	365.21	34.48	24.18 - 34.18	344.53
GWC-17	1065458.377	2438010.027	365.57	368.52	33.85	23.55 - 33.55	346.43
GWC-18	1064482.185	2437961.021	352.25	354.99	50.85	40.55 - 50.55	327.16

Notes:

1. Groundwater levels were measured on September 11, 2018.
2. TOC = top of casing (i.e., riser pipe).
3. All depths measured in feet below top of casing (BTOC).
4. The well depths for GWC-7, 8, 9, and 10 are depths to bottom of screen, as depths to bottom of casing were not provided in the construction logs.
5. Elevations measured in feet from mean sea level (MSL) (NGVD 1929).
6. Coordinates are in Georgia West State Plane, US Survey Feet, NAD 83.

NOTES:

1. SEE DRAWING C-002 FOR LEGEND
2. POTENTIOMETRIC CONTOURS BASED ON WATER LEVEL MEASUREMENTS TAKEN ON 09-11-2018

N

OCMULGEE RIVER

AP1GWA-1
320.81

AP1GWA-2
323.05

NORFOLK SOUTHERN RR

ARKWRIGHT ROAD

GWA-19
314.52

AP3 LANDFILL & MONOFILL PERMIT BOUNDARY

AP3 LANDFILL & MONOFILL PERMIT BOUNDARY

AP3 LANDFILL & MONOFILL PERMIT BOUNDARY

GWA-14
344.96

GWC-15
346.97

GWA-13
347.36

MONOFILL

GWA-20
314.93

340
335
330
325
320
315
310

GWC-16
344.53

GWA-3
352.78

GWC-17
346.43

GWC-7
328.91

SWC-1

GWA-5
352.79

350

UNAMED TRIBUTARY OF BEAVERDAM CREEK

345

AP3 LANDFILL AND MONOFILL PERMIT BOUNDARY

AP3 LANDFILL

CULVERT

WETLANDS

GWC-18
327.16

355

AP3 LANDFILL & MONOFILL PERMIT BOUNDARY

GWA-12
355.77

SWA-1

SWC-2

GWC-10
346.13

GWC-9
345.95

GWC-8
330.24

0 200' 400'

THIS FIGURE IS A REPRODUCTION OF THE "SITE MONITORING PLAN" LOCATED IN THE AP3 LANDFILL AND MONOFILL CLOSURE PLAN. ANY MODIFICATIONS TO THE MONITORING NETWORK SHALL BE DOCUMENTED ON THE "SITE MONITORING PLAN" SHEET IN THE CLOSURE PLAN, WHICH SHALL TAKE PRECEDENCE OVER THIS FIGURE.

GEORGIA REGISTERED No. PE14399 PROFESSIONAL ENGINEER MICHAEL T. FEENEY
11-14-18

BRET MCCLELLAN LICENSED No. 1540 GEORGIA REGISTERED PROFESSIONAL GEOLOGIST
11/14/18

FIGURE A1

SITE MONITORING PLAN

AP3 LANDFILL AND MONOFILL

FOR

GEORGIA POWER COMPANY
FORMER PLANT ARKWRIGHT
MACON - BIBB COUNTY, GA

Georgia Power

REV.	DATE	DESCRIPTION

JACOBS
404.978.7600
JACOBS.COM
Ten 10th Street NW, Suite 1400, Atlanta, GA 30309

PROJ. NO.	35DK9203	DWG. CS101	EDIT
SCALE	AS SHOWN	SHEET 5	OF 7
DATE	NOVEMBER 2018		

Project: PLANT ARKWRIGHT ASH MONOFILL

Location: MACON, GEORGIA

Purpose: GROUNDWATER MONITORING WELLS

HOLE No. GWA-3

SHEET 1 OF 2

Position: Surface Elevation: 387.15

Rig Type: CME 75 Contractor: SCS ATLANTA Driller: KIRK ROBINS

Drilling Method: HOLLOW STEM AUGER Boring Depth: 45.0 No. SPT: 8 No. UD Samples: 0

Date Started: 12/9/92 Date Completed: 12/9/92 Logged By: J. C. REDWINE Date Logged: 12/9/92

Hole Closure:

WATER TABLE	DEPTH AND ELEVN. (FT)	SYMBOLIC LOG	SOIL DESCRIPTION	SAMPLE NUMBER	SAMPLE LEGEND	SAMPLE RECOVERY (%)	SAMPLE SPT VALUES BLOWS/6" (N)	COMMENTS	TEST RESULTS MOISTURE CONTENT (%)	TEST RESULTS LIQUID LIMIT (%)	TEST RESULTS PLASTIC LIMIT (%)	TEST RESULTS K (cm/s)
	0 387.15		Red to orange micaceous (biotite) sandy silty CLAY									
	5			SS-1			3-5-7 (12)	Clay relatively stiff above 5.0'				
	380.15		Red to orange sandy silty CLAY									
	10			SS-2			2-2-3 (5)	Mica (biotite) not present in SS-2 Original rock type not discernable above 10.0'				
	375.15		Yellow to orange to red sandy silty CLAY to clayey silty fine SAND (biotite SCHIST to biotite hornblende quartzfeldspathic GNEISS)					Sample begins to get moist at approximately 12.0'				
	15			SS-3			2-3-5 (8)					
	20			SS-4			3-4-5 (9)					
	363.65 25		Gray-green to white to red hornblende GNEISS SAPROLITE (40% amphibole, 60% plag) (clayey silty very fine SAND)	SS-5			10-12-14 (26)	Foliation near horizontal				
	358.65 30		Biotite quartzofeldspathic GNEISS SAPROLITE (clayey silty fine to medium-grained SAND)	SS-6			7-13-12 (25)	Tends to be alternating layers of biotite and quartzofeldspathic gneiss "zebra rock"				
▽	35			SS-7			11-10-17 (27)	SS-7 similar to sample at 23.5' in GWA-2				
	348.65 40		AMPHIBOLITE (metagabbro?) to hornblende	SS-8			14-50/5					

SS = Split Spoon; ST = Shelby Tube;
D = Dennison; P = Pitcher; O = Other

▽ 35.0 while drilling
▼ after drilling

☑ after 24 hours

Hole No. GWA-3

Project: **PLANT ARKWRIGHT ASH MONOFILL**

Location: **MACON, GEORGIA**

Purpose: **GROUNDWATER MONITORING WELLS**

HOLE No. GWA-3

SHEET 2 OF 2

Position:

Surface Elevation: **387.15**

WATER TABLE	DEPTH AND ELEVN. (FT)	SYMBOLIC LOG	SOIL DESCRIPTION	SAMPLE NUMBER	SAMPLE LEGEND	SAMPLE RECOVERY (%)	SAMPLE SPT VALUES BLOWS/6" (N)	COMMENTS	TEST RESULTS MOISTURE CONTENT (%)	TEST RESULTS LIQUID LIMIT (%)	TEST RESULTS PLASTIC LIMIT (%)	TEST RESULTS K (cm/s)
	40		GNEISS SAPROLITE (clayey silty fine to coarse-grained SAND)									
	45		Boring Terminated									

SS = Split Spoon; ST = Shelby Tube;
D = Dennison; P = Pitcher; O = Other

35.0 while drilling

after drilling

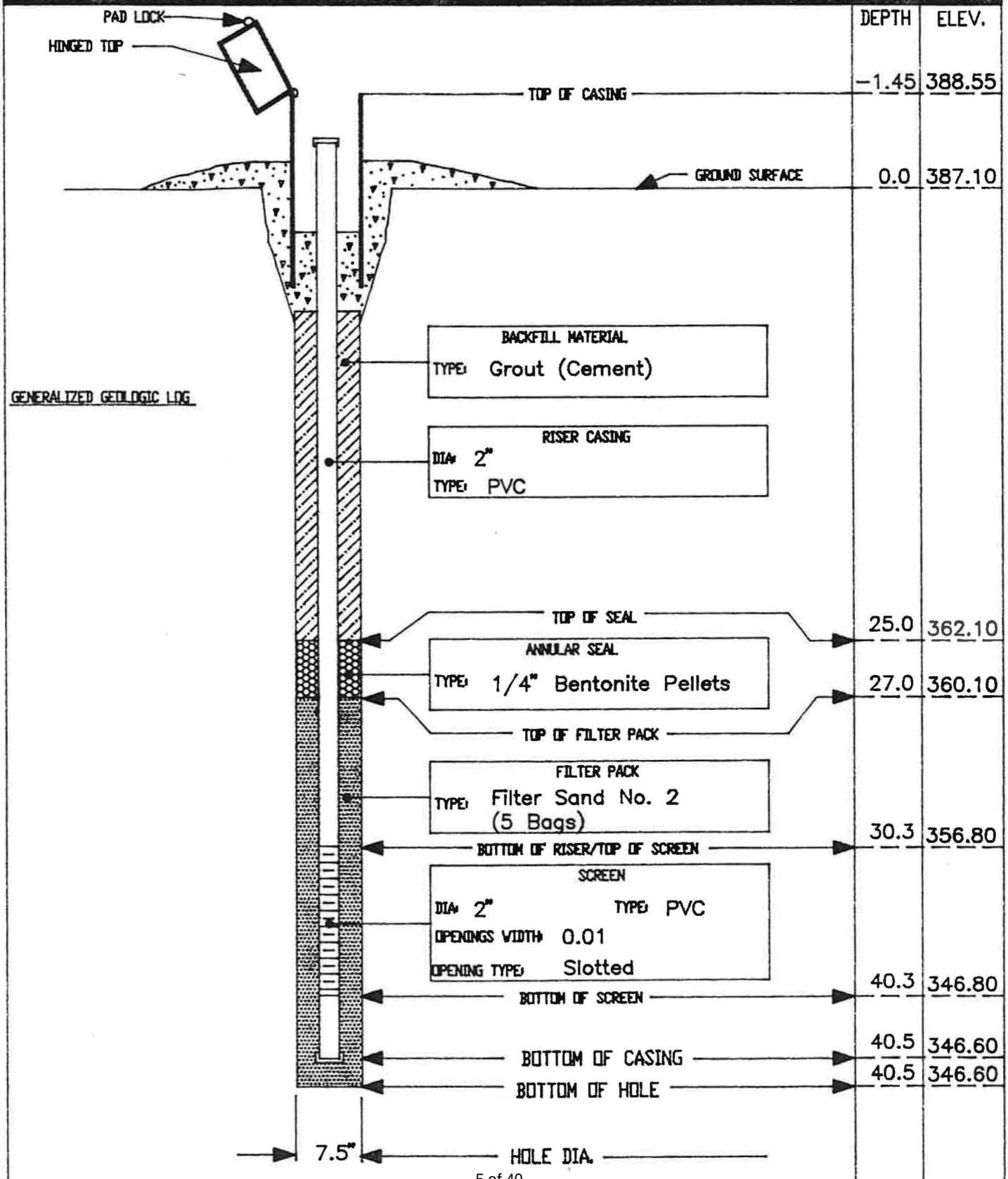
after 24 hours

Hole No. **GWA-3**

Southern Company Services

WELL CONSTRUCTION LOG

PROJECT: Plant Arkwright Monofill				WELL NO.: GWA-3
SITE: Arkwright Monofill		LOCATION: Macon, GA		
BEGUN: 12/9/92	COMPLETED: 12/8/92	PREPARED BY: J.C. Redwine	WATER TABLE LEVEL: 357.08 (1/14/93)	CONTRACTOR: SCS Atlanta



Project: PLANT ARKWRIGHT MONOFILL

Location: MACON, GA

Purpose: GROUNDWATER MONITORING WELLS

HOLE No. GWC-5

SHEET 1 OF 1

Position: E 1,248.1 N 3,613.8 Surface Elevation: 373.71

Rig Type: CME 850 Contractor: SCS ATLANTA Driller: JEFF GILREATH

Drilling Method: HOLLOW STEM AUGER Boring Depth: 30.0 No. SPT: No. UD Samples:

Date Started: 1/10/94 Date Completed: 1/10/94 Logged By: G.T. WATKINS Date Logged: 1/10/94

Hole Closure:

WATER TABLE	DEPTH AND ELEVN. (FT)	SYMBOLIC LOG	SOIL DESCRIPTION	SAMPLE NUMBER	SAMPLE LEGEND	SAMPLE RECOVERY (%)	SAMPLE SPT VALUES BLOWS/6" (N)	COMMENTS	TEST RESULTS MOISTURE CONTENT (%)	TEST RESULTS LIQUID LIMIT (%)	TEST RESULTS PLASTIC LIMIT (%)
	0 373.71		Brown-Red Slightly Sandy Silty CLAY with Occasional Weathered Amphiboles, Micas								
	5										
	10 363.21		Brown-Red to Orange Micacious Sandy SILT containing Abundant Weathered Amphiboles and Relict Foliation					TOP OF SAPROLITE			
	15 357.71		Tan to Buff-Colored Micaceous Sandy Silt to Silty Fine SAND (SAPROLITE) with Abundant Weathered Quartz, Mica, and Amphiboles.					Weathered Quartz Fragments to 1/4"			
	20							Relict Texture Beocmes More Apparent With Depth			
	351.71 25		Tan to Buff Wet Silty Fine SAND (SAPROLITE)								
	348.71		Tan to Buff Micaceous Quartzose Weathered Rock (GNEISS) Weathered, Oxidized, Silty Zones (SAPROLITE) Interbedded with Zones of GNEISS					TOP OF WEATHERED ROCK SAMPLE COLLECTED			
	30		Boring Terminated								

SS = Split Spoon; ST = Shelby Tube;
D = Dennison; P = Pitcher; O = Other

▽ while drilling
▼ after drilling

☑ after 24 hours

Hole No. GWC-5

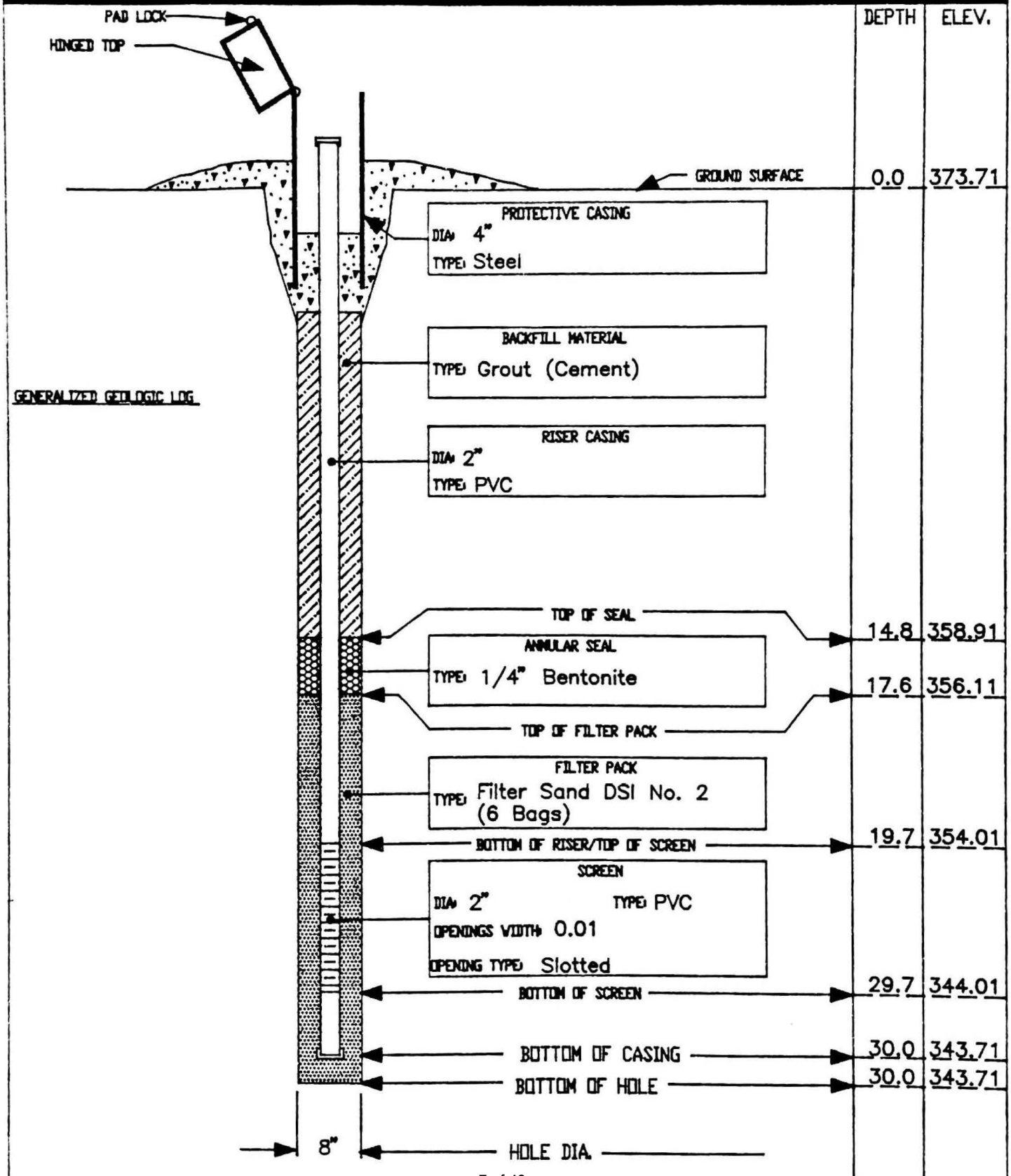
Southern Company Services

WELL CONSTRUCTION LOG

PROJECT	WELL NO.
Plant Arkwright Monofill	GWC-5

SITE	LOCATION
Arkwright Monofill	Macon, GA

BEGUN	COMPLETED	PREPARED BY	CONTRACTOR
1/10/94	1/10/94	G. T. Watkins	SCS Atlanta



	DEPTH	ELEV.
GROUND SURFACE	0.0	373.71
TOP OF SEAL	14.8	358.91
TOP OF FILTER PACK	17.6	356.11
BOTTOM OF RISER/TOP OF SCREEN	19.7	354.01
BOTTOM OF SCREEN	29.7	344.01
BOTTOM OF CASING	30.0	343.71
BOTTOM OF HOLE	30.0	343.71

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWA-12
Sheet 1 of 2

SITE: Former Plant Arkwright | HOLE DEPTH: 29 | SURF.ELEV.: 369.39
LOCATION: Solid Waste Management Area | COORDINATES N: 1067003.666 | E: 2436787.918
ANGLE: | BEARING: | CONTRACTOR: SCS, Inc. | DRILL NO.:
DRILLING METHOD: HSA/HQ Rock core with water | NO. SAMPLES: 3 | NO. U.D. SAMPLES: 0
CASING SIZE: | LENGTH: | CORE SIZE: | TOTAL % REC.:
WATER TABLE DEPTH: 14.2 | ELEV.: | TIME AFTER COMP.: | DATE TAKEN: 12/18/2008
TYPE GROUT: | QUANTITY: | MIX: | DRILLING START DATE: 11/18/2008
DRILLER: S. Milam | RECORDER: D. Brooks/L. Garland | APPROVED: | DRILLING COMP. DATE: 12/9/2008

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
0	369.39								
1	368.39								
2	367.39								
3	366.39								
4	365.39								
5	364.39	Reddish brown silty CLAY, damp, stiff	1	4.5-6	4-7-7	14			
6	363.39								
7	362.39								
8	361.39								
9	360.39								
10	359.39	Reddish yellow silty CLAY, with very fine grained sand	2	9.5-11	4-3-6	9			
11	358.39								
12	357.39								
13	356.39								
14	355.39								
15	354.39	Reddish yellow silty SAND, with clay, micaceous, saprolite	3	14.5-16	5-8-10	18			
16	353.39								
17	352.39								
18	351.39								
		Auger refusal at 18.7'							
19	350.39	Biotite gneiss, slightly to moderately weathered, slightly to heavily fractured with moderately to highly weathered fracture faces							
20	349.39			19-24				98	
21	348.39	19.1- fracture							
22	347.39	19.75 - fracture							
23	346.39	21.7- fracture							
24	345.39								

Form GS9901 8-19-2008

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWA-12
Sheet 2 of 2

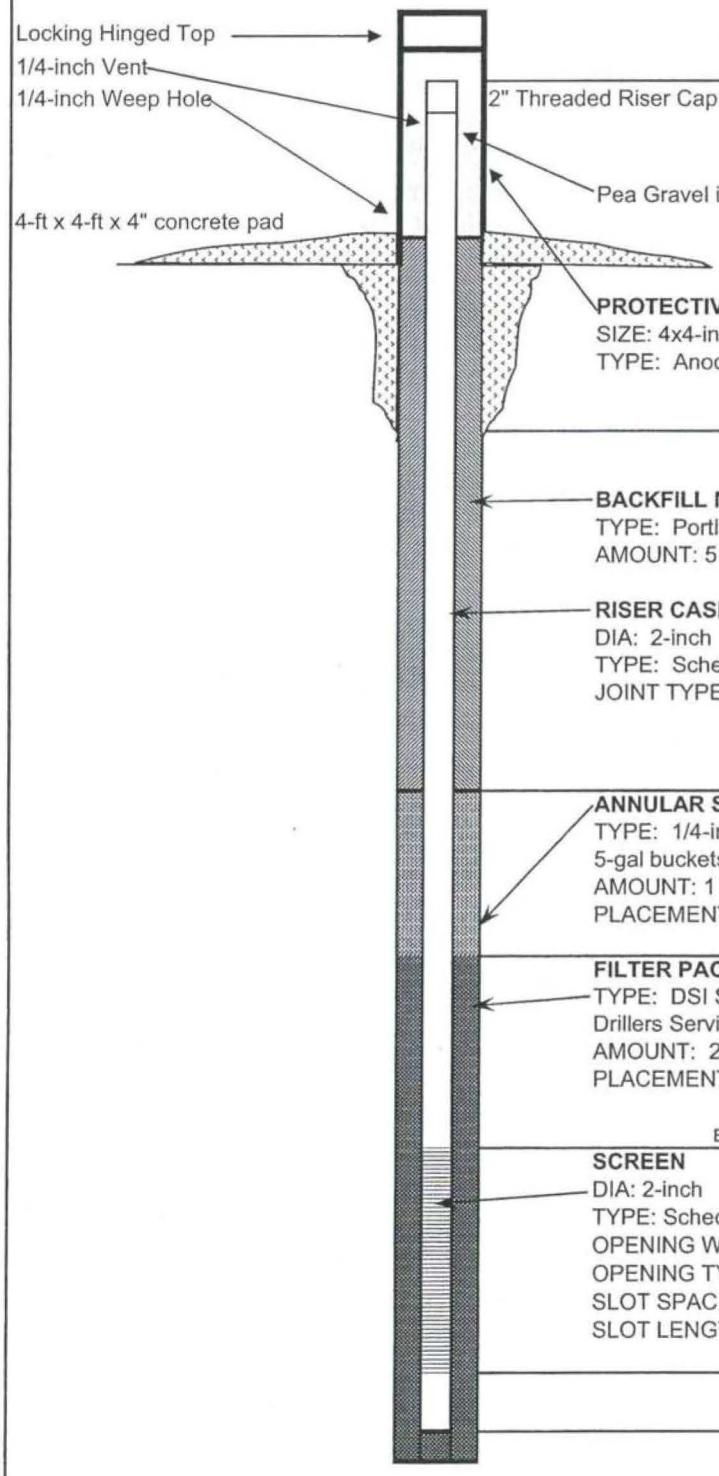
SITE Former Plant Arkwright TOTAL DEPTH 29 SURF.ELEV. 369.394

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
25	344.39	Same as above		24-29				98	
26	343.39	25.4- fracture							
27	342.39	26.7- fracture							
28	341.39								
29	340.39								
30	339.39	29' - Bottom of boring							
31	338.39								
32	337.39								
33	336.39								
34	335.39								
35	334.39								
36	333.39								
37	332.39								
38	331.39								
39	330.39								
40	329.39								
41	328.39								
42	327.39								
43	326.39								
44	325.39								
45	324.39								
46	323.39								
47	322.39								
48	321.39								
49	320.39								
50	319.39								
51	318.39								
52	317.39								
53	316.39								
54	315.39								
55	314.39								
56	313.39								

Form GS9901 8-19-2008

WELL CONSTRUCTION LOG — Southern Company Generation

PROJECT: Former Plant Arkwright	DRILLING CO.: SCS, Inc.	WELL NAME
Solid Waste Management Unit	DRILLER: S. Milam	
LOCATION: Ash Ponds 1, 2, 3	RIG TYPE: CME 550	
LOGGER: L. Garland	DRILLING METHODS: HSA, HQ Rock Core	GWA-12
DATE CONSTRUCTED: 12/10/2008		



	DEPTH FEET	ELEVATION FT, MSL
TOP OF RISER	-3.17	372.56
GROUND SURFACE	0.00	369.39
BOTTOM OF PROTECTIVE CASING		
TOP OF SEAL	16.04	353.35
TOP OF FILTER PACK	18.04	351.35
BOTTOM OF RISER / TOP OF SCREEN	19.04	350.35
BOTTOM OF SCREEN	29.04	340.35
BOTTOM OF CASING	29.34	340.05

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWA-13
Sheet 1 of 2

SITE: Former Plant Arkwright | HOLE DEPTH: 40 | SURF.ELEV.: 368.94
LOCATION: Solid Waste Management Area | COORDINATES N: 1065951.025 | E: 2438129.945
ANGLE: | BEARING: | CONTRACTOR: SCS, Inc. | DRILL NO.:
DRILLING METHOD: HSA/ HQ Rock Core | NO. SAMPLES: 4 | NO. U.D. SAMPLES: 0
CASING SIZE: | LENGTH: | CORE SIZE: | TOTAL % REC.:
WATER TABLE DEPTH: 21.8 | ELEV.: | TIME AFTER COMP.: | DATE TAKEN: 12/18/2008
TYPE GROUT: | QUANTITY: | MIX: | DRILLING START DATE: 12/3/2008
DRILLER: S. Milam | RECORDER: L. Garland | APPROVED: | DRILLING COMP. DATE: 12/10/2008

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
0	368.94								
1	367.94								
2	366.94								
3	365.94								
4	364.94								
5	363.94	Light reddish brown sandy SILT, micaceous fine grained sand	1	4.5-6	4-4-4	8			
6	362.94								
7	361.94								
8	360.94								
9	359.94								
10	358.94	Tan silty SAND, fine grained, micaceous	2	9.5-11	4-4-5	9			
11	357.94								
12	356.94								
13	355.94								
14	354.94								
15	353.94	Same as above	3	14.5-16	3-3-5	8			
16	352.94								
17	351.94								
18	350.94								
19	349.94								
20	348.94	Same as above	4	19.5-21	5-7-13	20			
21	347.94								
22	346.94								
23	345.94								
24	344.94								

Form GS9901 8-19-2008

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWA-13
Sheet 2 of 2

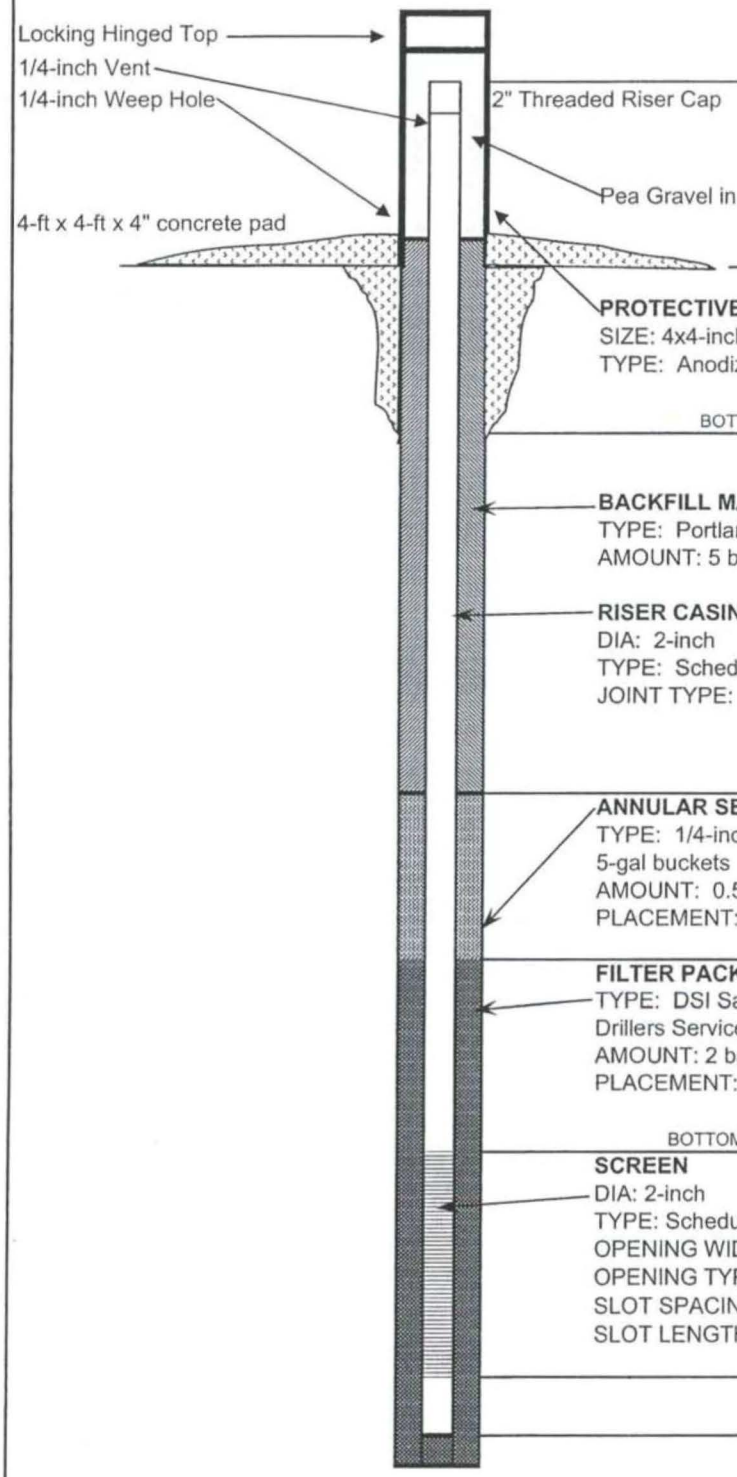
SITE Former Plant Arkwright TOTAL DEPTH 40 SURF.ELEV. 368.94066

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
		24.5' - Auger refusal							
25	343.94								
26	342.94	Biotite gneiss, moderatly weathered to decomposed, slightly to heavily fractured		24.5-28				88	
27	341.94								
28	340.94	28.6- fracture							
29	339.94								
30	338.94	Biotite gneiss, unweathered, slightly to heavily fractured, slightly weathered fracture faces		28-33				90	
31	337.94								
32	336.94								
33	335.94								
34	334.94	Same as above							
35	333.94			33-38				100	
36	332.94								
37	331.94								
38	330.94	Same as above		38-40				100	
39	329.94								
40	328.94								
		40' - Bottom of boring							
41	327.94								
42	326.94								
43	325.94								
44	324.94								
45	323.94								
46	322.94								
47	321.94								
48	320.94								
49	319.94								
50	318.94								
51	317.94								
52	316.94								
53	315.94								
54	314.94								
55	313.94								
56	312.94								

Form GS9901 8-19-2008

WELL CONSTRUCTION LOG — Southern Company Generation

PROJECT: Former Plant Arkwright	DRILLING CO.: SCS, Inc.	WELL NAME
Solid Waste Management Unit	DRILLER: S. Milam/ S. Denty	
LOCATION: Ash Ponds 1, 2, 3	RIG TYPE: CME 550	
LOGGER: L. Garland	DRILLING METHODS: HSA, HQ Rock Core	GWA-13
DATE CONSTRUCTED: 12/11/2008		



	DEPTH FEET	ELEVATION FT, MSL
TOP OF RISER	-2.87	371.81
GROUND SURFACE	0.00	368.94
BOTTOM OF PROTECTIVE CASING		
TOP OF SEAL	26.00	342.94
TOP OF FILTER PACK	28.44	340.50
BOTTOM OF RISER / TOP OF SCREEN	30.44	338.50
BOTTOM OF SCREEN	40.44	328.50
BOTTOM OF CASING	40.74	328.20

SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWA-14
Sheet 1 of 2

SITE: Former Plant Arkwright | HOLE DEPTH: 54.4 | SURF.ELEV.: 385.374
LOCATION: Solid Waste Management Area | COORDINATES N: 1066023.905 | E: 2438385.174
ANGLE: | BEARING: | CONTRACTOR: SCS, Inc. | DRILL NO.: CME-55
DRILLING METHOD: HSA/ HQ Rock Core | NO. SAMPLES: 5 | NO. U.D. SAMPLES: 0
CASING SIZE: | LENGTH: | CORE SIZE: | TOTAL % REC.:
WATER TABLE DEPTH: 32.5 | ELEV.: | TIME AFTER COMP.: | DATE TAKEN: 2/9/2009
TYPE GROUT: | QUANTITY: | MIX: | DRILLING START DATE: 2/4/2009
DRILLER: Brandon Poe | RECORDER: Luke Garland | APPROVED: | DRILLING COMP. DATE: 2/4/2009

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
0	385.37								
1	384.37								
2	383.37								
3	382.37								
4	381.37								
5	380.37								
6	379.37	Dark reddish brown clayey SAND with some organic material, medium to fine grained	1	4.5-6	3-5-8	13			
7	378.37								
8	377.37								
9	376.37								
10	375.37								
11	374.37	Reddish brown sandy SILT, micaceous fine grained sand	2	9.5-11	5-4-5	9			
12	373.37								
13	372.37								
14	371.37								
15	370.37								
16	369.37	Reddish brown clayey SILT with some sand	3	14.5-16	3-3-3	6			
17	368.37								
18	367.37								
19	366.37								
20	365.37								
21	364.37	Yellowish brown silty SAND, medium to fine grained	4	19.5-21	7-10-4	14			
22	363.37								
23	362.37								
24	361.37								

Form GS9901 7-26-2004

SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWA-14
Sheet 2 of 2

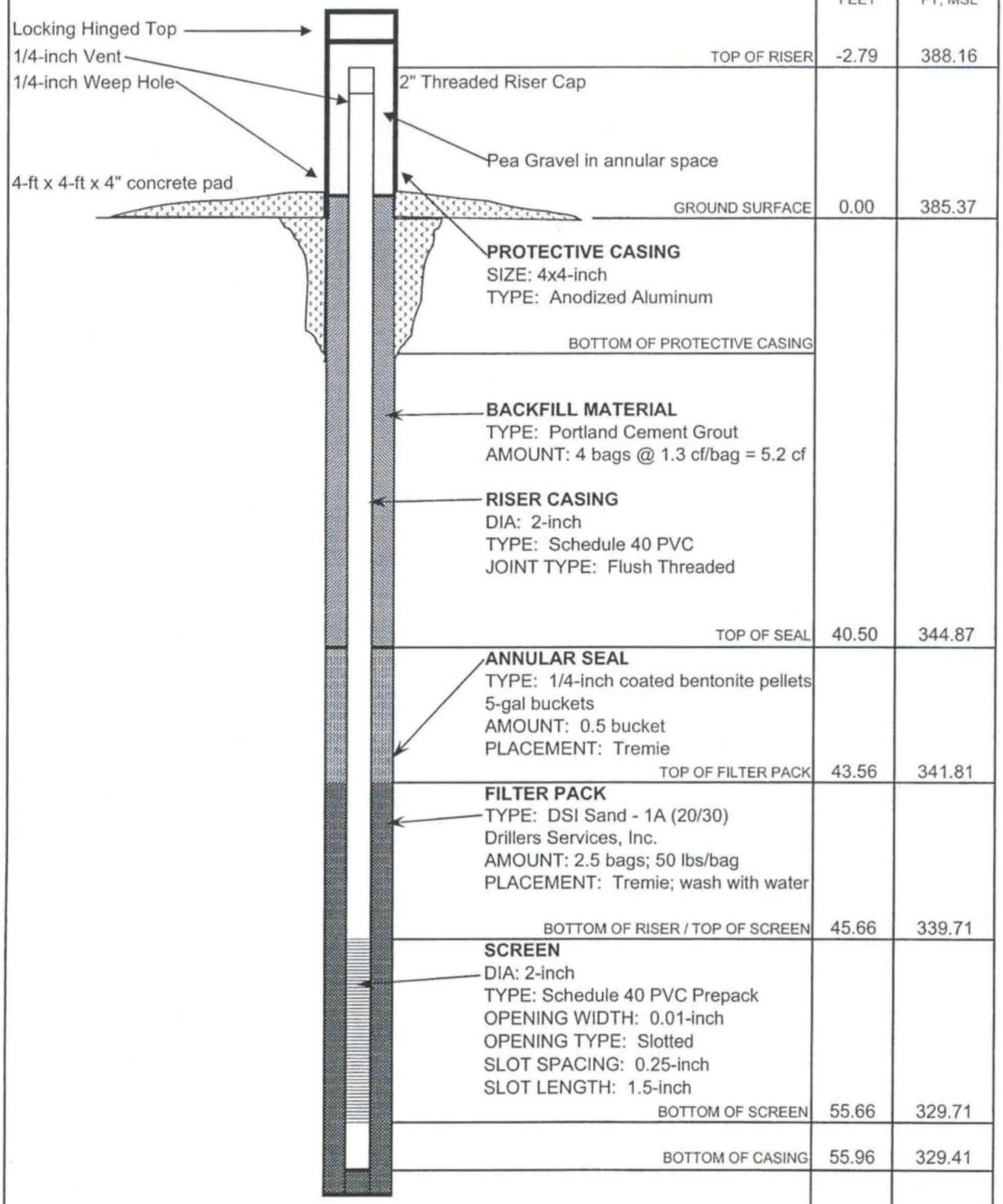
SITE: Former Plant Arkwright — TOTAL DEPTH: 54.4 — SURF.ELEV.: 385.374

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
25	360.37								
26	359.37	yellowish brown silty medium to fine SAND	5	24.5-26	50/4	R			
27	358.37								
28	357.37								
29	356.37								
30	355.37	Drilled through highly weathered rock from approx. 25 feet to 36 feet.							
31	354.37								
32	353.37								
33	352.37								
34	351.37								
35	350.37								
36	349.37								
37	348.37	Auger Refusal @ 35.4 feet							
38	347.37	BIOTITE GNEISS, unweathered to slightly weathered, very hard to medium hard, highly to slightly fractured with slightly to moderately weathered fracture faces		35.4-39.4				78	
39	346.37	36.0 - Fracture							
40	345.37	36.5 - Fracture BIOTITE GNEISS, unweathered to weathered, very hard, medium to fine grained, highly to slightly							
41	344.37	fractured, with slightly weathered fracture faces							
42	343.37	41.9 - Fracture, iron staining		39.4-44.4				100	
43	342.37	42.9 - Fracture, iron staining							
44	341.37	43.4 - Fracture, iron staining							
45	340.37	BIOTITE GNEISS, unweathered weathered, very hard, fine grained, highly to moderately fractured, slightly		44.4-49.4				100	
46	339.37	weathered fracture faces							
47	338.37								
48	337.37								
49	336.37	BIOTITE GNEISS unweathered weathered, very hard, fine grained, intensely to moderately fractured,		49.4-54.4				100	
50	335.37	with moderately weathered joints							
51	334.37	51.4 - 52.1 - nearly vertical fracture							
52	333.37								
53	332.37								
54	331.37	54.1 - nearly vertical fracture							
55	330.37	54.4' - Bottom of boring							
56	329.37								

Form GS9901 7-26-2004

WELL CONSTRUCTION LOG — Southern Company Generation

PROJECT: Former Plant Arkwright	DRILLING CO.: SCS, Inc.	WELL NAME
Solid Waste Management Unit	DRILLER: B. Poe	
LOCATION: Ash Ponds 1, 2, 3	RIG TYPE: CME 55	
LOGGER: L. Garland	DRILLING METHODS: HSA, HQ Rock Core	GWA-14
DATE CONSTRUCTED: 2/4/2009		



	DEPTH FEET	ELEVATION FT, MSL
TOP OF RISER	-2.79	388.16
GROUND SURFACE	0.00	385.37
BOTTOM OF PROTECTIVE CASING		
TOP OF SEAL	40.50	344.87
TOP OF FILTER PACK	43.56	341.81
BOTTOM OF RISER / TOP OF SCREEN	45.66	339.71
BOTTOM OF SCREEN	55.66	329.71
BOTTOM OF CASING	55.96	329.41

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DRILLING LOG
GEOLOGICAL SERVICES

GWA - 7
Sheet 1 of 2

SITE: Plant Arkwright, Pond #3 SAR | HOLE DEPTH: 45 | SURF.ELEV.: 349.003
LOCATION: Southeastern End of Pond | COORDINATES N: 1064410.279 | E: 2438355.107
ANGLE: 90 | BEARING: | CONTRACTOR: SCS | DRILL NO.: CME 550
OVERBURDEN DEPTH: | NO. PENT. TESTS: 8 | NO. U.D. SAMPLES: 2
CASING SIZE: | LENGTH: | CORE SIZE: | TOTAL % REC.:
WATER TABLE DEPTH: 19.3 | ELEV.: | TIME AFTER COMP.: TOB | DATE TAKEN: 12/11/2003
TYPE GROUT: | QUANTITY: | MIX: | DRILLING START DATE: 12/11/2003
DRILLER: Brad Filipovich | RECORDER: Stacy Sprayberry | APPROVED: | DRILLING COMP. DATE: 12/11/2003

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Pen. Test From To	Blows	N	Sample No.	Fluid Chg. %	Rec. %	RQD
	0	349.0								
	1		Reddish brown, silty CLAY (CL) FILL with wood and rock fragments	0-1.5	1-3-4	7	S-1			
	2									
	3									
	4									
	5									
	6		Hit hard object at 5.5'. Could not push tube deeper.	5.0-7.5	TUBE					
	7									
	8	341.0								
	9		Reddish brown, clayey SILT(ML/CL) with SAPROLITE							
	10									
	11			10-11.5	2-4-4	8	S-2			
	12									
	13									
	14									
	15									
	16		Becoming Sandier with depth	15-16.5	2-2-3	5	S-3			
	17									
	18	331.0								
	19		Tan to white, elastic SILT (MH) with SAPROLITE							
	20									
	21		K=1.0E-5 cm/sec	20-22	TUBE					
	22									
	23									
	24									

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DRILLING LOG
GEOLOGICAL SERVICES

GWA - 7
Sheet 2 of 2

SITE: Plant Arkwright, Pond #3 SAR — TOTAL DEPTH: 46.5 — SURF.ELEV.: 349.003

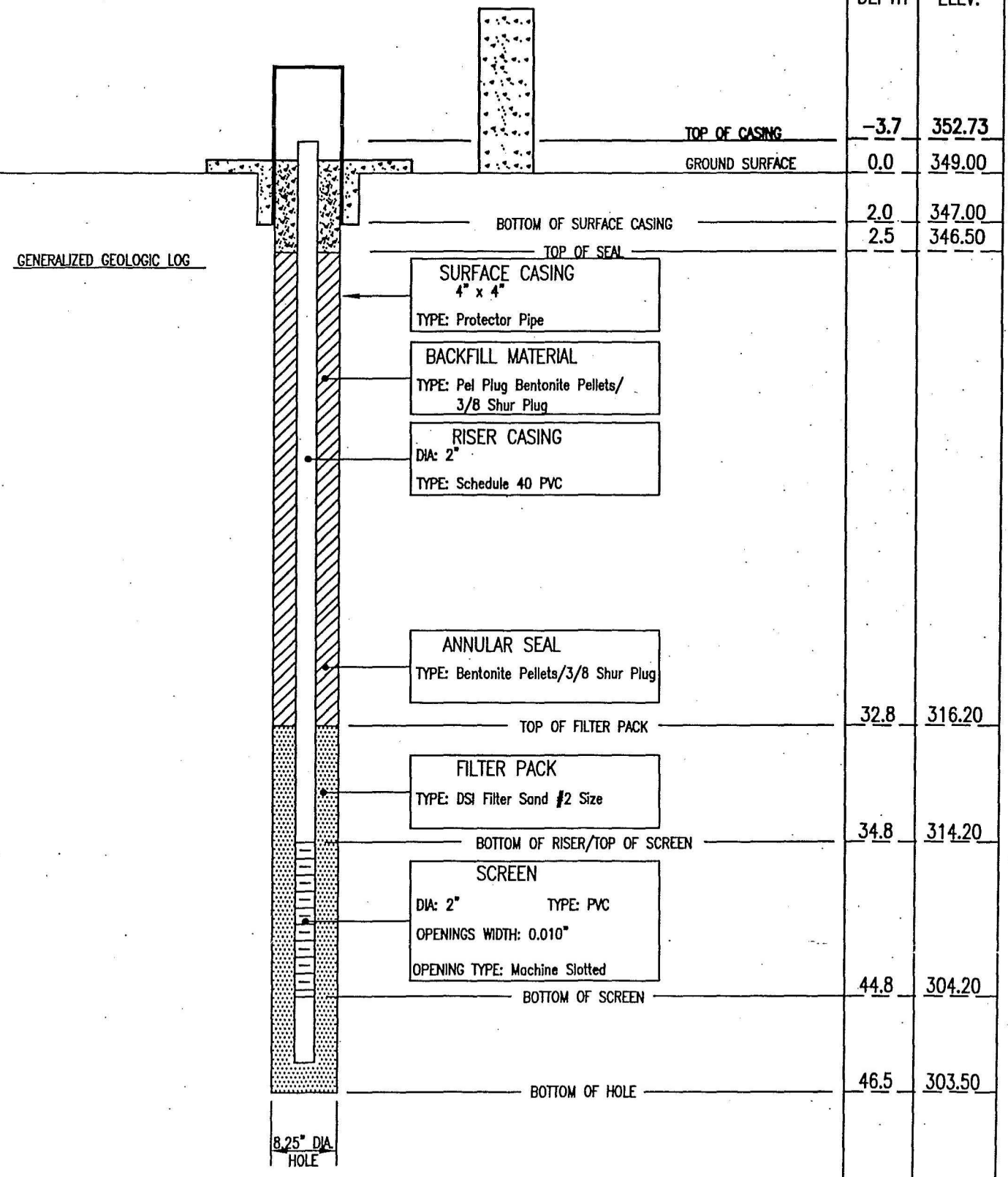
Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Pen. Test From To	Blows	N	Sample No.	Fluid Chg. %	Rec. %	RQD
	25		Free Water in 25 foot sample							
	26			25-26.5	3-4-5	9	S-4			
	27									
	28									
	29									
	30	319.0								
	31		Tan to white, sandy SILT (ML) with MICA and SAPROLITE	30-31.5	3-5-13	18	S-5			
	32									
	33									
	34									
	35									
	36			35-36.5	4-8-9	17	S-6			
	37	312.0								
	38		Tan to white, silty SAND (SM) with SAPROLITE							
	39									
	40	309.0								
	41		Reddish brown to brown, silty SAND (SM) with SAPROLITE	40-40.5	9-22-23	45	S-7			
	42									
	43									
	44		Well screened from 34.8 feet to 44.8 feet below ground surface							
	45									
	46			45-46.5	12-23-32	55	S-8			
	47	302.5	Boring Terminated at 46.5 Feet							
	48									
	49									
	50									
	51									
	52									
	53									
	54									
	55									
	56									

Form GS9902 4/24/2000

WELL CONSTRUCTION LOG	PROJECT: Arkwright Ash Pond #3 SAR	WELL NO.: GWA-7
SITE: Plant Arkwright	LOCATION: Ash Pond #3, N 1064410.279, E 2438355.107	

BEGUN	COMPLETED	PREPARED BY	WATER LEVEL	CONTRACTOR
12/11/03	12/11/03	Stacy Sprayberry	~19.3 ft.	SCS

GENERALIZED GEOLOGIC LOG



	DEPTH	ELEV.
TOP OF CASING	-3.7	352.73
GROUND SURFACE	0.0	349.00
BOTTOM OF SURFACE CASING	2.0	347.00
TOP OF SEAL	2.5	346.50
TOP OF FILTER PACK	32.8	316.20
BOTTOM OF RISER/TOP OF SCREEN	34.8	314.20
BOTTOM OF SCREEN	44.8	304.20
BOTTOM OF HOLE	46.5	303.50

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DRILLING LOG
GEOLOGICAL SERVICES

GWA - 8
Sheet 1 of 2

SITE: Plant Arkwright, Pond #3 SAR | HOLE DEPTH: 40 | SURF.ELEV.: 352.169
LOCATION: Southwestern Edge of Dike | COORDINATES N: 1064521.654 | E: 2437572.442
ANGLE: 90 | BEARING: | CONTRACTOR: SCS | DRILL NO.: CME 550
OVERBURDEN DEPTH: | NO. PENT. TESTS: 7 | NO. U.D. SAMPLES: 2
CASING SIZE: | LENGTH: | CORE SIZE: | TOTAL % REC.:
WATER TABLE DEPTH: 23 / 21.1 | ELEV.: | TIME AFTER COMP.: TOB / 24 hours | DATE TAKEN: 12/10-11/2003
TYPE GROUT: | QUANTITY: | MIX: | DRILLING START DATE: 12/10/2003
DRILLER: Brad Filipovich | RECORDER: Stacy Sprayberry | APPROVED: | DRILLING COMP. DATE: 12/10/2003

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Pen. Test From To	Blows	N	Sample No.	Fluid Chg. %	Rec. %	RQD
	0	352.2								
	1		Reddish brown, silty CLAY (CL/ML) with MICA FILL	0-1.5	3-3-8	11	S-1			
	2									
	3									
	4									
	5									
	6			5-6.5	4-5-7	12	S-2			
	7									
	8									
	9	343.2								
	10		Reddish brown, clayey SILT (ML/CL) FILL							
	11			10-11.5	2-3-4	7	S-3			
	12									
	13	339.2								
	14		Tan to orange SILT (ML) with SAPROLITE; non-plastic							
	15									
	16		K=6.4E-5 cm/sec	15-17	TUBE					
	17									
	18									
	19									
	20	332.2								
	21		Tan to orange to white, damp to wet, silty SAND (SM) with SAPROLITE	20-21.5	2-4-3	7	S-4			
	22									
	23									
	24									

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DRILLING LOG
GEOLOGICAL SERVICES

GWA - 8
Sheet 2 of 2

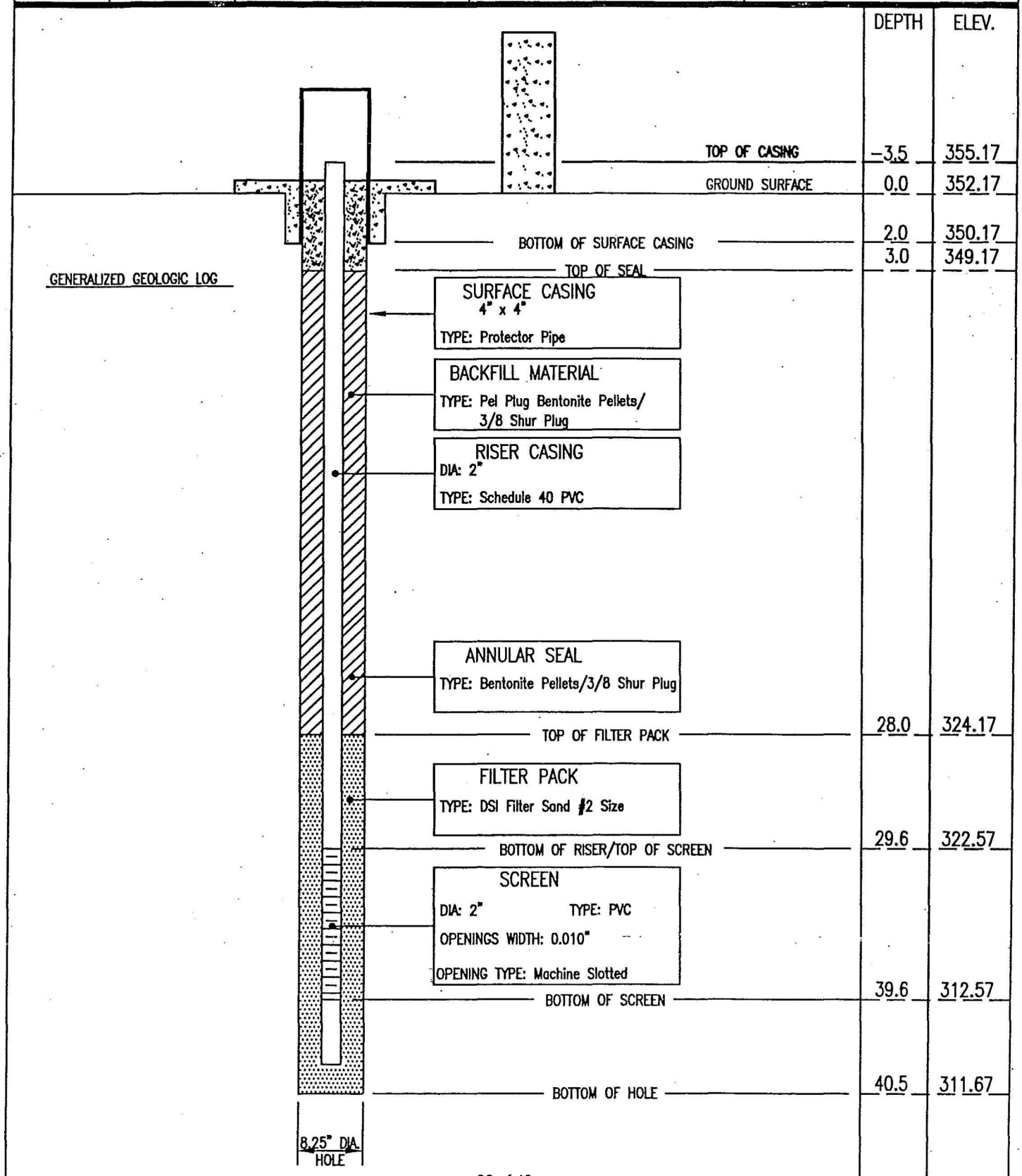
SITE: Plant Arkwright, Pond #3 SAR — TOTAL DEPTH: 40.5 — SURF.ELEV.: 352.169

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Pen. Test From To	Blows	N	Sample No.	Fluid Chg. %	Rec. %	RQD
	25									
	26		Brown, wet, silty SAND (SM) with MICA; non-plastic	25-27	TUBE					
	27		K=6.4E-5 cm/sec							
	28									
	29									
	30									
	31			30-31.5	2-6-8	14	S-5			
	32									
	33		Well screened from 29.6 feet to 39.6 feet below ground surface							
	34									
	35									
	36			35-36.5	3-5-8	13	S-6			
	37									
	38									
	39									
	40									
	41	311.7	Boring Termindated at 40.5 Feet	40-40.5	8-11-18	29	S-7			
	42									
	43									
	44									
	45									
	46									
	47									
	48									
	49									
	50									
	51									
	52									
	53									
	54									
	55									
	56									

Form GS9902 4/24/2000

WELL CONSTRUCTION LOG

PROJECT: Arkwright Ash Pond #3 SAR		WELL NO.: GWA-8
SITE: Plant Arkwright	LOCATION: Ash Pond #3, N 1064521.654, E 2437572.442	
BEGUN: 12/10/03	COMPLETED: 12/10/03	PREPARED BY: Stacy Sprayberry
WATER LEVEL: ~21.1	CONTRACTOR: SCS	



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DRILLING LOG
GEOLOGICAL SERVICES

GWA - 9
Sheet 1 of 2

SITE: Plant Arkwright, Pond #3 SAR | HOLE DEPTH: 35 | SURF.ELEV.: 363.937
LOCATION: Western Edge of Pond | COORDINATES N: 1065139.294 | E: 2437297.327
ANGLE: 90 | BEARING: | CONTRACTOR: SCS | DRILL NO.: CME 550
OVERBURDEN DEPTH: | NO. PENT. TESTS: 7 | NO. U.D. SAMPLES: 1
CASING SIZE: | LENGTH: | CORE SIZE: | TOTAL % REC.:
WATER TABLE DEPTH: 14.8 / 13.9 | ELEV.: | TIME AFTER COMP.: TOB / 24 hours | DATE TAKEN: 12/9-10/2003
TYPE GROUT: | QUANTITY: | MIX: | DRILLING START DATE: 12/9/2003
DRILLER: Brad Filipovich | RECORDER: Stacy Sprayberry | APPROVED: | DRILLING COMP. DATE: 12/9/2003

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Pen. Test From To	Blows	N	Sample No.	Fluid Chg. %	Rec. %	RQD
	0	363.9								
	1		Reddish brown, silty SAND (SM) with MICA FILL	0-1.5	2-4-4	8	S-1			
	2									
	3									
	4									
	5	358.9								
	6		Reddish brown, sandy CLAY (CL/SM) with ASH and WOOD FILL	5-6.5	2-2-3	5	S-2			
	7									
	8									
	9									
	10	353.9								
	11		Reddish brown to orange, silty SAND (SM) with MICA	10-12	TUBE					
	12		K=5.2E-5 cm/sec							
	13									
	14	349.9								
	15		White, medium to coarse grain, wet, silty SAND (SM) with SAPROLITE							
	16			15-16.5	1-1-3	4	S-3			
	17									
	18									
	19									
	20	343.9								
	21		Tan to brown, silty SAND (SM) with SAPROLITE	20-21.5	2-3-5	8	S-4			
	22									
	23									
	24									

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SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

GWA - 9
Sheet 2 of 2

SITE: Plant Arkwright, Pond #3 SAR | TOTAL DEPTH: 36.5 | SURF.ELEV.: 363.937

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Pen. Test From To	Blows	N	Sample No.	Fluid Chg. %	Rec. %	RQD
	25		Tan to brown, silty SAND (SM) with SAPROLITE							
	26			25-26.5	4-6-8	14	S-5			
	27									
	28									
	29									
	30		Well screened from 24.8 feet to 34.8 feet below ground surface							
	31			30-31.5	4-7-11	18	S-6			
	32									
	33									
	34									
	35		Becoming white with depth							
	36			35-36.5	7-10-17	27	S-7			
	37		Boring Terminated at 36.5 Feet							
	38									
	39									
	40									
	41									
	42									
	43									
	44									
	45									
	46									
	47									
	48									
	49									
	50									
	51									
	52									
	53									
	54									
	55									
	56									

Form GS9902 4/24/2000

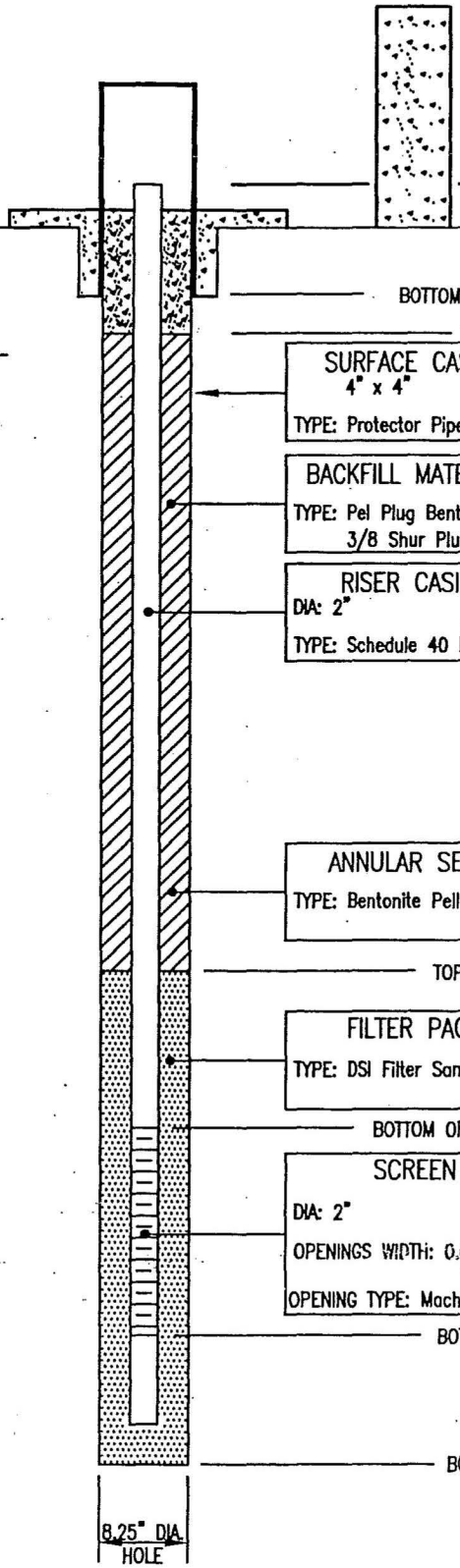
WELL CONSTRUCTION LOG

PROJECT	WELL NO.
Arkwright Ash Pond #3 SAR	GWA-9

SITE	LOCATION
Plant Arkwright	Ash Pond #3, N 1065139.294, E 2437297.327

BEGUN	COMPLETED	PREPARED BY	WATER LEVEL	CONTRACTOR
12/9/03	12/9/03	Stacy Sprayberry	~13.9	SCS

GENERALIZED GEOLOGIC LOG



	DEPTH	ELEV.
TOP OF CASING	-3.4	363.94
GROUND SURFACE	0.0	363.94
BOTTOM OF SURFACE CASING	2.0	361.94
TOP OF SEAL	3.0	360.94
TOP OF FILTER PACK	22.0	341.94
BOTTOM OF RISER/TOP OF SCREEN	24.8	339.14
BOTTOM OF SCREEN	34.8	329.14
BOTTOM OF HOLE	36.5	327.44

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DRILLING LOG
GEOLOGICAL SERVICES

GWA - 10
Sheet 1 of 2

SITE: Plant Arkwright, Pond #3 SAR | HOLE DEPTH: 40 | SURF.ELEV.: 367.659
LOCATION: Northwestern Edge of Pond | COORDINATES N: 1065419.082 | E: 2437191.693
ANGLE: 90 | BEARING: | CONTRACTOR: SCS | DRILL NO.: CME 550
OVERBURDEN DEPTH: | NO. PENT. TESTS: 9 | NO. U.D. SAMPLES:
CASING SIZE: | LENGTH: | CORE SIZE: | TOTAL % REC.:
WATER TABLE DEPTH: 19 / 13.6 | ELEV.: | TIME AFTER COMP.: TOB / 24 hours | DATE TAKEN: 12/8-9/2003
TYPE GROUT: | QUANTITY: | MIX: | DRILLING START DATE: 12/8/2003
DRILLER: Brad Filipovich | RECORDER: Stacy Sprayberry | APPROVED: | DRILLING COMP. DATE: 12/9/2003

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Pen. Test From To	Blows	N	Sample No.	Fluid Chg. %	Rec. %	RQD
	0	367.7								
	1		Reddish brown, sandy CLAY (CL/SM) with ASH FILL	0-1.5	3-4-7	11	S-1			
	2									
	3									
	4									
	5	362.7								
	6		White to reddish brown, silty CLAY (CL) with MICA and ASH FILL	5-6.5	7-5-6	11	S-2			
	7									
	8									
	9									
	10	357.7								
	11		Reddish brown, silty SAND (SM/ML) with MICA	10-11.5	2-3-5	8	S-3			
	12									
	13									
	14									
	15	352.7								
	16		Tan to brown, wet silty SAND (SM) with MICA and PYRITES	15-16.5	1-1-1	2	S-4			
	17									
	18									
	19									
	20									
	21		SAA with SAPROLITE and Free Water	20-21.5	2-2-3	5	S-5			
	22									
	23									
	24									

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DRILLING LOG
GEOLOGICAL SERVICES

GWA - 10
Sheet 2 of 2

SITE: Plant Arkwright, Pond #3 SAR — TOTAL DEPTH: 40 — SURF.ELEV.: 367.6

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Pen. Test From To	Blows	N	Sample No.	Fluid Chg. %	Rec. %
	25								
	26			25-26.5	3-6-9	15	S-6		
	27								
	28								
	29								
	30	337.7							
	31		White to brown, silty SAND (SM) with MICA and SAPROLITE	30-31.5	11-12-16	28	S-7		
	32								
	33								
	34								
	35								
	36		Well screened from 25 feet to 35 feet below ground surface	35-36.5	9-16-30	46	S-8		
	37								
	38								
	39								
	40								
	41			40-41.5	48-50/2"	100+	S-9		
	42	326.2	Boring Termindated at 40 Feet						
	43								
	44								
	45								
	46								
	47								
	48								
	49								
	50								
	51								
	52								
	53								
	54								
	55								
	56								

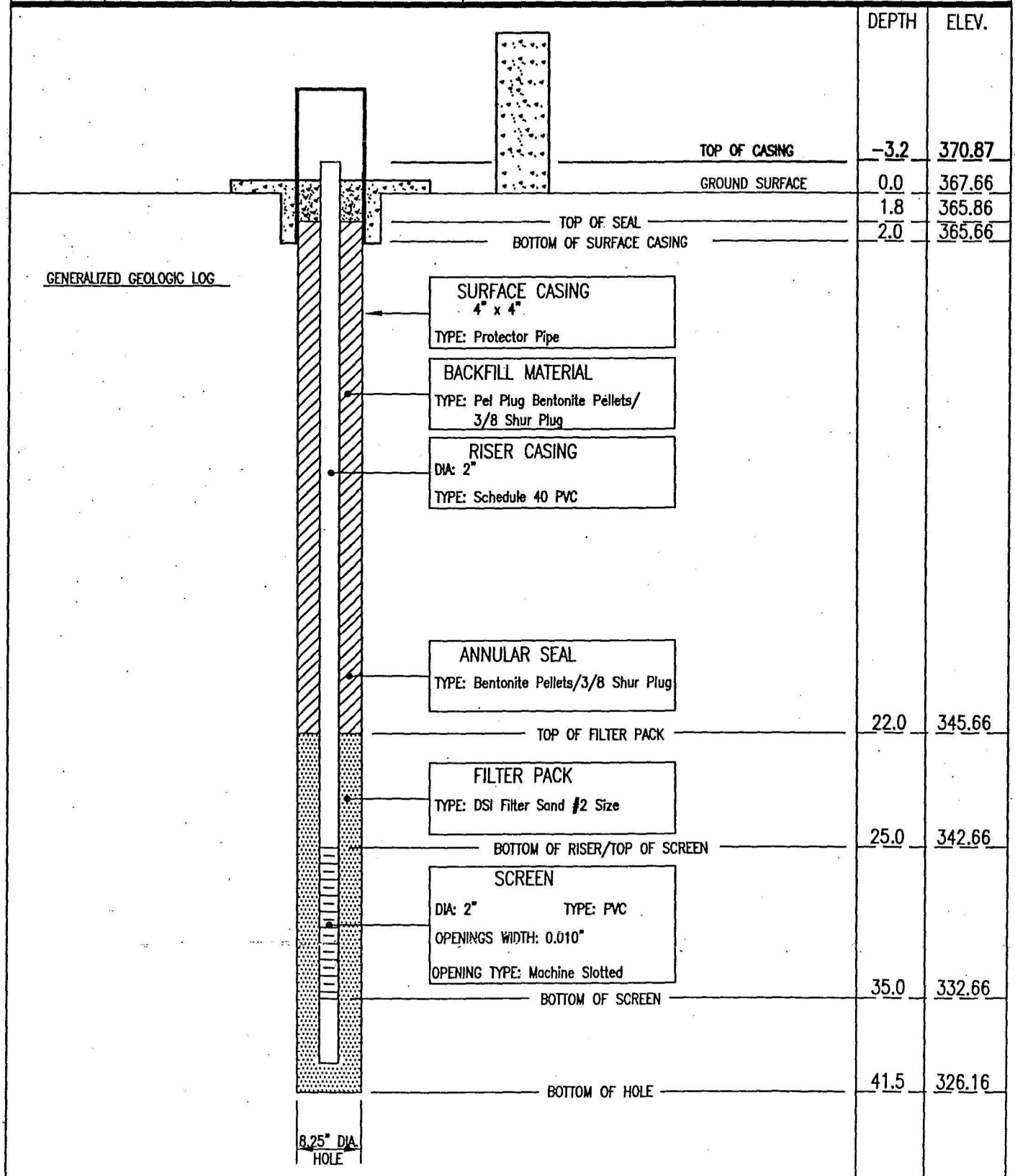
Form GS9902 4/24/2000

WELL CONSTRUCTION LOG

PROJECT	WELL NO.
Arkwright Ash Pond #3 SAR	GWA-10

SITE	LOCATION
Plant Arkwright	Ash Pond #3, N 1065419.082, E 2437191.693

BEGUN	COMPLETED	PREPARED BY	WATER LEVEL	CONTRACTOR
12/8/03	12/9/03	Stacy Sprayberry	~13.6	SCS



	DEPTH	ELEV.
TOP OF CASING	-3.2	370.87
GROUND SURFACE	0.0	367.66
	1.8	365.86
TOP OF SEAL		
BOTTOM OF SURFACE CASING	2.0	365.66
TOP OF FILTER PACK	22.0	345.66
BOTTOM OF RISER/TOP OF SCREEN	25.0	342.66
BOTTOM OF SCREEN	35.0	332.66
BOTTOM OF HOLE	41.5	326.16

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWC-15
Sheet 1 of 2

SITE: Former Plant Arkwright | HOLE DEPTH: 40.5 | SURF.ELEV.: 372.88
LOCATION: Solid Waste Management Area | COORDINATES N: 1065475.493 | E: 2438360.991
ANGLE: | BEARING: | CONTRACTOR: SCS, Inc. | DRILL NO.:
DRILLING METHOD: HSA/ HQ Rock Core | NO. SAMPLES: 4 | NO. U.D. SAMPLES: 0
CASING SIZE: | LENGTH: | CORE SIZE: | TOTAL % REC.:
WATER TABLE DEPTH: 26.9 | ELEV.: | TIME AFTER COMP.: | DATE TAKEN: 12/18/2008
TYPE GROUT: | QUANTITY: | MIX: | DRILLING START DATE: 11/18/2008
DRILLER: S. Milam/S. Denty | RECORDER: D. Brooks/L. Garland | APPROVED: | DRILLING COMP. DATE: 12/4/2008

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
0	372.88								
1	371.88								
2	370.88								
3	369.88								
4	368.88								
5	367.88	Reddish brown SILT, sandy, micaceous	1	4.5-6	9-7-9	16			
6	366.88								
7	365.88								
8	364.88								
9	363.88								
10	362.88	Gray and brown silty SAND, medium to fine grained	2	9.5-11	7-7-8	15			
11	361.88								
12	360.88								
13	359.88								
14	358.88								
15	357.88	Dark yellowish brown SILT, sandy, micaceous	3	14.5-16	4-4-4	8			
16	356.88								
17	355.88								
18	354.88								
19	353.88								
20	352.88	Gray and brown sandy SILT	4	19.5-21	10-9-11	20			
21	351.88								
22	350.88	Auger refusal at 22'							
23	349.88								
24	348.88								

Form GS9901 8-19-2008

SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWC-15
Sheet 2 of 2

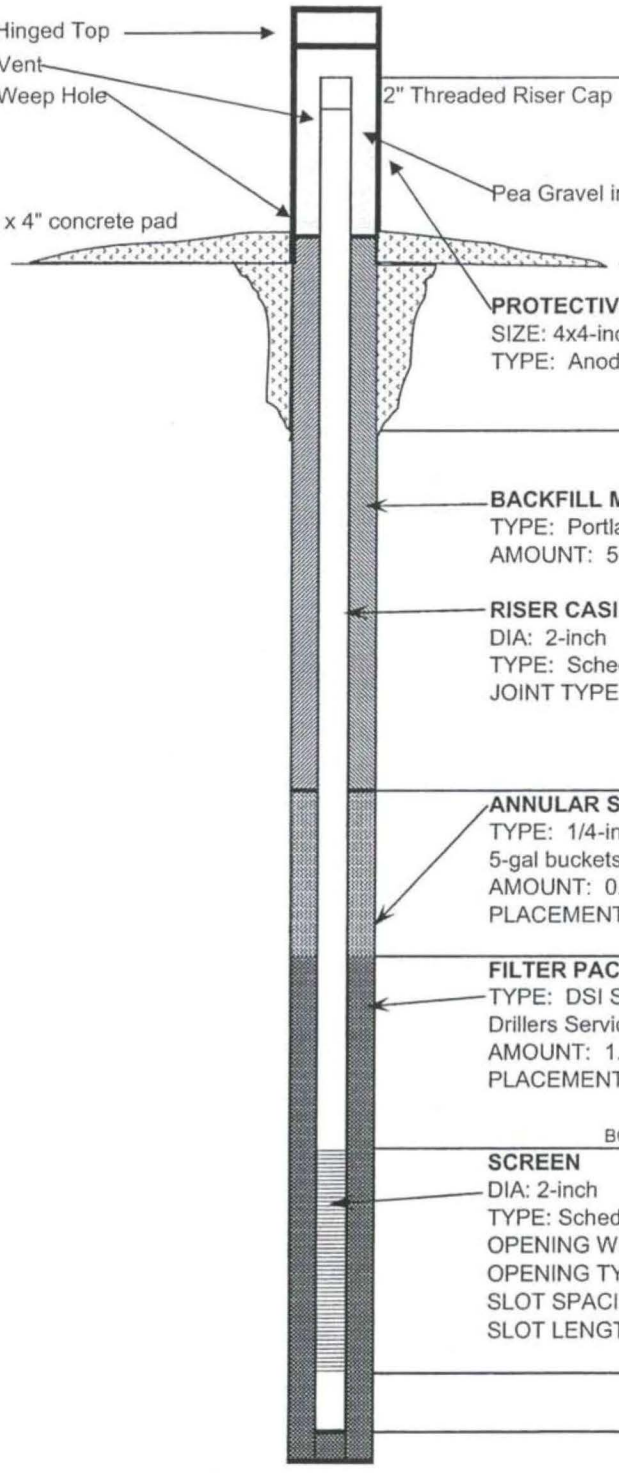
SITE Former Plant Arkwright TOTAL DEPTH 40.5 SURF.ELEV. 372.88399

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
25	347.88	Unweathered biotite gneiss, very hard, fine grained		22-25.5			3.5/3.5	100	
26	346.88								
27	345.88								
28	344.88								
29	343.88								
30	342.88	Slightly weathered to unweathered biotite gneiss, fine to medium grained, slightly to highly fractured with slight to moderate weathering in fractures		25.5-30.5			5.0/5.0	100	
31	341.88								
32	340.88								
33	339.88								
34	338.88								
35	337.88	Same as above		30.5-35.5			5.0/5.0	100	
36	336.88								
37	335.88								
38	334.88								
39	333.88	Unweathered biotite gneiss, fine to medium grained, slightly to moderately fractured, clean to slightly weathered fractures							
40	332.88			35.5-40.5			5.0/5.0	100	
41	331.88	40.5' - Bottom of boring							
42	330.88								
43	329.88								
44	328.88								
45	327.88								
46	326.88								
47	325.88								
48	324.88								
49	323.88								
50	322.88								
51	321.88								
52	320.88								
53	319.88								
54	318.88								
55	317.88								
56	316.88								

Form GS9901 8-19-2008

WELL CONSTRUCTION LOG — Southern Company Generation

PROJECT: Former Plant Arkwright	DRILLING CO.: SCS, Inc.	WELL NAME
Solid Waste Management Unit	DRILLER: S. Milam	
LOCATION: Ash Ponds 1, 2, 3	RIG TYPE: CME 550	
LOGGER: L. Garland	DRILLING METHODS: HSA, HQ Rock Core	GWC-15
DATE CONSTRUCTED: 12/4/2008		



	DEPTH FEET	ELEVATION FT, MSL
TOP OF RISER	-3.02	375.90
GROUND SURFACE	0.00	372.88
BOTTOM OF PROTECTIVE CASING		
TOP OF SEAL	24.68	348.20
TOP OF FILTER PACK	27.68	345.20
BOTTOM OF RISER / TOP OF SCREEN	29.68	343.20
BOTTOM OF SCREEN	39.68	333.20
BOTTOM OF CASING	39.98	332.90

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWC-16
Sheet 1 of 2

SITE: Former Plant Arkwright | HOLE DEPTH: 45 | SURF.ELEV.: 365.57
LOCATION: Solid Waste Management Area | COORDINATES N: 1065458.377 | E: 2438010.027
ANGLE: | BEARING: | CONTRACTOR: SCS, Inc. | DRILL NO.:
DRILLING METHOD: HSA/ HQ Rock Core | NO. SAMPLES: 5 | NO. U.D. SAMPLES: 0
CASING SIZE: | LENGTH: | CORE SIZE: | TOTAL % REC.:
WATER TABLE DEPTH: 17.5 | ELEV.: | TIME AFTER COMP.: | DATE TAKEN: 12/18/2008
TYPE GROUT: | QUANTITY: | MIX: | DRILLING START DATE: 11/18/2008
DRILLER: S. Milam/S. Denty | RECORDER: D. Brooks/L. Garland | APPROVED: | DRILLING COMP. DATE: 12/15/2008

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
0	365.57								
1	364.57								
2	363.57								
3	362.57								
4	361.57								
5	360.57	Reddish brown silty CLAY, damp, stiff, with medium to fine grained sand	1	4.5-6	5-6-7	13			
6	359.57								
7	358.57								
8	357.57								
9	356.57								
10	355.57	Reddish yellow silty CLAY, damp, micaceous	2	9.5-11	2-2-3	5			
11	354.57								
12	353.57								
13	352.57								
14	351.57								
15	350.57	Reddish yellow to black silty CLAY, micaceous	3	14.5-16	3-2-4	6			
16	349.57								
17	348.57								
18	347.57								
19	346.57								
20	345.57	Reddish yellow to black sandy CLAY, moist, medium grained sand	4	19.5-21	2-3-3	6			
21	344.57								
22	343.57								
23	342.57								
24	341.57								

Form GS9901 8-19-2008

SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWC-16
Sheet 2 of 2

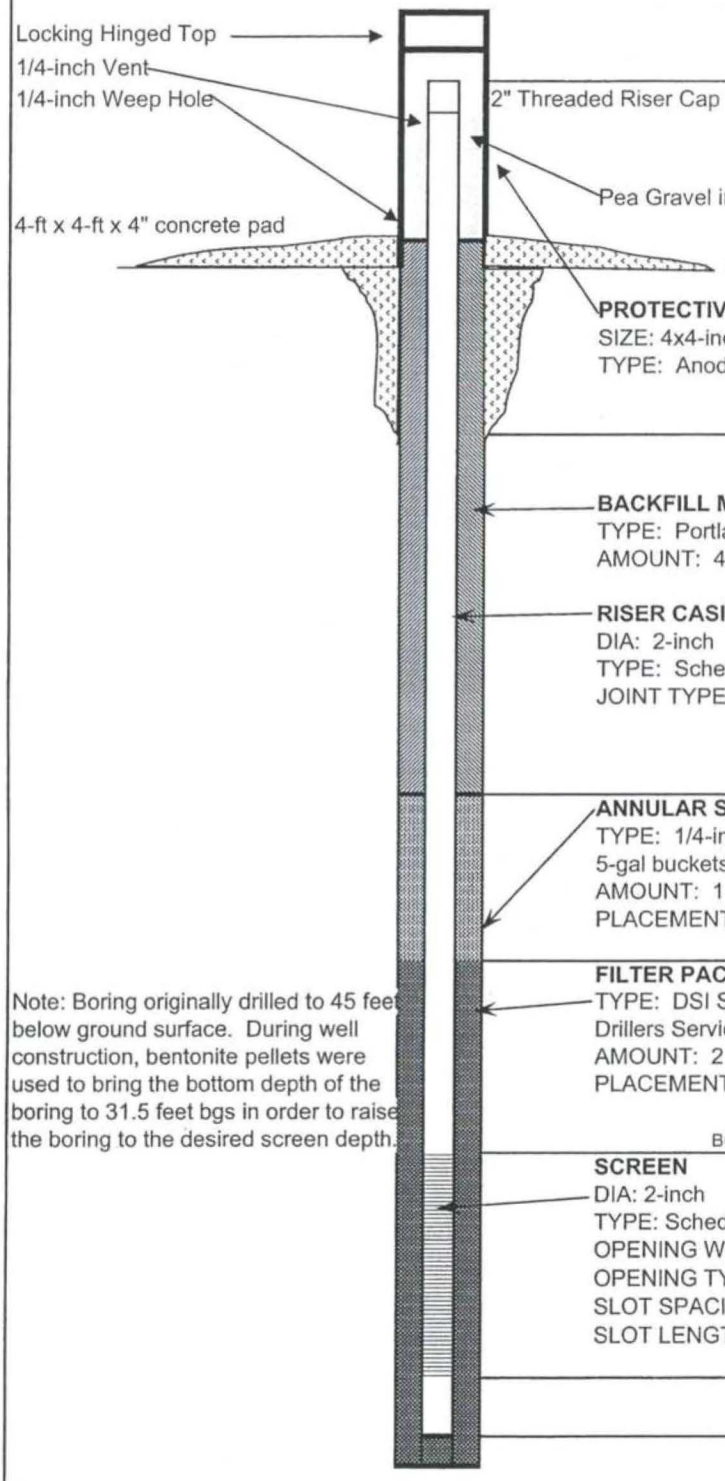
SITE Former Plant Arkwright TOTAL DEPTH 45 SURF.ELEV. 365.56602

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
25	340.57	Reddish brown, white, and black sandy CLAY, moist, medium to coarse grained sand, micaceous	5	24.5-26	7-50/4	R			
26	339.57	Auger refusal at 25.5'							
27	338.57								
28	337.57	28.7- fracture							
29	336.57	Biotite gneiss, unweathered to slightly weathered, slightly to heavily fractured, slightly to moderately weathered fracture faces		25.5-30				100	
30	335.57								
31	334.57	31.4- fracture							
32	333.57								
33	332.57			30-35				100	
34	331.57	Same as above							
35	330.57								
36	329.57								
37	328.57			35-40				100	
38	327.57	Same as above							
39	326.57								
40	325.57								
41	324.57								
42	323.57			40-45				100	
43	322.57	Same as above							
44	321.57								
45	320.57								
46	319.57	45' - Bottom of boring							
47	318.57								
48	317.57								
49	316.57								
50	315.57								
51	314.57								
52	313.57								
53	312.57								
54	311.57								
55	310.57								
56	309.57								

Form GS9901 8-19-2008

WELL CONSTRUCTION LOG — Southern Company Generation

PROJECT: Former Plant Arkwright	DRILLING CO.: SCS, Inc.	WELL NAME
Solid Waste Management Unit	DRILLER: S. Milam	
LOCATION: Ash Ponds 1, 2, 3	RIG TYPE: CME 550	
LOGGER: L. Garland	DRILLING METHODS: HSA, HQ Rock Core	GWC-16
DATE CONSTRUCTED: 12/15/2008		



	DEPTH FEET	ELEVATION FT, MSL
TOP OF RISER	-2.90	365.21
GROUND SURFACE	0.00	362.31
BOTTOM OF PROTECTIVE CASING		
TOP OF SEAL	17.00	345.31
TOP OF FILTER PACK	19.20	343.11
BOTTOM OF RISER / TOP OF SCREEN	21.28	341.03
BOTTOM OF SCREEN	31.28	331.03
BOTTOM OF CASING	31.58	330.73

Note: Boring originally drilled to 45 feet below ground surface. During well construction, bentonite pellets were used to bring the bottom depth of the boring to 31.5 feet bgs in order to raise the boring to the desired screen depth.

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWC-17
Sheet 1 of 2

SITE: Former Plant Arkwright | HOLE DEPTH: 30.8 | SURF.ELEV.: 365.57
LOCATION: Solid Waste Management Area | COORDINATES N: 1065458.377 | E: 2438010.027
ANGLE: | BEARING: | CONTRACTOR: SCS, Inc. | DRILL NO.:
DRILLING METHOD: HSA | NO. SAMPLES: 6 | NO. U.D. SAMPLES: 0
CASING SIZE: | LENGTH: | CORE SIZE: | TOTAL % REC.:
WATER TABLE DEPTH: 19.1 | ELEV.: | TIME AFTER COMP.: | DATE TAKEN: 12/18/2008
TYPE GROUT: | QUANTITY: | MIX: | DRILLING START DATE: 12/3/2008
DRILLER: S. Milam | RECORDER: L. Garland | APPROVED: | DRILLING COMP. DATE: 12/4/2008

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
0	365.57								
1	364.57								
2	363.57								
3	362.57								
4	361.57								
5	360.57	Reddish brown sandy SILT, with clay, micaceous fine grained sand	1	4.5-6	5-8-8	16			
6	359.57								
7	358.57								
8	357.57								
9	356.57								
10	355.57	Same as above	2	9.5-11	4-3-3	6			
11	354.57								
12	353.57								
13	352.57								
14	351.57								
15	350.57	Same as above	3	14.5-16	3-2-3	5			
16	349.57								
17	348.57								
18	347.57								
19	346.57								
20	345.57	Orange brown silty SAND, micaceous	4	19.5-21	2-2-2	4			
21	344.57								
22	343.57								
23	342.57								
24	341.57								

Form GS9901 8-19-2008

SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWC-17
Sheet 2 of 2

SITE **Former Plant Arkwright** TOTAL DEPTH **30.8** SURF.ELEV. 365.56602

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
25	340.57	Brown sandy SILT, micaceous	5	24.5-26	3-4-5	9			
26	339.57								
27	338.57								
28	337.57								
29	336.57								
30	335.57	Gray, white, and black silty SAND, fine grained	6	29.5-31	8-50/2	R			
		Auger refusal at 30.8'							
31	334.57								
32	333.57	30.8' - Bottom of boring							
33	332.57								
34	331.57								
35	330.57								
36	329.57								
37	328.57								
38	327.57								
39	326.57								
40	325.57								
41	324.57								
42	323.57								
43	322.57								
44	321.57								
45	320.57								
46	319.57								
47	318.57								
48	317.57								
49	316.57								
50	315.57								
51	314.57								
52	313.57								
53	312.57								
54	311.57								
55	310.57								
56	309.57								

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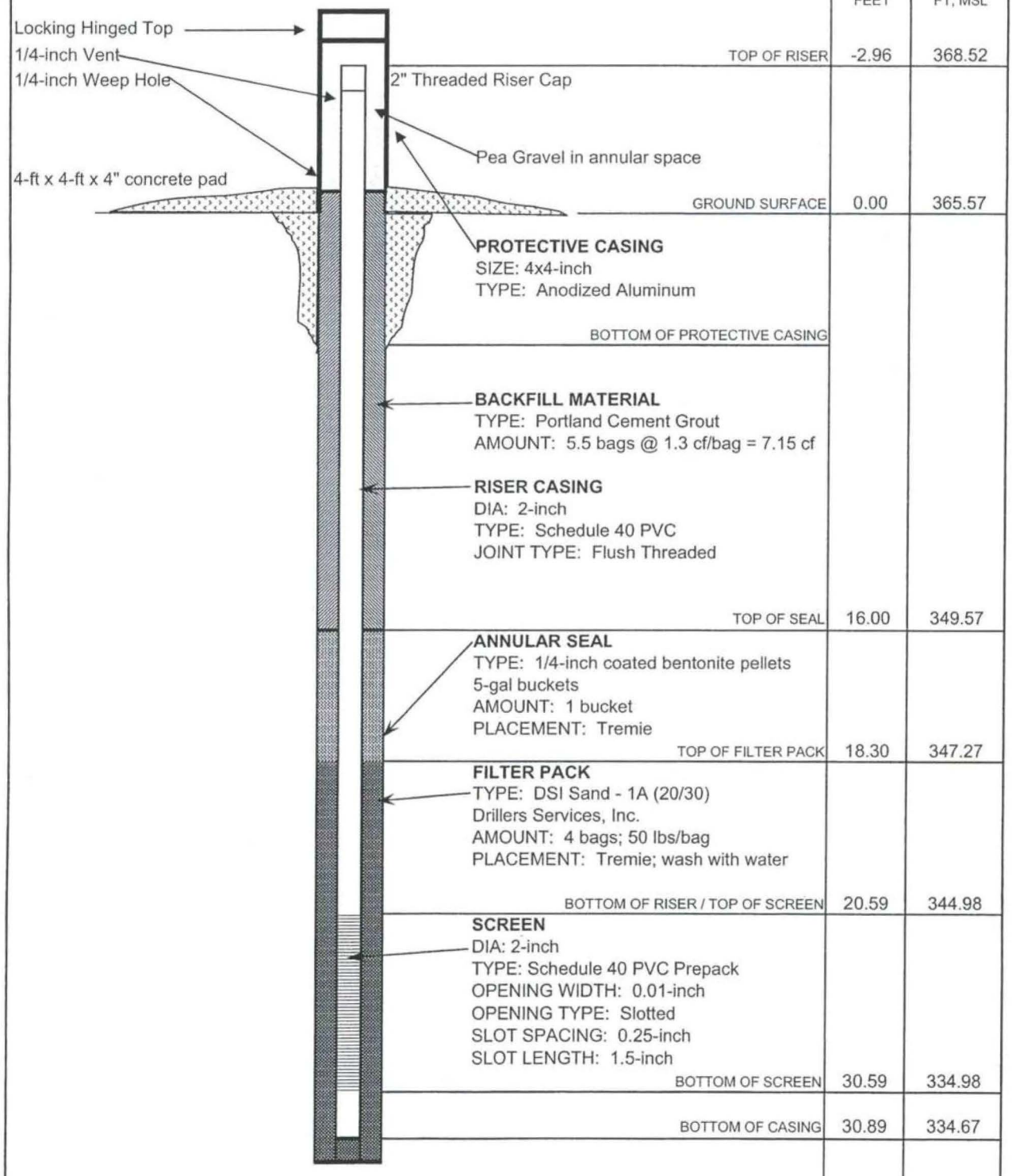
WELL CONSTRUCTION LOG — Southern Company Generation

PROJECT: Former Plant Arkwright	DRILLING CO.: SCS, Inc.	WELL NAME
Solid Waste Management Unit	DRILLER: S. Milam	
LOCATION: Ash Ponds 1, 2, 3	RIG TYPE: CME 550	
LOGGER: L. Garland	DRILLING METHODS: HSA, HQ Rock Core	GWC-17
DATE CONSTRUCTED: 12/4/2008		



	DEPTH FEET	ELEVATION FT, MSL
TOP OF RISER	-2.96	368.52
GROUND SURFACE	0.00	365.57
BOTTOM OF PROTECTIVE CASING		
TOP OF SEAL	16.00	349.57
TOP OF FILTER PACK	18.30	347.27
BOTTOM OF RISER / TOP OF SCREEN	20.59	344.98
BOTTOM OF SCREEN	30.59	334.98
BOTTOM OF CASING	30.89	334.67

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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWC-18
Sheet 1 of 2

SITE: Former Plant Arkwright
HOLE DEPTH: 47.5 SURF.ELEV.: 352.25
LOCATION: Solid Waste Management Area COORDINATES N: 1064482.185 E: 2437961.021
ANGLE: BEARING: CONTRACTOR: SCS, Inc. DRILL NO.:
DRILLING METHOD: HSA NO. SAMPLES: 9 NO. U.D. SAMPLES: 0
CASING SIZE: LENGTH: CORE SIZE: TOTAL % REC.:
WATER TABLE DEPTH: 22.9 ELEV.: TIME AFTER COMP.: DATE TAKEN: 12/18/2008
TYPE GROUT: QUANTITY: MIX: DRILLING START DATE: 11/18/2005
DRILLER: S. Milam RECORDER: D. Brooks APPROVED: DRILLING COMP. DATE: 11/18/2005

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
0	352.25								
1	351.25								
2	350.25								
3	349.25								
4	348.25								
5	347.25	Reddish brown silty CLAY, damp, with some medium grained sand	1	4.5-6	3-3-7	10			
6	346.25								
7	345.25								
8	344.25								
9	343.25								
10	342.25	Same as above, yellowish red, micaceous	2	9.5-11	4-3-5	8			
11	341.25								
12	340.25								
13	339.25								
14	338.25								
15	337.25	Yellowish red silty CLAY, damp, micaceous, with fine to medium grained sand	3	14.5-16	6-4-6	10			
16	336.25								
17	335.25								
18	334.25								
19	333.25								
20	332.25	Yellowish red silty CLAY, damp, with sand	4	19.5-21	2-4-7	11			
21	331.25								
22	330.25								
23	329.25								
24	328.25								

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SOUTHERN COMPANY
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DRILLING LOG
GEOLOGICAL SERVICES

Hole No. GWC-18
Sheet 2 of 2

SITE Former Plant Arkwright TOTAL DEPTH 47.5 SURF.ELEV. 352.25

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
25	327.25	Yellowish red sandy CLAY, damp, with silt and mica	5	24.5-26	3-4-5	10			
26	326.25								
27	325.25								
28	324.25								
29	323.25								
30	322.25	Same as above with medium grained sand	6	29.5-31	3-5-5	10			
31	321.25								
32	320.25								
33	319.25								
34	318.25								
35	317.25	Brown sandy CLAY, damp, fine to medium grained sand, with black organic matter	7	34.5-36	3-5-7	12			
36	316.25								
37	315.25								
38	314.25								
39	313.25								
40	312.25	Brown silty CLAY, damp, with sand	8	39.5-41	5-6-7	13			
41	311.25								
42	310.25								
43	309.25								
44	308.25								
45	307.25	Black and white silty SAND, moist, saproplite	9	44.5-46	31-50/2	R			
46	306.25								
47	305.25								
		Auger refusal at 47.5'							
48	304.25								
49	303.25	47.5' - Bottom of boring							
50	302.25								
51	301.25								
52	300.25								
53	299.25								
54	298.25								
55	297.25								
56	296.25								

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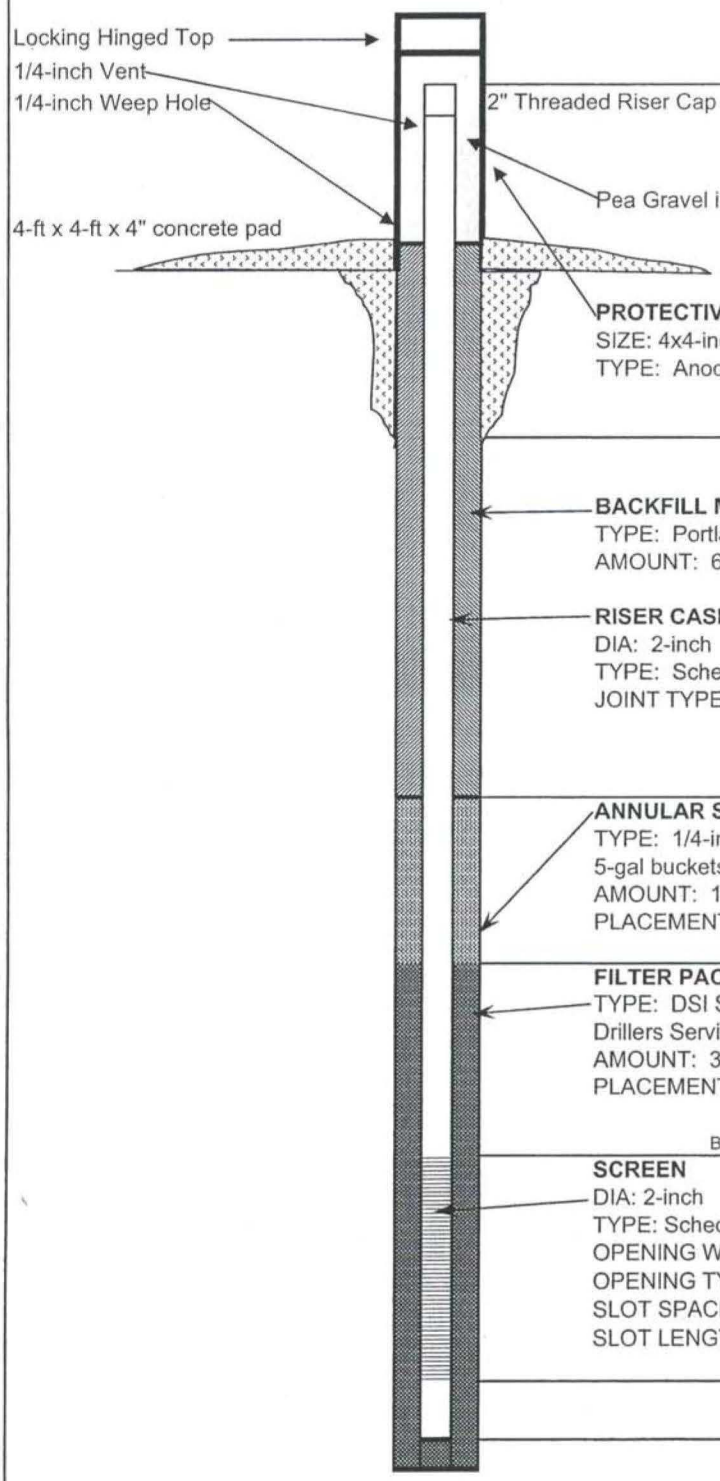
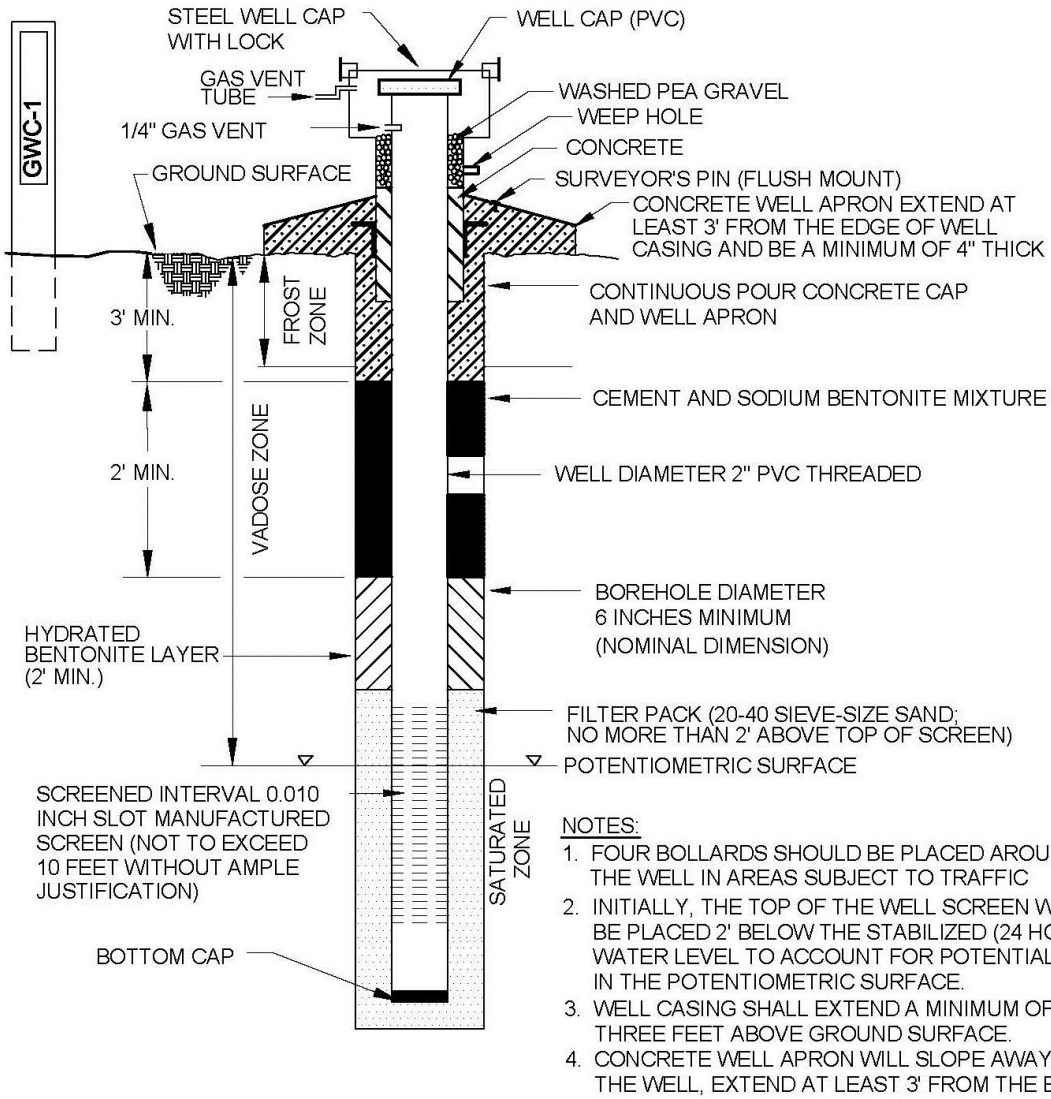
WELL CONSTRUCTION LOG — Southern Company Generation

PROJECT: Former Plant Arkwright	DRILLING CO.: SCS, Inc.	WELL NAME
Solid Waste Management Unit	DRILLER: S. Milam	
LOCATION: Ash Ponds 1, 2, 3	RIG TYPE: CME 550	
LOGGER: L. Garland	DRILLING METHODS: HSA	GWC-18
DATE CONSTRUCTED: 11/19/2008		



	DEPTH FEET	ELEVATION FT, MSL
TOP OF RISER	-2.74	354.99
GROUND SURFACE	0.00	352.25
BOTTOM OF PROTECTIVE CASING		
TOP OF SEAL	34.50	317.75
TOP OF FILTER PACK	36.50	315.75
BOTTOM OF RISER / TOP OF SCREEN	37.81	314.44
BOTTOM OF SCREEN	47.81	304.44
BOTTOM OF CASING	48.11	304.14

Appendix B. **Groundwater Well Detail**



GROUNDWATER MONITORING WELL (TYP.)

Appendix C. **Surface Water Monitoring Plan**

SURFACE WATER MONITORING PLAN

Surface water sampling will be conducted using USEPA Region 4 Field Quality and Technical Procedures as a guide. Surface water monitoring locations are shown in Figure A1 of Appendix A and on Sheet 5 of the Closure Plan.

SURFACE WATER SAMPLING PROCEDURE

The following procedures describe the general methods associated with surface water sampling at the site.

1. SAMPLING FROM A FLOWING OUTFALL:

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. Sample bottles should be filled to the top such that a meniscus forms at the top. Remove the container from underneath the outfall and place the uncontaminated cap back on the container.

d) Place the samples in an ice chest on ice for courier or hand delivery to the laboratory.

2. DIPPING USING A SAMPLE CONTAINER:

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) Push the sample container into the water (mouth down) and tilt-up towards the current to fill. A depth of about six inches is satisfactory. Great care should be taken to avoid breaching the surface while filling the container.

d) During times of little current movement, move the container slowly through the water laterally.

e) During times of extreme drought when stream depths are too shallow to allow submersion of the sample container, a pool may be scooped-out of the channel bottom and allowed to clear prior to sampling. However, sampling will not be conducted when stream flow conditions are below the 7-day, 10-year minimum flow (7Q10) condition.

f) Lift the container from the water and place the uncontaminated cap back on the container.

g) Place the samples in an ice chest on ice for courier or hand delivery to the laboratory.

SURFACE WATER MONITORING PARAMETERS AND FREQUENCY

Surface water monitoring at the site will be conducted semi-annually for the constituents listed in Table 1 below. Sampling events will not be conducted when stream flow conditions do not allow for a representative sample to be collected.

TABLE 1. SURFACE WATER MONITORING PARAMETERS

Indicator Parameters	Methods, SW846
Dissolved Oxygen (DO)	Field Test/360.2/NPDES 4500
Temperature (T)	Field Test
pH	Field Test/150.1/9045C
Specific Conductance	Field Test/120.1/9050A
Turbidity	Field Test
Appendix III Constituents	**Methods, SW846**
Boron	6010B/6020
Calcium	6010B/6020
Chloride	9250/9251/9253/9056A
Fluoride	9214/9056A
pH	150.1/9045C
Sulfate	9035/9036/9038/9056A
Total Dissolved Solids (TDS)	160/2540C

The Permittee shall compare detections of surface water monitoring parameters from upstream and downstream monitoring locations. Surface water will be considered impacted if the downstream results are consistently higher than the background surface water quality.

Within forty-five (45) days of documenting that downstream results are consistently higher than background surface water quality, the Permittee shall initiate sampling and analysis at all surface water monitoring points specified in the Plan for the chemical constituents listed in Rule 391-3-6-.03. The Permittee shall compare the results obtained to the instream concentrations of chemical constituents listed in this rule and certify compliance or noncompliance. In the event an exceedance of an instream concentration of a chemical constituent is detected, the Permittee shall develop a corrective action plan and schedule to eliminate further surface water impacts. Copies of the corrective action plan and proposed compliance schedule will be provided to the Georgia EPD Regional Compliance Officer within ninety (90) days of the documented exceedance.

Appendix D. **Groundwater Sampling Procedure**

GROUNDWATER SAMPLING PROCEDURE

Groundwater sampling will be conducted using USEPA Region 4 Field Quality and Technical Procedures as a guide. The following procedures describe the general methods associated with groundwater sampling at the site. Prior to sampling, the well must be evacuated (purged) to ensure that representative groundwater is obtained. Any item coming in contact with the inside of the well casing or the well water will be kept in a clean container and handled only with gloved hands.

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

1) Check the well, the lock, and the locking cap for damage or evidence of tampering. Record observations and notify GPC if it appears that the well has been compromised.
2) Measure and record the depth to water in all wells to be sampled prior to purging. 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 Region 4 USEPA Science and Ecosystem Support Division (SESD) Operating Procedure for Field Equipment Cleaning and Decontamination 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, ORP, and 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
    - ±10% for specific conductance (conductivity)
    - ±10% for DO where DO>0.5mg/L. If DO<0.5mg/L no stabilization criteria apply
    - ≤10 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 50 and 250 ml/min 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, 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. Filtered samples are not considered compliance samples and are only used to evaluate the effects of turbidity.
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 COC form.

Appendix E. **Statistical Analysis Overview**

Figure E1 – Statistical Analysis Plan Overview

Figure E2 – Decision Logic for Determining Appropriate Statistical Method

Figure E3 – Decision Logic for Computing Prediction Limits

Figure E1 – Statistical Analysis Plan Overview

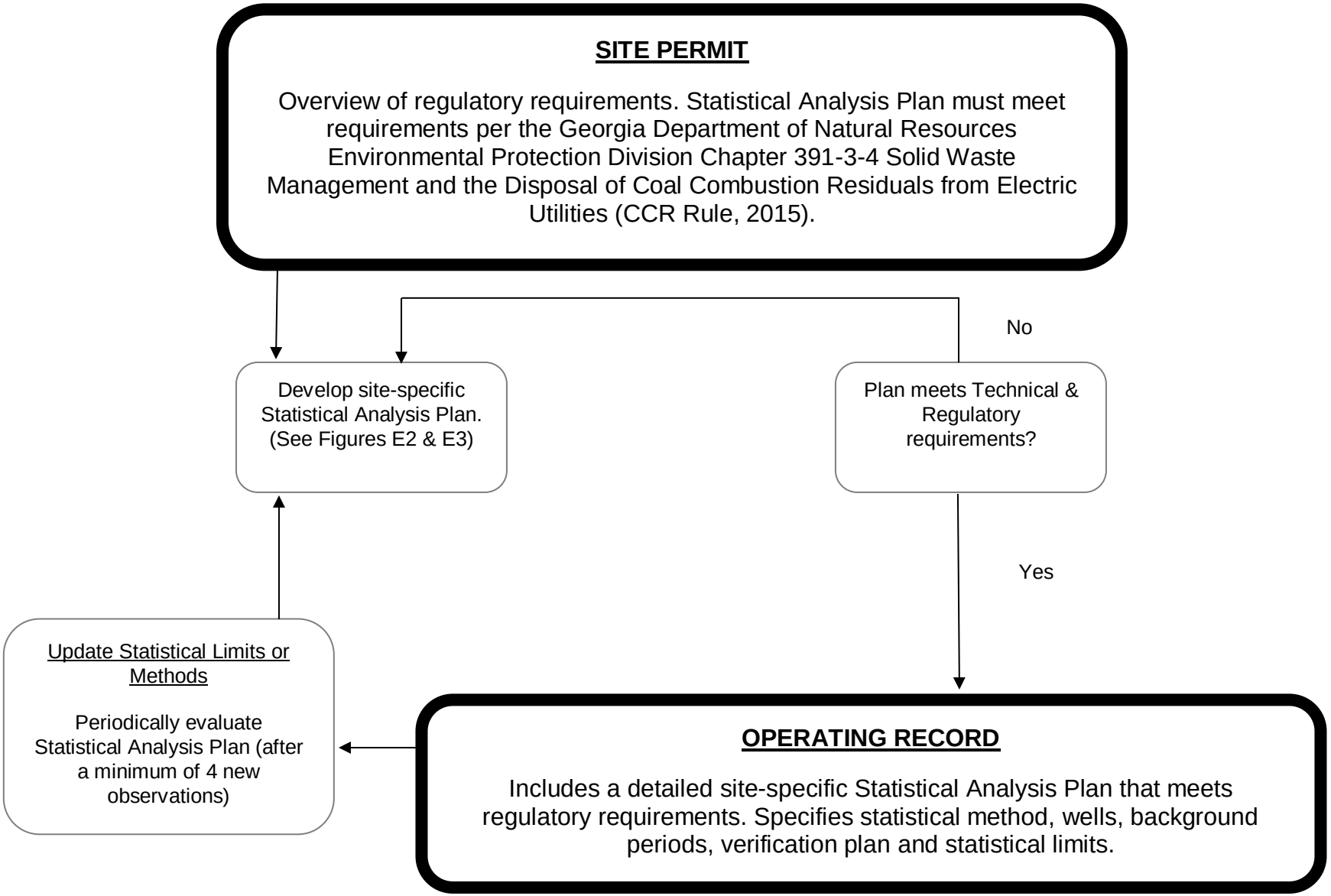


Figure E2 – Decision Logic for Determining Appropriate Statistical Method

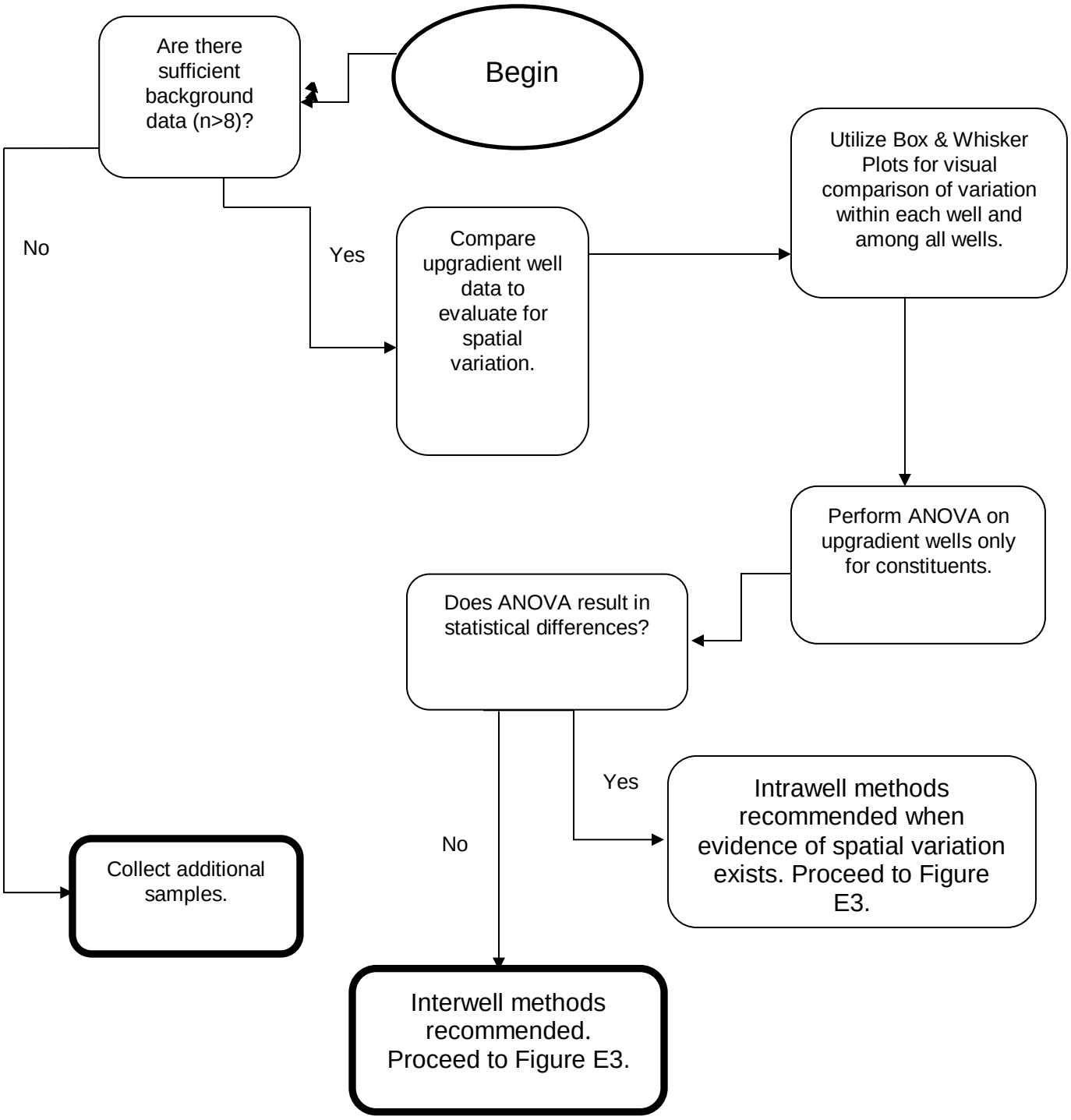
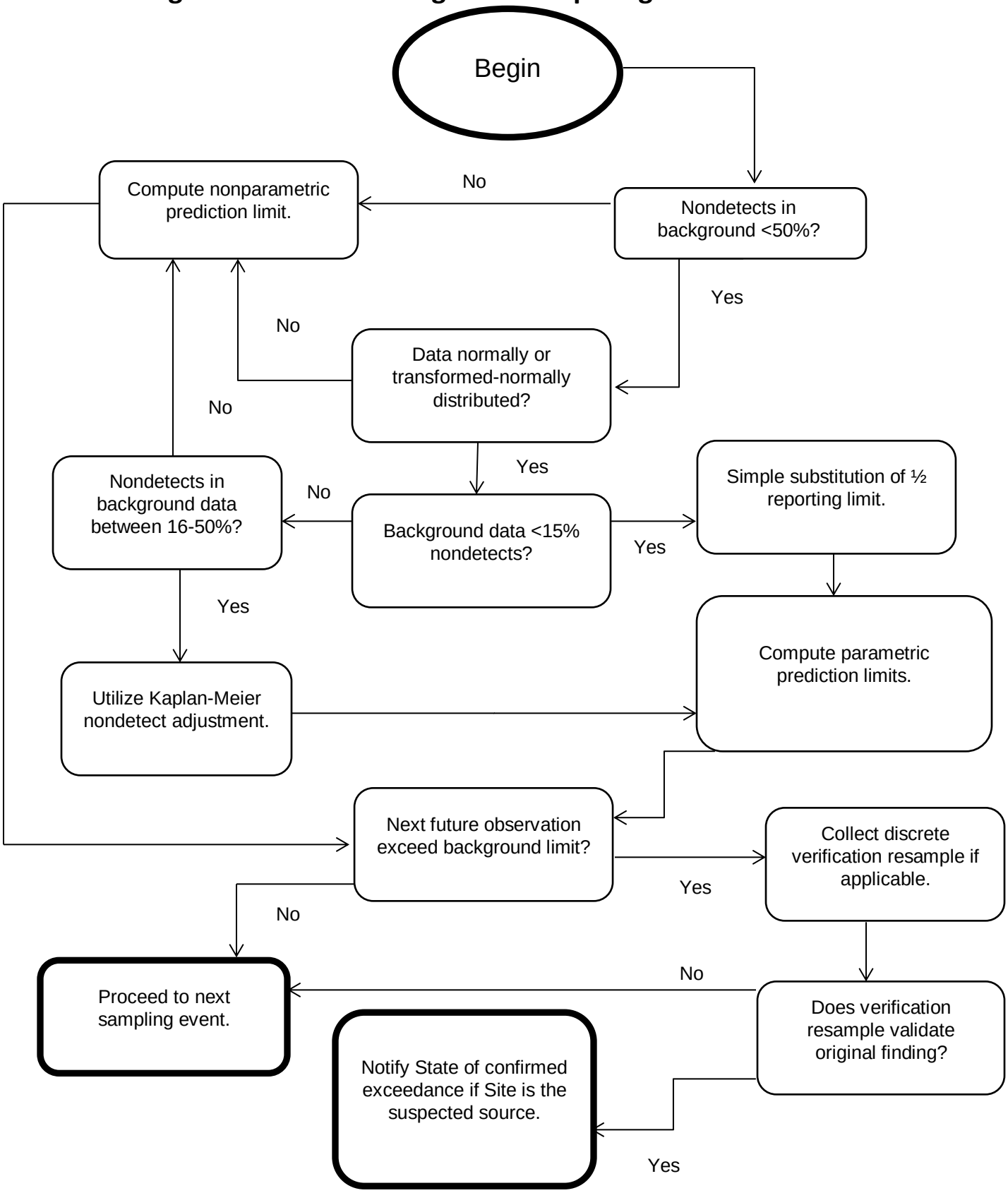



Figure E3 – Decision Logic for Computing Prediction Limits