



Dustin G. Brooks
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April 30, 2020

D-G-B
Received: 4/30/20

Mr. S. Scott Story, Chief
Solid Waste Branch
Alabama Department of Environmental Management
1400 Coliseum Boulevard
Montgomery, Alabama 36110-2400

Re: Revised Permit Application for the Plant Gorgas CCR and Gypsum Landfill

Dear Mr. Story:

Alabama Power Company is the owner and operator of the Plant Gorgas CCR and Gypsum Landfill, located at Parrish, Alabama. Pursuant to rules 335-13-15-.09 and 335-13-5-.02 of the regulations of the Alabama Department of Environmental Management (ADEM), and in response to your letter dated April 10, 2020, please find enclosed a revised permit application to operate the Plant Gorgas CCR and Gypsum Landfill. This revised permit application has been prepared to update the permit application package previously submitted to ADEM in December 2018. Specifically, the revised groundwater monitoring plans submitted on April 15, 2020 have been incorporated into the Plant Gorgas CCR and Gypsum Landfill permit application package.

Thank you for your consideration. Please feel free to contact me if Alabama Power can provide additional information or answer any questions.

Sincerely,

Dustin Brooks

Enclosures

**PERMIT APPLICATION FOR OPERATIONAL CCR LANDFILL
PLANT GORGAS CCR LANDFILL
PARRISH, ALABAMA
ALABAMA POWER COMPANY**

**PERMIT APPLICATION FOR OPERATIONAL CCR LANDFILL
PLANT GORGAS CCR LANDFILL
ADEM Admin. Code r. 335-13-15-.09
ADEM Admin. Code r. 335-13-5-.02**

1. ADEM Application form [r. 335-13-5-.02(1)(a)]

The completed application form can be found in Appendix 1.

2. Documentation of host government approval [r. 335-13-5-02(1)(b)]

The Plant Gorgas CCR Landfill is an industrial facility receiving waste generated by the permittee only and on site for purposes of §§ 22-27-48(h) and 22-27-48.1(m). Accordingly, by the operation of those provisions, §§22-27-48 and 22-27-48.1 do not apply.

3. Facility Design Plans and Operational Procedures [r. 335-13-5-02(1)(c)]

Facility design plans and operational related procedures and documents are addressed in Parts 5 and Parts 11 through 15 of this application.

4. Technical data and reports to comply with 335-13-4-.01 [r. 335-13-5-02(1)(d)]

(i) Floodplain [r.335-13-4-.01(1)(a)].

Based on the Flood Insurance Rate Maps (FIRM) of Walker County, Alabama, Panel Nos. 490 and 495, Map No. 01127C0490D, no portion of the Plant Gorgas CCR landfill is located in the 100-yr floodplain. Portions of the applicable maps are shown on ES2418 Figure 3_3 found in Appendix 2.

(ii) Threatened and Endangered Species [r.335-13-4-.01(1)(b)].

Alabama Power Company Field Biologists conducted a site assessment of the landfill site at the time of original siting and design to identify any possible inhabitation of Federally protected species. No Federally protected species were observed within the site boundaries. There are no critical habitat units on the site and the facility will not result in destruction or adverse modification of critical habitat. The full report can be found in Appendix 2.

(iii) Airport vicinity [335-13-4-.01(1)(c)].

The two nearest airport runways are located at Walker County Bevill Field near Jasper, Alabama at a distance of about 16 miles, and the Birmingham-Shuttlesworth International Airport at a distance of about 24 miles. The Plant Gorgas CCR Landfill is not located within 10,000 feet of any airport runway end, nor within 5 miles of any airport.

(iv) Fault areas [335-13-4-.01(1)(d)3.].

A review was conducted of various publications, including geologic maps available from the Geological Survey of Alabama, USGS databases and Open-File reports, historic mining maps from Russel Coal Company (1977) and site specific boring logs. The results of the review process indicate there are no faults within 200 feet of the landfill and therefore no faults that have had displacement since Holocene within 200 feet of the landfill.

(v) Seismic impact zones [335-13-4-.01(1)(d)4.].

The Peak Ground Acceleration for the facility location, as determined using the online USGS Unified Hazard Tool, Conterminous U.S. 2014 (v4.0.x), was determined to be 0.18, indicating that the impoundment is in a seismic impact zone. The structural components of the impoundment were analyzed using site-specific seismic analysis to determine anticipated loading and deformation. Computed strains on the various structural components are within acceptable strain tolerances for the materials. This analysis therefore indicates that the structural components are designed to resist the maximum horizontal acceleration in lithified earth material at the site.

(vi) Unstable area [335-13-4-.01(1)(d)5.].

The lined CCR landfill cells are formed by excavations in previously placed mine spoil material as well as the construction of earthen embankments. The embankments have been properly constructed using mechanical stabilization, compacted to a density sufficient to withstand the range of loading conditions. Factor of safety assessments have indicated that the embankments meet the generally accepted minimum factors of safety. The foundations beneath the embankments and the CCR units generally consist of previously placed mine spoils. Calculations at the time of original design and permitting documented that strains in the liner due to consolidation of the underlying mine spoil under the weight of CCR placed in the cells would be on the order of 1.7 percent, well within the manufacturer's tolerable strain limit of 4 percent. Furthermore, the CCR units are not located within karst terrain, and the site and its surrounding areas are not subject to mass movements (e.g. landslides). also, there are no local man-made features or events that would affect stability of the site.

(vii) Archaeological or Historical sensitivity [335-13-4-.01(1)(e)].

The University of Alabama's Office of Archaeological Research performed a cultural resources assessment of the proposed landfill area in November 2012, prior to

construction of the CCR units. The assessment was submitted to the State of Alabama Historical Commission for review. The Commission determined that the landfill would have no adverse effect on cultural resources eligible for or listed on the National Register of Historic Places and issued a letter concurring with the project activities proposed at the time, and thus as constructed. The project was assigned AHC Tracking Number 13-0201. A copy of the letter from the AHC can be found in Appendix 2.

(viii) NPDES Permit [335-13-4-.01(2)(a)].

Plant Gorgas currently maintains NPDES Permit No. AL002909 for discharges associated with plant operations. The ADEM Water Division approved changes to the permit to include the leachate piping system from the outlet of the landfill leachate ponds to the water treatment facility. The facility is regulated under the existing permit and has been designed so as to not cause a discharge of pollutants into the waters of the State in violation of this permit.

(ix) Wetlands [335-13-4-.01(2)(b)].

The Plant Gorgas CCR Landfill facility does not cause non-point source pollution of waters of the State, including wetlands, that violates any requirements of an area wide and statewide water quality management plan that has been approved under the Alabama Water Pollution Control Act. Furthermore, the facility will not cause non-point source pollution of waters of the State, including wetlands, that violates any requirements of an area wide and statewide water quality management plan that has been prepared under the Alabama Water Pollution Control Act.

Alabama Power Company Field Biologists conducted a site assessment prior to the design and construction of the CCR landfill to identify, delineate, assess and document possible U.S. Army Corps of Engineers' (Corps) "waters of the United States" which may be present on the site. No streams, open waters or wetlands were found on the landfill site. The full report can be found in Appendix 2. The landfill, including buffers, is not located in wetlands, beaches or dunes, and is not located in an area that would cause degradation of the same. The landfill is not located in the boundaries of the coastal area of Alabama.

5. Hydrogeology [335-13-4-.11(2) (per 335-13-5-.02(1)(d))].

Hydrogeological studies were conducted on the site prior to design and construction of the landfill, including the installation of temporary piezometers for the purpose of determining groundwater levels. The facility has been designed and constructed to maintain a minimum of 5-ft of separation between the bottom of the liner system and the highest measured groundwater level.

The Hydrogeological Report for the site can be found in Appendix 3.

6. Plans and Operational Reports [335-13-4-.12 (per 335-13-5-.02(1)(d))].

Plans and operational reports for construction, operation, maintenance, closure and post-closure care have been prepared and are maintained on site at Plant Gorgas. These drawings include locations and data for control points; a boundary survey and legal description of the facility; initial and final topographic maps and grading plans; plan and profile sheets of disposal areas; drainage plans and detention pond structures; designed buffers; roadways; and designation of the disposal area.

Copies of the Design and Construction drawings can be found in Appendix 4.

7. Site Geology and Hydrogeology [335-13-4-.13 (per 335-13-5-.02(1)(d))].

Site geology and hydrogeology, including detailed presentations of the geological and hydrogeological units, are addressed in the Hydrogeological Report found in Appendix 3.

8. Groundwater Resources [335-13-4-.14 (per 335-13-5-.02(1)(d))].

A discussion of groundwater resources and a groundwater monitoring plan can be found in Appendix 6.

9. Cover [335-13-4-.15 (per 335-13-5-.02(1)(d))].

Intermediate cover will not be routinely utilized on the active face of the CCR disposal areas. Any exposed area of the CCR disposal area materials that will not receive CCR for three months will be covered with temporary soil cover, as previously approved by the Department. See ADEM Solid Waste Permit No. 64-10, dated June 24, 2016. Furthermore, there is an active Fugitive Dust Control Plan that has been prepared for Plant Gorgas and is included in the Operations Plan found in Appendix 9.

Stacking plan drawings for the CCR cells show a 6-in intermediate cover to be placed on all exterior slopes of stacked CCR waste during filling operations which will be vegetated and maintained until final stabilization and closure. These stacking plans, included as a part of the Design and Construction Drawings, can be found in Appendix 4.

10. Explosive Gases [335-13-4-.16 (per 335-13-5-.02(1)(d))].

The Plant Gorgas CCR Landfill accepts only coal combustion residuals. Organic wastes having a potential to generate methane or other explosive gases are not accepted. Therefore, explosive gas control and monitoring is not required. A prior variance to this requirement has been provided by the Department. See ADEM Solid Waste Permit No. 64-10, dated June 24, 2016.

11. Drainage [335-13-4-.17 (per 335-13-5-.02(1)(d))].

The Plant Gorgas CCR Landfill has been designed and constructed to prevent flow onto the landfill from the 25-year storm. Furthermore, a runoff control system has been designed and constructed to collect and control at least the water volume resulting from the 24-hour, 25-year storm. Incident precipitation from the disposal site is controlled by drainage structures that minimize the generation of leachate, erosion and sedimentation and directs the runoff to a sedimentation ponds dedicated to each disposal cell. The Run-on and Run-off Control Plans along with the original Design calculations can be found in Appendix 5. The Run-on and Run-off Control Plans were initially prepared to satisfy federal standards, but also satisfy r. 335-13-15-.05(2)(c). Drawings showing the drainage structures and sedimentation basin can be found in Appendix 4.

12. Liners and Leachate Collection [335-13-4-.18 (per 335-13-5-.02(1)(d))].

The Plant Gorgas CCR Landfill has been designed with a composite liner system consisting of synthetic and soil liner materials. The liner system consists of a 60-mil high density polyethylene (HDPE) geomembrane overlying a geosynthetic clay liner (GCL) having a maximum permeability on the order of 1×10^{-9} cm/sec. The GCL is underlain by at least 12-in of compacted clay having a maximum permeability of 1×10^{-5} cm/sec. This alternative liner system was approved by the Department. See ADEM Solid Waste Permit No. 64-10 dated June 24, 2016. There is also a leachate collection system present that has been designed to maintain less than a 30 cm depth over the liner. The leachate collection system consists of a geosynthetic drainage layer (overlain by appropriate protective soil) above the composite liner system.

The installation of the liner and leachate collection system was performed in accordance with the requirements of 335-13-4-.18 and the project Technical Specifications, which covers material properties as well as quality control requirements. Technical specifications for the construction of the Plant Gorgas CCR Landfill disposal cells can be found in Appendix 7.

Calculations for the design of the leachate collection system can be found in Appendix 5.

13. Access [335-13-4-.19 (per 335-13-5-.02(1)(d))].

The facility is located on Plant Gorgas property, and access to the Plant, and thereby the Landfill, is restricted with security gates manned 24 hours a day. Public access is not allowed unless escorted by authorized personnel. No dumping of waste material by the public is allowed.

14. Closure and Post-closure [335-13-4-.20. per 335-13-5-.02(1)(d)]

As originally designed, the final cover system for the lined disposal cells within the CCR landfill will consist of a composite cover system incorporating a GCL overlain by a 60-mil HDPE liner and a double-sided geocomposite drainage layer covered with 12 inches of protective soil and 6

inches of topsoil.

Post-closure care will be conducted for a minimum of 30 years. Post-closure maintenance will include quarterly inspections and any problems identified will be corrected in a timely manner. All eroded areas or areas having extensive surface cracks will be filled with suitable soil cover and appropriate cover established. Areas where ponding of water occurs will be maintained and regraded to reduce the potential for future ponding. Signs will be posted stating the facility is closed. Any required monitoring devices and pollution control equipment will be maintained.

Written closure and post-closure care plans containing additional details that address the requirements of 335-13-4-.20 can be found in Appendix 8.

15. Operation Plan [335-13-4-.21. per 335-13-5-.02(1)(d)]

An Operation Plan for the Plant Gorgas CCR Landfill can be found in Appendix 9. Operation and use of the landfill will be as stipulated in the Permit. Waste accepted at the facility will be Coal Combustion Residuals generated by Alabama Power, including fly ash, bottom ash, gypsum, or other residuals resulting from the combustion of coal to generate electricity. The facility will not accept nor receive for disposal free liquids, regulated hazardous wastes, regulated medical wastes nor regulated PCB wastes.

Open burning is not allowed at the facility.

16. ADEM Admin. Code r. 335-13-4-.22 through r. 335-13-4-.24

The specific requirements for Municipal Solid Waste Landfills, Inert Construction/Demolition Landfills and Septic Tank Pumpings and Sewage Sludge, as outlined in ADEM Admin. Code sections r. 335-13-4-.22 through r. 335-13-4-.24, do not apply to CCR Landfills and are not included.

17. Groundwater Monitoring [335-13-5-.02(1)(h)3.]

A groundwater monitoring plan can be found in Appendix 6.

18. Recordkeeping [335-13-5-.02(1)(h)4.]

Records pertaining to the Plant Gorgas CCR Landfill will be maintained at Plant Gorgas, including, but not limited to, the Operating Record, the Solid Waste Disposal Permit issued by the Department, and the permit application, including the operational narrative and the engineering drawings.

All information in the Operating Record will be furnished upon request to the Department and will be made available at reasonable times for inspection by the Department.

In accordance with the requirements of 335-13-15 [per 335-13-5-.02(1)(h)5.], all required plans and assessments periodically required for CCR landfills will be updated when conditions change that modify such updates. Amended plans and assessments will be placed in the Plant Gorgas Operating Record, posted to the public internet website and notifications will be made to the Director of the Department.

19. Additional Permit Application Requirements [r. 335-13-5-.02(1)]

Plans, specifications, operational procedures and letters of final construction certification for construction of the operation of the facility have been previously submitted to the Department under signature and seal of a Professional Engineer licensed in the State of Alabama in support of ADEM Solid Waste Permit No. 64-10 dated June 24, 2016. Plans and operational procedures are again submitted with this application in Appendix 4 and Appendix 9, respectively. [r. 335-13-5-.02(1)(e)1.]

Reports, letters of certification and other documents concerning the siting standards of 335-13-4-.01, prepared by a person with technical expertise in the field of concern, have been previously submitted to the Department in support of ADEM Solid Waste Permit 64-10 dated June 24, 2016, and are again submitted with this application in Appendix 2, Appendix 3 and Appendix 6. [r. 335-13-5-.02(1)(e)2.]

A listing of adjacent property owners can be found in Appendix 10. [r. 335-13-5-.02(1)(f)]

Technical data and reports documenting compliance with the unstable area requirements of 335-13-15-.03(5) have been provided in Part 4.(vi) of this application. The Unstable Area demonstration originally submitted to satisfy federal standards also satisfies r. 335-13-15-.03(5) and is included in Appendix 11. [r. 335-13-15-.02(1)(h)1.]

A run-on and run-off control system plan developed in accordance with 335-13-15-.05(2)(1)(c) has been addressed in Part 11 of this application and is included in Appendix 5. [r. 335-13-15-.02(1)(h)1.]

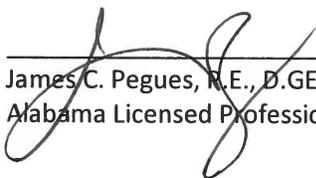
As required by r. 335-13-15-.04, Alabama Power will conduct and update assessments required by r. 335-13-15-.04(4)(a)2., (d) and (e) every 5 years. [335-13-5-.02(1)(h)5.]

Location restriction documentation showing compliance with the requirements of r. 335-13-5-.02(1)(i) have been addressed in Part 4 of this application.

A groundwater monitoring and analysis program developed in accordance with r. 335-13-15-.06 has been addressed in Part 17 of this application and is included in Appendix 6 [r. 335-13-15-.02(1)(h)3.]

Procedures for complying with recordkeeping and notification as required under r. 335-13-15-.08 has been addressed in Part 18 of this application.

By signature below, I hereby certify that the information contained within this permit application is accurate and correct based on the available information.

 12/4/18
James C. Pegues, R.E., D.GE
Alabama Licensed Professional Engineer No. 16516





Mike Godfrey
Alabama Power Company

APPENDIX 1
ADEM PERMIT APPLICATION FORM

SOLID WASTE APPLICATION

PERMIT APPLICATION
SOLID WASTE DISPOSAL FACILITY
ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
(Submit in Triplicate)

1. Facility type: Municipal Solid Waste Landfill (MSWLF)
 Industrial Landfill (ILF)
 CCR Landfill (CCRLF)
 CCR Surface Impoundment (CCRSI)
 Other (explain) _____

2. Facility Name Plant Gorgas CCR and Gypsum Landfill

3. Applicant:

Name: Mr Mike Godfrey (Physical Address)

Address: Alabama Power Company Plant Gorgas

Post Office Box 2641 460 Gorgas Road

Birmingham, Alabama 35291 Parrish, AL 35580-5715

Telephone: (205) 257-6131

4. Location: (include county highway map or USGSmap)

Township 16-South Range 06-West

Section 17 County Walker

5. Land Owner:

Name: Alabama Power Company

Address: Post Office Box 2641

Birmingham, AL 35291-0830

Telephone: (205) 257-4194

(Attach copy of agreement from landowner if applicable.)

6. Contact Person:

Name James Douglas Che George

Position or Affiliation Environmental Affairs Specialist Senior Compliance Specialist

Address: Post Office Box 2641 460 Gorgas Road
Birmingham, AL 35291-0831 Parrish, AL 35580-5716

Telephone: (205) 257-6782 (205) 686-2324

7. Size of Facility:

287.06 Acres

Size of Disposal Area(s):

Gypsum Landfill - 20.70, CCR Landfill Cell-1 - 9.21,
CCR Landfill Cell-2 - 14.13ac Acres

8. Identify proposed service area or specific industry that waste will be received from:

The landfill service area is limited to waste generated only from Alabama Power Company.

9. Proposed maximum average daily volume to be received at landfill (choose one):

 Tons/Day 2,000 Cubic Yards/Day

10. List all waste streams to be accepted at the facility (i.e., household solid waste, wood boiler ash, fires, trees, limbs, stumps, etc.):

CCR Related materials - flyash, FGD Gypsum, and baghouse byproducts consisting of a mixture of any or all of the following: flyash, powdered activated carbon, lime or other comparable dry sorbent material.

 11/26/18
SIGNATURE DATE

APPENDIX 2
FLOOD PLAIN, THREATENED & ENDANGERED SPECIES, CULTURAL RESOURCES AND WETLANDS
DOCUMENTATION

1 2 3 4

STATE PLAN
NAD 27
WEST ZONE

LEGEND

- 100 — EXISTING GROUND CONTOURS (10' CONTOUR INTERVAL)
- 100 — BAGHOUSE BYPRODUCT BASE GRADE
- 100 — GYPSUM FACILITY BASE GRADE
- EXISTING ROAD (DIRT/GRAVEL/ASPHALT)
- ACCESS/PERIMETER ROADS
- SITE LIMITS
- 100' SITE BUFFER
- OVERHEAD POWER
- EXISTING POWER POLE
- TREELINE
- SURFACE WATER
- 100 YEAR FLOOD ZONE
- 1000 YEAR FLOOD ZONE

PANEL 0490D

FIRM
FLOOD INSURANCE RATE MAP
WALKER COUNTY,
ALABAMA
AND INCORPORATED AREAS

PANEL 490 OF 595
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

COMMUNITY NUMBER: 030301
COUNTY: WALKER COUNTY

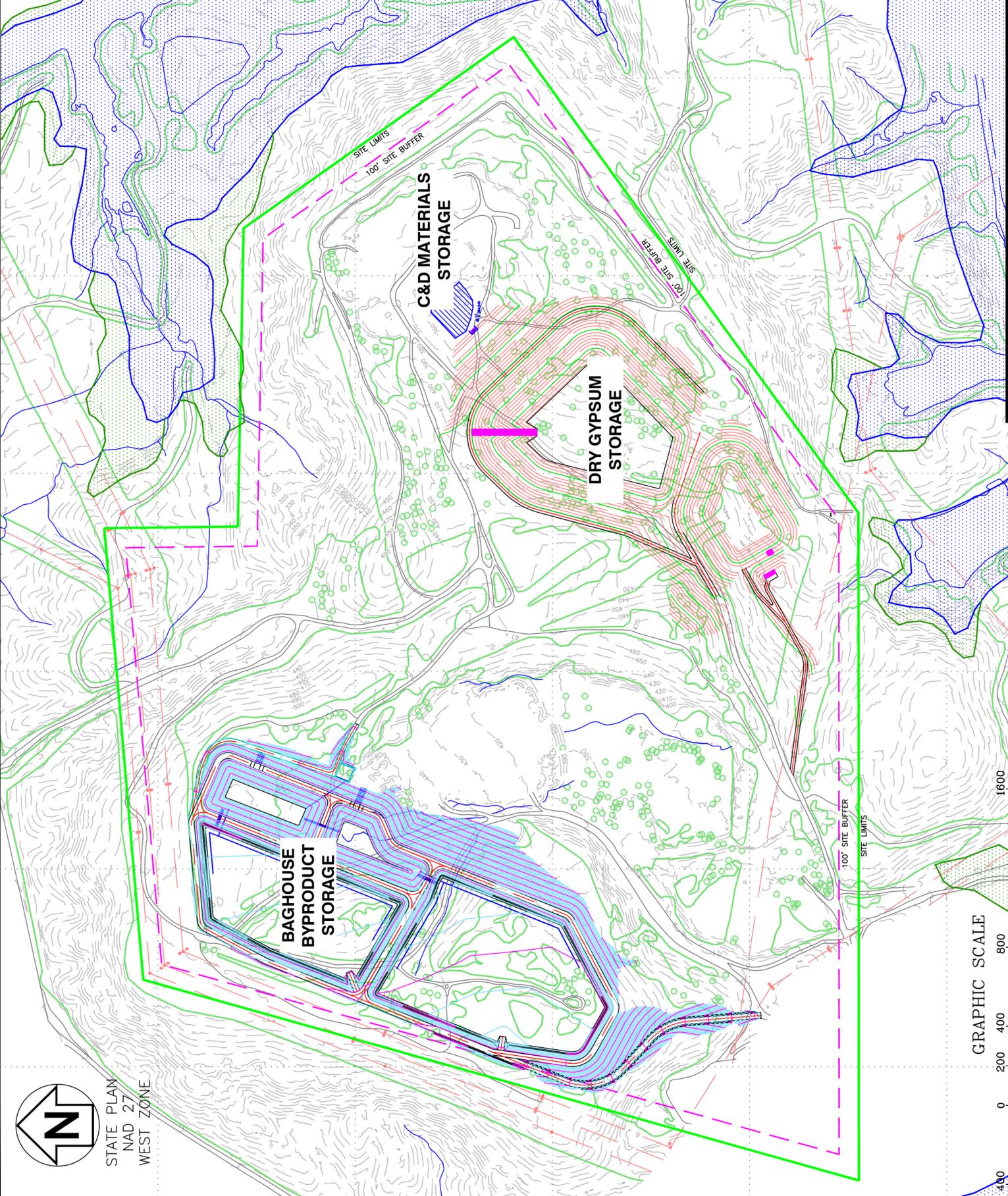
MAP NUMBER: 01127C0490D
EFFECTIVE DATE: AUGUST 2, 2007

State of Alabama
Federal Emergency Management Agency

Notice to User: The Map Number shown below should be used when showing map content. The Community Number shown below should be used when showing map content. The Community Number shown below should be used when showing map content.

- NOTES:**
- DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 - COORDINATES SHOWN ARE IN ALABAMA STATE PLANE NAD 27, WEST ZONE

FIGURE 3-3



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Southern Company Services
Engineering and Construction Services
FOR
Alabama Power Company

ISSUED FOR REPORT

DATE 07/28/2015

PLANT GORGAS
UNIT 8, UNIT 9 AND UNIT 10
CCB STORAGE FACILITY
FLOOD ZONE MAP

| REVISION | DATE | BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
|----------|------|-----|-------|------------|------------|----------|-----------|----------|----------|-----------------------|-------|--------|-----|
| | | ASF | GBD | SCB | XXX | XXX | XXX | XXX | AS SHOWN | ES2418 FIG 3 3 | 1 | FINAL | O |

| REVISION | DATE | BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR |
|----------|------|----|-------|------------|------------|----------|-----------|----------|
| | | | | | | | | |

| REVISION | DATE | BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR |
|----------|------|----|-------|------------|------------|----------|-----------|----------|
| | | | | | | | | |





STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

FRANK W. WHITE
EXECUTIVE DIRECTOR

TEL: 334-242-3184
FAX: 334-240-3477

November 20, 2012

William S. Gardner
Alabama Power Company
600 North 18th Street
Birmingham, Alabama 35291

Re: AHC 13-0201
Cultural Resource Assessment
Gorgas Steam Plant Industrial Landfill
Walker County, Alabama

Dear Mr. Gardner:

Upon review of the cultural resource assessment conducted by the University of Alabama's Office of Archaeological Research, we have determined that project activities will have no adverse effect on cultural resources eligible for or listed on the National Register of Historic Places. Therefore, we concur with the proposed project activities. However, should artifacts or archaeological features be encountered during project activities, work shall cease and our office shall be consulted immediately.

We appreciate your efforts on this project. Should you have any questions, please contact Greg Rhinehart at (334) 230-2662. Please have the AHC tracking number referenced above available and include it with any correspondence.

Truly yours,

Elizabeth Ann Brown
Deputy State Historic Preservation Officer

EAB/RJG/GCR/gcr

**THREATENED AND ENDANGERED SPECIES REPORT
& WETLANDS DELINEATION AND STREAM
ASSESSMENT REPORT**

ALABAMA POWER COMPANY

**PLANT GORGAS
LANDFILL PERMIT #64-10 MODIFICATION
PARRISH, WALKER COUNTY, ALABAMA**



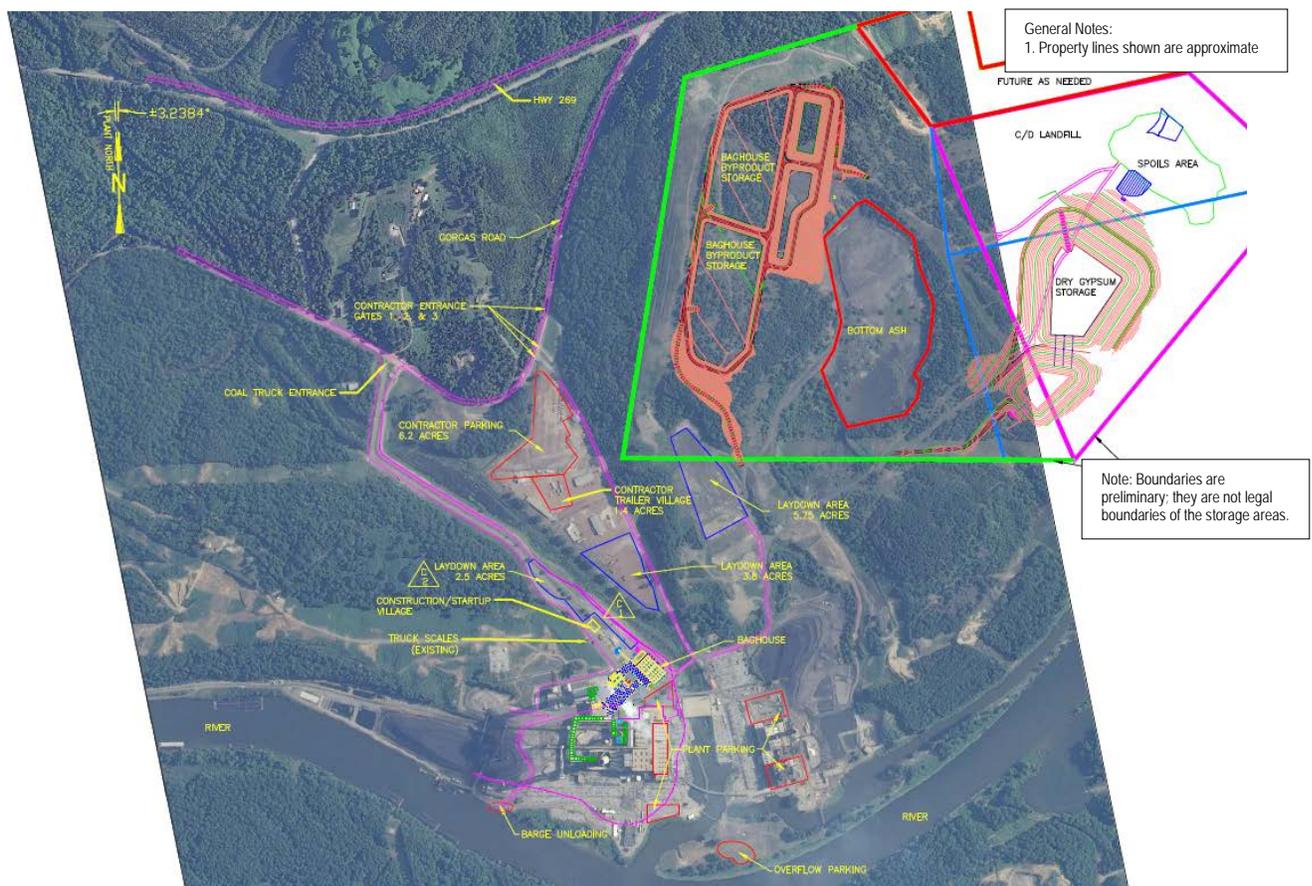
Prepared By:
Alabama Power Company
Birmingham, Alabama

December 2012

EXECUTIVE SUMMARY

In the winter of 2011, Alabama Power Company performed a site assessment to identify any possible inhabitation of Federally protected species in the proposed sites located on a landfill site as well as to identify, delineate, assess and document possible U.S. Army Corps of Engineers' (Corps) "waters of the United States" which may have occurred on the site.

The subject study area consisted of an approximate 352-acre study area and is located within Alabama Power's plant property, south of Alabama Highway 269, near Goodsprings, Alabama. Specifically, the property is located in portions of Sections 17 & 8, Township 16 north and Range 6 west. Center coordinates of the project are as follows: 33.6513 Latitude and -87.1872 Longitude.



Study Area – Gorgas Steam Plant Landfill

For the field studies, Alabama Power personnel identified the location of two areas of proposed work. Area 1 consists of a proposed Dry Gypsum Storage and existing C&D Materials Storage Site that is located on approximately 100 acres on the eastern side of the landfill. Area 2 consists of a site for Baghouse Byproduct Storage located on approximately 65 acres on the western side of the landfill.

SITE CONDITIONS

According to the Alabama Geological Survey, Geologic Map of Alabama dated 1988; the project lies in the Cumberland Plateau Physiographic Province and is underlain by the Pottsville Formation. The Pottsville Formation is Pennsylvanian in age and is primarily composed of sandstone, siltstone, shale and coal. The primary drainages in the area are Baker Creek and its tributaries, which drain to the Mulberry Fork with the primary drainage being the Mulberry Fork of the Black Warrior River. There are varying degrees of impacts to the streams and wetlands due to past land use practices in and adjacent to the proposed project boundaries. The project is located in HUC 03160109 – Mulberry Watershed.

According to the Walker Soil Survey most of the acreage within the subject area consists of previous mineral extraction (coal mining), which has been reclaimed. The topography is moderate to steep with few drainage courses. The elevation ranges from about 600 feet to approximately 240 feet above sea level in the project area. Specifically, the study area consisted primarily of Brilliant channery loam. These soils are formed in recent areas of excavated surface, typical of surface mining in the area. See attached Soil Report (Walker County).

Federally Protected Species

Field surveys were conducted for protected species known to occur within Walker County. Table 1 represents a list of state and federally protected species in Walker County. No federally protected species were observed with the site boundaries.

Table 1. List of state and federally protected species in Walker County.

| Scientific Name | Common Name | Federal Status | State Status |
|---------------------------------|---------------------------|----------------|--------------|
| <i>Aneides aeneus</i> | Green Salamander | | SP |
| <i>Necturus alabamensis</i> | Black Warrior Waterdog | C | SP |
| <i>Corvus corax</i> | Common Raven | | SP |
| <i>Dendroica petechia</i> | Yellow Warbler | | SP |
| <i>Falco sparverius</i> | American Kestrel | | SP |
| <i>Thryomanes bewickii</i> | Bewick's Wren | | SP |
| <i>Mustela frenata</i> | Long-tailed Weasel | | SP |
| <i>Ursus americanus</i> | Black Bear | | GANOS |
| <i>Macrochelys temminckii</i> | Alligator Snapping Turtle | | SP |
| <i>Masticophis flagellum</i> | Coachwhip | | SP |
| <i>Sternotherus depressus</i> | Flattened Musk Turtle | T | SP |
| <i>Marshallia mohrii</i> | Mohr's Barbara's Buttons | T | |
| <i>Platanthera integrilabia</i> | White Fringeless Orchid | C | |

C = Candidate Species, T = Federally Threatened, SP = State Protected, GANOS = Game Animal with No Open Season.

Waters of the United States (Wetlands and Streams and Open Waters)

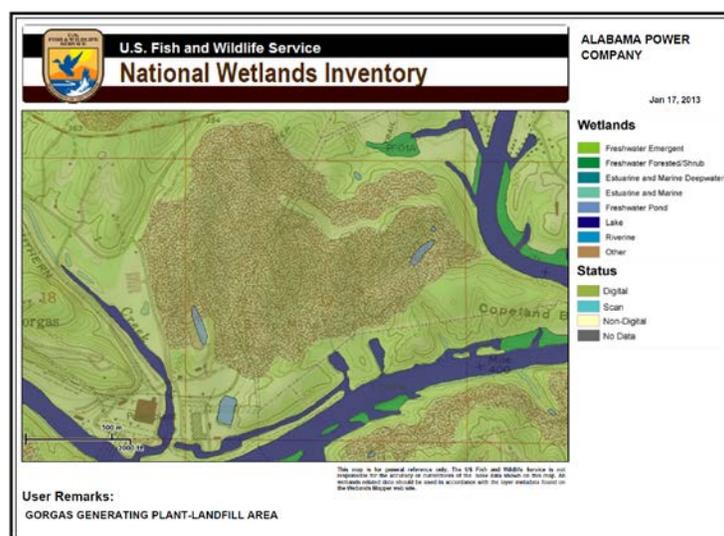
For the purpose of the current Corps guidance and subsequent jurisdiction over waters of the U.S., the following applies:

The agencies will assert jurisdiction over the following waters:

- Traditional navigable waters
- Wetlands adjacent to traditional navigable waters
- Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months)
- Wetlands that directly abut such tributaries

Three features characterize wetlands by definition: hydrology (hydroperiod, mean depth, etc.), the presence of hydric soils and the resulting biotic communities, particularly the presence of hydrophytic vegetation. Hydrology is considered the primary variable of wetland ecosystems, driving the development of wetland soils and leading to the development of the biotic communities (Mitsch and Gosselink 2000). First-order streams, usually designated by solid blue lines on U.S. Geological Survey (USGS) 7.5-min topographic maps (scale 1:24,000), are normally associated with riverine wetlands. They may also continue farther upstream where broken blue lines on topographic maps indicate the presence of channels. Perennial flow is not a requirement for a wetland to be classified as riverine.

A field plan was prepared to assist in the identification and location of wetlands within the subject property. Utilizing existing topographic maps, aerial photography, National Wetlands Inventory Maps (NWI), and field reconnaissance identified wetlands. The wetland survey was conducted in accordance with the USACE *Piedmont and Eastern Mountains Regional Supplement (April 2012)*.



NWI –USFWS Wetland Map

The NWI maps show no wetlands within the project boundary, but show two open water ponds located on the subject property, but do not currently exist. These NWI Maps are used as indicators that wetlands could exist and further investigation was performed to confirm the presence of jurisdictional wetlands.

DELINEATION RESULTS

The objective of the work was to perform a site study to determine possible Corps “waters of the United States”. The results of that delineation work are as follows:

Assessment and Findings

Waters of the U.S.

- **Area 1** - Area 1 consisted of approximately 100 acres on the eastern side of the landfill that contain a C&D Materials Storage Site and a proposed site for Dry Gypsum Storage. On Tuesday November 29, 2011, Jack Fuqua and Carl Hubbert surveyed the proposed site and surrounding areas included in Area 1. No streams, open waters or wetlands were found.
- **Area 2** - Area 2 consisted of approximately 65 acres on the western side of the landfill and will contain the proposed Baghouse Storage Site. On Thursday, September 20, 2012, Steve Krotzer and Chad Fitch surveyed the Gorgas Baghouse Project Site. No Streams, open waters or wetlands were observed.

QUALIFICATIONS

Steve Krotzer – Alabama Power Environmental Affairs

- Masters Degree in Biology
- 25 Years experience delineating wetlands submitted to the Corps for numerous APC Projects
- Has attended many workshops pertaining to wetland delineation, vegetation and hydric soils

Chad Fitch - Alabama Power Environmental Affairs

- Masters Degree in Biology
- 8 years experience delineating wetlands submitted to the Corps for numerous APC projects
- Has attended many workshops pertaining to wetland delineation, vegetation and hydric soils

Jack Fuqua - Alabama Power Environmental Affairs

- Successfully completed U.S Army Corps of Engineers 40-Hour Wetland Delineation Course and continuing education as recommended by the Corps related to wetland/upland plants, hydric soils, site hydrology, wetland mitigation, stream creation and classification and stream restoration.
- Mr. Fuqua has performed well over 300 wetland delineations over a 20-year period.
- His wetland forms and field experience have been verified by the Corps on dozens of instances for power line projects, substations, generating plant projects, and lakeshore projects.

Carl Hubbert - Alabama Power Environmental Affairs (Contractor)

- Bachelors Degree in Political Science with emphasis in U.S. Government Regulation and Policy
- Registered Environmental Manager #11752-National Registry of Environmental Professionals (NREP)
- Successfully completed U.S Army Corps of Engineers 40-Hour Wetland Delineation Course and continuing education
- Over 30 years of environmental experience specializing in permitting and compliance, 13 years experience in wetlands delineations and 404(b) Clean Water Act (33 U.S.C. 1344) and state (ADEM) permitting, water quality and prevention of sediment and erosion control

APPENDIX 3
HYDROGEOLOGICAL REPORT

PLANT WILLIAM C. GORGAS

Coal Combustion Byproduct Storage Facilities

Hydrogeological Characterization Report

July 2015

ES2418



ALABAMA POWER COMPANY
PLANT WILLIAM C. GORGAS
COAL COMBUSTION BYPRODUCT DISPOSAL FACILITY
HYDROGEOLOGICAL CHARACTERIZATION REPORT
ES2418

Prepared for

Alabama Power Company

By

Earth Science and Environmental Engineering
Southern Company Generation

2015



A **SOUTHERN COMPANY**

ALABAMA POWER COMPANY
PLANT WILLIAM C. GORGAS
COAL COMBUSTION BYPRODUCT DISPOSAL FACILITY
HYDROGEOLOGICAL CHARACTERIZATION REPORT
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TABLE OF CONTENTS

| | | |
|-------|------------------------------------------------------------------|----|
| 1 | INTRODUCTION | 8 |
| 2 | CHARACTERIZATION OF WASTES | 9 |
| 3 | GENERAL SITE AREA | 11 |
| 3.1 | Plant Location and Description..... | 11 |
| 3.2 | Proximity to Flood Plains | 11 |
| 3.3 | Proximity to Streams and Wetlands..... | 11 |
| 3.4 | Proximity to Roads, Airports and Railroads | 12 |
| 3.5 | Climate..... | 12 |
| 3.6 | Land Use | 12 |
| 3.7 | Historic Sites and Adjacent Properties of Concern..... | 12 |
| 3.8 | Mining Activity..... | 12 |
| 4 | WATER WELL SURVEY | 13 |
| 5 | GEOLOGIC SETTING | 16 |
| 5.1 | Physiography and Topography | 16 |
| 5.2 | Soil Descriptions..... | 16 |
| 5.3 | Regional Stratigraphy | 18 |
| 5.4 | Site Stratigraphy..... | 21 |
| 5.4.1 | Overburden Stratigraphy..... | 21 |
| 5.4.2 | Pottsville Stratigraphy..... | 25 |
| 5.5 | Geologic Structure | 29 |
| 5.6 | Seismic Zones and Seismicity | 29 |
| 6 | HYDROGEOLOGIC SETTING | 33 |
| 7 | FIELD INVESTIGATION | 35 |
| 7.1 | Geologic Mapping | 35 |
| 7.2 | Stratigraphic Borings and Investigative History | 35 |
| 7.2.1 | Drilling and Sampling Methods..... | 36 |
| 7.2.2 | Depth Criteria..... | 36 |
| 7.2.3 | Geophysical Methods..... | 36 |
| 7.2.4 | Mine-Spoil Overburden Targeted Borings | 37 |
| 7.2.5 | Temporary Piezometers | 37 |
| 7.2.6 | Permanent Piezometers and Proposed Monitoring Wells..... | 41 |
| 7.3 | Elemental Analyses of Mine Spoil/Coal Seam Samples | 48 |
| 8 | HYDROGEOLOGIC ASSESSMENT | 50 |
| 8.1 | Description of Vadose Zone | 50 |
| 8.2 | Determination of “First Zone of Saturation” | 50 |
| 8.3 | Groundwater Elevation Relative to Base of Facilities/Liner | 50 |
| 8.3.1 | Dry Gypsum Storage Facility | 50 |
| 8.3.2 | Baghouse Byproduct Facilities | 51 |
| 8.4 | Hydrologic Interconnection with Subsequent Lower Aquifers | 51 |
| 8.5 | Groundwater Elevation(s)..... | 51 |
| 8.6 | Groundwater Flow Direction and Gradient | 54 |
| 8.7 | Hydraulic Conductivity of Pottsville Rocks | 54 |
| 8.8 | Groundwater Quality | 55 |
| 9 | GROUNDWATER POLLUTION POTENTIAL | 60 |

| | | |
|-------|---------------------------------------------------------------------------------------------------|----|
| 9.1 | Introduction..... | 60 |
| 9.2 | DRASTIC Index | 60 |
| 9.3 | Pathway Analysis (Horizontal Travel Time) | 61 |
| 9.3.1 | Calculated Groundwater Velocities | 61 |
| 9.3.2 | Description of the Relationship Between Groundwater Flow Directions and Potential Receptors | 62 |
| 9.3.3 | Estimated Travel Time for Leachate to Reach Potential Receptors | 62 |
| 9.4 | Description of Relationship Between the Vadose Zone and Uppermost Aquifer | 63 |
| 9.5 | Mitigation of Geologic and Natural Hazards..... | 63 |
| 10 | DISCUSSION | 64 |
| 11 | CONCLUSIONS | 66 |
| 12 | REFERENCES | 68 |

LIST OF FIGURES

| | |
|--------------------|----------------------------------------------------------------|
| *Figure 3-1 | Area Site Location Map |
| *Figure 3-2 | CCB Storage Facility Cell Outline Map |
| *Figure 3-3 | Flood Zone Map |
| Figure 4-1 | Water Well and Surface Intake Survey Results |
| Figure 5-1 | Soil Map |
| Figure 5-2 | Regional Stratigraphy |
| Figure 5-3 | Mine Overburden Isopach Map |
| Figure 5-4 | Top of Rock Structure Map (Rock Elevation) |
| Figure 5-5 | Near Surface Pottsville Stratigraphy |
| Figure 5-6 | Major Geologic Structures |
| *Figure 5-7 | Fault Location Map |
| Figure 5-8 | Seismic Probability Map |
| Figure 6-1 | Regional Pottsville Recharge Model |
| *Figure 7-1 | Historic Boring and Piezometer Location Map (2011-2012) |
| *Figure 7-4 | Geologic Cross-Section B-B'' |
| *Figure 8-1 | Hydrogeologic Cross-Sections Through CCB Facility |
| *Figure 8-2 | Hydrogeologic Cross-Sections Through Gypsum Facility |
| *Figure 8-4 | Potentiometric Surface Map, March 2014 |
| *Figure 8-5 | Potentiometric Surface Map, April 2014 |
| *Figure 8-6 | Potentiometric Surface Map, December 2014 |

Figure 8-7 Piper Diagram
Figure 8-8 Pyrite Occurrence in the Pratt Seam (D-3)
***Located in Figures Tab**

LIST OF TABLES

| | |
|-----------|-------------------------------------------------------------------------------|
| Table 2-1 | Plant Gorgas Total Metals Data |
| Table 2-2 | Plant Gorgas Gypsum TCLP and SPLP Results |
| Table 2-3 | Mass Balance Calculation for Baghouse Facility |
| Table 5-1 | Historical Grain Size Analysis of Mine Overburden Materials |
| Table 5-2 | Near Surface Site Stratigraphy |
| Table 7-1 | Summary of Piezometer Data (2011-2012) |
| Table 7-2 | Summary of Piezometer Data (2013-2014) |
| Table 7-3 | Well Construction Details for Permanent Piezometers/Proposed Monitoring Wells |
| Table 7-4 | Trace Metal Analyses of Rock Samples |
| Table 8-1 | Hydraulic Gradients |
| Table 8-2 | Field Hydraulic Conductivity Tests |
| Table 8-3 | Background Groundwater Trace Element Analysis |
| Table 8-4 | Field Parameters from Background Locations |
| Table 8-5 | Hydrogeologic Summary for Locations MW-1 through MW-20 |
| Table 9-1 | Scenario 1: DRASTIC Index |
| Table 9-2 | Scenario 2: DRASTIC Index |

LIST OF ATTACHMENTS

| | |
|------------|---------------------------------------------------------------|
| Appendix A | Total Metals, TCLP, and SPLP Results – Bottom Ash and Gypsum |
| Appendix B | Wetlands Delineation and Threatened/Endangered Species Survey |
| Appendix C | Kemron Report |
| Appendix D | Boring Logs/Well Completion Forms |
| Appendix E | Geophysical Logs |
| Appendix F | Rock Chemistry – Total Metals, TCLP, and SPLP Results |
| Appendix G | Slug Test Graphs |
| Appendix H | Field Parameters and Background Water Quality |

EXECUTIVE SUMMARY

William Crawford Gorgas Electric Generating Plant (Plant Gorgas) is located in southeastern Walker County, Alabama, approximately fifteen miles south of Jasper, at 460 Gorgas Road, Parrish, Alabama 35580. Field investigations were conducted to establish baseline geologic, hydrogeologic, and waste characterization data in preparation for groundwater monitoring around proposed gypsum and baghouse byproduct disposal facilities.

In accordance with Alabama Department of Environmental Management (ADEM) Administrative Code r. 335-13-4 (Permit Requirements), site investigations have been performed to determine if the site is acceptable for coal combustion byproduct disposal and to determine a groundwater monitoring strategy for the disposal facilities. This Site Hydrogeological Evaluation Report presents the results of the investigation. The following key points are discussed in the report:

- The proposed disposal facilities are not located within the 100-yr flood zone.
- The proposed disposal facilities are not located within 10,000 feet of an airport runway.
- There are no registered historic sites or adjacent properties of concern.
- A field reconnaissance survey performed by Alabama Power found no wetlands or streams within the footprint of the disposal facilities. Therefore, the construction and operation of the facilities will not adversely impact any streams or wetlands.
- A water well inventory revealed no public drinking water supply sources within 1-mile of the proposed facilities. Three potential private wells were located; however, these wells are located hydraulically upgradient of the site.
- One fault was identified during field investigations; however, there has been no active faulting or dislocation during the Holocene epoch (~ 12,000 years). Another fault was identified on a historic mining map. Neither fault is located within 200-feet of the proposed baghouse or gypsum disposal facilities.
- The proposed disposal facilities are located within an area that was previously strip mined for coal; however, no underground mining or anthropogenic hazards were identified in association with previous mining-related activities at the site.
- The mapped peak ground acceleration for the site is 0.143 g and equates to 0.172 g with a dense soil, soft rock soil type. The proposed disposal facilities will be designed and constructed so as to withstand these peak ground acceleration values.
- Drinking water in the area is derived from a surface intake on the Mulberry Fork of the Warrior River, this intake is located upgradient and not within the 1-mile of the proposed disposal facilities. Groundwater use in Walker County accounts for less than 1% of the total water usage and is largely budgeted for irrigation purposes.
- The first zone of saturation for groundwater monitoring was determined to generally be the interval corresponding to the base of mine overburden – top of rock interface.
- Groundwater flow in the first saturated zone averages 3.62 ft/d and flows south-southeast across the site.
- Groundwater pollution potential was determined using the DRASTIC Index as well as a Pathway Analysis (horizontal travel time). The DRASTIC Index produced scores

between 66 and 128 for the site, indicating low to moderate vulnerability for groundwater pollution. The pathway analysis calculated from the edge of the disposal facilities to the Black Warrior River indicates travel times of 1.77 years from the gypsum facility and 3.70 years from the baghouse byproduct storage facility. Travel times do not factor in the low permeability liners used within the proposed gypsum and baghouse facilities.

- Rocks of the Pottsville Formation were found to have significant amounts of trace metals. These metals are likely associated with pyrite and other sulfide minerals. The presence of arsenic and thallium in background water samples is likely attributed to these sources.
- A groundwater monitoring network will be designed to provide early detection in the unlikely event that regulated constituents might reach groundwater and surface water.
- With permission from ADEM, these wells will be installed within the mine overburden – top of rock interface and downgradient wells will be located within 492 feet (150 meters) of the compliance boundary.
- A groundwater monitoring plan will be submitted in addition to this report. This plan will include sampling, transporting, and analysis procedures consistent with EPA and Division 13 regulations. Groundwater samples will be analyzed for trace metals identified during the leachate characterization phase and those specified by ADEM regulations.

1 INTRODUCTION

The purpose of this study is to investigate the suitability of site-specific geology and hydrogeology for solid waste disposal facilities at William Crawford Gorgas Electric Generating Plant (Plant Gorgas) pertaining to Alabama Department of Environmental Management (ADEM) siting standards and guidance (Administrative Code r. 335-13-4-.01, -.11, -.13, and -.14). Plant Gorgas is proposing two new solid waste disposal facilities under pre-existing industrial landfill permit number 64-10: (1) a 20.6-acre gypsum disposal facility and (2) a baghouse byproduct storage facility divided into two cells, with 12.7-acres and 17.5-acres of storage respectively. These facilities will be constructed with liner systems comprised of: one foot thick 5 to 10 centimeters per second (cm/sec) clay, a geocomposite clay layer, and a 60-milliter (mil) high-density polyethylene (HDPE) liner system. In addition, there will be a geocomposite leachate collection system overlying the HDPE liner.

In accordance with modified regulations, a site acceptability study was conducted to establish baseline hydrogeologic and waste characterization data in preparation for a groundwater monitoring plan. Southern Company Services (SCS) conducted field investigations at Plant Gorgas from August 2011 to November 2014. The primary objectives of these investigations were to: (1) characterize site-specific geology; (2) determine hydrogeologic conditions around the proposed facilities; (3) define leachate characteristics of all wastes; and (4) identify potentially sensitive receptors within a 1-mile radius of the waste facilities.

2 CHARACTERIZATION OF WASTES

Coal is comprised largely of carbon and hydrogen, but contains small percentages of mineral matter such as quartz, illite, calcite, and feldspars. Minor constituents such as magnesium, potassium, sodium, titanium, and sulfur average about 8% of the mineral content and trace metals such as arsenic, cadmium, lead, mercury, and selenium generally make up less than 1% of the total composition (EPRI, 2009). The solid byproducts of coal combustion have traditionally been categorized as coal ash solids or flue gas desulfurization (FGD) solids. New pollution controls installed to capture mercury and particulates have created a new class of solids referred to as baghouse byproducts. The chemical composition and leachability of coal combustion byproducts are determined by the coal composition, temperature based reactions, chemical speciation of constituents, solution pH, and availability of the constituent for leaching. Total metals concentrations for Plant Gorgas gypsum and leachability results are provided in Tables 2-1 and 2-2. A copy of these results are included in Appendix A.

Plant Gorgas is installing baghouses for purposes of complying with new Environmental Protection Agency (EPA) standards limiting mercury emissions. The baghouses will be installed downstream of the electrostatic precipitators and upstream of the FGD scrubber. Plant Gorgas proposes to use activated carbon injection (ACI) with addition of hydrated lime for sulfuric acid mist control (SAMC) to capture mercury prior to collection in the baghouse. The cleaned flue gas passing through the baghouse will be sent to the FGD scrubber for sulfur dioxide (SO₂) removal and gypsum production. A proposed mass balance for the baghouse byproducts is provided for reference in Table 2-3, and studies are ongoing to assess the nature of the baghouse byproduct handling and leachate characteristics. More information will be provided to ADEM as it is available.

FGD technologies are designed to capture SO₂ from flue gas emissions. The process involves aerating a mixture of flue gas, water, and hydrated lime. Calcium from the lime reacts with sulfur from the flue gas to form a gypsum (CaSO₄•2H₂O) saturated slurry.

The principal components of the gypsum slurry will be calcium, sulfate and water. This fact permits crystallization of the separated solid material into marketable gypsum (CaSO₄•2H₂O). Additional chemical components added to the gypsum by make-up water, limestone impurities or flue gas are considered to be minor in comparison to calcium and sulfate.

The baghouse is utilized to remove particulates and mercury out of the flue gas. The end products consisting of gypsum, calcium chloride, unreacted lime, powder activated carbon (PAC), and calcium fluoride along with fly ash are collected in the baghouse.

Table 2-1. Plant Gorgas Total Metals Data

| Element | Results (mg/kg) | Detection Limit (mg/kg) | Method |
|----------|-----------------|-------------------------|--------------|
| Gypsum | | | |
| Arsenic | 10.4 | 0.5 | EPA3051/6010 |
| Barium | 86.0 | 0.2 | EPA3051/6010 |
| Cadmium | 0.685 | 0.2 | EPA3051/6010 |
| Chromium | 1.0 | 0.1 | EPA3051/6010 |
| Lead | <0.4 | 0.4 | EPA3051/6010 |
| Mercury | 1.18 | 0.05 | EPA3051/7470 |
| Selenium | 11.4 | 0.5 | EPA3051/6010 |
| Silver | <0.6 | 0.6 | EPA3051/6010 |

Notes:

1. mg/kg indicates milligrams per kilogram.
2. < indicates the analyte was detected between the laboratory method detection limit (MDL) and the practical quantitation limit (PQL).

Table 2-2. Gypsum TCLP and SPLP Results

| Element | TCLP (mg/kg) | Detection Limit (mg/kg) | SPLP (mg/kg) | Detection Limit (mg/kg) | Method |
|----------|--------------|-------------------------|--------------|-------------------------|---------|
| Arsenic | 0.067 | 0.009 | 0.385 | 0.006 | EPA6010 |
| Barium | 0.085 | 0.003 | 0.177 | 0.006 | EPA6010 |
| Cadmium | 0.001 | 0.001 | 0.067 | 0.006 | EPA6010 |
| Chromium | <0.01 | 0.01 | 1.02 | 0.006 | EPA6010 |
| Lead | <0.01 | 0.01 | <0.006 | 0.006 | EPA6010 |
| Mercury | <0.0002 | 0.0002 | <0.006 | 0.006 | EPA7470 |
| Selenium | 0.14 | 0.02 | 0.051 | 0.006 | EPA6010 |
| Silver | <0.006 | 0.006 | <0.006 | 0.006 | EPA6010 |

Notes:

1. TCLP indicates toxicity characteristic leaching procedure.
2. SPLP indicates synthetic precipitation leaching procedure.
3. < indicates the analyte was detected between the laboratory MDL and the PQL.

Table 2-3. Mass Balance Calculations for Baghouse Facility

| Constituent | Solids Discharge, per Unit in pound per hour | % of Total |
|---------------------------------------------------------|----------------------------------------------|------------|
| Fly ash | 1,243 | 10 |
| Powerdered Activated Carbon | 1,337 | 11 |
| CaSO ₄ •2H ₂ O | 1,383 | 11 |
| Calcium fluoride (CaF ₂) | 202 | 2 |
| Calcium chloride (CaCl ₂ •2H ₂ O) | 6,104 | 49 |
| Unreacted Lime (Ca(OH) ₂) | 2,170 | 17 |
| Total | 12,439 | 100 |

3 GENERAL SITE AREA

3.1 Plant Location and Description

Plant Gorgas, the oldest operating fossil plant in Alabama, came on-line in 1917 when the first of ten generating units had been completed; five of these generating units are still active. Plant Gorgas has a total nameplate generating capacity of 1,221,250 kilowatts, and is located in southeastern Walker County, Alabama, approximately fifteen miles south of Jasper, at 460 Gorgas Road, Parrish, Alabama 35580.

New coal combustion byproduct storage cells are planned as an expansion (modification) to pre-existing ADEM industrial landfill permit number 64-10. The Plant plans to develop approximately 98.8-acres during the construction of the baghouse and gypsum disposal facilities. The locations of these disposal facilities are east and northeast of the plant, and they are bordered to the north by Highway 269 and to the south by the Mulberry Fork of the Black Warrior River. The location of Plant Gorgas is shown on Figure 3-1. A depiction of the proposed and existing solid waste disposal facilities is included as Figure 3-2.

3.2 Proximity to Flood Plains

Based on the Flood Insurance Rate Map (F.I.R.M.) flood maps of Walker County, Alabama (Panel Nos. 490 and 495, Map No. 01127C0490D) no portion of the proposed facility is located in the 100-year floodplain (Figure 3-3).

3.3 Proximity to Streams and Wetlands

Alabama Power conducted a field reconnaissance trip for wetland and stream delineation purposes, but found that no wetlands or streams exist in the footprint of the existing and proposed facilities. A summary of findings is presented in Appendix B.

3.4 Proximity to Roads, Airports and Railroads

Plant Gorgas is located off of Highway 269 in Walker County. No railways are connected to the plant as coal is received via barge. The two nearest airport runways are located at Walker County Beville Field near Jasper, Alabama at a distance of 15.7 miles and Birmingham-Shuttlesworth International Airport at a distance of approximately 24 miles. The site is not located within 10,000 feet of an airport runway or within 10 miles of an airport.

3.5 Climate

The nearest weather station to Plant Gorgas listed in the Southeast Regional Climate Center (SERCC) online database with complete temperature and precipitation data records is Cordova 2 ENE, located approximately 10 miles north of the site. Mean annual precipitation recorded from February 18, 1901 to July 31, 1991 here is 54.15 inches (in.). Mean monthly precipitation data from March and July showed the highest rainfall totals of 6.12 in. and 5.34 in., respectively. For the same interval, the lowest mean minimum monthly temperature was 34.0 degrees Fahrenheit (° F) for December, and the highest mean maximum temperature was 92.1° F for July (SERCC, 2010).

3.6 Land Use

Plant Gorgas is located in a rural section of southeastern Walker County with significant coal mining activity. The area consists of strip mines, undeveloped parcels, and sparse residential areas. The nearest residential area is located on Good Springs Road approximately 0.4 miles from the site. Based on a visual inspection of aerial photographs, it appears that there are approximately five residential dwellings in this area.

3.7 Historic Sites and Adjacent Properties of Concern

A search of the National Register of Historic Places on-line database available at: <http://www.nps.gov/nr/> was conducted on November 18, 2010. No historic places were identified. The nearest registered historic place identified is the Gilchrist House, in Cordova, Alabama, approximately nine miles west of Plant Gorgas.

A search of the United States EPA Envirofacts website conducted on November 16, 2010 available at: <http://epa.gov/enviro/> identified no EPA regulated facilities within one mile of Plant Gorgas. The Envirofacts database was last updated on September 3, 2010 (EPA, 2010).

3.8 Mining Activity

Plant Gorgas is located in the Warrior Coal Field. Two groups of coal beds belonging to the Pottsville Formation occur at Plant Gorgas; the Mary Lee Group and the Pratt Group. The Mary Lee Group has a stratigraphic thickness of approximately 220 feet in southeastern Walker County. The Pratt Group has a stratigraphic thickness of approximately 110 to 200 feet across Walker County. Numerous strip mines and underground coal mines are located within one mile

of Plant Gorgas (Ward II et al., 1989). In addition to coal resources, sandstone, shale, and refractory clays have been mined at or near Plant Gorgas (Dean, 1995).

Mining at Plant Gorgas was conducted via an open pit strip mining method. No deep underground mining was conducted beneath the proposed landfill sites. Open pit mining at the site targeted the major coal zones of the Pratt Coal Group (Upper Pottsville Formation) and was aimed at three key economical coal seams which are from top to bottom: (1) the Pratt Seam; (2) the Nickel Plate Seam; and (3) the American Seam. The surficial geology of the landfill site is dominated by rocks belonging to the Pratt Group.

Regionally, the Pratt and American seams are separated by 50 to 150 feet; beneath Plant Gorgas these seams are only separated by 40 to 75 feet. The Nickel Plate seam resides 20 to 35 feet below the Pratt and 30 to 40 feet above the American seam. Thicknesses of the Pratt and American Seams ranged from 2 feet to almost 4.5 feet across the site, whereas the Nickel Plate Seam ranged from 1 to 2.5 feet in thickness. Mining was conducted to a base elevation between 390 and 410 feet along the northern portion of the site and to a base of 290 to 310 feet along the southern boundary. The mining process stripped between 60 and 130 feet of natural overlying and interburden rocks to access the basal American Seam. Beneath the landfill sites, the Mary Lee Group was found to be too thin to be economical.

4 WATER WELL SURVEY

Southern Company Services contracted Kemron Environmental to conduct a public and private water well survey with a search radius of 1.5 miles from the center of the proposed disposal facilities (-87.189051 W; 33.653172 N) as well as surface water intake locations. The complete survey conducted by Kemron is provided as Appendix C.

The survey included the following:

- United States Geological Survey (USGS) Water Resources Division database search with a radius of 4 miles and ADEM records search.
- Obtaining tax maps of the adjacent properties from the Walker and Jefferson County Tax Assessor's Office to identify property owners.
- Contacting the City of West Jefferson Water Works, City of Birmingham Water Works, City of Jasper Water Board, City of Parrish Water Works, City of Cordova Water and Gas Board, and the Environmental Health Departments of Walker and Jefferson County.
- Field reconnaissance of a 1.5-mile radius for public water supply wells, surface water intakes, and private water supply wells.

The search provided the following information:

- No public supply wells were identified within the applicable 1.5-mile radius.
- No private supply wells were readily observed within the 1.5-mile radius of the Plant Gorgas coordinates with the exception of three (3) potential well houses, which were observed at 776 and 1110 Copeland Ferry Road and 506 Gross Camp Road. These properties are located approximately one mile from the subject site, are located in areas

that appear to be supplied with drinking water based on fire hydrants and water meters, and are further than 0.5 miles from the disposal facilities.

- The Alabama Power-Plant Gorgas facility surface water intake was the only surface water intake found within the 1.5-mile search radius.
- Figure 4-1 summarizes the findings of these surveys.

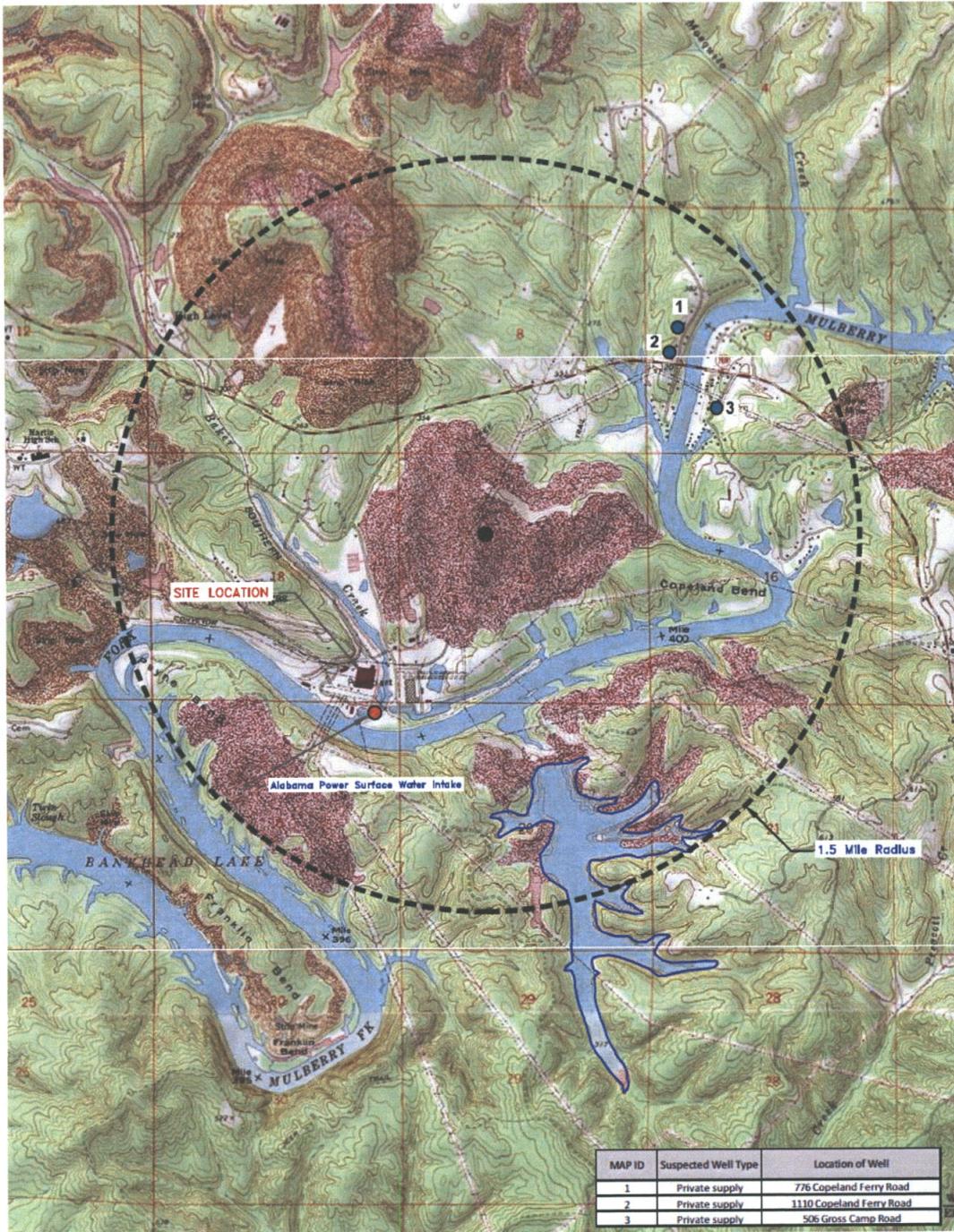


Figure 4-1. Water Well Survey Results

5 GEOLOGIC SETTING

5.1 Physiography and Topography

Plant Gorgas is located in the Warrior Basin physiographic region of the Cumberland Plateau and is a subsection of the Appalachian Plateaus physiographic province (Sapp and Emplaincourt, 1975). The Warrior Basin consists of a broad upland with moderate relief, and is formed on gently dipping strata of the Pottsville Formation.

Plant Gorgas topography is characterized by moderate topographic relief. Elevations range from approximately 260 feet above mean sea level (msl) in portions of the site near Mulberry Fork and Baker Creek to over 500 feet msl along a northwest-trending dissected ridge located approximately 1,000 feet northwest of the plant and in upland areas in the western part of the property.

5.2 Soil Descriptions

The proposed solid waste disposal facilities at Plant Gorgas are located within backfilled mine overburden materials. The only native soils on site are located along the extreme western and southwestern boundaries of the current bottom ash area. A soil inventory for Plant Gorgas and vicinity was conducted using the United States Department of Agriculture (USDA) Web Soil Survey on-line soil database and map interface (USDA, 2010). The major soil types present include Brilliant and Palmerdale extremely channery loams, Navoo-Townley complex, and Sunlight-Sipsey complex. Summarized below is a description of these three soil types and their map symbols. The soil delineation map is presented as Figure 5-1.

(BPE) Brilliant and Palmerdale Extremely Channery Loams

Brilliant and Palmerdale extremely channery loams consist of thin to moderately thick, well drained, and permeable anthropogenic soils formed from backfilled mine-spoil. The soils consist of alkaline coal extraction materials, gravelly mine-spoil, and earthy fill derived from shale and sandstone boulders. Slopes range from 6 to 60 percent.

(NaE) Navoo-Townley Complex

The Navoo-Townley complex consists of deep, well drained, moderately permeable soils that formed in loamy residuum weathered from sandstone or interbedded sandstone and shale. These soils are on broad plateaus, mountainsides, hilltops, and benches. Water runs off the surface slowly to rapidly, depending upon slope and vegetative cover. Slope is dominantly 2 to 10 percent, but can range up to 20%.

(SsE) Sunlight-Sipsey Complex

The Sunlight-Sipsey complex consists of deep, well drained, very low to moderately permeable soils that are comprised of loamy residuum derived from the weathering of sandstone. These soils are generally present on hill slopes and slope typically ranges from 15 to 40 percent.

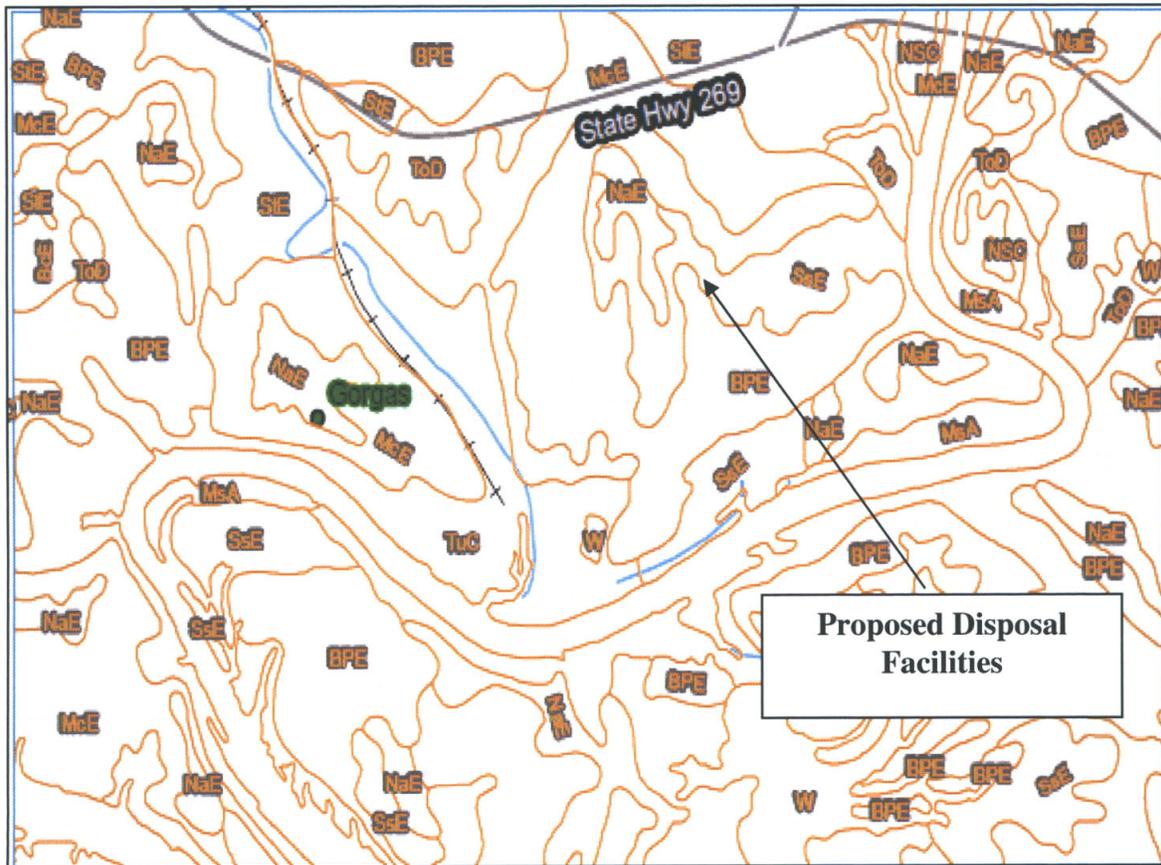


Figure 5-1. Soil Map

5.3 Regional Stratigraphy

The Warrior Basin physiographic region is a late Paleozoic foreland basin adjacent to the juncture of the Appalachian and Ouachita orogenic belts. The basin formed in response to structural flexure generated by collisional tectonics during early stages of Pangaeon supercontinent assembly. The basin served as a regional depocenter that was largely filled with deep water clastics during initial to mid-stages of basin evolution (Cambrian-Mississippian). During the Pennsylvanian Period, deposition switched from deep water clastics to marginal marine and terrestrial dominated depositional processes (Boland and Minihan, 1971).

The deep stratigraphy beneath Plant Gorgas is well constrained by neighboring coalbed methane wells and a deep onsite test well. The regional stratigraphy is outlined below and is presented in reverse chronological order (Figure 5-2).

Pennsylvanian Period

The lower Pottsville formation directly underlies Plant Gorgas and extends down to a depth of 2,100 feet below ground surface (bgs). This formation is characterized by cyclic sequences (cyclothems) of marginal marine shale/claystone, siltstone, sandstone, conglomerates, and individual coal beds. These depositional cyclothems reflect the sediment balance controlled by fourth or fifth order glacial eustasy, continued basin evolution, and variations in sedimentation rates.

Beneath the landfill disposal facility and down to a depth of 1,000 feet, the Pottsville is dominated by shale and claystone units which coarsen upwards into thin, fine-grained sandstone and cyclic coal beds. In contrast, from 1,000 feet to 2,100 feet beneath the site, the Pottsville is characterized by more sandstone dominated facies.

Mississippian Period

Beneath the site, the Mississippian Period is represented by the Parkwood Formation (2,100 feet), the Bangor Limestone (2,366 feet), the Hartselle Sandstone (2,622 feet), the Pride Mountain Formation (2,716 feet), the Lewis Limestone (2,888 feet), the Tusculumbia Limestone (2,914 feet), and the Feet Payne Chert (3,021 feet). Together, the total thickness of Mississippian-aged units spans roughly 1,100 feet beneath the site.

The Parkwood Formation is approximately 270 feet thick beneath the landfill and is composed primarily of interbedded sandstone and shale. The Parkwood was deposited in a marginal marine depositional setting and contains the Carter sandstone, the most prolific oil reservoir of the Black Warrior Basin. The Bangor Limestone is roughly 256 feet thick and is predominantly a bioclastic and oolitic-rich limestone unit deposited on a shoal-rimmed carbonate ramp. The upper portion of the Bangor Limestone contains alternating sections of green to red mudstone and siltstone. The Hartselle Sandstone Formation is approximately 94 feet thick and is made up of friable, thick- to massive-bedded quartzarenite sandstone and minor shale and siltstone. This unit was deposited largely as a beach and shoreface deposit, and furthermore, comprises another important reservoir within some parts of the state.

The Pride Mountain Formation and Lewis Limestone are often considered part of the same formation (Stapor and Cleaves, 1992) and are 198 feet thick beneath the plant. The Pride

Mountain formation is comprised of mixed sandstone, shale, and minor siltstone beds deposited in a lowstand clastic wedge. The Lewis Limestone member is comprised mostly of limestone and shale beneath the plant.

The Tuscumbia Limestone and Fort Payne Chert are comprised of light gray to olive gray, chert-rich, bioclastic limestone and vuggy siltstones. The Fort Payne chert is considered a lower carbonate ramp deposit, whereas the Tuscumbia Limestone was deposited in a mid- to upper-ramp setting. Upwelling along the Ouachita margin was considered to be the primary source of silica and nutrients for biogenic processes (Gutschick and Sandberg, 1983).

Devonian Period

The Devonian Period is comprised wholly of the Chattanooga Shale (3,109 feet to 3,190 feet), which disconformably overlies the Silurian-aged Red Mountain Formation. The Chattanooga shale is characterized as a dark gray to black, organic-rich, pyritiferous, marine shale with minor sandstone and siltstone beds. Beneath Plant Gorgas, the Chattanooga shale contains some limestone and micritic cement.

Silurian Period

The Silurian Period was marked with the deposition of the Red Mountain Formation, which is approximately 410 feet thick beneath the site (3,190 feet to 3,600 feet). The Red Mountain Formation is dominated by oolitic and bioclastic limestone in the upper 100 feet of the formation, but is largely comprised of yellow to red, silty, sandstone and minor shale throughout the rest of the formation. The Red Mountain Formation was deposited in a subtidal marine setting. The iron observed in the formation was the product of groundwater-rock interactions and the corresponding diagenetic formation of hematite.

Ordovician and Cambrian Periods

The Ordovician Period is dominated by the Stones River Group (3,600 feet) and the upper part of the Chepultepec Dolomite (4,026 feet). The Stones River Group is made up of yellow, brown, fine-grained, limestone and minor shale. The Chepultepec Dolomite (Knox Group) spans the early Ordovician to upper-Cambrian beneath the plant and is predominantly a dolomite formation with lesser amounts of preserved limestone. Transitioning to the mid-Cambrian, the Copper Ridge Dolomite (Knox) was the last observed formation. The Copper Ridge dolomite is a light gray, finely to coarsely crystalline, siliceous dolomite. Geologic logs show that the Copper Ridge also has significant lenses of sandy and shaly limestone beneath the plant.

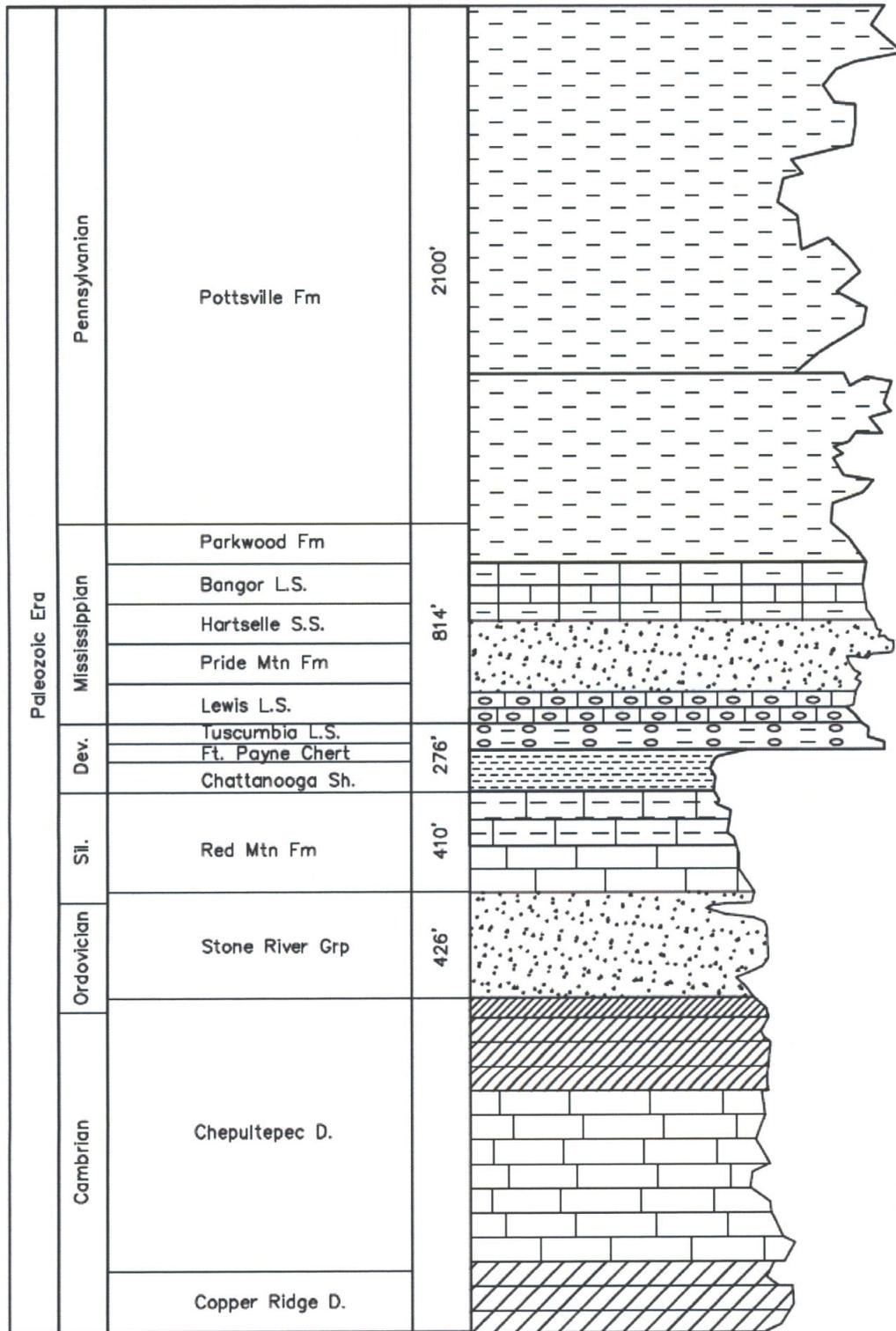


Figure 5-2. Regional Stratigraphy

5.4 Site Stratigraphy

5.4.1 Overburden Stratigraphy

Mining at Plant Gorgas was conducted via an open pit strip mining method. No deep underground mining was conducted beneath the proposed landfill sites. Open pit mining at the site targeted the major coal zones of the Pratt Coal Group (Upper Pottsville Formation) and was aimed at three key economical coal seams which are from top to bottom: (1) the Pratt seam; (2) the Nickel Plate seam; and (3) the American seam. Prior to mining, the surficial geology of the landfill site was dominated by rocks belonging to the Pratt Group. At elevations greater than 480 feet, basal portions of the Cobb Group may have also been present.

Regionally, the Pratt and American seams are separated by 50 to 150 feet of interburden; beneath Plant Gorgas these seams are only separated by 40 to 75 feet of interburden. The Nickel Plate seam resides 20 to 35 feet below the Pratt and 30 to 40 feet above the American seam. Thicknesses of the Pratt and American seams ranged from 2 feet to almost 4.5 feet across the site, whereas the Nickel Plate seam ranged from 1 to 2.5 feet in thickness. Mining was conducted to a base elevation between 390 and 410 feet along the northern portion of the site and to a base of 290 to 310 feet along the southern boundary. The mining process stripped between 60 and 130 feet of natural overlying and interburden rocks to access the basal American seam.

After mining, the area was reclaimed with backfilled mine-spoil material. The remnants of these mining-related activities have left a highly disturbed site with little to no natural overburden. This mine overburden is predominately characterized by poorly compacted shale and sandstone boulders with discontinuous lenses of silt, very fine-grained sand, and clay. Remnant coal fragments and dust are sometimes encountered within the spoil and more commonly towards the base of the spoil. Lenses of fine-grained sediment are less prevalent across the site and are a result of the physical and decompositional weathering of boulder zones. Table 5-1 shows a grain size analysis from a 2005 study in which three samples of mine overburden were collected. It is important to note that the mine overburden contains a significant percentage of boulders and thus, these grain sizes are reflective of only the soil portion of overburden materials. Individual shale and sandstone boulders range in thickness from less than 1 foot to almost 6 feet and are observed to be slightly- to -highly weathered. Select geophysical and geologic logs indicate that the mine overburden has a high degree of vertical and horizontal heterogeneity. No correlative stratigraphy can be deduced from the overburden as in a natural setting.

Mine overburden thickness averaged approximately 102 feet in borings, with a lowest observed thickness of 40 feet (CCB-3) and a highest observed thickness of 159 feet (MW-12) (See boring logs, Appendix D). Overburden thickness in mined areas appears to be a reflection of total elevation, meaning that with higher elevations come thicker surficial mine overburden zones (Figure 5-3).

Modeled depth to top of natural rock indicates that this interface tends to dip towards the south-southeast beneath the site (Figure 5-4) and is likely reflective of natural dip of the local Pottsville formation and coal seams targeted during mining operations.

Table 5-1. Historical Grain Size Analysis of Mine Overburden Materials

| <i>Sample</i> | <i>Grain Size</i> | | |
|--------------------|-------------------|---------------|----------------|
| | <i>% Gravel</i> | <i>% Sand</i> | <i>% Fines</i> |
| Mine Overburden #1 | 45.3 | 31.8 | 22.9 |
| Mine Overburden #2 | 37.5 | 31.7 | 30.8 |
| Mine Overburden #3 | 39.0 | 34.2 | 26.8 |
| #3 Recompacted | 21.0 | 40.6 | 38.4 |

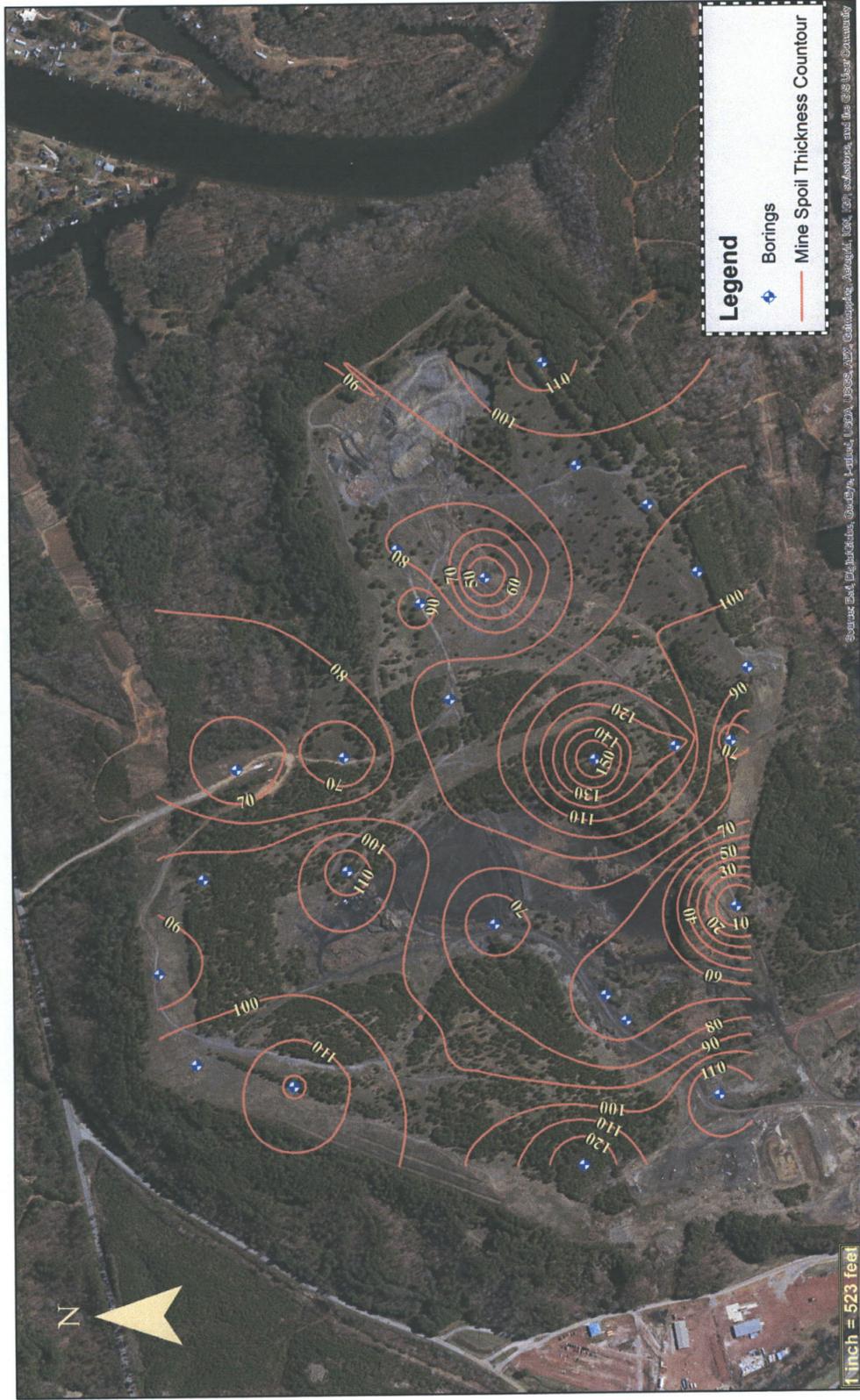


Figure 5-3. Mine Overburden Isopach Map



Figure 5-4. Top of Rock Structural Contours

5.4.2 Pottsville Stratigraphy

Plant Gorgas is located within the Pennsylvanian-Aged Upper Pottsville Formation. The underlying bedrock down to a depth of 300 feet bgs is dominated by the un-mined remains of the Pratt Coal Group and the Pratt-Mary Lee Coal Group interburden. Boring and geophysical logs provide lithologic constraints to an elevation of -13 feet relative to msl and road side outcrops provide some limited surface data within un-mined portions of the site. Boring logs are included in Appendix D. Geophysical logs are presented in Appendix E. For this project the near surface Pottsville Formation is divided into four distinct lithologic units and are described below (Table 5-2).

Unit 1

The basal unit penetrated by well borings was a 125 to 150 feet thick silty, shale unit. Limited data shows that this shale unit unconformably overlies a 2 feet to 10 feet thick ravinement surface marking the transition from the Mary Lee coal cyclothem to the Pratt Group cyclothem. This mudstone unit reflects a 4th or 5th order glacio-eustatic transgressive flooding surface and exemplifies a blocky yet moderately serrate gamma log pattern. This indicates the presence of many discrete depositional events during which clay minerals were deposited in periods of quiescence and larger-grained silts and sands were deposited in slightly higher energy environments. Core samples from Unit 1 display laminated shales with prevalent, wavy and discontinuous lenses of silty sandstone. The core also reveals isolated zones of pyritiferous shale, siderite nodules, and brachiopod faunas. This composite data favors a marginal marine to interdistributary bay depositional environment.

Unit 2

Gamma ray logs shows that the upper 10 to 20 feet of the basal mudstone grades vertically into a very fine- to fine-grained, ripple cross-bedded to massive-bedded, quartz arenite sandstone with very poor intergranular porosity. Contact amongst the basal shale and sandstone can be gradational or sharp across the site indicating slightly different depositional processes and settings. This sandstone unit varies from 10 to 35 feet in thickness across the site and contains trace lithic fragments and bimodal organic-rich mud-drapes near the top and base of the unit. Isolated sections near the base of the sandstone commonly contain convolute bedding and reworked fossils indicating the presence of storm events and minor soft rock deformation. Lycopoid remains and coal spars were commonly found in the upper 5 feet of the sandstone indicating a transition to a more lagoonal to paludal environment. Ripple marks, laminae, and small-scale trough cross-beds were also observed but did not appear to be very well preserved in the individual samples. Minor amounts of iron-staining were commonly observed throughout this unit. This sandstone was likely deposited within a distributary channel (stacked channel deposit) or represents an abandoned channel fill deposit. This sandstone terminates with a relatively sharp truncation in each of the electric logs and is overlain by a 25 to 40 feet thick series of alternating claystone and sandstone. This stacked mudstone and sandstone unit is capped by a thin (.5 to .75 feet) coal seam.

Unit 3

Overlying unit 2 is a 60 to 90 feet thick medium to dark gray, claystone unit that contains localized fine-grained sandstone beds. Flaser and convolute bedding structures are observed throughout the section as well as convolute bedding, flame structures, and mud drapes within more sandy zones. The upper 40 feet of this sequence contains one or two minor coal seams that average roughly 4 inches in thickness (Curry and Gillespy Coal Seams). These coal seams are not laterally persistent throughout the site and do not produce groundwater in usable quantities. When these coal seams are present there tends to be a 5 to 10 feet thick underlying succession of underclay and black organic-rich iron claystone. These claystone units contain rhythmical banded siderite and few siderite nodules. The composition and banding of the siderite within the claystone enhances the fissile nature and promotes bedding plane parallel weaknesses.

Electric and nuclear logs (Figure 5-5) indicate these zones to be predominantly claystone, but containing several small scale coarsening-upward trends. Normal resistivity, single point resistivity (SPR), and spontaneous potential (SP) logs illustrate that permeability is largely controlled by bedding planes, individual sandstone bodies, and coal seam fractures.

Unit 4

Directly overlaying this mudstone unit is a 2 to 3 feet thick claystone followed by the American Coal Seam. Together these mark a transition to a paludal, backswamp depositional environment. Prevalent lycopsid fossils, carbon imprints, and bioturbation are imprinted in the claystone unit. Thin to thick zones of pyrite occupy discrete fractures and cell walls within the coal (where un-mined). The American Coal Seam where present in sufficient thickness and in un-mined areas is approximately 3.5 to 4.5 feet in thickness and is of bituminous grade.

Overlying the American Coal Seam is an interbedded sequence of siltstone, mudstone, and fine-grained sandstone that make up the Pratt group strata. Gamma logs show that sandstone units predominate near the top of this sequence and geologic cores indicate a possible flood plain type depositional environment. Resistivity and SP logs were not run through this sequence due to a lack of groundwater in the borehole. Thus, it is a reasonable assumption to state that these zones will not produce groundwater.

Table 5-2. Near Surface Site Stratigraphy (Chronological)

| Unit | Dominant Rock Type | Thickness (feet) | Correlation |
|-------------|---------------------------|-------------------------|-----------------------------------------------|
| 4 | Claystone/Sandstone/Coal | 65-80 | Pratt Coal Group |
| 3 | Claystone/Siltstone/Coal | 50-75 | Base of Pratt Group Gillespy-Curry Zone |
| 2 | Fine-grained Sandstone | 10-35 | Forced Regression/Erosional Surface |
| 1 | Shale | 125-150 | Major Flooding Surface- Pratt Cyclothem |

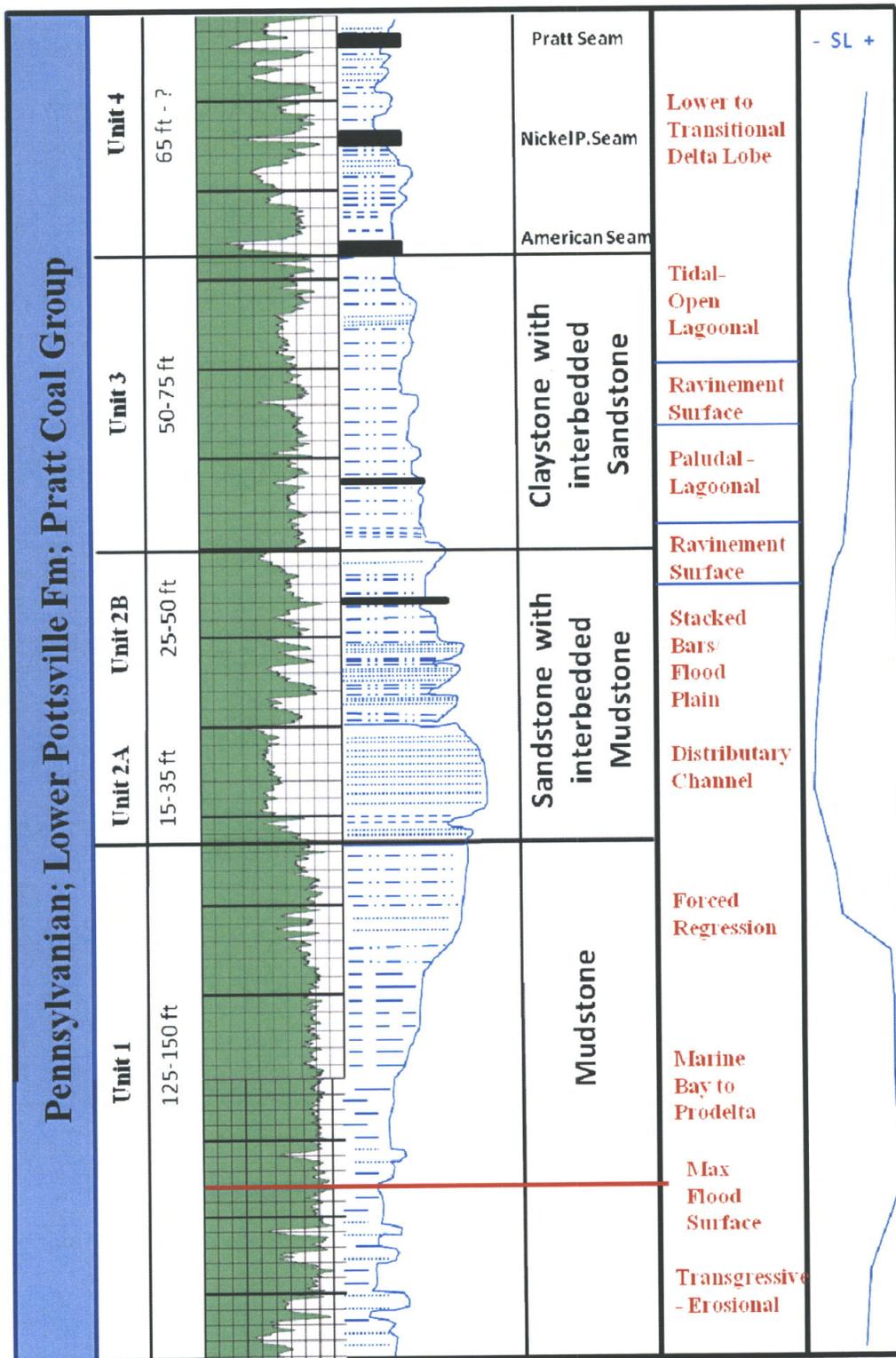


Figure 5-5. Near Surface Pottsville Stratigraphy

5.5 Geologic Structure

The Black Warrior Basin is a Paleozoic-aged, triangular shaped foreland basin that extends from northwest Alabama into eastern Mississippi. The basin can be described as a southwest dipping homoclinal structure with imprinted folds and faults related to Appalachian and Ouachita deformation. Geologic formations contained within the Black Warrior Basin generally dip to the southwest at approximately 3 degrees. Beneath Plant Gorgas individual rock units tend to dip very gently ($\sim 1^\circ$ to 2.5°) to the south-southeast or southeast into the Arkadelphia syncline (Figures 5-6). Small scale dip reversals are common within the Pottsville and were encountered during field investigations. Typically, dip reversals can be related to changes in depositional setting and or strata rolling over into post-depositional faults or larger structural features.

An east-northeast trending normal fault parallels the southeastern border of the landfill area, causing a localized dip reversal to the west-southwest. This fault was previously mapped to have a displacement of approximately 50 feet. A second, north-northwest to south-southeast trending fault was identified during historic coal mining operations. This fault resides to the west of the dry gypsum area and south of the bottom ash storage area. The fault locations as mapped during mining are not within 200 feet of the dry gypsum facility. These faults range from 510 to roughly 620 feet in horizontal distance from the dry gypsum area (Figure 5-7, located in Figures tab behind text).

5.6 Seismic Zones and Seismicity

Plant Gorgas is located in a relatively quiet seismic region approximately 225 miles southeast of the New Madrid Seismic Zone, approximately 225 miles southwest of the Eastern Tennessee Seismic Zone, and approximately 400 miles west of the South Carolina Seismic Zone. The mapped peak ground acceleration for the site is 0.143 g (force of gravity) and equates to 0.172 g with a dense soil, soft rock soil type. Plant Gorgas is located in an area with a 10% probability of exceeding 4.72 percent g in the next fifty years (USGS, 2010b). The primary seismic zones in the eastern United States and associated seismic probability zones are depicted on Figure 5-8. The proposed disposal facilities will be designed and constructed so as to withstand these peak ground acceleration values.

Seismicity in the state of Alabama has largely been clustered around large-scale basement faults of Precambrian and Mesozoic-age (Triassic Period) near the Southern Appalachian Seismic Zone and Bahamas Fracture Seismic Zone, respectively. A plot of historical seismicity data in the state shows a strong correlation with earthquakes and these basement faults. Additionally, a composite map of earthquake epicenters and basement faults kept by the Geological Survey of Alabama illustrates that the faults identified at Plant Gorgas during field investigations are neither basement faults nor seismically active since records have been kept. In fact, neither fault has been included in GSA maps. In Walker County and other coal mining areas around the state, seismic energy is often correlated to deep mine collapses (See: December 12, 1997, West Jefferson County Earthquake; TimesDaily, 1997). Roof collapses of deep mines often create enough elastic wave energy to register at stations. No deep underground mines are known to directly underlie the project site.

Although 1 fault location was deduced during field efforts and another was mapped during coal mining operations, they are not active faults. The fault locations mapped by Russell Coal, Inc. during 1977 mining activities of the site are presented as Figure 5-7. The fault locations as mapped during mining are not within 200 feet of the dry gypsum facility. These faults range from 510 to roughly 620 feet in horizontal distance from the dry gypsum area.

If a fault is reactivated, then there should be structural evidence in overlying deposits owing to displacement of underlying strata. Pashin (1991) stated that normal faulting in the Black Warrior Basin must have ceased prior to the Late Cretaceous, as there is no evidence of normal faults extending into Upper Cretaceous strata. Therefore, it is reasonable to assume that faults of the same origin, without overlying younger strata, have also not experienced any more recent activity, especially during the Holocene.

As a general response to Holocene Faulting in the area of Plant Gorgas it has been found through numerous seismic sections that these faults do not extend into overlying younger strata. Therefore, it is reasonable to conclude that these faults were only active during various stages of Appalachian-Ouachita flexural extension and have been inactive for the past 270 million years.



Figure 5-6. Major Geologic Structures Map

6 HYDROGEOLOGIC SETTING

The Pottsville aquifer system is the primary aquifer in Walker County. Although on a regional scale there are other aquifer systems in the vicinity of Plant Gorgas, the Pottsville aquifer system recharge area underlie the site (Stricklin, 1989). The nearest exposure of the Valley and Ridge aquifer system occurs in central Jefferson County, approximately 25 miles east of Plant Gorgas. The nearest exposure of the Tuscaloosa aquifer system occurs in northwestern most Walker County, approximately 30 miles northwest of Plant Gorgas. The Tuscaloosa aquifer system is not considered a primary source of groundwater in Walker County (Stricklin, 1989).

The Pottsville aquifer system is comprised primarily of Pennsylvanian-aged sandstones, shales, conglomerates, and coal. Although the Pottsville aquifer system is the primary aquifer in Walker County, groundwater use is relatively limited. According to O’Rear et al., 1972, groundwater use accounted for approximately 15% of total water use in Walker County in 1966. By 2005, groundwater use had declined to less than 1% of total water use in Walker County, or 1.14 million gallons per day (mgd) of groundwater out of a total water use of 969.5 mgd (USGS, 2005).

Groundwater typically occurs in secondary porosity features such as bedding planes and fractures. Major recharge zones to the Pottsville Formation are related to major geologic structures such as large fault zones or along systematic fold axes (Pashin, 2007). The Pottsville Formation is approximately 2,100 feet thick beneath the proposed disposal facilities and is considered a single, unconfined aquifer in which water is transmitted through fractures, bedding plains, and larger structural features. Recharge to the Pottsville Formation in the vicinity of site is largely through infiltration of precipitation and to a lesser extent, downward seepage of river water at hydraulically favored locations. Average rainfall at the site is approximately 54 in. per year; however, due to the less permeable silty, clay-rich mine overburdenoverburden materials, infiltration rates are lower.

The “First Zone of Saturation” beneath the proposed disposal facilities is generally encountered between 100 and 115 feet bgs. Background literature review and geophysical logs indicate that fracture density and permeability decrease significantly below depths of 300 feet within the area. Figure 6-1 shows a conceptual model of the Pottsville recharge system near Plant Gorgas.

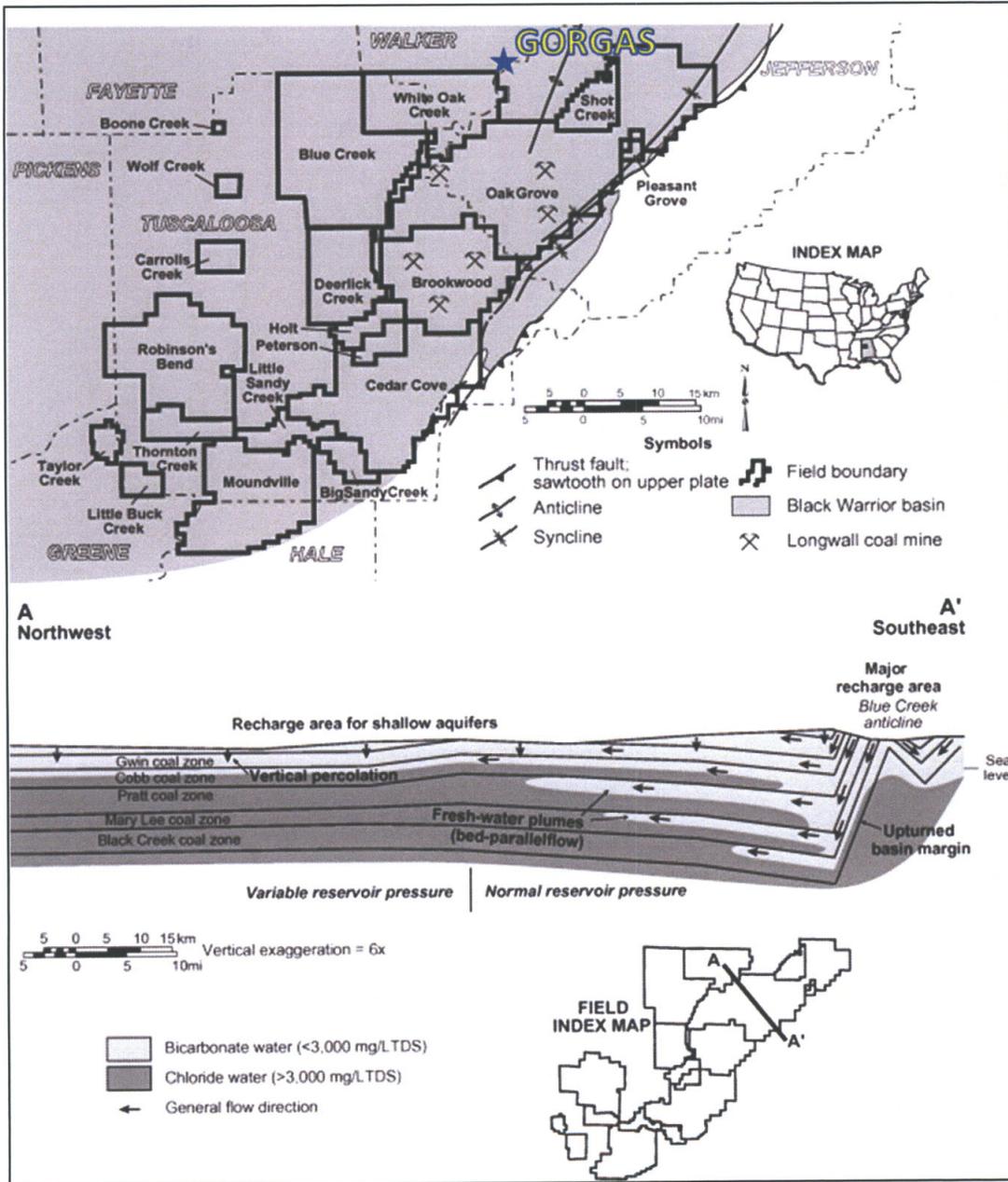


Figure 6-1. Regional Pottsville Recharge Model (modified after Pashin, 2007)

7 FIELD INVESTIGATION

7.1 Geologic Mapping

Geologic mapping was conducted on the only rock outcrop exposed near the proposed disposal facilities. This exercise was conducted to constrain site-specific structural features such as strike and dip direction, jointing, and fracture patterns as well as to augment stratigraphic data obtained from borings.

The outcrop mapped follows the contractor's gate access road and spans approximately 1,500 feet to the south-southeast. The particular rock package associated with this outcrop corresponds to the American Coal Seam and Pratt Group interburden claystone, siltstone, and fine-grained sandstone. The sequence of rocks contain a (1) basal silt-rich, claystone, (2) a bituminous coal seam (3 to 5-in), (3) an organic-rich claystone (3 to 5-feet), (4) the American Coal Seam (3 to 3.5-feet), and (5) a clay-rich siltstone that coarsens upwards into a fine-grained, massive bedded sandstone (10 to 15-feet thick). Stratigraphic dip was roughly parallel to the road in a south-southeast direction and dip varied from around 1.8 to 2.1 degrees.

Joint and fracture patterns were most readily observed within the siltstone/sandstone sequence above the American Coal Seam. These joint/fracture sets are vertical to subvertical and terminate at the top of the American Coal Seam. Joints were observed to be filled with siltstone/sandstone.

7.2 Stratigraphic Borings and Investigative History

Geotechnical and hydrogeological site characterization activities were conducted between 2011 and 2014 to assess suitability of site-specific geology and hydrogeology for solid waste disposal facilities. Locations for soil boring and piezometer installed from 2011 through 2012 are provided on Figure 7-1. Boring locations drilled for the final proposed monitoring well network is provided on Figure 7-2. Data from 52 borings were used to describe mine overburden thickness, subsurface lithology, and the hydrostratigraphy of the site. Boring information from all S-series (2012), D-series (2012), and MW-series (2013-2014) are presented in subsequent sections. Data from three pre-existing microseismic monitoring wells (Huckleberry, Gooseberry, and Blackberry shown on Figure 7-1) were also used to help constrain site geology and geologic cross-sections. All pertinent field documentation, including: boring logs, temporary piezometer construction logs, proposed groundwater monitoring well construction logs, and survey information are provided in Appendix D.

During site characterization activities conducted in 2011, 19 geotechnical borings (CCB-1 through CCB-19) were advanced using a Diedrich D50 drill rig to an approximate depth of 75 feet bgs. Temporary piezometers were installed at seven of the 19 boring locations (CCB-1, CCB-5, CCB-7, CCB-8, CCB-12, CCB-16, and CCB-19) to an approximate depth of 75 feet bgs.

In 2012, five piezometers (S-1 through S-5) were installed in the "First Zone of Saturation" and generally screened across the mine overburden – top of rock interface using a CME drill rig. Nine additional piezometers were installed deeper into rock in the Pottsville formation (D-1 through D-9)

Based on groundwater elevation data collected during 2011 and 2012, monitoring wells (MW-1 through MW-20) were installed to replace S-series temporary piezometers. Temporary piezometers installed in 2011 and 2012 were properly abandoned. The current site groundwater monitoring network for the “First Zone of Saturation” is shown on Figure 7-2. With permission from ADEM, MW-1 through MW-20 will be used as monitoring wells in the groundwater monitoring plan.

7.2.1 Drilling and Sampling Methods

From 2011 to 2014 three different drilling methods were used: a CME coring rig with casing advance mechanism for mine overburden, air hammer and rotary, and Rotosonic. Using the CME coring rig, drilling was performed using a 4-inch diameter casing advance system down to the top of rock. Due to the unstable nature of the mine spoil, casing was continuously advanced until natural rock was encountered, and no samples were acquired from the overburden. HW size surface casing was set into the top of rock. Rock coring was performed using a HQ wire-line coring system. The recovered core was placed in wooden boxes, labeled with the boring number, date, and depth of the run. The borings were advanced with a CME drill rig by Civil Field Services, Engineering and Construction Services, Southern Company Generation (Vincent, Alabama) as well as Tri-State Drilling Company (July-August 2012) of Chattanooga, Tennessee. Well D-4 was drilled by Tri-State Drilling Company using a 6-inch diameter air-hammer rig. All sampling and coring were logged by a registered geologist or a geologist or geotechnical engineer under the direct supervision of a geologist registered in the State of Alabama.

In October and November of 2014, a J-1866 sonic rig operated by Cascade Drilling of Greenville, South Carolina was utilized to install monitoring wells MW-2, MW-3, MW-5, MW-6, MW-7, MW-9, MW-11, MW-12, MW-13, MW-14, MW-16, MW-17, MW-18, and MW-20. The Rotosonic rig utilized continuous coring and telescoping casing to advance through the subsurface. Continuous samples were obtained from these locations.

Locations MW-1, MW-4, MW-8, MW-15 and MW-19 were installed earlier (late 2013-early 2014) with a CME rig equipped with a casing advance system. Location MW-10 corresponds to location D-4 (re-named for final groundwater monitoring strategy).

7.2.2 Depth Criteria

Literature reviews indicated that permeability and fracture-density decrease below depths of 250 to 300 feet within the Pottsville Formation. Therefore, a terminal depth of 300 feet bgs was chosen for water exploration efforts. Mine overburden targeted piezometers targeted the basal 5-feet of spoil and the upper 5-feet of natural rock. In some instances, rock was cored slightly deeper to ensure that this was in fact natural rock and not a mine overburden boulder.

7.2.3 Geophysical Methods

In order to assist geologic and hydrogeologic characterization efforts of Pottsville rock, downhole geophysical methods were used on select holes. Caliper, natural gamma, normal

resistivity, single point resistance, spontaneous potential, fluid resistivity, fluid temperature, and heat-pulse flowmeter logs were utilized in part to determine borehole integrity, fracture density, lithology, and to identify transmissive zones. Results of downhole geophysical logging are provided in Appendix F.

7.2.4 Mine-Spoil Overburden Targeted Borings

Thirty-two (32) piezometers and an additional 12 geotechnical borings were completed within the mine-spoil overburden.

7.2.5 Temporary Piezometers

Twelve temporary piezometers were installed for geotechnical and hydrogeological evaluations of the site. Boring and piezometer locations for historic investigations are presented in Figure 7-1. Piezometers CCB-1, CCB-3, CCB-7, CCB-8, CCB-12, CCB-16, and CCB-19 were installed for geotechnical purposes at depths between 70 and 80 feet. Piezometers CCB-1, CCB-3, CCB-7, CCB-8, CCB-12, and CCB-16 did not encounter groundwater saturation and were found to be dry during subsequent water level monitoring events. With the exception of CCB-19, each of these screened intervals were located within the middle of the mine overburden materials and therefore, screened above the “First Zone of Saturation”.

Temporary piezometers S-1 through S-5 were set within the mine overburden – top of rock interface and were installed strictly for site hydrogeological evaluation during 2012. Temporary piezometers D-1 through D-9 were set deeper within the Pottsville Formation to further characterize site hydrogeology during 2012. For this chapter, we exclude discussion on piezometers CCB-1, CCB-3, CCB-7, CCB-8, CCB-12, and CCB-16. With the exception of geotechnical borings (CCB-series) casing was continuously advanced until natural rock was encountered, and no samples were acquired from the overburden.

Temporary piezometer CCB-19 was installed to approximately 76 feet bgs and screened from 66 to 76 feet bgs. The interval from 65 to 70 feet was originally interpreted to be natural bedrock, but recovery and weathering was more typical of overburden boulders. Based upon core recovery, top of native rock is likely 70 feet. CCB-19 demonstrated to be an above average groundwater producer at the site with static water levels remaining relatively constant while pumping at 2 gallons per minute during development. Water level monitoring from CCB-19 showed that levels varied from 60.0 feet below top of casing (BTOC) in the late winter to 63.8 feet (BTOC) in the late summer.

Temporary piezometer S-1 was installed to an approximate total depth of 129.75 feet bgs. Top of Pottsville bedrock was encountered at approximately 124.5 feet. A 4-inch thick coal seam was encountered at 125 feet and the remaining core (125-130.8 feet) was a dark gray to black, organic-rich, silty, claystone. The well screen was set within the mine – spoil top of rock interface (approximately 4 feet of mine overburden and 6 feet of Pottsville) from 120.84 to 130.84 feet. Water levels exhibit fluctuations ranging from 121.1 feet bgs in the late winter to 122.5 feet bgs in the late summer. During field developments, S-1 was found to produce approximately 0.5 gpm while maintaining a relatively constant head.

Temporary piezometer S-2 was installed to an approximate depth of 102.7 feet (bgs). Top of Pottsville bedrock was encountered at approximately 97 feet bgs. From 97 to 101 feet bgs, a dark gray claystone with thin, light-gray, flaser bedded sandstone laminae was encountered. The well screen was installed from 92.68 to 102.68 feet (bgs). Well development data from S-2 shows that the screened interval was naturally very turbid and water injections would be needed in order to develop the well to turbidity levels less than 10 Nephelometric Turbidity Units (NTUs). During field developments, a pumping rate of 0.25 gallons per minute was sufficient to drop hydraulic head 8-feet over the course of 2 hours.

Temporary piezometer S-3 was bored down to a depth of 81.9 feet bgs. Originally, the top of bedrock was believed to be encountered at 77 feet bgs; however, drilling conducted during 2012 in the vicinity of the location confirmed that top of bedrock appeared at a depth of 87 feet bgs. It is likely that a weathered mine overburden derived boulder was encountered around 77 feet bgs, and inadvertently mistaken for bedrock. The well was screened from 71.9 to 81.9 feet bgs. S-3 did not produce groundwater for well developments.

Temporary piezometer S-4 was installed to an approximate total depth of 125 feet bgs. The top of Pottsville bedrock was encountered in the boring at approximately 120 feet bgs. The rock interval from 120 to 125 feet was light gray to gray, ripple laminated sandstone. The temporary piezometer was screened from 115 to 125 feet bgs. Water levels exhibit fluctuations ranging from 105.6 feet bgs in the late winter to 109.3 feet bgs in the late summer. During field developments, S-4 was found to produce approximately 0.5 gpm while maintaining a relatively constant head.

Temporary piezometer S-5 was bored down to a depth of 74 feet bgs. The top of Pottsville bedrock was encountered at approximately 73 feet (bgs). Top of rock was originally believed to have been encountered at 69 feet but core recovery; however, small borehole caving that occurred during temporary monitoring well installation likely indicated that this interval was derived of mine overburden boulders. The well screen was set from 60 to 70 feet (bgs) due to continued caving during well installation procedures. Data from S-5 has static water levels remaining around 64.65 feet (bgs) in the winter and summer. Static water level data indicates that the temporary piezometer was screened across the water table. During field developments, S-5 was found to produce approximately 0.25 gpm while maintaining a relatively constant head.

Pottsville Formation Targeted Piezometers

Boring D-1 was drilled down to a depth of 209 feet (bgs). The first 112 feet encountered were mine-spoil overburden materials. Casing was continuously advanced through the mine overburden because of borehole stability issues. Due to a lack of compaction and extreme vertical heterogeneity of layered material, borehole collapse and in-filling was a significant barrier to overburden sampling and piezometer installation. At 112 feet (bgs) top of natural rock was encountered. Unit 3 composed predominantly of sandy, mudstone/claystone was cored through from 112 feet to the bottom of the hole at 209 feet. From 115 feet to 139.5, Unit 3 was notably more silty/sandy and contained a small 6 to 8 inch thick coal seam at approximately 124 feet. At 173 feet depth another small 6 inch coal seam was encountered. No significant water-yielding zones were encountered down to a depth of 209 feet and therefore, the well was sanded

up to capture the coal seam interval at 174 feet. Geophysical data (gamma and single-point resistivity) also indicated that this zone was the most likely to produce groundwater. The piezometer was screened from 172.4 feet to 182.4 feet (bgs). Static groundwater levels within this well are between 169 feet and 170 feet (bgs). However, the well was difficult to develop due to the extremely turbid nature of the Pottsville formation and also, because of slow recharge rates.

Boring D-2 was drilled down to a depth of 164.5 feet (bgs). The first 114 feet encountered were mine-spoil overburden materials. No samples were collected in the overburden due to aforementioned borehole stability problems. Unit 2 consisting of very fine-grained- to fine-grained, light gray, sandstone was encountered at 114 feet. This unit was 35.5 feet thick within the borehole and extended down to a depth of 149.5 feet. The interval from 149.5 to 164.5 marks the transition from Unit 2 down to Unit 1 and consisted of organic-rich claystone and lower interbedded mudstone and fine-grained sandstone. The borehole was sanded up to 150.7 feet to capture the bedding plane intersection of the massive sandstone and lower claystone-dominated interval as well as to determine the productivity of the sandstone unit. The well screen interval is from 140.7 to 150.7 feet (bgs) and static water-level within the well varies from 110 to 112 feet (bgs). Well development data shows that this well went dry after 23 minutes of low-flow pumping between 0.4 and 0.18 gallons per minute.

Boring D-3 was drilled down to a depth of 55.8 feet (bgs) and was located west of previous mining limits. The top 6.5 feet was described as organic-rich, silty, clay to silt. Coring began at 6.5 and the rock encountered was from the Pratt Coal Group (Unit 4). From 6.5 feet to 46.5 feet, the rock was described as silty, claystone to siltstone. The Pratt coal seam was cored through from 46.5 feet to 50 feet. An organic-rich claystone with prevalent siderite and lycopsid fossils was logged from 50 feet to 55.8 feet. The piezometer was screened across the Pratt seam from 45.8 to 55.8 feet (bgs). However, it was found that the Pratt Seam and associated claystone rocks did not produce groundwater. The static water-level was encountered to be 54.35 feet (1.45 feet water column). Therefore, no development could take place.

Boring D-4 (MW-10) was sited near previous boring D-3 and targeted the American coal seam. In total, the boring penetrated 105 feet (bgs) and intersected the Pratt seam (41-45 feet), the Nickel Plate seam (62-64 feet), and the American seam (Bench 1: 90-94 feet; Bench 2: 98.5-99.3 feet). The coal seams of the Pratt Group were separated by siltstone, organic-rich claystone, and intercalated mudstone and fine-grained sandstone. Upon hammering through the Pratt and Nickel Plate seams the drill rig was shut down for 30 minutes to see if these seams would produce groundwater. However, it was found that neither seam produced enough groundwater for monitoring. Conversely, the American coal zone did produce enough groundwater for monitoring and the well screen was installed from 85 feet to 105 feet depth to capture both American seam benches. Eighteen hours after well installation groundwater had risen to 83.91 feet (bgs) (21.09' water column).

Boring D-5 was drilled down to a depth of 220 feet (bgs). The upper 82 feet encountered was mine spoil. Unit 3 consisting predominantly of sandy mudstone, iron claystone, and two minor coal seams (Gillespy and Curry) was encountered at 82 feet and extended downwards to a depth of 154 feet. The Gillespy seam was cored through at 130.2 feet, but was only 5 inches in thickness. The Curry seam was encountered at 173.4 feet, but was only 3 to 4 inches in

thickness. A 5 foot sandy splay or flood deposit was encountered from 110 feet to 115 feet. This deposit is encountered in most boreholes and geophysical logs serving as an important correlation bed. At 154 feet, Unit 2 comprised of very fine-grained sandstone was encountered. However, it was only 14 feet thick within the borehole and extended down to a depth of 168 feet. Unit 1 was encountered from 168 feet down to the bottom of the borehole at 220 feet. Core logging and gamma logs show that this unit is comprised of claystone and interbedded sandstone-mudstone. Geophysical logs and heat pulse flowmeter tests were run to constrain points of fluid entry or exit relative to the borehole. These logs indicated that the interval from 159 to 179 feet (bgs) would produce the most significant amount of groundwater (0.3 gallons per minute) and therefore the well screen was set within this zone.

Boring D-6 was drilled down to a depth of 250 feet (bgs). The upper 87 feet encountered was mine overburden and ravine-fill material. Unit 3 was encountered at 87 feet and extended downwards to 140 feet. Unit 3 consisted of sandy claystone, mudstone, iron claystone, and one isolated coal seam. Fracturing in the rock was common from 87 feet down to 131 feet and individual core samples contained microfaults with 1 to 2 centimeters of displacement. Observed fractures were subhorizontal to subvertical in nature and contained secondary calcite growths along open fracture planes. A 3 inch thick bituminous coal seam was encountered at 93.5 feet. From 130 to 140 feet there was a gradational change from sandy, claystone (130 to 140 feet) to muddy, sandstone (140 to 160 feet), to sandstone at 162.5 feet depth. This gradational change reflects the contact between Unit 3 and Unit 2 within boring D-6. The major sandstone bed of Unit 2 was found from 162.5 feet to 177.2 feet. This sandstone bed was very fine-grained, contained ripple bedding, and had prevalent mud drapes at the top and base. Unit 1 was encountered at 177.2 feet and extended down to the bottom of the borehole at 250 feet. This unit was comprised predominantly of finely laminated sandy, claystone and mudstone. Geophysical logs and heat pulse flowmeter tests were run to constrain points of fluid entry or exit relative to the borehole. These logs indicated that the interval from 110 to 140 feet (bgs) would produce the most significant amount of groundwater (0.01 to 0.3 gallons per minute) and therefore the well screen was set from 114.5 to 134.5 feet (bgs).

Boring D-7 was initially slated to be drilled down to a depth of 300 feet, but could only be drilled down to 201 feet (bgs) due to mechanical issues with the drilling rig. The first 120 feet encountered was mine spoil. Unit 2 consisting of fine- to- very fine-grained sandstone was encountered at 120 feet and extended down to a depth of 148.5 feet. At 148.5 feet Unit 1 was encountered. This unit extended down to the bottom of the borehole at 201 feet and consisted of sandy claystone, iron claystone, mudstone with lenticular bedded sandstone, and minor coal. The interval from 180 to 201 feet did contain numerous bedding parallel fractures and 4 inch coal seam at 197 feet (bgs). Fracture density was highest from 197 to 200 feet. Due to technical challenges the well was screened from 181 feet to 201 feet (bgs).

Boring D-8 was drilled down to a depth of 296 feet (bgs) with the first 116 feet mine overburdenoverburden. Unit 3 was encountered at 116 feet and extended down to a depth of 234 feet. Unit 3 was composed of sandy and organic-rich claystone, mudstone, claystone with lenticular bedded sands, very fine-grained sandstone and minor coal. Two five inch thick coal seams were encountered at 124.6 feet and 173 feet. Unit 2 was encountered at 236 feet and extends down to 276 feet. This unit is composed largely of very fine-grained, massive bedded to

laminated sandstone with a 7 foot thick claystone interbed from 239 to 246 feet. Geophysical logs and heat pulse flowmeter tests were run to constrain points of fluid entry or exit relative to the borehole. However, these logs indicated that no zones would produce more than 0.009 gallons per minute. The well screen was installed from 239 to 259 feet (bgs) corresponding to peak observed flow rates (~0.009 gpm) and slight deviations in fluid temperature.

Boring D-9 was drilled down to a total depth of 130 feet (bgs). The first 55 to 60 feet of which was mine overburden materials. The top of rock – mine overburden interface was particularly hard to distinguish at D-9 due to the compact nature of the mine overburden near the base. Recovered core from the 50 to 60 foot interval indicate that top of natural rock is likely closer to 60 feet. Unit 2 was encountered at 60 feet and extended down to roughly 100 feet. This interval was predominantly characterized as silty claystone with thin, discontinuous sand laminae and sporadic iron-rich sections. Unit 2 contained a fair amount of subvertical to bedding plane parallel fractures from 60 to 78 feet within the borehole. The gradation from unit 2 to unit 3 occurred from 100 to 122 feet. In this interval deposition switched from silty claystone to muddy sandstone and finely, to fine-grained massive- to- thinly laminated sandstone. Unit 3 was cored down to 130 feet at which point the boring was terminated. Previous data indicates that intervals below Unit 3 are not very good water producers due to low permeability of unit 3. The well would best be set within the more fracture-rich intervals of unit 2. The well screen was installed from 59.5 feet to 79.5 feet (bgs).

7.2.6 Permanent Piezometers and Proposed Monitoring Wells

Boring locations for most recent investigations and current piezometers on site are presented in Figure 7-2. Monitoring well MW-1 was installed to an approximate total depth of 105 feet bgs. The top of Pottsville bedrock was encountered at approximately 95 feet bgs. No mine overburden samples were obtained from MW-1 due to the casing advance method used. A medium to dark gray mudstone was encountered from 95 to 105 feet bgs. The well screen was set from 94 to 104 feet bgs. MW-1 exhibits a static water level between 87 and 89 feet (bgs). During field developments, MW-1 was found to produce approximately 0.3 gpm while maintaining a relatively constant head.

Well MW-2 was bored down to a depth of 91 feet (bgs). The top of Pottsville bedrock was encountered at approximately 84.2 feet (bgs). Mine overburden material was predominantly logged dark to medium gray mudstone/siltstone rock fragments with lesser amounts of dark gray to brownish gray and orange sandy silt. Intermittent seams of sandstone fragments and clay were also logged. A dark to medium gray mudstone was cored from 84.2 to 91 feet (bgs). The well screen was set from 80.6 to 90.6 feet (bgs). MW-2 exhibits a static water level around 82 feet (bgs). During field developments, MW-2 was found to produce approximately 1 gpm while maintaining a relatively constant head.

Well MW-3 was bored down to a depth of 115.5 feet (bgs). The top of Pottsville bedrock was encountered at approximately 108 feet (bgs). Mine overburden material was predominantly logged as dark to medium gray mudstone/siltstone rock fragments within a dark gray silty soil matrix. Intermittent seams of sandstone fragments and clay were also logged. Percentages of rock fragments and boulders increased with depth. A medium to light gray sandstone with nodular inclusions was encountered from 108 to 115.5 feet (bgs). The well screen was set from

105.1 to 115.1 feet (bgs). MW-3 exhibits a static water level around 107.5 feet (bgs). During field developments, MW-3 was found to be a slow producer with a pumping rate of 0.2 gallons per minute dropping hydraulic head almost 3 feet in 5 minutes. A second attempt at development indicated that MW-3 was only able to produce 0.05 gallons per minute.

Well MW-4 was bored down to a depth of 129.5 feet (bgs). The top of Pottsville bedrock was encountered at approximately 120.8 feet (bgs). No mine overburden samples were obtained from MW-4 due to the casing advance method used. A medium to dark gray mudstone was encountered from 120.8 to 129.5 feet (bgs). The well screen was set from 116.3 to 126.3 feet (bgs). MW-4 exhibits a static water level around 114 feet (bgs). During field developments, MW-4 was found to produce approximately 0.2 gpm while maintaining a relatively constant head.

Well MW-5 was bored down to a depth of 136 feet (bgs). The top of Pottsville bedrock was encountered at approximately 127 feet (bgs). Mine overburden material was predominantly logged as dark to medium gray coarse sand to coarse gravel sized mudstone/siltstone rock fragments within a dark to medium gray silty matrix. Near the base of the spoil material a zone of mixed mudstone and coal fragments were encountered. Black, very fine to fine gravel sized coal fragments and very fine coal dust were noted at the very base of the mine spoil. Interbedded mudstone and sandstone was encountered from 120.8 to 136 feet (bgs). The well screen was set from 123.6 to 133.6 feet (bgs). MW-5 exhibits a static water level around 123 feet (bgs). During field developments, MW-5 was found to produce approximately 0.1 gpm while maintaining a relatively constant head.

Well MW-6 was bored down to a depth of 126 feet (bgs). The top of Pottsville bedrock was encountered at approximately 119 feet (bgs). Mine overburden material was logged as a mixture of sandstone, siltstone, and mudstone rock fragments within a sandy and silty soil matrix. The last 10-feet of recovered spoil materials contained coarse sand and gravel sized coal fragments and coal dust. A dark to medium gray, mudstone was encountered from 119 to 126 feet (bgs). The well screen was set from 115.6 to 125.6 feet (bgs). MW-6 exhibits a static water level around 103 feet (bgs). During field developments, MW-6 was found to produce approximately 0.75 gpm while maintaining a relatively constant head.

Well MW-7 was bored down to a depth of 71 feet (bgs). The top of Pottsville bedrock was encountered at approximately 64 feet (bgs). Mine overburden material was logged predominantly as dark to medium gray fine gravel to coarse gravel sized mudstone/siltstone within a medium gray silty matrix. Lesser amounts of sandstone rock fragments were also encountered. A very dark to medium gray organic-rich, mudstone with coal spars was encountered from 64 to 71 feet (bgs). The well screen was set from 60.6 to 70.6 feet (bgs). MW-7 exhibits a static water level around 58 feet (bgs). MW-7 has shown to be an above average groundwater producer with static water levels around 58 feet (bgs). During field developments, MW-7 was found to produce approximately 2.0 gpm while maintaining a relatively constant head.

Well MW-8 was bored down to a depth of 69.5 feet (bgs). The top of Pottsville bedrock was encountered at approximately 64.5 feet (bgs). No mine overburden samples were obtained from MW-8 due to the casing advance method used. A dark gray mudstone was encountered from

64.5 to 69.5 feet (bgs). The well screen was set from 58.9 to 68.9 feet (bgs). MW-8 exhibits a static water level around 60 feet (bgs). During field developments, MW-8 was found to produce approximately 0.4 gpm while maintaining a relatively constant head.

Well MW-9 was bored down to a depth of 121 feet (bgs). The top of Pottsville bedrock was encountered at approximately 115 feet (bgs). Mine overburden material was logged as dark to medium gray mudstone/siltstone within a light brown to grayish brown sandy silt matrix. Lesser amounts of sandstone fragments and clay were also encountered. A dark to medium gray mudstone was encountered from 115 to 121 feet (bgs). The well screen was set from 109.6 to 119.6 feet (bgs). MW-9 exhibits a static water level around 110 feet (bgs). During field developments, MW-9 was found to produce approximately 0.05 gpm while maintaining a relatively constant head.

Well MW-11 was bored down to a depth of 136 feet (bgs). The top of Pottsville bedrock was encountered at approximately 125 feet (bgs). Mine overburden material was logged as dark to medium gray mudstone/siltstone fragments within a dark to medium gray silty matrix. Lesser amounts of sandstone rock fragments and clay were also encountered. A dark to medium gray mudstone was encountered from 125 to 136 feet (bgs). Coal spars were logged from 134.5 to 136 feet (bgs). The well screen was set from 121.6 to 131.6 feet (bgs). MW-11 exhibits a static water level around 104.5 feet (bgs). During field developments, MW-11 was found to produce approximately 1.0 gpm while maintaining a relatively constant head.

Well MW-12 was bored down to a depth of 166 feet (bgs). The top of Pottsville bedrock was encountered at approximately 159 feet (bgs). Mine overburden material was logged as dark to medium gray mudstone/siltstone fragments within a dark to medium gray silty matrix. Lesser amounts of sandstone rock fragments and clay were also encountered. A very dark gray to black organic-rich mudstone with trace coal spars was encountered from 159 to 166 feet (bgs). The well screen was set from 155.6 to 165.6 feet (bgs). MW-12 exhibits a static water level around 153 feet (bgs). During field developments, MW-12 was found to produce approximately 0.2 gpm while maintaining a relatively constant head.

Well MW-13 was bored down to a depth of 106 feet (bgs). The top of Pottsville bedrock was encountered at approximately 98.8 feet (bgs). Mine overburden material was logged as dark to medium gray mudstone/siltstone fragments within a dark to medium gray silty matrix. Lesser amounts of sandstone rock fragments and clay were also encountered. Coal fragments and dust was encountered at approximately 47 feet (bgs). A dark to medium gray and black mudstone with coal was encountered from 98.8 to 106 feet (bgs). The well screen was set from 95.6 to 105.6 feet (bgs). MW-13 exhibits a static water level around 92 feet (bgs). During field developments, MW-13 was found to produce approximately 0.1 gpm while maintaining a relatively constant head.

Well MW-14 was bored down to a depth of 101 feet (bgs). The top of Pottsville bedrock was encountered at approximately 94 feet (bgs). Mine overburden material was logged as dark to medium gray mudstone/siltstone fragments within a dark to medium gray to orangish brown silty matrix. Lesser amounts of sandstone rock fragments and clay were also encountered. A medium to dark gray mudstone with nodular inclusions was encountered from 94 to 101 feet (bgs). The

well screen was set from 90.1 to 101.1 feet (bgs). MW-14 exhibits a static water level around 86.5 feet (bgs). During field developments, MW-14 was found to produce approximately 1.0 gpm while maintaining a relatively constant head.

Well MW-15 was bored down to a depth of 84.2 feet (bgs). The top of Pottsville bedrock was encountered at approximately 79 feet (bgs). No mine overburden samples were obtained from MW-15 due to the casing advance method used. A dark gray mudstone was encountered from 79 to 84.2 feet (bgs). The well screen was set from 74 to 84 feet (bgs). MW-15 exhibits a static water level around 64 feet (bgs). During field developments, MW-15 was found to produce approximately 1.0 gpm while maintaining a relatively constant head.

Well MW-16 was bored down to a depth of 107 feet (bgs). The top of Pottsville bedrock was encountered at approximately 100 feet (bgs). Mine overburden material was logged as dark to medium gray mudstone/siltstone fragments within a dark to medium gray silty matrix. Lesser amounts of sandstone rock fragments and clay were also encountered. Coal fragments were encountered at the base of mine overburden materials. A dark to medium gray mudstone was encountered from 100 to 107 feet (bgs). The well screen was set from 96.6 to 106.6 feet (bgs). MW-16 exhibits a static water level around 88.5 feet (bgs). During field developments, MW-16 was found to produce approximately 1.5 gpm while maintaining a relatively constant head.

Well MW-17 was bored down to a depth of 111 feet (bgs). The top of Pottsville bedrock was encountered at approximately 99 feet (bgs). Mine overburden material was logged as dark to medium gray mudstone/siltstone fragments within a dark to medium gray silty matrix. Lesser amounts of sandstone rock fragments and clay were also encountered. Coal fragments were encountered at approximately 48 feet (bgs). A dark to medium gray sandstone was encountered from 99 to 111 feet (bgs). The well screen was set from 96.1 to 106.1 feet (bgs). MW-17 is not a groundwater producer. During development the well was effectively dry and will have to be abandoned and replaced.

Well MW-18 was bored down to a depth of 117 feet (bgs). The top of Pottsville bedrock was encountered at approximately 108.5 feet (bgs). Mine overburden material was logged as dark to medium gray mudstone/siltstone fragments within a dark to medium gray silty matrix. Lesser amounts of sandstone rock fragments and clay were also encountered. Coal fragments and dust were encountered at approximately 49 feet (bgs). A dark to medium gray sandstone was encountered from 108.5 to 117 feet (bgs). The well screen was set from 104.6 to 114.6 feet (bgs). MW-18 exhibits a static water level around 112 feet (bgs). During field developments, MW-18 was found to produce approximately 1.5 gpm while maintaining a relatively constant head.

Well MW-19 was bored down to a depth of 95.1 feet (bgs). The top of Pottsville bedrock was encountered at approximately 91 feet (bgs). No mine overburden samples were obtained from MW-19 due to the casing advance method used. An organic-rich dark gray mudstone with coal spars was encountered from 91 to 95.1 feet (bgs). The well screen was set from 84.7 to 94.7 feet (bgs). MW-19 exhibits a static water level around 80 feet (bgs). During field developments, MW-18 was found to produce approximately 0.4 gpm while maintaining a relatively constant head.

Well MW-20 was bored down to a depth of 71 feet (bgs). The top of Pottsville bedrock was encountered at approximately 64 feet (bgs). Mine overburden material was logged as dark to medium gray mudstone/siltstone fragments within a dark to medium gray silty matrix. Lesser amounts of sandstone rock fragments and clay were also encountered. Coal fragments were encountered at approximately 63 feet (bgs). A medium gray sandstone was encountered beneath this fragmented coal layer from 66 to 71 feet (bgs). The well screen was set from 60.5 to 70.5 feet (bgs). MW-20 exhibits a static water level around 32 feet (bgs). During field developments, MW-20 was found to produce approximately 2.5 gpm while maintaining a relatively constant head.

Two cross-sections (Figures 7-3 and 7-4) were constructed from boring logs (Appendix D). Table 7-1 summarizes piezometer location, depth, and groundwater elevation details. Table 7-2 summarizes well construction details for permanent piezometers and proposed monitoring wells.

Table 7-1. Summary of Piezometer Data (2011-2012)

| Boring | Northing NAD27 (feet) | Easting NAD27 (feet) | TOC Elevation feet (msl) | Mine Overburden Thickness (feet) | Bottom Depth of Well (feet bgs) | Depth to Groundwater (feet) | GW Elevation (feet msl) |
|-------------------------------|--------------------------|----------------------------|--------------------------------|----------------------------------------|------------------------------------------|-----------------------------------|----------------------------------|
| Overburden Piezometers | | | | | | | |
| S-1 | 1329997.66 | 592799.9 | 516.58 | 124 | 130.84 | 122.51 | 394.07 |
| S-2 | 1330920.74 | 594276.59 | 440.69 | 97 | 100.55 | 87.72 | 352.97 |
| S-4 | 1328920.88 | 597073.7 | 430.62 | 120 | 127.90 | 108.31 | 322.31 |
| S-5 | 1329683.64 | 595928.33 | 406.78 | 70 | 72.83 | 64.64 | 342.14 |
| CCB- 19 | 1328484.6 | 593284.787 | 390.26 | 65 | 78.82 | 60.9 | 329.36 |
| Pottsville Piezometers | | | | | | | |
| D-1 | 1330686.91 | 593113.25 | 522.53 | 112 | 182.40 | 169.98 | 352.55 |
| D-2 | 1328842.69 | 596982.36 | 432.43 | 114 | 150.70 | 111.8 | 320.63 |
| D-4 | 1327773.9 | 593907.17 | 394.81 | 4 | 105.00 | 86.03 | 308.78 |
| D-5 | 1329728.85 | 596032.37 | 398.75 | 82 | 182.82 | 129.13 | 269.62 |
| D-6 | 1327591.92 | 595275.02 | 366.81 | 87 | 138.13 | 107.25 | 259.56 |
| D-7 | 1328824.21 | 596921.99 | 433.1 | 121 | 203.74 | 131.72 | 301.38 |
| D-8 | 1330724.16 | 593125.13 | 522.81 | 116 | 258.78 | 141.69 | 381.12 |
| D-9 | 1330600.07 | 594700.08 | 391.61 | 60 | 79.30 | 58.95 | 332.66 |

Table 7-2. Summary of Piezometer Data (2013-2014)

| Well ID | Northing | Easting | TOC Elev (ft MSL) | Mine overburdenT hickness (ft) | Depth of Well (ft) | Depth to GW 12/8/14 (ft TOC) | GW Elevation 12/8/14 (ft MSL) |
|--------------|-------------|------------|-------------------|--------------------------------|--------------------|------------------------------|-------------------------------|
| MW-1 | 1330794.064 | 594082.361 | 502.38 | 95.2 | 104.1 | 92.10 | 410.28 |
| MW-2 | 1331053.309 | 593548.802 | 502.17 | 84.2 | 90.6 | 85.33 | 416.84 |
| MW-3 | 1330842.402 | 593025.397 | 525.90 | 108 | 115.1 | 110.58 | 415.32 |
| MW-4 | 1330289.727 | 592896.414 | 517.89 | 120.8 | 126.3 | 117.82 | 400.07 |
| MW-5 | 1328645.982 | 592436.538 | 474.76 | 127 | 133.6 | 126.18 | 348.58 |
| MW-6 | 1327877.972 | 592829.837 | 413.01 | 119 | 125.6 | 106.29 | 306.72 |
| MW-7 | 1328515.235 | 593408.341 | 394.36 | 64 | 70.6 | 60.77 | 333.59 |
| MW-8 | 1329140.729 | 593813.964 | 415.53 | 64.5 | 68.9 | 63.40 | 352.13 |
| MW-9 | 1329976.529 | 594124.617 | 490.60 | 115 | 119.6 | 113.86 | 376.74 |
| *MW-10/(D-4) | 1327772.466 | 593907.164 | 395.10 | N/A | 105 | 86.13 | 308.97 |
| MW-11 | 1328108.244 | 594813.968 | 406.96 | 125 | 131.6 | 107.36 | 299.60 |
| MW-12 | 1328563.733 | 594741.233 | 474.24 | 159 | 165.6 | 155.84 | 318.40 |
| MW-13 | 1329383.939 | 595088.06 | 445.29 | 98.8 | 105.6 | 94.60 | 350.69 |
| MW-14 | 1329549.381 | 595627.606 | 430.20 | 94 | 101.1 | 89.46 | 340.74 |
| MW-15 | 1329680.612 | 595932.099 | 406.05 | 79 | 84 | 67.97 | 338.08 |
| MW-16 | 1328655.721 | 596399.878 | 414.68 | 100 | 106.6 | 91.54 | 323.14 |
| MW-17 | 1328253.359 | 596174.137 | 432.27 | 99 | 106.1 | Dry | Dry |
| MW-18 | 1327977.419 | 595793.776 | 415.09 | 108.5 | 114.6 | 114.51 | 300.58 |
| MW-19 | 1327697.305 | 595251.571 | 378.53 | 91 | 94.7 | 83.05 | 295.48 |
| MW-20 | 1327792.527 | 594841.227 | 332.88 | 64 | 70.5 | 35.22 | 297.66 |

*Denotes Pottsville Aquifer – no mine overburdenat this location

*MSL – Mean Sea Level

*TOC – Top of Casing

*N/A – indicates no mine overburden encountered

Table 7-3. Well Construction Details for Permanent Piezometers/Proposed Monitoring Wells

| Well ID | Northing | Easting | Ground Elev (feet MSL) | TOC Elev (ft MSL) | Top of Seal (ft MSL) | Top Filter Pack (ft MSL) | Top of Screen (ft MSL) | Screen Length (ft) | Drilling Method |
|--------------|-------------|------------|------------------------|-------------------|----------------------|--------------------------|------------------------|--------------------|-----------------|
| MW-1 | 1330794.064 | 594082.361 | 499.191 | 502.38 | 411.8 | 407.6 | 405.1 | 10 | CME |
| MW-2 | 1331053.309 | 593548.802 | 498.539 | 502.17 | 478.5 | 421.0 | 417.9 | 10 | Rotosonic |
| MW-3 | 1330842.402 | 593025.397 | 522.233 | 525.90 | 500.2 | 419.7 | 417.1 | 10 | Rotosonic |
| MW-4 | 1330289.727 | 592896.414 | 516.665 | 517.89 | 407.7 | 403.6 | 400.4 | 10 | CME |
| MW-5 | 1328645.982 | 592436.538 | 471.545 | 474.76 | 451.0 | 351.0 | 347.9 | 10 | Rotosonic |
| MW-6 | 1327877.972 | 592829.837 | 409.985 | 413.01 | 390.5 | 297.4 | 294.4 | 10 | Rotosonic |
| MW-7 | 1328515.235 | 593408.341 | 391.587 | 394.36 | 371.4 | 334.6 | 331.0 | 10 | Rotosonic |
| MW-8 | 1329140.729 | 593813.964 | 413.15 | 415.53 | 360.1 | 356.9 | 354.3 | 10 | CME |
| MW-9 | 1329976.529 | 594124.617 | 487.147 | 490.60 | 467.1 | 381.3 | 377.5 | 10 | Rotosonic |
| *MW-10/(D-4) | 1327772.466 | 593907.164 | 391.66 | 395.10 | 313.3 | 311.2 | 307.4 | 20 | Air Hammer |
| MW-11 | 1328108.244 | 594813.968 | 403.685 | 406.96 | 383.2 | 285.7 | 282.1 | 10 | Rotosonic |
| MW-12 | 1328563.733 | 594741.233 | 470.738 | 474.24 | 450.6 | 318.2 | 315.1 | 10 | Rotosonic |
| MW-13 | 1329383.939 | 595088.06 | 442.04 | 445.29 | 421.0 | 349.5 | 346.4 | 10 | Rotosonic |
| MW-14 | 1329549.381 | 595627.606 | 426.904 | 430.20 | 406.9 | 339.9 | 336.8 | 10 | Rotosonic |
| MW-15 | 1329680.612 | 595932.099 | 403.104 | 406.05 | 338.1 | 332.7 | 329.1 | 10 | CME |
| MW-16 | 1328655.721 | 596399.878 | 411.57 | 414.68 | 392.1 | 318.6 | 315.0 | 10 | Rotosonic |
| MW-17 | 1328253.359 | 596174.137 | 429.032 | 432.27 | 409.5 | 336.0 | 332.9 | 10 | Rotosonic |
| MW-18 | 1327977.419 | 595793.776 | 411.417 | 415.09 | 391.4 | 309.9 | 306.8 | 10 | Rotosonic |
| MW-19 | 1327697.305 | 595251.571 | 375.109 | 378.53 | 298.1 | 293.1 | 290.4 | 10 | CME |
| MW-20 | 1327792.527 | 594841.227 | 329.892 | 332.88 | 311.9 | 271.9 | 269.6 | 10 | Rotosonic |

**Bold denotes Bentonite Seal was installed to 20 feet below ground surface in Rotosonic drilled borings, cement was utilized from 20 feet bgs to surface*

7.3 Elemental Analyses of Mine Spoil/Coal Seam Samples

Fragments of mine overburden boulders and silty, clay samples were collected from the base of the overburden at boring locations S-1, S-2, S-4, and S-5. Samples of the Curry and Gillespy coal seams from boring location D-1 were also collected. Pyrite was commonly observed within the core samples, which may cause elevated concentrations of naturally occurring trace metals in groundwater. To adequately describe and characterize groundwater geochemistry findings as they relate to naturally occurring trace metals due to fluid-rock interactions, an elemental analyses was conducted on each sample. The results of the elemental analyses are summarized in the Table 7-3. TCLP and SPLP were also run on these samples. All findings are included in Appendix F.

Table 7-4. Trace Metal Analysis of Rock Samples (parts per million [ppm])

| Well | Rock Type | Sr | As | Ba | Be | Cd | Cr | Co | Cu | Pb | Mn | Mo | Ni | Se | Tl | V | Zn |
|------|----------------------|------------|-------------|--------------|------------|------------|-------------|-------------|-------------|-------------|--------------|------------|-------------|------------|------------|-------------|-------------|
| S-1 | Shale Frag/Clay | 5.87 | 6 | 647 | 2.97 | 76.7 | 76.7 | 17.4 | 38.7 | 27.5 | 197 | 1.23 | 21.4 | 0 | 0 | 132 | 83.4 |
| | Coaly Claystone | 13.92 | 4.1 | 405 | 3.62 | 1.07 | 91.6 | 31.2 | 57.1 | 30.3 | 31.1 | 2.89 | 28.9 | 1.87 | 0 | 170 | 76.4 |
| | Sandstone Frag | 4.39 | 0.6 | 284 | 1.74 | 0.596 | 72.1 | 22.5 | 18 | 17.8 | 382 | 0 | 11.7 | 0 | 0 | 73.6 | 96 |
| | Lenticular Sandstone | 4.2 | 1.3 | 269 | 1.89 | 0 | 48.3 | 20.5 | 15.7 | 18.9 | 503 | 0 | 12.7 | 0 | 0 | 89.4 | 80.7 |
| S-2 | Foss. Claystone | 4.79 | 5.3 | 288 | 2.67 | 0 | 78.7 | 26.1 | 18.6 | 24.4 | 481 | 0 | 28.3 | 0 | 0 | 129 | 113 |
| | Silty, Mudstone | 5.64 | 4.3 | 393 | 2.1 | 0 | 73.8 | 23.6 | 16.1 | 23 | 477 | 0 | 19.3 | 0 | 0 | 110 | 98.3 |
| S-4 | Claystone | 1.91 | 0 | 139 | 1.21 | 0.916 | 28.5 | 13.6 | 2.58 | 11.3 | 325 | 0 | 5.51 | 0 | 0 | 52.1 | 48 |
| S-5 | Org-rich Claystone | 8.48 | 2.9 | 484 | 3.35 | 0.544 | 96.7 | 16.8 | 14.1 | 24.6 | 68.9 | 0 | 18.6 | 0 | 0 | 162 | 69.7 |
| D-1 | Coal Seam 1 | 1.61 | 28.9 | 176 | 1.88 | 0.279 | 32.8 | 11.1 | 29 | 12.8 | 77.2 | 2.05 | 12.7 | 0 | 0 | 54.4 | 45 |
| | Coal Seam 2 | 0 | 384.1 | 92.8 | 2.27 | 7.88 | 6.22 | 2.79 | 44.3 | 4.8 | 7.13 | 4.38 | 5.43 | 0 | 0 | 15.3 | 20.8 |
| | Median | 4.6 | 4.2 | 286 | 2.2 | 0.6 | 73.0 | 19.0 | 18.3 | 21.0 | 261 | 0 | 15.7 | 0 | 0 | 99.7 | 78.6 |
| | Average | 5.1 | 43.8 | 317.8 | 2.4 | 8.8 | 60.5 | 18.6 | 25.4 | 19.5 | 254.9 | 1.1 | 16.5 | 0.2 | 0.0 | 98.8 | 73.1 |

8 HYDROGEOLOGIC ASSESSMENT

Thirty-two piezometers were installed within mine overburden materials and an additional nine piezometers were installed deeper within the Pottsville Formation in order to investigate the subsurface hydrogeology. The objectives were to: (1) determine the first zone of saturation; (2) determine depth to lower aquifers; (3) determine interconnection amongst the first zone of saturation and lower aquifers; (4) determine the potentiometric surface; (5) estimate groundwater flow rate and direction; and (6) characterize existing groundwater quality.

8.1 Description of Vadose Zone

The vadose or unsaturated zone beneath the proposed disposal facilities extends down near the base of the mine overburden and averages 95 to 100 feet in thickness. In general, vadose zone thickness mimics site topography and depth to rock. Recharge through the vadose zone in mine overburden materials is typically channeled through interconnected silty layers. Flow through these zones may be vertical or horizontal, but eventually reaches the top of rock interface. At higher elevations, depth to the first signs of moisture can be as great as 155 feet and conversely, at lower elevations can appear from 55 to 65 feet.

8.2 Determination of “First Zone of Saturation”

The first saturated zone beneath the site generally corresponds to the interface zone at which the mine-spoil overburden transitions to bedrock (Pottsville Formation). Average depth to the first saturated zone beneath the site is approximately 107 feet (bgs). Depth to the first saturated zone is generally between 100 and 110 feet (bgs) near the Baghouse Storage Facility with an average piezometric surface rising to 13 feet above the base of screen. Depth to the first saturated zone is generally between 105 and 115 feet near the Gypsum Storage Facility. Hydraulic conductivity (K) in this zone varies widely, but is generally between 10^{-1} to 10^{-4} cm/sec as determined by slug testing. Well developments generally indicate low groundwater yields (quantity) between 0.02 and 0.5 gallons per minute (gpm). Two wells (MW-7 and MW-20) produce groundwater at rates greater than 2.0 gpm. Groundwater flow is to the south and south-southeast across the site, paralleling trends in structural dip and historic strip pit floors (top of rock elevation).

8.3 Groundwater Elevation Relative to Base of Facilities/Liner

All monitored groundwater elevations were greater than the mandatory 5-foot vertical separation from the base of the cell/liner as required by ADEM Admin Rule 335-13-4-.11(2)(a). Groundwater elevations range between 22 feet (north end) to 50 feet (south end) below the base of the Dry Gypsum Facility and approximately 22 to 35 feet below the base of the Dry Gypsum Facilities' sedimentation pond (Figure 8-1). Groundwater elevations range from 94 feet (north) to 152 feet (south) below the base of Baghouse Byproduct cells 1 and 2 (Figure 8-2).

8.3.1 Dry Gypsum Storage Facility

The base of the Dry Gypsum Storage Facility is 360 feet above MSL and the base elevation of the sedimentation pond for this facility is 332 feet above MSL. Groundwater elevation data from piezometers proximal to these facilities (MW-11, MW-12, MW-14, MW-15, MW-16, MW-18, MW-19, and MW-20) indicate that groundwater elevations are between 338 and 295 feet above MSL in the subsurface from northeast to southwest, respectively. GW elevation ranges from 310 to 338 below the dry gypsum and 300 to 298 below the sedimentation pond. Groundwater

elevation monitoring data from the site indicates that groundwater elevations are subject to seasonal variations of around +/- 3 feet at the site. Therefore, data suggests a vertical separation of greater than 20-feet for both facilities. Hydrogeologic cross-sections through these facilities are presented as Figure 8-1.

8.3.2 Baghouse Byproduct Facilities

The base elevation of cells 1 and 2 are 504 feet above MSL. Groundwater elevation data from piezometers proximal to these facilities (MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, and MW-9) indicate that groundwater elevations are between 415 and 334 feet above MSL from north to south, respectively. Groundwater elevation monitoring data from the site indicates that groundwater elevations are subject to seasonal variations of around +/- 3 feet at the site. Therefore, data suggests a vertical separation of greater than 87-feet for these facilities. Hydrogeologic cross-sections through these facilities are presented as Figure 8-2.

8.4 Hydrologic Interconnection with Subsequent Lower Aquifers

The Pottsville Formation is approximately 2,100 feet thick beneath the proposed disposal facilities and is considered a single, unconfined aquifer in which water is transmitted through fractures, bedding planes, and larger structural features. Background literature review and geophysical logs indicate that fracture density and permeability decrease significantly below depths of 300 feet within the area and therefore, vertical groundwater flow at depth is most likely controlled by larger structural features. No groundwater data is available for formations below the Pottsville.

The groundwater elevation differential between monitoring wells installed in the first zone of saturation (temporary piezometers and MW-1 through MW-20) and deep (D-series) temporary piezometers, is greater for the mine spoil-top of rock interface than the slightly deeper zones within Pottsville aquifer (D-series). This indicates separate but not necessarily confining conditions between the two groundwater producing zones. Based on lithologic and geotechnical observations in deep borings, groundwater recharge from mine overburden materials to the Pottsville aquifer likely occurs slowly through zones of weathered and fractured rock. At some locations, less permeable clay or shale layers may retard vertical recharge into the Pottsville. At locations where mine overburden meets un-mined Pottsville (headwall), groundwater between the two zones may be more directly connected (MW-10).

8.5 Groundwater Elevation(s)

Groundwater elevation data was obtained from piezometers for the months of February, March, and April 2014 to satisfy ADEM Admin Rule 335-13-4-.11(2)(a). Water levels were collected from 10 mine overburden– top of rock piezometers at the site. Groundwater elevations during this time of year are generally the highest. Water level data suggests that levels are generally stable, and fluctuate less than 1-foot between events during this time-frame. Water levels are expected to generally display seasonal variations of +/- 3 feet at the site. Since these groundwater elevations were calculated, many piezometers were either abandoned and replaced or re-named

for this report and groundwater monitoring plan. The data is summarized in Table 8-1 below. Potentiometric surfaces are presented in Figures 8-3 through 8-6. Figure 8-6 presents the most recent potentiometric surface map for MW-series wells. Groundwater elevation and flow data is consistent across each event.

8.6 Groundwater Flow Direction and Gradient

Potentiometric surface maps (Figures 8-3, 8-4, 8-5, & 8-6) generated from water level measurements collected in February, March, April and December of 2014. Calculated groundwater elevations show that groundwater flow in the mine overburden parallels the top of rock surface. Groundwater flow beneath the site is generally towards the south and south-southeast towards the Mulberry Fork River.

Using depth to groundwater data collected December 8, 2014, the horizontal hydraulic gradient for the “First Zone of Saturation” was computed. Horizontal hydraulic gradients were computed for several areas of the site using the following equation:

$$\text{hydraulic gradient} = i = \frac{(h_1 - h_2)}{L}$$

where:

h_1 = groundwater elevation at upgradient well

h_2 = groundwater elevation at downgradient well

L = distance between h_1 and h_2

The average hydraulic gradient at the site is 0.032 ft/ft. Calculated horizontal groundwater gradients are tabulated in Table 8-1.

Table 8-1. Hydraulic Gradients

| Wells | h_1 | h_2 | L | i |
|---------------|-------------------------|-------------------------|----------------|--------------|
| | ft msl | ft msl | ft | ft/ft |
| MW-2 & MW-20 | 416.84 | 297.66 | 3,507 | 0.034 |
| MW-3 & MW-6 | 415.32 | 306.72 | 2,970 | 0.037 |
| MW-14 & MW-19 | 340.74 | 295.48 | 1,890 | 0.024 |
| | | | Average | 0.032 |

8.7 Hydraulic Conductivity of Pottsville Rocks

Aquifer testing (slug tests) to establish hydraulic conductivity (K) values for the site were performed at locations MW-1, MW-4, MW-7, MW-11, MW-15, MW-16, and MW-20. Table 8-2 presents the results of the K tests. Results from MW-7 were not included in the average due to unusually high values and potentially turbulent flow. Data from MW-7 will be preserved in the event that groundwater modeling and calibration are needed for the site. A copy of the data reduction and graphs are included in Appendix G.

Table 8-2. Field Hydraulic Conductivity Tests

| Location | Stratigraphic Unit | K (initial) cm/sec | K (initial) ft/day |
|----------|--------------------|-----------------------------------------|--------------------|
| MW-1 | Spoil/Mudstone | 2.47×10^{-4} | 0.70 |
| MW-4 | Spoil/Mudstone | 4.07×10^{-3} | 11.54 |
| *MW-7 | Spoil/Mudstone | 0.46 | 1292.3 |
| MW-11 | Spoil/Mudstone | 4.28×10^{-3} | 12.13 |
| MW-15 | Spoil/Mudstone | 4.36×10^{-4} | 1.24 |
| MW-16 | Spoil/Mudstone | 0.022 | 62.35 |
| MW-20 | Spoil/Sandstone | 5.11×10^{-3} | 14.48 |
| | Average | 6.02×10^{-3} | 17.1 |

8.8 Groundwater Quality

Groundwater samples were analyzed from historic background locations S-1, S-2, D-1, and D-9 to obtain groundwater quality data. Individual samples were analyzed for major anions, major cations, trace elements, and pH (Table 8-3). Field parameters were also recorded during the time of sampling (Table 8-4). Groundwater pH was found to be between 5.3 and 7.0. A piper diagram of major cations and anions reveal that groundwater associated with the site is predominantly of a Ca-Mg-SO₄ hydrogeochemical facies (Figure 8-7). The predominance of calcium and magnesium as major cations is likely related to two factors: (1) primary deposition of the Pottsville along a marginal marine setting and (2) diagenetic carbonate-rich cements in the matrix of Pottsville rocks as well as calcite vein-filling. The Pottsville formation overlies alternating sequences of Cambrian through Mississippian limestones and dolomites. Stages of basin-wide burial, uplift, and fluid upwelling from carbonate-rich sequences are major contributing sources of calcium and magnesium. High concentrations of sulfate are likely the result of pyrite oxidation. Groundwater in coal basins characterized by relatively high concentrations of Ca-Mg-SO₄ and lower concentrations of Na and Cl typically indicate zones proximal to recharge areas.

Disseminated pyrite was found to be widespread in claystone, shale, and individual coal seams (Figure 8-8). An analysis of trace elements revealed that thallium was detected above primary Maximum Contaminant Levels (MCLs) in three of four background locations (S-1, D-1, and D-9) and arsenic matched the MCL in S-1 (Table 8-3). However, arsenic and thallium are commonly found in association with pyrite and marcasite (Diehl et al., 2004) and is likely attributed to the widespread occurrence of these minerals in Pottsville rocks and coal systems. Figure 8-8 shows pyrite occurrence within the Pratt coal seam taken from boring D-3. Arsenic detected (white dots) with a scanning electron microscope (SEM) is also presented as a panel in

Figure 8-8. Results of trace element analyses and field parameters are provided in Tables 8-3 and 8-4, respectively. Laboratory analytical reports and groundwater sampling forms are provided in Appendix H. A complete summary of hydrogeologic data for wells MW-1 through MW-20 is included as Table 8-5.

Figure 8-7. Piper diagram

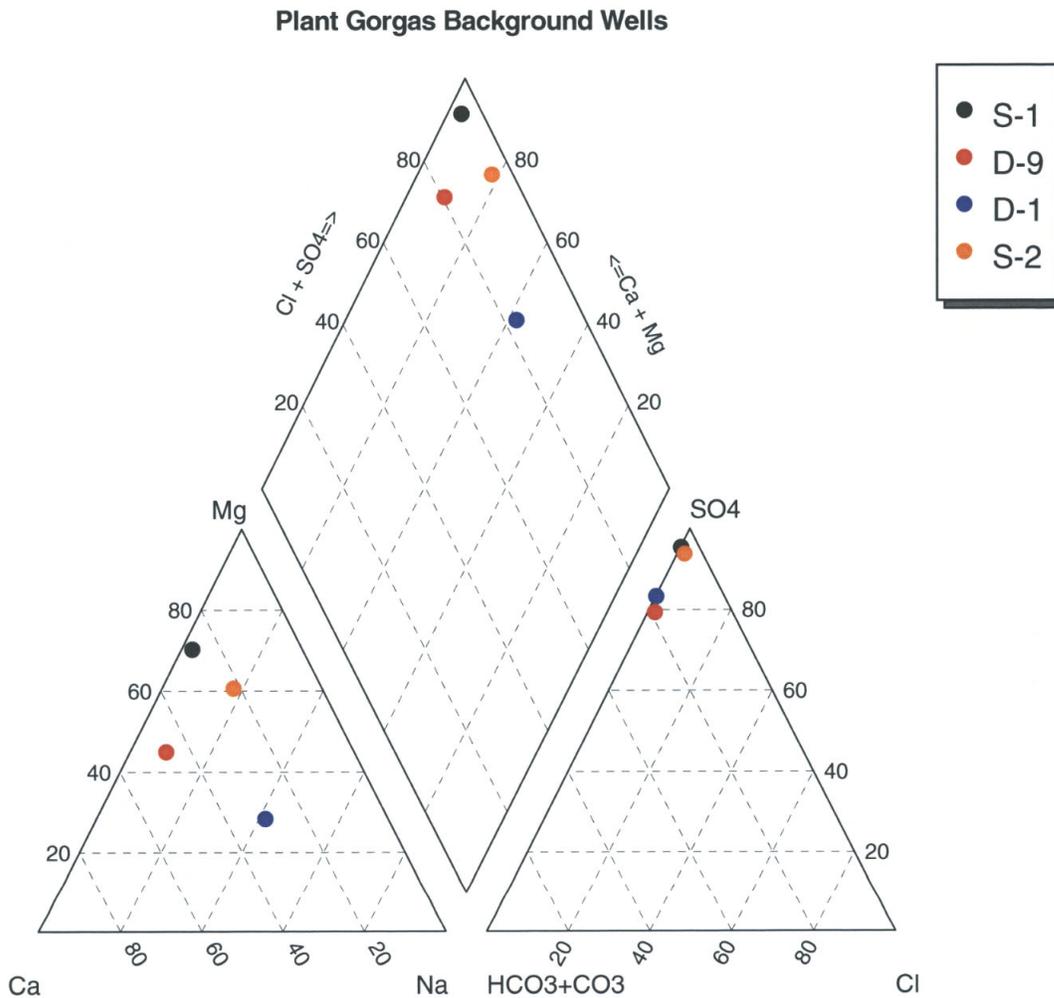


Table 8-3. Historic Background Well Trace Element Concentrations (mg/l)

| Location | Sb | As | Ba | Be | Cd | Cr | Co | Cu | Pb | Ni | Se | Ag | Tl | V | Zn |
|------------|--------------|-------------|------------|--------------|--------------|------------|-------------|-------------|---------------|------------|-------------|------------|--------------|-------------|--------------|
| S-1 | 0.004 | 0.010 | 0.010 | ND | ND | ND | ND | ND | ND | 0.011 | 0.020 | ND | 0.005 | 0.067 | 0.021 |
| S-2 | 0.003 | 0.005 | 0.032 | ND | ND | ND | 0.311 | ND | ND | 0.072 | 0.009 | ND | ND | 0.058 | 0.077 |
| D-1 | ND | 0.009 | 0.039 | ND | ND | ND | ND | ND | ND | 0.006 | ND | ND | 0.004 | 0.053 | 0.011 |
| D-9 | ND | 0.005 | 0.048 | ND | ND | ND | ND | ND | ND | 0.004 | ND | ND | 0.004 | 0.052 | 0.009 |
| MCL | 0.006 | 0.01 | 2.0 | 0.004 | 0.005 | 0.1 | None | 1.0* | 0.015* | 0.1 | 0.05 | 0.1 | 0.002 | None | 5.0** |

*ND – Non-Detect

*All concentrations are in mg/l

** Indicates secondary MCL

Table 8-4. Field Parameters from Background Locations

| Location | Average pH (SU) | Average Conductivity (mS/cm) | Average ORP (mv) |
|----------|-----------------|------------------------------|------------------|
| S-1 | 6.51 | 4.35 | 51.30 |
| S-2 | 5.35 | 1.81 | 105.07 |
| D-1 | 6.95 | 2.94 | -74.83 |
| D-9 | 6.15 | 1.65 | 27.57 |

Notes:

SU indicates standard units.

mS/cm indicates millisiemens per centimeter.

mV indicates millivolts.

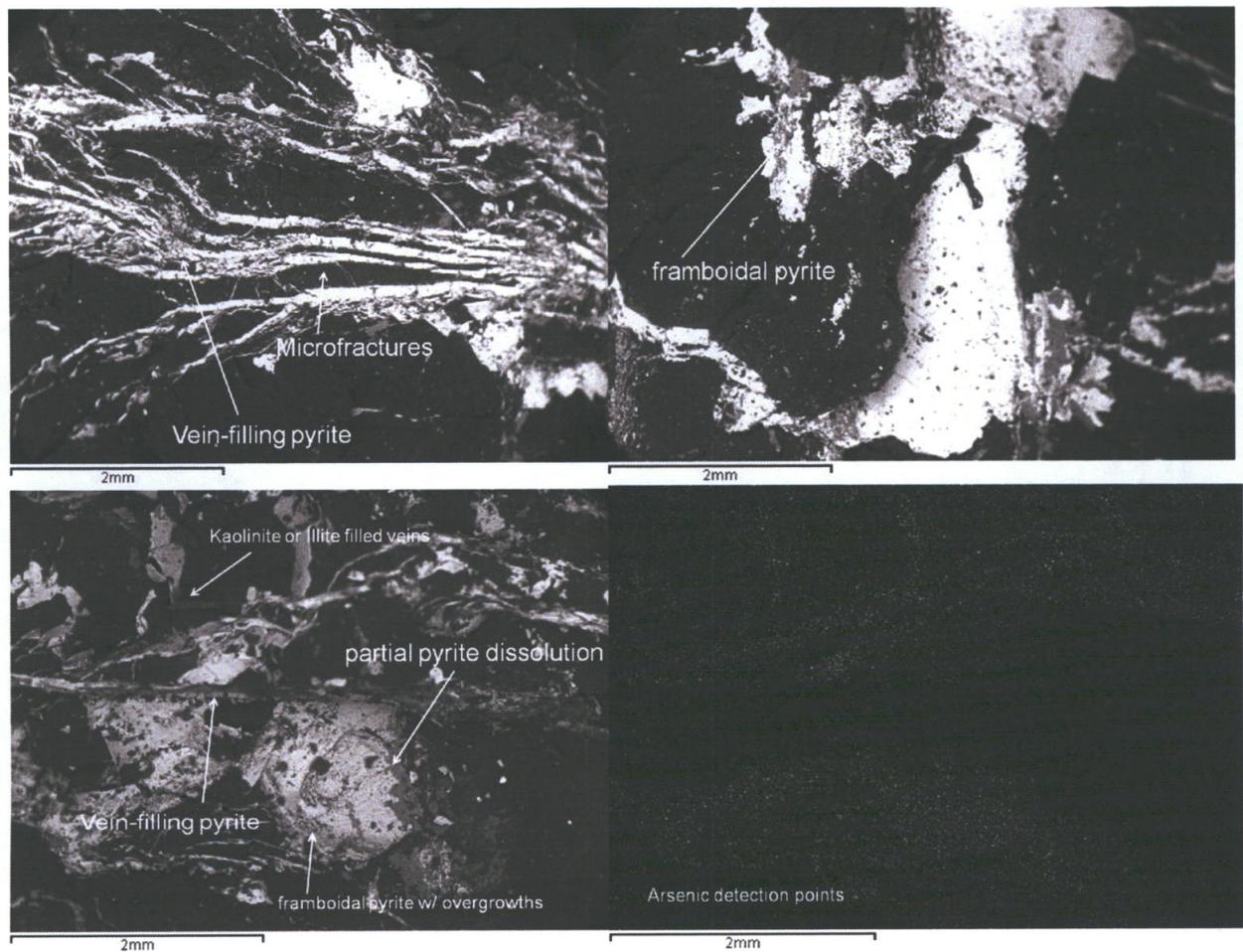


Figure 8-8. Pyrite occurrence in the Pratt seam (D-3).

Table 8-5. Hydrogeologic Summary of Locations MW-1 through MW-20

| Well ID | Northing | Eastings | Ground Elev (feet MSL) | TOC Elev (ft MSL) | Top of Screen (ft MSL) | GW Elevation 12/8/14 (ft MSL) | GW Elevation 1/6/15 (ft MSL) | Recharge Rate (gpm) | Hydraulic Cond. (cm/s) | Drilling Method |
|--------------|-------------|------------|------------------------|-------------------|------------------------|-------------------------------|------------------------------|---------------------|-------------------------|-----------------|
| MW-1 | 1330794.064 | 594082.361 | 499.19 | 502.38 | 405.1 | 410.28 | 410.73 | 0.3 | 2.47 x 10 ⁻⁴ | CME |
| MW-2 | 1331053.309 | 593548.802 | 498.54 | 502.17 | 417.9 | 416.84 | 420.18 | 1.0 | | Rotosonic |
| MW-3 | 1330842.402 | 593025.397 | 522.23 | 525.90 | 417.1 | 415.32 | 420.20 | 0.05 | | Rotosonic |
| MW-4 | 1330289.727 | 592896.414 | 516.67 | 517.89 | 400.4 | 400.07 | 402.27 | 0.2 | 4.07 x 10 ⁻³ | CME |
| MW-5 | 1328645.982 | 592436.538 | 471.55 | 474.76 | 347.9 | 348.58 | 348.83 | 0.1 | | Rotosonic |
| MW-6 | 1327877.972 | 592829.837 | 409.99 | 413.01 | 294.4 | 306.72 | 308.55 | 0.8 | | Rotosonic |
| MW-7 | 1328515.235 | 593408.341 | 391.59 | 394.36 | 331.0 | 333.59 | 334.68 | +2.0 | 0.46 | Rotosonic |
| MW-8 | 1329140.729 | 593813.964 | 413.15 | 415.53 | 354.3 | 352.13 | 352.13 | 0.4 | | CME |
| MW-9 | 1329976.529 | 594124.617 | 487.15 | 490.60 | 377.5 | 376.74 | 376.78 | 0.05 | | Rotosonic |
| *MW-10/(D-4) | 1327772.466 | 593907.164 | 391.66 | 395.10 | 307.4 | 308.97 | 309.37 | 0.5 | 7.13 x 10 ⁻⁵ | Air Hammer |
| MW-11 | 1328108.244 | 594813.968 | 403.69 | 406.96 | 282.1 | 299.60 | 305.00 | 1.0 | 4.28 x 10 ⁻³ | Rotosonic |
| MW-12 | 1328563.733 | 594741.233 | 470.74 | 474.24 | 315.1 | 318.40 | 319.36 | 0.2 | | Rotosonic |
| MW-13 | 1329383.939 | 595088.06 | 442.04 | 445.29 | 346.4 | 350.69 | 352.05 | 0.1 | | Rotosonic |
| MW-14 | 1329549.381 | 595627.606 | 426.90 | 430.20 | 336.8 | 340.74 | 341.39 | 1.0 | | Rotosonic |
| MW-15 | 1329680.612 | 595932.099 | 403.10 | 406.05 | 329.1 | 338.08 | 338.57 | 1.0 | 4.36 x 10 ⁻⁴ | CME |
| MW-16 | 1328655.721 | 596399.878 | 411.57 | 414.68 | 315.0 | 323.14 | 325.71 | 1.5 | 0.022 | Rotosonic |
| MW-17 | 1328253.359 | 596174.137 | 429.03 | 432.27 | 332.9 | Dry | Dry | Dry | | Rotosonic |
| MW-18 | 1327977.419 | 595793.776 | 411.42 | 415.09 | 306.8 | 300.58 | 300.54 | 1.5 | | Rotosonic |
| MW-19 | 1327697.305 | 595251.571 | 375.11 | 378.53 | 290.4 | 295.48 | 297.83 | 0.4 | | CME |
| MW-20 | 1327792.527 | 594841.227 | 329.89 | 332.88 | 269.6 | 297.66 | 303.40 | 2.5 | 5.11 x 10 ⁻³ | Rotosonic |

* Indicates well installed in native Pottsville Formation (American Coal Seam)

9 GROUNDWATER POLLUTION POTENTIAL

9.1 Introduction

In order to determine groundwater pollution potential and rate of leachate migration from the proposed disposal facilities, two analyses were performed:

- DRASTIC Index, and a
- Pathway Analysis (Horizontal).

9.2 DRASTIC Index

DRASTIC (U.S. EPA 600/2-87/035, June 1987) is a relative rating system that can be used as a preliminary screening tool to indicate the relative vulnerability of groundwater pollution in the proposed disposal facility area. The DRASTIC system, as published by the EPA, is an empirical point-count system originally developed by H. E. LeGrand in 1964 and modified by the EPA. The system contains three significant parts: (1) weights, (2) ranges, and (3) ratings. The DRASTIC index is defined by: (1) depth to water, (2) net recharge, (3) the aquifer media, (4) the soil media, (5) topography, (6) impact of the vadose zone, and (7) hydraulic conductivity of the aquifer media.

Each DRASTIC factor has been evaluated with respect to the other in order to determine the relative importance of each factor. Weights range from 1 to 5, with a weight of 5 being the most significant. Ranges are assigned to different media or physical properties of the site and are rated by category with regards to which media or property is most likely to lead to groundwater pollution. For each DRASTIC Factor, the rating is multiplied by the predetermined weight and then added to calculate the DRASTIC index of the site.

The DRASTIC index is calculated by the following formula:

$$\text{Pollution Potential} = D_r D_w + R_r R_w + A_r A_w + S_r S_w + T_r T_w + I_r I_w + C_r C_w$$

where:

r = rating

w = weight

D = depth to water

R = net recharge,

A = aquifer media,

S = soil media,

T = topography,

I = impact of vadose zone, and

C = hydraulic conductivity of aquifer media

The DRASTIC index of the site was calculated with a few different ranges for the respective factors that make up the index. This allows for a presentation of the best case and worst case scenarios within the range of factors encountered at the site. Based upon the field data, the

estimated DRASTIC index ranges from a score of 66 to 128. These indicate low to moderate susceptibility for aquifer contamination at the site. This is in agreement with the USGS’s report on “Geohydrology and Susceptibility of Major Aquifers to Surface Contamination in Alabama; Area 3” (Stricklin, 1989).

Table 9-1. Scenario 1 DRASTIC Index

| <i>Factor</i> | <i>Range</i> | <i>Rating</i> | <i>Weight</i> | <i>Point Score</i> |
|------------------------|--------------------------------|---------------|---------------|--------------------|
| Depth to Water | 30-50 | 5 | 5 | 25 |
| Net Recharge | 7-10 in/yr | 8 | 4 | 32 |
| Aquifer Media | Shale Sequences | 6 | 3 | 18 |
| Soil Media | Silty Loam | 4 | 2 | 8 |
| Topography | 2-6% slope | 9 | 1 | 9 |
| Impact of Vadose Zone | Sand/Gravel with silt and clay | 6 | 5 | 30 |
| Hydraulic Conductivity | 100-300 gpd/ft ² | 2 | 3 | 6 |
| Score | | | | 128 |

Table 9-2. Scenario 2 DRASTIC Index

| <i>Factor</i> | <i>Range</i> | <i>Rating</i> | <i>Weight</i> | <i>Point Score</i> |
|------------------------|---------------------------|---------------|---------------|--------------------|
| Depth to Water | 100+ | 1 | 5 | 5 |
| Net Recharge | 4-7 in/yr | 6 | 4 | 24 |
| Aquifer Media | Shale Sequences | 6 | 3 | 18 |
| Soil Media | Clay Loam | 3 | 2 | 6 |
| Topography | 6-12% slope | 5 | 1 | 5 |
| Impact of Vadose Zone | Silt/Clay | 1 | 5 | 5 |
| Hydraulic Conductivity | 1-100 gpd/ft ² | 1 | 3 | 3 |
| Score | | | | 66 |

9.3 Pathway Analysis (Horizontal Travel Time)

9.3.1 Calculated Groundwater Velocities

Pathway analyses provide an estimate on how long it would take pollutants to reach potentially sensitive receptors. As discovered in the water well survey, no private or public supply wells are located down-gradient of the proposed disposal facilities. Therefore, for the purpose of this pathway analysis, we consider the Warrior River as the only potential sensitive to receptor. Horizontal flow velocity calculations were performed using the Darcy equation. The linear flow velocity can be estimated with known values of hydraulic conductivity (K), calculated values of hydraulic gradient (i), an appropriate estimate of effective porosity (η), and the following equation:

$$v = \frac{Ki}{\eta}$$

where :

v = linear velocity (ft / sec or m / sec)

i = hydraulic gradient = $\frac{(h_1 - h_2)}{l}$ (ft / ft)

η = estimated effective porosity

K = hydraulic conductivity (ft/sec or m/sec)

The calculated average hydraulic gradient at the site is 0.032 ft/ft (Table 8-1). The average hydraulic conductivity of initial determined from the first saturated zone is 17.07 feet/day as determined by field tests (Table 8-2). The average porosity of Pottsville rocks is generally around 10% (Hunter, J.A. and Moser, P.H., 1990); however, no data is present for effective porosity. No porosity data is known for mine overburden materials underneath Plant Gorgas. However, a study by Hawkins (1995) of mine overburden hydrology in the Appalachians revealed a porosity between 13.8 and 16.4%. Therefore, we will consider effective porosity to equal total porosity and use Hawkins' average 15.1% porosity for these calculations. The resulting flow velocity is as follows:

With an average hydraulic conductivity of 17.07 feet/day (Table 8-2), the flow velocity is as follows:

$$v = \frac{(17.07 \text{ ft/day})(0.032 \text{ ft/ft})}{(0.151)} = 3.62 \text{ ft/day}$$

9.3.2 Description of the Relationship Between Groundwater Flow Directions and Potential Receptors

The groundwater flow directions indicated on the potentiometric map are to the Mulberry Fork of the Black Warrior River. The distance to the river from the proposed gypsum facility is approximately 2,340 feet and 4,890 feet from the proposed baghouse facility given the flow path.

9.3.3 Estimated Travel Time for Leachate to Reach Potential Receptors

The estimated travel times for leachate to reach the Black Warrior River is determined from the average calculated groundwater flow velocities of Section 8.3.1. Using the calculated groundwater flow velocity of 3.62 feet/day, travel times to reach the river would be 1.77 years from the proposed gypsum facility and 3.70 years from the proposed baghouse facility. This calculation does not factor in the presence of liner systems installed at each facility or changes in lithology from mine overburden to native Pottsville.

9.4 Description of Relationship Between the Vadose Zone and Uppermost Aquifer

A minimum 5 feet of separation has been established between the bottom of the composite liner and the seasonal high groundwater elevations. Anticipated flow paths for any leachate generated within the cells would be through the liner and compacted soil system and the separation zone prior to reaching groundwater. The liner system will be comprised of 1 foot of low conductive clay at the base, overlain by a geocomposite layer (GCL), a 60-mil HDPE liner, and a geocomposite leachate collection system.

The lower 3 to 5 feet of mine overburden material and upper 5 to 7 feet of Pottsville comprise the uppermost aquifer. The vadose or unsaturated zone beneath the proposed disposal facilities extends down near the base of the mine overburden and averages 95 to 100 feet in thickness. In general, vadose zone thickness mimics site topography and depth to rock. Recharge through the vadose zone in mine overburden materials is typically channeled through interconnected silty layers. Flow through these zones may be vertical or horizontal, but eventually reaches the top of rock interface. At higher elevations, depth to the first signs of moisture can be as great as 155 feet and conversely, at lower elevations can appear from 55 to 65 feet.

9.5 Mitigation of Geologic and Natural Hazards

There were no geologic or other hazards detected at this site.

10 DISCUSSION

The proposed disposal facilities at Plant Gorgas are located within a highly disturbed site that has been open pit mined over several stages for economical coal seams of the Pratt Group. Along the southwest and extreme western boundaries of the proposed facilities, no mining took place. In locations that have been mined, the overburden is characterized by thick (40 to 160 feet) successions of backfilled mine overburden and are comprised of variable components of shale and sandstone boulders and silty, clay. Un-mined locations display a natural overburden, comprised of 3 to 5 feet of residual silt and clay.

The local bedrock beneath the proposed disposal facilities is comprised of alternating sequences of shale, siltstone, sandstone, and coal of the Upper Pottsville formation. Locally, the Pottsville is approximately 2100 feet thick beneath the site. Depth to bedrock in mined portions of the site range from as shallow as 3 feet (in un-mined areas) and up to 160 feet in previously mined areas. Rocks exposed and correlated through boring logs indicate that local dip is to the south-southeast between 1.0 and 2.5 degrees.

A geochemical analysis of rock and coal fragments (from spoil materials and natural formation) revealed that locally the Pottsville Formation contains significant amounts of natural trace metals. These trace metals are most likely associated with pyrite and other sulfides within coal seams and other organic-rich zones. Preliminary background water quality analyses indicate that arsenic and thallium are present at concentrations near the MCL. In reviewing the elemental analyses, arsenic is commonly detected in samples and thallium was detected in one coal seam sample. Thus, trace metals are likely to occur naturally in the groundwater system. More background sampling will be conducted with wells MW-1 through MW-20 to build a statistical base for downgradient comparison.

Site hydrogeological characterization studies and ADEM Admin Rule 335-13-1-.03(121) indicate that the Relevant Point of Compliance for the landfill facilities should be the mine-spoil overburden – rock interface zone. This zone is largely the first saturated zone beneath the site and is laterally extensive enough to represent the quality of background groundwater that has not been affected by leakage from a unit and also would be the first zone impacted by leakage downgradient of the landfill facility. At one location, MW-10, mine overburden is not present and therefore, the first groundwater producing zone of the Pottsville formation will be monitored. Utilizing this strategy, the Relevant Point of Compliance would be protective of the Pottsville Aquifer.

All monitoring wells will be located with 150 meters (492 feet) of the waste management boundary and will be located to ensure that samples representative of the first zone of saturation are collected during monitoring activities.

Data from a network of mine overburden – top of rock piezometers were used to facilitate a groundwater monitoring plan. Separate groundwater monitoring systems are proposed for the site's landfill facilities. In total, the systems will be comprised of 20 monitoring wells. Location MW-17 did not produce water and will have to be abandoned and replaced.

The baghouse byproduct facility's groundwater monitoring network will be comprised of four upgradient wells and six downgradient wells. Upgradient wells will be clustered to the north of the baghouse landfill facility and compliance wells will be located around the perimeter and within 150 meters of the waste management boundary.

The gypsum facility's groundwater monitoring network will be comprised of eight upgradient wells and five downgradient wells located around the perimeter of the facility and within 150 meters of the waste management boundary. Locations MW-1 through MW-4 will serve as background locations for both the baghouse byproduct and gypsum facilities. Location MW-11 is not truly upgradient or downgradient of the gypsum facility and therefore, will be treated as a side or crossgradient well.

Groundwater monitoring wells will be screened across the mine overburden – top of rock interface as this corresponds to the first zone of saturation beneath the site and complies best with ADEM's general definition of the relevant point of compliance. All groundwater monitoring wells will be designed and constructed in accordance with: "Design and Installation of Groundwater Monitoring Wells in Aquifers", ASTM Subcommittee D18.21.

11 CONCLUSIONS

Per ADEM Administrative Code r. 335-13-4 (Permit Requirements), site investigations were performed to determine if the site is acceptable for coal combustion byproduct disposal and to determine a groundwater monitoring strategy for the disposal facilities. This Site Hydrogeological Evaluation Report presents the results of the investigation. The following key points are summarized below:

- The proposed disposal facilities are located well upland of the 100-yr flood zone.
- The proposed disposal facilities are not located within 10,000 feet of an airport runway.
- There are no registered historic sites or adjacent properties of concern.
- A field reconnaissance survey performed by Alabama Power found no wetlands or streams within the footprint of the disposal facilities. Therefore, the construction and operation of the facilities will not adversely impact any streams or wetlands.
- A water well inventory revealed no public drinking water supply sources within 1-mile of the proposed facilities. Three potential private wells were located; however, these wells are located hydraulically upgradient of the site
- One fault was identified during field investigations; however, there has been no active faulting or dislocation during the Holocene epoch (~ 12,000 years). Another fault was identified on a historic mining map. Neither fault is located within 200-feet of the proposed baghouse or gypsum disposal facilities.
- The proposed disposal facilities are located within an area that was previously strip mined for coal; however, no underground mining or anthropogenic hazards were identified in association with previous mining-related activities at the site.
- The mapped peak ground acceleration for the site is 0.143 g and equates to 0.172 g with a dense soil, soft rock soil type. The proposed disposal facilities will be designed and constructed so as to withstand these peak ground acceleration values.
- Drinking water in the area is derived from a surface intake on the Mulberry Fork of the Warrior River, this intake is located upgradient and not within the 1-mile of the proposed disposal facilities. Groundwater use in Walker County accounts for less than 1% of the total water usage and is largely budgeted for irrigation purposes.
- The first zone of saturation for groundwater monitoring was determined to generally be the interval corresponding to the base of mine overburden– top of rock interface.
- Groundwater flow across the site averages between 3.62 ft/d and flows south-southeast across the site.
- Groundwater pollution potential was determined using the DRASTIC Index as well as a Pathway Analysis (horizontal travel time). The DRASTIC Index produced scores between 66 and 128 for the site, indicating low to moderate vulnerability for groundwater pollution. The pathway analysis calculated from the edge of the disposal facilities to the Black Warrior River indicates travel times of 1.77 years from the gypsum facility, 2.67 years from the bottom ash area, and 3.70 years from the baghouse byproduct storage facility. Travel times do not factor in the low permeability liners used within the proposed gypsum and baghouse facilities.
- Rocks of the Pottsville Formation were found to have significant amounts of trace metals. These metals are likely associated with pyrite and other sulfide minerals. The presence of arsenic and thallium in background water samples is likely attributed to these sources.

- A groundwater monitoring network will be designed to provide early detection in the unlikely event that regulated constituents might reach groundwater and surface water.
- With permission from ADEM, these wells will be installed within the mine overburden-top of rock interface and down gradient wells will be located within 150 meters of the compliance boundary.
- A groundwater monitoring plan will be submitted in addition to this report. This plan will include sampling, transporting, and analysis procedures consistent with EPA and Division 13 regulations. Groundwater samples will be analyzed for trace metals identified during the leachate characterization phase and those specified by ADEM regulations.

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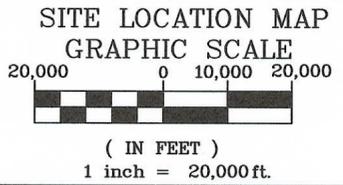
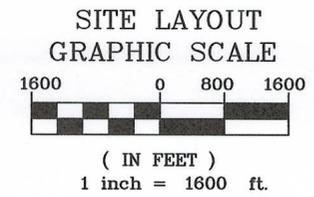
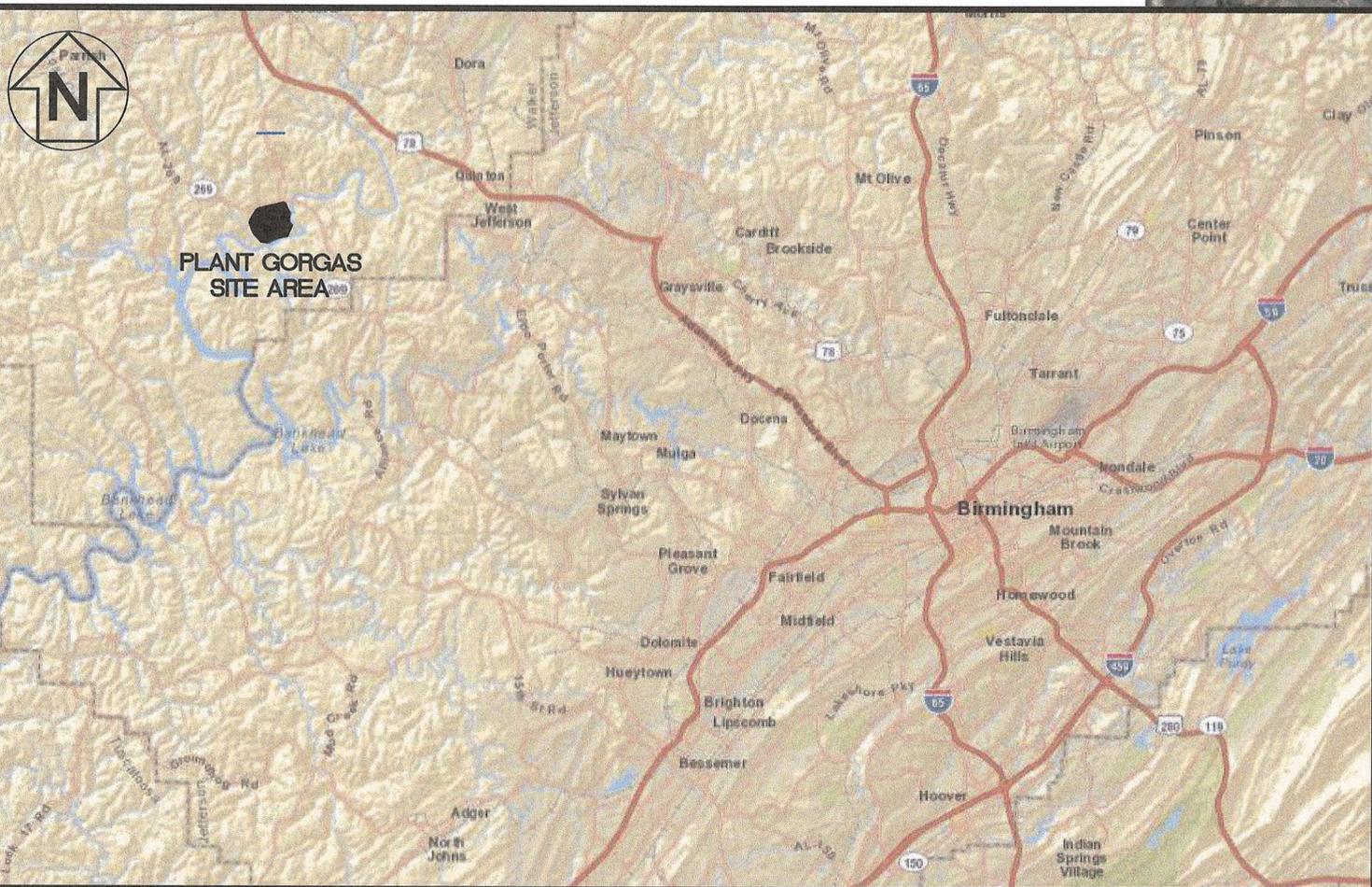
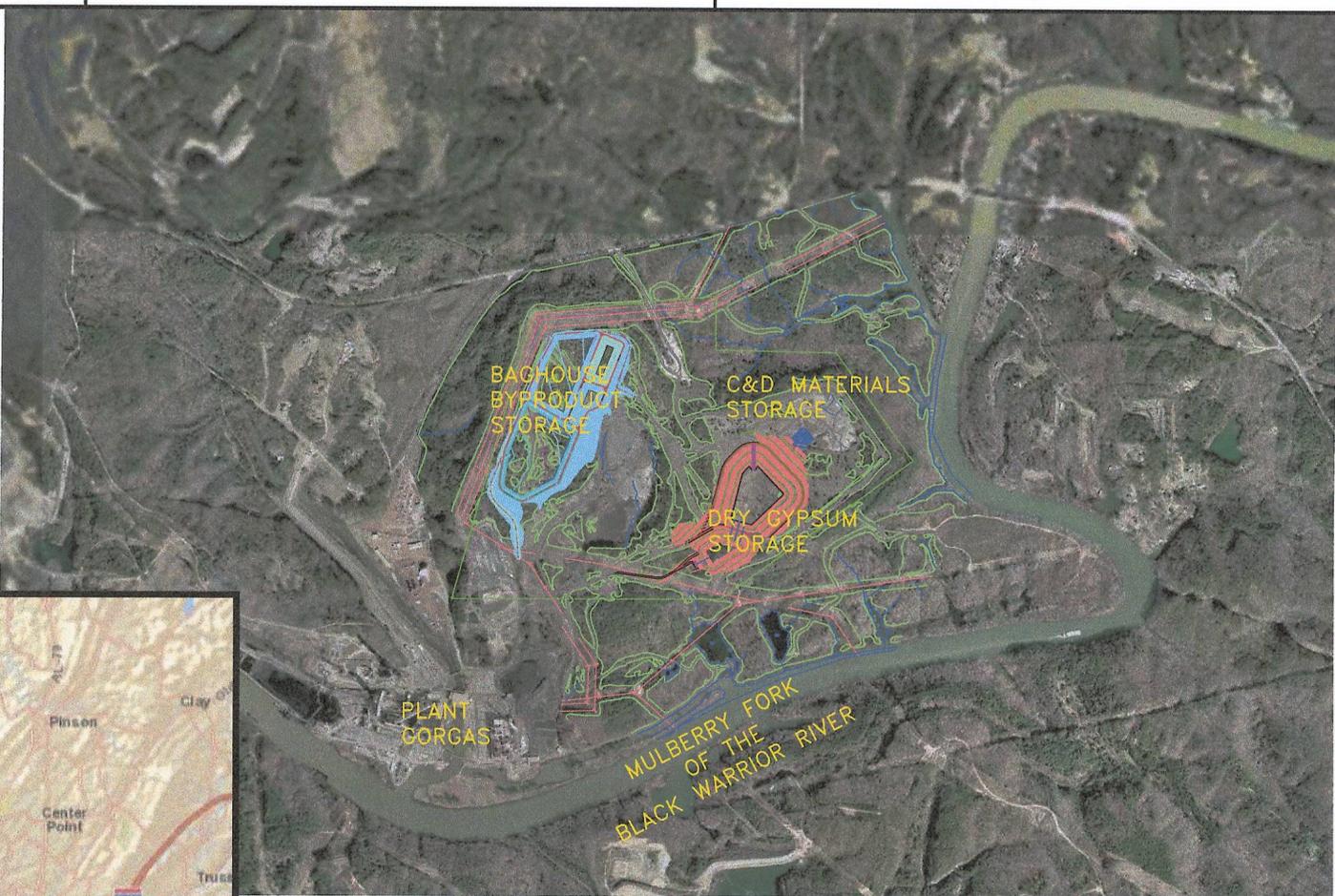
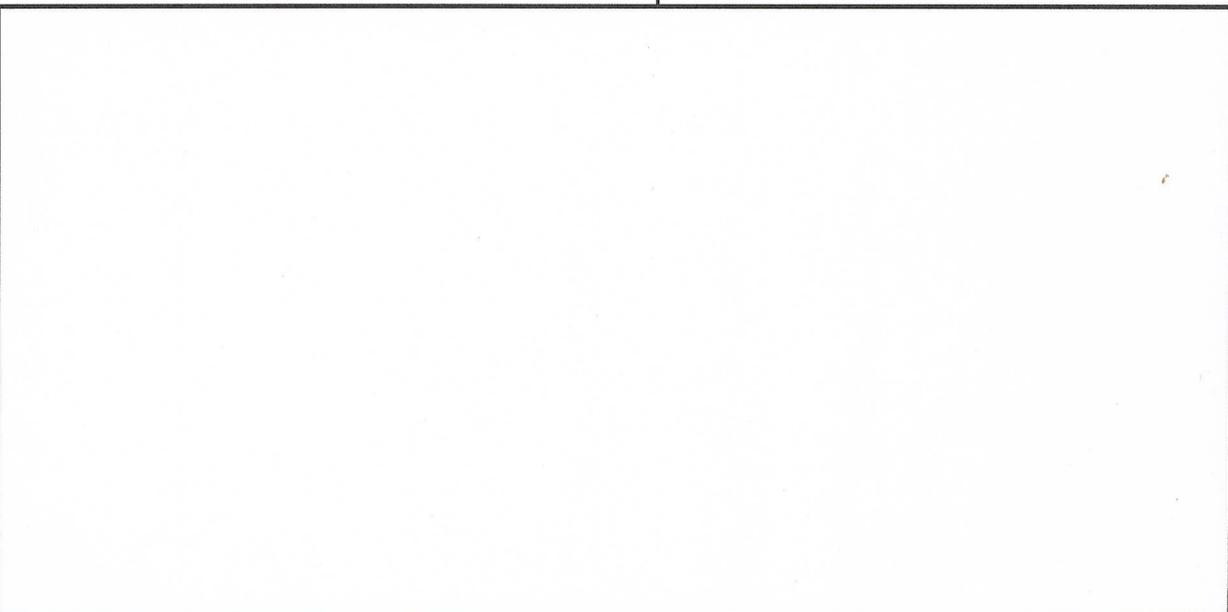


FIGURE 3-1

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**Southern Company Services
Engineering and Construction Services
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Alabama Power Company

**PLANT GORGAS
UNIT 8, UNIT 9 AND UNIT 10
CCB STORAGE FACILITY
SITE LOCATION MAP**

| REVISION | DATE | REVISION | DATE |
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| REVISION | DATE |
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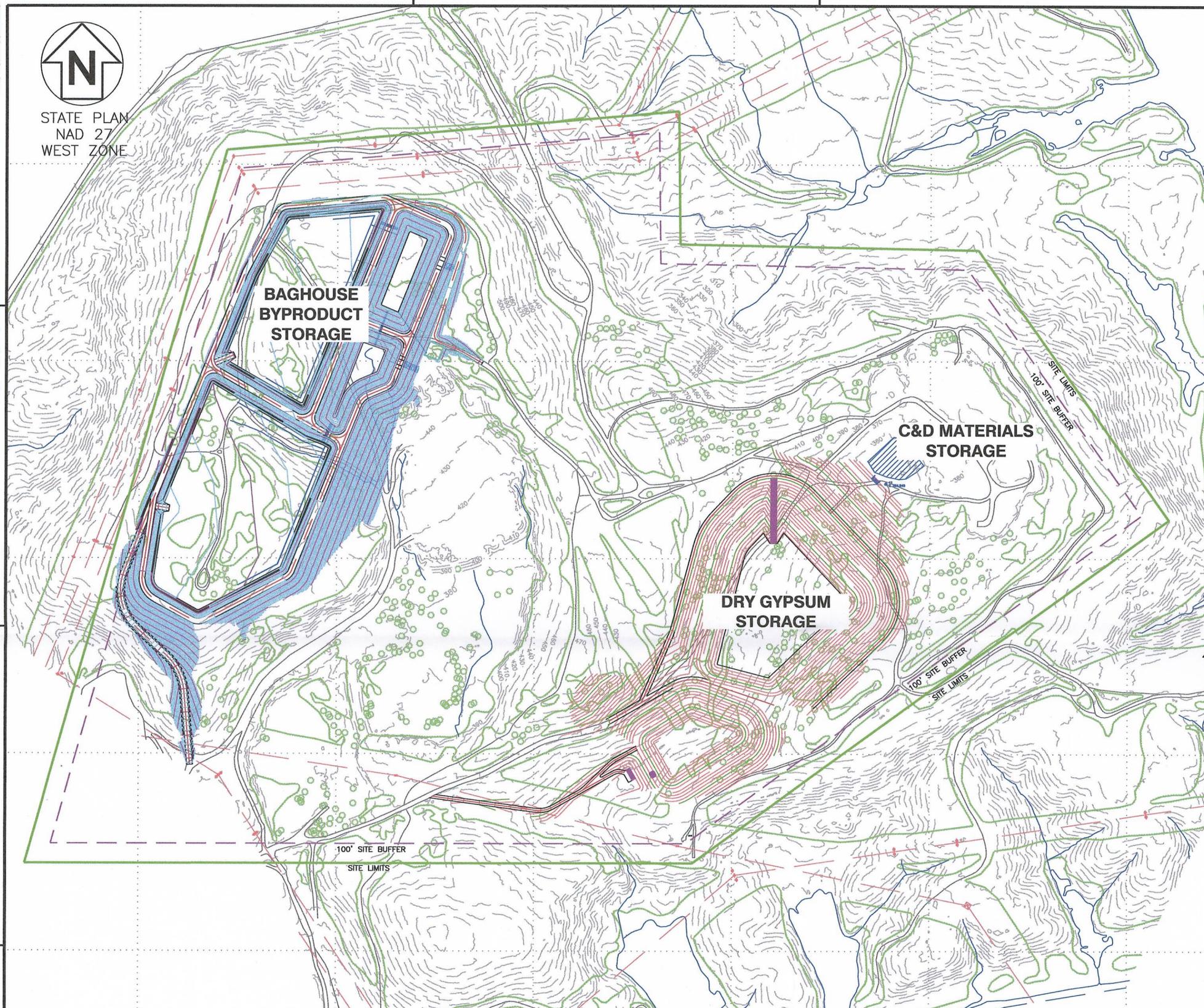
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| ASF | GBD | SCB | XXX | XXX | XXX | XXX | ASF | GBD | SCB | XXX | XXX | XXX | XXX | AS SHOWN | ES2418 FIG 3 1 | 1 | FINAL | 0 |

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STATE PLAN
NAD 27
WEST ZONE



LEGEND

- 100 — — EXISTING GROUND CONTOURS (10' CONTOUR INTERVAL)
- 100 — — BAGHOUSE BYPRODUCT BASE GRADE
- 100 — — GYPSUM FACILITY BASE GRADE
- — — — EXISTING ROAD (DIRT/GRAVEL/ASPHALT)
- — — — ACCESS/PERIMETER ROADS
- — — — SITE LIMITS
- - - - 100' SITE BUFFER
- - - - OVERHEAD POWER
- ⊕ EXISTING POWER POLE
- ⌞ TREELINE
- — — — SURFACE WATER

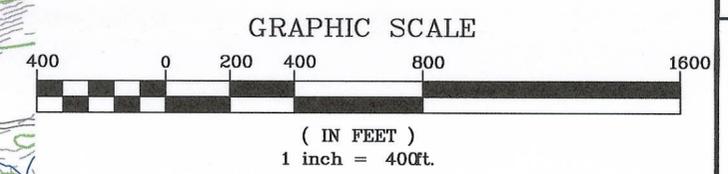


FIGURE 3-2

NOTES:

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FOR

Alabama Power Company

PLANT GORGAS
UNIT 8, UNIT 9 AND UNIT 10
CCB STORAGE FACILITY
SITE TOPOGRAPHIC AND
PLAN MAP

| REVISION | DATE | REVISION | DATE |
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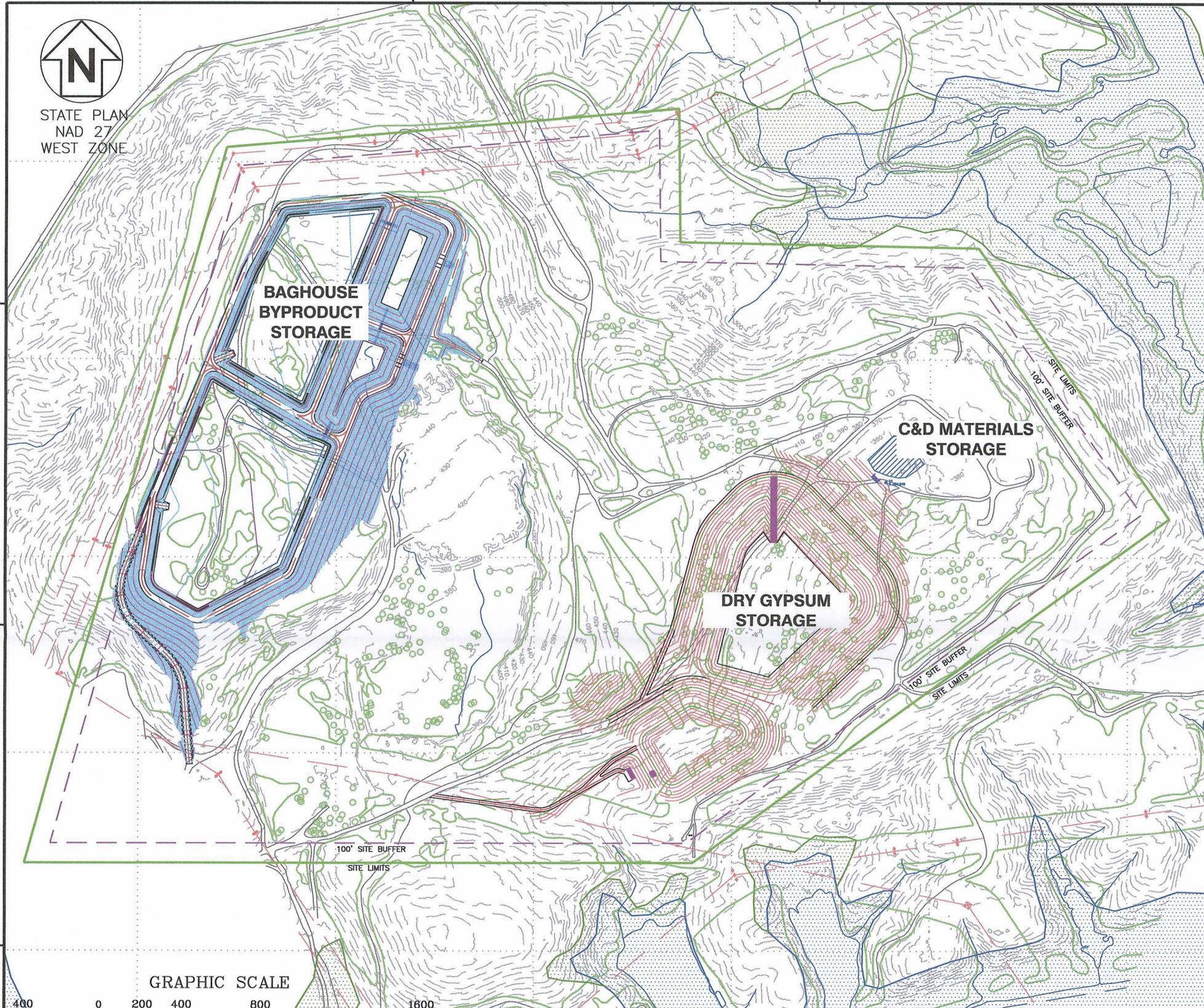
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| ASF | GBD | SCB | XXX | XXX | XXX | XXX | ASF | GBD | SCB | XXX | XXX | XXX | XXX | AS SHOWN | ES2418 FIG 3 2 | 1 | FINAL | 0 |

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STATE PLAN
NAD 27
WEST ZONE



LEGEND

- 100 — EXISTING GROUND CONTOURS (10' CONTOUR INTERVAL)
- 100 — BAGHOUSE BYPRODUCT BASE GRADE
- 100 — GYPSUM FACILITY BASE GRADE
- — EXISTING ROAD (DIRT/GRAVEL/ASPHALT)
- — ACCESS/PERIMETER ROADS
- — SITE LIMITS
- - - 100' SITE BUFFER
- - - OVERHEAD POWER
- ⊕ EXISTING POWER POLE
- ☁ TREELINE
- — SURFACE WATER
- [Pattern] 100 YEAR FLOOD ZONE
- [Pattern] 1000 YEAR FLOOD ZONE

PANEL 0490D

FIRM
FLOOD INSURANCE RATE MAP

WALKER COUNTY,
ALABAMA
AND INCORPORATED AREAS

PANEL 490 OF 595
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:
COMMUNITY NUMBER PANEL SUFFIX
WALKER COUNTY 010201 0490 D

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

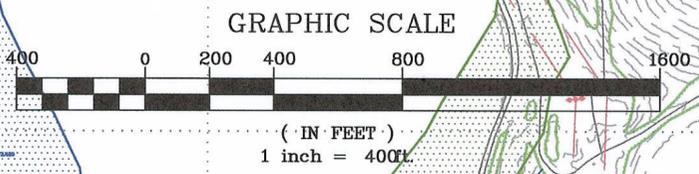
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AUGUST 2, 2007 01127C0490D

State of Alabama
Federal Emergency Management Agency

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FIGURE 3-3



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Alabama Power Company

PLANT GORGAS
UNIT 8, UNIT 9 AND UNIT 10
CCB STORAGE FACILITY
FLOOD ZONE MAP

| REVISION | DATE | REVISION | DATE | REVISION | DATE | | | | | | | | | | | | | | | | |
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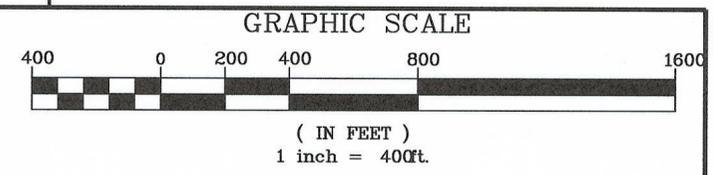


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STATE PLAN
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LEGEND

- 100 --- EXISTING GROUND CONTOURS (10' CONTOUR INTERVAL)
- 100 — BAGHOUSE BYPRODUCT BASE GRADE
- 100 — GYPSUM FACILITY BASE GRADE
- — — EXISTING ROAD (DIRT/GRAVEL/ASPHALT)
- — — ACCESS/PERIMETER ROADS
- — — SITE LIMITS
- - - 100' SITE BUFFER
- - - OVERHEAD POWER
- ⊕ EXISTING POWER POLE
- ⌋ TREELINE
- — — SURFACE WATER
- D U FAULT AS MAPPED DURING MINING

NOTES:

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3. FAULT LINE SOURCE: 1977 RUSSELL COAL MINING HISTORICAL MAP.



FIGURE 5-7

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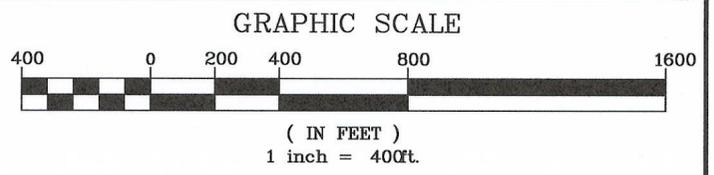
**PLANT GORGAS
UNIT 8, UNIT 9 AND UNIT 10
CCB STORAGE FACILITY
FAULT LOCATION MAP**

| REVISION | DATE | REVISION | DATE | REVISION | DATE | | | | | | | | | | | | | | | | | | | | |
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| BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
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STATE PLAN
NAD 27
WEST ZONE



LEGEND

- 100 EXISTING GROUND CONTOURS (10' CONTOUR INTERVAL)
- 100 BAGHOUSE BYPRODUCT BASE GRADE
- 100 GYPSUM FACILITY BASE GRADE
- EXISTING ROAD (DIRT/GRAVEL/ASPHALT)
- ACCESS/PERIMETER ROADS
- SITE LIMITS
- 100' SITE BUFFER
- OVERBURDEN PIEZOMETER
- GEOTECHNICAL PIEZOMETER OR BORING
- ROCK PIEZOMETER
- OVERHEAD POWER
- EXISTING POWER POLE
- TREELINE
- SURFACE WATER
- FAULT AS MAPPED DURING MINING

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FIGURE 7-1

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HISTORIC BORING LOCATION MAP**

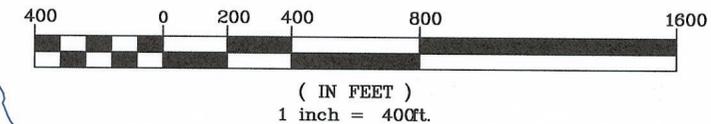
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| | | | | | | | ASF | GBD | SCB | XXX | XXX | XXX | XXX | AS SHOWN | | | | | | | ES2418 FIG 7_1 | 1 | FINAL | 0 | |

target
ZERO
Every day, every job, safely.



STATE PLAN
NAD 27
WEST ZONE

GRAPHIC SCALE



LEGEND

- 100 — — EXISTING GROUND CONTOURS (10' CONTOUR INTERVAL)
- 100 — — BAGHOUSE BYPRODUCT BASE GRADE
- 100 — — GYPSUM FACILITY BASE GRADE
- — — — EXISTING ROAD (DIRT/GRAVEL/ASPHALT)
- — — — ACCESS/PERIMETER ROADS
- — — — SITE LIMITS
- — — — 100' SITE BUFFER
- ⊙* CURRENT WELL LOCATIONS (ASTERICK DENOTES ROCK WELL)
- TREELINE
- SURFACE WATER
- D — U — FAULT AS MAPPED DURING MINING

NOTES:

1. DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
2. COORDINATES SHOWN ARE IN ALABAMA STATE PLANE NAD 27, WEST ZONE
3. LOCATION MW-17 WILL BE ABANDONED AND REPLACED WITH PERMISSION FROM ADEM.
4. MW-10 IS SCREENED ACROSS THE AMERICAN COAL SEAM. (NO MINE SPOIL ENCOUNTERED)

NOTE:

FAULTS INDICATED AS MAPPED DURING ACTIVE COAL MINING OPERATIONS.

FIGURE 7-2

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Engineering and Construction Services
FOR**

Alabama Power Company

**PLANT GORGAS
UNIT 8, UNIT 9 AND UNIT 10
CCB STORAGE FACILITY
CURRENT WELL LOCATION MAP**

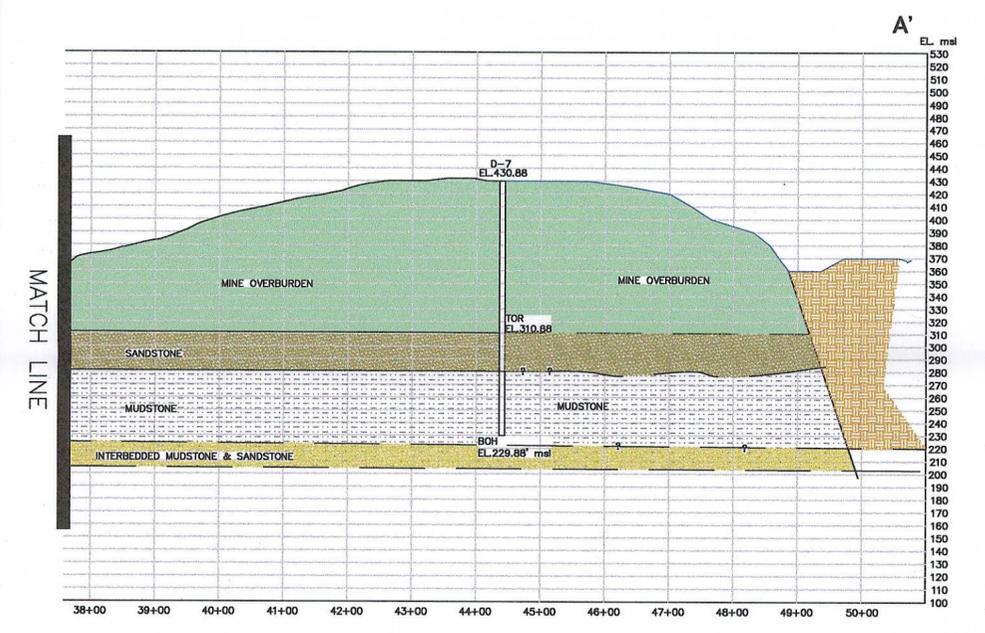
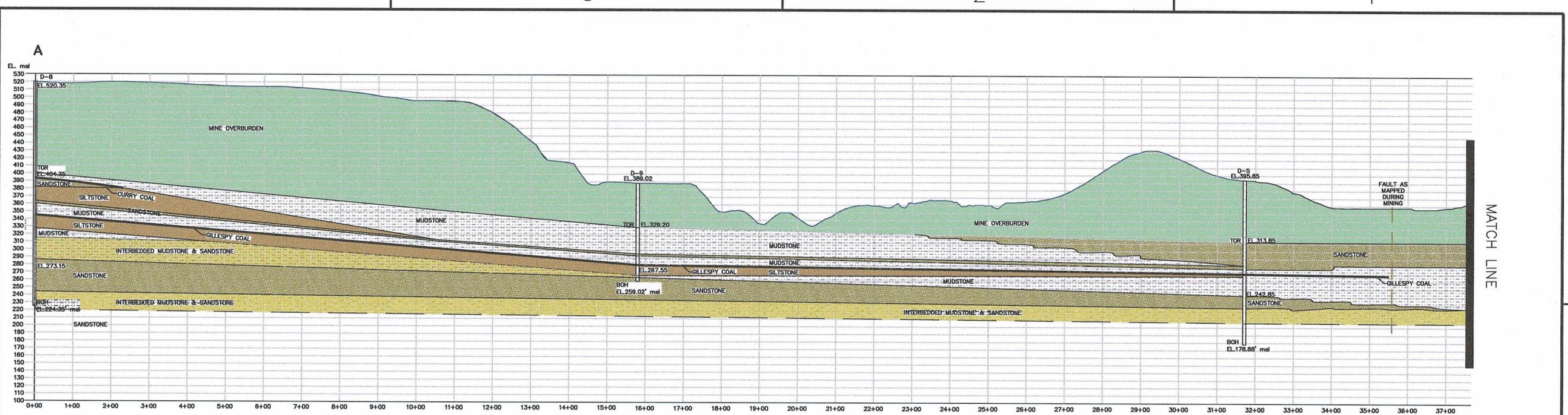
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| REVISION | DATE | REVISION | DATE | REVISION 0 | DATE 07/28/2015 |
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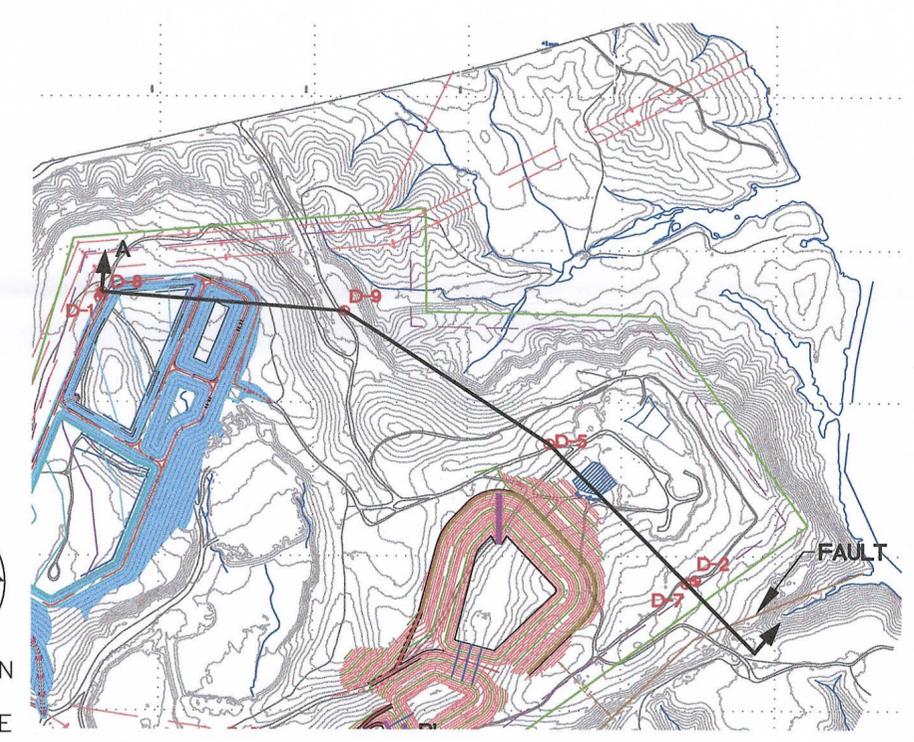
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| BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
| | | | | | | | ASF | GBD | SCB | XXX | XXX | XXX | XXX | NONE | | | | | | | NONE | ES2417 FIG 7 2 | 1 | FINAL | 0 |

target
ZERO
Every day, every job, safely.



SECTION A-A'
SCALE: VERT: 1" = 100'
HORIZ: 1" = 200'

SECTION A-A'
SCALE: VERT: 1" = 100'
HORIZ: 1" = 200'



GRAPHIC SCALE

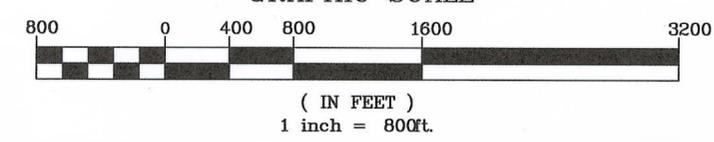
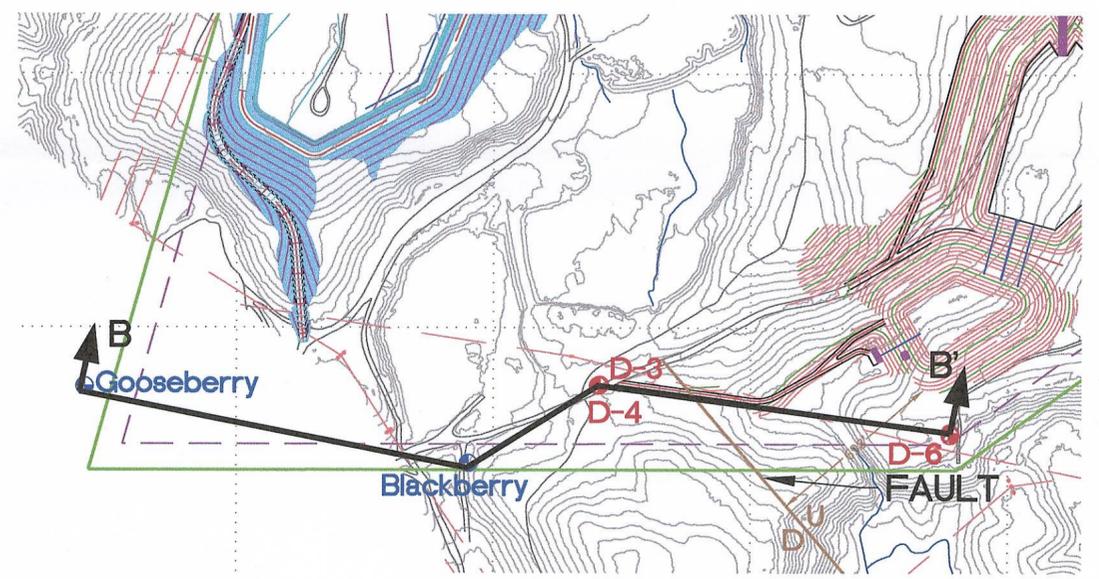
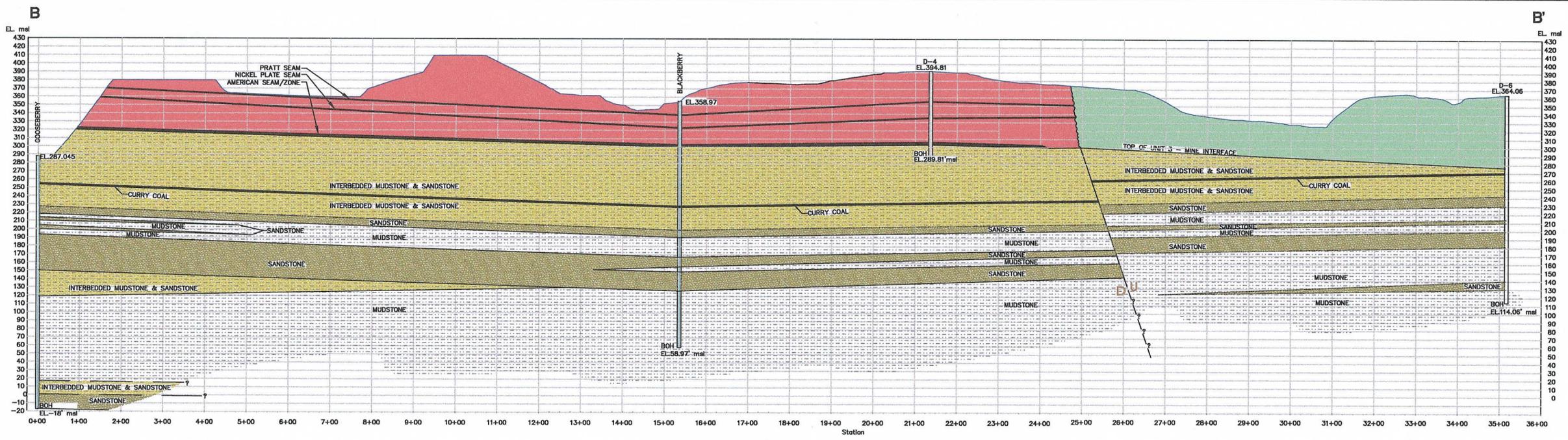


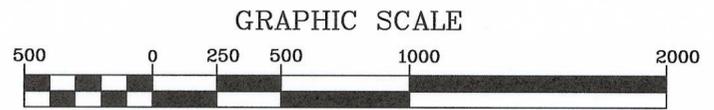
FIGURE 7-3

| | | | | | | | | | | | | | | | | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|------------|------------|----------|-----------------|----------|-----|-------|------------|-----------------------------------------------------------------------------------------------------------------------------------------|----------|-----------|----------|----------|-----------------------|-------|--------|-----|--|
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| REVISION 0 ISSUED FOR REPORT | | | | | DATE 07/28/2015 | | | | | PLANT GORGAS UNIT 8, UNIT 9 AND UNIT 10 CCB STORAGE FACILITY GEOLOGIC CROSS SECTION A-A' | | | | | | | | | |
| BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV | |
| ASF | GBD | SCB | XXX | XXX | XXX | XXX | ASF | GBD | SCB | XXX | XXX | XXX | XXX | AS SHOWN | ES2418 FIG 7_3 | 1 | FINAL | 0 | |

target
ZERO
 Every day, every job, safely.



STATE PLAN
 NAD 27
 WEST ZONE



(IN FEET)
 1 inch = 500ft.

FIGURE 7-4

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Southern Company Services
Engineering and Construction Services
 FOR

Alabama Power Company

PLANT GORGAS
UNIT 8, UNIT 9 AND UNIT 10
CCB STORAGE FACILITY
GEOLOGIC CROSS
SECTION B-B'

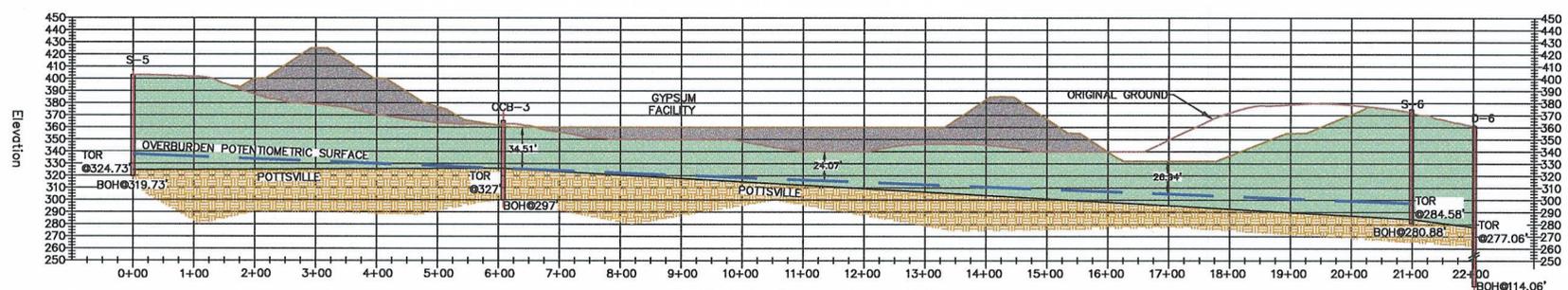
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|-------------------|-----------------|
| REVISION 0 | DATE 07/28/2015 |
| ISSUED FOR REPORT | |
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| REVISION | DATE | REVISION | DATE |
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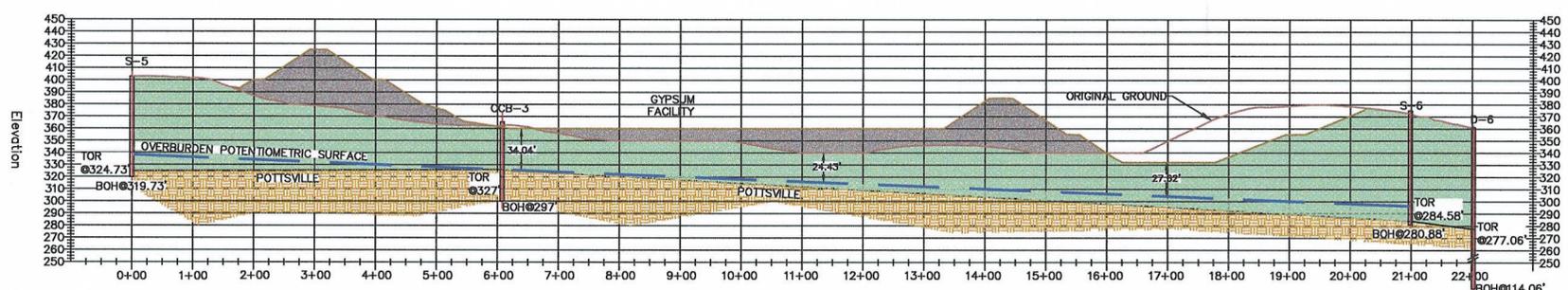
| BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR |
|-----|-------|------------|------------|----------|-----------|----------|-----|-------|------------|------------|----------|-----------|----------|
| ASF | GBD | SCB | XXX | XXX | XXX | XXX | ASF | GBD | SCB | XXX | XXX | XXX | XXX |

| SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
|----------|-----------------------|-------|--------|-----|
| AS SHOWN | ES2418 FIG 7_4 | 1 | FINAL | 0 |

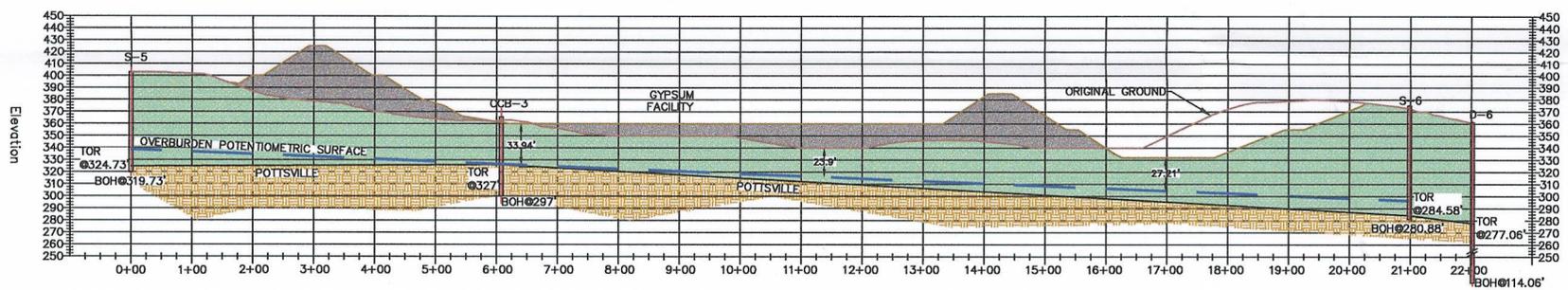
target
ZERO
Every day, every job, safely.



FEBRUARY 12, 2014
SCALE: HORIZ: 1" = 200'
VERT: 1" = 100"



MARCH 27, 2014
SCALE: HORIZ: 1" = 200'
VERT: 1" = 100"



APRIL 7, 2014
SCALE: HORIZ: 1" = 200'
VERT: 1" = 100"

- LEGEND:**
- CONSTRUCTED GYPSUM FACILITY
 - MINE OVERBURDEN
 - POTTSVILLE FORMATION
 - POTENTIOMETRIC SURFACE
 - BORING LOCATION

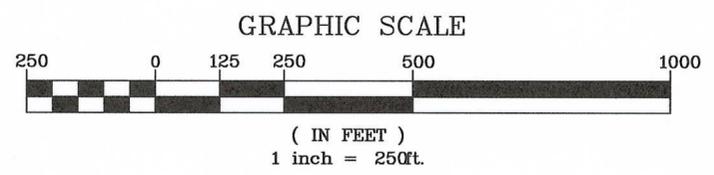
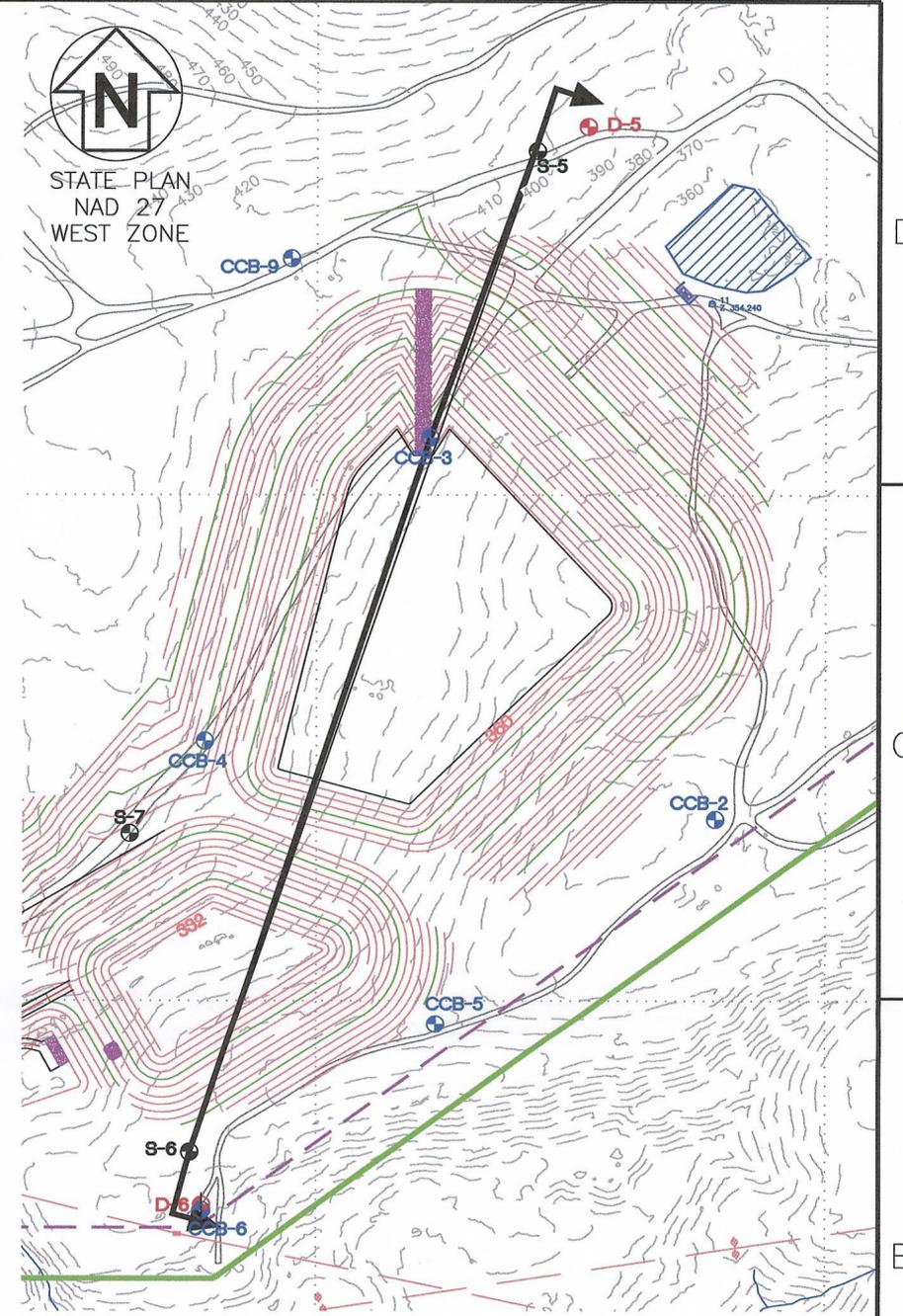


FIGURE 8-1

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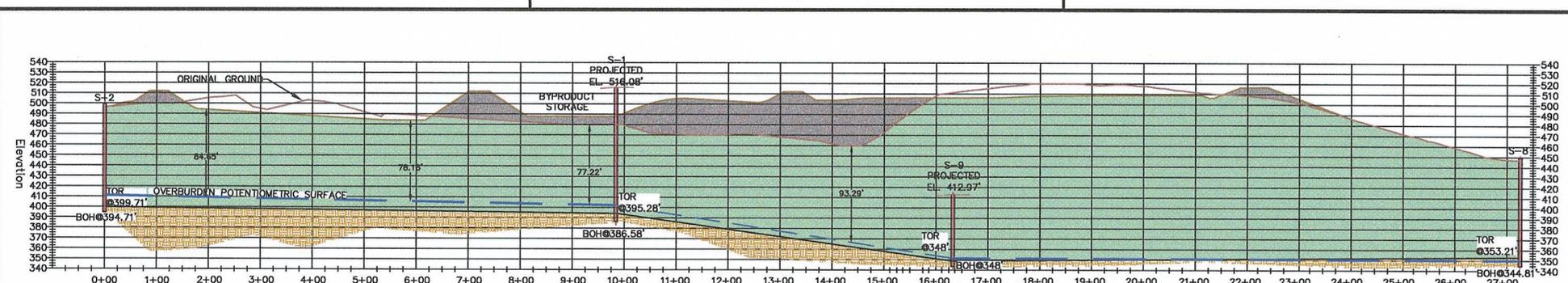
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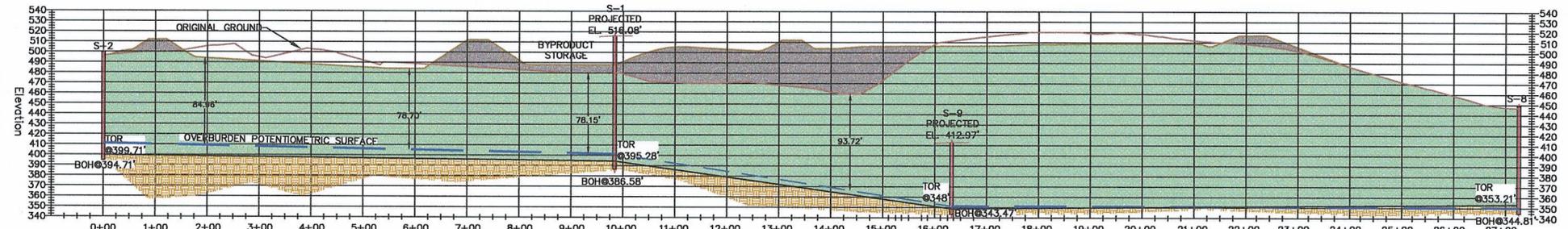
**PLANT GORGAS
UNIT 8, UNIT 9 AND UNIT 10
CCB STORAGE FACILITY
HYDROGEOLOGIC SECTIONS
WATER LEVEL RELATIVE TO BASE OF CELL**

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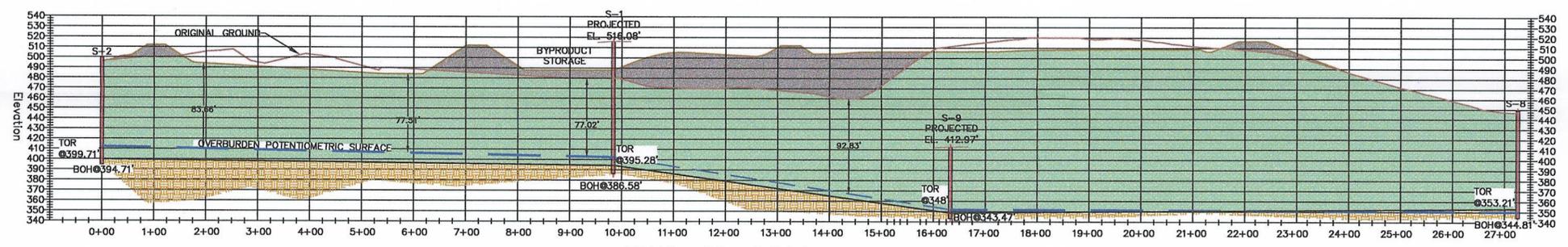
| | | | | |
|----------|-----------------------|-------|--------|-----|
| SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
| AS SHOWN | ES2418 FIG 8_1 | 1 | FINAL | 0 |



FEBRUARY 12, 2014
SCALE: HORIZ: 1" = 200'
VERT: 1" = 100"

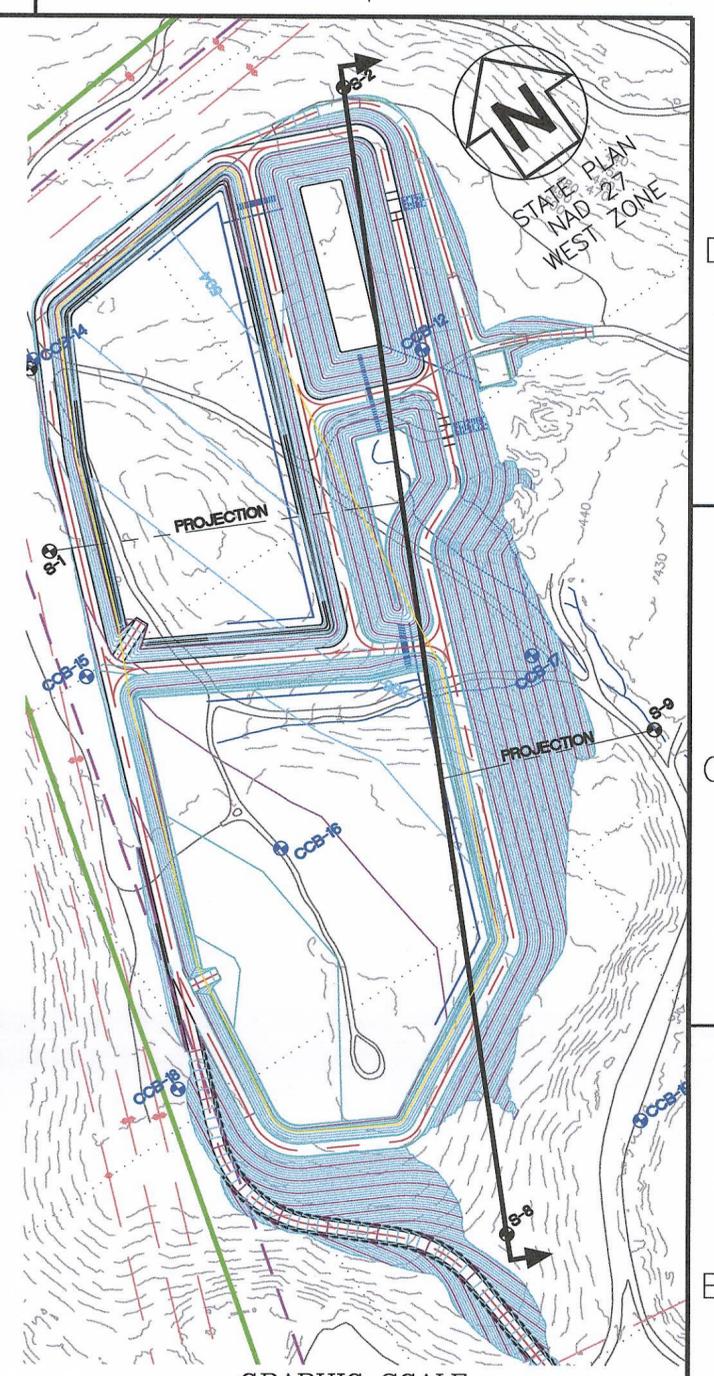


MARCH 27, 2014
SCALE: HORIZ: 1" = 200'
VERT: 1" = 100"



APRIL 29, 2014
SCALE: HORIZ: 1" = 200'
VERT: 1" = 100"

NOTE:
GROUNDWATER ELEVATION AT PROJECTED S-1
LOCATION WOULD BE 10'-12' LOWER THAN
SHOWN ON DRAWING.



GRAPHIC SCALE
300 0 150 300 600 1200
(IN FEET)
1 inch = 300 ft.

FIGURE 8-2

LEGEND:

- CONSTRUCTED BAGHOUSE BYPRODUCT FACILITY
- MINE OVERBURDEN
- POTTSVILLE FORMATION
- POTENTIOMETRIC SURFACE
- BORING LOCATION

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Southern Company Services
Engineering and Construction Services
FOR

Alabama Power Company

PLANT GORGAS
UNIT 8, UNIT 9 AND UNIT 10
CCB STORAGE FACILITY
HYDROGEOLOGIC SECTIONS
WATER LEVEL RELATIVE TO BASE OF CELL

| REVISION | DATE | REVISION | DATE | REVISION | DATE | | | | | | | | |
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| | | | | | | | ASF | GBD | SCB | XXX | XXX | XXX | XXX |

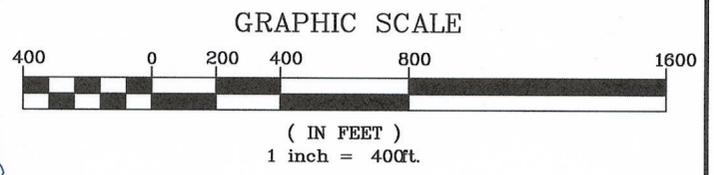


| SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
|----------|----------------|-------|--------|-----|
| AS SHOWN | ES2418 FIG 8_2 | 1 | FINAL | 0 |

target
ZERO
Every day, every job, safely.



STATE PLAN
NAD 27
WEST ZONE



LEGEND

- 100 --- EXISTING GROUND CONTOURS (10' CONTOUR INTERVAL)
- 100 --- BAGHOUSE BYPRODUCT BASE GRADE
- 100 --- GYPSUM FACILITY BASE GRADE
- --- EXISTING ROAD (DIRT/GRAVEL/ASPHALT)
- --- ACCESS/PERIMETER ROADS
- --- SITE LIMITS
- --- 100' SITE BUFFER
- S-6 OVERBURDEN PIEZOMETERS
- WSE 256 WATER SURFACE ELEVATION
- --- OVERHEAD POWER
- ⊕ EXISTING POWER POLE
- --- TREELINE
- --- SURFACE WATER
- D U FAULT AS MAPPED DURING MINING
- 340 --- GROUNDWATER CONTOURS
- ← --- GW FLOW DIRECTION

NOTES:

1. DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
2. COORDINATES SHOWN ARE IN ALABAMA STATE PLANE NAD 27, WEST ZONE
3. S-10 CONTAINS ONLY A FEW INCHES OF WATER AND HAS BEEN EFFECTIVELY DRY SINCE DEVELOPMENT.

FIGURE 8-4

NOTE:
FAULTS INDICATED AS MAPPED DURING ACTIVE COAL MINING OPERATIONS.

| | | | | | | | | | | | | | | | | | | | | | |
|----------|-------|------------|------------|-------------------|-----------------|----------|-----|-------|------------|------------|----------|-----------|----------|----|-------|------------|------------|----------|-----------|----------|--|
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| | | | | | | | ASF | GBD | SCB | XXX | XXX | XXX | XXX | | | | | | | | |

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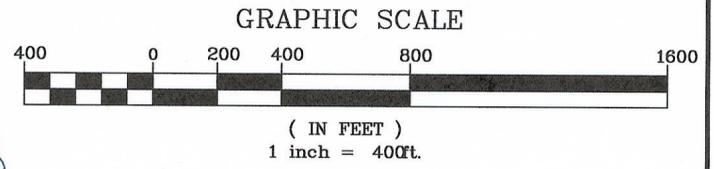
Southern Company Services
Engineering and Construction Services
FOR
Alabama Power Company

PLANT GORGAS
UNIT 8, UNIT 9 AND UNIT 10
CCB STORAGE FACILITY
OVERBURDEN POTENTIOMETRIC SURFACE MAP
MARCH 12, 2014

| | | | | |
|-------|----------------|-------|--------|-----|
| SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
| NONE | ES2418 FIG 8_4 | 1 | FINAL | 0 |



STATE PLAN
NAD 27
WEST ZONE



LEGEND

- 100 --- EXISTING GROUND CONTOURS (10' CONTOUR INTERVAL)
- 100 --- BAGHOUSE BYPRODUCT BASE GRADE
- 100 --- GYPSUM FACILITY BASE GRADE
- --- EXISTING ROAD (DIRT/GRAVEL/ASPHALT)
- --- ACCESS/PERIMETER ROADS
- --- SITE LIMITS
- --- 100' SITE BUFFER
- ⊕ S-6 OVERBURDEN PIEZOMETERS
- WSE 256 WATER SURFACE ELEVATION
- --- OVERHEAD POWER
- ⊕ EXISTING POWER POLE
- --- TREELINE
- --- SURFACE WATER
- D U FAULT AS MAPPED DURING MINING
- 340 --- GROUNDWATER CONTOURS
- --- GW FLOW DIRECTION

NOTES:

1. DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
2. COORDINATES SHOWN ARE IN ALABAMA STATE PLANE NAD 27, WEST ZONE
3. S-10 CONTAINS ONLY A FEW INCHES OF WATER AND HAS BEEN EFFECTIVELY DRY SINCE DEVELOPMENT.

FIGURE 8-5

NOTE:
FAULTS INDICATED AS MAPPED DURING ACTIVE COAL MINING OPERATIONS.

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FOR**

Alabama Power Company

**PLANT GORGAS
UNIT 8, UNIT 9 AND UNIT 10
CCB STORAGE FACILITY
OVERBURDEN POTENTIOMETRIC SURFACE MAP
APRIL 7, 2014**

REVISION 0 DATE 07/28/2015

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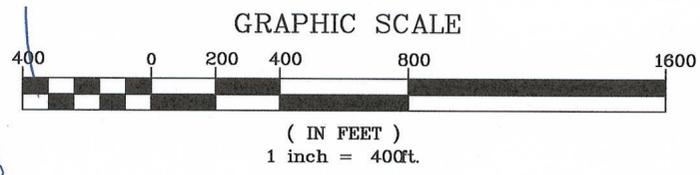


| REVISION | DATE | REVISION | DATE | REVISION | DATE |
|----------|------|----------|------|----------|------------|
| | | | | 0 | 07/28/2015 |

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|----|-------|------------|------------|----------|-----------|----------|-----|-------|------------|------------|----------|-----------|----------|----|-------|------------|------------|----------|-----------|----------|-------|-----------------------|-------|--------|-----|
| | | | | | | | ASF | GBD | SCB | XXX | XXX | XXX | XXX | | | | | | | | NONE | ES2418 FIG 8_5 | 1 | FINAL | 0 |



STATE PLAN
NAD 27
WEST ZONE



LEGEND

- 100 --- EXISTING GROUND CONTOURS (10' CONTOUR INTERVAL)
- 100 --- BAGHOUSE BYPRODUCT BASE GRADE
- 100 --- GYPSUM FACILITY BASE GRADE
- --- EXISTING ROAD (DIRT/GRAVEL/ASPHALT)
- --- ACCESS/PERIMETER ROADS
- --- SITE LIMITS
- --- 100' SITE BUFFER
- ⊙* CURRENT WELL LOCATIONS (ASTERICK DENOTES ROCK WELL)
- WSE 256 WATER SURFACE ELEVATION
- --- OVERHEAD POWER
- ⊕ EXISTING POWER POLE
- --- TREELINE
- --- SURFACE WATER
- --- FAULT AS MAPPED DURING MINING
- 340 --- GROUNDWATER CONTOURS
- ← GW FLOW DIRECTION

- NOTES:**
1. DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 2. COORDINATES SHOWN ARE IN ALABAMA STATE PLANE NAD 27, WEST ZONE
 3. LOCATION MW-10/(D-4) DID NOT ENCOUNTER MINE SPOIL MATERIAL.
 4. MW-17 DOES NOT PRODUCE GROUNDWATER AT MINE SPOIL-TOP OF ROCK INTERFACE.

FIGURE 8-6

NOTE:
FAULTS INDICATED AS MAPPED DURING ACTIVE COAL MINING OPERATIONS.

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Alabama Power Company**

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**PLANT GORGAS
UNIT 8, UNIT 9 AND UNIT 10
CCB STORAGE FACILITY
OVERBURDEN POTENTIOMETRIC SURFACE MAP
DECEMBER 8, 2014**

| | | | | | | | | | | | | | | | | | | | | | | | | | |
|----|-------|------------|------------|----------|-----------|----------|-----|-------|------------|------------|----------|-----------|----------|------|-------|-----------------------|------------|----------|-----------|----------|-------|----------------|-------|--------|-----|
| BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVIL APPR | ELECT APPR | I/C APPR | MECH APPR | DISC MGR | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
| | | | | | | | ASF | GBD | SCB | XXX | XXX | XXX | XXX | NONE | | ES2418 FIG 8 6 | | 1 | FINAL | 0 | | | | | |

Alabama Power
 General Test Laboratory
 P.O. Box 2641
 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer
 Mr. John David Pugh

Customer Account : HWGOR
 Sample Date : 06-Nov-12
 Customer ID :
 Received Date : 07-Nov-12

Description : Plant Gorgas
 Gypsum 8,9,10

Laboratory ID Number : AS26496

| Test Name | Reference | VSpec | MDL | Result | Units |
|----------------------------|--------------|-------|-------|--------------|---------|
| Arsenic, Total | EPA3051/6010 | | 0.5 | 10.4 | mg/kg |
| Barium, Total | EPA3051/6010 | | 0.2 | 86.0 | mg/kg |
| Cadmium, Total | EPA3051/6010 | | 0.2 | 0.685 | mg/kg |
| Chromium, Total | EPA3051/6010 | | 0.1 | 1.00 | mg/kg |
| Lead, Total | EPA3051/6010 | | 0.4 | Not Detected | mg/kg |
| Mercury, Total | EPA3051/7470 | | 0.05 | 1.18 | mg/kg |
| Selenium, Total | EPA3051/6010 | | 0.5 | 11.4 | mg/kg |
| Silver, Total | EPA3051/6010 | | 0.6 | Not Detected | mg/kg |
| Solids Content of Sample | EPA 1311 | | 0.01 | 100 | percent |
| pH of TCLP Extract | EPA 1311 | | 0. | 5.03 | |
| pH of SPLP Extract | EPA 1312 | | 0. | 3.69 | |
| TCLP Extraction Fluid | EPA 1311 | | 0. | 1 | |
| Arsenic, SPLP Extractable | EPA1312 | | 0.006 | 0.385 | mg/l |
| Cadmium, SPLP Extractable | EPA1312 | | 0.006 | 0.067 | mg/l |
| Chromium, SPLP Extractable | EPA1312 | | 0.006 | 1.02 | mg/l |
| Lead, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Selenium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Silver, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Mercury, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Barium, SPLP Extractable | EPA1312 | | 0.006 | 0.177 | mg/l |
| Silver, TCLP Extractable | EPA1311/6010 | | 0.006 | Not Detected | mg/l |

This Certificate states the physical and/or chemical characteristics of the sample as submitted. This document shall not be reproduced, except in full, without written consent from Alabama Power's General Test Laboratory.

Comments :

CC: Mr. Tommy Ryals

Quality Control _____ Supervision _____

Date: 11/28/2012

Alabama Power
General Test Laboratory
P.O. Box 2641
Birmingham, Alabama 35291
(205) 664 - 6032 or 6171
FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer
Mr. John David Pugh

Customer Account : HWGOR

Sample Date : 06-Nov-12

Customer ID :

Received Date : 07-Nov-12

Description : Plant Gorgas
Gypsum 8,9,10

Laboratory ID Number : AS26496

| Test Name | Reference | VSpec | MDL | Result | Units |
|----------------------------|--------------|-------|--------|--------------|-------|
| Arsenic, TCLP Extractable | EPA1311/6010 | | 0.009 | 0.067 | mg/l |
| Barium, TCLP Extractable | EPA1311/6010 | | 0.003 | 0.085 | mg/l |
| Cadmium, TCLP Extractable | EPA1311/6010 | | 0.001 | 0.001 | mg/l |
| Chromium, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Mercury, TCLP Extractable | EPA1311/7470 | | 0.0002 | Not Detected | mg/l |
| Lead, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Selenium, TCLP Extractable | EPA1311/6010 | | 0.02 | 0.14 | mg/l |

This Certificate states the physical and/or chemical characteristics of the sample as submitted. This document shall not be reproduced, except in full, without written consent from Alabama Power's General Test Laboratory.

Comments :

CC: Mr. Tommy Ryals

Quality Control _____ Supervision _____

Date: 11/28/2012

Alabama Power
General Test Laboratory
P.O. Box 2641
Birmingham, Alabama 35291
(205) 664 - 6032 or 6171
FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer
Mr. John David Pugh

Customer Account : HWGOR
Sample Date : 06-Nov-12
Customer ID :
Received Date : 07-Nov-12

Description : Plant Gorgas
Gypsum 8,9,10 TCLP Duplicate

Laboratory ID Number : AS26499

| Test Name | Reference | VSpec | MDL | Result | Units |
|----------------------------|--------------|-------|--------|--------------|---------|
| Solids Content of Sample | EPA 1311 | | 0.01 | 100 | percent |
| pH of TCLP Extract | EPA 1311 | | 0. | 5.10 | |
| TCLP Extraction Fluid | EPA 1311 | | 0. | 1 | |
| Silver, TCLP Extractable | EPA1311/6010 | | 0.006 | Not Detected | mg/l |
| Arsenic, TCLP Extractable | EPA1311/6010 | | 0.009 | 0.104 | mg/l |
| Barium, TCLP Extractable | EPA1311/6010 | | 0.003 | 0.102 | mg/l |
| Cadmium, TCLP Extractable | EPA1311/6010 | | 0.001 | 0.003 | mg/l |
| Chromium, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Mercury, TCLP Extractable | EPA1311/7470 | | 0.0002 | Not Detected | mg/l |
| Lead, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Selenium, TCLP Extractable | EPA1311/6010 | | 0.02 | 0.15 | mg/l |

This Certificate states the physical and/or chemical characteristics of the sample as submitted. This document shall not be reproduced, except in full, without written consent from Alabama Power's General Test Laboratory.

Comments :

CC: Mr. Tommy Ryals

Quality Control _____ Supervision _____

Date: 11/28/2012

**Threatened and Endangered Species
&
Wetlands Delineation and Stream
Assessment Reports**

**Alabama Power Company
Plant Gorgas
Landfill Permit 64-10 Modification
Parrish, Walker County, Alabama**



December 2012

***Prepared By:*
Alabama Power Company
Environmental Affairs
Birmingham, Alabama**

**Threatened and Endangered Species
&
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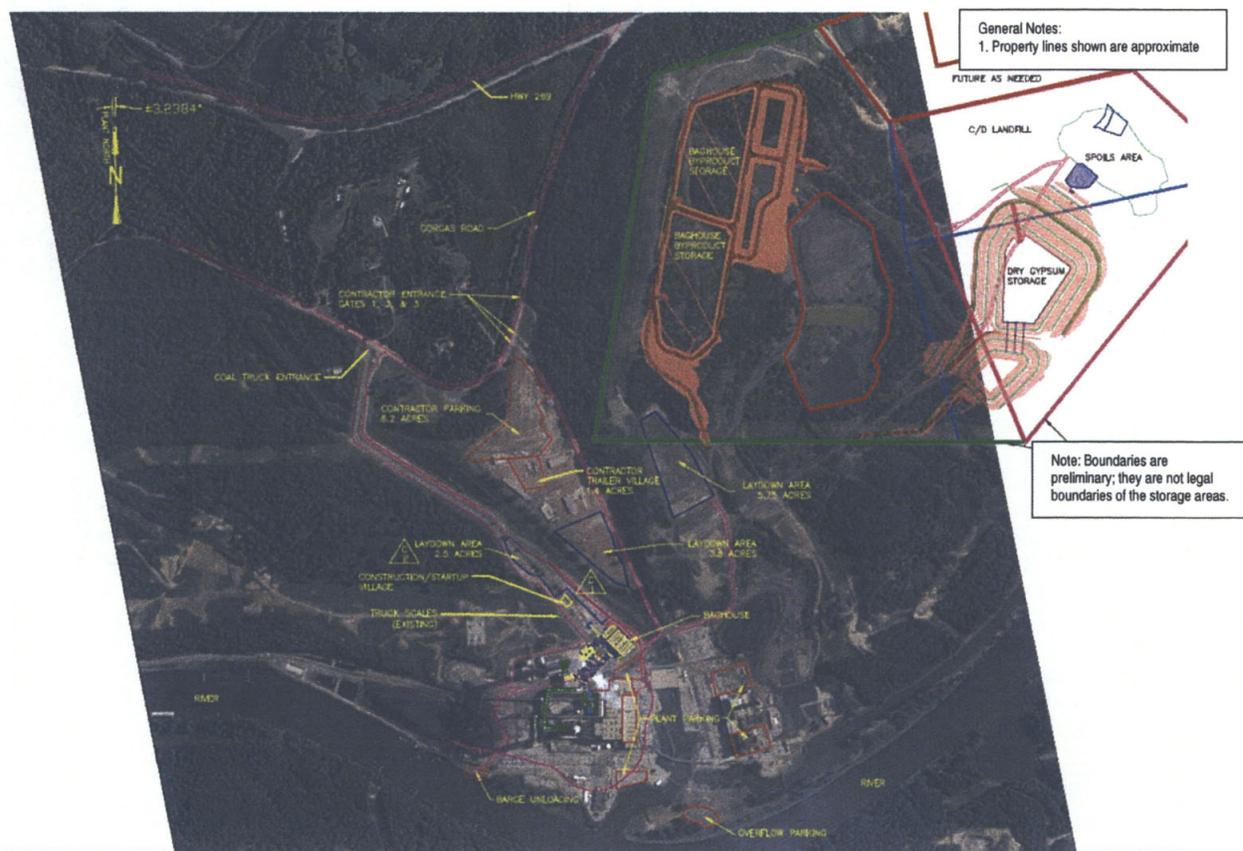
Charles M. Stover, PE

Alabama License # 13315

EXECUTIVE SUMMARY

In the winter of 2011, Alabama Power Company performed a site assessment to identify any possible inhabitation of Federally protected species in the proposed sites located on a landfill site as well as to identify, delineate, assess and document possible U.S. Army Corps of Engineers' (Corps) "waters of the United States" which may have occurred on the site.

The subject study area consisted of an approximate 352-acre study area and is located within Alabama Power's plant property, south of Alabama Highway 269, near Goodsprings, Alabama. Specifically, the property is located in portions of Sections 17 & 8, Township 16 north and Range 6 west. Center coordinates of the project are as follows: 33.6513 Latitude and -87.1872 Longitude.



Study Area – Gorgas Steam Plant Landfill

For the field studies, Alabama Power personnel identified the location of two areas of proposed work. Area 1 consists of a proposed Dry Gypsum Storage and existing C&D Materials Storage Site that is located on approximately 100 acres on the eastern side of the landfill. Area 2 consists of a site for Baghouse Byproduct Storage located on approximately 65 acres on the western side of the landfill.

SITE CONDITIONS

According to the Alabama Geological Survey, Geologic Map of Alabama dated 1988; the project lies in the Cumberland Plateau Physiographic Province and is underlain by the Pottsville Formation. The Pottsville Formation is Pennsylvanian in age and is primarily composed of sandstone, siltstone, shale and coal. The primary drainages in the area are Baker Creek and its tributaries, which drain to the Mulberry Fork with the primary drainage being the Mulberry Fork of the Black Warrior River. There are varying degrees of impacts to the streams and wetlands due to past land use practices in and adjacent the proposed project boundaries. The project is located in HUC 03160109 – Mulberry Watershed.

According to the Walker Soil Survey most of the acreage within the subject area consists of previous mineral extraction (coal mining), which has been reclaimed. The topography is moderate to steep with few drainage courses. The elevation ranges from about 600 feet to approximately 240 feet above sea level in the project area. Specifically, the study area consisted primarily of Brilliant channery loam. These soils are formed in recent areas of excavated surface, typical of surface mining in the area. See attached Soil Report (Walker County).

Federally Protected Species

Field surveys were conducted for protected species known to occur within Walker County. Table 1 represents a list of state and federally protected species in Walker County. No federally protected species were observed with the site boundaries.

Table 1. List of state and federally protected species in Walker County.

| Scientific Name | Common Name | Federal Status | State Status |
|---------------------------------|---------------------------|----------------|--------------|
| <i>Aneides aeneus</i> | Green Salamander | | SP |
| <i>Necturus alabamensis</i> | Black Warrior Waterdog | C | SP |
| <i>Corvus corax</i> | Common Raven | | SP |
| <i>Dendroica petechia</i> | Yellow Warbler | | SP |
| <i>Falco sparverius</i> | American Kestrel | | SP |
| <i>Thryomanes bewickii</i> | Bewick's Wren | | SP |
| <i>Mustela frenata</i> | Long-tailed Weasel | | SP |
| <i>Ursus americanus</i> | Black Bear | | GANOS |
| <i>Macrochelys temminckii</i> | Alligator Snapping Turtle | | SP |
| <i>Masticophis flagellum</i> | Coachwhip | | SP |
| <i>Sternotherus depressus</i> | Flattened Musk Turtle | T | SP |
| <i>Marshallia mohrii</i> | Mohr's Barbara's Buttons | T | |
| <i>Platanthera integrilabia</i> | White Fringeless Orchid | C | |

C = Candidate Species, T = Federally Threatened, SP = State Protected, GANOS = Game Animal with No Open Season.

Waters of the United States (Wetlands and Streams and Open Waters)

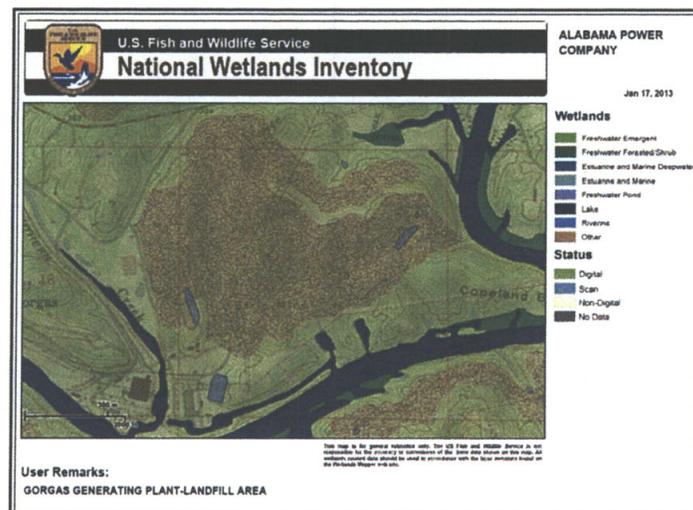
For the purpose of the current Corps guidance and subsequent jurisdiction over waters of the U.S., the following applies:

The agencies will assert jurisdiction over the following waters:

- Traditional navigable waters
- Wetlands adjacent to traditional navigable waters
- Non-navigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (e.g., typically three months)
- Wetlands that directly abut such tributaries

Three features characterize wetlands by definition: hydrology (hydroperiod, mean depth, etc.), the presence of hydric soils and the resulting biotic communities, particularly the presence of hydrophytic vegetation. Hydrology is considered the primary variable of wetland ecosystems, driving the development of wetland soils and leading to the development of the biotic communities (Mitsch and Gosselink 2000). First-order streams, usually designated by solid blue lines on U.S. Geological Survey (USGS) 7.5-min topographic maps (scale 1:24,000), are normally associated with riverine wetlands. They may also continue farther upstream where broken blue lines on topographic maps indicate the presence of channels. Perennial flow is not a requirement for a wetland to be classified as riverine.

A field plan was prepared to assist in the identification and location of wetlands within the subject property. Utilizing existing topographic maps, aerial photography, National Wetlands Inventory Maps (NWI), and field reconnaissance identified wetlands. The wetland survey was conducted in accordance with the USACE *Piedmont and Eastern Mountains Regional Supplement (April 2012)*.



NWI-USFWS Wetland Map

The NWI maps show no wetlands within the project boundary, but show two open water ponds located on the subject property, but do not currently exist. These NWI Maps are used as indicators that wetlands could exist and further investigation was performed to confirm the presence of jurisdictional wetlands.

DELINEATION RESULTS

The objective of the work was to perform a site study to determine possible Corps “waters of the United States”. The results of that delineation work are as follows:

Assessment and Findings

Waters of the U.S.

- **Area 1** - Area 1 consisted of approximately 100 acres on the eastern side of the landfill that contain a C&D Materials Storage Site and a proposed site for Dry Gypsum Storage. On Tuesday November 29, 2011, Jack Fuqua and Carl Hubbert surveyed the proposed site and surrounding areas included in Area 1. No streams, open waters or wetlands were found.
- **Area 2** - Area 2 consisted of approximately 65 acres on the western side of the landfill and will contain the proposed Baghouse Storage Site. On Thursday, September 20, 2012, Steve Krotzer and Chad Fitch surveyed the Gorgas Baghouse Project Site. No Streams, open waters or wetlands were observed.

QUALIFICATIONS

Steve Krotzer – Alabama Power Environmental Affairs

- Masters Degree in Biology
- 25 Years experience delineating wetlands submitted to the Corps for numerous APC Projects
- Has attended many workshops pertaining to wetland delineation, vegetation and hydric soils

Chad Fitch - Alabama Power Environmental Affairs

- Masters Degree in Biology
- 8 years experience delineating wetlands submitted to the Corps for numerous APC projects
- Has attended many workshops pertaining to wetland delineation, vegetation and hydric soils

Jack Fuqua - Alabama Power Environmental Affairs

- Successfully completed U.S Army Corps of Engineers 40-Hour Wetland Delineation Course and continuing education as recommended by the Corps related to wetland/upland plants, hydric soils, site hydrology, wetland mitigation, stream creation and classification and stream restoration.
- Mr. Fuqua has performed well over 300 wetland delineations over a 20-year period.
- His wetland forms and field experience have been verified by the Corps on dozens of instances for power line projects, substations, generating plant projects, and lakeshore projects.

Carl Hubbert - Alabama Power Environmental Affairs (Contractor)

- Bachelors Degree in Political Science with emphasis in U.S. Government Regulation and Policy
- Registered Environmental Manager #11752-National Registry of Environmental Professionals (NREP)
- Successfully completed U.S Army Corps of Engineers 40-Hour Wetland Delineation Course and continuing education
- Over 30 years of environmental experience specializing in permitting and compliance, 13 years experience in wetlands delineations and 404(b) Clean Water Act (33 U.S.C. 1344) and state (ADEM) permitting, water quality and prevention of sediment and erosion control

KEMRON

ENVIRONMENTAL SERVICES

1359A Ellsworth Industrial Boulevard NW ■ Atlanta, GA 30318 ■ Telephone (404) 636-0928 ■ FAX (404) 636-7162 ■ <http://www.kemron.com>

Project 4742-004-001

September 21, 2012

Mr. Gregory Bryce Dyer
Earth Science & Environmental Engineering
Southern Company
42 Inverness Center Parkway
Bin B 426
Birmingham, AL 35242

**Subject: Water Supply Well and Surface Water Intake Survey
Plant Gorgas
Goodsprings Road
Parrish, Walker County, Alabama**

Dear Mr. Dyer:

KEMRON Environmental Services, Inc. (KEMRON) is pleased to submit this letter report describing the results of the water supply well and surface water intake survey conducted with a center point location of (-87.189051 W; 33.653172 N) near the Plant Gorgas Facility in Parrish, Walker County, Alabama. The purpose of this survey was to locate all reasonably identifiable private (domestic) water supply wells and public water supply wells/intakes within a one and a half (1.5) mile radius of the above referenced coordinates.

Survey activities included site reconnaissance, contacting the County agencies, researching the State of Alabama Department of Environmental Management (ADEM) for any applicable records, requesting a water well search from the United States Geologic Survey (USGS), obtaining appropriate tax maps from the County Tax Assessors' offices, and using the information obtained to determine the location and ownership of public or private wells in the area.

SITE DESCRIPTION

The search coordinates (near Alabama Power-Plant Gorgas), the subject site, are located east of Goodsprings Road and south of Alabama Highway 269 (AL 269) in Parrish, Walker County, Alabama. On August 27, 2012, Southern Company provided the topographic coordinates via e-mail for the subject site location. The Black Warrior River lies approximately 3,300 feet to the east and approximately 3,000 feet to the south of the provided coordinates. The subject site is adjacently surrounded on the north, east, south, and west by sparsely populated residential developments. The area within a one and a half-mile radius of the subject site is developed with scattered residences. A map plotting the location of the subject site is included as Figure 1.

RECORDS SEARCH

USGS SEARCH

On August 27, 2012, KEMRON requested a well search from the USGS office in Montgomery, Alabama. The well search was conducted in an attempt to determine any water supply wells registered with the USGS. KEMRON requested that a 4 mile radius from the provided topographic coordinates be used in the search. KEMRON received a reply on September 11, 2012 from the USGS stating that zero (0) wells were located in their database. Telephone Memorandum documenting the conversation is included as Exhibit I.

ADEM RECORDS SEARCH

KEMRON researched the Alabama Department Environmental Management (ADEM) for any records that identify water wells and surface water intakes within the applicable radius. No records were found that would assist KEMRON in the identification of water wells/intakes.

TAX ASSESSOR AND WATER DEPARTMENT SEARCH

KEMRON obtained relevant tax maps from the Walker County and Jefferson County Tax Assessor's offices to determine the properties and owners that are located adjacent to the subject site. This information is summarized in Table 1 and Table 2 and is illustrated in Figure 2. Telephone Memorandums documenting the conversations are included as Exhibit I.

KEMRON contacted the City of West Jefferson Water Works in order to obtain any information regarding surface water intakes and/or public water supply wells in the vicinity of the site. The City of West Jefferson Water Works informed KEMRON that their water is obtained from the City of Birmingham. The Water Works stated that they supply water to the City of West Jefferson area including Porter Road and Short Creek Road during an October 26, 2010 survey.

KEMRON contacted the City of Birmingham Water Works in order to obtain any information regarding surface water intakes and/or public water supply wells in the vicinity of the site on October 26, 2010. The City of Birmingham Water Works informed KEMRON that their water is obtained from a surface water intake on the Mulberry Fork of the Warrior River outside the applicable search radius. The Water Works stated that they supply water exclusively to the City of Jasper area. The Water Works also stated that water is sold to the City of West Jefferson and Graysville.

KEMRON contacted the City of Jasper Water Board in order to obtain any information regarding surface water intakes and/or public water supply wells in the vicinity of the subject site. The City of Jasper Water Board informed KEMRON that their water is obtained from a surface water intake on the Mulberry Fork of the Warrior River outside the applicable search radius. The Water Board stated that they supply water to the City of Jasper area. The Water Board also stated that water is sold to the City of Parrish.

KEMRON contacted the City of Parrish Water Works in order to obtain any information regarding surface water intakes and/or public water supply wells in the vicinity of the site. The

City of Parrish Water Works informed KEMRON that their water is obtained from the City of Jasper. The Water Works stated that they supply water to the City of Goodsprings area ending near the Copeland Ferry Bridge.

The City of Cordova Water and Gas Board was contacted to obtain information regarding any surface water intakes and/or public water supply wells in the vicinity of the site. The City of Cordova Water and Gas Board informed KEMRON that their water is obtained from the City of Jasper.

KEMRON contacted the Walker County and Jefferson County Environmental Health Departments in order to obtain any information regarding private supply wells in the vicinity of the subject site. The Walker County Environmental Health Department stated that they do not keep any records of that type. The Jefferson County Environmental Health Department referred KEMRON to ADEM.

FIELD RECONNAISSANCE

Field reconnaissance activities were performed on September 14, 2012. KEMRON conducted a drive-through reconnaissance of the one and a half (1.5) mile radius surrounding the search coordinates and searched for evidence of private wells, public water supply wells and surface water intakes. It should be noted that during site reconnaissance, KEMRON performed only a visual inspection from the right-of-way. KEMRON did not enter upon private property during the assessment. At the request of the client, home owners were not interviewed concerning the status or existence of private wells in the area. KEMRON did not comprehensively search those areas determined by research to be owned by Southern Company.

WELLS WITHIN THE APPLICABLE RADII

KEMRON conducted a street by street drive-by of the areas surrounding the subject site. These streets include but are not limited to Alabama Highway 269 (AL 269), Gorgas-Cordova Road (Co. Rd. 61), Tutwiler Road (Co. Rd. 53), Goodsprings Road, Copeland Ferry Road, Bankhead Road, Pumpkin Center Road, Eagle Port Road, Riverview Road, Hummingbird Lane, and Pridmore Road, Copeland Ferry Road, Old Copeland Ferry Crossing, and Gross Camp Road. No wells/well houses were observed along these roads. Water meters and fire hydrants were observed throughout the search radius. The results of the field reconnaissance are as follows:

- No private supply wells were readily observed within the 1.5-mile radius of the Plant Gorgas coordinates with the exception of three (3) potential well houses, which were observed at 776 and 1110 Copeland Ferry Road and 506 Gross Camp Road. These properties are located approximately one (1) mile from the subject site and are located in areas that appear to be supplied with drinking water based on fire hydrants and water meters.
- No public supply wells were readily observed within the 1.5-mile radius of the Plant Gorgas coordinates.

SURFACE WATER AND SURFACE WATER INTAKES

The nearest downgradient surface water from the subject site is the Black Warrior River. Alabama Power-Plant Gorgas maintains one (1) surface water intake within 1-mile of the subject site. KEMRON did not observe this intake location while conducting the well survey. The apparent location of this surface water intake based on aerial imagery is illustrated on Figure 1.

The location of the Plant Gorgas Facility intake was identified based on aerial imagery to be located on the northern shore of the Black Warrior River on the Plant Gorgas property. It is assumed that the surface water intake is utilized for non-potable industrial use. The location and use of the surface water intake was confirmed by Southern Company representatives.

FINDINGS

The purpose of this survey was to locate all reasonably identifiable private (domestic) water supply and public water supply wells/intakes within the one and a half (1.5) mile radius of the provided coordinates. To the best of our knowledge, KEMRON provides the following conclusions:

Private Supply Wells

- No private supply wells were readily observed within the 1.5-mile radius of the Plant Gorgas coordinates with the exception of three (3) potential well houses, which were observed at 776 and 1110 Copeland Ferry Road and 506 Gross Camp Road. These properties are located approximately one (1) mile from the subject site and are located in areas that appear to be supplied with drinking water based on fire hydrants and water meters.

Public Supply Wells

- No public supply wells were identified within the applicable 1.5-mile public well radius of the Plant Gorgas Property.

Surface Water Intake

- The Alabama Power-Plant Gorgas facility surface water intake is located on the subject site along the western bank of a fork on the Black Warrior River. The location and use of the surface water intake was confirmed by Southern Company.

KEMRON appreciates this opportunity to be of service to Southern Company. If you have any questions regarding this well search, or if KEMRON can be of further service, please do not hesitate to call the undersigned at (404) 636-0928.

Sincerely,
KEMRON Environmental Services, Inc.

Jeff Goodwin
Project Scientist

Daniel S Robinson
Project Manager

FIGURES

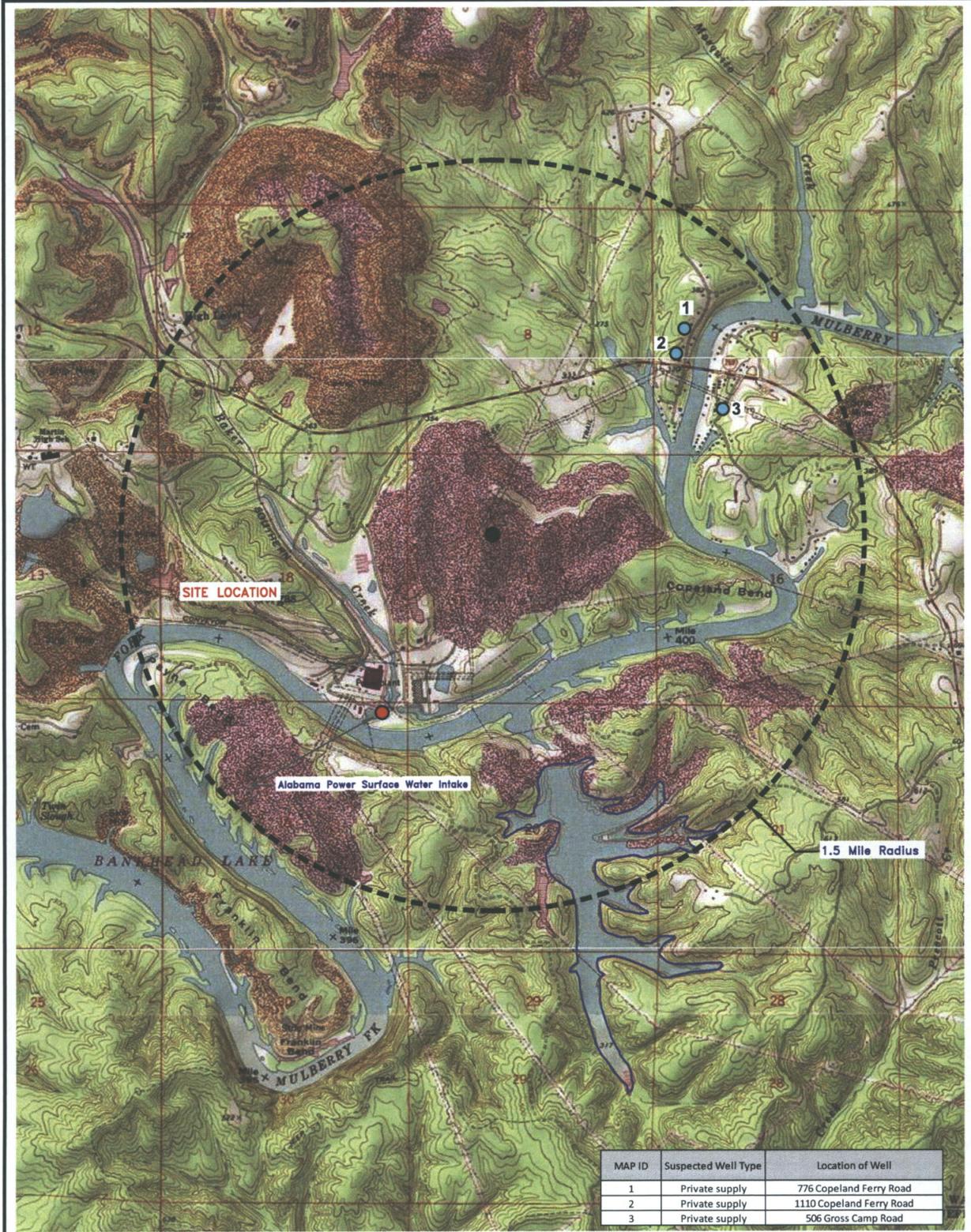
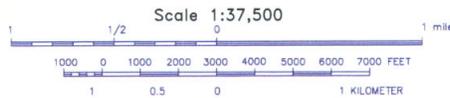


FIGURE 1. WATER RESOURCE LOCATION MAP
 PLANT GORGAS
 PARRISH, WALKER COUNTY
 ALABAMA

7.5 Minute USGS Topographic Quadrangle
 GOODSRING QUADRANGLE, ALABAMA

- Alabama Power Company Water Well/Surface Water Intake
- Coordinate Center Point
- Potential Well House (Domestic Water Supply)



CONTOUR INTERVAL 10 FEET
 DATUM IS MEAN SEA LEVEL

SOURCE: USGS



LEGEND

- - - - - PLANT PROPERTY BOUNDARY
- - - - - PROPERTY LINE
- - - - - ASH POND BOUNDARY
- 64-28-04-20-0-000-004-000 PARCEL ID NUMBER
- CENTER POINT COORDINATE

| | | | | | |
|--|--------------|---------------------|----------------------------|----------|---------------------------------------------------------------------|
| | NOT TO SCALE | DRAWN BY: KG | DATE: 19 SEPTEMBER 2012 | FIGURE 2 | TAX MAP PLANT GORGAS PARRISH, WALKER COUNTY ALABAMA |
| | | REVIEWED: R JG 6 | PROJECT NO. SE4742-004 | | |
| | | APPROVED: DSR | DWG. FILE NO. TAX MAP | | |

TABLES

Plant Gorgas
Goodsprings Road
Parrish, Walker County, Georgia

Table 1: Adjacent Property Owners (Plant)

| Parcel ID | County | Property Owner | Mailing Address |
|---------------------------|--------|----------------------------------|---------------------------------------------------------------|
| 64 26 05 16 0 000 040.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 04 17 0 000 001.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 03 08 0 000 003.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 04 17 0 000 001.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 04 19 0 000 001.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 04 20 0 000 001.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 27 06 13 0 000 001.002 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 03 08 0 000 007.001 | Walker | Mary J Hyche | 5231 Summerside Dr, Katy, Tx. 77450 |
| 64 26 02 09 0 000 026.002 | Walker | Darrell L Warren | 106 14th St. E, Jasper, AL 35501 |
| 64 26 03 08 0 000 011.000 | Walker | Richard E Hyche | 37 Christopher Cove, Sterrett, AL 35147 |
| 64 26 03 08 0 000 007.005 | Walker | Richard E Hyche | 37 Christopher Cove, Sterrett, AL 35147 |
| 64 26 03 08 0 000 009.000 | Walker | Mary and Robert L Mealer Jr. | 14967 Highway 269, Cordova, AL 35550 |
| 64 26 03 08 0 000 010.001 | Walker | Brenda and Franklin F Tillman | 12010 Old Mt Park Rd, Roswell, GA 30075 |
| 64 26 03 08 0 000 008.000 | Walker | Cary and Mildred L Oakley | 14839 Highway 269, Cordova, AL 35550 |
| 64 26 03 08 0 000 003.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 04 18 0 000 010.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 03 07 0 000 001.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 04 18 0 000 010.000 | Walker | Lamar Winsett | 551 Gorgas Rd, Parrish, AL 35580 |
| 64 27 01 12 0 000 001.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 27 06 13 0 000 015.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 04 18 0 000 006.000 | Walker | Gorgas Baptist Church | RT 2 Box 2002, Parrish, AL 35580 |
| 64 27 01 12 0 000 001.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 27 01 12 0 000 052.000 | Walker | Walker County Board of Education | PO Box 311, Jasper, AL 35502 |
| 64 27 06 13 0 000 015.001 | Walker | Walker County Board of Education | PO Box 311, Jasper, AL 35502 |
| 64 27 06 13 0 000 001.001 | Walker | Martin High School | 19th St, Jasper, AL 35501 |
| 64 27 01 12 0 000 053.000 | Walker | Thomas W Martin School | 19th St, Jasper, AL 35501 |
| 64 27 06 13 0 000 001.002 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 27 06 13 0 000 007.000 | Walker | R T Winn Jr | 156 Dee Hendrix Rd, Hueytown, AL 35023 |
| 64 27 06 13 0 000 001.000 | Walker | Mrs. Short | 519 Sellers Rd, Dora, AL 35062 |
| 64 27 06 13 0 000 005.000 | Walker | Drummond Co Inc | PO Box 1549, Jasper, AL 35502 |
| 64 27 06 13 0 000 006.000 | Walker | Drummond Co Inc | PO Box 1549, Jasper, AL 35502 |
| 64 27 06 13 0 000 002.000 | Walker | Drummond Co Inc | PO Box 1549, Jasper, AL 35502 |
| 64 27 06 13 0 000 003.000 | Walker | Drummond Co Inc | PO Box 1549, Jasper, AL 35502 |
| 64 27 06 13 0 000 015.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 27 06 24 0 000 004.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 04 18 0 000 011.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 27 06 13 0 000 015.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 04 19 0 000 002.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 04 20 0 000 002.000 | Walker | University of Alabama | University of Alabama System Box 870106, Tuscaloosa, AL 25487 |
| 64 26 04 20 0 000 004.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 04 20 0 000 003.001 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 05 16 0 000 041.000 | Walker | Sam Walker Murphy | PO Box 1345, Jasper, AL 35502 |
| 64 26 04 17 0 000 002.000 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 04 20 0 000 003.002 | Walker | Alabama Power Co | PO Box 2641 5S-0157, Birmingham, AL. 35201 |
| 64 26 05 16 0 000 041.001 | Walker | Lawson W Murphy | PO Box 1345, Jasper, AL 35502 |
| 64 26 05 16 0 000 038.000 | Walker | Sam W Murphy | PO Box 1345, Jasper, AL 35502 |
| 64 26 05 16 0 000 010.001 | Walker | Roy Minor | 629 Rainwood Rd, Quinton, AL 35130 |
| 64 26 05 16 0 000 014.000 | Walker | Don R and Johnnie R Stanton | 665 Rainwood Lodge Rd, Quinton, AL 35130 |
| 64 26 05 16 0 000 013.000 | Walker | Don R and Johnnie R Stanton | 665 Rainwood Lodge Rd, Quinton, AL 35130 |
| 64 26 05 16 0 000 004.000 | Walker | Lynn B and Donna F Hicks | 271 Canoe Lane, Quinton, AL 35130 |
| 64 26 05 16 0 000 004.001 | Walker | Kevin L and Lorrie A Hicks | 132 Hicks Camp Road, Quinton, AL 35130 |
| 64 26 05 16 0 000 004.000 | Walker | Lynn B and Donna F Hicks | 271 Canoe Lane, Quinton, AL 35130 |
| 64 26 02 09 0 000 076.001 | Walker | Lillie Irene Oliver | 17 Oliver Camp Rd, Quinton, AL 35130 |

EXHIBIT I



1359-A Ellsworth Industrial Boulevard ■ Atlanta, GA 30318 ■ Telephone (404) 636-0928 ■ FAX (404) 636-7162 ■ <http://www.kemron.com>

Telephone Memorandum

Project: Plant Gorgas Water Well and Surface Intake Survey

Project Number: SE 4742-004-001

Date: 9/13/2012

Employee: Jeff Goodwin

Conversation Summary:

City of Parrish Water Works- 9/13/2012 1:19 p.m. – Spoke with Renee Brown with the City of Parrish Water Works (205)-686-5085. Renee stated that the City of Parrish Water Works obtains water from the City of Jasper. The Water Works supplies water to the Good Springs area. Renee said that water service ends near the Copeland Ferry Bridge.



1359-A Ellsworth Industrial Boulevard ■ Atlanta, GA 30318 ■ Telephone (404) 636-0928 ■ FAX (404) 636-7162 ■ <http://www.kemron.com>

Telephone Memorandum

Project: Plant Gorgas Water Well and Surface Intake Survey

Project Number: SE 4742-004-001

Date: 9/13/2012

Employee: Jeff Goodwin

Conversation Summary:

City of Jasper Water Board- 9/13/2012 1:20 p.m. – Spoke with Tim with the City of Jasper Water Board (205)-648-2156. Tim stated that the City of Jasper Water Board obtain water from a surface water intake on the Mulberry Fork of the Warrior River. The Water Board supplies water exclusively to the City of Jasper area. The Water Board also stated that water is sold to the City of Parrish.



1359-A Ellsworth Industrial Boulevard ■ Atlanta, GA 30318 ■ Telephone (404) 636-0928 ■ FAX (404) 636-7162 ■ <http://www.kemron.com>

Telephone Memorandum

Project: Plant Gorgas Water Well and Surface Intake Survey

Project Number: SE 4742-004-001

Date: 9/13/2012

Employee: Jeff Goodwin

Conversation Summary:

City of West Jefferson Water Works- 9/13/2012 2:01 pm – Spoke with Susan with the City of Cordova Water and Gas Board, (205)-483-9235. Susan stated that the City of Cordova obtains water from the City of Jasper.



1359-A Ellsworth Industrial Boulevard ■ Atlanta, GA 30318 ■ Telephone (404) 636-0928 ■ FAX (404) 636-7162 ■ <http://www.kemron.com>

Telephone Memorandum

Project: Plant Gorgas Water Well and Surface Intake Survey

Project Number: SE 4742-004-001

Date: 9/13/2012

Employee: Danny Robinson

Conversation Summary:

USGS - 9/11/2012 10:00 am – Spoke with Rick Treece with the Alabama USGS. Mr. Treece stated that the search was conducted using the provided coordinates and 0 wells were located in their database.

Well Search Request

To: Alabama Water Science Center
Attn: Data Section
mwtreece@usgs.gov

Site Address: Parrish, Walker County, Alabama

Site Coordinates: **-87.189051 (W)**
33.653172 (N)

Search Radius: 4 miles

Kemron Project Number: **SE4742-004-001**

Requested by: Daniel Robinson
Kemron Environmental Services
1359-A Ellsworth Industrial Blvd.
Atlanta, GA 30318
Phone: 404-636-0928
Fax: 404-636-7162

Kemron's Federal Tax Id: 112393978

Responsible Party for Payment: Daniel Robinson, Project Manager

2012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418_HYDROGEO CHARACTER REPORT_CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-1
PAGE 1 OF 3
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

DATE STARTED 1/13/2014 COMPLETED 1/15/2014 SURF. ELEV. 499.2 COORDINATES: N:1,330,794.06 E:594,082.36

CONTRACTOR CFS EQUIPMENT _____ METHOD CME

DRILLED BY S. Milam LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 104.7 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 88.92 ft.

NOTES _____

| DEPTH (ft) GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5 | <p>Fill (FILL) - <i>Mine Spoil</i>, Backfilled Spoil consisting of rock fragments, silty clay, clayey silt, and lesser amounts of sand and coal fragments</p> | <p style="text-align: right;">ELEV. (DEPTH)</p> <p style="text-align: center;">ELEV. _____</p> <p style="text-align: center;">Protective aluminum cover with bollards 2-foot square concrete pad Top of casing Elev. = 502.25</p> <p style="text-align: center;">← Surface Seal: concrete</p> |
| 10 | | <p>497.2 (2.0)</p> |
| 15 | | |
| 20 | | |
| 25 | | |
| 30 | | |
| 35 | | |
| 40 | | |



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-1
PAGE 2 OF 3
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

D:\012 GEOTECH LOG WITH WELL - ESEE2012\DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI

| DEPTH (ft) GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA | ELEV. (DEPTH) |
|---------------------------|--------------------|-------------------|-------------------------------------------------------------------------------------------------------|
| | | Fill (FILL)(Cont) | Protective aluminum cover with bollards 2-foot square concrete pad Top of casing Elev. = 502.25 |
| 45 | | | |
| 50 | | | |
| 55 | | | |
| 60 | | | |
| 65 | | | |
| 70 | | | |
| 75 | | | |
| 80 | | | |
| 85 | | | |

ELEV. (CONTINUED)

← Annular Fill: 80/20 Portland Cement/Bentonite Powder



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-2
PAGE 1 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

DATE STARTED 10/23/2014 COMPLETED _____ SURF. ELEV. 498.5 COORDINATES: N:1,331,053.31 E:593,548.80

CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotosonic

DRILLED BY M. Coleman LOGGED BY B. Smelser CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 91 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 81.7 ft.

NOTES _____

1012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 HYDROGEO CHARACTER REPORT_CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI

| DEPTH (ft) GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| | | ELEV. (DEPTH) |
| | | 496.5 (2.0) |
| 5 | Fill (FILL) - <i>Mine Spoils</i> , dark gray to medium gray mudstone/siltstone with trace sandstone, coarse sand to coarse gravel sized angular rock fragments within a dark gray to brownish gray to orangish brown sandy silt - trace cobble sized rock fragments | Protective aluminum cover with bollards 4-foot square concrete pad Top of casing Elev. = 501.54 ← Surface Seal: concrete |
| 10 | - trace reddish brown staining on some rock fragments | |
| 15 | | |
| 20 | | 478.5 (20.0) |
| 25 | | |
| 30 | - upper coarse sand to bolder sized (limited core recovered) dark gray to medium gray rock fragments within a dark gray silty matrix with trace layers of orangish brown clay/silt | |
| 35 | | |
| 40 | | |
| 45 | - trace weathered sandstone fragments with orangish brown staining | |
| 50 | | |
| 55 | | |
| 60 | | ← Annular Seal: 3/8 Hole Plug (medium bentonite chips) |



LOG OF TEST BORING AND WELL INSTALLATION

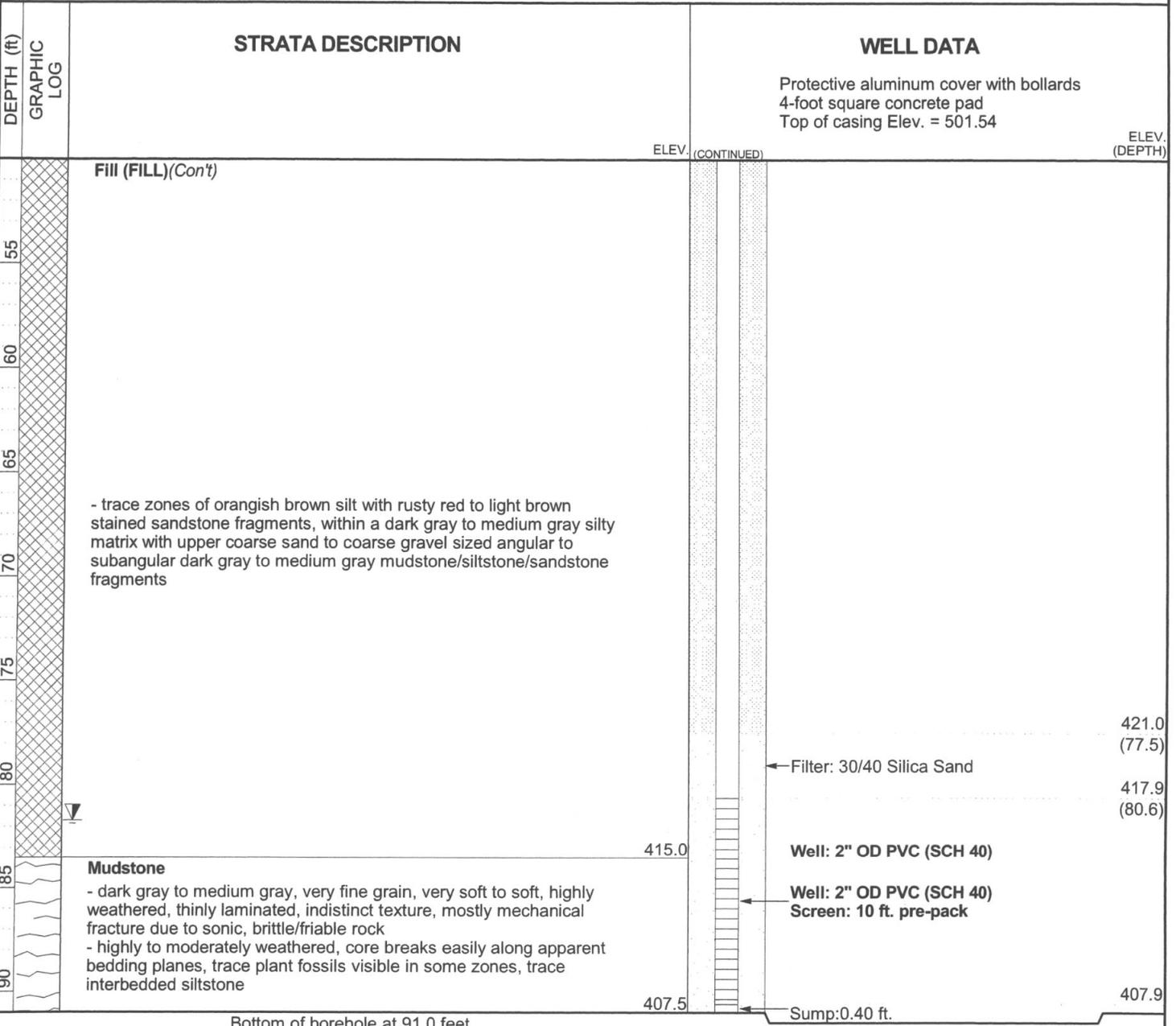
BORING MW-2
PAGE 2 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

1012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418_HYDROGEO CHARACTER REPORT_CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI





LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-3
PAGE 1 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
LOCATION APCO - Plant Gorgas

DATE STARTED 10/23/2014 COMPLETED _____ SURF. ELEV. 522.2 COORDINATES: N:1,330,842.40 E:593,025.40

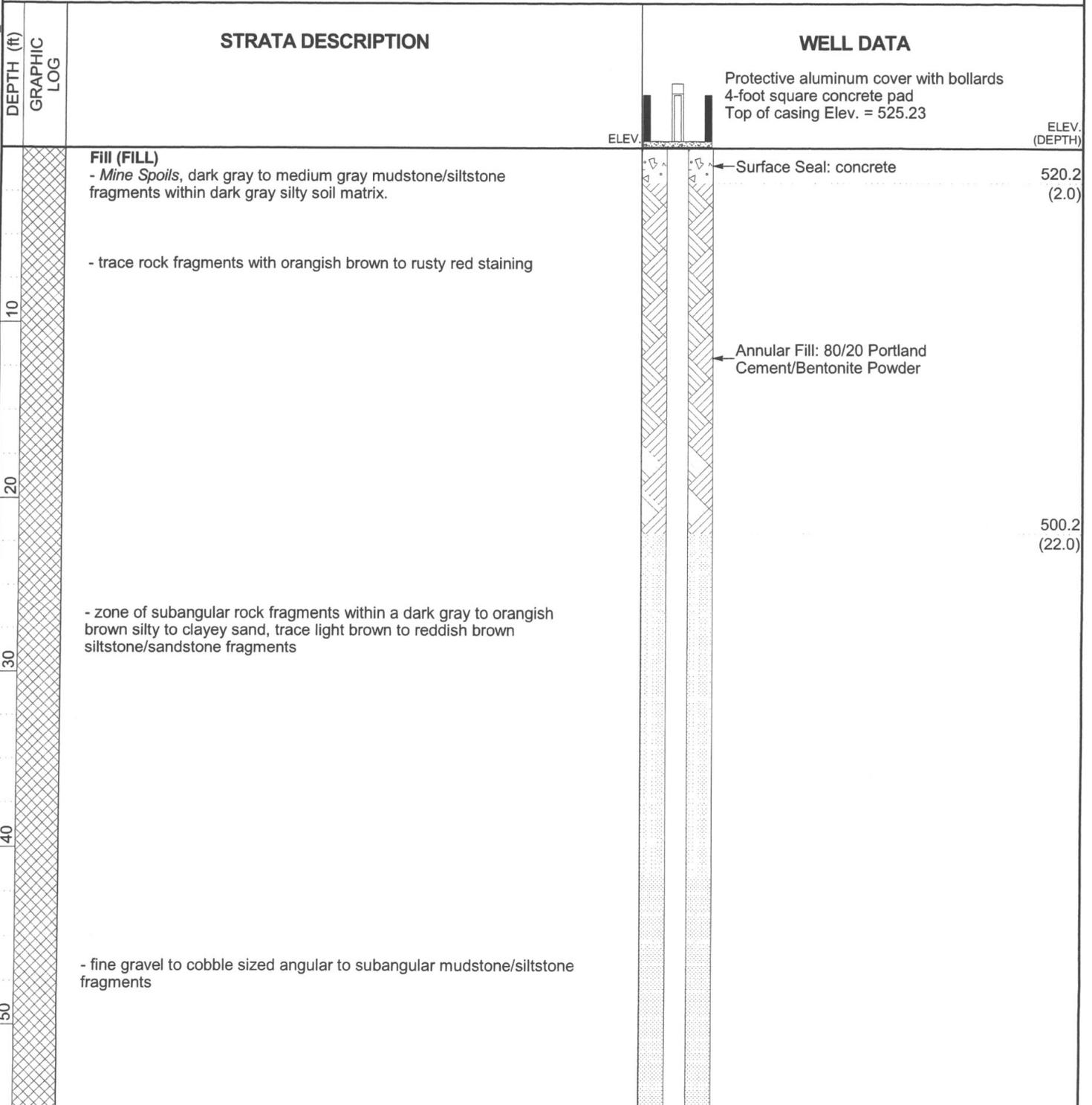
CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotosonic

DRILLED BY M. Coleman LOGGED BY B. Smelser CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 115.5 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 106.91 ft.

NOTES _____

012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015ES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO





LOG OF TEST BORING AND WELL INSTALLATION

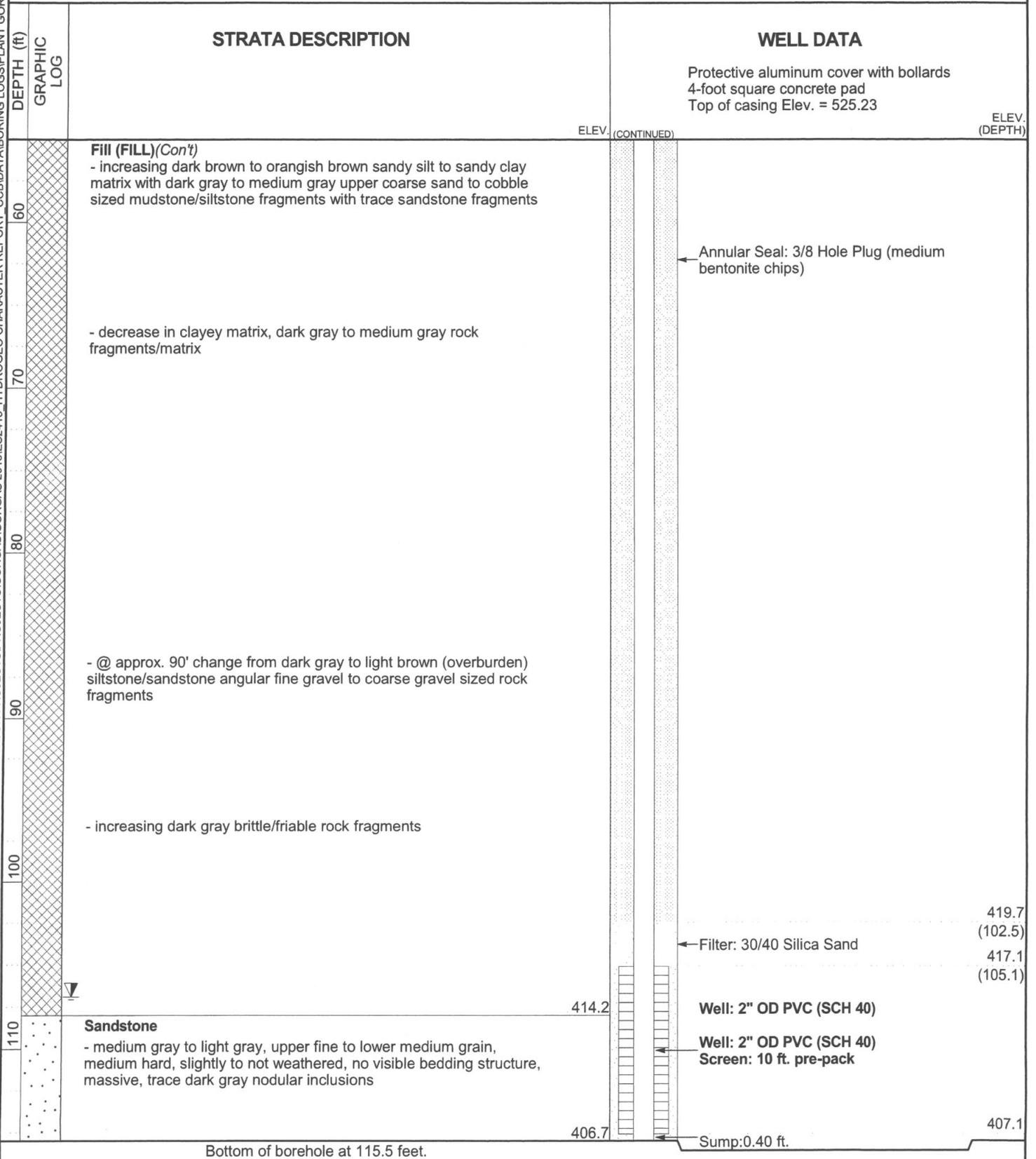
BORING MW-3
PAGE 2 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\IES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO





LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-4
PAGE 1 OF 3
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

DATE STARTED 2/12/2014 COMPLETED 2/19/2012 SURF. ELEV. 516.7 COORDINATES: N:1,330,289.73 E:592,896.41

CONTRACTOR CFS EQUIPMENT _____ METHOD CME

DRILLED BY S. Milam LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 129.5 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 116.59 ft.

NOTES _____

012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOR

| DEPTH (ft) | GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA |
|------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | | ELEV. (DEPTH) |
| | | | 518.63 |
| | | | 514.7 (2.0) |
| 5 | | Fill (FILL) - <i>Mine Spoil</i> , Backfilled Spoil consisting of rock fragments, silty clay, clayey silt, and lesser amounts of sand and coal fragments | <div style="display: flex; justify-content: space-between;"> <div> <p>Protective aluminum cover with bollards 2-foot square concrete pad Top of casing Elev. = 518.63</p> </div> <div> <p>← Surface Seal: concrete</p> </div> </div> |
| 10 | | | |
| 15 | | | |
| 20 | | | |
| 25 | | | |
| 30 | | | |
| 35 | | | |
| 40 | | | |

2012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418_HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-4
 PAGE 2 OF 3
 ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
 EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

| DEPTH (ft) GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA |
|---------------------------|--------------------|-------------------------------------------------------------------------------------------------------|
| 45 | Fill (FILL)(Cont) | Protective aluminum cover with bollards 2-foot square concrete pad Top of casing Elev. = 518.63 |
| 50 | | ELEV. (CONTINUED) |
| 55 | | ELEV. (DEPTH) |
| 60 | | Annular Fill: 80/20 Portland Cement/Bentonite Powder |
| 65 | | |
| 70 | | |
| 75 | | |
| 80 | | |
| 85 | | |



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-4
PAGE 3 OF 3
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

2012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STORAGE

| DEPTH (ft) | GRAPHIC LOG | STRATA DESCRIPTION | ELEV. (CONTINUED) | WELL DATA | ELEV. (DEPTH) |
|------------|-------------|-------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------|------------------|
| 90 | | Fill (FILL)(Con't) | | Protective aluminum cover with bollards 2-foot square concrete pad Top of casing Elev. = 518.63 | |
| 95 | | | | | |
| 100 | | | | | |
| 105 | | | | | |
| 110 | | | | | |
| 111 | | | | Annular Seal: 3/8 Hole Plug (medium bentonite chips) | 407.7 (109.0) |
| 115 | | | | Filter: 30/40 Silica Sand | 403.6 (113.1) |
| 120 | | | | Well: 2" OD PVC (SCH 40) | 400.4 (116.3) |
| 125 | | mudstone - dark gray, lenticular, (Pottsville Formation) | 395.9 | Well: 2" OD PVC (SCH 40) Screen: 10 ft. pre-pack | |
| | | | | Sump: 0.20 ft. | 390.4 (126.3) |
| | | | 387.2 | | |

Bottom of borehole at 129.5 feet.



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-5
PAGE 1 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

DATE STARTED 10/28/2014 COMPLETED _____ SURF. ELEV. 471.5 COORDINATES: N:1,328,645.98 E:592,436.54

CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotosonic

DRILLED BY M. Coleman LOGGED BY B. Smelser CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 136 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 122.97 ft.

NOTES _____

012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418_HYDROGEO CHARACTER REPORT_CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI

| DEPTH (ft) | GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA | ELEV. (DEPTH) |
|------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-----------------|
| | | | Protective aluminum cover with bollards 4-foot square concrete pad Top of casing Elev. = 474.55 | |
| | | | ← Surface Seal: concrete | 469.5 (2.0) |
| 10 | | Fill (FILL) - <i>Mine Spoils</i> , dark gray to medium gray upper coarse sand to coarse gravel sized angular to subangular mudstone/siltstone fragments within a dark gray to medium gray silty matrix - trace coal fragments | | |
| 20 | | - zone of reddish brown to orangish brown to dark brown silt with lower coarse sand to fine gravel sized dark gray rock fragments and coal fragments | ← Annular Fill: 80/20 Portland Cement/Bentonite Powder | 451.0 (20.5) |
| 30 | | | | |
| 40 | | | | |
| 50 | | - zones of orangish brown to reddish brown silt with included dark gray to medium gray angular to subangular upper coarse sand to cobble sized rock fragments | | |
| 60 | | | | |



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-6
PAGE 1 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

DATE STARTED 10/29/2014 COMPLETED _____ SURF. ELEV. 410.0 COORDINATES: N:1,327,877.97 E:592,829.84

CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotosonic

DRILLED BY M. Coleman LOGGED BY B. Smelser CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 126 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 103.27 ft.

NOTES _____

012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\GORGAS\GORGAS\15IES2418_HYDROGEO CHARACTER REPORT_CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI

| DEPTH (ft) GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| | | Protective aluminum cover with bollards 4-foot square concrete pad Top of casing Elev. = 412.99 ELEV. (DEPTH) |
| 0 | Fill (FILL) - <i>Mine Spoils</i> , light gray to medium gray sandstone fragments with trace dark gray to grayish brown mudstone/siltstone fragments within a light gray to medium gray pulverized rock powder matrix, upper coarse sand to cobble sized with trace bolder sized rock fragments - dark gray to medium gray mudstone siltstone rock fragments, interlayered zones of orangish brown to brownish gray sandy silt with dark gray to grayish brown upper coarse sand to fine gravel sized angular to subangular rock fragments | ← Surface Seal: concrete 408.0 (2.0) |
| 10 | | |
| 20 | | |
| 30 | - zones of orangish brown to reddish brown silty to clayey matrix with dark gray mottling within an overall dark gray silty matrix | |
| 40 | - dark gray to medium gray silty soil matrix with dark gray to medium gray angular to subangular mudstone/siltstone fragments | |
| 50 | - zones of grayish brown silt with included upper course to fine gravel sized angular rock fragments | |
| | | 390.5 (19.5) |



LOG OF TEST BORING AND WELL INSTALLATION

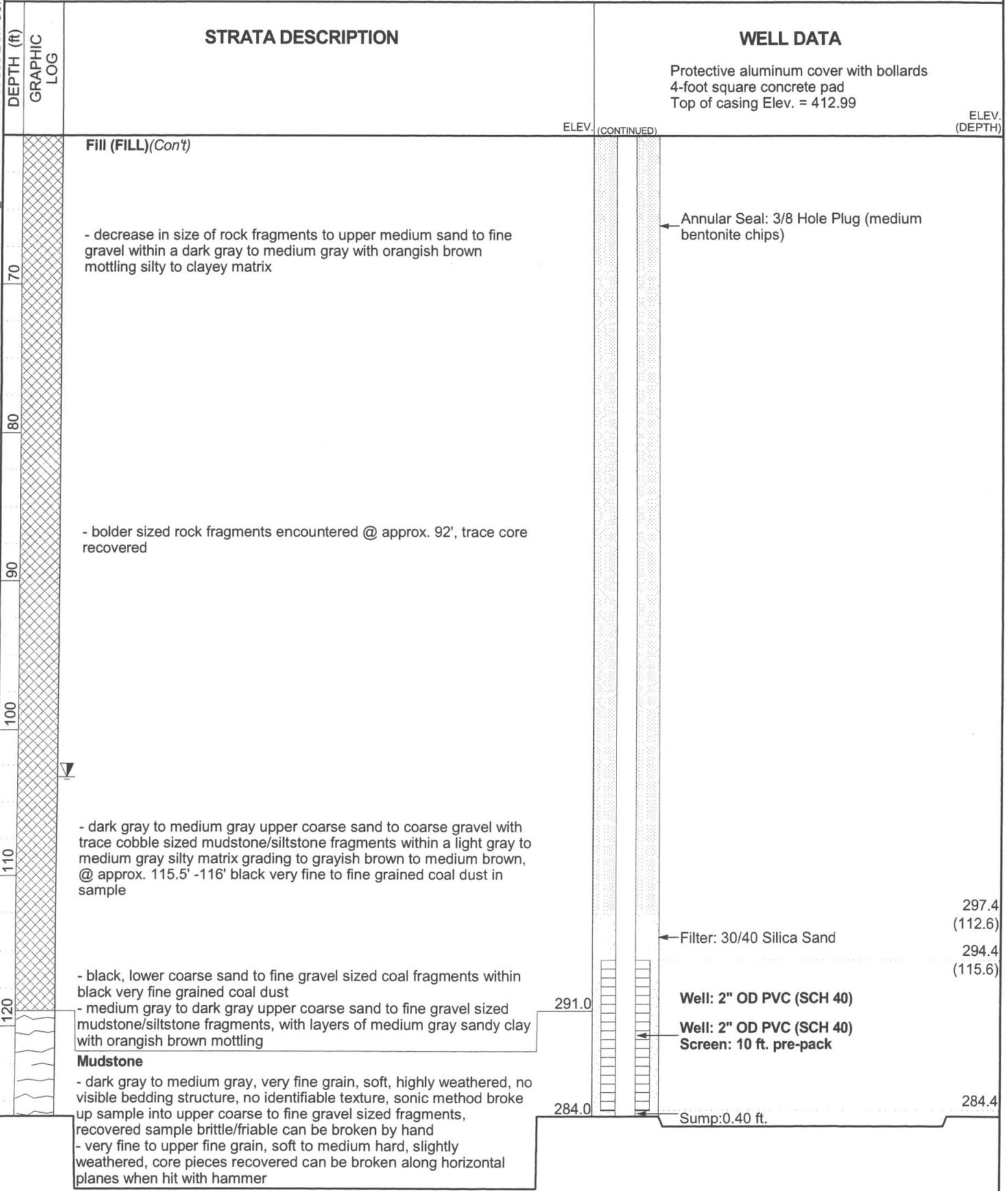
BORING MW-6
 PAGE 2 OF 2
 ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
 EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\RES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI



Bottom of borehole at 126.0 feet



LOG OF TEST BORING AND WELL INSTALLATION

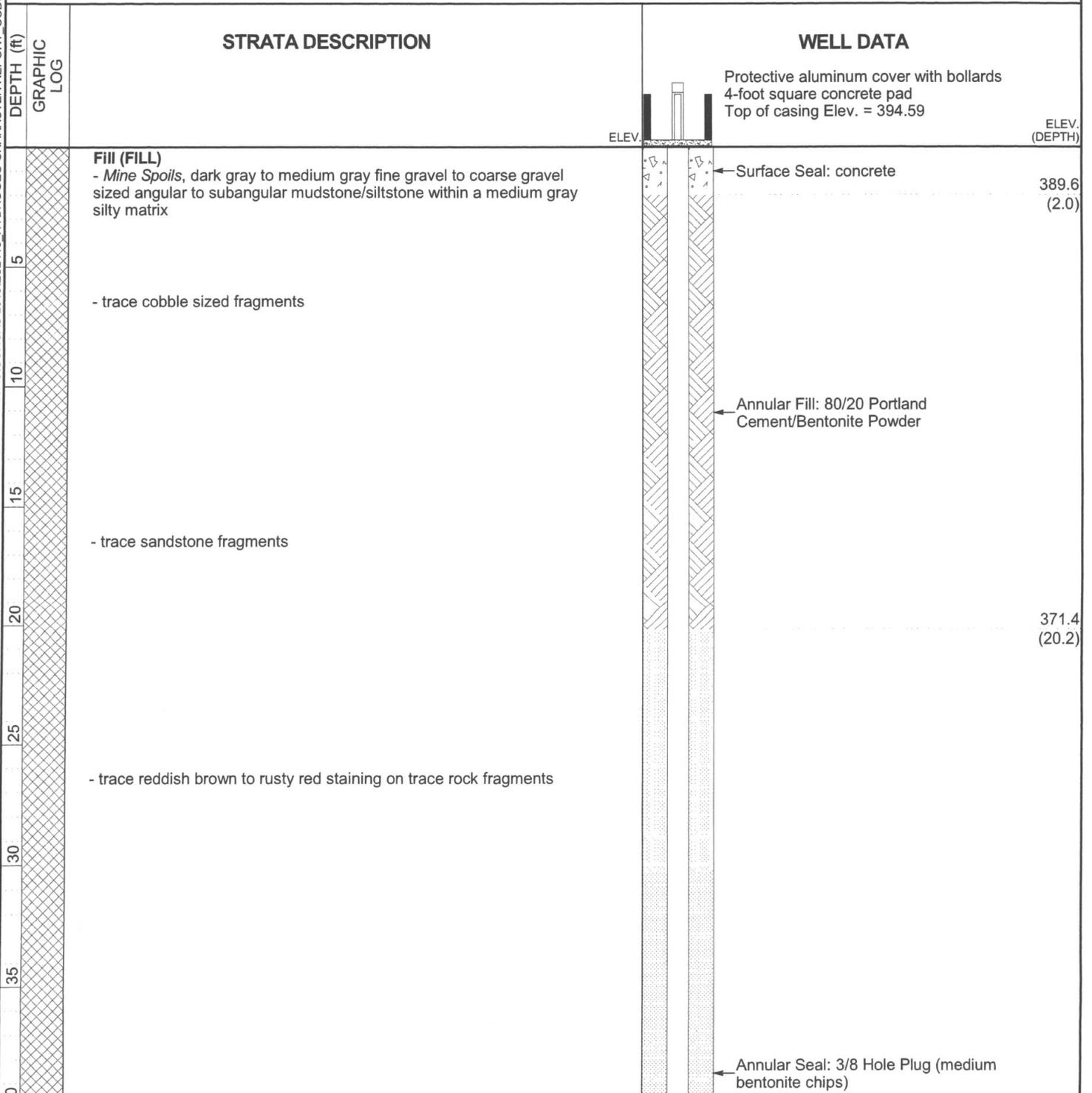
BORING MW-7
PAGE 1 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
LOCATION APCO - Plant Gorgas

DATE STARTED 10/29/2014 COMPLETED _____ SURF. ELEV. 391.6 COORDINATES: N:1,328,515.24 E:593,408.34
 CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotosonic
 DRILLED BY M. Coleman LOGGED BY B. Smelser CHECKED BY _____ ANGLE _____ BEARING _____
 BORING DEPTH 71 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 58 ft.
 NOTES _____

012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\BES2418_HYDROGEO CHARACTER REPORT_CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO



012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 - HYDROGEO CHARACTER REPORT - CCBID\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI

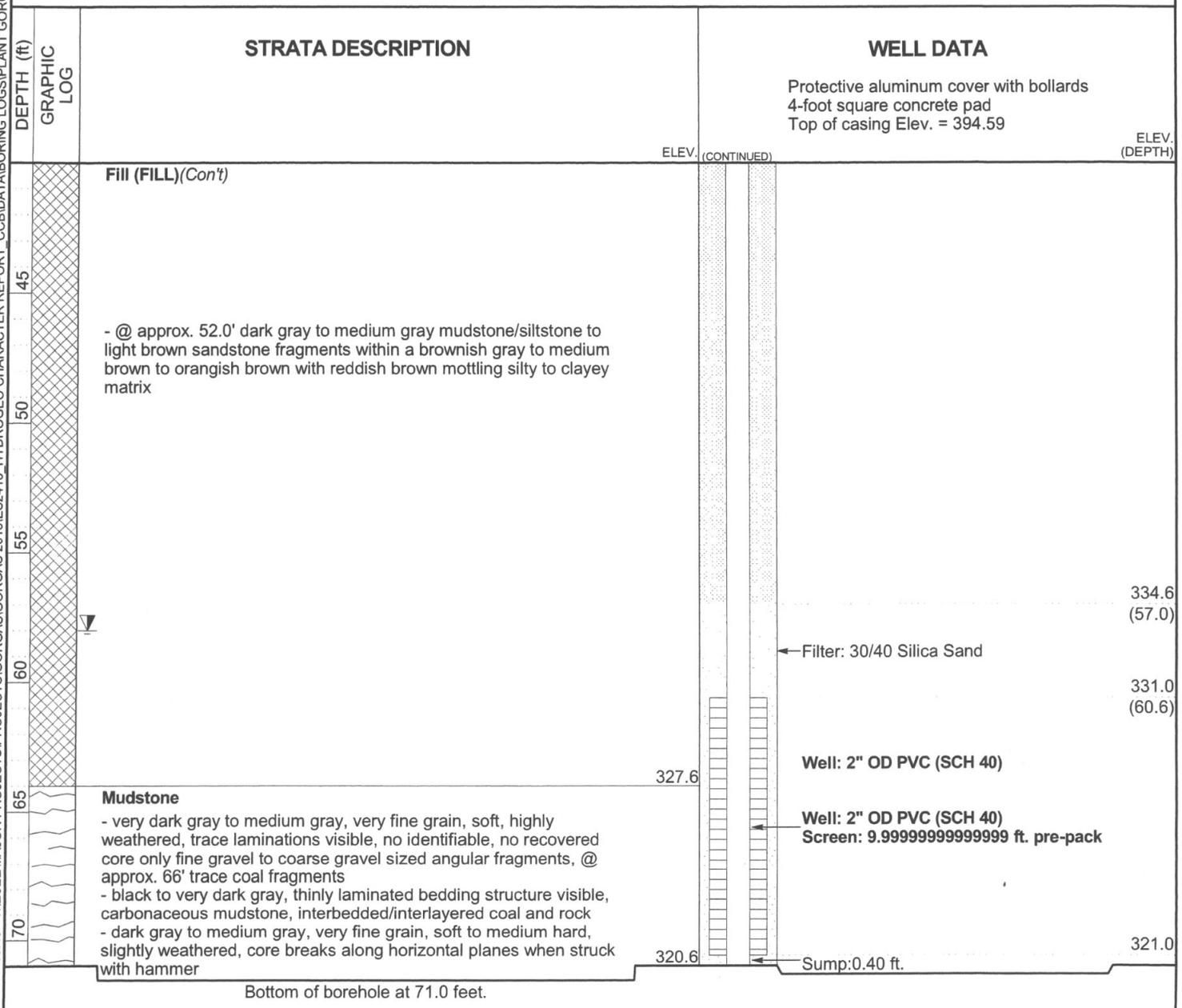


LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-7
 PAGE 2 OF 2
 ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
 EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
 LOCATION APCO - Plant Gorgas





LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-8
PAGE 1 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

DATE STARTED 1/15/2014 COMPLETED 1/16/2014 SURF. ELEV. 413.2 COORDINATES: N:1,329,140.73 E:593,813.96

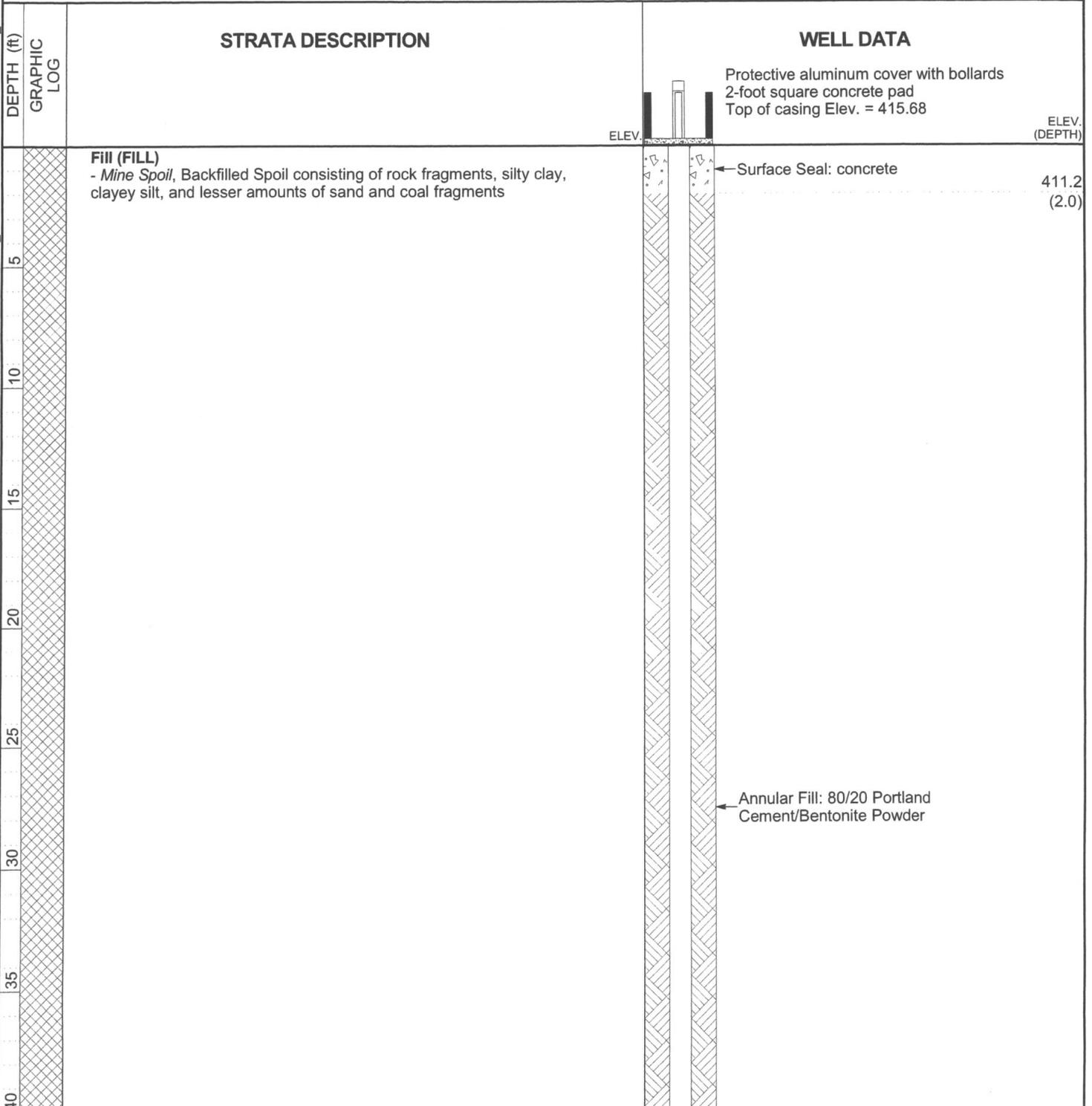
CONTRACTOR CFS EQUIPMENT METHOD CME

DRILLED BY S. Milam LOGGED BY G. Dyer CHECKED BY ANGLE BEARING

BORING DEPTH 69.5 ft. GROUND WATER DEPTH: DURING COMP. DELAYED 61.02 ft.

NOTES

T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO



012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418_HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-8
 PAGE 2 OF 2
 ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
 EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

| DEPTH (ft) GRAPHIC LOG | STRATA DESCRIPTION | ELEV. (CONTINUED) | WELL DATA | ELEV. (DEPTH) |
|---------------------------|---------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------|------------------|
| 45 | Fill (FILL)(Cont) | | Protective aluminum cover with bollards 2-foot square concrete pad Top of casing Elev. = 415.68 | |
| 50 | | | | |
| 55 | | | | |
| 60 | | | ← Annular Seal: 3/8 Hole Plug (medium bentonite chips) | 360.1 (53.1) |
| 65 | | | ← Filter: 30/40 Silica Sand | 356.9 (56.3) |
| 65 | mudstone - gray, lenticular, (Pottsville Formation) | 348.7 | Well: 2" OD PVC (SCH 40) Well: 2" OD PVC (SCH 40) Screen: 10 ft. pre-pack | 354.3 (58.9) |
| | | 343.7 | Sump: 0.20 ft. | 344.3 |

Bottom of borehole at 69.5 feet.



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-9
PAGE 1 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

DATE STARTED 10/27/2014 COMPLETED _____ SURF. ELEV. 487.1 COORDINATES: N:1,329,976.53 E:594,124.62

CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotosonic

DRILLED BY M. Coleman LOGGED BY B. Smelser CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 121 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 110.41 ft.

NOTES _____

2012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418_HYDROGEO CHARACTER REPORT_CBIDATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO

| DEPTH (ft) GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| | | Protective aluminum cover with bollards 4-foot square concrete pad Top of casing Elev. = 490.15 ELEV. (DEPTH) |
| 10 | Fill (FILL) - <i>Mine Spoils</i> , dark gray to medium gray mudstone/siltstone and trace sandstone with trace reddish brown staining, angular to subangular upper coarse sand to coarse gravel sized rock fragments within a light brown to grayish brown to light gray sandy silt matrix - trace bolder sized rock fragments (trace core returned) within a light gray powder/pulverized rock | ← Surface Seal: concrete 485.1 (2.0) |
| 20 | - trace zones of medium brown to reddish brown gravelly silt to gravelly clay matrix containing upper coarse sand to fine gravel sized rock fragments | ← Annular Fill: 80/20 Portland Cement/Bentonite Powder 467.1 (20.0) |
| 30 | | |
| 40 | - orangish brown to reddish brown to grayish brown gravelly silt, upper coarse sand to coarse gravel sized dark gray to medium gray angular to subangular mudstone/siltstone fragments | |
| 50 | | |
| 60 | - dark gray to medium gray upper coarse sand to coarse gravel to trace bolder sized mudstone/siltstone fragments within a dark gray to med gray silt to light gray pulverized rock powder with trace light | |



LOG OF TEST BORING AND WELL INSTALLATION

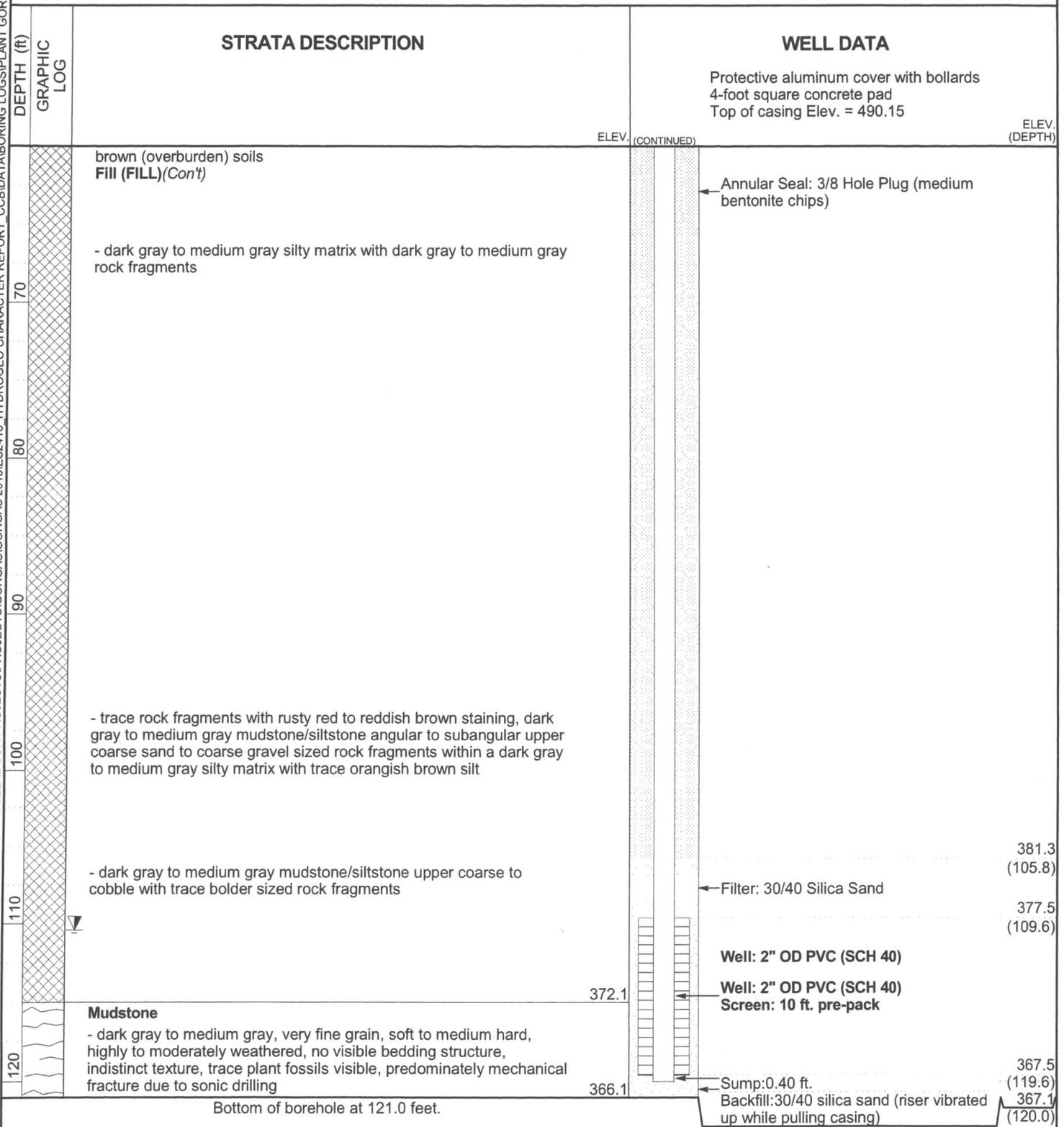
BORING MW-9
PAGE 2 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2019\ES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI



012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\IES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS AND GYPSUM STOI



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-11
 PAGE 1 OF 2
 ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
 EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
 LOCATION APCO - Plant Gorgas

DATE STARTED 10/30/2014 COMPLETED _____ SURF. ELEV. 403.7 COORDINATES: N:1,328,108.24 E:594,813.97

CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotosonic

DRILLED BY M. Coleman LOGGED BY B. Smelser CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 136 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 104.09 ft.

NOTES _____

| DEPTH (ft) | GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA |
|------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| | | | Protective aluminum cover with bollards 4-foot square concrete pad Top of casing Elev. = 406.69 |
| | | | ELEV. (DEPTH) |
| 10 | | Fill (FILL) - <i>Mine Spoils</i> , dark gray to medium gray upper coarse sand to coarse gravel sized angular to subangular mudstone/siltstone with trace sandstone fragments within a dark gray to medium gray silty matrix - trace bolder sized rock fragments due to pulverized rock powder and trace core pieces recovered | ← Surface Seal: concrete 401.7 (2.0) |
| 20 | | - trace zones of interlayered reddish brown to orangish brown gravelly silt and gravelly clay with dark gray the medium gray subangular to subrounded rock fragments | ← Annular Fill: 80/20 Portland Cement/Bentonite Powder 383.2 (20.5) |
| 30 | | | |
| 40 | | | |
| 50 | | - trace reddish brown to rusty red staining on some rock fragments | |
| 60 | | - trace orangish brown to reddish brown clayey zones | |



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-11
PAGE 2 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

112 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\IES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO

| DEPTH (ft) | GRAPHIC LOG | STRATA DESCRIPTION | ELEV. (DEPTH) | WELL DATA |
|------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------|
| | | | | Protective aluminum cover with bollards 4-foot square concrete pad Top of casing Elev. = 406.69 |
| | | | ELEV. (CONTINUED) | |
| 70 | | Fill (FILL)(Con't) | | |
| 80 | | - dark gray to medium gray silty matrix grading to light brown to orangish brown gravelly silt matrix (overburden layer) with subangular to subrounded dark gray to medium gray to reddish brown coarse sand to fine gravel sized mudstone/siltstone and trace sandstone rock fragments | | |
| 90 | | - trace coal fragments included in a light brown to orangish brown to grayish brown silty to clayey matrix | | ← Annular Seal: 3/8 Hole Plug (medium bentonite chips) |
| 100 | | - dark gray to medium gray to light brown upper coarse sand to coarse gravel with trace cobble sized angular to subangular rock fragments within an orangish brown to brownish gray sandy silt matrix | | |
| 110 | | - trace coal fragments and coal dust increasing with depth | | |
| 120 | | - dark gray to medium gray rock fragments within a dark gray to medium gray silty matrix, @ approx. 124' - 125' light brown to orangish brown silt with fine gravel sized angular rock fragments (overburden layer) | 285.7 (118.0) | ← Filter: 30/40 Silica Sand |
| | | | 282.1 (121.6) | |
| | | | 278.7 | Well: 2" OD PVC (SCH 40) |
| | | | | Well: 2" OD PVC (SCH 40) |
| | | | | Screen: 10 ft. pre-pack |
| | | | | Sump: 0.40 ft. (131.6) |
| | | | | Backfill: 30/40 silica sand (sand up to 132.0') (132.0) |
| 130 | | Mudstone | | |
| | | - dark gray to medium gray to light gray, very fine to upper fine grain, highly to moderately weathered, thinly laminated bedding structure visible, no identifiable texture, @ approx. 125' - 126' light gray pulverized rock powder with coarse sand to fine gravel sized brittle/friable mudstone fragments, @ 127' tagged up competent rock | | |
| | | - dark gray to medium gray mudstone that breaks along horizontal planes when struck with a hammer, @ approx. 134.5' black, very brittle/friable carbonaceous mudstone with coal spars, very soft zone | 267.7 | |

Bottom of borehole at 136.0 feet.



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-12
 PAGE 1 OF 2
 ACP137766/ACP133592

SOUTHERN COMPANY SERVICES, INC.
 EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
 LOCATION APCO - Plant Gorgas

DATE STARTED 11/3/2014 COMPLETED _____ SURF. ELEV. 470.7 COORDINATES: N:1,328,563.73 E:594,741.23

CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotosonic

DRILLED BY M. Coleman LOGGED BY B. Smelser CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 166 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 152.33 ft.

NOTES _____

2012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418_HYDROGEO CHARACTER REPORT_CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI

| DEPTH (ft) | STRATA DESCRIPTION | WELL DATA |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | ELEV. (DEPTH) |
| | | 468.7 (2.0) |
| 10 | <p>Fill (FILL)</p> <p>- <i>Mine Spoils</i>, dark gray to medium gray upper coarse sand to coarse gravel with trace cobble sized angular to subangular mudstone/siltstone fragments within a dark gray to medium gray silty matrix</p> | <p>Protective aluminum cover with bollards 4-foot square concrete pad Top of casing Elev. = 473.74</p> <p>← Surface Seal: concrete</p> |
| 20 | <p>- trace reddish brown to rusty red staining on some rock fragments</p> | 450.6 (20.1) |
| 30 | | |
| 40 | <p>- trace zones of orangish brown silt and clay matrix with upper coarse sand to fine gravel sized rock fragments, trace orangish brown sandstone fragments</p> | |
| 50 | <p>- dark gray to medium gray upper coarse sand to coarse gravel with trace cobble sized angular to subangular mudstone/siltstone fragments within a dark gray to medium gray silty matrix</p> | |
| 60 | <p>- trace zones of orangish brown silt and clay matrix with upper coarse sand to fine gravel sized rock fragments, trace orangish brown sandstone fragments</p> | |
| 70 | | |
| 80 | <p>- dark gray to medium gray upper coarse sand to coarse gravel with trace cobble sized angular to subangular mudstone/siltstone</p> | |



LOG OF TEST BORING AND WELL INSTALLATION

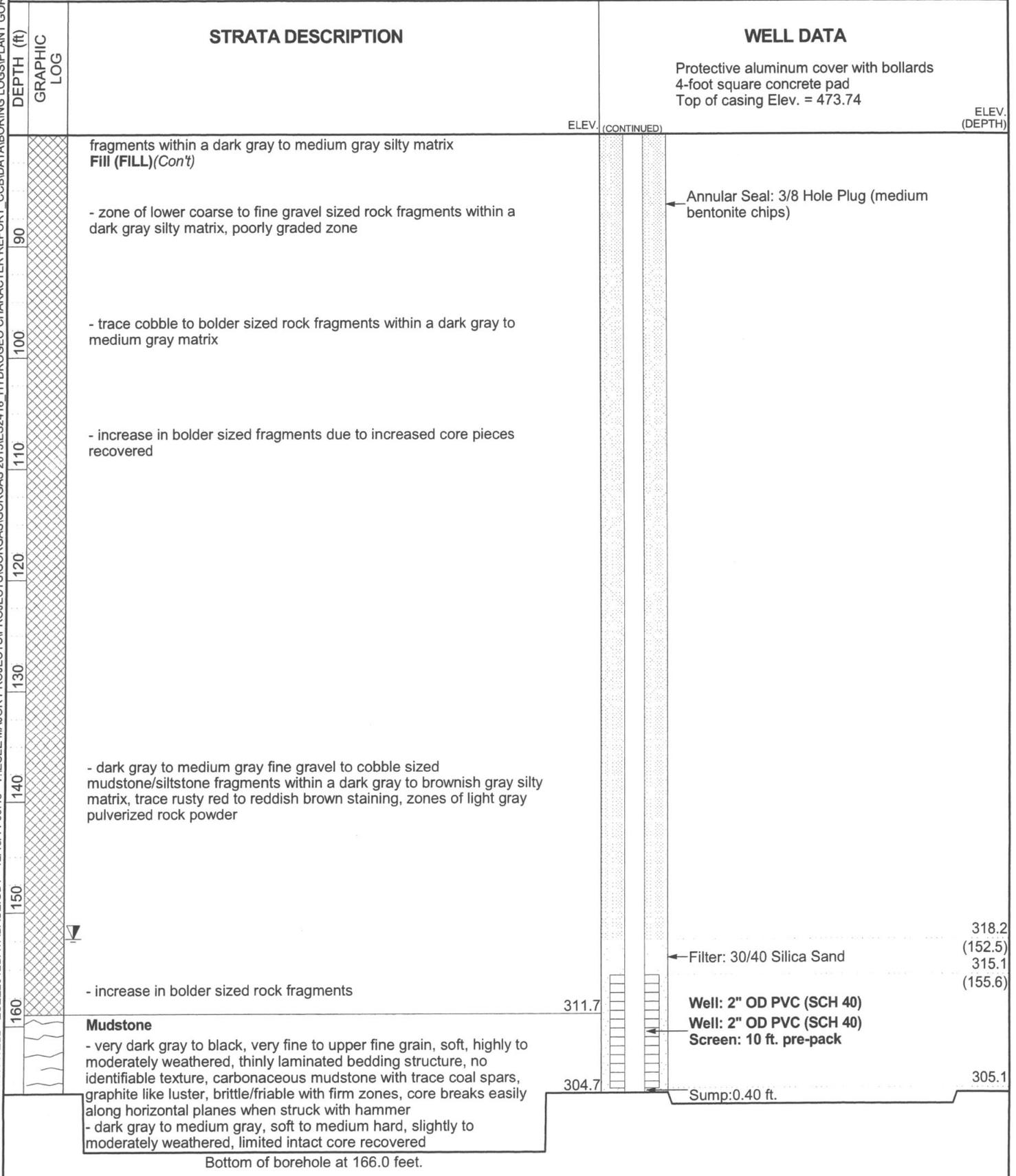
BORING MW-12
PAGE 2 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

12 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO



2012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-13
PAGE 1 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
LOCATION APCO - Plant Gorgas

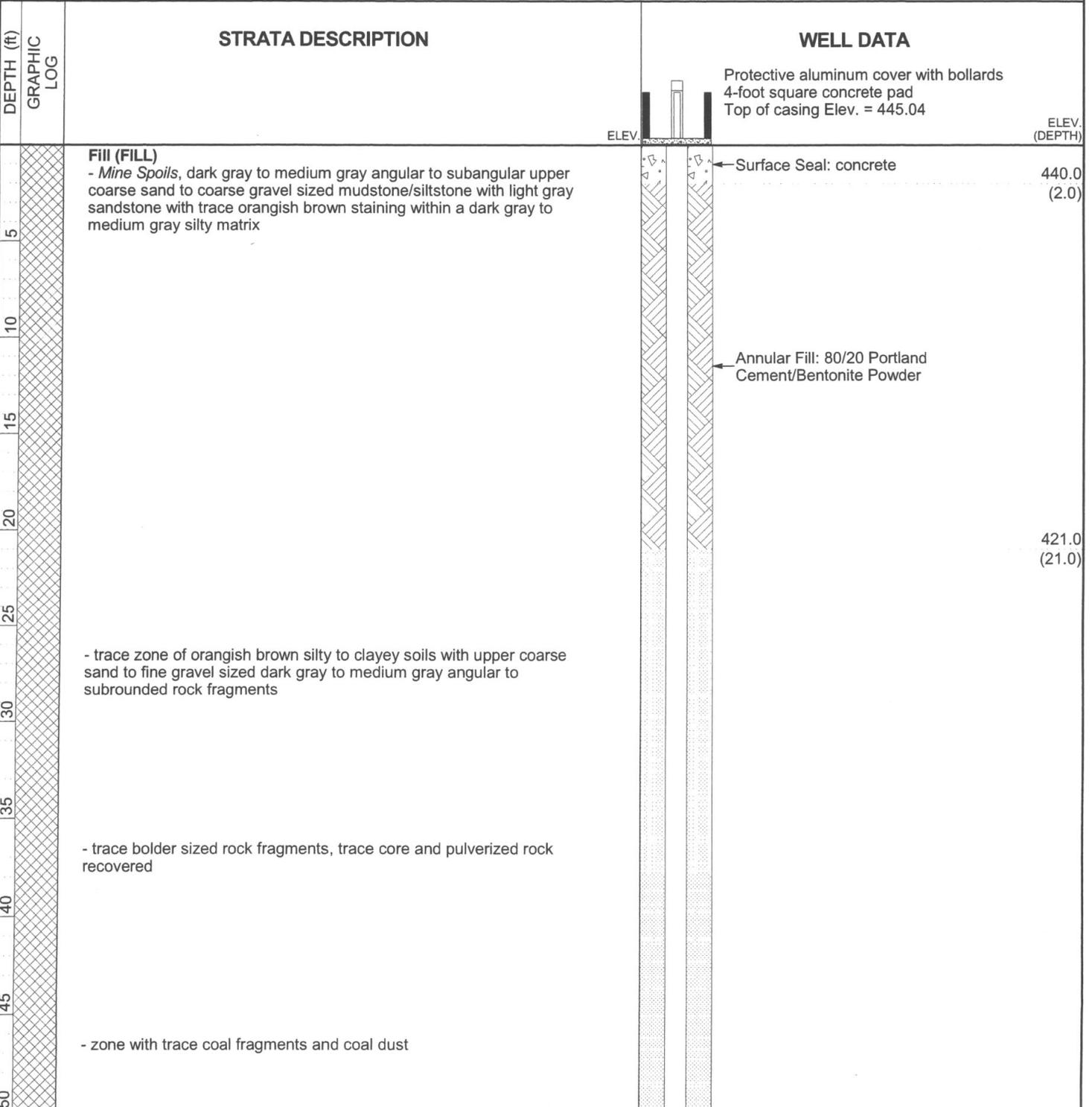
DATE STARTED 11/4/2014 COMPLETED _____ SURF. ELEV. 442.0 COORDINATES: N:1,329,383.94 E:595,088.06

CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotosonic

DRILLED BY M. Coleman LOGGED BY B. Smelser CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 106 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 91.35 ft.

NOTES _____





LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-13
PAGE 2 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

12 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\IES2418 - HYDROGEO CHARACTER REPORT - CGBIDATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI

| DEPTH (ft) GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| | | Protective aluminum cover with bollards 4-foot square concrete pad Top of casing Elev. = 445.04 |
| | | ELEV. (DEPTH) |
| | | ELEV. (CONTINUED) |
| 55 | Fill (FILL)(Con't) | |
| 60 | | ← Annular Seal: 3/8 Hole Plug (medium bentonite chips) |
| 65 | | |
| 70 | - trace rusty red to orangish brown stained sandstone fragments included with dark gray to medium gray mudstone fragments, zones of orangish brown sandy silt | |
| 75 | | |
| 80 | | |
| 85 | | |
| 90 | | |
| 95 | - dark gray to medium gray angular upper coarse sand to fine gravel sized mudstone fragments within a orangish brown sandy silty (overburden layer) with trace lower medium to fine gravel sized coal fragments | ← Filter: 30/40 Silica Sand |
| 100 | | Well: 2" OD PVC (SCH 40) |
| 105 | Mudstone - dark gray to medium gray to black, very fine to lower fine grain, medium hard to soft, moderately to highly weathered, trace thinly laminated bedding structure visible, no identifiable texture, mudstone grading to a darker carbonaceous mudstone with depth, drilled dry - limited core recovery, @ approx. 104' - 105' interbedded coal (returned pulverized coal fragments and dust), @ approx. 105' grades to medium gray to dark gray mudstone - grades out of the carbonaceous mudstone/coal layers | Well: 2" OD PVC (SCH 40) Screen: 10 ft. pre-pack |
| | | Sump: 0.40 ft. |
| | | 349.5 (92.5) |
| | | 346.4 (95.6) |
| | | 343.0 |
| | | 336.4 |

Bottom of borehole at 106.0 feet.



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-14
PAGE 1 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

DATE STARTED 11/5/2014 COMPLETED _____ SURF. ELEV. 426.9 COORDINATES: N:1,329,549.38 E:595,627.61

CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotasonic

DRILLED BY M. Coleman LOGGED BY B. Smelser CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 101 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 86.17 ft.

NOTES _____

12 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 HYDROGEO CHARACTER REPORT COBIDATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI

| DEPTH (ft) | GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA |
|------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| | | | Protective aluminum cover with bollards 4-foot square concrete pad Top of casing Elev. = 429.90 ELEV. (DEPTH) |
| 5 | | Fill (FILL) - <i>Mine Spoils</i> , dark gray to medium gray upper coarse sand to coarse gravel sized with trace cobble sized angular to subangular mudstone/siltstone with trace sandstone fragments within a dark gray to medium gray silty matrix with zones of orangish brown to grayish brown silt | ← Surface Seal: concrete 424.9 (2.0) |
| 10 | | | |
| 15 | | | |
| 20 | | | 406.9 (20.0) |
| 25 | | - dark gray silty matrix | |
| 30 | | | |
| 35 | | | |
| 40 | | | |
| 45 | | | |
| 50 | | - trace bolder sized fragments due to core fragments and pulverized rock powder returned | |



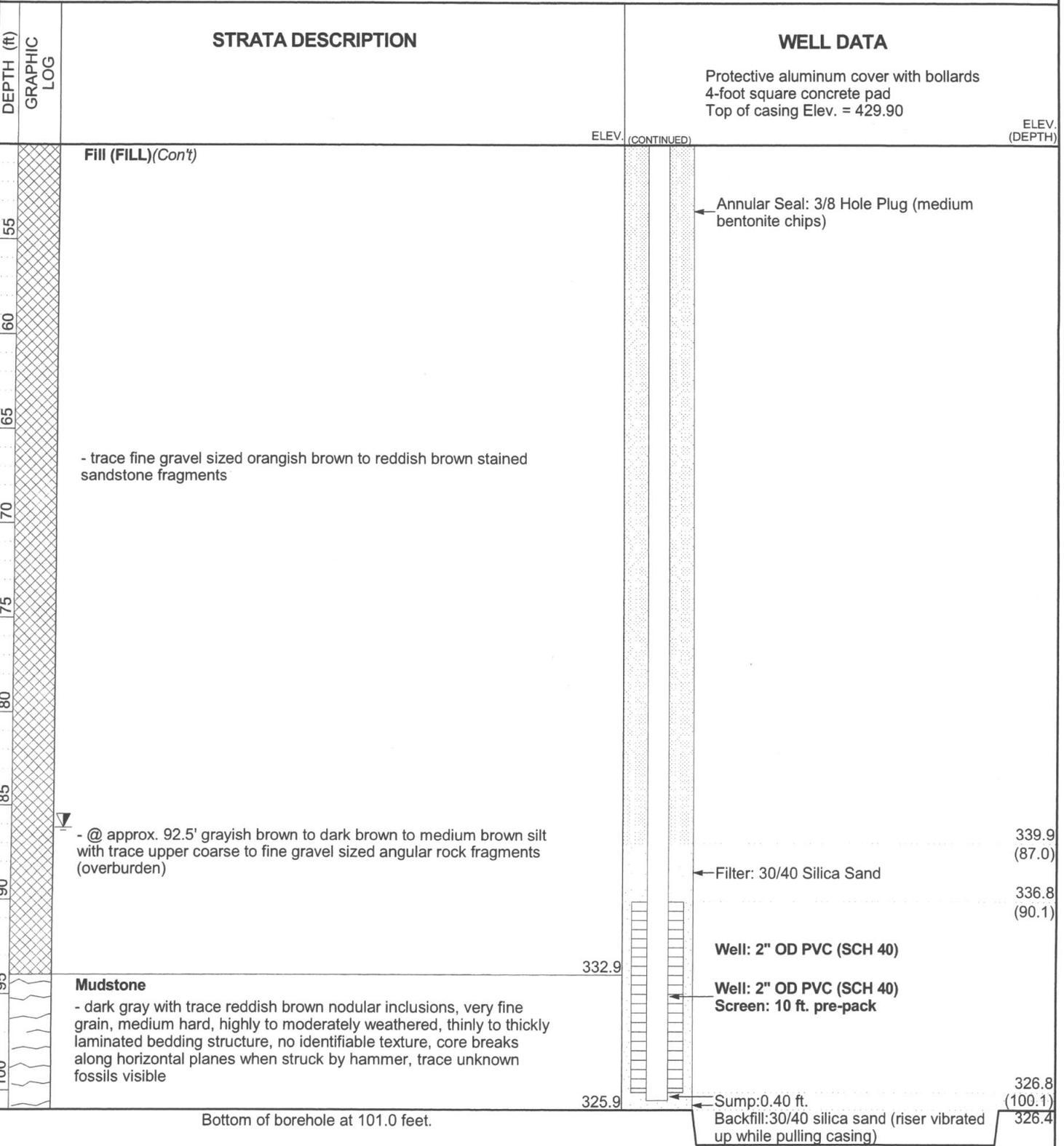
LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-14
 PAGE 2 OF 2
 ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
 EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
 LOCATION APCO - Plant Gorgas

12 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI



12 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\GORGAS\GORGAS 2015\ES2418_HYDROGEO CHARACTER REPORT_CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-15
 PAGE 1 OF 2
 ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
 EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
 LOCATION APCO - Plant Gorgas

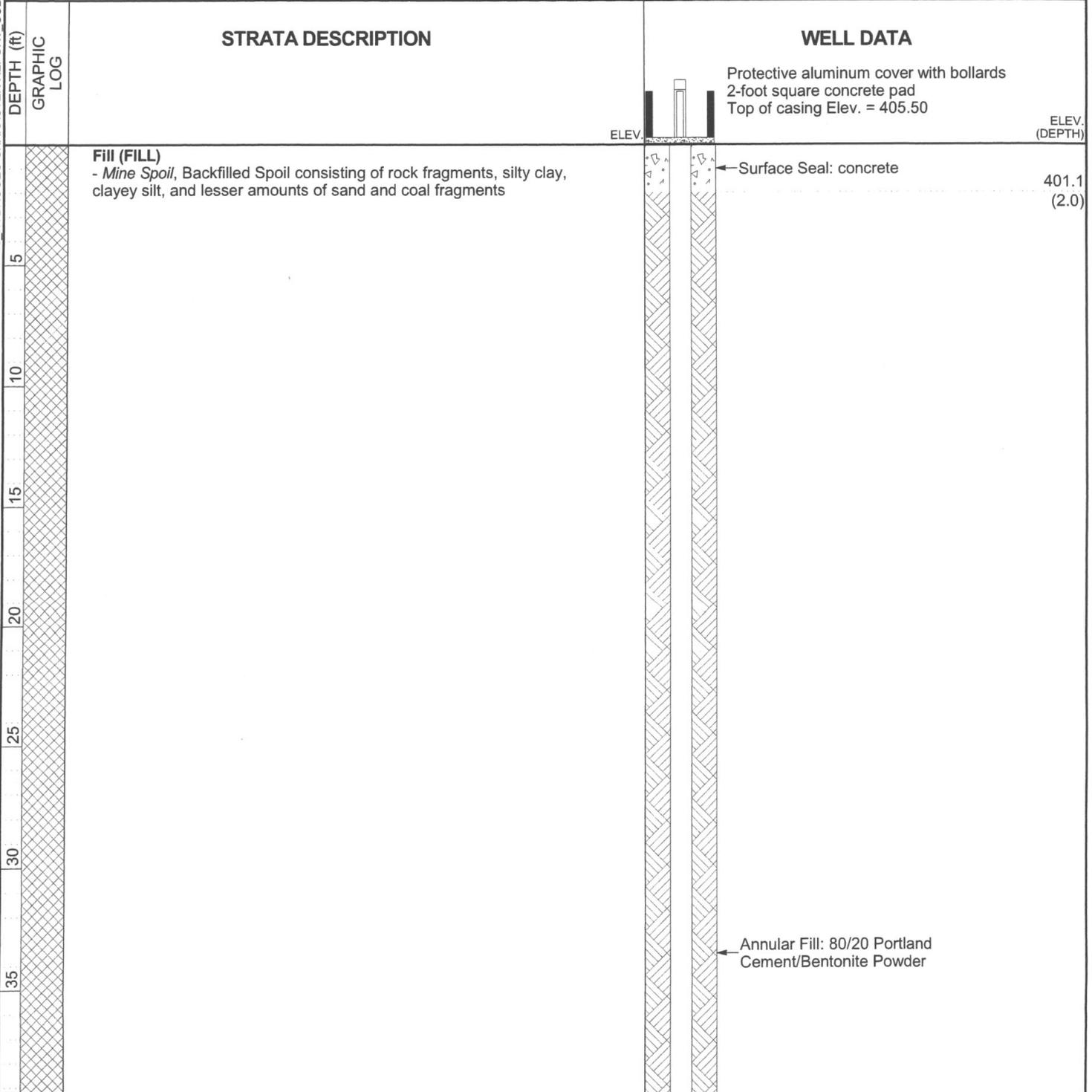
DATE STARTED 11/16/2013 COMPLETED 11/17/2013 SURF. ELEV. 403.1 COORDINATES: N:1,329,680.61 E:595,932.10

CONTRACTOR CFS EQUIPMENT _____ METHOD CME

DRILLED BY S. Milam LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 84.2 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 65.03 ft.

NOTES _____



ELEV.

ELEV.
(DEPTH)

12 GEOTECH LOG WITH WELL - ES2012DATABASE.GDT - 12/18/14 09:43 - T:ISEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO

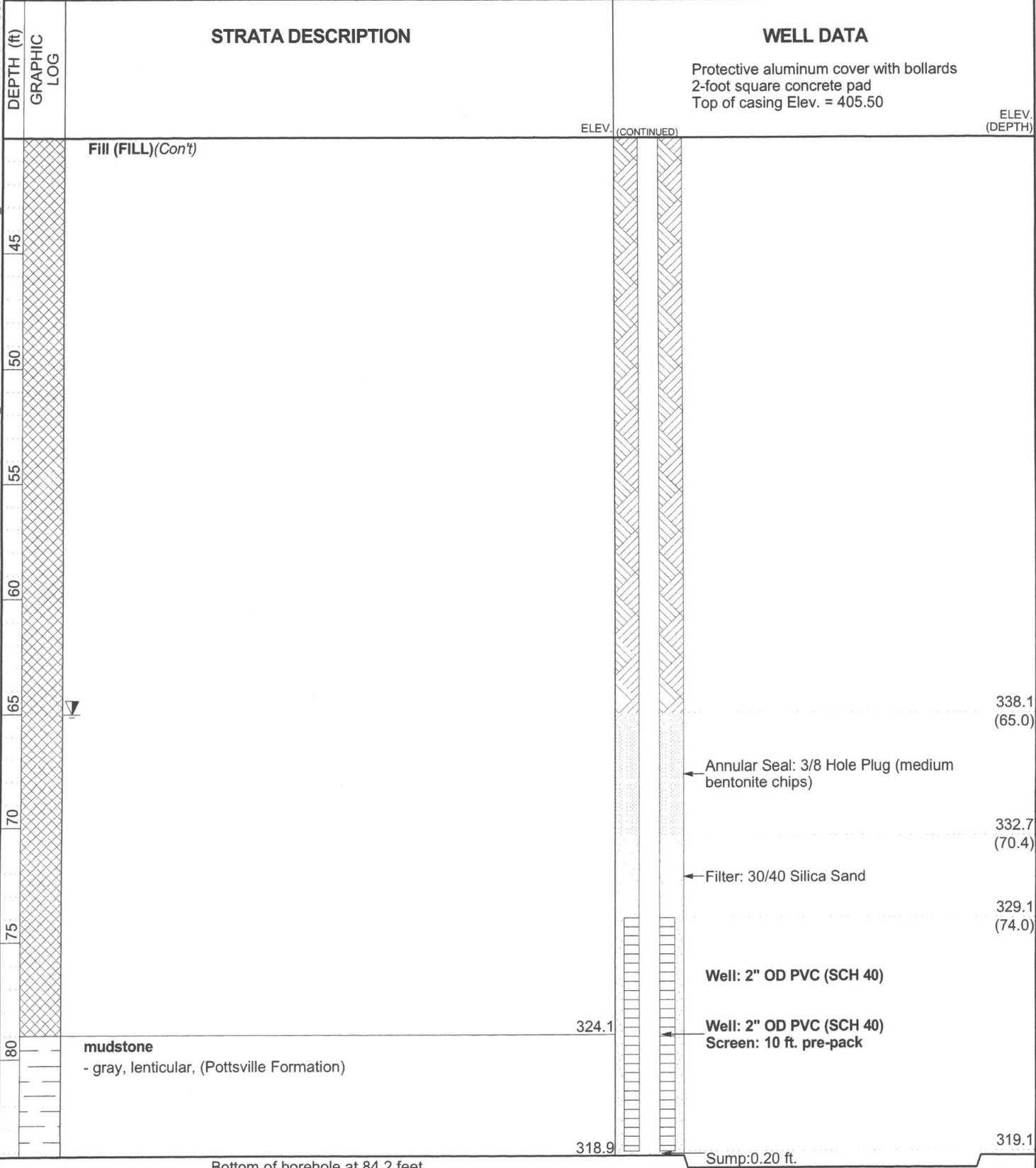


LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-15
PAGE 2 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
LOCATION APCO - Plant Gorgas



Bottom of borehole at 84.2 feet.



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-16
PAGE 1 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

DATE STARTED 11/5/2014 COMPLETED _____ SURF. ELEV. 411.6 COORDINATES: N:1,328,655.72 E:596,399.88

CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotosonic

DRILLED BY M. Coleman LOGGED BY B. Smelser CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 107 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 88.43 ft.

NOTES _____

12.GEOTECH.LOG.WITH.WELL - ESEE2012.DATABASE.GDT - 12/18/14 09:43 - T:IESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\IES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO

| DEPTH (ft) | GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA |
|------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| | | | Protective aluminum cover with bollards 4-foot square concrete pad Top of casing Elev. = 414.57 ELEV. _____ (DEPTH) |
| 0 | | Fill (FILL) - Mine Spoils, dark gray to medium gray upper coarse sand to coarse gravel sized angular to subangular mudstone/siltstone fragments within a dark gray to medium gray silty matrix | ← Surface Seal: concrete 409.6 (2.0) |
| 5 | | | |
| 10 | | | |
| 15 | | - trace bolder sized fragments due to limited core recovered | |
| 20 | | | 392.1 (19.5) |
| 25 | | | |
| 30 | | | |
| 35 | | | |
| 40 | | | |
| 45 | | - zones of dark brown to orangish brown silt/clay with fine gravel sized angular rock fragments | |
| 50 | | | |



LOG OF TEST BORING AND WELL INSTALLATION

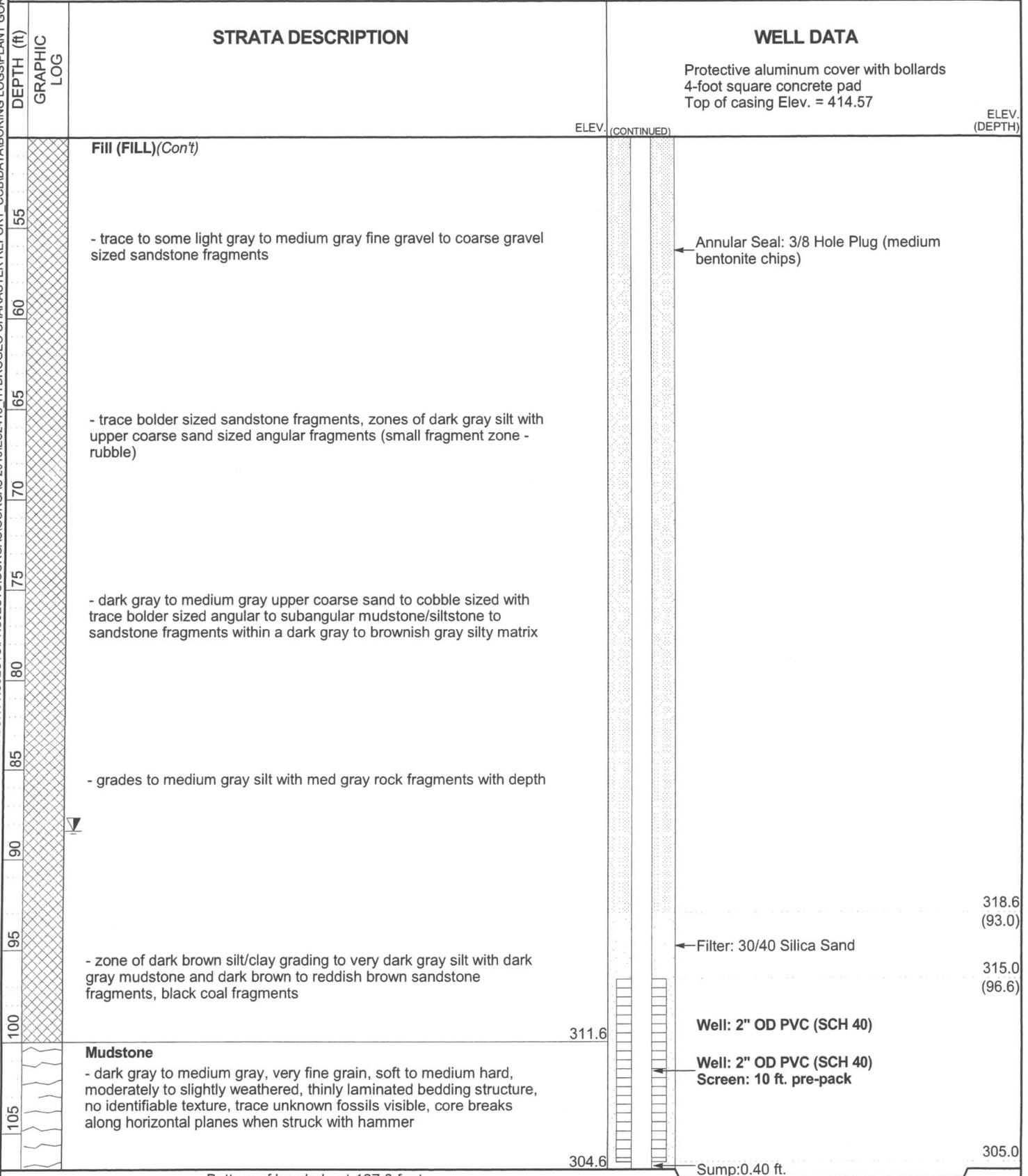
BORING MW-16
PAGE 2 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

12 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 - HYDROGEO CHARACTER REPORT - CGBIDATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO





LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-17
PAGE 1 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
LOCATION APCO - Plant Gorgas

DATE STARTED 11/6/2014 COMPLETED _____ SURF. ELEV. 429.0 COORDINATES: N:1,328,253.36 E:596,174.14

CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotosonic

DRILLED BY M. Coleman LOGGED BY B. Smelser CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 111 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES _____

12 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 HYDROGEO CHARACTER REPORT_CCB\DATA\BORING LOGS\PLANT_GORGAS_CCB AND GYPSUM STO

| DEPTH (ft) | GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA |
|------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| | | | Protective aluminum cover with bollards 4-foot square concrete pad Top of casing Elev. = 432.03 ELEV. (DEPTH) |
| | | Fill (FILL) - <i>Mine Spoils</i> , orangish brown clay fill soils with trace dark gray angular gravel rock fragments grading to dark gray to medium gray angular to subangular upper coarse to coarse gravel sized with trace cobble sized mudstone/siltstone fragments within a dark gray to med gray silty matrix | ← Surface Seal: concrete 427.0 (2.0) |
| 10 | | | |
| 20 | | | |
| 30 | | | |
| 40 | | - orangish brown to grayish brown to dark brown silty to clayey matrix with included rock fragments | |
| 50 | | - trace coal fragments visible | 409.5 (19.5) |



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-17
PAGE 2 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
LOCATION APCO - Plant Gorgas

2012 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 - HYDROGEO CHARACTER REPORT - COBIDATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO

| DEPTH (ft) | GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA |
|------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| | | | Protective aluminum cover with bollards 4-foot square concrete pad Top of casing Elev. = 432.03 |
| | | | ELEV. (DEPTH) |
| | | | ELEV. (CONTINUED) |
| 60 | | Fill (FILL)(Con't) | ← Annular Seal: 3/8 Hole Plug (medium bentonite chips) |
| 70 | | - bolder sized rock fragments, core pieces and pulverized rock powder recovered | |
| 80 | | - @ approx. 85' - 86' zone of light brown silty (overburden soils) with fine gravel to cobble sized light brown sandstone fragments | |
| 90 | | | |
| 100 | | | ← Filter: 30/40 Silica Sand |
| | | | 336.0 (93.0) |
| | | | 332.9 (96.1) |
| | | | Well: 2" OD PVC (SCH 40) |
| | | | Well: 2" OD PVC (SCH 40) Screen: 10 ft. pre-pack |
| | | | 322.9 (106.1) |
| | | | ← Sump: 0.40 ft. |
| | | | 322.5 (106.5) |
| | | | ← Backfill: 30/40 silica sand (sand up to 106.5') |
| | | | 318.0 |

Bottom of borehole at 111.0 feet.

112 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\GORGAS\GORGAS 2015\ES2418_HYDROGEO CHARACTER REPORT_CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-18
PAGE 1 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

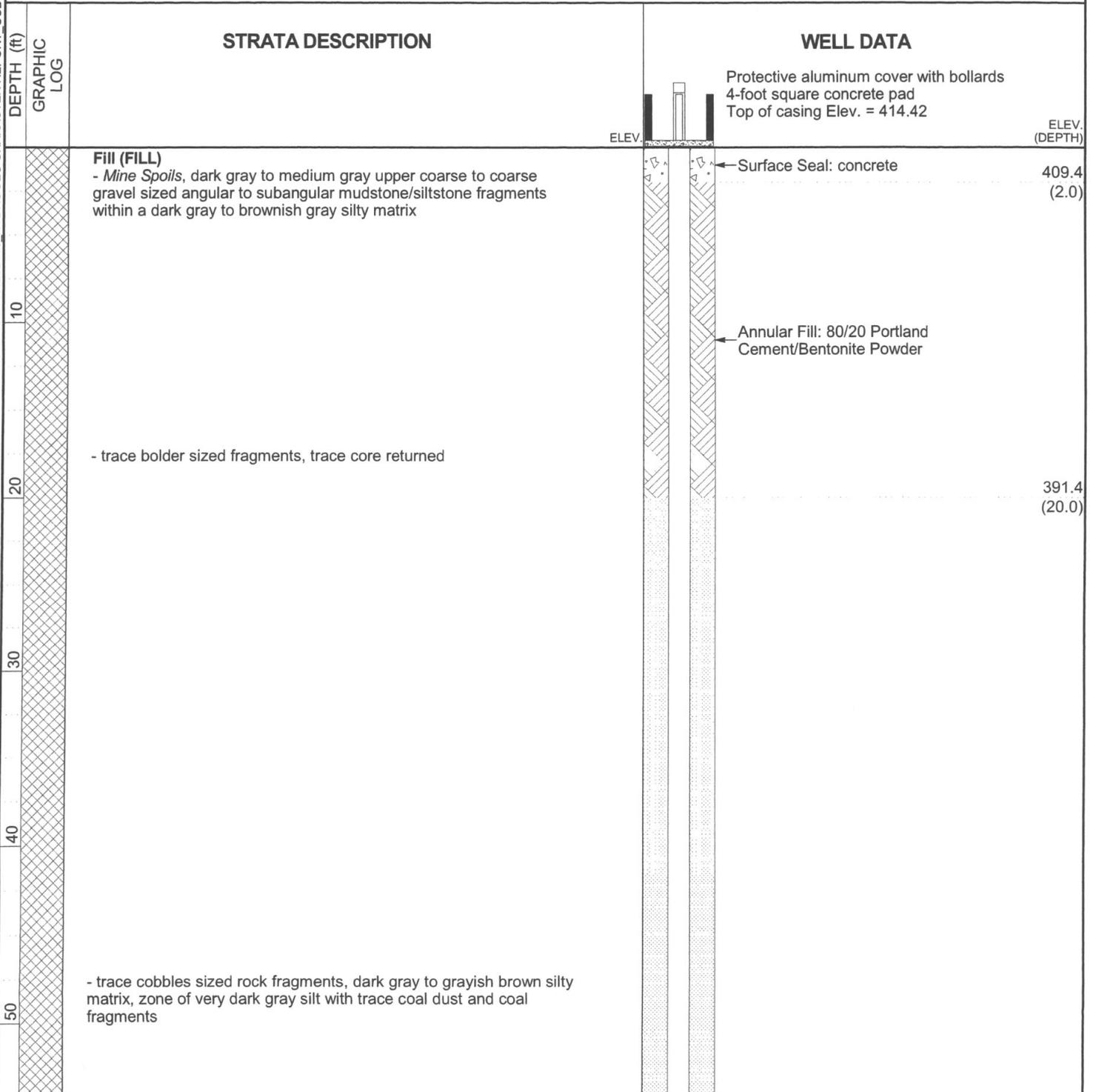
DATE STARTED 11/6/2014 COMPLETED _____ SURF. ELEV. 411.4 COORDINATES: N:1,327,977.42 E:595,793.78

CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotosonic

DRILLED BY M. Coleman LOGGED BY B. Smelser CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 117 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 110.84 ft.

NOTES _____





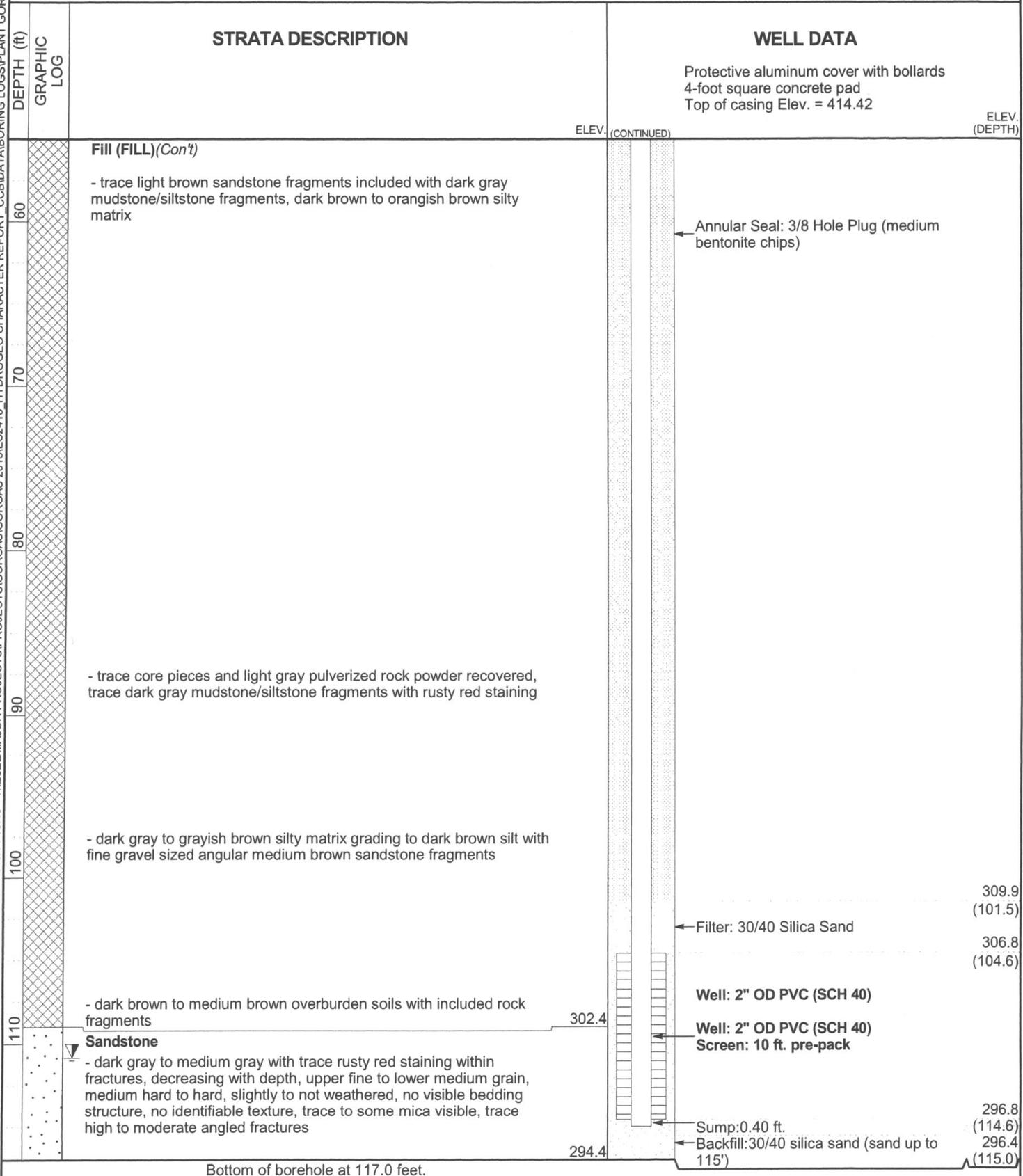
LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-18
PAGE 2 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
LOCATION APCO - Plant Gorgas

12 GEOTECH LOG WITH WELL - ES2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO



12 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 HYDROGEO CHARACTER REPORT_CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-19
 PAGE 1 OF 3
 ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
 EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
 LOCATION APCO - Plant Gorgas

DATE STARTED 11/4/2013 COMPLETED 11/6/2013 SURF. ELEV. 375.1 COORDINATES: N:1,327,697.31 E:595,251.57

CONTRACTOR CFS EQUIPMENT _____ METHOD CME

DRILLED BY S. Milam LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 95.1 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 79.63 ft.

NOTES _____

| DEPTH (ft) GRAPHIC LOG | STRATA DESCRIPTION | WELL DATA |
|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0 5 10 15 20 25 30 35 | <p>Fill (FILL) - <i>Mine Spoil</i>, Backfilled Spoil consisting of rock fragments, silty clay, clayey silt, and lesser amounts of sand and coal fragments</p> | <div style="text-align: right;"> <p>ELEV. _____</p> <p>(DEPTH) _____</p> </div> <p> Protective aluminum cover with bollards 2-foot square concrete pad Top of casing Elev. = 377.32 </p> <p>← Surface Seal: concrete</p> <p style="text-align: right;">373.1 (2.0)</p> <p style="text-align: right;">Annular Fill: 80/20 Portland</p> |



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-19
PAGE 2 OF 3
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

12 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO

| DEPTH (ft) | GRAPHIC LOG | STRATA DESCRIPTION | ELEV. (DEPTH) | WELL DATA |
|------------|-------------|--------------------|-----------------|-------------------------------------------------------------------------------------------------------|
| 45 | | Fill (FILL)(Con't) | | Protective aluminum cover with bollards 2-foot square concrete pad Top of casing Elev. = 377.32 |
| 50 | | | | |
| 55 | | | | |
| 60 | | | | |
| 65 | | | | |
| 70 | | | | |
| 75 | | | | |
| 80 | | | 298.1 (77.0) | ← Annular Seal: 3/8 Hole Plug (medium bentonite chips) |
| | | | 293.1 (82.0) | ← Filter: 30/40 Silica Sand |
| 85 | | | 290.4 (84.7) | |
| | | | | Well: 2" OD PVC (SCH 40) |

12 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STOI



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-19
PAGE 3 OF 3
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

| DEPTH (ft) | GRAPHIC LOG | STRATA DESCRIPTION | | WELL DATA |
|------------|-------------|-------------------------------------------------------------------------------------------------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 90 | | Fill (FILL)(Con't) | ELEV. (CONTINUED) | Protective aluminum cover with bollards 2-foot square concrete pad Top of casing Elev. = 377.32 Well: 2" OD PVC (SCH 40) Screen: 10 ft. pre-pack |
| 95 | | mudstone - dark gray, fossiliferous, Contains trace coal spars (Pottsville Formation) | 284.1 | |
| | | Bottom of borehole at 95.1 feet. | 280.0 | Sump: 0.20 ft. ELEV. (DEPTH) 280.4 |

112 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T: ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015IES2418 - HYDROGEO CHARACTER REPORT - CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO



LOG OF TEST BORING AND WELL INSTALLATION

BORING MW-20
PAGE 1 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling
LOCATION APCO - Plant Gorgas

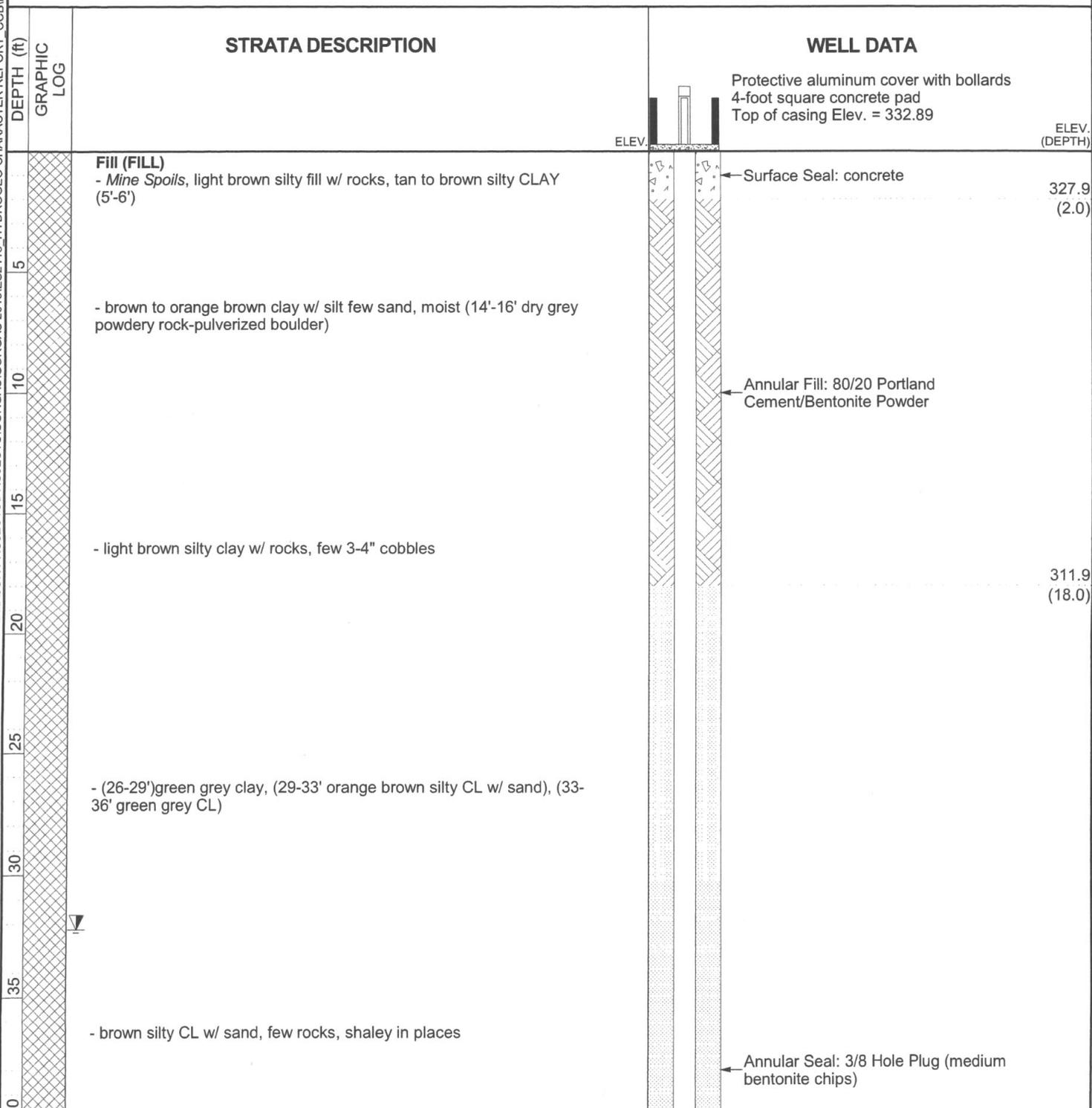
DATE STARTED 11/10/2014 COMPLETED _____ SURF. ELEV. 329.9 COORDINATES: N:1,327,792.53 E:594,841.23

CONTRACTOR Cascade Drilling EQUIPMENT J-1866 METHOD Rotosonic

DRILLED BY M. Coleman LOGGED BY B. Coates CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 70.5 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED 32.23 ft.

NOTES _____





LOG OF TEST BORING AND WELL INSTALLATION

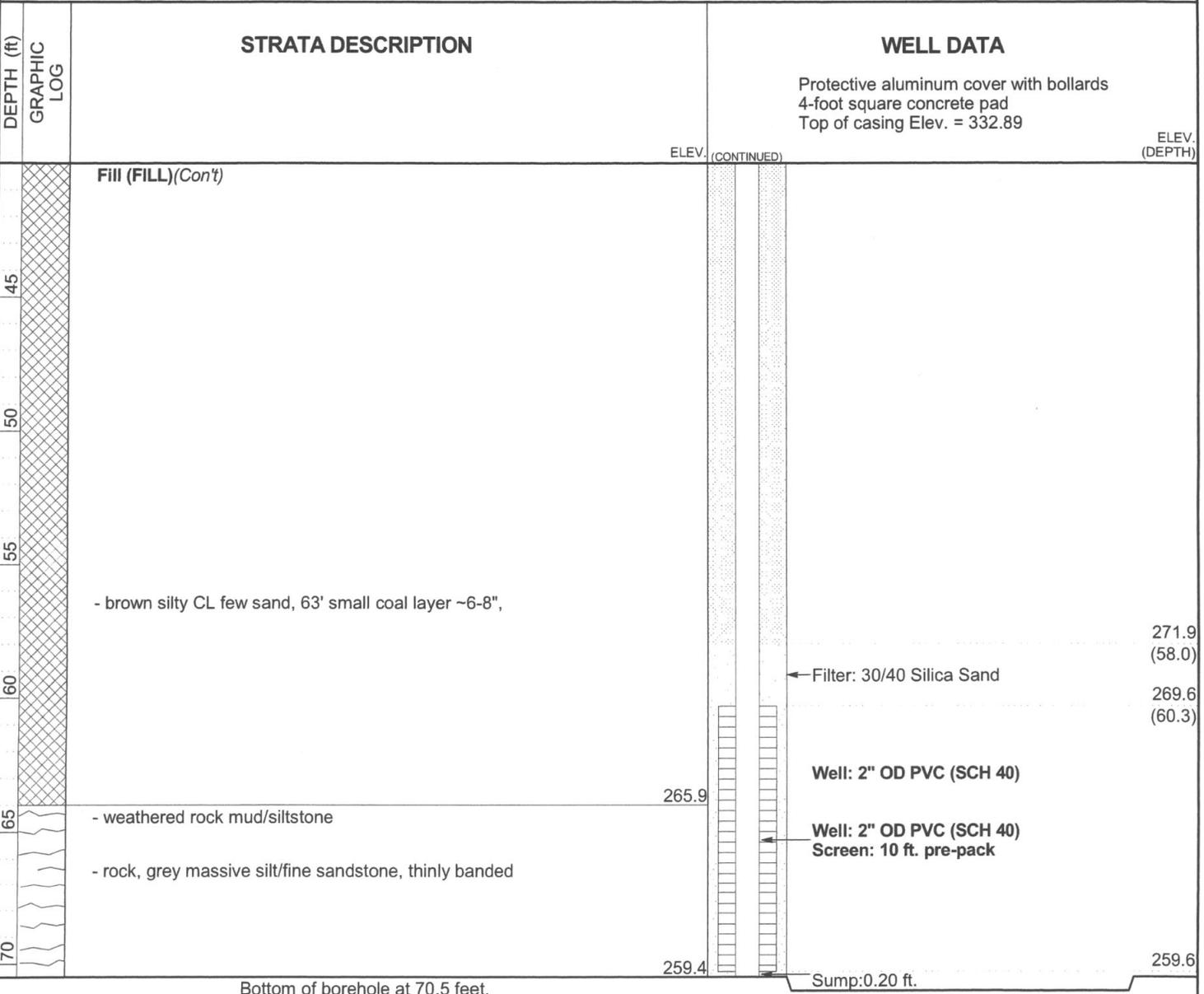
BORING MW-20
PAGE 2 OF 2
ACP137766/ACP133582

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas CCB & Gypsum Storage Drilling

LOCATION APCO - Plant Gorgas

12 GEOTECH LOG WITH WELL - ESEE2012DATABASE.GDT - 12/18/14 09:43 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2015\ES2418_HYDROGEO CHARACTER REPORT_CCB\DATA\BORING LOGS\PLANT GORGAS CCB AND GYPSUM STO





LOG OF TEST BORING

BORING D-1
PAGE 1 OF 4
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 1/11/2012 COMPLETED 1/18/2012 SURF. ELEV. 520.2 COORDINATES: N:1,330,686.91 E:593,113.25

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Milam LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 209.5 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

G:\GEOLOGY LOG - 33EE - DATABASE.GDT - 1/18/12 16:14 - T:\ESSEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|---------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------|----------|
| 5 | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous | | | |
| 10 | | | | | |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |
| 35 | | | | | |
| 40 | | | | | |
| 45 | | | | | |



LOG OF TEST BORING

BORING D-1
PAGE 2 OF 4
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - \\SEE\DATA\BASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\Es2113 GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCl REACTION | COMMENTS |
|---------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------|----------|
| | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous (Cont) | | | |
| 55 | | | | | |
| 60 | | | | | |
| 65 | | | | | |
| 70 | | | | | |
| 75 | | | | | |
| 80 | | | | | |
| 85 | | | | | |
| 90 | | | | | |
| 95 | | | | | |
| 100 | | | | | |
| 105 | | | | | |



LOG OF TEST BORING

BORING D-1
PAGE 3 OF 4
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - L3:EE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION | COMMENTS |
|---------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------|----------|
| 115 | | Claystone; dark gray; with wavy discontinuous siltstone beds; pressure-related structures; few trace organics (lycopids) | | | |
| 120 | | | | | |
| 125 | | Bituminous Coal; black; 6"-8" in total thickness with approximately 6" of dk. gray to black carbonaceous mudstone | | | |
| 130 | | Mudstone with siltstone interbeds; dark to light gray; compositionally banded; few biogenic structures | | | |
| 135 | | Siltstone with shale/clay interbeds; Brown-Gray; shale interbeds are very thin < 1 cm, with the exception of one thicker bed from 133.5 to 134.2; euhedral calcium carbonate crystals present in fractures; some red, iron staining | | | |
| 140 | | Mudstone; gray; wavy discontinuous to continuous bedforms; lenticular bedding | | | |
| 145 | | | | | |
| 150 | | | | | |
| 155 | | | | | |
| 160 | | Siltstone; light gray; interbedded within mudstone/claystone sequence; lenticularly bedded | | | |
| 165 | | Claystone; gray; thin discontinuous siltstone beds; lenticular bedding | | | |



LOG OF TEST BORING

BORING D-1
PAGE 4 OF 4
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - ES2113 - 11/8/12 16:14 - T:\ES2113\GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

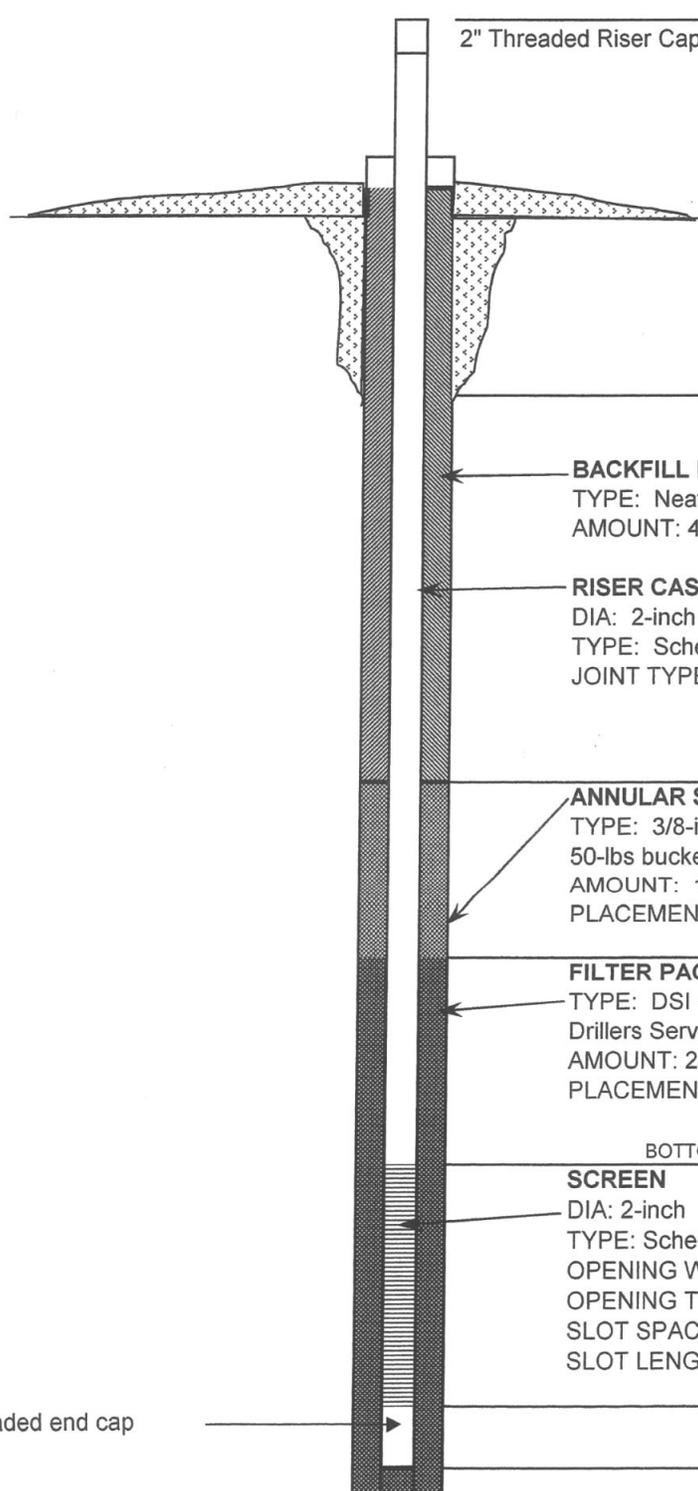
| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION | COMMENTS |
|------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|----------|
| | | Claystone; gray; thin discontinuous siltstone beds; lenticular bedding (Con't) | | | |
| 175 | | Bituminous Coal Zone; thin overlying and underlying dk. gray to black, carbonaceous mudstone/claystone; very organic-rich; lycopsid fossils, carbon imprints; pyrite growths associated with this zone | | | |
| | | Claystone; gray; thin discontinuous siltstone beds; lenticular bedding | | | |
| 180 | | | | | |
| 185 | | | | | |
| 190 | | | | | |
| 195 | | | | | |
| 200 | | | | | |
| 205 | | | | | |
| 210 | | Bottom of borehole at 209.5 feet. | | | |
| 215 | | | | | |
| 220 | | | | | |
| 225 | | | | | |

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|------------|-------------------|----------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | SCS, CFS | WELL NAME |
| | | DRILLER: | S. Mylum | |
| LOCATION: | Parish, AL | RIG TYPE: | CME | D-1 |
| LOGGER: | G. Dyer | DRILLING METHODS: | | |
| DATE CONSTRUCTED: | 1/18/2012 | | | |

| | | DEPTH FEET | ELEVATION FT, MSL |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------|----------------------|
| TOP OF RISER | | 2.30 | 522.53 |
| 2" Threaded Riser Cap | | | |
| GROUND SURFACE | | 0.00 | 520.23 |
| <p>BACKFILL MATERIAL TYPE: Neat Portland Cement AMOUNT: 42 bags (94 lbs/per)</p> <p>RISER CASING DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded</p> | | | |
| TOP OF SEAL | | 156.00 | 364.23 |
| <p>ANNULAR SEAL TYPE: 3/8-in coated Bentonite Pellets 50-lbs bucket AMOUNT: 1 bucket PLACEMENT: Tremie</p> | | | |
| TOP OF FILTER PACK | | 168.00 | 352.23 |
| <p>FILTER PACK TYPE: DSI Sand - Size #2 Drillers Services, Inc. AMOUNT: 2 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water</p> | | | |
| BOTTOM OF RISER / TOP OF SCREEN | | 172.00 | 348.23 |
| <p>SCREEN DIA: 2-inch TYPE: Schedule 40 PVC Pre-Pack OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch</p> | | | |
| BOTTOM OF SCREEN | | 182.00 | 338.23 |
| Flush-threaded end cap | | | |
| BOTTOM OF CASING | | 182.40 | 337.83 |
| HOLE DIA: ~ 4 in | | | |





LOG OF TEST BORING

BORING D-2
PAGE 1 OF 3
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 1/23/2012 COMPLETED 1/25/2012 SURF. ELEV. 429.4 COORDINATES: N:1,328,842.69 E:596,982.36

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Milam LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 164.5 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

GEOLOGY LOG - E-SEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATABORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION Weak Moderate Strong | COMMENTS |
|------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------|----------|
| 5 | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous | | | |
| 10 | | | | | |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |
| 35 | | | | | |
| 40 | | | | | |
| 45 | | | | | |



LOG OF TEST BORING

BORING D-2
PAGE 2 OF 3
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation

LOCATION Parish, AL

GEOLOGY LOG - E-SEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|---------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------|----------|
| | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous (Cont) | | | |
| 55 | | | | | |
| 60 | | | | | |
| 65 | | | | | |
| 70 | | | | | |
| 75 | | | | | |
| 80 | | | | | |
| 85 | | | | | |
| 90 | | | | | |
| 95 | | | | | |
| 100 | | | | | |
| 105 | | | | | |



LOG OF TEST BORING

BORING D-2
PAGE 3 OF 3
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation

LOCATION Parish, AL

GEOLOGY LOG - ...SEE DATABASE.GDT - 11/8/12 16:14 T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113_GORGAS SAR DATABORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION Weak Moderate Strong | COMMENTS |
|---------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------|----------|
| | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous (Cont) | | | |
| 115 | | Claystone/Mudstone; from 114-115 claystone is dk. gray to black; highly organic, carbon imprints, plant fossils; from 115-116 interbedded dk. gray mudstone and lt. gray fine-grained sandstone dominates, muds are flaser bedded | | | |
| 120 | | Sandstone; light-gray; fine- to- medium grained; contains lithic fragments; micas; possible ripple structures present; small amount of iron staining; small organic-rich zones which appear to be "coalified" | | | |
| 125 | | | | | |
| 130 | | | | | |
| 135 | | | | | |
| 140 | | | | | |
| 145 | | | | | |
| 150 | | Bituminous Coal; 6" thick; followed by 6" of organic-rich mudstone; plant fossils present | | | |
| | | Sandstone; light to dark gray; fine-grained; clay-rich, contains pebbles and heavy bioturbation | | | |
| 155 | | Mudstone; dk. gray to black organic-rich sections interbedded with fine-grained graywacke sandstone; convolute bedding in isolated locations | | | |
| 160 | | | | | |
| 165 | | | | | |

Bottom of borehole at 164.5 feet.

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|------------|-------------------|----------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | SCS, CFS | WELL NAME |
| | | DRILLER: | S. Mylum | |
| LOCATION: | Parish, AL | RIG TYPE: | CME | D-2 |
| LOGGER: | G. Dyer | DRILLING METHODS: | | |
| DATE CONSTRUCTED: | 1/25/2012 | | | |

| | | DEPTH FEET | ELEVATION FT, MSL |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------|----------------------|
| TOP OF RISER | | 3.06 | 432.43 |
| | | | |
| GROUND SURFACE | | 0.00 | 429.37 |
| <p>BACKFILL MATERIAL TYPE: Bentonite Chips, Medium AMOUNT: 9 bags (50 lbs/per)</p> | | | |
| <p>RISER CASING DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded</p> | | | |
| TOP OF SEAL | | 125.50 | 303.87 |
| <p>ANNULAR SEAL TYPE: 3/8-in coated Bentonite Pellets 50-lbs bucket AMOUNT: 1/2 bucket PLACEMENT: Tremie</p> | | | |
| TOP OF FILTER PACK | | 133.00 | 296.37 |
| <p>FILTER PACK TYPE: DSI Sand - Size #2 Drillers Services, Inc. AMOUNT: 2 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water</p> | | | |
| BOTTOM OF RISER / TOP OF SCREEN | | 140.70 | 288.67 |
| <p>SCREEN DIA: 2-inch TYPE: Schedule 40 PVC Pre-Pack OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch</p> | | | |
| BOTTOM OF SCREEN | | 150.70 | 278.67 |
| Flush-threaded end cap | | | |
| BOTTOM OF CASING | | 160.00 | 269.37 |
| HOLE DIA: ~ 4 in | | | |



LOG OF TEST BORING

BORING D-3
PAGE 1 OF 2
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 1/19/2012 COMPLETED 1/20/2012 SURF. ELEV. 392.1 COORDINATES: N:1,327,777.05 E:593,913.73

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Milam LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 55.75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

GEOLOGY LOG - ESEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113_GORGAS SAR DATA\BORING LOGS\GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCl REACTION Weak Moderate Strong | COMMENTS |
|------------|-------------|-----------------------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------|----------|
| 0 - 5 | | - topsoil | | | |
| 5 - 10 | | Siltstone; tan; contains thin sandstone and gray shale interbeds | | | |
| 10 - 15 | | Sandstone; tan | | | |
| 15 - 20 | | Mudstone; gray; contains prevalent siltstone interbeds | | | |
| 20 - 25 | | Sandstone; gray; fine-grained; micaceous; lacks sedimentary structure | | | |
| 25 - 30 | | Mudstone; gray; contains prevalent thin lenticular silty sandstone layers | | | |
| 30 - 35 | | Mudstone; gray; contains prevalent thin lenticular silty sandstone layers | | | |
| 35 - 40 | | Mudstone/Claystone; dk. gray to black; organic-rich; lacks sedimentary structures | | | |
| 40 - 45 | | Sandstone; lt. gray; fine-grained; lenticular bedded organic-rich zones | | | |
| 45 - 50 | | Mudstone; gray; sporadic wavy, discontinuous organic-rich zones | | | |
| 50 - 55.75 | | Bituminous Coal; competent; pyrite occupies fractures and cell walls; shaly coal above and below (American Coal Seam) | | | |



LOG OF TEST BORING

BORING D-3
PAGE 2 OF 2
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION Weak Moderate Strong | COMMENTS |
|------------|-------------|---------------------------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------|----------|
| | | Mudstone; black to gray; very organic-rich, prevalent pyrite zones; laminated appearance; some isolated coal spars (Cont) | | | |
| 55 | | | | | |

Bottom of borehole at 55.8 feet.

GEOLOGY LOG - L:\e\DATABASE_GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\GORGAS\GORGAS 2012\ES2113_GORGAS SAR DATABORING LOGS.GPJ

60
65
70
75
80
85
90
95
100
105

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|------------|-------------------|----------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | SCS, CFS | WELL NAME |
| LOCATION: | Parish, AL | DRILLER: | S. Mylum | |
| LOGGER: | G. Dyer | RIG TYPE: | CME | D-3 |
| DATE CONSTRUCTED: | 1/20/2012 | DRILLING METHODS: | | |

| | DEPTH FEET | ELEVATION FT, MSL |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------|
| TOP OF RISER | 2.62 | 394.75 |
| 2" Threaded Riser Cap | | |
| GROUND SURFACE | 0.00 | 392.13 |
| BACKFILL MATERIAL TYPE: Bentonite Chips, Medium AMOUNT: 5.5 bags (50 lbs/per) | | |
| RISER CASING DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded | | |
| TOP OF SEAL | 31.70 | 360.43 |
| ANNULAR SEAL TYPE: 3/8-in coated Bentonite Pellets 50-lbs bucket AMOUNT: 3/4 bucket PLACEMENT: Tremie | | |
| TOP OF FILTER PACK | 37.60 | 354.53 |
| FILTER PACK TYPE: DSI Sand - Size #2 Drillers Services, Inc. AMOUNT: 2 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water | | |
| BOTTOM OF RISER / TOP OF SCREEN | 42.30 | 349.83 |
| SCREEN DIA: 2-inch TYPE: Schedule 40 PVC Pre-Pack OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch | | |
| BOTTOM OF SCREEN | 52.30 | 339.83 |
| BOTTOM OF CASING | 52.60 | 339.53 |
| Flush-threaded end cap | | |
| HOLE DIA: ~ 4 in | | |



LOG OF TEST BORING

BORING D-4
PAGE 1 OF 2
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 7/24/2012 COMPLETED 7/24/2012 SURF. ELEV. 392.3 COORDINATES: N:1,327,773.90 E:593,907.17

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Neal LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 105 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

GEOLOGY LOG - L:\SEE\DATABASE.GDT - 11/8/12 16:14 - T:\SEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|------------|-------------|-------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------|----------|
| 5 | | Silty Clay (CL-ML) - clayey, silt to silty, clay | | | |
| 10 | | Mudstone and Siltstone - horizontal | | | |
| 15 | | Fine-grained Sandstone with thin mudstone interbeds - flaser | | | |
| 20 | | Mudstone with thin sandstone interbeds - lenticular | | | |
| 25 | | Mudstone with thin sandstone interbeds - lenticular | | | |
| 30 | | Mudstone with thin sandstone interbeds - lenticular | | | |
| 35 | | Mudstone with thin sandstone interbeds - lenticular | | | |
| 40 | | Fine-grained Sandstone with thin, organic-rich mud drapes - wavy | | | |
| 45 | | Pratt Coal Zone - Bituminous Coal, 3 to 4 feet in thickness, non-yielding | | | |
| | | Mudstone, sandy - horizontal | | | |



LOG OF TEST BORING

BORING D-4
PAGE 2 OF 2
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - ESEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|------------|-------------|-----------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------|----------|
| 55 | | Mudstone, sandy (Cont') | | | |
| 60 | | | | | |
| 65 | | Nickel Plate Coal Zone - Bituminous, 2 to 2.5 feet in thickness, non-yielding | | | |
| 70 | | Mudstone with thin sandstone interbeds - interbedded | | | |
| 75 | | | | | |
| 80 | | | | | |
| 85 | | | | | |
| 90 | | | | | |
| 95 | | American Coal Zone - Bituminous, 4 feet in thickness, water-yielding | | | |
| 100 | | Mudstone/Claystone, very-organic rich, trace lycopsid fossils - horizontal | | | |
| 100 | | Coal - Bituminous, 1 to 1.5 feet in thickness | | | |
| 100 | | Mudstone, sandy - horizontal | | | |
| 105 | | | | | |

Bottom of borehole at 105.0 feet.

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|------------|-------------------|------------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | Tri-State | WELL NAME |
| | | DRILLER: | Todd Neal | |
| LOCATION: | Parish, AL | RIG TYPE: | Air-Hammer | D-4 |
| LOGGER: | G. Dyer | DRILLING METHODS: | | |
| DATE CONSTRUCTED: | 7/24/2012 | | | |

| | DEPTH FEET | ELEVATION FT, MSL |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------|
| TOP OF RISER | 2.54 | 394.81 |
| 2" Threaded Riser Cap | | |
| 2-ft x 2-ft concrete pad | | |
| GROUND SURFACE | 0.00 | 392.27 |
| BACKFILL MATERIAL TYPE: Bentonite Chips, Medium AMOUNT: 19.5 bags | | |
| RISER CASING DIA: 2-inch TYPE: Schedule 80 PVC JOINT TYPE: Flush Threaded | | |
| TOP OF SEAL | 79.00 | 313.27 |
| ANNULAR SEAL TYPE: Bentonite Chips, Medium 50-lbs bag AMOUNT: 1/4 bag (12.5 lbs) PLACEMENT: Tremie | | |
| TOP OF FILTER PACK | 81.10 | 311.17 |
| FILTER PACK TYPE: DSI Sand - Size #2 Drillers Services, Inc. AMOUNT: 8 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water | | |
| BOTTOM OF RISER / TOP OF SCREEN | 84.90 | 307.37 |
| SCREEN DIA: 2-inch TYPE: Schedule 80 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch | | |
| BOTTOM OF SCREEN | 104.90 | 287.37 |
| Flush-threaded end cap | | |
| BOTTOM OF CASING | 105.20 | 287.07 |

HOLE DIA: ~ 6 in



LOG OF TEST BORING

BORING D-5
PAGE 1 OF 4
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 7/30/2012 COMPLETED 8/2/2012 SURF. ELEV. 395.9 COORDINATES: N:1,329,728.85 E:596,032.37

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Neal LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 220 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCl REACTION Weak Moderate Strong | COMMENTS |
|------------|-------------|--------------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------|----------|
| 5 | | Mine Spoil Overburden, consisting of shale and sandstone boulders with discontinuous lenses of silt and clay | | | |
| 10 | | | | | |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |
| 35 | | | | | |
| 40 | | | | | |
| 45 | | | | | |
| | | | | | |

E GEOLOGY LOG - ESEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ



LOG OF TEST BORING

BORING D-5
PAGE 2 OF 4
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation

LOCATION Parish, AL

GEOLOGY LOG - L-SEE DATABASE.GDT - 1/18/12 16:14 - T-SEE MAJOR PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|---------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------|----------|
| 55 | | Mine Spoil Overburden, consisting of shale and sandstone boulders with discontinuous lenses of silt and clay (Con't) | | | |
| 60 | | | | | |
| 65 | | | | | |
| 70 | | | | | |
| 75 | | | | | |
| 80 | | | | | |
| 85 | | Mudstone and siltstone; gray-to-light gray; wavy, lenticular to pinstripe laminated siltstone; moderate-to-heavy bioturbation; minor calcite cementing; lycopsid fossils and disseminated pyrite in organic-rich zones | | | |
| 90 | | | | | |
| 95 | | | | | |
| 100 | | | | | |
| 105 | | | | | |



LOG OF TEST BORING

BORING D-5
PAGE 3 OF 4
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - JEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113_GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------|----------|
| 115 | | Sandstone, muddy; light-to-medium gray; fining-downward/coarsening upward; convolute bedding structures; heavy bioturbation from 114.5 to 116.5; silica or calcite cement | | | |
| 120 | | Mudstone; dark gray-to-black; thin siltstone interbeds | | | |
| 125 | | | | | |
| 130 | | Bituminous Coal (Gillespy) | | | |
| 135 | | Mudstone and siltstone; gray-to-dark gray; laminated-to-flaser bedded siltstone; coaly laminations and prevalent pyrite from 154.5 to 156 | | | |
| 140 | | | | | |
| 145 | | | | | |
| 150 | | | | | |
| 155 | | | | | |
| 160 | | Sandstone; light gray; fine-grained; micaceous; prevalent lithics; thinly laminated to ripple cross-laminated; thin mud drapes - 168-169, 45 degree fracture, silica or carbonate filling | | | |
| 165 | | | | | |



LOG OF TEST BORING

BORING D-5
PAGE 4 OF 4
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - 11/8/12 16:14 - T:\ES&E DATABASE.GDT - 11/8/12 16:14 - T:\ES&E MAJOR PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION | | COMMENTS |
|---------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|--------------------|----------|
| | | | | Weak | Moderate Strong | |
| 175 | | - 177-178, bedding plane parallel fractures, from 177.4 to 174.6 a 2-inch clay-filled bedding parallel fracture was cored Mudstone/Claystone; dark gray-to-black; fine, wavy silt laminations; siderite banding; thin coal seam from 173.4 to 173.9 (Cont) | | | | |
| 180 | | | | | | |
| 185 | | | | | | |
| 190 | | | | | | |
| 195 | | Sandstone; light gray-to-medium gray; fine-grained; micaceous; fining-downward into a muddy, sandstone; laminated at the base | | | | |
| 200 | | | | | | |
| 205 | | Mudstone/Claystone; medium-to-dark gray; horizontal laminations; disseminated pyrite; trace iron-staining | | | | |
| 210 | | Sandstone, light-to-medium gray; thin mudstone interbeds; small scale cross-stratification; slight iron-staining | | | | |
| 215 | | | | | | |
| 220 | | | | | | |

Bottom of borehole at 220.0 feet.

225

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|------------|-------------------|-----------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | Tri-State | WELL NAME |
| | | DRILLER: | Todd Neal | |
| LOCATION: | Parish, AL | RIG TYPE: | CME | D-5 |
| LOGGER: | G. Dyer | DRILLING METHODS: | | |
| DATE CONSTRUCTED: | 8/2/2012 | | | |

| | | DEPTH FEET | ELEVATION FT, MSL |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------|----------------------|
| TOP OF RISER | | 2.90 | 398.75 |
| 2" Threaded Riser Cap | | | |
| 2-ft x 2-ft concrete pad | GROUND SURFACE | 0.00 | 395.85 |
| BACKFILL MATERIAL TYPE: Bentonite Chips, Medium AMOUNT: 5 7/8 bags | | | |
| RISER CASING DIA: 2-inch TYPE: Schedule 80 PVC JOINT TYPE: Flush Threaded | | | |
| TOP OF SEAL | | 149.00 | 246.85 |
| ANNULAR SEAL TYPE: Bentonite Chips, Medium 50-lbs bag AMOUNT: 1/7 bag (7.2 lbs) PLACEMENT: Tremie | | | |
| TOP OF FILTER PACK | | 153.00 | 242.85 |
| FILTER PACK TYPE: DSI Sand - Size #2 Drillers Services, Inc. AMOUNT: 8.5 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water | | | |
| BOTTOM OF RISER / TOP OF SCREEN | | 159.90 | 235.95 |
| SCREEN DIA: 2-inch TYPE: Schedule 80 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch | | | |
| BOTTOM OF SCREEN | | 179.90 | 215.95 |
| Flush-threaded end cap | BOTTOM OF CASING | 180.20 | 215.65 |
| HOLE DIA: ~ 4 in | | | |



LOG OF TEST BORING

BORING D-6
PAGE 1 OF 5
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 8/3/2012 COMPLETED 8/5/2012 SURF. ELEV. 364.1 COORDINATES: N:1,327,591.92 E:595,275.02

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Neal LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 250 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|------------|-------------|--------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------|----------|
| 5 | | Mine Spoil Overburden, consisting of shale and sandstone boulders with discontinuous lenses of silt and clay | | | |
| 10 | | | | | |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |
| 35 | | | | | |
| 40 | | | | | |
| 45 | | | | | |
| | | | | | |

G:\GEOLOGY LOG - SEE DATABASE.GDT - 11/8/12 16:14 - T:\SEE MAJOR PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ



LOG OF TEST BORING

BORING D-6
PAGE 2 OF 5
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - ESEE DATA\BASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|---------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------|----------|
| | | Mine Spoil Overburden, consisting of shale and sandstone boulders with discontinuous lenses of silt and clay (Con't) | | | |
| 55 | | | | | |
| 60 | | | | | |
| 65 | | | | | |
| 70 | | | | | |
| 75 | | | | | |
| 80 | | | | | |
| 85 | | | | | |
| 90 | | Mudstone/Claystone; dark gray-to-black; thin pinstripe bedded sandstone laminae; siderite banding - 91-93, small subvertical fractures | | | |
| 95 | | Bituminous Coal (Gillespy?) | | | |
| | | Mudstone; light gray-to-dark gray; wavy, discontinuous sandstone laminae; limited convolute bedding; zones of bioturbation; 2 ft thick sandstone bed from 99.5 to 101.5 - Fractured from 99.2 to 117 | | | |
| 100 | | | | | |
| 105 | | | | | |



LOG OF TEST BORING

BORING D-6
PAGE 3 OF 5
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation

LOCATION Parish, AL

GEOLOGY LOG - SEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION Weak Moderate Strong | COMMENTS |
|---------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------|----------|
| 115 | | Mudstone; light gray-to-dark gray; wavy, discontinuous sandstone laminae; limited convolute bedding; zones of bioturbation; 2 ft thick sandstone bed from 99.5 to 101.5 (Con't) | | | |
| 120 | | Sandstone; medium gray; flaser bedded muds; bioturbated; small siderite nodules; fining-downward into a sandy, mudstone | | | |
| 125 | | Mudstone; medium gray-to-dark gray; very sandy; lenticular bedded sands; some convolute bedding structures; bimodal mud drapes in thicker sandstone beds; heavily bioturbated; siderite bands present near the base | | | |
| 130 | | | | | |
| 135 | | | | | |
| 140 | | Mudstone and Sandstone, light gray-to-medium gray; flaser to lenticular bedded; coarsening-up/fining down sequence | | | |
| 145 | | | | | |
| 150 | | | | | |
| 155 | | | | | |
| 160 | | | | | |
| 165 | | Sandstone; light gray; fine-grained; micaceous; prevalent lithics; bimodal mud drapes; gradational contacts above and below sandstone | | | |



LOG OF TEST BORING

BORING D-6
PAGE 4 OF 5
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - L:\SEE\DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|----------------------------------------------------------------------------------------------------------------------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------|----------|
| 175 | | Sandstone; light gray; fine-grained; micaceous; prevalent lithics; bimodal mud drapes; gradational contacts above and below sandstone (Con't) | | | |
| 180 185 190 195 200 205 210 215 220 | | Mudstone; medium gray-to-dark gray; lenticular bedded sandstone laminae; prevalent convolute bedding; flame structures | | | |
| 225 | | Siltstone; light-to-medium gray; muddy; bimodal mud drapes | | | |



LOG OF TEST BORING

BORING D-6
PAGE 5 OF 5
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation

LOCATION Parish, AL

GEOLOGY LOG - ES2113 - ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCl REACTION Weak Moderate Strong | COMMENTS |
|-----------------------------------|----------------|-------------------------------------------------------------------|-----------|-----------------------------------------------|----------|
| | | Mudstone; medium-to-dark gray; finely laminated sandstone laminae | | | |
| 235 | | | | | |
| 240 | | | | | |
| 245 | | | | | |
| 250 | | | | | |
| Bottom of borehole at 250.0 feet. | | | | | |
| 255 | | | | | |
| 260 | | | | | |
| 265 | | | | | |
| 270 | | | | | |
| 275 | | | | | |
| 280 | | | | | |
| 285 | | | | | |

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|------------|-------------------|-----------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | Tri-State | WELL NAME |
| LOCATION: | Parish, AL | DRILLER: | Todd Neal | |
| LOGGER: | G. Dyer | RIG TYPE: | CME | D-6 |
| DATE CONSTRUCTED: | 8/5/2012 | DRILLING METHODS: | | |

| | | DEPTH FEET | ELEVATION FT, MSL |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------|----------------------|
| TOP OF RISER | | 2.75 | 366.81 |
| 2" Threaded Riser Cap | | | |
| GROUND SURFACE | | 0.00 | 364.06 |
| <p>BACKFILL MATERIAL TYPE: Bentonite Chips, Medium AMOUNT: 6 7/8 bags</p> <p>RISER CASING DIA: 2-inch TYPE: Schedule 80 PVC JOINT TYPE: Flush Threaded</p> | | | |
| TOP OF SEAL | | 110.00 | 254.06 |
| <p>ANNULAR SEAL TYPE: Bentonite Chips, Medium 50-lbs bag AMOUNT: 1/7 bag (7.2 lbs) PLACEMENT: Tremie</p> | | | |
| TOP OF FILTER PACK | | 112.10 | 251.96 |
| <p>FILTER PACK TYPE: DSI Sand - Size #2 Drillers Services, Inc. AMOUNT: 15 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water</p> | | | |
| BOTTOM OF RISER / TOP OF SCREEN | | 114.40 | 249.66 |
| <p>SCREEN DIA: 2-inch TYPE: Schedule 80 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch</p> | | | |
| BOTTOM OF SCREEN | | 134.40 | 229.66 |
| BOTTOM OF CASING | | 134.70 | 229.36 |

HOLE DIA: ~ 4 in



LOG OF TEST BORING

BORING D-7
PAGE 1 OF 4
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 8/12/2012 COMPLETED 8/14/2012 SURF. ELEV. 430.9 COORDINATES: N:1,328,824.21 E:596,921.99

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Neal LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 201 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

GEOLOGY LOG - L:\SEE DATA\BASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\IES2113 - GORGAS SAR DATA\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION Weak Moderate Strong | COMMENTS |
|------------|-------------|--------------------------------------------------------------------------------------------------------------|-----------|--------------------------------------------|----------|
| 5 | | Mine Spoil Overburden, consisting of shale and sandstone boulders with discontinuous lenses of silt and clay | | | |
| 10 | | | | | |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |
| 35 | | | | | |
| 40 | | | | | |
| 45 | | | | | |



LOG OF TEST BORING

BORING D-7
PAGE 2 OF 4
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - ESEE DATA\BASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCl REACTION Weak Moderate Strong | COMMENTS |
|---------------|----------------|----------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------|----------|
| | | Mine Spoil Overburden, consisting of shale and sandstone boulders with discontinuous lenses of silt and clay (Con't) | | | |
| 55 | | | | | |
| 60 | | | | | |
| 65 | | | | | |
| 70 | | | | | |
| 75 | | | | | |
| 80 | | | | | |
| 85 | | | | | |
| 90 | | | | | |
| 95 | | | | | |
| 100 | | | | | |
| 105 | | | | | |



LOG OF TEST BORING

BORING D-7
PAGE 3 OF 4
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - ESEE DATA BASE GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\IES2113_GORGAS SAR DATA\BORING LOGS\GFPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCl REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------|----------|
| 115 | | Mine Spoil Overburden, consisting of shale and sandstone boulders with discontinuous lenses of silt and clay (Con't) | | | |
| 120 | | Sandstone; light gray; fine-grained; micaceous; prevalent lithics; bioturbated; mud drapes near top and base of sandstone; some iron-staining | | | |
| 125 | | | | | |
| 130 | | | | | |
| 135 | | | | | |
| 140 | | | | | |
| 145 | | | | | |
| 150 | | Claystone; dark gray-to-black; sandy; organic-rich | | | |
| 155 | | Mudstone; medium gray-to-dark gray; bedded sandstone; convolute structures from 160 to 190; heavy bioturbation from 175 to 190; isolated siderite bands near the base - 181, 2-inch clay filled fracture | | | |
| 160 | | | | | |
| 165 | | | | | |



LOG OF TEST BORING

BORING D-7
PAGE 4 OF 4
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - E-SEE D:\1\ABASE_GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION | COMMENTS |
|-----------------------------------|----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------|----------|
| 175 | | Mudstone; medium gray-to-dark gray; bedded sandstone; convolute structures from 160 to 190; heavy bioturbation from 175 to 190; isolated siderite bands near the base (Cont) | | | |
| 180 | | | | | |
| 185 | | | | | |
| 190 | | | | | |
| 195 | | | | | |
| 200 | | | | | |
| Bottom of borehole at 201.0 feet. | | | | | |
| 205 | | | | | |
| 210 | | | | | |
| 215 | | | | | |
| 220 | | | | | |
| 225 | | | | | |

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|------------|-------------------|-----------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | Tri-State | WELL NAME |
| LOCATION: | Parish, AL | DRILLER: | Todd Neal | |
| LOGGER: | G. Dyer | RIG TYPE: | CME | D-7 |
| DATE CONSTRUCTED: | 8/14/2012 | DRILLING METHODS: | | |

| | DEPTH FEET | ELEVATION FT, MSL |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------|
| TOP OF RISER | 2.22 | 433.10 |
| 2" Threaded Riser Cap | | |
| GROUND SURFACE | 0.00 | 430.88 |
| 2-ft x 2-ft concrete pad | | |
| BACKFILL MATERIAL TYPE: Bentonite Chips, Medium AMOUNT: 7 bags | | |
| RISER CASING DIA: 2-inch TYPE: Schedule 80 PVC JOINT TYPE: Flush Threaded | | |
| TOP OF SEAL | 174.10 | 256.78 |
| ANNULAR SEAL TYPE: Bentonite Chips, Medium 50-lbs bag AMOUNT: 1/8 bag (6.25 lbs) PLACEMENT: Tremie | | |
| TOP OF FILTER PACK | 178.00 | 252.88 |
| FILTER PACK TYPE: DSI Sand - Size #2 Drillers Services, Inc. AMOUNT: 7.5 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water | | |
| BOTTOM OF RISER / TOP OF SCREEN | 180.90 | 249.98 |
| SCREEN DIA: 2-inch TYPE: Schedule 80 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch | | |
| BOTTOM OF SCREEN | 200.90 | 229.98 |
| Flush-threaded end cap | | |
| BOTTOM OF CASING | 201.20 | 229.68 |
| HOLE DIA: ~ 4 in | | |



LOG OF TEST BORING

BORING D-8
PAGE 1 OF 6
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 8/15/2012 COMPLETED 8/19/2012 SURF. ELEV. 520.4 COORDINATES: N:1,330,724.16 E:593,125.13

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Neal LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 296 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

GEOLOGY LOG - ESEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION | COMMENTS |
|------------|-------------|-------------------------------------------------------------------------------------------------------------|-----------|--------------|----------|
| 5 | | Mine Spoil Overburden, comprised of shale and sandstone boulders with discontinuous lenses of silt and clay | | | |
| 10 | | | | | |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |
| 35 | | | | | |
| 40 | | | | | |
| 45 | | | | | |



LOG OF TEST BORING

BORING D-8
PAGE 2 OF 6
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - ESEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|---------------|----------------|----------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------|----------|
| | | Mine Spoil Overburden, comprised of shale and sandstone boulders with discontinuous lenses of silt and clay (Con't) | | | |
| 55 | | | | | |
| 60 | | | | | |
| 65 | | | | | |
| 70 | | | | | |
| 75 | | | | | |
| 80 | | | | | |
| 85 | | | | | |
| 90 | | | | | |
| 95 | | | | | |
| 100 | | | | | |
| 105 | | | | | |



LOG OF TEST BORING

BORING D-8
PAGE 3 OF 6
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - SEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION | | COMMENTS |
|---------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|--------------------|----------|
| | | | | Weak | Moderate Strong | |
| 115 | | Mine Spoil Overburden, comprised of shale and sandstone boulders with discontinuous lenses of silt and clay (Con't) | | | | |
| 120 | | Claystone; gray, organic-rich; slightly sandy - 120.5 - 121.2, clay-filled at 121.2 | | | | |
| 125 | | Bituminous Coal (Gillespy?) | | | | |
| 130 | | Sandstone; medium gray; very fine-grained; prevalent mud drapes - 131, bedding parallel fracture; 135.5, clay-filled bedding plain fracture | | | | |
| 135 | | | | | | |
| 140 | | Siltstone; medium gray; thin, flaser bedded muds; convolute bedding observed near base; trace organics | | | | |
| 145 | | Claystone/Mudstone; dark gray-to-black; slightly sandy; lenticular bedded sands; visual reworking in sandy zones | | | | |
| 150 | | | | | | |
| 155 | | | | | | |
| 160 | | Sandstone; light gray-to-medium gray; fine-grained; prevalent reworked brachiopod fossils; slightly calcareous; small subvertical fracturing - 159.5, small subvertical fracturing | | | | |
| 165 | | Claystone; dark gray-to-black; very organic-rich; slightly sandy; pinstripe bedded sands; siderite present in the forms of nodules and bands (Iron Claystone) | | | | |



LOG OF TEST BORING

BORING D-8
PAGE 4 OF 6
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - \\E:\DATA\BASE\GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCl REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------|----------|
| 175 |  | Claystone; dark gray-to-black; very organic-rich; slightly sandy; pinstripe bedded sands; siderite present in the forms of nodules and bands (Iron Claystone) (Cont) | | | |
| 175 |  | Bituminous Coal (Curry?) | | | |
| 180 |  | Mudstone/Claystone; dark gray; slightly to moderately sandy; pinstripe to lenticular bedded sands, zones of reworked fossils from 205 to 206 and 220 to 222; bioturbated in part | | | |
| 185 |  | | | | |
| 190 |  | | | | |
| 195 |  | | | | |
| 200 |  | | | | |
| 205 |  | | | | |
| 210 |  | | | | |
| 215 |  | | | | |
| 220 |  | | | | |
| 225 |  | | | | |



LOG OF TEST BORING

BORING D-8
PAGE 5 OF 6
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113_GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------|----------|
| | | Mudstone/Claystone; dark gray; slightly to moderately sandy; pinstripe to lenticular bedded sands, zones of reworked fossils from 205 to 206 and 220 to 222; bioturbated in part (Cont) | | | |
| 235 | | Sandstone; light gray; fine-grained; slightly muddy; laminated | | | |
| 240 | | Mudstone; medium gray; sandy; cross-bedded sands; pyritiferous | | | |
| 245 | | | | | |
| 250 | | Sandstone; light gray; fine-grained; micaceous; prevalent lithics; small scale ripple cross-bedding; limited iron staining; condensed section of reworked fossils at base | | | |
| 255 | | | | | |
| 260 | | | | | |
| 265 | | | | | |
| 270 | | | | | |
| 275 | | Mudstone; light gray-to-dark gray; sandy; alternating zones of lenticular and flaser bedding | | | |
| 280 | | | | | |
| 285 | | | | | |



LOG OF TEST BORING

BORING D-8
PAGE 6 OF 6
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION | COMMENTS |
|-----------------------------------|----------------|-----------------------------------------------------------------------------------------------------|-----------|----------------------------|----------|
| 295 | | Mudstone; light gray-to-dark gray; sandy; alternating zones of lenticular and flaser bedding (Cont) | | Weak Moderate Strong | |
| Bottom of borehole at 296.0 feet. | | | | | |
| 300 | | | | | |
| 305 | | | | | |
| 310 | | | | | |
| 315 | | | | | |
| 320 | | | | | |
| 325 | | | | | |
| 330 | | | | | |
| 335 | | | | | |
| 340 | | | | | |
| 345 | | | | | |

GEOLOGY LOG - L:\JEE DAY\BASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS.GPJ

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|------------|-------------------|-----------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | Tri-State | WELL NAME |
| | | DRILLER: | Todd Neal | |
| LOCATION: | Parish, AL | RIG TYPE: | CME | D-8 |
| LOGGER: | G. Dyer | DRILLING METHODS: | | |
| DATE CONSTRUCTED: | 8/19/2012 | | | |

| | DEPTH FEET | ELEVATION FT, MSL |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------|
| TOP OF RISER | 2.46 | 522.81 |
| 2" Threaded Riser Cap | | |
| 2-ft x 2-ft concrete pad | | |
| GROUND SURFACE | 0.00 | 520.35 |
| BACKFILL MATERIAL TYPE: Bentonite Chips, Medium AMOUNT: 8 bags | | |
| RISER CASING DIA: 2-inch TYPE: Schedule 80 PVC JOINT TYPE: Flush Threaded | | |
| TOP OF SEAL | 229.10 | 291.25 |
| ANNULAR SEAL TYPE: Bentonite Chips, Medium 50-lbs bag AMOUNT: 1/8 bag (6.25 lbs) PLACEMENT: Tremie | | |
| TOP OF FILTER PACK | 233.00 | 287.35 |
| FILTER PACK TYPE: DSI Sand - Size #2 Drillers Services, Inc. AMOUNT: 8 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water | | |
| BOTTOM OF RISER / TOP OF SCREEN | 234.90 | 285.45 |
| SCREEN DIA: 2-inch TYPE: Schedule 80 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch | | |
| BOTTOM OF SCREEN | 254.90 | 265.45 |
| Flush-threaded end cap | | |
| BOTTOM OF CASING | 255.20 | 265.15 |

HOLE DIA: ~ 4 in



LOG OF TEST BORING

BORING D-9
PAGE 1 OF 3
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 8/21/2012 COMPLETED 8/22/2012 SURF. ELEV. 389.2 COORDINATES: N:1,330,600.07 E:594,700.08

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Neal LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 130 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

GEOLOGY LOG - ESEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION | COMMENTS |
|------------|-------------|--------------------------------------------------------------------------------------------------------------|-----------|--------------|----------|
| 5 | | Mine Spoil Overburden, consisting of shale and sandstone boulders with discontinuous lenses of silt and clay | | | |
| 10 | | | | | |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |
| 35 | | | | | |
| 40 | | | | | |
| 45 | | | | | |



LOG OF TEST BORING

BORING D-9
PAGE 2 OF 3
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG: J:\E\DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\Es2113 GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|------------|-------------|--------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------|----------|
| 55 | | Mine Spoil Overburden, consisting of shale and sandstone boulders with discontinuous lenses of silt and clay (Con't) | | | |
| 60 | | Claystone; dark gray-to-black; silty; wavy, discontinuous silts; isolated zones of siderite banding in more organic-rich zones | | | |
| 65 | | | | | |
| 70 | | | | | |
| 75 | | | | | |
| 80 | | | | | |
| 85 | | | | | |
| 90 | | | | | |
| 95 | | | | | |
| 100 | | Sandstone; light gray-to-medium gray; reworked fossils | | | |
| 105 | | Siltstone; light gray; organic-rich mud drapes; laminated in part, but largely structureless - 107, subvertical fracture | | | |

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|------------|-------------------|-----------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | Tri-State | WELL NAME |
| | | DRILLER: | Todd Neal | |
| LOCATION: | Parish, AL | RIG TYPE: | CME | D-9 |
| LOGGER: | G. Dyer | DRILLING METHODS: | | |
| DATE CONSTRUCTED: | 8/22/2012 | | | |

| | DEPTH FEET | ELEVATION FT, MSL |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------|
| TOP OF RISER | 2.41 | 391.61 |
| 2" Threaded Riser Cap | | |
| 2-ft x 2-ft concrete pad | | |
| GROUND SURFACE | 0.00 | 389.20 |
| BACKFILL MATERIAL TYPE: Bentonite Chips, Medium AMOUNT: 3 bags | | |
| RISER CASING DIA: 2-inch TYPE: Schedule 80 PVC JOINT TYPE: Flush Threaded | | |
| TOP OF SEAL | 50.10 | 339.10 |
| ANNULAR SEAL TYPE: Bentonite Chips, Medium 50-lbs bag AMOUNT: 1/8 bag (6.25 lbs) PLACEMENT: Tremie | | |
| TOP OF FILTER PACK | 53.00 | 336.20 |
| FILTER PACK TYPE: DSI Sand - Size #2 Drillers Services, Inc. AMOUNT: 6.5 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water | | |
| BOTTOM OF RISER / TOP OF SCREEN | 59.30 | 329.90 |
| SCREEN DIA: 2-inch TYPE: Schedule 80 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch | | |
| BOTTOM OF SCREEN | 79.30 | 309.90 |
| Flush-threaded end cap | | |
| BOTTOM OF CASING | 79.60 | 309.60 |

HOLE DIA: ~ 4 in



LOG OF TEST BORING

BORING S-1
PAGE 1 OF 3
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 1/30/2012 COMPLETED 1/31/2012 SURF. ELEV. 515.5 COORDINATES: N:1,329,997.66 E:592,799.90

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Milam LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 130.84 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

GEOLOGY LOG - SEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|---------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------|----------|
| 5 | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous | | | |
| 10 | | | | | |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |
| 35 | | | | | |
| 40 | | | | | |
| 45 | | | | | |
| | | | | | |



LOG OF TEST BORING

BORING S-1
PAGE 2 OF 3
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation

LOCATION Parish, AL

GEOLOGY LOG - ...EE \DATA\BASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\IES\113 GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION Weak Moderate Strong | COMMENTS |
|---------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------|----------|
| 55 | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous (Con't) | | | |
| 60 | | | | | |
| 65 | | | | | |
| 70 | | | | | |
| 75 | | | | | |
| 80 | | | | | |
| 85 | | | | | |
| 90 | | | | | |
| 95 | | | | | |
| 100 | | | | | |
| 105 | | | | | |



LOG OF TEST BORING

BORING S-1
PAGE 3 OF 3
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation

LOCATION Parish, AL

GEOLOGY LOG - _JSEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113_GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION | COMMENTS |
|-----------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------|----------|
| 115 | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous (Con't) | | | |
| 120 | | | | | |
| 125 | | Bituminous Coal ~ 7" thick | | | |
| 130 | | Claystone/Mudstone, dk. gray to black; lacks sedimentary structure | | | |
| Bottom of borehole at 130.8 feet. | | | | | |
| 135 | | | | | |
| 140 | | | | | |
| 145 | | | | | |
| 150 | | | | | |
| 155 | | | | | |
| 160 | | | | | |
| 165 | | | | | |

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|--------------|-------------------|----------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | SCS, CFS | WELL NAME |
| | | DRILLER: | S. Mylum | |
| LOCATION: | Parish, AL | RIG TYPE: | CME | S-1 |
| LOGGER: | N. McCormick | DRILLING METHODS: | | |
| DATE CONSTRUCTED: | 2/9/2012 | | | |

| | DEPTH FEET | ELEVATION FT, MSL |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------|
| TOP OF RISER | 2.10 | 440.69 |
| <p>2" Threaded Riser Cap</p> | | |
| GROUND SURFACE | 0.00 | 438.59 |
| <p>BACKFILL MATERIAL TYPE: Portland Neat Cement AMOUNT: 15 bags (94 lbs/per)</p> <p>RISER CASING DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded</p> | | |
| TOP OF SEAL | 112.60 | 325.99 |
| <p>ANNULAR SEAL TYPE: 3/8-in coated Bentonite Pellets 50-lbs bucket AMOUNT: 3/4 bucket PLACEMENT: Tremie</p> | | |
| TOP OF FILTER PACK | 116.60 | 321.99 |
| <p>FILTER PACK TYPE: DSI Sand - Size #2 Drillers Services, Inc. AMOUNT: 3.0 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water</p> | | |
| BOTTOM OF RISER / TOP OF SCREEN | 119.10 | 319.49 |
| <p>SCREEN DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch</p> | | |
| BOTTOM OF SCREEN | 129.10 | 309.49 |
| BOTTOM OF CASING | 129.20 | 309.39 |
| <p>Flush-threaded end cap</p> <p>HOLE DIA: ~ 4 in</p> | | |



LOG OF TEST BORING

BORING S-2
PAGE 1 OF 2
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 2/1/2012 COMPLETED 2/2/2012 SURF. ELEV. 438.6 COORDINATES: N:1,330,920.74 E:594,276.59

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Milam LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 102 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

G:\GEOLOGY LOGS\DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------------------------------------------|----------|
| 5 | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous | | | |
| 10 | | | | | |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |
| 35 | | | | | |
| 40 | | | | | |
| 45 | | | | | |
| | | | | | |



LOG OF TEST BORING

BORING S-2
PAGE 2 OF 2
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation

LOCATION Parish, AL

E GEOLOGY LOG - ES2113 - DATABASE_GDT - 11/8/12 16:14 - T:\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCl REACTION Weak Moderate Strong | COMMENTS |
|---------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------|----------|
| 55 | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous (Con't) | | | |
| 60 | | | | | |
| 65 | | | | | |
| 70 | | | | | |
| 75 | | | | | |
| 80 | | | | | |
| 85 | | | | | |
| 90 | | | | | |
| 95 | | | | | |
| 100 | | Claystone; dk. gray with few light gray silty interbeds | | | |

Bottom of borehole at 102.0 feet.

105

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|--------------|-------------------|----------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | SCS, CFS | WELL NAME |
| | | DRILLER: | S. Mylum | |
| LOCATION: | Parish, AL | RIG TYPE: | CME | S-2 |
| LOGGER: | N. McCormick | DRILLING METHODS: | | |
| DATE CONSTRUCTED: | 2/7/2012 | | | |

| | DEPTH FEET | ELEVATION FT, MSL |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------|
| TOP OF RISER | 1.04 | 516.58 |
| 2" Threaded Riser Cap | | |
| GROUND SURFACE | 0.00 | 515.54 |
| BACKFILL MATERIAL TYPE: Bentonite Chips, Medium AMOUNT: 6.5 bags (50 lbs/per) | | |
| RISER CASING DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded | | |
| TOP OF SEAL | 80.50 | 435.04 |
| ANNULAR SEAL TYPE: 3/8-in coated Bentonite Pellets 50-lbs bucket AMOUNT: 1/2 bucket PLACEMENT: Tremie | | |
| TOP OF FILTER PACK | 85.50 | 430.04 |
| FILTER PACK TYPE: DSI Sand - Size #2 Drillers Services, Inc. AMOUNT: 2.5 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water | | |
| BOTTOM OF RISER / TOP OF SCREEN | 88.40 | 427.14 |
| SCREEN DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch | | |
| BOTTOM OF SCREEN | 98.40 | 417.14 |
| Flush-threaded end cap | | |
| BOTTOM OF CASING | 98.50 | 417.04 |
| HOLE DIA: ~ 4 in | | |



LOG OF TEST BORING

BORING S-3
PAGE 1 OF 2
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 2/6/2012 COMPLETED 2/6/2012 SURF. ELEV. 363.7 COORDINATES: N:1,327,582.35 E:595,276.06

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Milam LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 81.5 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

G:\GEOLOGY LOG - ESEL - DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\GPFJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION | COMMENTS |
|---------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------|-----------------|----------|
| | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous | | | |
| 5 | | | | | |
| | | | | | |
| 10 | | | | | |
| | | | | | |
| 15 | | | | | |
| | | | | | |
| 20 | | | | | |
| | | | | | |
| 25 | | | | | |
| | | | | | |
| 30 | | | | | |
| | | | | | |
| 35 | | | | | |
| | | | | | |
| 40 | | | | | |
| | | | | | |
| 45 | | | | | |



LOG OF TEST BORING

BORING S-3
PAGE 2 OF 2
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation

LOCATION Parish, AL

G:\GEOLOGY LOGS - ESEE - DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\GORGAS\GORGAS 2012\ES2113_GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

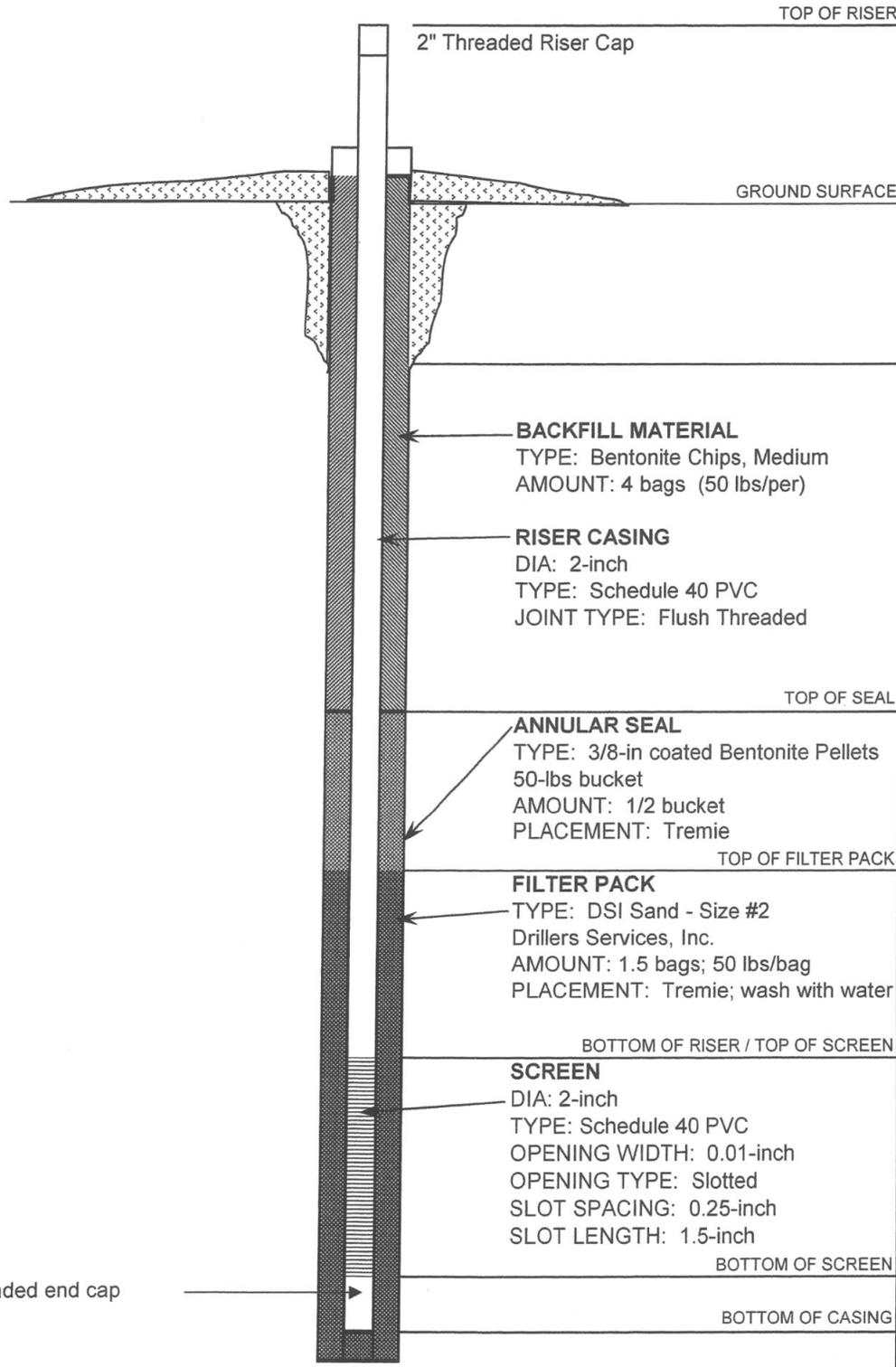
| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|----------------------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------|----------|
| 55 | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous (Con't) | | | |
| 60 | | | | | |
| 65 | | | | | |
| 70 | | | | | |
| 75 | | | | | |
| 80 | | Claystone, gray to dk. gray; silty; vertical fracturing; chaotically structured (resembling fault gauge); prevalent iron staining within fractures - Near Vertical | | | |
| Bottom of borehole at 81.5 feet. | | | | | |
| 85 | | | | | |
| 90 | | | | | |
| 95 | | | | | |
| 100 | | | | | |
| 105 | | | | | |

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|--------------|-------------------|----------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | SCS, CFS | WELL NAME |
| LOCATION: | Parish, AL | DRILLER: | S. Mylum | |
| LOGGER: | N. McCormick | RIG TYPE: | CME | S-3 |
| DATE CONSTRUCTED: | 2/8/2012 | DRILLING METHODS: | | |

| | DEPTH FEET | ELEVATION FT, MSL |
|---------------------------------|------------|-------------------|
| TOP OF RISER | 2.53 | 366.20 |
| GROUND SURFACE | 0.00 | 363.67 |
| TOP OF SEAL | 63.00 | 300.67 |
| TOP OF FILTER PACK | 68.00 | 295.67 |
| BOTTOM OF RISER / TOP OF SCREEN | 71.40 | 292.27 |
| BOTTOM OF SCREEN | 81.40 | 282.27 |
| BOTTOM OF CASING | 81.50 | 282.17 |



BACKFILL MATERIAL
 TYPE: Bentonite Chips, Medium
 AMOUNT: 4 bags (50 lbs/per)

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

ANNULAR SEAL
 TYPE: 3/8-in coated Bentonite Pellets
 50-lbs bucket
 AMOUNT: 1/2 bucket
 PLACEMENT: Tremie

FILTER PACK
 TYPE: DSI Sand - Size #2
 Drillers Services, Inc.
 AMOUNT: 1.5 bags; 50 lbs/bag
 PLACEMENT: Tremie; wash with water

SCREEN
 DIA: 2-inch
 TYPE: Schedule 40 PVC
 OPENING WIDTH: 0.01-inch
 OPENING TYPE: Slotted
 SLOT SPACING: 0.25-inch
 SLOT LENGTH: 1.5-inch

Flush-threaded end cap

HOLE DIA: ~ 4 in



LOG OF TEST BORING

BORING S-4
PAGE 1 OF 3
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 2/7/2012 COMPLETED 2/8/2012 SURF. ELEV. 427.8 COORDINATES: N:1,328,920.88 E:597,073.70

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Milam LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 125 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

GEOLOGY LOG - ESEE DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|---------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------|----------|
| 5 | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous | | | |
| 10 | | | | | |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |
| 35 | | | | | |
| 40 | | | | | |
| 45 | | | | | |



LOG OF TEST BORING

BORING S-4
PAGE 2 OF 3
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

E GEOLOGY LOG - ESEL-DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|---------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------|----------|
| 55 | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous (Cont) | | | |
| 60 | | | | | |
| 65 | | | | | |
| 70 | | | | | |
| 75 | | | | | |
| 80 | | | | | |
| 85 | | | | | |
| 90 | | | | | |
| 95 | | | | | |
| 100 | | | | | |
| 105 | | | | | |



LOG OF TEST BORING

BORING S-4
PAGE 3 OF 3
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

GEOLOGY LOG - ESEL - DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\IES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION | COMMENTS |
|------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|----------|
| 115 | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous (Con't) | | | |
| 120 | | Sandstone; lt. gray; fine-grained; contains lithic fragments, micas, and larger clasts of siderite; ripple structures | | | |
| 125 | | Bottom of borehole at 125.0 feet. | | | |
| 130 | | | | | |
| 135 | | | | | |
| 140 | | | | | |
| 145 | | | | | |
| 150 | | | | | |
| 155 | | | | | |
| 160 | | | | | |
| 165 | | | | | |

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|--------------|-------------------|----------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | SCS, CFS | WELL NAME |
| | | DRILLER: | S. Mylum | |
| LOCATION: | Parish, AL | RIG TYPE: | CME | S-4 |
| LOGGER: | N. McCormick | DRILLING METHODS: | | |
| DATE CONSTRUCTED: | 2/6/2012 | | | |

| | DEPTH FEET | ELEVATION FT, MSL |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------|
| TOP OF RISER | 2.84 | 430.62 |
| 2" Threaded Riser Cap | | |
| GROUND SURFACE | 0.00 | 427.78 |
| BACKFILL MATERIAL TYPE: Bentonite Chips, Medium AMOUNT: 6.0 bags (50 lbs/per) | | |
| RISER CASING DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded | | |
| TOP OF SEAL | 106.00 | 321.78 |
| ANNULAR SEAL TYPE: 3/8-in coated Bentonite Pellets 50-lbs bucket AMOUNT: 1/2 bucket PLACEMENT: Tremie | | |
| TOP OF FILTER PACK | 111.70 | 316.08 |
| FILTER PACK TYPE: DSI Sand - Size #2 Drillers Services, Inc. AMOUNT: 2.0 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water | | |
| BOTTOM OF RISER / TOP OF SCREEN | 114.60 | 313.18 |
| SCREEN DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch | | |
| BOTTOM OF SCREEN | 124.60 | 303.18 |
| BOTTOM OF CASING | 124.50 | 303.28 |
| Flush-threaded end cap | | |
| HOLE DIA: ~ 4 in | | |



LOG OF TEST BORING

BORING S-5
PAGE 1 OF 2
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation
LOCATION Parish, AL

DATE STARTED 2/8/2012 COMPLETED 2/12/2012 SURF. ELEV. 403.9 COORDINATES: N:1,329,683.64 E:595,928.33

CONTRACTOR _____ EQUIPMENT _____ METHOD _____

DRILLED BY T. Milam LOGGED BY G. Dyer CHECKED BY _____ ANGLE _____ BEARING _____

BORING DEPTH 74 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Well installed. Refer to well data sheet.

GEOLOGY LOG - ES2113 - DATABASE.GDT - 11/8/12 16:14 - T:\ES&E MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\GFPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION | COMMENTS |
|------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------|----------|
| 5 | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous | | | |
| 10 | | | | | |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |
| 30 | | | | | |
| 35 | | | | | |
| 40 | | | | | |
| 45 | | | | | |



LOG OF TEST BORING

BORING S-5
PAGE 2 OF 2
ES2113

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Plant Gorgas Hydrogeologic Evaluation

LOCATION Parish, AL

GEOLOGY LOG - ESEL - DATABASE.GDT - 11/8/12 16:14 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2012\ES2113 - GORGAS SAR DATA\BORING LOGS\BORING LOGS.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | HCL REACTION <small>Weak Moderate Strong</small> | COMMENTS |
|---------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------|----------|
| 55 | | Backfilled mine spoil; consisting of mudstone/claystone boulders, lithic fragments, and localized clay and silt layer; highly heterogeneous (Con't) | | | |
| 60 | | | | | |
| 65 | | | | | |
| 70 | | Claystone; dk. gray to gray; lacks sedimentary structures | | | |
| 75 | | Bottom of borehole at 74.0 feet. | | | |
| 80 | | | | | |
| 85 | | | | | |
| 90 | | | | | |
| 95 | | | | | |
| 100 | | | | | |
| 105 | | | | | |

WELL CONSTRUCTION LOG

Southern Company Generation

| | | | | |
|-------------------|--------------|-------------------|----------|-----------|
| PROJECT: | Gorgas | DRILLING CO.: | SCS, CFS | WELL NAME |
| | | DRILLER: | S. Mylum | |
| LOCATION: | Parish, AL | RIG TYPE: | CME | S-5 |
| LOGGER: | N. McCormick | DRILLING METHODS: | | |
| DATE CONSTRUCTED: | 2/12/2012 | | | |

| | DEPTH FEET | ELEVATION FT, MSL |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------|
| TOP OF RISER | 2.91 | 406.78 |
| 2" Threaded Riser Cap | | |
| GROUND SURFACE | 0.00 | 403.87 |
| BACKFILL MATERIAL TYPE: Bentonite Chips, Medium AMOUNT: 3 bags (50 lbs/per) | | |
| RISER CASING DIA: 2-inch TYPE: Schedule 40 PVC JOINT TYPE: Flush Threaded | | |
| TOP OF SEAL | 53.80 | 350.07 |
| ANNULAR SEAL TYPE: 3/8-in coated Bentonite Pellets 50-lbs bucket AMOUNT: 1 bucket PLACEMENT: Tremie | | |
| TOP OF FILTER PACK | 57.70 | 346.17 |
| FILTER PACK TYPE: DSI Sand - Size #2 Drillers Services, Inc. AMOUNT: 6.0 bags; 50 lbs/bag PLACEMENT: Tremie; wash with water | | |
| BOTTOM OF RISER / TOP OF SCREEN | 60.50 | 343.37 |
| SCREEN DIA: 2-inch TYPE: Schedule 40 PVC OPENING WIDTH: 0.01-inch OPENING TYPE: Slotted SLOT SPACING: 0.25-inch SLOT LENGTH: 1.5-inch | | |
| BOTTOM OF SCREEN | 70.50 | 333.37 |
| BOTTOM OF CASING | 70.60 | 333.27 |
| Flush-threaded end cap | | |

HOLE DIA: ~ 4 in



LOG OF TEST BORING

BORING CCB-01
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

DATE STARTED 8/31/2011 COMPLETED 9/1/2011 SURF. ELEV. 426.5 COORDINATES: N:1,328,955.41 E:2,065,565.24

CONTRACTOR Thompson Engineering EQUIPMENT D 50 METHOD PQ Rock Core

DRILLED BY B. Green LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Piezometer set at 75.0'

C:\ENGINEERING\LOGS\ESSE DATABASE.GDT - 11/17/11 14:15 - T:\ESSE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 425.0 | | Silty Sand (SM) - dark brown, damp, very dense, medium to coarse grain | 425.0 | SS -1 | 0.0-1.5 | 18-32-31 (63) | | |
| 5 | | Shale boulders - grey, fine grain, hard, highly weathered, iron staining; drilled to 3' and lost circulation, PQ down to 5' (technically a 2' run from 3' - 5') [with sandy clay soil matrix] | | RC -1 | 1.5-5.0 | | 51 (0) | |
| 10 | | | | RC -2 | 5.0-10.0 | | 26 (0) | |
| 15 | | | | RC -3 | 10.0-15.0 | | 32 (0) | |
| 20 | | | | RC -4 | 15.0-20.0 | | 26 (12) | |
| 25 | | | | RC -5 | 20.0-25.0 | | 0 (0) | |
| 30 | | | | RC -6 | 25.0-30.0 | | 0 (0) | |
| 35 | | | | RC -7 | 30.0-35.0 | | 50 (0) | |
| | | | | RC -8 | 35.0-40.0 | | 0 (0) | |

- highly to completely weathered



LOG OF TEST BORING

BORING CCB-02
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

DATE STARTED 9/8/2011 COMPLETED 9/9/2011 SURF. ELEV. 437.2 COORDINATES: N:1,328,441.34 E:2,064,781.62

CONTRACTOR Thompson Engineering EQUIPMENT D 50 METHOD PQ Rock Core

DRILLED BY B. Green LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES _____

E:\ENGINEERING\...ESEE DATABASE.GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (ROD) | COMMENTS |
|------------|-------------|-----------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|---------------------------------|
| 435.7 | | Silty Sand (SM) - dark brown, damp, dense, fine grain, some clay | 435.7 | SS -1 | 0.0-1.5 | 6-20-28 (48) | | |
| | | Shale boulders - light grey, fine grain, medium hard, highly weathered, [with sandy clay soil matrix] | | RC -1 | 0.0-5.0 | | 18 (8) | |
| 5 | | | | RC -2 | 5.0-10.0 | | 0 (0) | No recovery: drill bit clogged. |
| 10 | | - moderately to highly weathered | | RC -3 | 10.0-15.0 | | 46 (16) | |
| 15 | | | | RC -4 | 15.0-20.0 | | 36 (14) | |
| 20 | | - highly weathered | | RC -5 | 20.0-25.0 | | 26 (0) | |
| 25 | | | | RC -6 | 25.0-30.0 | | 26 (0) | |
| 30 | | | | RC -7 | 30.0-35.0 | | 16 (0) | |
| 35 | | | | RC -8 | 35.0-40.0 | | 30 (0) | |



LOG OF TEST BORING

BORING CCB-02
PAGE 2 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

C:\ENGINEERING\..._LOGS - ESEE DATABASE.GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION - C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS | |
|------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------|--------------------|-----------------------|------------------|----------|--|
| 45 | | Shale boulders (cont) - Shale boulders: light grey, fine grain, medium hard, moderately to highly weathered, [with sandy clay soil matrix] | | RC -9 | 40.0-45.0 | | 58 (30) | | |
| 50 | | | | RC -10 | 45.0-50.0 | | 40 (16) | | |
| 55 | | | | RC -11 | 50.0-55.0 | | 36 (12) | | |
| 60 | | | | RC -12 | 55.0-60.0 | | 52 (0) | | |
| 65 | | | - highly weathered | | RC -13 | 60.0-65.0 | | 74 (36) | |
| 70 | | | - highly to completely weathered | | RC -14 | 65.0-70.0 | | 22 (0) | |
| 75 | | | | 362.2 | RC -15 | 70.0-75.0 | | 2 (0) | |

Bottom of borehole at 75.0 feet.

80

85



LOG OF TEST BORING

BORING CCB-03
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

DATE STARTED 9/28/2011 COMPLETED 9/30/2011 SURF. ELEV. 367.0 COORDINATES: N:1,329,195.85 E:2,064,220.34

CONTRACTOR SCS Field Services EQUIPMENT CME 550 METHOD NQ Rock Core

DRILLED BY T. Milam LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 70 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES _____

ECS ENGINEERING LOGS - ESEE DATABASE.GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|----------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| | | - No recovery of SS sample | 366.0 | SS -1 | 0.0-0.8 | 27-50/4" (100+) | | |
| | | Shale boulders | | RC -1 | 0.0-5.0 | | 22 (0) | |
| 5 | | - grey, fine grain, medium hard, highly weathered, [with sandy clay soil matrix] | | RC -2 | 5.0-10.0 | | 34 (6) | |
| 10 | | | | RC -3 | 10.0-15.0 | | 0 (0) | |
| 15 | | | | RC -4 | 15.0-20.0 | | 28 (0) | |
| 20 | | | | RC -5 | 20.0-25.0 | | 30 (0) | |
| 25 | | | | RC -6 | 25.0-30.0 | | 48 (0) | |
| 30 | | | | RC -7 | 30.0-35.0 | | 66 (26) | |
| 35 | | | | RC -8 | 35.0-40.0 | | 32 (0) | |



LOG OF TEST BORING

BORING CCB-04
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

DATE STARTED 9/15/2011 **COMPLETED** 9/19/2011 **SURF. ELEV.** 398.6 **COORDINATES:** N:1,328,595.53 E:2,063,778.17

CONTRACTOR SCS Field Services **EQUIPMENT** CME 550 **METHOD** NQ Rock Core

DRILLED BY T. Milam **LOGGED BY** N. McCormick **CHECKED BY** R. Garrett **ANGLE** _____ **BEARING** _____

BORING DEPTH 75 ft. **GROUND WATER DEPTH: DURING** _____ **COMP.** _____ **DELAYED** _____

NOTES

ECS - ESEE DATABASE.GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|-------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|-------------------------------------------|
| 0 | | Shale boulders - grey, fine grain, medium hard, highly to completely weathered, [with sandy clay soil matrix] | | | | | | Driller notes boulders from 0.0' - 10.0'. |
| 5 | | | | | | | | |
| 10 | | Poorly-graded Gravel (GP) - light grey, dry, loose, medium to coarse grain, mudstone | 388.6 | SS -1 | 10.0-11.5 | 11-3-4 (7) | | |
| 15 | | - greyish brown, very dense, coarse grain, slightly silty, mudstone | | SS -2 | 13.5-14.2 | 20-50/2" (100+) | | |
| 20 | | Shale boulders - dark grey, medium hard, highly weathered, [with sandy clay soil matrix] | 383.1 | RC -1 | 15.5-19.0 | | 49 (11) | |
| 25 | | | | RC -2 | 19.0-24.0 | | 38 (12) | |
| 30 | | | | RC -3 | 24.0-29.0 | | 56 (34) | |
| 35 | | | | RC -4 | 29.0-34.0 | | 62 (6) | |
| | | | | RC -5 | 34.0-39.0 | | 48 (0) | |



LOG OF TEST BORING

BORING CCB-05
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

DATE STARTED 9/1/2011 COMPLETED 9/7/2011 SURF. ELEV. 404.4 COORDINATES: N:1,328,035.27 E:2,064,232.01

CONTRACTOR Thompson Engineering EQUIPMENT D 50 METHOD PQ Rock Core

DRILLED BY B. Green LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 76.5 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Piezometer set at 75.0'

TECH ENGINEERING LOGS - ESEE DATABASE_GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\GORGAS\2011\GORGAS CCB STORAGE\2ND LOCATION-C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|-----------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 402.9 | | Silty Sand (SM) - light grey, dry, very dense, fine to coarse grain | 402.9 | SS -1 | 0.0-1.5 | 15-33-50 (83) | | |
| | | Shale boulders - grey, fine grain, medium hard, highly weathered, [with sandy clay soil matrix] | | RC -1 | 0.0-5.0 | | 62 (0) | |
| 399.4 | | Silt (ML) - light brown, damp, stiff, low plasticity, sandy | 399.4 | SS -2 | 5.0-6.5 | 4-5-10 (15) | | |
| 397.9 | | Shale boulders | 397.9 | RC -2 | 5.0-10.0 | | 42 (0) | |
| 394.4 | | Well-graded Gravel (GP) - grey, very moist, medium dense, with clay, mudstone | 394.4 | SS -3 | 10.0-11.5 | 8-8-7 (15) | | |
| 392.9 | | Shale boulders | 392.9 | RC -3 | 10.0-15.0 | | 26 (0) | |
| | | | | RC -4 | 15.0-20.0 | | 42 (20) | |
| | | | | RC -5 | 20.0-25.0 | | 46 (18) | |
| | | | | RC -6 | 25.0-30.0 | | 46 (0) | |
| | | | | RC -7 | 30.0-35.0 | | 34 (16) | |
| | | | | RC -8 | 35.0-40.0 | | 36 (12) | |



LOG OF TEST BORING

BORING CCB-05
PAGE 2 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

CH ENGINEER, _LOGS - ESEE DATABASE.GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS CCB STORAGE\2ND LOCATION - C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 45 | | Shale boulders (con't) - Shale boulders: grey, fine grain, medium hard, highly to completely weathered, [with sandy clay soil matrix] | | RC -9 | 40.0-45.0 | | 22 (6) | |
| | | - completely weathered | | RC -10 | 45.0-50.0 | | 0 (0) | |
| 50 | | | | RC -11 | 50.0-55.0 | | 0 (0) | |
| 55 | | Poorly-graded Gravel (GP) - brown, wet, medium dense, with silt, mudstone | 349.4 | SS -4 | 55.0-56.5 | 13-11-14 (25) | | |
| | | Shale boulders - completely weathered | 347.9 | RC -12 | 55.0-60.0 | | 0 (0) | |
| 60 | | Lean Clay (CL) - dark brown, damp, very stiff, silty | 344.4 | SS -5 | 60.0-61.5 | 3-6-21 (27) | | |
| 65 | | - brown, dry, with mudstone gravel | | SS -6 | 65.0-66.5 | 11-12-11 (23) | | |
| 70 | | Silty Sand (SM) - grey mottled with black and light brown, damp, dense, fine to medium grain | 334.4 | SS -7 | 70.0-71.5 | 14-17-19 (36) | | |
| 75 | | - layers of grey, light brown, and yellowish brown, damp, medium dense | 327.9 | SS -8 | 75.0-76.5 | 11-12-15 (27) | | |

Bottom of borehole at 76.5 feet.

80

85



LOG OF TEST BORING

BORING CCB-06
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

DATE STARTED 9/22/2011 COMPLETED 9/22/2011 SURF. ELEV. 362.8 COORDINATES: N:1,327,664.43 E:2,063,773.09

CONTRACTOR SCS Field Services EQUIPMENT CME 550 METHOD NQ Rock Core

DRILLED BY T. Milam LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES _____

ECS ENGINEERING LOGS - ESEE DATABASE.GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|-----------------|
| 5 | | Shale boulders - grey, fine to medium grain, medium hard, highly to completely weathered, [with sandy clay soil matrix] | | SS -1 | 4.5-6.0 | 10-16-12 (28) | | Sample missing. |
| 10 | | | | SS -2 | 9.5-11.0 | 14-12-9 (21) | | Sample missing. |
| 15 | | | | SS -3 | 14.5-16.0 | 14-11-7 (18) | | Sample missing. |
| 20 | | | | RC -1 | 16.5-24.0 | | 47 (20) | |
| 25 | | | | RC -2 | 24.0-34.0 | | 25 (3) | |
| 30 | | | | RC -3 | 34.0-44.0 | | 17 (0) | |



LOG OF TEST BORING

BORING CCB-07
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

DATE STARTED 8/29/2011 COMPLETED 8/30/2011 SURF. ELEV. 411.4 COORDINATES: N:1,328,149.37 E:2,063,050.76

CONTRACTOR Thompson Engineering EQUIPMENT D 50 METHOD PQ Rock Core

DRILLED BY B. Green LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Piezometer set at 75.0'

TECH ENGINEER... LOGS - ESEE DATABASE.GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|---------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 5 | | Shale boulders - grey, medium hard, highly weathered, slight iron staining; [with sandy clay soil matrix] | | SS -1 | 0.0-1.5 | 20-30-23 (53) | | |
| | | | | RC -1 | 0.0-5.0 | | 34 (6) | |
| | | | | SS -2 | 3.5-4.8 | 5-3-50/4" (100+) | | |
| | | | | RC -2 | 5.0-10.0 | | 18 (0) | |
| 10 | | - iron staining; top 3" has silty coarse gravel | | RC -3 | 10.0-15.0 | | 46 (0) | |
| 15 | | - medium hard, not weathered | | RC -4 | 15.0-20.0 | | 62 (10) | |
| 20 | | - slightly weathered, iron staining | | RC -5 | 20.0-25.0 | | 50 (0) | |
| 25 | | | | RC -6 | 25.0-30.0 | | 36 (0) | |
| 30 | | Silt (ML) - dark brown, very damp, stiff, low plasticity, clayey with some gravel | 381.4 | SS -3 | 30.0-31.5 | 5-5-6 (11) | | |
| | | | 379.5 | RC -7 | 30.0-35.0 | | 36 (0) | |
| 35 | | Shale boulders | | SS -4 | 35.0-36.5 | 5-6-8 (14) | | |
| | | | 376.4 | RC -8 | 35.0-40.0 | | 4 (0) | |
| | | Silt (ML) | 374.9 | | | | | |
| | | Shale boulders | | | | | | |



LOG OF TEST BORING

BORING CCB-07
PAGE 2 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

TECH ENGINEER: J. J. ESEE DATABASE.GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION - C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|--------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 45 | | Silt (ML) - light brown, damp, mottled red and damp at approximately 2.5' Shale boulders | 369.9 | SS -5 | 40.0-41.5 | 3-4-6 (10) | | |
| | | | 366.4 | RC -9 | 41.5-45.0 | | 23 (14) | |
| | | Silt (ML) Shale boulders - slightly weathered, iron staining | 364.9 | RC -10 | 45.0-50.0 | | 44 (16) | |
| 50 | | | | RC -11 | 50.0-55.0 | | 10 (10) | |
| 55 | | Silt (ML) - very stiff | 356.4 | SS -6 | 55.0-56.5 | 4-6-9 (15) | | |
| | | | | RC -12 | 55.0-60.0 | | 10 (0) | |
| 60 | | - ML: brown, damp, hard, low plasticity, clayey; bottom 3" pwr/gravel, damp, and shale-like | | SS -7 | 60.0-61.5 | 4-7-10 (17) | | |
| 65 | | | | SS -8 | 65.0-66.5 | 9-21-17 (38) | | |
| 70 | | | | SS -9 | 70.0-71.5 | 12-13-14 (27) | | |
| 75 | | | 336.4 | | | | | |

Bottom of borehole at 75.0 feet.

80

85



LOG OF TEST BORING

BORING CCB-08
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

DATE STARTED 9/15/2011 COMPLETED 9/16/2011 SURF. ELEV. 456.9 COORDINATES: N:1,329,314.48 E:2,063,326.64

CONTRACTOR Thompson Engineering EQUIPMENT D 50 METHOD PQ Rock Core

DRILLED BY H. Carnley LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. 59.2 ft. DELAYED _____

NOTES Piezometer set at 75.0'

TECH ENGINEER... LOGS - ESEE DATABASE.GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 455.9 | | Silty Sand (SM) - light grey, dry, dense, fine to coarse grain | 455.9 | SS -1 | 0.0-1.5 | 19-22-20 (42) | | |
| | | Shale boulders - grey, fine grain, highly weathered, [with sandy clay soil matrix]; from 1.0' - 5.0' interbedded CL: light grey and light brown mottled dark brown and black, very damp, low plasticity, silty | | RC -1 | 0.0-5.0 | | 34 (0) | |
| 5 | | | | RC -2 | 5.0-10.0 | | 14 (0) | |
| 10 | | | | RC -3 | 10.0-15.0 | | 18 (0) | |
| 15 | | | | RC -4 | 15.0-20.0 | | 38 (0) | |
| 20 | | | | RC -5 | 20.0-25.0 | | 20 (0) | |
| 25 | | | | RC -6 | 25.0-30.0 | | 4 (0) | |
| 30 | | Poorly-graded Gravel (GP) - grey, wet, loose, SM traces on the mudstone gravel | 426.9 | SS -2 | 30.0-31.5 | 2-3-3 (6) | | |
| | | Shale boulders | 425.4 | RC -7 | 30.0-35.0 | | 14 (0) | |
| 35 | | | | RC -8 | 35.0-40.0 | | 16 (0) | |



LOG OF TEST BORING

BORING CCB-08
PAGE 2 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

C:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION - C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|---------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 45 | | Shale boulders (cont) - Shale boulders: grey, fine grain, highly weathered, [with sandy clay soil matrix] | | RC -9 | 40.0-45.0 | | 46 (18) | |
| 50 | | - highly to completely weathered | | RC -10 | 45.0-50.0 | | 16 (10) | |
| 55 | | | 401.9 | RC -11 | 50.0-55.0 | | 0 (0) | |
| | | Silt (ML) - light brown, wet, very soft, sandy with gravel | 400.9 | SS -3 | 55.0-56.0 | 6-1-WH/0" (100+) | | |
| | | Cavity - Void 56.0' - 59.0' | | RC -12 | 55.0-60.0 | | 22 (10) | |
| 60 | | Shale boulders - moderately to highly weathered | 397.9 | RC -13 | 60.0-65.0 | | 36 (34) | |
| 65 | | Silty Sand (SM) - dark grey, wet, dense, medium to coarse grain, with clay | 391.9 | SS -4 | 65.0-66.5 | 12-16-15 (31) | | |
| | | Shale boulders | 390.4 | RC -14 | 65.0-70.0 | | 0 (0) | |
| 70 | | Poorly-graded Gravel (GP) - dark grey and light brown, medium dense, coarse grain, mudstone | 386.9 | SS -5 | 70.0-71.5 | 12-12-10 (22) | | |
| | | - No recovery | 385.4 | RC -15 | 70.0-75.0 | | 0 (0) | |
| 75 | | | 381.9 | | | | | |

Bottom of borehole at 75.0 feet.

80

85



LOG OF TEST BORING

BORING CCB-09
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

DATE STARTED 9/12/2011 COMPLETED 9/13/2011 SURF. ELEV. 427.2 COORDINATES: N:1,329,551.31 E:2,063,947.23

CONTRACTOR Thompson Engineering EQUIPMENT D 50 METHOD NQ Rock Core

DRILLED BY B. Green LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 80 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES _____

ECS ENGINEERING, INC. - ESEE DATABASE.GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|---------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 425.7 | | Silt (ML) - light grey, dry, hard, with gravel | 425.7 | SS -1 | 0.0-1.5 | 22-27-17 (44) | | |
| | | Shale boulders - grey, fine to medium grain, medium hard, highly weathered, [with sandy clay soil matrix] | | RC -1 | 0.0-5.0 | | 26 (0) | |
| 5 | | | | RC -2 | 5.0-10.0 | | 36 (16) | |
| 10 | | | | RC -3 | 10.0-15.0 | | 26 (0) | |
| 15 | | | | RC -4 | 15.0-20.0 | | 34 (0) | |
| 20 | | | | RC -5 | 20.0-25.0 | | 26 (0) | |
| 25 | | | | RC -6 | 25.0-30.0 | | 30 (0) | |
| 30 | | | | RC -7 | 30.0-35.0 | | 40 (6) | |
| 35 | | | | RC -8 | 35.0-40.0 | | 48 (0) | |



LOG OF TEST BORING

BORING CCB-09
PAGE 2 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

C:\ENGINEERING\..._LOGS - ESEE DATABASE.GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION - C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------|--------------------|-----------------------|------------------|----------|
| 45 | | Shale boulders (cont) - Shale boulders: grey, fine to medium grain, medium hard, highly weathered, [with sandy clay soil matrix] | | RC -9 | 40.0-45.0 | | 50 (10) | |
| | | | | RC -10 | 45.0-50.0 | | 36 (0) | |
| 50 | | | | RC -11 | 50.0-55.0 | | 66 (14) | |
| | | | | RC -12 | 55.0-60.0 | | 60 (6) | |
| 55 | | | | RC -13 | 60.0-65.0 | | 36 (8) | |
| | | | | RC -14 | 65.0-70.0 | | 40 (0) | |
| 60 | | | - slightly to moderately weathered | RC -15 | 70.0-75.0 | | 78 (60) | |
| | | | | RC -16 | 75.0-80.0 | | 42 (0) | |
| 65 | | | | | | | | |
| 70 | | | | | | | | |
| 75 | | - highly weathered | | | | | | |
| 80 | | | | | | | | |

Bottom of borehole at 80.0 feet.

347.2

85



LOG OF TEST BORING

BORING CCB-10
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

DATE STARTED 9/13/2011 COMPLETED 9/14/2011 SURF. ELEV. 428.0 COORDINATES: N:1,330,073.25 E:2,063,261.23

CONTRACTOR Thompson Engineering EQUIPMENT D 50 METHOD NQ Diamond Core; PQ Rock Core

DRILLED BY B. Green LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES _____

TECH ENGINEER... LOGS - ESEE DATABASE.GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|-----------------------------------------------------------------------------------------------------------|----------------------------------|--------------------|--------------------|-----------------------|------------------|----------|
| 5 | | Shale boulders - grey, fine grain, medium hard, highly weathered, [with sandy clay soil matrix] | | RC -1 | 0.0-5.0 | | 8 (0) | |
| 10 | | | RC -2 | 5.0-10.0 | | 42 (10) | | |
| 15 | | | RC -3 | 10.0-15.0 | | 66 (18) | | |
| 20 | | | RC -4 | 15.0-20.0 | | 56 (0) | | |
| 25 | | | RC -5 | 20.0-25.0 | | 26 (0) | | |
| 30 | | | RC -6 | 25.0-30.0 | | 34 (0) | | |
| 35 | | | RC -7 | 30.0-35.0 | | 30 (0) | | |
| | | | - highly to completely weathered | | RC -8 | 35.0-40.0 | | 0 (0) |



LOG OF TEST BORING

BORING CCB-10
PAGE 2 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

TECH ENGINEER... LOGS - ESEE DATABASE.GDT - 11/17/11 14:15 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 45 | | Shale boulders (con't) - Shale boulders: grey, fine grain, medium hard, highly to completely weathered, [with sandy clay soil matrix] | | RC -9 | 40.0-45.0 | | 0 (0) | |
| | | | | RC -10 | 45.0-50.0 | | 0 (0) | |
| 50 | | Poorly-graded Gravel (GP) - dark grey with light brown, very damp, medium dense, coarse grain, with silt and sand | 378.0 | SS -1 | 50.0-51.5 | 5-6-7 (13) | | |
| | | - moist, with clay | | SS -2 | 55.0-56.5 | 6-9-12 (21) | | |
| 55 | | | | | | | | |
| 60 | | Clayey Sand (SC) - black, moist, very dense, fine to medium grain, coal | 368.0 | SS -3 | 60.0-60.8 | 42-50/4" (100+) | | |
| | | Bituminous Coal - black, medium grain, medium hard, highly weathered, shale-like | 367.2 | RC -11 | 60.0-65.0 | | | 36 (0) |
| 65 | | Silty Sand (SM) - dark grey, moist, very dense, fine grain, clayey; coal fines | 363.0 | SS -4 | 65.0-65.4 | 50/5" (100+) | | |
| | | Shale - grey, fine grain, hard, not weathered, interpreted to be parent bedrock | 362.0 | RC -12 | 65.0-70.0 | | | 88 (88) |
| 70 | | | | | | | | |
| | | | | | RC -13 | 70.0-75.0 | | 96 (96) |
| 75 | | | | 353.0 | | | | |

Bottom of borehole at 75.0 feet.

80

85



LOG OF TEST BORING

BORING CCB-11
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

DATE STARTED 9/26/2011 COMPLETED 9/26/2011 SURF. ELEV. 480.4 COORDINATES: N:1,329,769.63 E:2,062,929.90

CONTRACTOR SCS Field Services EQUIPMENT CME 550 METHOD NQ Rock Core

DRILLED BY T. Milam LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES _____

ENGINEER: JGS - ESEE DATABASE.GDT - 11/17/11 14:16 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|-----------------------------------------------------|
| 5 | | Shale boulders - grey, fine to medium grain, medium hard, moderately to highly weathered, [with sandy clay soil matrix] | | | | | | Driller notes boulders; started rock coring @ 5.3'. |
| | | | | RC -1 | 5.3-9.5 | | 26 (0) | |
| 10 | | | | RC -2 | 9.5-14.5 | | 50 (0) | |
| 15 | | | | RC -3 | 14.5-19.5 | | 40 (0) | |
| 20 | | | | RC -4 | 19.5-24.5 | | 22 (0) | |
| 25 | | | | RC -5 | 24.5-29.5 | | 40 (10) | |
| 30 | | | | RC -6 | 29.5-34.5 | | 48 (0) | |
| 35 | | | | RC -7 | 34.5-39.5 | | 32 (0) | |



LOG OF TEST BORING

BORING CCB-11
PAGE 2 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

TECH ENGINEER: _____ LOGS - ESEE DATABASE.GDT - 11/17/11 14:16 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION - C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 45 | | Shale boulders (cont) - Shale boulders: grey, fine to medium grain, medium hard, moderately to highly weathered, [with sandy clay soil matrix] | 405.4 | RC -8 | 39.5-44.5 | | 54 (0) | |
| 50 | | | | RC -9 | 44.5-54.5 | | 66 (16) | |
| 55 | | | | RC -10 | 54.5-64.5 | | 51 (0) | |
| 65 | | | | RC -11 | 64.5-75.0 | | 23 (7) | |
| 70 | | | | | | | | |
| 75 | | | | | | | | |

Bottom of borehole at 75.0 feet.

80

85



LOG OF TEST BORING

BORING CCB-12
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

DATE STARTED 9/21/2011 COMPLETED 9/21/2011 SURF. ELEV. 488.2 COORDINATES: N:1,330,266.41 E:2,062,379.02

CONTRACTOR Thompson Engineering EQUIPMENT D 50 METHOD PQ Rock Core

DRILLED BY H. Camley LOGGED BY G. Wilson CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Piezometer set at 75.0'

E:EESEE DATABASE_GDT - 11/17/11 14:16 - T:EESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS_2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (ROD) | COMMENTS |
|------------|-------------|----------------------------------------------------------------------------------------------------------------------------|---------------|--------------------|--------------------|-----------------------|------------------|----------|
| 5 | | Shale boulders - grey, fine to medium grain, hard, moderately to highly weathered, [with sandy clay soil matrix] | | RC -1 | 0.0-5.0 | | 34 (6) | |
| 10 | | | | RC -2 | 5.0-10.0 | | 36 (14) | |
| 15 | | | | RC -3 | 10.0-15.0 | | 56 (34) | |
| 20 | | | | RC -4 | 15.0-20.0 | | 18 (0) | |
| 25 | | | | RC -5 | 20.0-25.0 | | 58 (26) | |
| 30 | | | | RC -6 | 25.0-30.0 | | 56 (18) | |
| 35 | | | | RC -7 | 30.0-35.0 | | 26 (0) | |
| | | | - No recovery | | SS -1 | 35.0-35.2 | 50/2" (100+) | |
| | | | | RC -8 | 35.0-40.0 | | 50 (0) | |



LOG OF TEST BORING

BORING CCB-13
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

DATE STARTED 9/22/2011 COMPLETED 9/22/2011 SURF. ELEV. 438.0 COORDINATES: N:1,331,002.28 E:2,062,773.67

CONTRACTOR SCS Field Services EQUIPMENT CME 550 METHOD NQ Rock Core

DRILLED BY T. Milam LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES _____

TECH ENGINEER... \OGS - ESEE DATABASE.GDT - 11/17/11 14:16 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION - C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|-------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 5 | | - GP: dark brown, dry, medium dense, medium to coarse grain, silty; mudstone gravel | | SS -1 | 4.5-6.0 | 8-7-10 (17) | | |
| | | - damp | 429.0 | SS -2 | 7.5-9.0 | 14-14-7 (21) | | |
| 10 | | Shale boulders - grey, fine grain, medium hard, moderately to highly weathered, [with sandy clay soil matrix] | | RC -1 | 10.0-15.0 | | 46 (0) | |
| 15 | | | | RC -2 | 15.0-20.0 | | 14 (0) | |
| 20 | | | | RC -3 | 20.0-25.0 | | 18 (0) | |
| 25 | | Silt (ML) - dark brown mottled light brown, black, and orange, damp, medium stiff, clayey | 413.0 | SS -3 | 25.0-26.5 | 2-3-3 (6) | | |
| 30 | | - dry | | SS -4 | 29.5-31.0 | WH-2-3 (5) | | |
| 35 | | Shale boulders - [with sandy clay soil matrix] | 402.0 | SS -5 | 34.5-36.0 | 2-3-3 (6) | | |
| | | | | RC -4 | 36.0-40.0 | | 28 (0) | |



LOG OF TEST BORING

BORING CCB-13
PAGE 2 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

C:\ESEE\DATABASE_GDT - 11/17/11 14:16 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 45 | | Shale boulders (cont) - Shale boulders: grey, fine grain, medium hard, moderately to highly weathered, [with sandy clay soil matrix] | 363.0 | RC -5 | 40.0-45.0 | | 46 (0) | |
| 50 | | | | RC -6 | 45.0-50.0 | | 40 (0) | |
| 55 | | | | RC -7 | 50.0-55.0 | | 46 (0) | |
| 60 | | | | RC -8 | 55.0-60.0 | | 70 (0) | |
| 65 | | | | RC -9 | 60.0-65.0 | | 38 (0) | |
| 70 | | | | RC -10 | 65.0-70.0 | | 54 (0) | |
| 75 | | | | RC -11 | 70.0-75.0 | | 60 (0) | |

Bottom of borehole at 75.0 feet.

80
85



LOG OF TEST BORING

BORING CCB-14

PAGE 1 OF 2

ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

DATE STARTED 9/19/2011 COMPLETED 9/19/2011 SURF. ELEV. 519.3 COORDINATES: N:1,330,764.74 E:2,061,620.09

CONTRACTOR SCS Field Services EQUIPMENT CME 550 METHOD NQ Rock Core

DRILLED BY T. Milam LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES _____

C:\ENGINEERING\JG\...ESEE DATABASE.GDT - 11/17/11 14:16 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION - C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|----------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|-----------------------------------------------------|
| 5 | | Shale boulders - grey, fine to medium grain, soft, highly to completely weathered, [with sandy clay soil matrix] | | | | | | Driller notes boulders; started rock coring @ 4.5'. |
| 10 | | | RC -1 | 4.5-9.5 | | 20 (0) | | |
| 15 | | | RC -2 | 9.5-14.5 | | 38 (0) | | |
| 20 | | | RC -3 | 14.5-19.5 | | 40 (0) | | |
| 25 | | | RC -4 | 19.5-24.5 | | 30 (0) | | |
| 30 | | | RC -5 | 24.5-29.5 | | 24 (0) | | |
| 35 | | RC -6 | 29.5-39.5 | | 18 (0) | | | |



LOG OF TEST BORING

BORING CCB-14
PAGE 2 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

C:\ENGINEERING\LOGS\SEE DATABASE.GDT - 11/17/11 14:16 - T:\NESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2\11\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|------------------------|-----------|--------------------|----------------------------------|-----------------------|------------------|----------|
| 45 | | Shale boulders (con't) | 444.3 | RC -7 | 39.5-44.5 | | 26 (0) | |
| 50 | | | | RC -8 | 44.5-49.5 | | 48 (8) | |
| 55 | | | | RC -9 | 49.5-54.5 | | 20 (0) | |
| 60 | | | | RC -10 | 54.5-59.5 | | 14 (0) | |
| 65 | | | | RC -11 | 59.5-64.5 | | 20 (0) | |
| 70 | | | | RC -12 | 64.5-69.5 | | 20 (0) | |
| 75 | | | | RC -13 | 69.5-75.0 | | 22 (0) | |
| 80 | | | | | Bottom of borehole at 75.0 feet. | | | |
| 85 | | | | | | | | |



LOG OF TEST BORING

BORING CCB-15
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

DATE STARTED 9/21/2011 COMPLETED 9/26/2011 SURF. ELEV. 514.5 COORDINATES: N:1,330,081.68 E:2,061,296.85

CONTRACTOR SCS Field Services EQUIPMENT CME 550 METHOD NQ Rock Core

DRILLED BY T. Milam LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES _____

E:SEEE DATABASE.GDT - 11/17/11 14:16 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|---------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|-----------------------------------------------------|
| 5 | | Shale boulders - grey, fine grain, soft to medium hard, highly to completely weathered, [with sandy clay soil matrix] | | | | | | Driller notes boulders; started rock coring @ 3.9'. |
| | | | | RC -1 | 3.9-9.0 | | 45 (2) | |
| 10 | | | | RC -2 | 9.0-14.0 | | 14 (0) | |
| 15 | | | | RC -3 | 14.0-19.0 | | 18 (0) | |
| 20 | | | | RC -4 | 19.0-24.0 | | 22 (0) | |
| 25 | | | | RC -5 | 24.0-29.0 | | 46 (0) | |
| 30 | | | | RC -6 | 29.0-34.0 | | 40 (0) | |
| 35 | | | | RC -7 | 34.0-39.0 | | 46 (0) | |



LOG OF TEST BORING

BORING CCB-16
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

DATE STARTED 9/21/2011 COMPLETED 9/26/2011 SURF. ELEV. 525.8 COORDINATES: N:1,329,492.51 E:2,061,438.64

CONTRACTOR Thompson Engineering EQUIPMENT D 50 METHOD PQ Rock Core

DRILLED BY H. Camley LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES Piezometer set at 75.0'

ECS ENGINEERING, LOG - ESEE DATABASE.GDT - 11/17/11 14:16 - T:\ESEE MAJOR PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 5 | | Shale boulders - grey, fine grain, medium hard, highly weathered, [with sandy clay soil matrix] - interbedded CL: dark grey, moist, silty | | RC -1 | 0.0-5.0 | | 36 (6) | |
| 10 | | | | RC -2 | 5.0-10.0 | | 26 (6) | |
| 15 | | | | RC -3 | 10.0-15.0 | | 28 (0) | |
| 20 | | | | RC -4 | 15.0-20.0 | | 28 (14) | |
| 25 | | | | RC -5 | 20.0-25.0 | | 0 (0) | |
| 30 | | | | RC -6 | 25.0-30.0 | | 18 (0) | |
| 35 | | | | RC -7 | 30.0-35.0 | | 24 (0) | |
| | | | | RC -8 | 35.0-40.0 | | 36 (8) | |



LOG OF TEST BORING

BORING CCB-16
PAGE 2 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

C:\ENGINEERING\...ESEE DATABASE.GDT - 11/17/11 14:16 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION-C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 45 | | Shale boulders (con't) - Shale boulders: grey, fine grain, medium hard, highly weathered, [with sandy clay soil matrix] 40.0' - 40.5' interbedded CL: reddish brown, moist, low plasticity - [with sandy clay soil matrix] 59.5' - 60' interbedded CL: brown, damp, low plasticity, silty - [with sandy clay soil matrix] 70.0' - 70.75' interbedded CL: dark grey, damp, low plasticity | | RC -9 | 40.0-45.0 | | 20 (12) | |
| 50 | | | | RC -10 | 45.0-50.0 | | 34 (0) | |
| 55 | | | | RC -11 | 50.0-55.0 | | 40 (18) | |
| 60 | | | | RC -12 | 55.0-60.0 | | 26 (0) | |
| 65 | | | | RC -13 | 60.0-65.0 | | 30 (0) | |
| 70 | | | | RC -14 | 65.0-70.0 | | 28 (0) | |
| 75 | | | | RC -15 | 70.0-75.0 | | 26 (0) | |
| | | | 450.8 | | | | | |

Bottom of borehole at 75.0 feet.

80

85



LOG OF TEST BORING

BORING CCB-17
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification

LOCATION Parrish, AL

DATE STARTED 9/22/2011 COMPLETED 9/22/2011 SURF. ELEV. 437.6 COORDINATES: N:1,329,527.96 E:2,062,177.35

CONTRACTOR SCS Field Services EQUIPMENT CME 550 METHOD NQ Rock Core

DRILLED BY T. Milam LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES _____

E:\ENGINEERING LOGS\ESEE DATABASE.GDT - 11/17/11 14:16 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION-C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|-------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 5 | | Shale boulders - grey, fine grain, soft to medium hard, highly weathered, [with sandy clay soil matrix] | | RC -1 | 4.3-9.2 | | 39 (16) | |
| 10 | | | RC -2 | 9.2-14.2 | | 18 (0) | | |
| 15 | | | RC -3 | 14.2-19.2 | | 56 (34) | | |
| 20 | | | RC -4 | 19.2-24.2 | | 32 (8) | | |
| 25 | | | | | | | | |
| 30 | | | RC -5 | 24.2-34.2 | | 41 (0) | | |
| 35 | | | | RC -6 | 34.2-39.2 | | 20 (14) | |



LOG OF TEST BORING

BORING CCB-17
PAGE 2 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

C:\ENGINEERING\...ESEE DATABASE.GDT - 11/17/11 14:16 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 45 | | Shale boulders (con't) - Shale boulders: grey, fine grain, soft to medium hard, highly weathered, [with sandy clay soil matrix] | 362.4 | RC -7 | 39.2-44.2 | | 62 (0) | |
| 50 | | | | RC -8 | 44.2-49.2 | | 62 (10) | |
| 55 | | | | RC -9 | 49.2-54.2 | | 40 (0) | |
| 60 | | | | RC -10 | 54.2-64.2 | | 61 (19) | |
| 70 | | | | RC -11 | 64.2-75.0 | | 32 (6) | |
| 75 | | Bottom of borehole at 75.0 feet. | | | | | | |
| 80 | | | | | | | | |
| 85 | | | | | | | | |



LOG OF TEST BORING

BORING CCB-18
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

DATE STARTED 9/21/2011 COMPLETED 9/22/2011 SURF. ELEV. 501.8 COORDINATES: N:1,329,161.33 E:2,060,916.80

CONTRACTOR SCS Field Services EQUIPMENT CME 550 METHOD NQ Rock Core

DRILLED BY T. Milam LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 75 ft. GROUND WATER DEPTH: DURING _____ COMP. _____ DELAYED _____

NOTES _____

ENGINEER, LOG... ESEE DATABASE: GDT - 11/17/11 14:16 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION- C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|-----------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|------------------------------------------------------|
| 5 | | Shale boulders - grey, fine to medium grain, soft to medium hard, highly weathered, [with sandy clay soil matrix] | | | | | | Driller notes boulders; started rock coring @ 10.5'. |
| | | - GP: brownish grey, dry, dense, coarse to medium grain, silty | | SS -1 | 5.0-6.5 | 20-19-21 (40) | | |
| 10 | | | 491.3 | RC -1 | 10.5-14.5 | | 45 (10) | |
| 15 | | | | RC -2 | 14.5-19.5 | | 38 (6) | |
| 20 | | | | RC -3 | 19.5-24.5 | | 36 (8) | |
| 25 | | | | | | | | |
| 30 | | | | RC -4 | 24.5-34.5 | | 62 (4) | |
| 35 | | | | RC -5 | 34.5-44.5 | | 53 (8) | |



LOG OF TEST BORING

BORING CCB-19
PAGE 1 OF 2
ECS 23073

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Gorgas CCB Storage Landfill Permit Modification
LOCATION Parrish, AL

DATE STARTED 9/26/2011 COMPLETED 9/28/2011 SURF. ELEV. 390.3 COORDINATES: N:1,328,484.60 E:2,061,759.75

CONTRACTOR Thompson Engineering EQUIPMENT D 50 METHOD PQ Rock Core

DRILLED BY H. Camley LOGGED BY N. McCormick CHECKED BY R. Garrett ANGLE _____ BEARING _____

BORING DEPTH 76 ft. GROUND WATER DEPTH: DURING 57.5 ft. COMP. 59.5 ft. DELAYED _____

NOTES Piezometer set at 76.0'

ECS ENGINEERING, INC. - ESEE DATABASE.GDT - 11/17/11 14:16 - T:\ESEE MAJOR PROJECTS\PROJECTS\GORGAS\GORGAS 2011\GORGAS CCB STORAGE\2ND LOCATION - C & D LANDFILL\GORGAS CCB STORAGE C&D LANDFILL.GPJ

| DEPTH (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | ELEVATION | SAMPLE TYPE NUMBER | SAMPLE DEPTH (ft.) | BLOW COUNTS (N VALUE) | RECOVERY % (RQD) | COMMENTS |
|------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------|--------------------|--------------------|-----------------------|------------------|----------|
| 5 | | Shale boulders - grey, fine to medium grain, soft to medium hard, highly to completely weathered, [with sandy clay soil matrix] | | RC -1 | 0.0-5.0 | | 10 (0) | |
| 10 | | | | RC -2 | 5.0-10.0 | | 30 (16) | |
| 15 | | | | RC -3 | 10.0-15.0 | | 24 (0) | |
| 20 | | - from 20.0' - 25.0' interbedded CL: dark brown, very moist, silty, sandy | | RC -4 | 15.0-20.0 | | 26 (0) | |
| 25 | | | | RC -5 | 20.0-25.0 | | 16 (0) | |
| 30 | | | | RC -6 | 25.0-30.0 | | 34 (0) | |
| 35 | | - highly weathered | | RC -7 | 30.0-35.0 | | 74 (46) | |
| | | | | RC -8 | 35.0-40.0 | | 28 (14) | |

GEOPHYSICAL RECORD OF WELL: D1

Gorgas Steam Plant

Client: Southern Company Services, Inc.



Project Number: 12390010

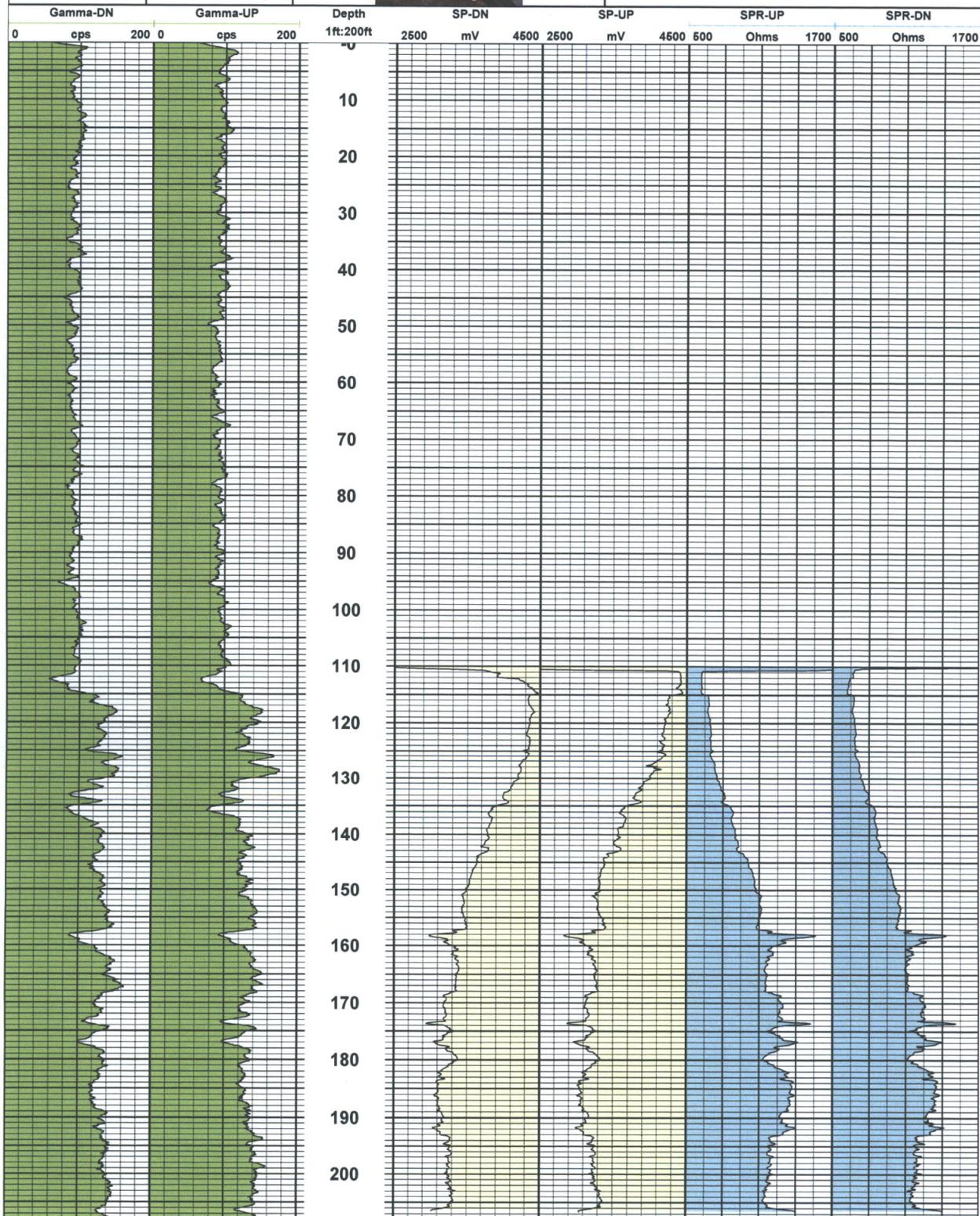
Date: January, 2012

Location: Parrish, AL
 Easting: na
 Northing: na
 Ground Elev mst: na
 Borehole Dip: Vertical
 Borehole Az: na
 Borehole Size: HQ
 Drilled Depth: 209.5 ft
 Drill Comp Date: 01-17-2012
 Casing Depth: 112 ft bgs

Casing Diameter: 4 inches
 Casing Stick-up: 2.33 ft
 Casing Material: Steel
 Water Level: 110.62 ft bgs
 Logged By: B. Abernathy
 Log Depth Ref: GS
 Log Date: 01-31-2012
 Image Plot(s) Ref: na



Borehole Orientation Ref. to True North -



GEOPHYSICAL RECORD OF WELL: D2

Gorgas Steam Plant

Client: Southern Company Services, Inc.



Project Number: 12390010

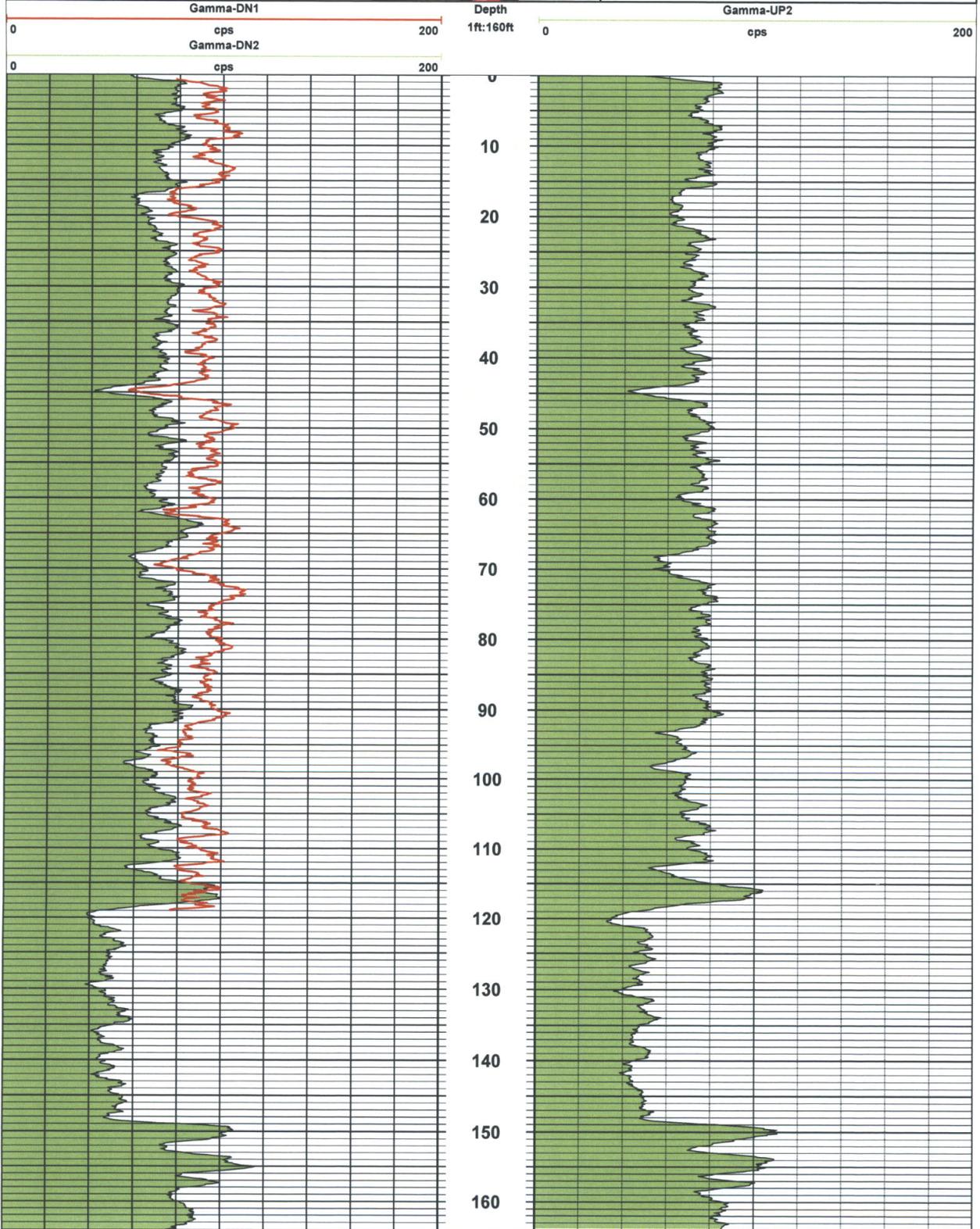
Date: January, 2012

Location: Parrish, AL
Easting: na
Northing: na
Ground Elev msl: na
Borehole Dip: Vertical
Borehole Az: na
Borehole Size: HQ
Drilled Depth: 164.5 ft
Drill Comp Date: 01-25-2012
Casing Depth: 112 ft bgs

Casing Diameter: 4 inches
Casing Stick-up: 1.62 ft/3.3 ft
Casing Material: Steel/Rod
Water Level: 107 ft bgs
Logged By: B. Abernathy
Log Depth Ref: GS
Log Date: 01-31-2012
Image Plot(s) Ref: na



Borehole Orientation Ref. to True North -



GEOPHYSICAL RECORD OF WELL: D3

Gorgas Steam Plant

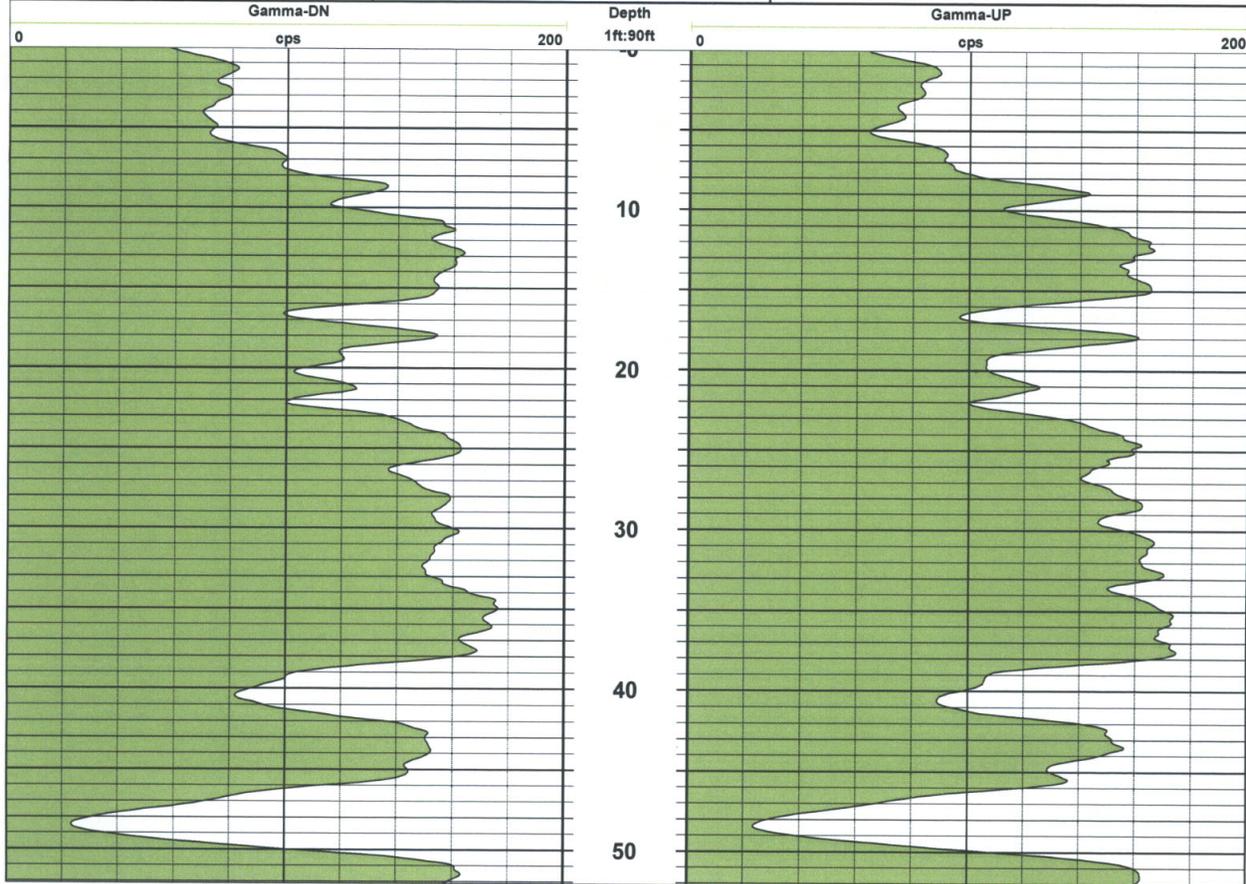
Client: Southern Company Services, Inc.



Project Number: 12390010

Date: January, 2012

| | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Location: Parrish, AL Easting: na Northing: na Ground Elev msl: na Borehole Dip: Vertical Borehole Az: na Borehole Size: HQ Drilled Depth: 52.4 ft Drill Comp Date: na Casing Depth: 47 ft bgs | Casing Diameter: 4 inches Casing Stick-up: 2.5 ft Casing Material: Steel/Rod Water Level: 47.25 ft bgs Logged By: B. Abernathy Log Depth Ref: GS Log Date: 01-31-2012 Image Plot(s) Ref: na | Borehole Orientation Ref. to True North - |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|



GEOPHYSICAL RECORD OF BOREHOLE: D5

Gorgas Steam Plant

Client: Southern Company Services



Project Number: 12390238
Date: August 30, 2012

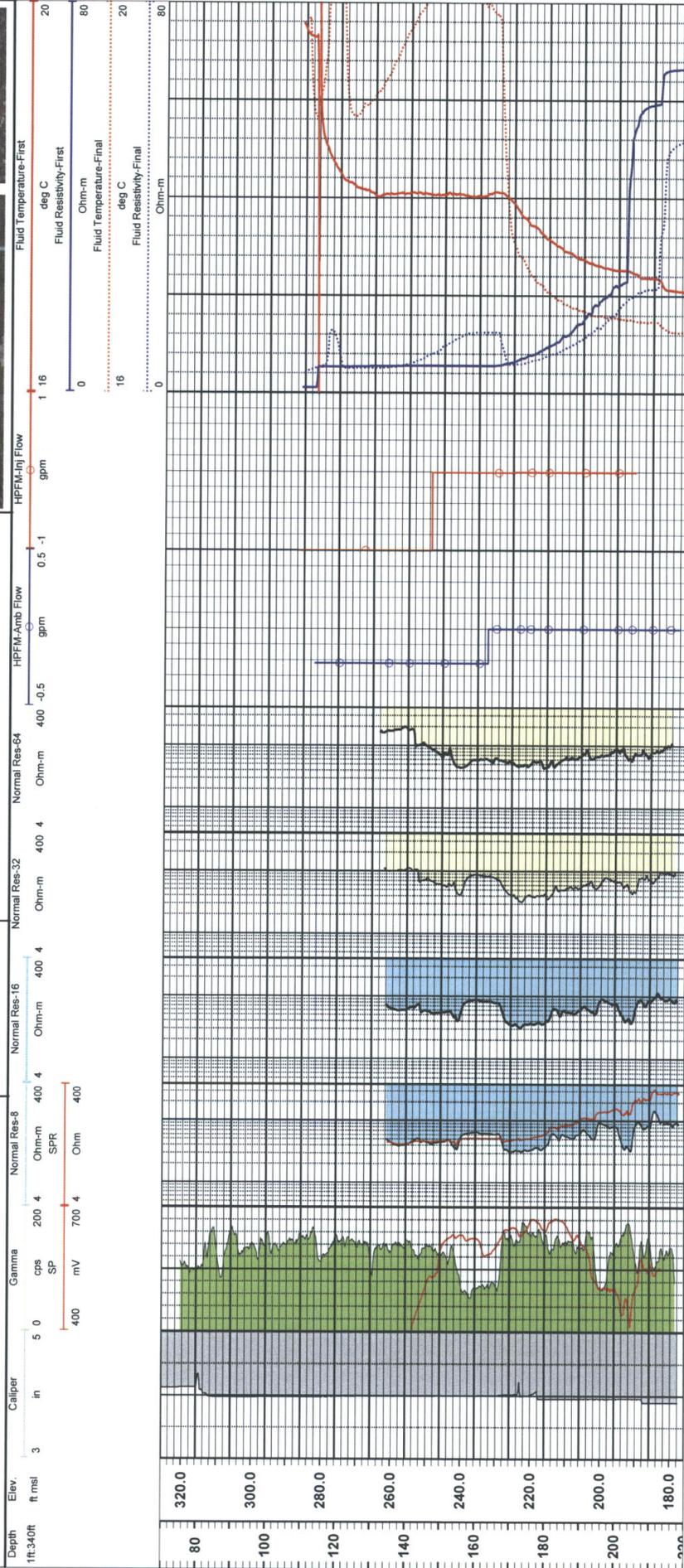


Location: Parrish, AL
Log Date: 08-03-2012
Logged By: B. Abernathy

Drill Comp. Date: 08-02-2012
Casing Stick-up: flush
Casing Diameter: 4 inches
Casing Depth: 80 ft bgs

Depth Reference: 10" at top of concrete pad
Core
Borehole Diameter: HQ
Drilled Depth: 220 ft

Note:
HPFM testing under ambient and injecting at 1 gpm.
Static water level was 113.2 ft bgs. 112.95 ft bgs at end of ambient run.
The maximum water level rise during injection was not recorded.



GEOPHYSICAL RECORD OF BOREHOLE: D6

Gorgas Steam Plant

Client: Southern Company Services

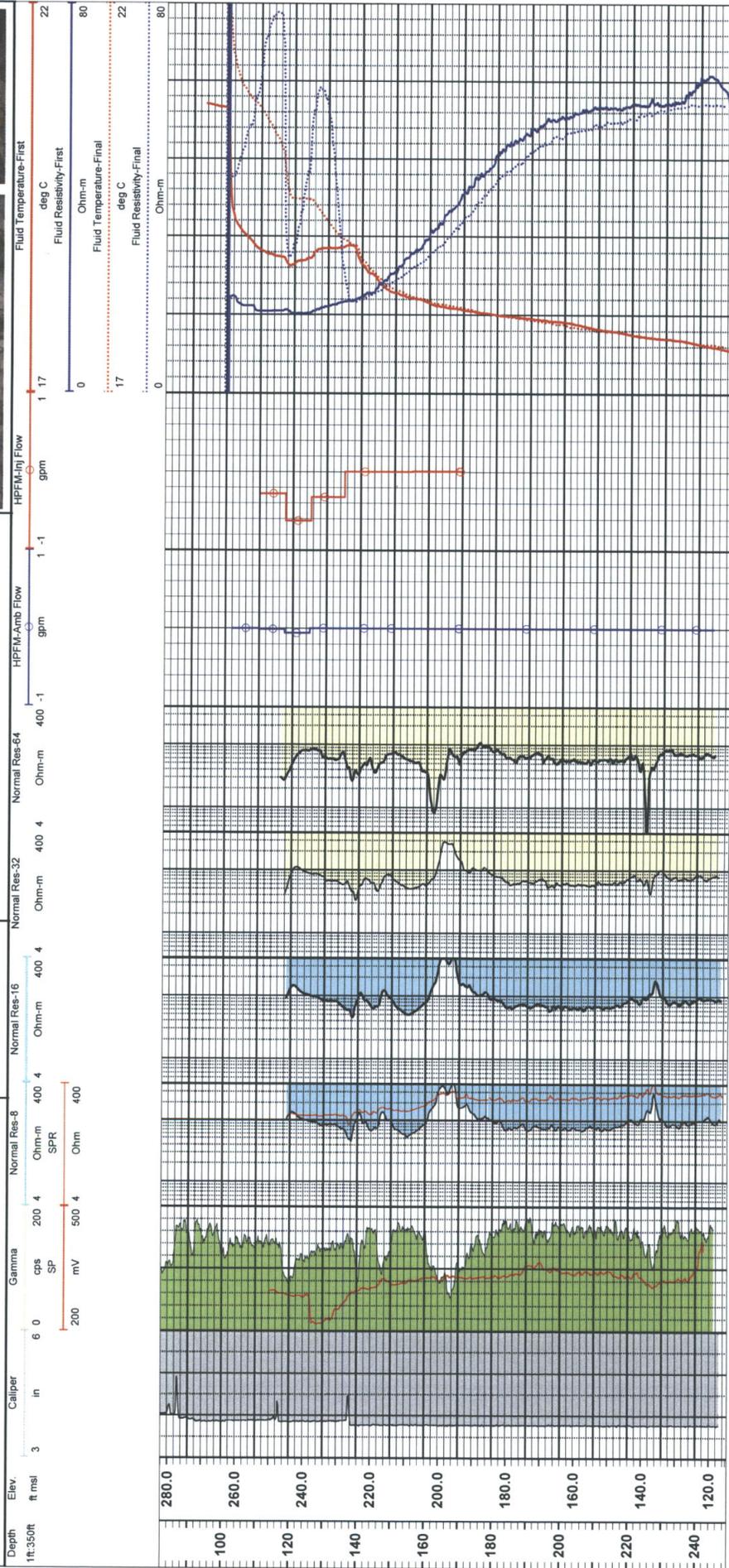


Project Number: 12390238
Date: August 30, 2012



| | | |
|-------------------------------------------------|---------------------------------------------|------------------------------|
| Datum: Alabama West Zone - NAD27 | Depth Reference: "0" at top of concrete pad | Drill Comp. Date: 06-02-2012 |
| Easting: 595275.022 | Core | Casing Stick-up: 1.13 ft ogs |
| Northing: 1327591.919 | Borehole Diameter: HQ | Casing Diameter: 4 inches |
| Elevation: 364.064 ft msl (top of concrete pad) | Drilled Depth: 250 ft | Casing Depth: 84 ft bgs |

Note: HPFM testing under ambient and injecting at 0.5 gpm. Static water level was 100.3 ft bgs. The maximum water level rise during injection was 7.5 ft, 27 gals over 54 min.



GEOPHYSICAL RECORD OF BOREHOLE: D8

Gorgas Steam Plant

Client: Southern Company Services



Project Number: 12390238
Date: August 30, 2012

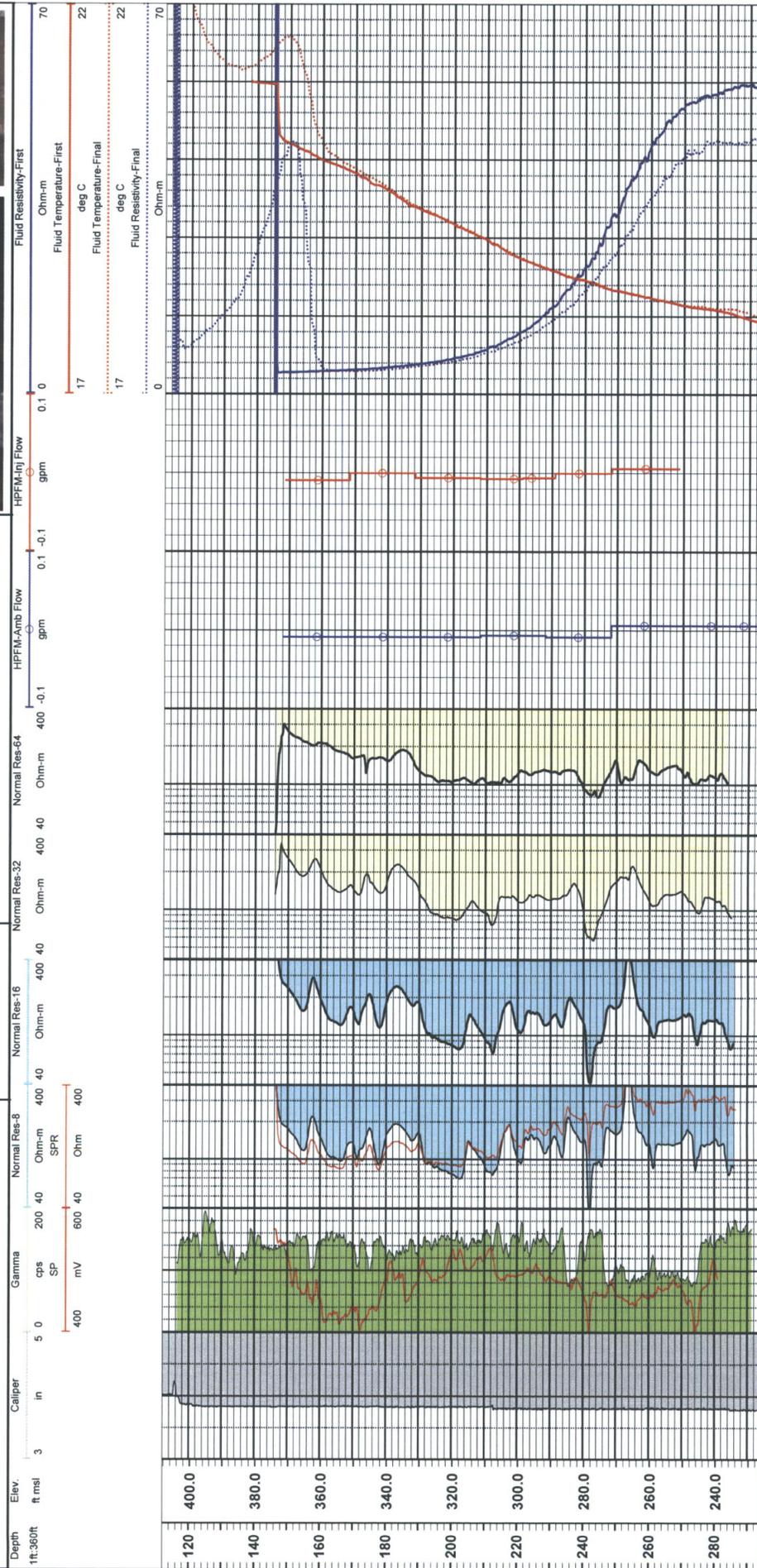


Datum: Alabama West Zone - NAD27
 Easting: 583125.13
 Northing: 1330724.161
 Elevation: 520.35 ft msl (top of concrete pad)

Depth Reference: "0" at top of concrete pad
 Drilling Method: Core
 Borehole Diameter: HQ
 Drilled Depth: 296 ft

Drill Comp. Date: 08-17-2012
 Casing Stick-up: 2 ft ags
 Casing Diameter: 4 inches
 Casing Depth: 115.2 ft bgs

Note: HPFM testing under ambient and injecting at 0.5 gpm. Static water level was 146.2 ft bgs. The maximum water level rise during injection was 31.2 ft, 28 gals over 56 min.



Alabama Power
 General Test Laboratory
 P.O. Box 2641
 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-1 Overburden
 Mine Spoil & Clay 123.6-124.1

Laboratory ID Number : AS11058

| Test Name | Reference | VSpec | MDL | Result | Units |
|-------------------|--------------|-------|------|--------------|-------|
| Silicon | EPA3051/6010 | | 1. | 235 | mg/kg |
| Aluminum, Total | EPA3051/6010 | | 10 | 48000 | mg/kg |
| Antimony, Total | EPA3051/6010 | | 1.2 | 5.867 | mg/kg |
| Arsenic, Total | EPA3051/6010 | | 0.5 | 6.0 | mg/kg |
| Barium, Total | EPA3051/6010 | | 0.2 | 647 | mg/kg |
| Beryllium, Total | EPA3051/6010 | | 0.1 | 2.97 | mg/kg |
| Cadmium, Total | EPA3051/6010 | | 0.2 | Not Detected | mg/kg |
| Calcium, Total | EPA3051/6010 | | 1. | 277 | mg/kg |
| Chromium, Total | EPA3051/6010 | | 0.1 | 76.7 | mg/kg |
| Cobalt, Total | EPA3051/6010 | | 0.4 | 17.4 | mg/kg |
| Copper, Total | EPA3051/6010 | | 0.5 | 38.7 | mg/kg |
| Iron, Total | EPA3051/6010 | | 1. | 24800 | mg/kg |
| Lead, Total | EPA3051/6010 | | 0.4 | 27.5 | mg/kg |
| Magnesium, Total | EPA3051/6010 | | 1. | 6360 | mg/kg |
| Manganese, Total | EPA3051/6010 | | 1. | 197 | mg/kg |
| Mercury, Total | EPA3051/7470 | | 0.05 | 0.09 | mg/kg |
| Molybdenum, Total | EPA3051/6010 | | 1. | 1.23 | mg/kg |
| Nickel, Total | EPA3051/6010 | | 0.4 | 21.4 | mg/kg |
| Strontium, Total | EPA3051/6010 | | 1. | 24.3 | mg/kg |
| Selenium, Total | EPA3051/6010 | | 0.5 | Not Detected | mg/kg |
| Potassium, Total | EPA3051/6010 | | 1. | 13100 | mg/kg |

This Certificate states the physical and/or chemical characteristics of the sample as submitted. This document shall not be reproduced, except in full, without written consent from Alabama Power's General Test Laboratory.

Comments : 50.73g for SPLP

CC:

Quality Control _____ Supervision _____

Date: 7/3/2012

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 General Test Laboratory
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 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-1 Overburden
 Mine Spoil & Clay 123.6-124.1

Laboratory ID Number : AS11058

| Test Name | Reference | VSpec | MDL | Result | Units |
|----------------------------|--------------|-------|-------|--------------|---------|
| Silver, Total | EPA3051/6010 | | 0.6 | Not Detected | mg/kg |
| Titanium, Total | EPA3051/6010 | | 1. | 3560 | mg/kg |
| Thallium, Total | EPA3051/6010 | | 0.7 | Not Detected | mg/kg |
| Tin, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Sodium, Total | EPA3051/6010 | | 1. | 2190 | mg/kg |
| Vanadium, Total | EPA3051/6010 | | 0.2 | 132 | mg/kg |
| Zinc, Total | EPA3051/6010 | | 0.4 | 83.4 | mg/kg |
| Solids Content of Sample | EPA 1311 | | 0.01 | 100 | percent |
| pH of SPLP Extract | EPA 1311 | | 0. | 6.54 | |
| pH of TCLP Extract | EPA 1311 | | 0. | 4.96 | |
| TCLP Extraction Fluid | EPA 1311 | | 0. | 1 | |
| Chromium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Mercury, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Silver, SPLP Extractable | EPA1312 | | 0.006 | 0.00677 | mg/l |
| Lead, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Cadmium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Barium, SPLP Extractable | EPA1312 | | 0.006 | 0.0571 | mg/l |
| Arsenic, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Silver, TCLP Extractable | EPA1311/6010 | | 0.006 | Not Detected | mg/l |
| Selenium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Arsenic, TCLP Extractable | EPA1311/6010 | | 0.009 | Not Detected | mg/l |

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-1 Overburden
 Mine Spoil & Clay 123.6-124.1

Laboratory ID Number : AS11058

| Test Name | Reference | VSpec | MDL | Result | Units |
|-----------------------------|--------------|-------|--------|--------------|-------|
| Barium, TCLP Extractable | EPA1311/6010 | | 0.003 | 0.342 | mg/l |
| Beryllium, SPLP Extractable | EPA1312/6010 | | 0.002 | Not Detected | mg/l |
| Beryllium, TCLP Extractable | EPA1311/6010 | | 0.002 | Not Detected | mg/l |
| Cadmium, TCLP Extractable | EPA1311/6010 | | 0.001 | 0.001 | mg/l |
| Cobalt, SPLP Extractable | EPA1312/6010 | | 0.02 | Not Detected | mg/l |
| Cobalt, TCLP Extractable | EPA1311/6010 | | 0.02 | 0.0686 | mg/l |
| Chromium, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Copper, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Copper, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.10 | mg/l |
| Mercury, TCLP Extractable | EPA1311/7470 | | 0.0002 | Not Detected | mg/l |
| Nickel, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Nickel, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.07 | mg/l |
| Lead, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.03 | mg/l |
| Antimony, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Antimony, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Selenium, TCLP Extractable | EPA1311/6010 | | 0.02 | Not Detected | mg/l |
| Thallium, SPLP Extractable | EPA1312/6010 | | 0.025 | Not Detected | mg/l |
| Thallium, TCLP Extractable | EPA1311/6010 | | 0.025 | Not Detected | mg/l |
| Vanadium, TCLP Extractable | EPA1311/6010 | | 0.004 | 0.005 | mg/l |
| Vanadium, SPLP Extractable | EPA1312/6010 | | 0.004 | Not Detected | mg/l |
| Zinc, SPLP Extractable | EPA1312/6010 | | 0.01 | 0.01 | mg/l |

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Comments : 50.73g for SPLP

CC:

Quality Control _____ Supervision _____

Date: 7/3/2012

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P.O. Box 2641
Birmingham, Alabama 35291
(205) 664 - 6032 or 6171
FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-1 Overburden
Mine Spoil & Clay 123.6-124.1

Laboratory ID Number : AS11058

| Test Name | Reference | VSpec | MDL | Result | Units |
|------------------------|--------------|-------|------|--------|-------|
| Zinc, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.07 | mg/l |

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-1 Coaly Claystone
 124.3-124.6

Laboratory ID Number : AS11059

| Test Name | Reference | VSpec | MDL | Result | Units |
|-------------------|--------------|-------|------|--------------|-------|
| Silicon | EPA3051/6010 | | 1. | 301 | mg/kg |
| Aluminum, Total | EPA3051/6010 | | 10 | 66600 | mg/kg |
| Antimony, Total | EPA3051/6010 | | 1.2 | 13.92 | mg/kg |
| Arsenic, Total | EPA3051/6010 | | 0.5 | 4.1 | mg/kg |
| Barium, Total | EPA3051/6010 | | 0.2 | 405 | mg/kg |
| Beryllium, Total | EPA3051/6010 | | 0.1 | 3.62 | mg/kg |
| Cadmium, Total | EPA3051/6010 | | 0.2 | 1.07 | mg/kg |
| Calcium, Total | EPA3051/6010 | | 1. | 289 | mg/kg |
| Chromium, Total | EPA3051/6010 | | 0.1 | 91.6 | mg/kg |
| Cobalt, Total | EPA3051/6010 | | 0.4 | 31.2 | mg/kg |
| Copper, Total | EPA3051/6010 | | 0.5 | 57.1 | mg/kg |
| Iron, Total | EPA3051/6010 | | 1. | 15600 | mg/kg |
| Magnesium, Total | EPA3051/6010 | | 1. | 3360 | mg/kg |
| Lead, Total | EPA3051/6010 | | 0.4 | 30.3 | mg/kg |
| Manganese, Total | EPA3051/6010 | | 1. | 31.1 | mg/kg |
| Mercury, Total | EPA3051/7470 | | 0.05 | Not Detected | mg/kg |
| Molybdenum, Total | EPA3051/6010 | | 1. | 2.89 | mg/kg |
| Nickel, Total | EPA3051/6010 | | 0.4 | 28.9 | mg/kg |
| Selenium, Total | EPA3051/6010 | | 0.5 | 1.87 | mg/kg |
| Strontium, Total | EPA3051/6010 | | 1. | 16.3 | mg/kg |
| Potassium, Total | EPA3051/6010 | | 1. | 14000 | mg/kg |

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Comments : Insufficient sample for SPLP extraction.

CC:

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Date: 7/3/2012

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-1 Coaly Claystone
 124.3-124.6

Laboratory ID Number : AS11059

| Test Name | Reference | VSpec | MDL | Result | Units |
|-----------------------------|--------------|-------|--------|--------------|---------|
| Silver, Total | EPA3051/6010 | | 0.6 | Not Detected | mg/kg |
| Titanium, Total | EPA3051/6010 | | 1. | 6010 | mg/kg |
| Thallium, Total | EPA3051/6010 | | 0.7 | Not Detected | mg/kg |
| Sodium, Total | EPA3051/6010 | | 1. | 1160 | mg/kg |
| Tin, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Vanadium, Total | EPA3051/6010 | | 0.2 | 170 | mg/kg |
| Zinc, Total | EPA3051/6010 | | 0.4 | 76.4 | mg/kg |
| Solids Content of Sample | EPA 1311 | | 0.01 | 100 | percent |
| pH of TCLP Extract | EPA 1311 | | 0. | 5.01 | |
| TCLP Extraction Fluid | EPA 1311 | | 0. | 1 | |
| Silver, TCLP Extractable | EPA1311/6010 | | 0.006 | Not Detected | mg/l |
| Arsenic, TCLP Extractable | EPA1311/6010 | | 0.009 | Not Detected | mg/l |
| Barium, TCLP Extractable | EPA1311/6010 | | 0.003 | 0.424 | mg/l |
| Beryllium, TCLP Extractable | EPA1311/6010 | | 0.002 | 0.003 | mg/l |
| Cadmium, TCLP Extractable | EPA1311/6010 | | 0.001 | Not Detected | mg/l |
| Cobalt, TCLP Extractable | EPA1311/6010 | | 0.02 | 0.0984 | mg/l |
| Chromium, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Copper, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.19 | mg/l |
| Mercury, TCLP Extractable | EPA1311/7470 | | 0.0002 | Not Detected | mg/l |
| Nickel, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.08 | mg/l |
| Lead, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.06 | mg/l |

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Comments : Insufficient sample for SPLP extraction.

CC:

Quality Control _____ Supervision _____

Date: 7/3/2012

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(205) 664 - 6032 or 6171
FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-1 Coaly Claystone
124.3-124.6

Laboratory ID Number : AS11059

| Test Name | Reference | VSpec | MDL | Result | Units |
|----------------------------|--------------|-------|-------|--------------|-------|
| Antimony, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Selenium, TCLP Extractable | EPA1311/6010 | | 0.02 | Not Detected | mg/l |
| Thallium, TCLP Extractable | EPA1311/6010 | | 0.025 | Not Detected | mg/l |
| Vanadium, TCLP Extractable | EPA1311/6010 | | 0.004 | 0.004 | mg/l |
| Zinc, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.13 | mg/l |

This Certificate states the physical and/or chemical characteristics of the sample as submitted. This document shall not be reproduced, except in full, without written consent from Alabama Power's General Test Laboratory.

Comments : Insufficient sample for SPLP extraction.

CC:

Quality Control _____ Supervision _____

Date: 7/3/2012

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 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-1 Mine Spoil
 Fragment SS 122.8-123

Laboratory ID Number : AS11060

| Test Name | Reference | VSpec | MDL | Result | Units |
|-------------------|--------------|-------|------|--------------|-------|
| Silicon | EPA3051/6010 | | 1. | 253 | mg/kg |
| Aluminum, Total | EPA3051/6010 | | 10 | 39800 | mg/kg |
| Antimony, Total | EPA3051/6010 | | 1.2 | 4.392 | mg/kg |
| Arsenic, Total | EPA3051/6010 | | 0.5 | 0.6 | mg/kg |
| Barium, Total | EPA3051/6010 | | 0.2 | 284 | mg/kg |
| Beryllium, Total | EPA3051/6010 | | 0.1 | 1.74 | mg/kg |
| Cadmium, Total | EPA3051/6010 | | 0.2 | 0.596 | mg/kg |
| Calcium, Total | EPA3051/6010 | | 1. | 2320 | mg/kg |
| Chromium, Total | EPA3051/6010 | | 0.1 | 72.1 | mg/kg |
| Cobalt, Total | EPA3051/6010 | | 0.4 | 22.5 | mg/kg |
| Copper, Total | EPA3051/6010 | | 0.5 | 18.0 | mg/kg |
| Iron, Total | EPA3051/6010 | | 1. | 26200 | mg/kg |
| Magnesium, Total | EPA3051/6010 | | 1. | 6560 | mg/kg |
| Lead, Total | EPA3051/6010 | | 0.4 | 17.8 | mg/kg |
| Manganese, Total | EPA3051/6010 | | 1. | 382 | mg/kg |
| Mercury, Total | EPA3051/7470 | | 0.05 | Not Detected | mg/kg |
| Molybdenum, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Nickel, Total | EPA3051/6010 | | 0.4 | 11.7 | mg/kg |
| Selenium, Total | EPA3051/6010 | | 0.5 | Not Detected | mg/kg |
| Strontium, Total | EPA3051/6010 | | 1. | 39.0 | mg/kg |
| Potassium, Total | EPA3051/6010 | | 1. | 10400 | mg/kg |

This Certificate states the physical and/or chemical characteristics of the sample as submitted. This document shall not be reproduced, except in full, without written consent from Alabama Power's General Test Laboratory.

Comments : 42.63g for SPLP extraction.

CC:

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-1 Mine Spoil
 Fragment SS 122.8-123

Laboratory ID Number : AS11060

| Test Name | Reference | VSpec | MDL | Result | Units |
|----------------------------|--------------|-------|-------|--------------|---------|
| Silver, Total | EPA3051/6010 | | 0.6 | 29.4 | mg/kg |
| Titanium, Total | EPA3051/6010 | | 1. | 3940 | mg/kg |
| Thallium, Total | EPA3051/6010 | | 0.7 | Not Detected | mg/kg |
| Tin, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Sodium, Total | EPA3051/6010 | | 1. | 11200 | mg/kg |
| Vanadium, Total | EPA3051/6010 | | 0.2 | 73.6 | mg/kg |
| Zinc, Total | EPA3051/6010 | | 0.4 | 96.0 | mg/kg |
| Solids Content of Sample | EPA 1311 | | 0.01 | 100 | percent |
| pH of TCLP Extract | EPA 1311 | | 0. | 5.04 | |
| pH of SPLP Extract | EPA 1311 | | 0. | 7.54 | |
| TCLP Extraction Fluid | EPA 1311 | | 0. | 1 | |
| Arsenic, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Mercury, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Silver, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Selenium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Lead, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Chromium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Cadmium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Barium, SPLP Extractable | EPA1312 | | 0.006 | 0.176 | mg/l |
| Silver, TCLP Extractable | EPA1311/6010 | | 0.006 | Not Detected | mg/l |
| Arsenic, TCLP Extractable | EPA1311/6010 | | 0.009 | Not Detected | mg/l |

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Comments : 42.63g for SPLP extraction.

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-1 Mine Spoil
 Fragment SS 122.8-123

Laboratory ID Number : AS11060

| Test Name | Reference | VSpec | MDL | Result | Units |
|-----------------------------|--------------|-------|--------|--------------|-------|
| Barium, TCLP Extractable | EPA1311/6010 | | 0.003 | 0.488 | mg/l |
| Beryllium, SPLP Extractable | EPA1312/6010 | | 0.002 | Not Detected | mg/l |
| Beryllium, TCLP Extractable | EPA1311/6010 | | 0.002 | Not Detected | mg/l |
| Cadmium, TCLP Extractable | EPA1311/6010 | | 0.001 | Not Detected | mg/l |
| Cobalt, TCLP Extractable | EPA1311/6010 | | 0.02 | 0.0792 | mg/l |
| Cobalt, SPLP Extractable | EPA1312/6010 | | 0.02 | Not Detected | mg/l |
| Chromium, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.02 | mg/l |
| Copper, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Copper, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.08 | mg/l |
| Mercury, TCLP Extractable | EPA1311/7470 | | 0.0002 | Not Detected | mg/l |
| Nickel, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Nickel, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.06 | mg/l |
| Lead, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.04 | mg/l |
| Antimony, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Antimony, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Selenium, TCLP Extractable | EPA1311/6010 | | 0.02 | Not Detected | mg/l |
| Thallium, TCLP Extractable | EPA1311/6010 | | 0.025 | Not Detected | mg/l |
| Thallium, SPLP Extractable | EPA1312/6010 | | 0.025 | Not Detected | mg/l |
| Vanadium, SPLP Extractable | EPA1312/6010 | | 0.004 | 0.006 | mg/l |
| Vanadium, TCLP Extractable | EPA1311/6010 | | 0.004 | 0.009 | mg/l |
| Zinc, SPLP Extractable | EPA1312/6010 | | 0.01 | 0.02 | mg/l |

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Comments : 42.63g for SPLP extraction.

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-1 Mine Spoil
Fragment SS 122.8-123

Laboratory ID Number : AS11060

| Test Name | Reference | VSpec | MDL | Result | Units |
|------------------------|--------------|-------|------|--------|-------|
| Zinc, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.17 | mg/l |

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Description : Gorgas Fine-Grained SS
 w/Int Mud & Silt

Received Date : 18-May-12

Laboratory ID Number : AS11061

| Test Name | Reference | VSpec | MDL | Result | Units |
|-------------------|--------------|-------|------|--------------|-------|
| Silicon | EPA3051/6010 | | 1. | 151 | mg/kg |
| Aluminum, Total | EPA3051/6010 | | 10 | 27900 | mg/kg |
| Antimony, Total | EPA3051/6010 | | 1.2 | 4.203 | mg/kg |
| Arsenic, Total | EPA3051/6010 | | 0.5 | 1.3 | mg/kg |
| Barium, Total | EPA3051/6010 | | 0.2 | 269 | mg/kg |
| Beryllium, Total | EPA3051/6010 | | 0.1 | 1.89 | mg/kg |
| Cadmium, Total | EPA3051/6010 | | 0.2 | Not Detected | mg/kg |
| Calcium, Total | EPA3051/6010 | | 1. | 1130 | mg/kg |
| Chromium, Total | EPA3051/6010 | | 0.1 | 48.3 | mg/kg |
| Cobalt, Total | EPA3051/6010 | | 0.4 | 20.5 | mg/kg |
| Copper, Total | EPA3051/6010 | | 0.5 | 15.7 | mg/kg |
| Iron, Total | EPA3051/6010 | | 1. | 32700 | mg/kg |
| Lead, Total | EPA3051/6010 | | 0.4 | 18.9 | mg/kg |
| Magnesium, Total | EPA3051/6010 | | 1. | 6810 | mg/kg |
| Manganese, Total | EPA3051/6010 | | 1. | 503 | mg/kg |
| Mercury, Total | EPA3051/7470 | | 0.05 | Not Detected | mg/kg |
| Molybdenum, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Nickel, Total | EPA3051/6010 | | 0.4 | 12.7 | mg/kg |
| Strontium, Total | EPA3051/6010 | | 1. | 32.9 | mg/kg |
| Selenium, Total | EPA3051/6010 | | 0.5 | Not Detected | mg/kg |
| Potassium, Total | EPA3051/6010 | | 1. | 11300 | mg/kg |

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Comments : 23.7g for SPLP extraction.

CC:

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Date: 7/3/2012

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas Fine-Grained SS
 w/Int Mud & Silt

Laboratory ID Number : AS11061

| Test Name | Reference | VSpec | MDL | Result | Units |
|----------------------------|--------------|-------|-------|--------------|---------|
| Silver, Total | EPA3051/6010 | | 0.6 | Not Detected | mg/kg |
| Titanium, Total | EPA3051/6010 | | 1. | 3960 | mg/kg |
| Thallium, Total | EPA3051/6010 | | 0.7 | Not Detected | mg/kg |
| Sodium, Total | EPA3051/6010 | | 1. | 7620 | mg/kg |
| Tin, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Vanadium, Total | EPA3051/6010 | | 0.2 | 89.4 | mg/kg |
| Zinc, Total | EPA3051/6010 | | 0.4 | 80.7 | mg/kg |
| Solids Content of Sample | EPA 1311 | | 0.01 | 100 | percent |
| pH of SPLP Extract | EPA 1311 | | 0. | 7.51 | |
| pH of TCLP Extract | EPA 1311 | | 0. | 4.99 | |
| TCLP Extraction Fluid | EPA 1311 | | 0. | 1 | |
| Barium, SPLP Extractable | EPA1312 | | 0.006 | 0.107 | mg/l |
| Silver, TCLP Extractable | EPA1311/6010 | | 0.006 | Not Detected | mg/l |
| Silver, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Cadmium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Chromium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Lead, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Selenium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Mercury, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Arsenic, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Arsenic, TCLP Extractable | EPA1311/6010 | | 0.009 | Not Detected | mg/l |

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Comments : 23.7g for SPLP extraction.

CC:

Quality Control _____ Supervision _____

Date: 7/3/2012

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas Fine-Grained SS
 w/Int Mud & Silt

Laboratory ID Number : AS11061

| Test Name | Reference | VSpec | MDL | Result | Units |
|-----------------------------|--------------|-------|--------|--------------|-------|
| Barium, TCLP Extractable | EPA1311/6010 | | 0.003 | 0.179 | mg/l |
| Beryllium, SPLP Extractable | EPA1312/6010 | | 0.002 | Not Detected | mg/l |
| Beryllium, TCLP Extractable | EPA1311/6010 | | 0.002 | Not Detected | mg/l |
| Cadmium, TCLP Extractable | EPA1311/6010 | | 0.001 | 0.002 | mg/l |
| Cobalt, SPLP Extractable | EPA1312/6010 | | 0.02 | Not Detected | mg/l |
| Cobalt, TCLP Extractable | EPA1311/6010 | | 0.02 | 0.0837 | mg/l |
| Chromium, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.01 | mg/l |
| Copper, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Copper, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.08 | mg/l |
| Mercury, TCLP Extractable | EPA1311/7470 | | 0.0002 | Not Detected | mg/l |
| Nickel, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.08 | mg/l |
| Nickel, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Lead, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.08 | mg/l |
| Antimony, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Antimony, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Selenium, TCLP Extractable | EPA1311/6010 | | 0.02 | Not Detected | mg/l |
| Thallium, SPLP Extractable | EPA1312/6010 | | 0.025 | Not Detected | mg/l |
| Thallium, TCLP Extractable | EPA1311/6010 | | 0.025 | Not Detected | mg/l |
| Vanadium, SPLP Extractable | EPA1312/6010 | | 0.004 | Not Detected | mg/l |
| Vanadium, TCLP Extractable | EPA1311/6010 | | 0.004 | 0.005 | mg/l |
| Zinc, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.13 | mg/l |

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Comments : 23.7g for SPLP extraction.

CC:

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Date: 7/3/2012

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas Fine-Grained SS
w/Int Mud & Silt

Laboratory ID Number : AS11061

| Test Name | Reference | VSpec | MDL | Result | Units |
|------------------------|--------------|-------|------|--------------|-------|
| Zinc, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |

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Comments : 23.7g for SPLP extraction.

CC:

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Date: 7/3/2012

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-5 Foss, Org-Rich
 Claystone ~ 72

Laboratory ID Number : AS11062

| Test Name | Reference | VSpec | MDL | Result | Units |
|-------------------|--------------|-------|------|--------------|-------|
| Silicon | EPA3051/6010 | | 1. | 296 | mg/kg |
| Aluminum, Total | EPA3051/6010 | | 10 | 61500 | mg/kg |
| Antimony, Total | EPA3051/6010 | | 1.2 | 8.479 | mg/kg |
| Arsenic, Total | EPA3051/6010 | | 0.5 | 2.9 | mg/kg |
| Barium, Total | EPA3051/6010 | | 0.2 | 484 | mg/kg |
| Beryllium, Total | EPA3051/6010 | | 0.1 | 3.35 | mg/kg |
| Cadmium, Total | EPA3051/6010 | | 0.2 | 0.544 | mg/kg |
| Calcium, Total | EPA3051/6010 | | 1. | 254 | mg/kg |
| Chromium, Total | EPA3051/6010 | | 0.1 | 96.7 | mg/kg |
| Cobalt, Total | EPA3051/6010 | | 0.4 | 16.8 | mg/kg |
| Copper, Total | EPA3051/6010 | | 0.5 | 14.1 | mg/kg |
| Iron, Total | EPA3051/6010 | | 1. | 16800 | mg/kg |
| Lead, Total | EPA3051/6010 | | 0.4 | 24.6 | mg/kg |
| Magnesium, Total | EPA3051/6010 | | 1. | 4280 | mg/kg |
| Manganese, Total | EPA3051/6010 | | 1. | 68.9 | mg/kg |
| Mercury, Total | EPA3051/7470 | | 0.05 | Not Detected | mg/kg |
| Molybdenum, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Nickel, Total | EPA3051/6010 | | 0.4 | 18.6 | mg/kg |
| Strontium, Total | EPA3051/6010 | | 1. | 14.9 | mg/kg |
| Selenium, Total | EPA3051/6010 | | 0.5 | Not Detected | mg/kg |
| Potassium, Total | EPA3051/6010 | | 1. | 20300 | mg/kg |

This Certificate states the physical and/or chemical characteristics of the sample as submitted. This document shall not be reproduced, except in full, without written consent from Alabama Power's General Test Laboratory.

Comments : 70.0g for SPLP extraction.

CC:

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Date: 7/3/2012

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-5 Foss, Org-Rich
 Claystone ~ 72

Laboratory ID Number : AS11062

| Test Name | Reference | VSpec | MDL | Result | Units |
|----------------------------|--------------|-------|-------|--------------|---------|
| Silver, Total | EPA3051/6010 | | 0.6 | Not Detected | mg/kg |
| Titanium, Total | EPA3051/6010 | | 1. | 5110 | mg/kg |
| Thallium, Total | EPA3051/6010 | | 0.7 | Not Detected | mg/kg |
| Tin, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Sodium, Total | EPA3051/6010 | | 1. | 1150 | mg/kg |
| Vanadium, Total | EPA3051/6010 | | 0.2 | 162 | mg/kg |
| Zinc, Total | EPA3051/6010 | | 0.4 | 69.7 | mg/kg |
| Solids Content of Sample | EPA 1311 | | 0.01 | 100 | percent |
| pH of TCLP Extract | EPA 1311 | | 0. | 5.00 | |
| pH of SPLP Extract | EPA 1311 | | 0. | 7.58 | |
| TCLP Extraction Fluid | EPA 1311 | | 0. | 1 | |
| Arsenic, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Mercury, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Silver, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Selenium, SPLP Extractable | EPA1312 | | 0.006 | 0.00993 | mg/l |
| Lead, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Chromium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Barium, SPLP Extractable | EPA1312 | | 0.006 | 0.0884 | mg/l |
| Silver, TCLP Extractable | EPA1311/6010 | | 0.006 | Not Detected | mg/l |
| Cadmium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Arsenic, TCLP Extractable | EPA1311/6010 | | 0.009 | Not Detected | mg/l |

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Comments : 70.0g for SPLP extraction.

CC:

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Date: 7/3/2012

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Description : Gorgas S-5 Foss, Org-Rich
 Claystone ~ 72

Received Date : 18-May-12

Laboratory ID Number : AS11062

| Test Name | Reference | VSpec | MDL | Result | Units |
|-----------------------------|--------------|-------|--------|--------------|-------|
| Barium, TCLP Extractable | EPA1311/6010 | | 0.003 | 0.696 | mg/l |
| Beryllium, SPLP Extractable | EPA1312/6010 | | 0.002 | Not Detected | mg/l |
| Beryllium, TCLP Extractable | EPA1311/6010 | | 0.002 | 0.004 | mg/l |
| Cadmium, TCLP Extractable | EPA1311/6010 | | 0.001 | 0.001 | mg/l |
| Cobalt, TCLP Extractable | EPA1311/6010 | | 0.02 | 0.0486 | mg/l |
| Cobalt, SPLP Extractable | EPA1312/6010 | | 0.02 | Not Detected | mg/l |
| Chromium, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Copper, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.09 | mg/l |
| Copper, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Mercury, TCLP Extractable | EPA1311/7470 | | 0.0002 | Not Detected | mg/l |
| Nickel, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Nickel, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.06 | mg/l |
| Lead, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.13 | mg/l |
| Antimony, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Antimony, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.01 | mg/l |
| Selenium, TCLP Extractable | EPA1311/6010 | | 0.02 | Not Detected | mg/l |
| Thallium, SPLP Extractable | EPA1312/6010 | | 0.025 | Not Detected | mg/l |
| Thallium, TCLP Extractable | EPA1311/6010 | | 0.025 | Not Detected | mg/l |
| Vanadium, TCLP Extractable | EPA1311/6010 | | 0.004 | 0.006 | mg/l |
| Vanadium, SPLP Extractable | EPA1312/6010 | | 0.004 | Not Detected | mg/l |
| Zinc, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.21 | mg/l |

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Comments : 70.0g for SPLP extraction.

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Quality Control _____ Supervision _____

Date: 7/3/2012

Alabama Power
General Test Laboratory
P.O. Box 2641
Birmingham, Alabama 35291
(205) 664 - 6032 or 6171
FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-5 Foss, Org-Rich
Claystone ~ 72

Laboratory ID Number : AS11062

| Test Name | Reference | VSpec | MDL | Result | Units |
|------------------------|--------------|-------|------|--------|-------|
| Zinc, SPLP Extractable | EPA1312/6010 | | 0.01 | 0.01 | mg/l |

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Date: 7/3/2012

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 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-2 Fossiliferous
 Claystone 99.4

Laboratory ID Number : AS11063

| Test Name | Reference | VSpec | MDL | Result | Units |
|-------------------|--------------|-------|------|--------------|-------|
| Silicon | EPA3051/6010 | | 1. | 175 | mg/kg |
| Aluminum, Total | EPA3051/6010 | | 10 | 44700 | mg/kg |
| Antimony, Total | EPA3051/6010 | | 1.2 | 4.792 | mg/kg |
| Arsenic, Total | EPA3051/6010 | | 0.5 | 5.3 | mg/kg |
| Barium, Total | EPA3051/6010 | | 0.2 | 288 | mg/kg |
| Beryllium, Total | EPA3051/6010 | | 0.1 | 2.67 | mg/kg |
| Cadmium, Total | EPA3051/6010 | | 0.2 | Not Detected | mg/kg |
| Calcium, Total | EPA3051/6010 | | 1. | 624 | mg/kg |
| Chromium, Total | EPA3051/6010 | | 0.1 | 78.7 | mg/kg |
| Cobalt, Total | EPA3051/6010 | | 0.4 | 26.1 | mg/kg |
| Copper, Total | EPA3051/6010 | | 0.5 | 18.6 | mg/kg |
| Iron, Total | EPA3051/6010 | | 1. | 37800 | mg/kg |
| Magnesium, Total | EPA3051/6010 | | 1. | 8270 | mg/kg |
| Lead, Total | EPA3051/6010 | | 0.4 | 24.4 | mg/kg |
| Manganese, Total | EPA3051/6010 | | 1. | 481 | mg/kg |
| Mercury, Total | EPA3051/7470 | | 0.05 | Not Detected | mg/kg |
| Molybdenum, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Nickel, Total | EPA3051/6010 | | 0.4 | 28.3 | mg/kg |
| Strontium, Total | EPA3051/6010 | | 1. | 21.4 | mg/kg |
| Selenium, Total | EPA3051/6010 | | 0.5 | Not Detected | mg/kg |
| Potassium, Total | EPA3051/6010 | | 1. | 16500 | mg/kg |

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Comments : 48.9g for SPLP extraction.

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-2 Fossiliferous
 Claystone 99.4

Laboratory ID Number : AS11063

| Test Name | Reference | VSpec | MDL | Result | Units |
|----------------------------|--------------|-------|-------|--------------|---------|
| Silver, Total | EPA3051/6010 | | 0.6 | Not Detected | mg/kg |
| Titanium, Total | EPA3051/6010 | | 1. | 4440 | mg/kg |
| Thallium, Total | EPA3051/6010 | | 0.7 | Not Detected | mg/kg |
| Sodium, Total | EPA3051/6010 | | 1. | 4770 | mg/kg |
| Tin, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Vanadium, Total | EPA3051/6010 | | 0.2 | 129 | mg/kg |
| Zinc, Total | EPA3051/6010 | | 0.4 | 113 | mg/kg |
| Solids Content of Sample | EPA 1311 | | 0.01 | 100 | percent |
| pH of SPLP Extract | EPA 1311 | | 0. | 7.53 | |
| pH of TCLP Extract | EPA 1311 | | 0. | 4.98 | |
| TCLP Extraction Fluid | EPA 1311 | | 0. | 1 | |
| Barium, SPLP Extractable | EPA1312 | | 0.006 | 0.0858 | mg/l |
| Chromium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Lead, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Selenium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Mercury, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Arsenic, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Silver, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Cadmium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Silver, TCLP Extractable | EPA1311/6010 | | 0.006 | Not Detected | mg/l |
| Arsenic, TCLP Extractable | EPA1311/6010 | | 0.009 | Not Detected | mg/l |

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-2 Fossiliferous
 Claystone 99.4

Laboratory ID Number : AS11063

| Test Name | Reference | VSpec | MDL | Result | Units |
|-----------------------------|--------------|-------|--------|--------------|-------|
| Barium, TCLP Extractable | EPA1311/6010 | | 0.003 | 0.453 | mg/l |
| Beryllium, SPLP Extractable | EPA1312/6010 | | 0.002 | Not Detected | mg/l |
| Beryllium, TCLP Extractable | EPA1311/6010 | | 0.002 | 0.003 | mg/l |
| Cadmium, TCLP Extractable | EPA1311/6010 | | 0.001 | Not Detected | mg/l |
| Cobalt, TCLP Extractable | EPA1311/6010 | | 0.02 | 0.126 | mg/l |
| Cobalt, SPLP Extractable | EPA1312/6010 | | 0.02 | Not Detected | mg/l |
| Chromium, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Copper, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.20 | mg/l |
| Copper, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Mercury, TCLP Extractable | EPA1311/7470 | | 0.0002 | Not Detected | mg/l |
| Nickel, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.13 | mg/l |
| Nickel, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Lead, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.06 | mg/l |
| Antimony, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Antimony, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Selenium, TCLP Extractable | EPA1311/6010 | | 0.02 | Not Detected | mg/l |
| Thallium, SPLP Extractable | EPA1312/6010 | | 0.025 | Not Detected | mg/l |
| Thallium, TCLP Extractable | EPA1311/6010 | | 0.025 | Not Detected | mg/l |
| Vanadium, SPLP Extractable | EPA1312/6010 | | 0.004 | 0.005 | mg/l |
| Vanadium, TCLP Extractable | EPA1311/6010 | | 0.004 | 0.005 | mg/l |
| Zinc, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.10 | mg/l |

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FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-2 Fossiliferous
Claystone 99.4

Laboratory ID Number : AS11063

| Test Name | Reference | VSpec | MDL | Result | Units |
|------------------------|--------------|-------|------|--------|-------|
| Zinc, SPLP Extractable | EPA1312/6010 | | 0.01 | 0.02 | mg/l |

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas D-1 Coal Seam #1
 123.6-124.2

Laboratory ID Number : AS11064

| Test Name | Reference | VSpec | MDL | Result | Units |
|-------------------|--------------|-------|------|--------------|-------|
| Silicon | EPA3051/6010 | | 1. | 111 | mg/kg |
| Aluminum, Total | EPA3051/6010 | | 10 | 56700 | mg/kg |
| Antimony, Total | EPA3051/6010 | | 1.2 | 1.607 | mg/kg |
| Arsenic, Total | EPA3051/6010 | | 0.5 | 28.9 | mg/kg |
| Barium, Total | EPA3051/6010 | | 0.2 | 176 | mg/kg |
| Beryllium, Total | EPA3051/6010 | | 0.1 | 1.88 | mg/kg |
| Cadmium, Total | EPA3051/6010 | | 0.2 | 0.279 | mg/kg |
| Calcium, Total | EPA3051/6010 | | 1. | 139 | mg/kg |
| Chromium, Total | EPA3051/6010 | | 0.1 | 32.8 | mg/kg |
| Cobalt, Total | EPA3051/6010 | | 0.4 | 11.1 | mg/kg |
| Copper, Total | EPA3051/6010 | | 0.5 | 29.0 | mg/kg |
| Iron, Total | EPA3051/6010 | | 1. | 20400 | mg/kg |
| Lead, Total | EPA3051/6010 | | 0.4 | 12.8 | mg/kg |
| Magnesium, Total | EPA3051/6010 | | 1. | 5790 | mg/kg |
| Manganese, Total | EPA3051/6010 | | 1. | 77.2 | mg/kg |
| Mercury, Total | EPA3051/7470 | | 0.05 | 0.14 | mg/kg |
| Molybdenum, Total | EPA3051/6010 | | 1. | 2.05 | mg/kg |
| Nickel, Total | EPA3051/6010 | | 0.4 | 12.7 | mg/kg |
| Selenium, Total | EPA3051/6010 | | 0.5 | Not Detected | mg/kg |
| Strontium, Total | EPA3051/6010 | | 1. | 7.61 | mg/kg |
| Potassium, Total | EPA3051/6010 | | 1. | 4770 | mg/kg |

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Comments : 50.0g for SPLP extraction.

CC:

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR
 Sample Date : 12-May-12
 Customer ID :
 Received Date : 18-May-12

Description : Gorgas D-1 Coal Seam #1
 123.6-124.2

Laboratory ID Number : AS11064

| Test Name | Reference | VSpec | MDL | Result | Units |
|----------------------------|--------------|-------|-------|--------------|---------|
| Silver, Total | EPA3051/6010 | | 0.6 | Not Detected | mg/kg |
| Titanium, Total | EPA3051/6010 | | 1. | 2150 | mg/kg |
| Thallium, Total | EPA3051/6010 | | 0.7 | Not Detected | mg/kg |
| Tin, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Sodium, Total | EPA3051/6010 | | 1. | 1370 | mg/kg |
| Vanadium, Total | EPA3051/6010 | | 0.2 | 54.4 | mg/kg |
| Zinc, Total | EPA3051/6010 | | 0.4 | 45.0 | mg/kg |
| Solids Content of Sample | EPA 1311 | | 0.01 | 100 | percent |
| pH of SPLP Extract | EPA 1311 | | 0. | 6.50 | |
| pH of TCLP Extract | EPA 1311 | | 0. | 5.01 | |
| TCLP Extraction Fluid | EPA 1311 | | 0. | 1 | |
| Cadmium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Arsenic, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Silver, TCLP Extractable | EPA1311/6010 | | 0.006 | Not Detected | mg/l |
| Barium, SPLP Extractable | EPA1312 | | 0.006 | 0.0803 | mg/l |
| Mercury, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Chromium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Lead, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Selenium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Silver, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Arsenic, TCLP Extractable | EPA1311/6010 | | 0.009 | Not Detected | mg/l |

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas D-1 Coal Seam #1
 123.6-124.2

Laboratory ID Number : AS11064

| Test Name | Reference | VSpec | MDL | Result | Units |
|-----------------------------|--------------|-------|--------|--------------|-------|
| Barium, TCLP Extractable | EPA1311/6010 | | 0.003 | 0.316 | mg/l |
| Beryllium, TCLP Extractable | EPA1311/6010 | | 0.002 | 0.003 | mg/l |
| Beryllium, SPLP Extractable | EPA1312/6010 | | 0.002 | Not Detected | mg/l |
| Cadmium, TCLP Extractable | EPA1311/6010 | | 0.001 | Not Detected | mg/l |
| Cobalt, TCLP Extractable | EPA1311/6010 | | 0.02 | 0.123 | mg/l |
| Cobalt, SPLP Extractable | EPA1312/6010 | | 0.02 | 0.0371 | mg/l |
| Chromium, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Copper, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.14 | mg/l |
| Copper, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Mercury, TCLP Extractable | EPA1311/7470 | | 0.0002 | Not Detected | mg/l |
| Nickel, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.17 | mg/l |
| Nickel, SPLP Extractable | EPA1312/6010 | | 0.01 | 0.05 | mg/l |
| Lead, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.06 | mg/l |
| Antimony, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.01 | mg/l |
| Antimony, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Selenium, TCLP Extractable | EPA1311/6010 | | 0.02 | Not Detected | mg/l |
| Thallium, TCLP Extractable | EPA1311/6010 | | 0.025 | Not Detected | mg/l |
| Thallium, SPLP Extractable | EPA1312/6010 | | 0.025 | Not Detected | mg/l |
| Vanadium, TCLP Extractable | EPA1311/6010 | | 0.004 | Not Detected | mg/l |
| Vanadium, SPLP Extractable | EPA1312/6010 | | 0.004 | Not Detected | mg/l |
| Zinc, SPLP Extractable | EPA1312/6010 | | 0.01 | 0.05 | mg/l |

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Comments : 50.0g for SPLP extraction.

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FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas D-1 Coal Seam #1
123.6-124.2

Laboratory ID Number : AS11064

| Test Name | Reference | VSpec | MDL | Result | Units |
|------------------------|--------------|-------|------|--------|-------|
| Zinc, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.09 | mg/l |

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas D-1 Coal Seam #2
 174-174.3

Laboratory ID Number : AS11065

| Test Name | Reference | VSpec | MDL | Result | Units |
|-------------------|--------------|-------|------|--------------|-------|
| Silicon | EPA3051/6010 | | 1. | 588 | mg/kg |
| Aluminum, Total | EPA3051/6010 | | 1. | 3690 | mg/kg |
| Antimony, Total | EPA3051/6010 | | 1.2 | Not Detected | mg/kg |
| Arsenic, Total | EPA3051/6010 | | 0.5 | 384.1 | mg/kg |
| Barium, Total | EPA3051/6010 | | 0.2 | 92.8 | mg/kg |
| Beryllium, Total | EPA3051/6010 | | 0.1 | 2.27 | mg/kg |
| Cadmium, Total | EPA3051/6010 | | 0.2 | 7.88 | mg/kg |
| Calcium, Total | EPA3051/6010 | | 1. | 1070 | mg/kg |
| Chromium, Total | EPA3051/6010 | | 0.1 | 6.22 | mg/kg |
| Cobalt, Total | EPA3051/6010 | | 0.4 | 2.79 | mg/kg |
| Copper, Total | EPA3051/6010 | | 0.5 | 44.3 | mg/kg |
| Iron, Total | EPA3051/6010 | | 1. | 40700 | mg/kg |
| Lead, Total | EPA3051/6010 | | 0.4 | 4.8 | mg/kg |
| Magnesium, Total | EPA3051/6010 | | 1. | 144 | mg/kg |
| Manganese, Total | EPA3051/6010 | | 1. | 7.13 | mg/kg |
| Mercury, Total | EPA3051/7470 | | 0.05 | 0.51 | mg/kg |
| Molybdenum, Total | EPA3051/6010 | | 1. | 4.38 | mg/kg |
| Nickel, Total | EPA3051/6010 | | 0.4 | 5.43 | mg/kg |
| Selenium, Total | EPA3051/6010 | | 0.5 | Not Detected | mg/kg |
| Strontium, Total | EPA3051/6010 | | 1. | 43.4 | mg/kg |
| Potassium, Total | EPA3051/6010 | | 1. | 301 | mg/kg |

This Certificate states the physical and/or chemical characteristics of the sample as submitted. This document shall not be reproduced, except in full, without written consent from Alabama Power's General Test Laboratory.

Comments : Insufficient sample for SPLP extraction.

CC:

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Date: 7/3/2012

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Description : Gorgas D-1 Coal Seam #2
 174-174.3

Received Date : 18-May-12

Laboratory ID Number : AS11065

| Test Name | Reference | VSpec | MDL | Result | Units |
|-----------------------------|--------------|-------|--------|--------------|---------|
| Silver, Total | EPA3051/6010 | | 0.6 | Not Detected | mg/kg |
| Titanium, Total | EPA3051/6010 | | 1. | 202 | mg/kg |
| Thallium, Total | EPA3051/6010 | | 0.7 | 1.89 | mg/kg |
| Tin, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Sodium, Total | EPA3051/6010 | | 1. | 167 | mg/kg |
| Vanadium, Total | EPA3051/6010 | | 0.2 | 15.3 | mg/kg |
| Zinc, Total | EPA3051/6010 | | 0.4 | 20.8 | mg/kg |
| Solids Content of Sample | EPA 1311 | | 0.01 | 100 | percent |
| pH of TCLP Extract | EPA 1311 | | 0. | 4.99 | |
| TCLP Extraction Fluid | EPA 1311 | | 0. | 1 | |
| Silver, TCLP Extractable | EPA1311/6010 | | 0.006 | Not Detected | mg/l |
| Arsenic, TCLP Extractable | EPA1311/6010 | | 0.009 | Not Detected | mg/l |
| Barium, TCLP Extractable | EPA1311/6010 | | 0.003 | 0.478 | mg/l |
| Beryllium, TCLP Extractable | EPA1311/6010 | | 0.002 | 0.002 | mg/l |
| Cadmium, TCLP Extractable | EPA1311/6010 | | 0.001 | 0.001 | mg/l |
| Cobalt, TCLP Extractable | EPA1311/6010 | | 0.02 | Not Detected | mg/l |
| Chromium, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Copper, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.10 | mg/l |
| Mercury, TCLP Extractable | EPA1311/7470 | | 0.0002 | Not Detected | mg/l |
| Nickel, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.03 | mg/l |
| Lead, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |

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Comments : Insufficient sample for SPLP extraction.

CC:

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Date: 7/3/2012

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas D-1 Coal Seam #2
174-174.3

Laboratory ID Number : AS11065

| Test Name | Reference | VSpec | MDL | Result | Units |
|----------------------------|--------------|-------|-------|--------------|-------|
| Antimony, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.01 | mg/l |
| Selenium, TCLP Extractable | EPA1311/6010 | | 0.02 | Not Detected | mg/l |
| Thallium, TCLP Extractable | EPA1311/6010 | | 0.025 | Not Detected | mg/l |
| Vanadium, TCLP Extractable | EPA1311/6010 | | 0.004 | Not Detected | mg/l |
| Zinc, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.07 | mg/l |

This Certificate states the physical and/or chemical characteristics of the sample as submitted. This document shall not be reproduced, except in full, without written consent from Alabama Power's General Test Laboratory.

Comments : Insufficient sample for SPLP extraction.

CC:

Quality Control _____ Supervision _____

Date: 7/3/2012

Alabama Power
 General Test Laboratory
 P.O. Box 2641
 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-4
 123.8-125

Laboratory ID Number : AS11066

| Test Name | Reference | VSpec | MDL | Result | Units |
|-------------------|--------------|-------|------|--------------|-------|
| Silicon | EPA3051/6010 | | 1. | 108 | mg/kg |
| Aluminum, Total | EPA3051/6010 | | 10 | 14700 | mg/kg |
| Antimony, Total | EPA3051/6010 | | 1.2 | 1.910 | mg/kg |
| Arsenic, Total | EPA3051/6010 | | 0.5 | Not Detected | mg/kg |
| Barium, Total | EPA3051/6010 | | 0.2 | 139 | mg/kg |
| Beryllium, Total | EPA3051/6010 | | 0.1 | 1.21 | mg/kg |
| Cadmium, Total | EPA3051/6010 | | 0.2 | 0.916 | mg/kg |
| Calcium, Total | EPA3051/6010 | | 1. | 820 | mg/kg |
| Chromium, Total | EPA3051/6010 | | 0.1 | 28.5 | mg/kg |
| Cobalt, Total | EPA3051/6010 | | 0.4 | 13.6 | mg/kg |
| Copper, Total | EPA3051/6010 | | 0.5 | 2.58 | mg/kg |
| Iron, Total | EPA3051/6010 | | 1. | 19000 | mg/kg |
| Magnesium, Total | EPA3051/6010 | | 1. | 4150 | mg/kg |
| Lead, Total | EPA3051/6010 | | 0.4 | 11.3 | mg/kg |
| Manganese, Total | EPA3051/6010 | | 1. | 325 | mg/kg |
| Mercury, Total | EPA3051/7470 | | 0.05 | Not Detected | mg/kg |
| Molybdenum, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Nickel, Total | EPA3051/6010 | | 0.4 | 5.51 | mg/kg |
| Selenium, Total | EPA3051/6010 | | 0.5 | Not Detected | mg/kg |
| Strontium, Total | EPA3051/6010 | | 1. | 20.6 | mg/kg |
| Potassium, Total | EPA3051/6010 | | 1. | 8370 | mg/kg |

This Certificate states the physical and/or chemical characteristics of the sample as submitted. This document shall not be reproduced, except in full, without written consent from Alabama Power's General Test Laboratory.

Comments : 28.1g for SPLP extraction.

CC:

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Date: 7/3/2012

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 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-4
 123.8-125

Laboratory ID Number : AS11066

| Test Name | Reference | VSpec | MDL | Result | Units |
|----------------------------|--------------|-------|-------|--------------|---------|
| Silver, Total | EPA3051/6010 | | 0.6 | Not Detected | mg/kg |
| Titanium, Total | EPA3051/6010 | | 1. | 2450 | mg/kg |
| Thallium, Total | EPA3051/6010 | | 0.7 | Not Detected | mg/kg |
| Tin, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Sodium, Total | EPA3051/6010 | | 1. | 8380 | mg/kg |
| Vanadium, Total | EPA3051/6010 | | 0.2 | 52.1 | mg/kg |
| Zinc, Total | EPA3051/6010 | | 0.4 | 48.0 | mg/kg |
| Solids Content of Sample | EPA 1311 | | 0.01 | 100 | percent |
| pH of SPLP Extract | EPA 1311 | | 0. | 7.49 | |
| pH of TCLP Extract | EPA 1311 | | 0. | 5.03 | |
| TCLP Extraction Fluid | EPA 1311 | | 0. | 1 | |
| Silver, TCLP Extractable | EPA1311/6010 | | 0.006 | Not Detected | mg/l |
| Cadmium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Arsenic, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Lead, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Mercury, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Selenium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Silver, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Barium, SPLP Extractable | EPA1312 | | 0.006 | 0.0983 | mg/l |
| Chromium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Arsenic, TCLP Extractable | EPA1311/6010 | | 0.009 | Not Detected | mg/l |

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-4
 123.8-125

Laboratory ID Number : AS11066

| Test Name | Reference | VSpec | MDL | Result | Units |
|-----------------------------|--------------|-------|--------|--------------|-------|
| Barium, TCLP Extractable | EPA1311/6010 | | 0.003 | 0.303 | mg/l |
| Beryllium, SPLP Extractable | EPA1312/6010 | | 0.002 | Not Detected | mg/l |
| Beryllium, TCLP Extractable | EPA1311/6010 | | 0.002 | Not Detected | mg/l |
| Cadmium, TCLP Extractable | EPA1311/6010 | | 0.001 | Not Detected | mg/l |
| Cobalt, SPLP Extractable | EPA1312/6010 | | 0.02 | Not Detected | mg/l |
| Cobalt, TCLP Extractable | EPA1311/6010 | | 0.02 | 0.0708 | mg/l |
| Chromium, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Copper, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Copper, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.05 | mg/l |
| Mercury, TCLP Extractable | EPA1311/7470 | | 0.0002 | Not Detected | mg/l |
| Nickel, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Nickel, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.08 | mg/l |
| Lead, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.09 | mg/l |
| Antimony, SPLP Extractable | EPA1312/6010 | | 0.01 | 0.01 | mg/l |
| Antimony, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Selenium, TCLP Extractable | EPA1311/6010 | | 0.02 | Not Detected | mg/l |
| Thallium, TCLP Extractable | EPA1311/6010 | | 0.025 | Not Detected | mg/l |
| Thallium, SPLP Extractable | EPA1312/6010 | | 0.025 | Not Detected | mg/l |
| Vanadium, SPLP Extractable | EPA1312/6010 | | 0.004 | Not Detected | mg/l |
| Vanadium, TCLP Extractable | EPA1311/6010 | | 0.004 | Not Detected | mg/l |
| Zinc, SPLP Extractable | EPA1312/6010 | | 0.01 | 0.01 | mg/l |

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Comments : 28.1g for SPLP extraction.

CC:

Quality Control _____ Supervision _____

Date: 7/3/2012

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General Test Laboratory
P.O. Box 2641
Birmingham, Alabama 35291
(205) 664 - 6032 or 6171
FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-4
123.8-125

Laboratory ID Number : AS11066

| Test Name | Reference | VSpec | MDL | Result | Units |
|------------------------|--------------|-------|------|--------|-------|
| Zinc, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.10 | mg/l |

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 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-2
 Mudstone w/Silt

Laboratory ID Number : AS11067

| Test Name | Reference | VSpec | MDL | Result | Units |
|-------------------|--------------|-------|------|--------------|-------|
| Silicon | EPA3051/6010 | | 1. | 79.6 | mg/kg |
| Aluminum, Total | EPA3051/6010 | | 10 | 25900 | mg/kg |
| Antimony, Total | EPA3051/6010 | | 1.2 | 5.640 | mg/kg |
| Arsenic, Total | EPA3051/6010 | | 0.5 | 4.3 | mg/kg |
| Barium, Total | EPA3051/6010 | | 0.2 | 393 | mg/kg |
| Beryllium, Total | EPA3051/6010 | | 0.1 | 2.10 | mg/kg |
| Cadmium, Total | EPA3051/6010 | | 0.2 | Not Detected | mg/kg |
| Calcium, Total | EPA3051/6010 | | 1. | 2020 | mg/kg |
| Chromium, Total | EPA3051/6010 | | 0.1 | 73.8 | mg/kg |
| Cobalt, Total | EPA3051/6010 | | 0.4 | 23.6 | mg/kg |
| Copper, Total | EPA3051/6010 | | 0.5 | 16.1 | mg/kg |
| Iron, Total | EPA3051/6010 | | 1. | 33700 | mg/kg |
| Magnesium, Total | EPA3051/6010 | | 1. | 7580 | mg/kg |
| Lead, Total | EPA3051/6010 | | 0.4 | 23.0 | mg/kg |
| Manganese, Total | EPA3051/6010 | | 1. | 477 | mg/kg |
| Mercury, Total | EPA3051/7470 | | 0.05 | Not Detected | mg/kg |
| Molybdenum, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Nickel, Total | EPA3051/6010 | | 0.4 | 19.3 | mg/kg |
| Strontium, Total | EPA3051/6010 | | 1. | 45.5 | mg/kg |
| Selenium, Total | EPA3051/6010 | | 0.5 | Not Detected | mg/kg |
| Potassium, Total | EPA3051/6010 | | 1. | 11300 | mg/kg |

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Comments : 70.0g for SPLP extraction.

CC:

Quality Control _____ Supervision _____

Date: 7/3/2012

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 Birmingham, Alabama 35291
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 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR
 Sample Date : 12-May-12
 Customer ID :
 Received Date : 18-May-12

Description : Gorgas S-2
 Mudstone w/Silt

Laboratory ID Number : AS11067

| Test Name | Reference | VSpec | MDL | Result | Units |
|----------------------------|--------------|-------|-------|--------------|---------|
| Silver, Total | EPA3051/6010 | | 0.6 | Not Detected | mg/kg |
| Titanium, Total | EPA3051/6010 | | 1. | 4700 | mg/kg |
| Thallium, Total | EPA3051/6010 | | 0.7 | Not Detected | mg/kg |
| Sodium, Total | EPA3051/6010 | | 1. | 7580 | mg/kg |
| Tin, Total | EPA3051/6010 | | 1. | Not Detected | mg/kg |
| Vanadium, Total | EPA3051/6010 | | 0.2 | 110 | mg/kg |
| Zinc, Total | EPA3051/6010 | | 0.4 | 98.3 | mg/kg |
| Solids Content of Sample | EPA 1311 | | 0.01 | 100 | percent |
| pH of TCLP Extract | EPA 1311 | | 0. | 5.03 | |
| pH of SPLP Extract | EPA 1311 | | 0. | 7.53 | |
| TCLP Extraction Fluid | EPA 1311 | | 0. | 1 | |
| Selenium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Barium, SPLP Extractable | EPA1312 | | 0.006 | 0.113 | mg/l |
| Silver, TCLP Extractable | EPA1311/6010 | | 0.006 | Not Detected | mg/l |
| Arsenic, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Cadmium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Chromium, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Mercury, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Lead, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Silver, SPLP Extractable | EPA1312 | | 0.006 | Not Detected | mg/l |
| Arsenic, TCLP Extractable | EPA1311/6010 | | 0.009 | Not Detected | mg/l |

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Comments : 70.0g for SPLP extraction.

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CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-2
 Mudstone w/Silt

Laboratory ID Number : AS11067

| Test Name | Reference | VSpec | MDL | Result | Units |
|-----------------------------|--------------|-------|--------|--------------|-------|
| Barium, TCLP Extractable | EPA1311/6010 | | 0.003 | 1.476 | mg/l |
| Beryllium, TCLP Extractable | EPA1311/6010 | | 0.002 | 0.002 | mg/l |
| Beryllium, SPLP Extractable | EPA1312/6010 | | 0.002 | Not Detected | mg/l |
| Cadmium, TCLP Extractable | EPA1311/6010 | | 0.001 | Not Detected | mg/l |
| Cobalt, SPLP Extractable | EPA1312/6010 | | 0.02 | Not Detected | mg/l |
| Cobalt, TCLP Extractable | EPA1311/6010 | | 0.02 | 0.0932 | mg/l |
| Chromium, TCLP Extractable | EPA1311/6010 | | 0.01 | Not Detected | mg/l |
| Copper, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Copper, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.09 | mg/l |
| Mercury, TCLP Extractable | EPA1311/7470 | | 0.0002 | Not Detected | mg/l |
| Nickel, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Nickel, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.10 | mg/l |
| Lead, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.07 | mg/l |
| Antimony, SPLP Extractable | EPA1312/6010 | | 0.01 | Not Detected | mg/l |
| Antimony, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.03 | mg/l |
| Selenium, TCLP Extractable | EPA1311/6010 | | 0.02 | Not Detected | mg/l |
| Thallium, SPLP Extractable | EPA1312/6010 | | 0.025 | Not Detected | mg/l |
| Thallium, TCLP Extractable | EPA1311/6010 | | 0.025 | Not Detected | mg/l |
| Vanadium, TCLP Extractable | EPA1311/6010 | | 0.004 | 0.014 | mg/l |
| Vanadium, SPLP Extractable | EPA1312/6010 | | 0.004 | Not Detected | mg/l |
| Zinc, SPLP Extractable | EPA1312/6010 | | 0.01 | 0.01 | mg/l |

This Certificate states the physical and/or chemical characteristics of the sample as submitted. This document shall not be reproduced, except in full, without written consent from Alabama Power's General Test Laboratory.

Comments : 70.0g for SPLP extraction.

CC:

Quality Control _____ Supervision _____

Date: 7/3/2012

Alabama Power
General Test Laboratory
P.O. Box 2641
Birmingham, Alabama 35291
(205) 664 - 6032 or 6171
FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

TO: Mr. Greg Dyer

Customer Account : SSOGOR

Sample Date : 12-May-12

Customer ID :

Received Date : 18-May-12

Description : Gorgas S-2
Mudstone w/Silt

Laboratory ID Number : AS11067

| Test Name | Reference | VSpec | MDL | Result | Units |
|------------------------|--------------|-------|------|--------|-------|
| Zinc, TCLP Extractable | EPA1311/6010 | | 0.01 | 0.09 | mg/l |

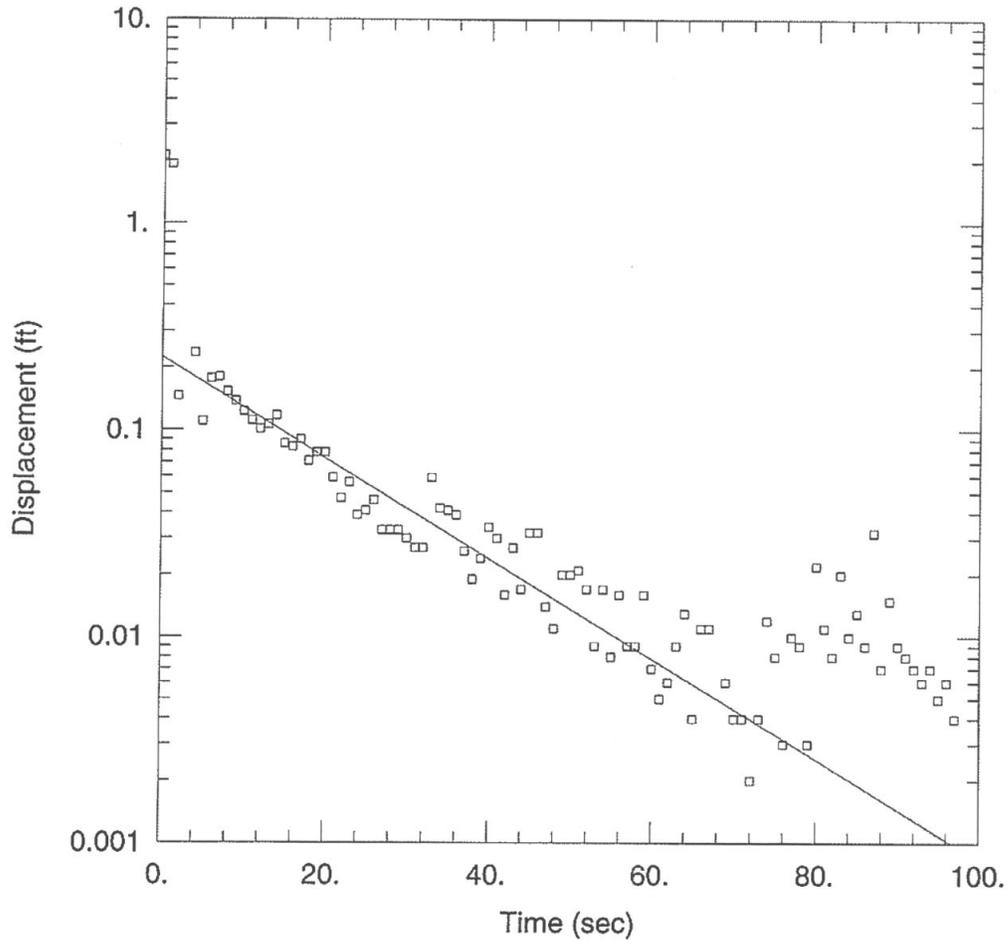
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Comments : 70.0g for SPLP extraction.

CC:

Quality Control _____ Supervision _____

Date: 7/3/2012



MW-20 SLUG IN

Data Set: T:\...MW-20 Slug In.aqt
 Date: 12/16/14

Time: 10:39:56

PROJECT INFORMATION

Company: Southern Company
 Client: Alabama Power/Plant Gorgas
 Project: Plant Gorgas CCB
 Location: Plant Gorgas
 Test Well: MW-20
 Test Date: 12/12/14

AQUIFER DATA

Saturated Thickness: 38.16 ft

Anisotropy Ratio (K_z/K_r): 1.

WELL DATA (MW-20)

Initial Displacement: 2.134 ft

Static Water Column Height: 38.16 ft

Total Well Penetration Depth: 38.16 ft

Screen Length: 10 ft

Casing Radius: 0.083 ft

Well Radius: 0.167 ft

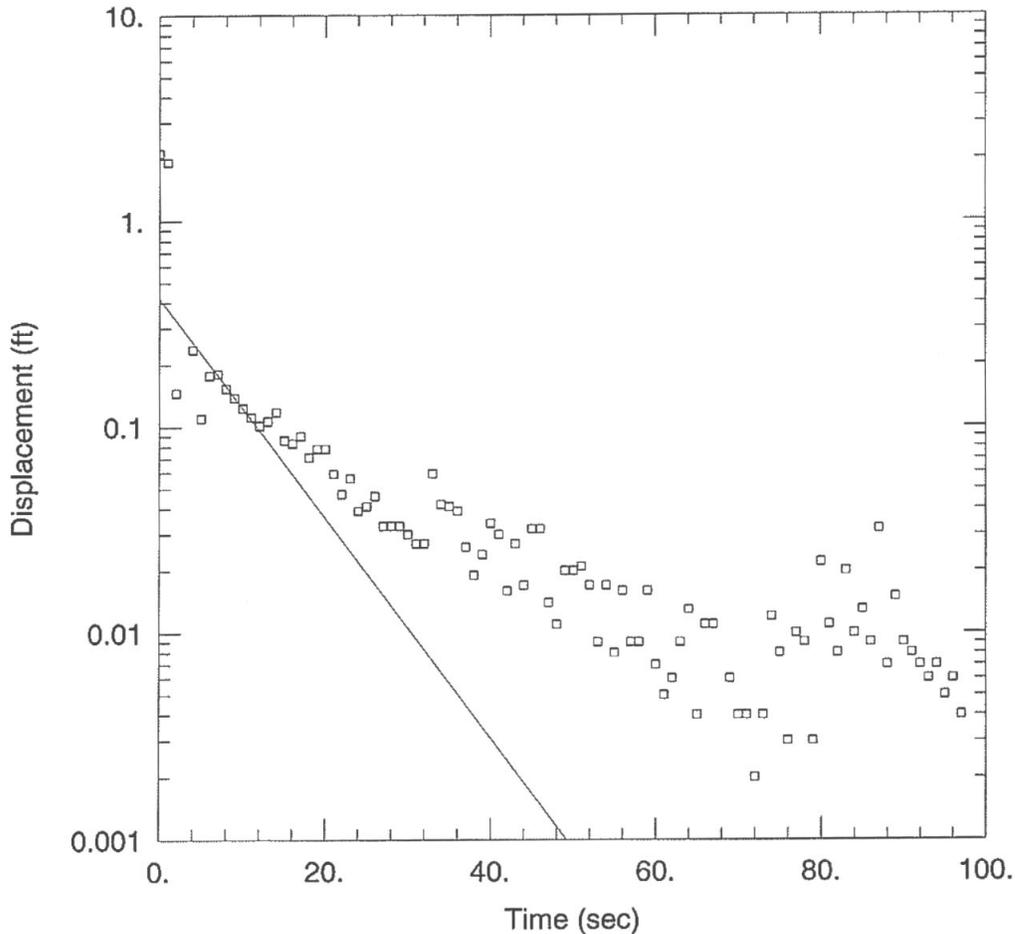
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bower-Rice

$K = 0.002331$ cm/sec

$y_0 = 0.2248$ ft



MW-20 SLUG IN

Data Set: T:\...\MW-20 Slug In.aqt
 Date: 12/16/14

Time: 10:58:33

PROJECT INFORMATION

Company: Southern Company
 Client: Alabama Power/Plant Gorgas
 Project: Plant Gorgas CCB
 Location: Plant Gorgas
 Test Well: MW-20
 Test Date: 12/12/14

AQUIFER DATA

Saturated Thickness: 38.16 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-20)

Initial Displacement: 2.134 ft
 Total Well Penetration Depth: 38.16 ft
 Casing Radius: 0.083 ft

Static Water Column Height: 38.16 ft
 Screen Length: 10. ft
 Well Radius: 0.167 ft

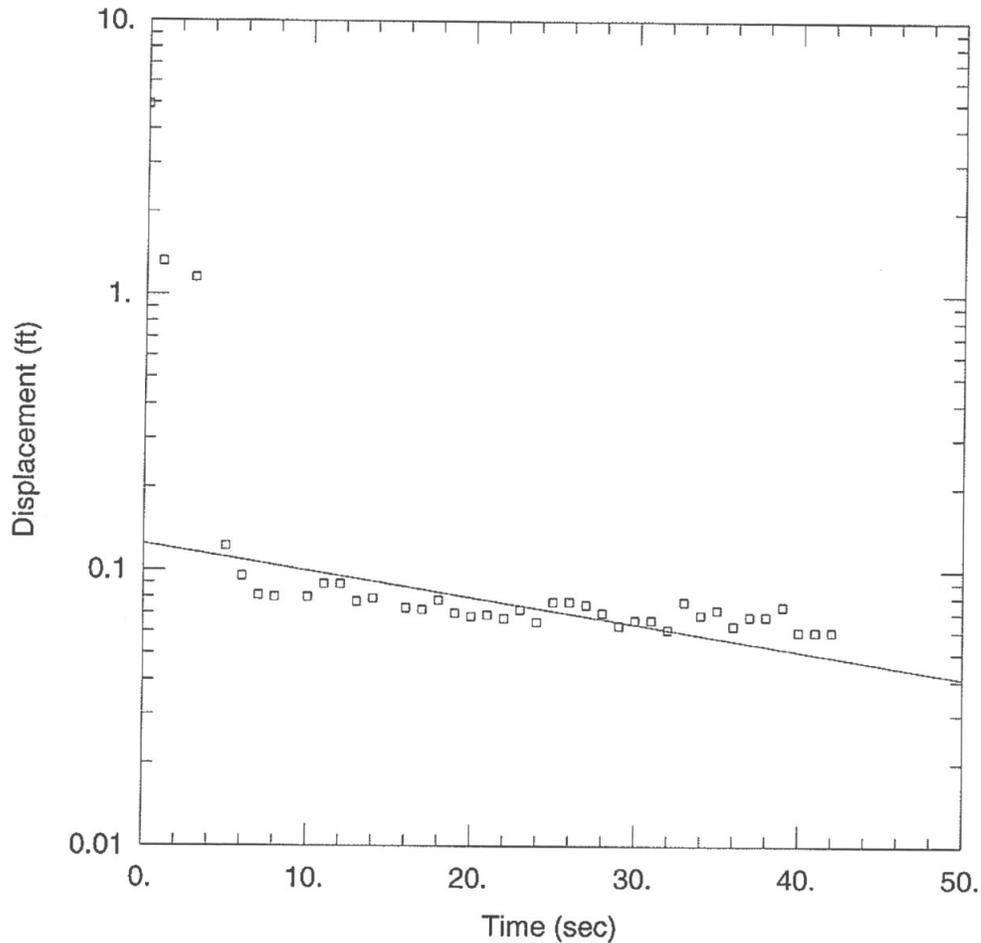
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.005107 cm/sec

y0 = 0.4202 ft



MW-16 SLUG IN

Data Set: T:\...\MW-16 Slug In Final.aqt
 Date: 12/16/14

Time: 10:39:03

PROJECT INFORMATION

Company: Southern Company
 Client: Alabama Power/Plant Gorgas
 Project: Plant Gorgas CCB
 Location: Plant Gorgas
 Test Well: MW-16
 Test Date: 12/12/14

AQUIFER DATA

Saturated Thickness: 18.1 ft

Anisotropy Ratio (Kz/Kr): 1

WELL DATA (MW-16)

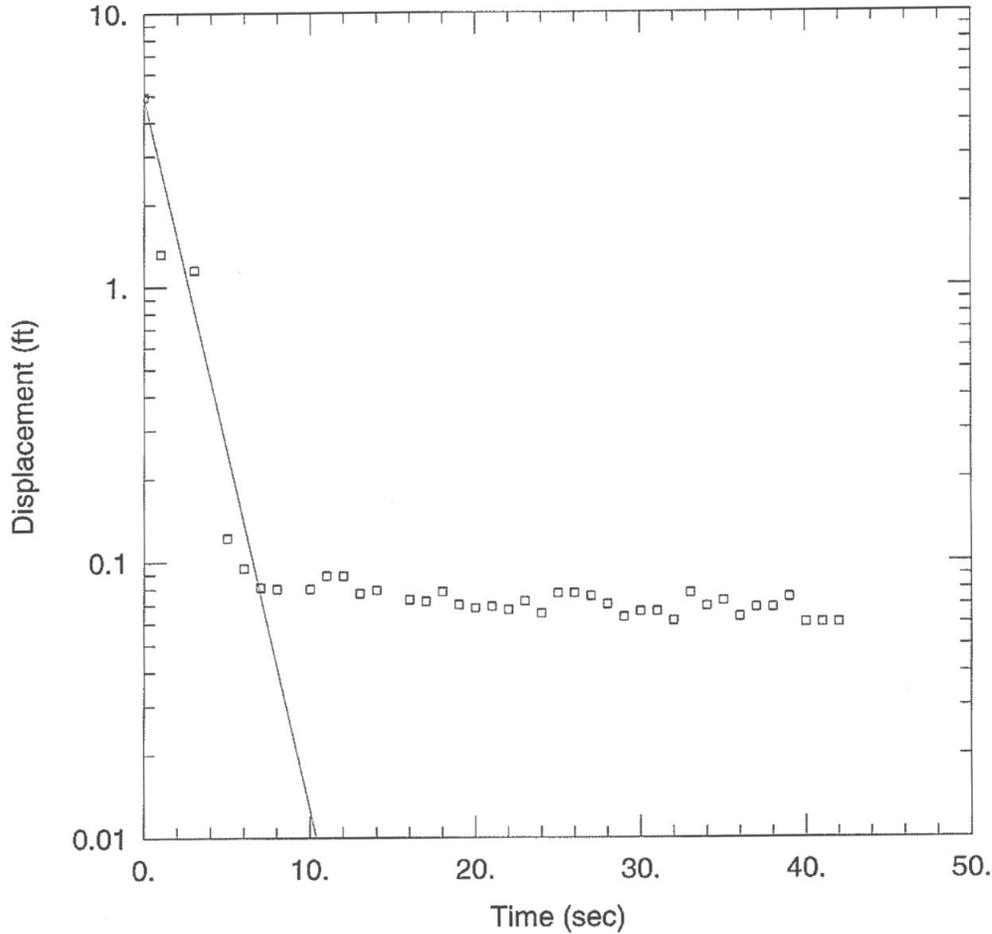
Initial Displacement: 4.947 ft
 Total Well Penetration Depth: 18.1 ft
 Casing Radius: 0.083 ft

Static Water Column Height: 18.1 ft
 Screen Length: 10 ft
 Well Radius: 0.167 ft

SOLUTION

Aquifer Model: Unconfined
 K = 0.0008232 cm/sec

Solution Method: Bouwer-Rice
 y0 = 0.1242 ft



MW-16 SLUG IN

Data Set: T:\...MW-16 Slug In Final.aqt
 Date: 12/15/14

Time: 14:49:47

PROJECT INFORMATION

Company: Southern Company
 Client: Alabama Power/Plant Gorgas
 Project: Plant Gorgas CCB
 Location: Plant Gorgas
 Test Well: MW-16
 Test Date: 12/12/14

AQUIFER DATA

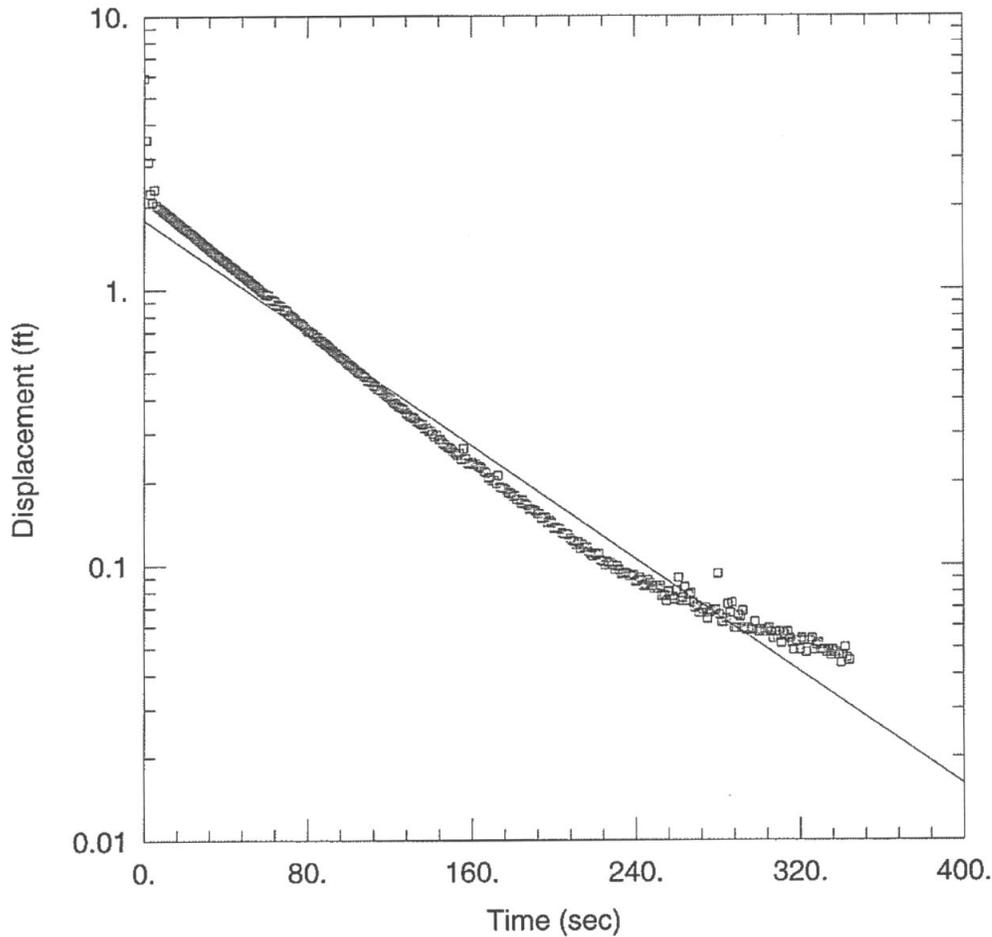
Saturated Thickness: 18.1 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-16)

Initial Displacement: 4.947 ft Static Water Column Height: 18.1 ft
 Total Well Penetration Depth: 18.1 ft Screen Length: 10. ft
 Casing Radius: 0.083 ft Well Radius: 0.167 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice
 K = 0.02197 cm/sec y0 = 4.948 ft



MW-15 SLUG IN

Data Set: T:\...MW-15 Slug In.aqt
 Date: 12/15/14

Time: 14:49:10

PROJECT INFORMATION

Company: Southern Company
 Client: Alabama Power/Plant Gorgas
 Project: Plant Gorgas CCB
 Location: Plant Gorgas
 Test Well: MW-15
 Test Date: 12/12/14

AQUIFER DATA

Saturated Thickness: 18.34 ft

Anisotropy Ratio (K_z/K_r): 1

WELL DATA (MW-15)

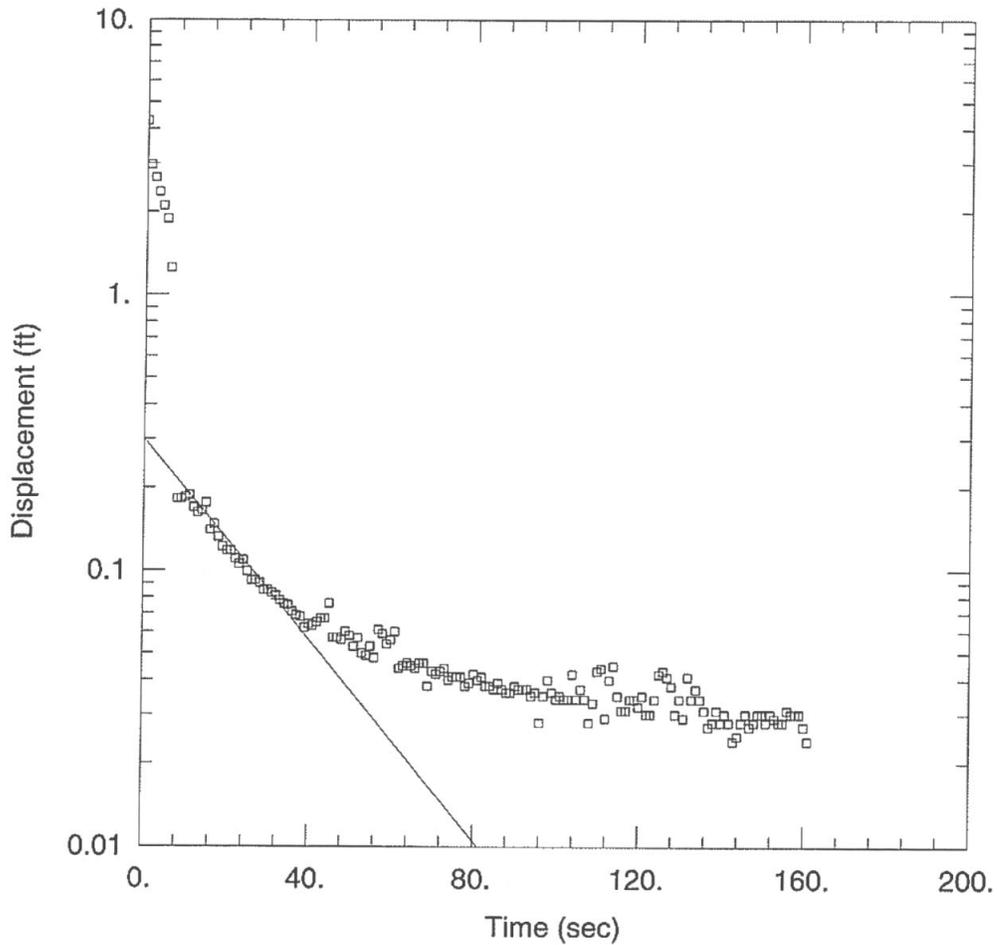
Initial Displacement: 5.895 ft
 Total Well Penetration Depth: 18.34 ft
 Casing Radius: 0.083 ft

Static Water Column Height: 18.34 ft
 Screen Length: 10 ft
 Well Radius: 0.167 ft

SOLUTION

Aquifer Model: Unconfined
 $K = 0.000436$ cm/sec

Solution Method: Bouwer-Rice
 $y_0 = 1.79$ ft



MW-11 SLUG IN

Data Set: T:\...\MW-11 Slug In.aqt

Date: 12/16/14

Time: 10:35:34

PROJECT INFORMATION

Company: Southern Company

Client: Alabama Power/Plant Gorgas

Project: Plant Gorgas CCB

Location: Plant Gorgas

Test Well: MW-11

Test Date: 12/12/14

AQUIFER DATA

Saturated Thickness: 27.26 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-11)

Initial Displacement: 4.294 ft

Static Water Column Height: 27.26 ft

Total Well Penetration Depth: 27.26 ft

Screen Length: 10. ft

Casing Radius: 0.083 ft

Well Radius: 0.167 ft

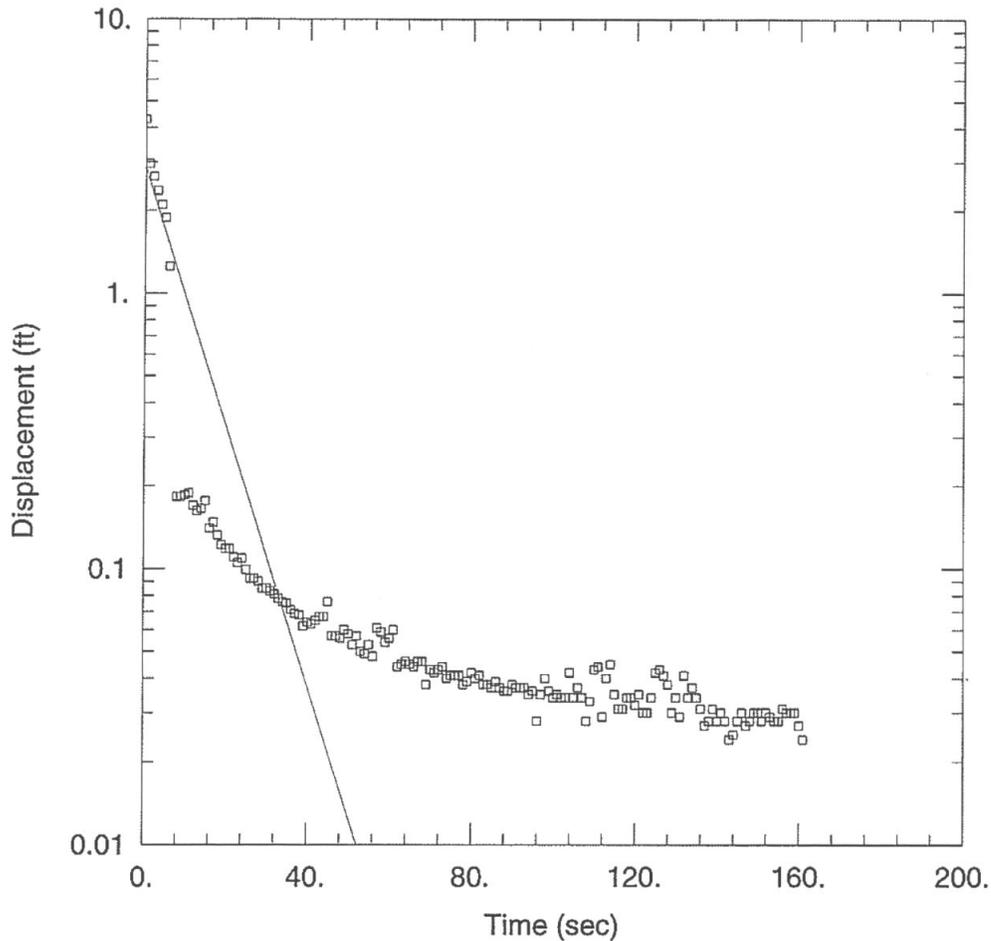
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bower-Rice

K = 0.001653 cm/sec

y0 = 0.2998 ft



MW-11 SLUG IN

Data Set: T:\...\MW-11 Slug In.aqt
 Date: 12/16/14

Time: 10:36:58

PROJECT INFORMATION

Company: Southern Company
 Client: Alabama Power/Plant Gorgas
 Project: Plant Gorgas CCB
 Location: Plant Gorgas
 Test Well: MW-11
 Test Date: 12/12/14

AQUIFER DATA

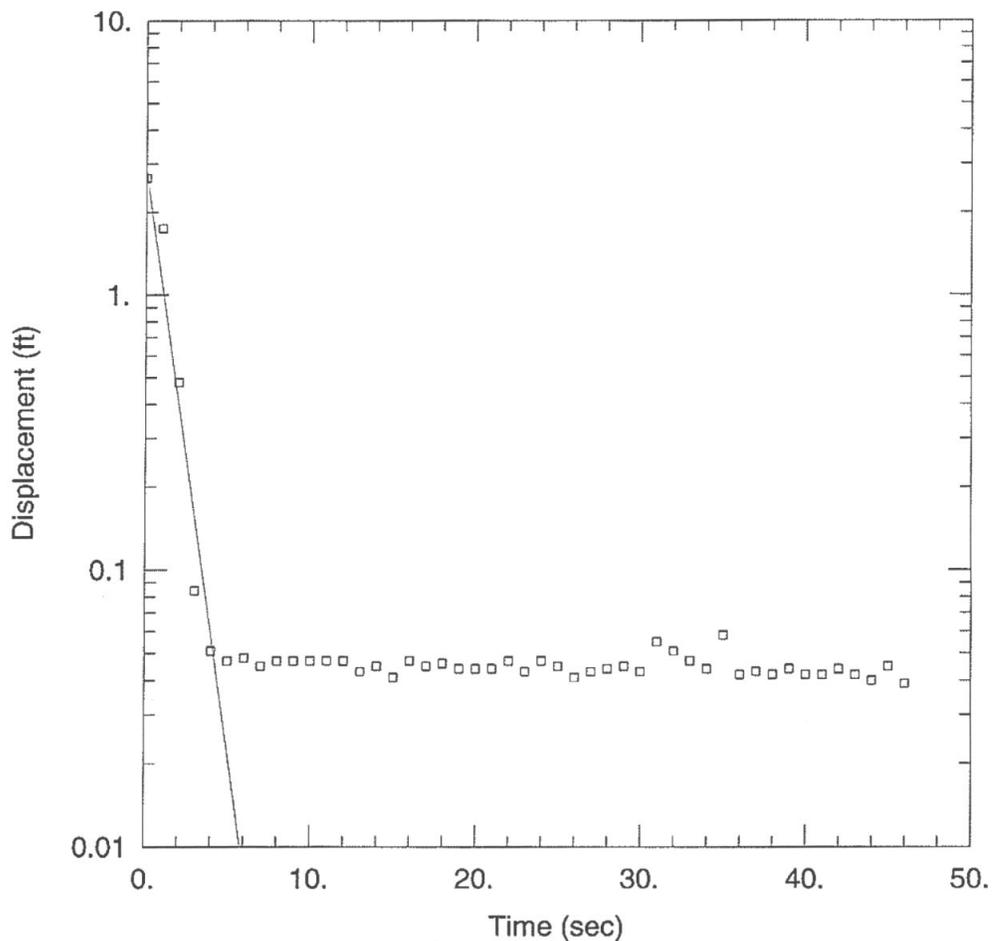
Saturated Thickness: 27.26 ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-11)

Initial Displacement: 4.294 ft Static Water Column Height: 27.26 ft
 Total Well Penetration Depth: 27.26 ft Screen Length: 10. ft
 Casing Radius: 0.083 ft Well Radius: 0.167 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bower-Rice
 K = 0.004282 cm/sec $y_0 =$ 2.873 ft



MW-7 SLUG IN

Data Set: T:\...\MW-7 Slug In.aqt

Date: 12/15/14

Time: 14:47:27

PROJECT INFORMATION

Company: Southern Company
 Client: Alabama Power/Plant Gorgas
 Project: Plant Gorgas CCB
 Location: Plant Gorgas
 Test Well: MW-7
 Test Date: 12/12/14

AQUIFER DATA

Saturated Thickness: 12.38 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-7)

Initial Displacement: 2.669 ft

Static Water Column Height: 12.38 ft

Total Well Penetration Depth: 12.38 ft

Screen Length: 10. ft

Casing Radius: 0.083 ft

Well Radius: 0.167 ft

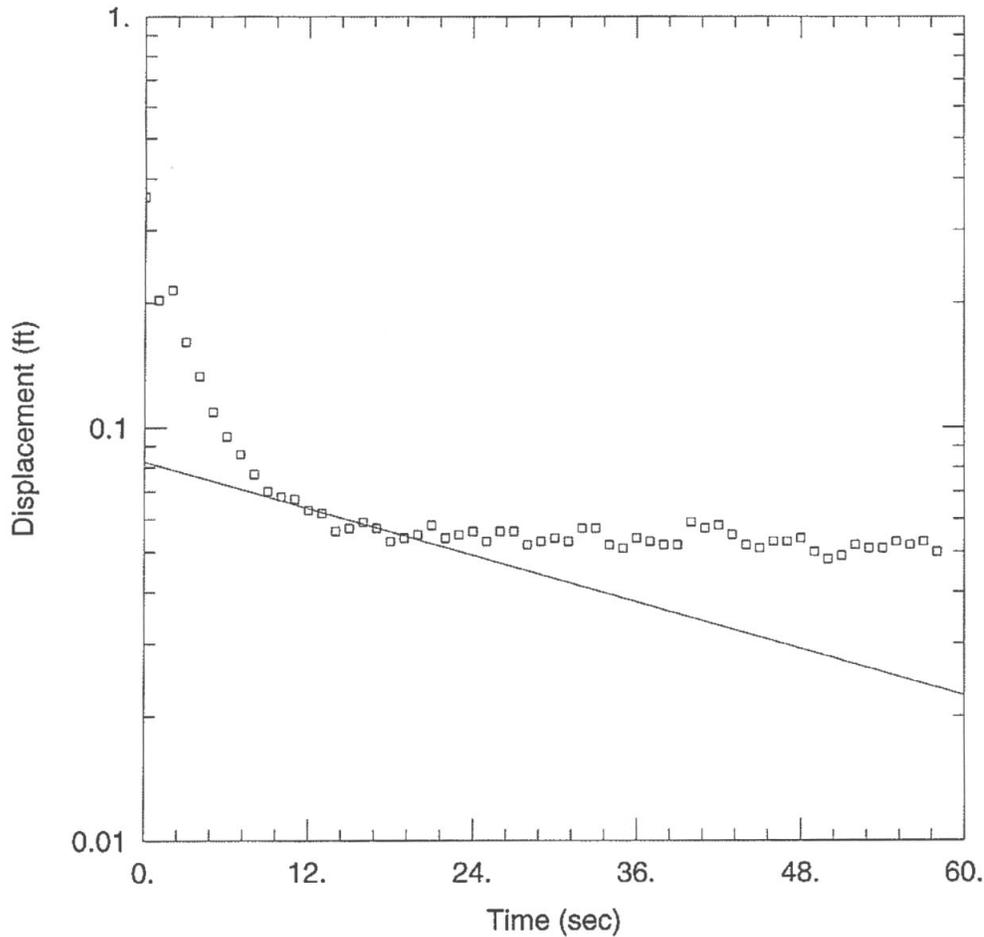
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.4559 cm/sec

y0 = 2.843 ft



MW-4 SLUG IN

Data Set: T:\...MW-4 Slug In.aqt
 Date: 12/16/14

Time: 10:21:34

PROJECT INFORMATION

Company: Southern Company
 Client: Alabama Power/Plant Gorgas
 Project: Plant Gorgas CCB
 Location: Plant Gorgas
 Test Well: MW-4
 Test Date: 12/12/14

AQUIFER DATA

Saturated Thickness: 10.23 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-4)

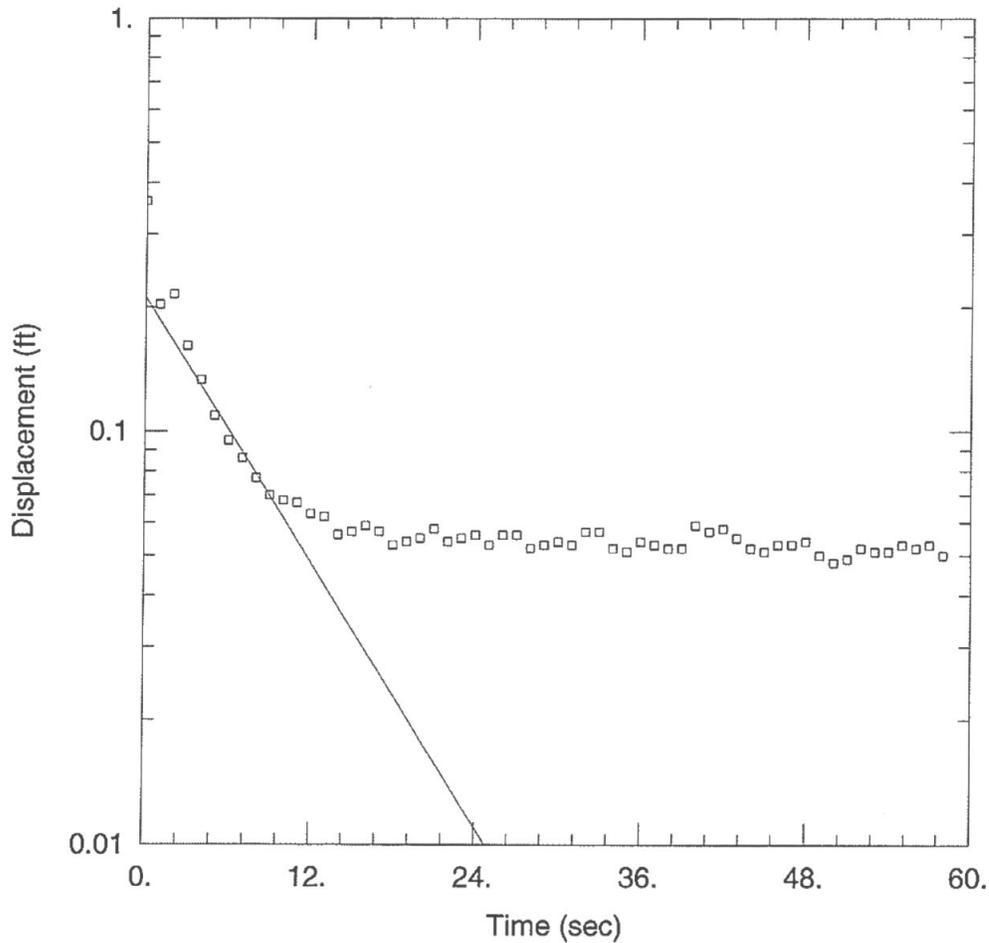
Initial Displacement: 0.361 ft
 Total Well Penetration Depth: 10.23 ft
 Casing Radius: 0.083 ft

Static Water Column Height: 10.23 ft
 Screen Length: 10. ft
 Well Radius: 0.167 ft

SOLUTION

Aquifer Model: Unconfined
 K = 0.0007179 cm/sec

Solution Method: Bouwer-Rice
 y0 = 0.08254 ft



MW-4 SLUG IN

Data Set: T:\...MW-4 Slug In.aqt
 Date: 12/16/14

Time: 10:24:41

PROJECT INFORMATION

Company: Southern Company
 Client: Alabama Power/Plant Gorgas
 Project: Plant Gorgas CCB
 Location: Plant Gorgas
 Test Well: MW-4
 Test Date: 12/12/14

AQUIFER DATA

Saturated Thickness: 10.23 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-4)

Initial Displacement: 0.361 ft
 Total Well Penetration Depth: 10.23 ft
 Casing Radius: 0.083 ft

Static Water Column Height: 10.23 ft
 Screen Length: 10. ft
 Well Radius: 0.167 ft

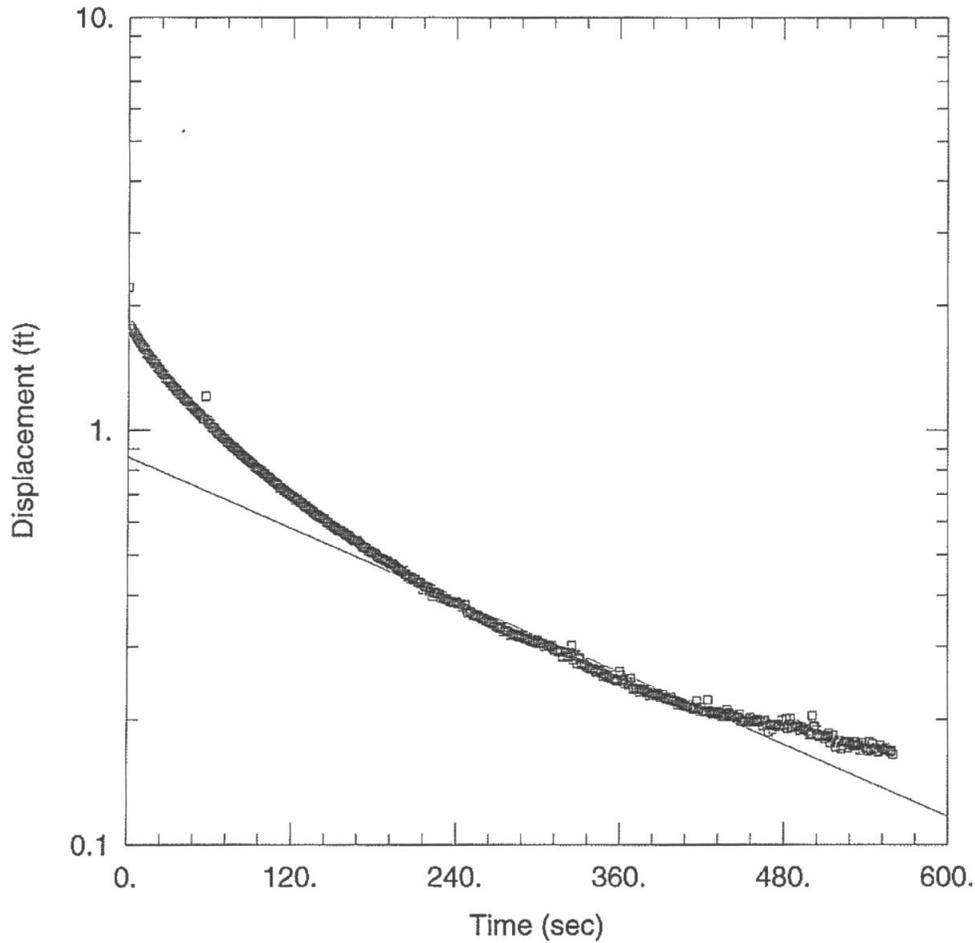
SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.004068 cm/sec

y0 = 0.2109 ft



MW-1 SLUG-IN

Data Set: T:\...MW-1 SLUG IN.aqt
 Date: 12/16/14

Time: 10:18:05

PROJECT INFORMATION

Company: Southern Company
 Client: Alabama Power/Plant Gorgas
 Project: Plant Gorgas CCB
 Location: Plant Gorgas
 Test Well: MW-1
 Test Date: 12/12/14

AQUIFER DATA

Saturated Thickness: 11.99 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-1)

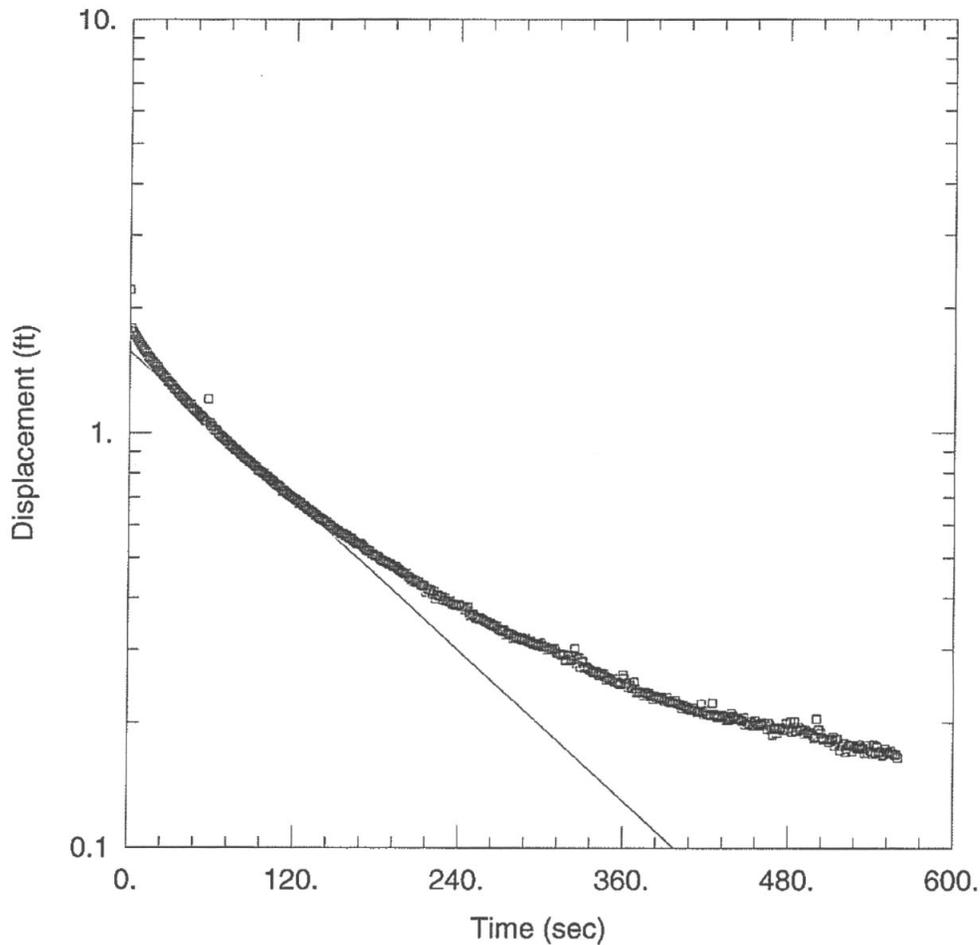
Initial Displacement: 2.217 ft
 Total Well Penetration Depth: 15.08 ft
 Casing Radius: 0.083 ft

Static Water Column Height: 11.99 ft
 Screen Length: 10. ft
 Well Radius: 0.167 ft

SOLUTION

Aquifer Model: Unconfined
 K = 0.0001189 cm/sec

Solution Method: Bouwer-Rice
 y0 = 0.8625 ft



MW-1 SLUG-IN

Data Set: T:\...MW-1 SLUG IN.aqt
 Date: 12/16/14

Time: 10:16:59

PROJECT INFORMATION

Company: Southern Company
 Client: Alabama Power/Plant Gorgas
 Project: Plant Gorgas CCB
 Location: Plant Gorgas
 Test Well: MW-1
 Test Date: 12/12/14

AQUIFER DATA

Saturated Thickness: 11.99 ft

Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-1)

Initial Displacement: 2.217 ft
 Total Well Penetration Depth: 15.08 ft
 Casing Radius: 0.083 ft

Static Water Column Height: 11.99 ft
 Screen Length: 10. ft
 Well Radius: 0.167 ft

SOLUTION

Aquifer Model: Unconfined

Solution Method: Bouwer-Rice

K = 0.0002474 cm/sec

y0 = 1.576 ft

**Civil Field Services
Daily Calibration Log**

Site ID _____ Plant Gorgas
Site Location _____ Landfill

| Analysis Equipment Used | Equipment S. Number |
|-------------------------|---------------------|
| Insitu Smart Troll | |
| Lamotte 2020we | |
| | |

Instrument Calibration

| | | | | | |
|--------------|------------|--------------------------------|--------------|---------------------|-----------------------|
| Day 1 | | | | | |
| pH | | Conductivity | DO | Barometric Pressure | Turbidity Zero (NTUs) |
| 4.01= | 4.00 | 1412 $\mu\text{S}/\text{cm} =$ | % Saturation | | 0.00 = 0.00 |
| 7.00= | 7.02 | 1401 | | | 1.00 = 1.01 |
| 10.00= | 10.04 | | | | 10.00 = |
| Date: | 11/17/2014 | Time: | 0700 | | 100.00 = |
| Day 2 | | | | | |
| pH | | Conductivity | DO | Barometric Pressure | Turbidity Zero (NTUs) |
| 4.01= | 4.02 | 1412 $\mu\text{S}/\text{cm} =$ | % Saturation | | 0.00 = 0.02 |
| 7.00= | 7.05 | 1477 | | | 1.00 = |
| 10.00= | 10.08 | | | | 10.00 = 10.00 |
| Date: | 11/18/2014 | Time: | 0620 | | 100.00 = |
| Day 3 | | | | | |
| pH | | Conductivity | DO | Barometric Pressure | Turbidity Zero (NTUs) |
| 4.01= | 4.00 | 1412 $\mu\text{S}/\text{cm} =$ | % Saturation | | 0.00 = 0.01 |
| 7.00= | 7.06 | 1424 | | | 1.00 = 1.01 |
| 10.00= | 10.08 | | | | 10.00 = 10.01 |
| Date: | 11/19/2014 | Time: | 0630 | | 100.00 = |
| Day 4 | | | | | |
| pH | | Conductivity | DO | Barometric Pressure | Turbidity Zero (NTUs) |
| 4.01= | | 1412 $\mu\text{S}/\text{cm} =$ | % Saturation | | 0.00 = |
| 7.00= | | | | | 1.00 = |
| 10.00= | | | | | 10.00 = |
| Date: | | Time: | | | 100.00 = |
| Day 5 | | | | | |
| pH | | Conductivity | DO | Barometric Pressure | Turbidity Zero (NTUs) |
| 4.01= | | 1412 $\mu\text{S}/\text{cm} =$ | % Saturation | | 0.00 = |
| 7.00= | | | | | 1.00 = |
| 10.00= | | | | | 10.00 = |
| Date: | | Time: | | | 100.00 = |
| Day 6 | | | | | |
| pH | | Conductivity | DO | Barometric Pressure | Turbidity Zero (NTUs) |
| 4.01= | | 1412 $\mu\text{S}/\text{cm} =$ | % Saturation | | 0.00 = |
| 7.00= | | | | | 1.00 = |
| 10.00= | | | | | 10.00 = |
| Date: | | Time: | | | 100.00 = |
| Day 7 | | | | | |
| pH | | Conductivity | DO | Barometric Pressure | Turbidity Zero (NTUs) |
| 4.01= | | 1412 $\mu\text{S}/\text{cm} =$ | % Saturation | | 0.00 = |
| 7.00= | | | | | 1.00 = |
| 10.00= | | | | | 10.00 = |
| Date: | | Time: | | | 100.00 = |

DO over 25

Form FD 9000-24
GROUNDWATER SAMPLING LOG

SITE NAME: Gorgas SITE LOCATION: Parrish AL
WELL NO.: _____ SAMPLE ID: MW-3 DATE: 11/19/14

PURGING DATA

WELL DIAMETER (inches): 2 TUBING DIAMETER (inches): 1/2 WELL SCREEN INTERVAL DEPTH: _____ TO WATER (feet): 110.41 PURGE PUMP TYPE OR BAILER: ESP
WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable) = $(118.85 \text{ feet} - 110.41 \text{ feet}) \times 1.16 \text{ gallons/foot} = 9.74 \text{ gallons}$
EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME ÷ (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable) N/A = _____ gallons ÷ (_____ gallons/foot X _____ feet) ÷ _____ gallons = _____ gallons

| TIME | VOLUME PURGED (gallons) | CUMUL VOLUME PURGED (gallons) | PURGE RATE (gpm) | DEPTH TO WATER (feet) | pH (standard units) | TEMP. (°C) | COND. (circle units) (µmhos/cm or µS/cm) | DISSOLVED OXYGEN (circle units) (mg/L or % saturation) | TURBIDITY (NTUs) | COLOR (describe) | ODOR (describe) | DRP |
|------|-------------------------|-------------------------------|------------------|-----------------------|---------------------|------------|------------------------------------------|--------------------------------------------------------|------------------|------------------|-----------------|-----|
| 1225 | 5 | 5 | .5 | 115.80 | 5.74 | 20.7 | 3738 | 1.60 | >1000 | Black | none | -1 |
| 1235 | 3 | 8 | .3 | | | | | | | | | |
| 1315 | 1 | 6 | .2 | 113.85 | 6.04 | 18.8 | 3434 | 2.88 | >1000 | Gray | | -1 |
| 1320 | 1 | 7 | .2 | 116.20 | 5.91 | 22.2 | 3361 | 2.96 | >1000 | " | | +2 |

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.05; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.008; 1/2" = 0.010; 5/8" = 0.016
PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Brett Surles / RDH SAMPLER(S) SIGNATURE(S): [Signature] SAMPLING INITIATED AT: N/A SAMPLING ENDED AT: _____
PUMP OR TUBING DEPTH IN WELL (feet): 117 TUBING MATERIAL CODE: PE FIELD-FILTERED: Y N FILTER SIZE: _____ µm
FIELD DECONTAMINATION: PUMP Y N TUBING Y N (replaced) DUPLICATE: Y N

| SAMPLE CONTAINER SPECIFICATION | | | | SAMPLE PRESERVATION | | | INTENDED ANALYSIS AND/OR METHOD | SAMPLING EQUIPMENT CODE | SAMPLE PUMP FLOW RATE (mL per minute) |
|--------------------------------|--------------|---------------|--------|---------------------|-------------------------------|----------|---------------------------------|-------------------------|---------------------------------------|
| SAMPLE ID CODE | # CONTAINERS | MATERIAL CODE | VOLUME | PRESERVATIVE USED | TOTAL VOL ADDED IN FIELD (mL) | FINAL pH | | | |
| | | | | | | | | | |

REMARKS: Well Development
MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

WL - Dropped 5' in 10 min
slowed to .3 gpm @ 1225 + well going dry @ 1230
* Stopped pump - Restart @ 1310 WL 110.90
Revision Date: February 12, 2009

Form FD 9000-24
GROUNDWATER SAMPLING LOG

| | |
|--------------------------|----------------------------------------------|
| SITE NAME: <u>Geogas</u> | SITE LOCATION: <u>Parrish AI</u> |
| WELL NO: | SAMPLE ID: <u>MW-7</u> DATE: <u>11/19/14</u> |

PURGING DATA

| | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|------------------------------------------------|--------------------------------------------|-------------------------------------------|
| WELL DIAMETER (inches): <u>2</u> | TUBING DIAMETER (inches): <u>1/2</u> | WELL SCREEN INTERVAL DEPTH: feet to feet | STATIC DEPTH TO WATER (feet): <u>60.73</u> | PURGE PUMP TYPE OR BAILER: <u>ESP</u> |
| WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) $= (73.65 \text{ feet} - 60.73 \text{ feet}) \times .16 \text{ gallons/foot} = 2.06 \text{ gallons}$ | | | | |
| EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME ÷ (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME (only fill out if applicable) $N/A = \text{gallons} + (\text{gallons/foot} \times \text{feet}) + \text{gallons} = \text{gallons}$ | | | | |
| INITIAL PUMP OR TUBING DEPTH IN WELL (feet): <u>72</u> | FINAL PUMP OR TUBING DEPTH IN WELL (feet): <u>63</u> | PURGING INITIATED AT: <u>0900</u> | PURGING ENDED AT: <u>1010</u> | TOTAL VOLUME PURGED (gallons): <u>140</u> |

| TIME | VOLUME PURGED (gallons) | CUMUL. VOLUME PURGED (gallons) | PURGE RATE (gpm) | DEPTH TO WATER (feet) | pH (standard units) | TEMP. (°C) | COND. (circle units) $\mu\text{mhos/cm or } \mu\text{S/cm}$ | DISSOLVED OXYGEN (circle units) (mg/L or % saturation) | TURBIDITY (NTUs) | COLOR (describe) | ODOR (describe) | |
|------|-------------------------|--------------------------------|------------------|-----------------------|---------------------|------------|-------------------------------------------------------------|--------------------------------------------------------|------------------|------------------|-----------------|-----|
| 0920 | 40 | 40 | 2.0 | 60.85 | 6.68 | 19.4 | 2997 | .34 | >1000 | muddy | none | +6 |
| 0940 | 40 | 80 | 2.0 | 60.88 | 6.67 | 19.5 | 3004 | .29 | 127 | clear | | +10 |
| 1000 | 40 | 120 | 2.0 | 60.88 | 6.67 | 19.5 | 3012 | .29 | 6.32 | clear | | +12 |
| 1005 | 80 | 130 | 2.0 | 60.88 | 6.67 | 19.6 | 3019 | .28 | 3.97 | clear | | +12 |
| 1010 | 10 | 140 | 2.0 | 60.88 | 6.67 | 19.6 | 3020 | .27 | 3.33 | clear | | +12 |

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.85
 TUBING INSIDE DIA. CAPACITY (Gal./ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.008; 1/2" = 0.010; 5/8" = 0.016
 PURGING EQUIPMENT CODES: B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

| | | | | | | | | | | | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------------|---------------------------------------------|---------------------|-------------------------------|----------------------------------|--|----------------------------------|--|-------------------------|--|---------------------------------------|--|
| SAMPLED BY (PRINT) / AFFILIATION: <u>Brett Surles / RDH</u> | | | SAMPLER(S) SIGNATURE(S): <u>[Signature]</u> | | | SAMPLING INITIATED AT: <u>NA</u> | | SAMPLING ENDED AT: | | | | | |
| PUMP OR TUBING DEPTH IN WELL (feet): <u>72 / 63</u> | | | TUBING MATERIAL CODE: <u>PE</u> | | | FIELD-FILTERED: Y N | | FILTER SIZE: _____ μm | | | | | |
| FIELD DECONTAMINATION: PUMP Y N | | | TUBING Y N (replaced) | | | DUPLICATE: Y N | | | | | | | |
| SAMPLE CONTAINER SPECIFICATION | | | | SAMPLE PRESERVATION | | | | INTENDED ANALYSIS AND/OR METHOD | | SAMPLING EQUIPMENT CODE | | SAMPLE PUMP FLOW RATE (mL per minute) | |
| SAMPLE ID CODE | # CONTAINERS | MATERIAL CODE | VOLUME | PRESERVATIVE USED | TOTAL VOL ADDED IN FIELD (mL) | FINAL pH | | | | | | | |
| | | | | | | | | | | | | | |
| REMARKS: <u>Well Development only</u> | | | | | | | | | | | | | |
| MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify) | | | | | | | | | | | | | |
| SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPF = Reverse Flow Peristaltic Pump; SM = Szwed Method (Tubing Gravity Drain); O = Other (Specify) | | | | | | | | | | | | | |

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
 2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
 pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: $\pm 5\%$ Dissolved Oxygen: all readings $\leq 20\%$ saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or $\pm 10\%$ (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or $\pm 10\%$ (whichever is greater)

Form FD 9000-24
GROUNDWATER SAMPLING LOG

| | |
|--------------------------|-----------------------------------------------|
| SITE NAME: <u>Gargas</u> | SITE LOCATION: <u>Parish A1</u> |
| WELL NO: | SAMPLE ID: <u>mw-12</u> DATE: <u>11/18/14</u> |

PURGING DATA

| | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|----------------------------------------------------|---------------------------------------------|--------------------------------------------|
| WELL DIAMETER (inches): <u>2</u> | TUBING DIAMETER (inches): <u>3/8</u> | WELL SCREEN INTERVAL DEPTH: feet to feet | STATIC DEPTH TO WATER (feet): <u>155.95</u> | PURGE PUMP TYPE OR BAILER: <u>ESP</u> |
| WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) $= (167.56 \text{ feet} - 155.95 \text{ (13.55) feet}) \times 16.0 \text{ gallons/foot} = 216 \text{ gallons}$ | | | | |
| EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL = PUMP VOLUME ÷ (TUBING CAPACITY X TUBING LENGTH) ÷ FLOW CELL VOLUME (only fill out if applicable) $N/A = \text{gallons} \div (\text{gallons/foot} \times \text{feet}) \div \text{gallons} = \text{gallons}$ | | | | |
| INITIAL PUMP OR TUBING DEPTH IN WELL (feet): <u>167</u> | FINAL PUMP OR TUBING DEPTH IN WELL (feet): <u>160</u> | PURGING INITIATED AT: <u>1020</u> | PURGING ENDED AT: <u>1140</u> | TOTAL VOLUME PURGED (gallons): <u>16.0</u> |

| TIME | VOLUME PURGED (gallons) | CUMUL VOLUME PURGED (gallons) | PURGE RATE (gpm) | DEPTH TO WATER (feet) | pH (standard units) | TEMP. (°C) | COND. (circle units) $\mu\text{mhos/cm}$ or $\mu\text{S/cm}$ | DISSOLVED OXYGEN (circle units) mg/L or % saturation | TURBIDITY (NTUs) | COLOR (describe) | ODOR (describe) | DRP |
|------|-------------------------|-------------------------------|------------------|-----------------------|---------------------|------------|--------------------------------------------------------------|---------------------------------------------------------------|------------------|------------------|-----------------|-----|
| 1030 | 2 | 2 | .2 | 156.30 | 6.15 | 27.2 | 3021 | .27 | 76.2 | cloudy | none | -50 |
| 1050 | 4 | 6 | .2 | 156.34 | 6.06 | 26.4 | 3596 | .17 | 135 | cloudy | | -33 |
| 1110 | 4 | 10 | .2 | 156.35 | 6.02 | 26.5 | 3555 | .14 | 21.1 | cloudy | | -30 |
| 1120 | 2 | 12 | .2 | 156.36 | 6.00 | 26.4 | 3571 | .14 | 9.47 | clear | | -30 |
| 1130 | 2 | 14 | .2 | 156.36 | 5.97 | 26.3 | 3566 | .12 | 7.39 | clear | | -27 |
| 1140 | 2 | 16 | .2 | 156.37 | 5.95 | 26.3 | 3549 | .11 | 5.00 | clear | | -24 |

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.05; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
 TUBING INSIDE DIA. CAPACITY (Gal./ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.008; 1/2" = 0.010; 5/8" = 0.016
 PURGING EQUIPMENT CODES: B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

| | | | | | | | | | | | | | |
|-------------------------------------------------------------|--------------|---------------|---------------------------------------------|---------------------|-------------------------------|-----------------------------------|--|----------------------------------|--|-------------------------|--|---------------------------------------|--|
| SAMPLED BY (PRINT) / AFFILIATION: <u>Brett Swales / PDH</u> | | | SAMPLER(S) SIGNATURE(S): <u>[Signature]</u> | | | SAMPLING INITIATED AT: <u>N/A</u> | | SAMPLING ENDED AT: | | | | | |
| PUMP OR TUBING DEPTH IN WELL (feet): <u>167/160</u> | | | TUBING MATERIAL CODE: <u>PE</u> | | | FIELD FILTERED: Y N | | FILTER SIZE: _____ μm | | | | | |
| FIELD DECONTAMINATION: PUMP Y N | | | TUBING Y N (replaced) | | | DUPLICATE: Y N | | | | | | | |
| SAMPLE CONTAINER SPECIFICATION | | | | SAMPLE PRESERVATION | | | | INTENDED ANALYSIS AND/OR METHOD | | SAMPLING EQUIPMENT CODE | | SAMPLE PUMP FLOW RATE (mL per minute) | |
| SAMPLE ID CODE | # CONTAINERS | MATERIAL CODE | VOLUME | PRESERVATIVE USED | TOTAL VOL ADDED IN FIELD (mL) | FINAL pH | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |
| | | | | | | | | | | | | | |

REMARKS: well Development

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RFPF = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
 2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
 pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: $\pm 5\%$ Dissolved Oxygen: all readings $\leq 20\%$ saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or $\pm 10\%$ (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or $\pm 10\%$ (whichever is greater)

Revision Date: February 12, 2009

Form FD 9000-24
GROUNDWATER SAMPLING LOG

| | | |
|--------------------------------|---------------------------------|-----------------------|
| SITE NAME: <u>Plant Gargas</u> | SITE LOCATION: <u>Parish A1</u> | DATE: <u>11/17/14</u> |
| WELL NO: | SAMPLE ID: <u>MW-13</u> | |

PURGING DATA

| | | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------------------------------------------|--------------------------------------------|---------------------------------------|
| WELL DIAMETER (inches): <u>2</u> | TUBING DIAMETER (inches): <u>3/8</u> | WELL SCREEN INTERVAL DEPTH: feet to feet | STATIC DEPTH TO WATER (feet): <u>94.88</u> | PURGE PUMP TYPE OR BAILER: <u>ESP</u> |
| WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) $= 109.25 \text{ feet} - 94.88 \text{ (13.37) feet} \times 1.6 \text{ gallons/foot} = 2.13 \text{ gallons}$ | | | | |
| EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME ÷ (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME (only fill out if applicable) $N/A = \text{gallons} \div (\text{gallons/foot} \times \text{feet}) + \text{gallons} = \text{gallons}$ | | | | |

| | | | | |
|------------------------------------------------------------|-------------------------------------------------------|-----------------------------------|----------------------------|------------------------------------------|
| INITIAL PUMP OR TUBING DEPTH IN WELL (feet): <u>Bottom</u> | FINAL PUMP OR TUBING DEPTH IN WELL (feet): <u>100</u> | PURGING INITIATED AT: <u>1505</u> | PURGING ENDED AT: <u>0</u> | TOTAL VOLUME PURGED (gallons): <u>33</u> |
|------------------------------------------------------------|-------------------------------------------------------|-----------------------------------|----------------------------|------------------------------------------|

| TIME | VOLUME PURGED (gallons) | CUMUL VOLUME PURGED (gallons) | PURGE RATE (gpm) | DEPTH TO WATER (feet) | pH (standard units) | TEMP. (°C) | COND. (circle units) <small>µmhos/cm or µS/cm</small> | DISSOLVED OXYGEN (circle units) <small>(mg/L) or % Saturation</small> | TURBIDITY (NTUs) | COLOR (describe) | ODOR (describe) | ORP |
|-------|-------------------------|-------------------------------|------------------|-----------------------|---------------------|------------|-------------------------------------------------------|-----------------------------------------------------------------------|------------------|------------------|-----------------|-----|
| 1520 | 7.5 | 7.5 | .5 | 97.33 | 6.02 | 21.9 | 2666 | .82 | 788 | cloudy | none | -35 |
| 1540 | 10 | 17.5 | .5 | 101.00 | 6.10 | 22.0 | 2514 | .41 | 21000 | cloudy | | -43 |
| 1600 | 10 | 25.5 | .5 | 105.00 | 6.06 | 22.6 | 2773 | .26 | 21000 | cloudy | | -40 |
| 1610 | 1.0 | 26.5 | .1 | 105.86 | 6.09 | 23.4 | 2975 | 1.17 | 21000 | cloudy | | -26 |
| 127.5 | | | | | | | | | | | | |
| 0735 | 1.0 | 27.5 | .1 | 95.70 | 6.28 | 19.5 | 3578 | 3.54 | 132 | cloudy | | +61 |
| 0745 | 2.0 | 29.5 | .1 | 96.55 | 6.24 | 19.6 | 3548 | 3.14 | 22.1 | cloudy | | +55 |
| 0805 | 2.0 | 31.5 | .1 | 97.60 | 6.22 | 19.6 | 3511 | 2.63 | 9.97 | clear | | +39 |
| 0315 | 1.0 | 32.5 | .1 | 98.01 | 6.23 | 19.8 | 3542 | 2.26 | 9.46 | clear | | +33 |
| 0820 | .5 | 33.0 | .1 | 98.33 | 6.31 | 19.4 | 3522 | 2.18 | 9.17 | clear | | +31 |

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.05; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

| | | | |
|-------------------------------------------------------------|---------------------------------------------|-----------------------------------|-----------------------|
| SAMPLED BY (PRINT) / AFFILIATION: <u>Brett Surles / RDH</u> | SAMPLER(S) SIGNATURE(S): <u>[Signature]</u> | SAMPLING INITIATED AT: <u>N/A</u> | SAMPLING ENDED AT: |
| PUMP OR TUBING DEPTH IN WELL (feet): <u>107/100</u> | TUBING MATERIAL CODE: <u>PE</u> | FIELD-FILTERED: Y N | FILTER SIZE: _____ µm |
| FIELD DECONTAMINATION: PUMP Y N TUBING Y N (replaced) | | DUPLICATE: Y N | |

| SAMPLE CONTAINER SPECIFICATION | | | | SAMPLE PRESERVATION | | | INTENDED ANALYSIS AND/OR METHOD | SAMPLING EQUIPMENT CODE | SAMPLE PUMP FLOW RATE (mL per minute) |
|--------------------------------|--------------|---------------|--------|---------------------|-------------------------------|----------|---------------------------------|-------------------------|---------------------------------------|
| SAMPLE ID CODE | # CONTAINERS | MATERIAL CODE | VOLUME | PRESERVATIVE USED | TOTAL VOL ADDED IN FIELD (mL) | FINAL pH | | | |
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REMARKS: Well Development

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; RFP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Revision Date: February 12, 2009

1600 - Slowed - To .1gpm
Stopped @ 1610 - Let recharge over night

Form FD 9000-24
GROUNDWATER SAMPLING LOG

SITE NAME: Plant Gargers SITE LOCATION: Parish #1
 WELL NO.: _____ SAMPLE ID: MW-14 DATE: 11/18/14

PURGING DATA

WELL DIAMETER (inches): 2 TUBING DIAMETER (inches): 3/8 WELL SCREEN INTERVAL DEPTH: _____ TO WATER (feet): 89.54 PURGE PUMP TYPE OR BAILER: ESP
 WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
 = 1163.65 feet - 89.54 (14.11) feet X .16 gallons/foot = 2.25 gallons
 EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME ÷ (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
N/A = gallons ÷ (gallons/foot X feet) + gallons = gallons

INITIAL PUMP OR TUBING DEPTH IN WELL (feet): 102 FINAL PUMP OR TUBING DEPTH IN WELL (feet): 95 PURGING INITIATED AT: 1200 PURGING ENDED AT: 1410 TOTAL VOLUME PURGED (gallons): 120

| TIME | VOLUME PURGED (gallons) | CUMUL VOLUME PURGED (gallons) | PURGE RATE (gpm) | DEPTH TO WATER (feet) | pH (standard units) | TEMP. (°C) | COND. (circle units) (µmhos/cm or µS/cm) | DISSOLVED OXYGEN (circle units) (mg/L or % saturation) | TURBIDITY (NTUs) | COLOR (describe) | ODOR (describe) | |
|------|-------------------------|-------------------------------|------------------|-----------------------|---------------------|------------|---------------------------------------------|-----------------------------------------------------------|------------------|------------------|-----------------|-----|
| 1215 | 15 | 15 | 1.0 | 90.90 | 6.40 | 22.3 | 3234 | .11 | 542 | cloudy | none | -46 |
| 1230 | 15 | 30 | 1.0 | 90.91 | 6.36 | 25.1 | 3313 | .06 | 130 | cloudy | | -52 |
| 1245 | 15 | 45 | | | | | | | | | | |
| 1310 | 30 | 60 | 1.0 | 90.05 | 6.35 | 22.1 | 3351 | .08 | 166 | cloudy | | -48 |
| 1340 | 30 | 90 | 1.0 | 90.10 | 6.33 | 22.3 | 3373 | .06 | 16.8 | cloudy | | -42 |
| 1350 | 10 | 100 | 1.0 | 90.12 | 6.34 | 21.6 | 3375 | .06 | 10.0 | clear | | -41 |
| 1400 | 10 | 110 | 1.0 | 90.12 | 6.33 | 21.8 | 3370 | .06 | 9.71 | clear | | -39 |
| 1410 | 10 | 120 | 1.0 | 90.13 | 6.31 | 21.7 | 3366 | .05 | 9.54 | clear | | -35 |

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.05; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
 TUBING INSIDE DIA. CAPACITY (Gal./ft.): 1/8" = 0.0005; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.005; 1/2" = 0.010; 5/8" = 0.016
 PURGING EQUIPMENT CODES: B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

SAMPLED BY (PRINT) / AFFILIATION: Brett Sikes / RDT SAMPLER(S) SIGNATURE(S): _____
 PUMP OR TUBING DEPTH IN WELL (feet): 102 / 95 TUBING MATERIAL CODE: PE SAMPLING INITIATED AT: N/A SAMPLING ENDED AT: _____
 FIELD DECONTAMINATION: PUMP Y N TUBING Y N (replaced) DUPLICATE: Y N
 FIELD-FILTERED: Y N FILTER SIZE: _____ µm
 Filtration Equipment Type: _____

| SAMPLE CONTAINER SPECIFICATION | | | | SAMPLE PRESERVATION | | | INTENDED ANALYSIS AND/OR METHOD | SAMPLING EQUIPMENT CODE | SAMPLE PUMP FLOW RATE (mL per minute) |
|--------------------------------|--------------|---------------|--------|---------------------|-------------------------------|----------|---------------------------------|-------------------------|---------------------------------------|
| SAMPLE ID CODE | # CONTAINERS | MATERIAL CODE | VOLUME | PRESERVATIVE USED | TOTAL VOL ADDED IN FIELD (mL) | FINAL pH | | | |
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REMARKS: Well Development

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RPPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
 2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
 pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Pump stopped @ 1240 - Pull out + flushed. Revision Date: February 12, 2009

Form FD 9000-24
GROUNDWATER SAMPLING LOG

| | |
|--------------------------------|-----------------------------------------------|
| SITE NAME: <u>Plant Gorgas</u> | SITE LOCATION: <u>Parrish AI</u> |
| WELL NO: | SAMPLE ID: <u>MLW-9</u> DATE: <u>11/24/14</u> |

PURGING DATA

| | | | | |
|----------------------------------|--------------------------------------|----------------------------------------------------|---------------------------------------------|---------------------------------------|
| WELL DIAMETER (inches): <u>2</u> | TUBING DIAMETER (inches): <u>3/8</u> | WELL SCREEN INTERVAL DEPTH: feet to feet | STATIC DEPTH TO WATER (feet): <u>113.85</u> | PURGE PUMP TYPE OR BAILER: <u>ESP</u> |
|----------------------------------|--------------------------------------|----------------------------------------------------|---------------------------------------------|---------------------------------------|

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
 (only fill out if applicable)
 $= 1 \text{ } 123.0 \text{ feet} - 113.85 \text{ (9.15) (feet)} \times .16 \text{ gallons/foot} = 1.46 \text{ gallons}$

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL = PUMP VOLUME ÷ (TUBING CAPACITY X TUBING LENGTH) ÷ FLOW CELL VOLUME
 (only fill out if applicable)
 $\frac{.16}{.16} = \text{gallons} + (\text{gallons/foot} \times \text{feet}) \div \text{gallons} = \text{gallons}$

| | | | | |
|---------------------------------------------------------|-------------------------------------------------------|-----------------------------------|-------------------------------|--------------------------------------------|
| INITIAL PUMP OR TUBING DEPTH IN WELL (feet): <u>122</u> | FINAL PUMP OR TUBING DEPTH IN WELL (feet): <u>120</u> | PURGING INITIATED AT: <u>0835</u> | PURGING ENDED AT: <u>1645</u> | TOTAL VOLUME PURGED (gallons): <u>26.0</u> |
|---------------------------------------------------------|-------------------------------------------------------|-----------------------------------|-------------------------------|--------------------------------------------|

| TIME | VOLUME PURGED (gallons) | CUMUL VOLUME PURGED (gallons) | PURGE RATE (gpm) | DEPTH TO WATER (feet) | pH (standard units) | TEMP. (°C) | COND. (circle units) $\mu\text{mhos/cm}$ or $\mu\text{S/cm}$ | DISSOLVED OXYGEN (circle units) mg/L or % saturation | TURBIDITY (NTUs) | COLOR (describe) | ODOR (describe) | ORP |
|-----------------|-------------------------|-------------------------------|------------------|-----------------------|---------------------|------------|--------------------------------------------------------------|---------------------------------------------------------------|------------------|------------------|-----------------|------|
| 0855 | 5 | 5 | .5 | 118.65 | 7.05 | 21.6 | 1402 | 4.35 | >1000 | Gray | none | +54 |
| 0915 | 10 | 15 | .5 | 121.22 | 7.00 | 21.5 | 977 | 3.88 | >1000 | Gray | | +60 |
| 1025 | 3 | 18 | .3 | 117.0 | 6.98 | 20.9 | 875 | 3.11 | >1000 | Gray | | +71 |
| 1455 | 1 | 19 | .1 | 115.60 | 7.18 | 18.9 | 901 | 6.38 | >1000 | Gray | | +79 |
| 1525 | 3 | 22 | .1 | 117.52 | 7.04 | 18.5 | 1965 | 6.65 | 193 | cloudy | | +85 |
| 1555 | 3 | 25 | .1 | | | | | | | | | |
| 1555 | 1.5 | 23.5 | .05 | 118.14 | 7.02 | 17.0 | 1453 | 5.89 | 27.4 | cloudy | | +93 |
| 1615 | 1 | 24.5 | .05 | 118.35 | 6.99 | 16.5 | 1352 | 5.52 | 21.1 | cloudy | | +98 |
| 1645 | 1.5 | 26.0 | .05 | 118.61 | 6.99 | 15.9 | 1307 | 5.50 | 15.2 | clear | | +100 |

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.05; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
 TUBING INSIDE DIA. CAPACITY (Gal./Ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.006; 1/2" = 0.010; 5/8" = 0.016
 PURGING EQUIPMENT CODES: B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

| | | | |
|-------------------------------------------------------------|---------------------------------------------|------------------------|----------------------------------|
| SAMPLED BY (PRINT) / AFFILIATION: <u>Brett Surles / RDT</u> | SAMPLER(S) SIGNATURE(S): <u>[Signature]</u> | SAMPLING INITIATED AT: | SAMPLING ENDED AT: |
| PUMP OR TUBING DEPTH IN WELL (feet): <u>122 / 120</u> | TUBING MATERIAL CODE: <u>PE</u> | FIELD-FILTERED: Y N | FILTER SIZE: _____ μm |
| FIELD DECONTAMINATION: PUMP Y N TUBING Y N (replaced) | DUPLICATE: Y N | | |

| SAMPLE CONTAINER SPECIFICATION | | | | SAMPLE PRESERVATION | | | INTENDED ANALYSIS AND/OR METHOD | SAMPLING EQUIPMENT CODE | SAMPLE PUMP FLOW RATE (mL per minute) |
|--------------------------------|--------------|---------------|--------|---------------------|-------------------------------|----------|---------------------------------|-------------------------|---------------------------------------|
| SAMPLE ID CODE | # CONTAINERS | MATERIAL CODE | VOLUME | PRESERVATIVE USED | TOTAL VOL ADDED IN FIELD (mL) | FINAL pH | | | |
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| | | | | | | | | | |

REMARKS: RE - Well Development

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)
 SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RFP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
 2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
 pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: $\pm 5\%$ Dissolved Oxygen: all readings $\leq 20\%$ saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or $\pm 10\%$ (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or $\pm 10\%$ (whichever is greater)

Revision Date: February 12, 2009

well going dry @ 0915
1015-WL-118.60 - Restart 1115 WL 113.90
changed record app @ 1025/stop

Form FD 9000-24
GROUNDWATER SAMPLING LOG

| | |
|--------------------------------|----------------------------------------------|
| SITE NAME: <u>Plant Gorgas</u> | SITE LOCATION: <u>Parish A1</u> |
| WELL NO: | SAMPLE ID: <u>MW-3</u> DATE: <u>11/25/14</u> |

PURGING DATA

| | | | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|------------------------------------------|---------------------------------------------|------------------------------------------|
| WELL DIAMETER (inches): <u>2</u> | TUBING DIAMETER (inches): <u>1.375</u> | WELL SCREEN INTERVAL DEPTH: feet to feet | STATIC DEPTH TO WATER (feet): <u>110.55</u> | PURGE PUMP TYPE OR BAILER: <u>ESP BP</u> |
| WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY (only fill out if applicable) <u>= (118.85 feet - 110.55 (8.27) feet) X .16 gallons/foot = 1.32 gallons</u> | | | | |
| EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL = PUMP VOLUME ÷ (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME (only fill out if applicable) <u>N/A = gallons + (gallons/foot X feet) + gallons = gallons</u> | | | | |

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|---------------------------------------------------------|-------------------------------------------------------|-----------------------------------|-------------------------------|-------------------------------------------|
| INITIAL PUMP OR TUBING DEPTH IN WELL (feet): <u>118</u> | FINAL PUMP OR TUBING DEPTH IN WELL (feet): <u>114</u> | PURGING INITIATED AT: <u>0745</u> | PURGING ENDED AT: <u>1055</u> | TOTAL VOLUME PURGED (gallons): <u>9.5</u> |
|---------------------------------------------------------|-------------------------------------------------------|-----------------------------------|-------------------------------|-------------------------------------------|

| TIME | VOLUME PURGED (gallons) | CUMUL VOLUME PURGED (gallons) | PURGE RATE (gpm) | DEPTH TO WATER (feet) | pH (standard units) | TEMP. (°C) | COND. (circle units) µmhos/cm or (µS/cm) | DISSOLVED OXYGEN (circle units) mg/L or % saturation | TURBIDITY (NTUs) | COLOR (describe) | ODOR (describe) | ORP |
|------|-------------------------|-------------------------------|------------------|-----------------------|---------------------|------------|------------------------------------------|------------------------------------------------------|------------------|------------------|-----------------|-----|
| 0755 | .5 | .5 | .05 | 109.41 | 6.14 | 13.7 | 3235 | 1.20 | >1000 | gray | none | -11 |
| 0825 | 1.5 | 2.0 | .05 | 110.85 | 5.67 | 13.9 | 1263 | 4.40 | 687 | cloudy | | +83 |
| 0855 | 1.5 | 3.5 | .05 | 111.09 | 5.52 | 14.9 | 1750 | 2.74 | 375 | cloudy | | +98 |
| 0925 | 1.5 | 5.0 | .05 | 111.10 | 5.70 | 15.5 | 2466 | 1.57 | 59.7 | cloudy | | +61 |
| 0955 | 1.5 | 6.5 | .05 | 111.12 | 5.78 | 15.4 | 2926 | .56 | 23.4 | cloudy | | +47 |
| 1025 | 1.5 | 8.0 | .05 | 111.12 | 5.83 | 15.9 | 3146 | .42 | 13.3 | clear | | +38 |
| 1055 | 1.5 | 9.5 | .05 | 111.13 | 5.83 | 16.2 | 3177 | .38 | 8.77 | clear | | +35 |

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0026; 5/16" = 0.004; 3/8" = 0.005; 1/2" = 0.010; 5/8" = 0.016
PURGING EQUIPMENT CODES: B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

| | | | |
|------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------|-----------------------|
| SAMPLED BY (PRINT) / AFFILIATION: <u>Brett Sales / RDH</u> | SAMPLER(S) SIGNATURE(S): <u>[Signature]</u> | SAMPLING INITIATED AT: <u>N/A</u> | SAMPLING ENDED AT: |
| PUMP OR TUBING DEPTH IN WELL (feet): <u>118 / 114</u> | TUBING MATERIAL CODE: <u>PE</u> | FIELD-FILTERED: Y <input checked="" type="checkbox"/> N | FILTER SIZE: _____ µm |
| FIELD DECONTAMINATION: PUMP Y N TUBING Y N (replaced) | DUPLICATE: Y N | | |

| SAMPLE CONTAINER SPECIFICATION | | | | SAMPLE PRESERVATION | | | INTENDED ANALYSIS AND/OR METHOD | SAMPLING EQUIPMENT CODE | SAMPLE PUMP FLOW RATE (mL per minute) |
|--------------------------------|--------------|---------------|--------|---------------------|-------------------------------|----------|---------------------------------|-------------------------|---------------------------------------|
| SAMPLE ID CODE | # CONTAINERS | MATERIAL CODE | VOLUME | PRESERVATIVE USED | TOTAL VOL ADDED IN FIELD (mL) | FINAL pH | | | |
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REMARKS: well development

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicons; T = Teflon; O = Other (Specify)
SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RPPP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: ± 5% Dissolved Oxygen: all readings ≤ 20% saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or ± 10% (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or ± 10% (whichever is greater)

Started @ 0700 - no water coming up Revision Date: February 12, 2009
Pooled pump + intake screen plugged with mud.
Pur 5 gallons of water into well restart @ 0745

Form FD 9000-24
GROUNDWATER SAMPLING LOG

| | |
|--------------------------------|----------------------------------------------|
| SITE NAME: <u>Plant Borgas</u> | SITE LOCATION: <u>Parrish A1</u> |
| WELL NO: | SAMPLE ID: <u>mw-5</u> DATE: <u>11/25/14</u> |

PURGING DATA

| | | | | |
|----------------------------------|--------------------------------------|----------------------------------------------------|---------------------------------------------|--------------------------------------|
| WELL DIAMETER (inches): <u>2</u> | TUBING DIAMETER (inches): <u>1/4</u> | WELL SCREEN INTERVAL DEPTH: feet to feet | STATIC DEPTH TO WATER (feet): <u>126.17</u> | PURGE PUMP TYPE OR BAILER: <u>BP</u> |
|----------------------------------|--------------------------------------|----------------------------------------------------|---------------------------------------------|--------------------------------------|

WELL VOLUME PURGE: 1 WELL VOLUME = (TOTAL WELL DEPTH - STATIC DEPTH TO WATER) X WELL CAPACITY
(only fill out if applicable)

= (137.3 feet - 126.17) (11.13) (feet) X 1.16 gallons/foot = 1.78 gallons

EQUIPMENT VOLUME PURGE: 1 EQUIPMENT VOL. = PUMP VOLUME + (TUBING CAPACITY X TUBING LENGTH) + FLOW CELL VOLUME
(only fill out if applicable)

N/A = gallons + (gallons/foot X feet) + gallons = gallons

| | | | | |
|---------------------------------------------------------|-------------------------------------------------------|-----------------------------------|-------------------------------|------------------------------------------|
| INITIAL PUMP OR TUBING DEPTH IN WELL (feet): <u>136</u> | FINAL PUMP OR TUBING DEPTH IN WELL (feet): <u>128</u> | PURGING INITIATED AT: <u>1145</u> | PURGING ENDED AT: <u>1445</u> | TOTAL VOLUME PURGED (gallons): <u>18</u> |
|---------------------------------------------------------|-------------------------------------------------------|-----------------------------------|-------------------------------|------------------------------------------|

| TIME | VOLUME PURGED (gallons) | CUMUL VOLUME PURGED (gallons) | PURGE RATE (gpm) | DEPTH TO WATER (feet) | pH (standard units) | TEMP. (°C) | COND. (circle units) $\mu\text{mhos/cm}$ or $\mu\text{S/cm}$ | DISSOLVED OXYGEN (circle units) (mg/l) or % saturation | TURBIDITY (NTUs) | COLOR (describe) | ODOR (describe) | <u>ORP</u> |
|------|-------------------------|-------------------------------|------------------|-----------------------|---------------------|------------|--------------------------------------------------------------|--------------------------------------------------------|------------------|------------------|-----------------|------------|
| 1155 | 1 | 1 | .1 | 126.28 | 6.47 | 18.0 | 3360 | .68 | >1000 | orange | none | +12 |
| 1225 | 3 | 4 | .1 | 126.40 | 6.49 | 17.5 | 3476 | .50 | 336 | cloudy | | +13 |
| 1255 | 3 | 7 | .1 | 126.53 | 6.50 | 18.1 | 3634 | .42 | 116 | cloudy | | -4 |
| 1325 | 3 | 10 | .1 | 126.59 | 6.50 | 18.0 | 3659 | .38 | 56.7 | cloudy | | -8 |
| 1355 | 3 | 13 | .1 | 126.63 | 6.50 | 17.8 | 3685 | .35 | 16.4 | cloudy | | -13 |
| 1425 | 3 | 16 | .1 | 126.66 | 6.50 | 17.8 | 3685 | .33 | 11.4 | clear | | -15 |
| 1435 | 1 | 17 | .1 | 126.69 | 6.51 | 17.9 | 3682 | .30 | 9.97 | clear | | -16 |
| 1445 | 1 | 18 | .1 | 126.71 | 6.51 | 17.9 | 3679 | .28 | 9.28 | clear | | -15 |

WELL CAPACITY (Gallons Per Foot): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3" = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47; 12" = 5.88
TUBING INSIDE DIA. CAPACITY (Gal./ft.): 1/8" = 0.0006; 3/16" = 0.0014; 1/4" = 0.0025; 5/16" = 0.004; 3/8" = 0.008; 1/2" = 0.010; 5/8" = 0.016

PURGING EQUIPMENT CODES: B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Other (Specify)

SAMPLING DATA

| | | | |
|----------------------------------------------------------------|----------------------------------------|-----------------------------------|--------------------|
| SAMPLED BY (PRINT) / AFFILIATION: <u>Brett Surles / RDH</u> | SAMPLER(S) SIGNATURE(S): <u>B-S</u> | SAMPLING INITIATED AT: <u>N/A</u> | SAMPLING ENDED AT: |
|----------------------------------------------------------------|----------------------------------------|-----------------------------------|--------------------|

| | | |
|-------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------|
| PUMP OR TUBING DEPTH IN WELL (feet): <u>136 / 128</u> | TUBING MATERIAL CODE: <u>PE</u> | FIELD-FILTERED: Y N FILTER SIZE: _____ μm Filtration Equipment Type: |
|-------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------|

| | |
|------------------------------------------------------------|----------------|
| FIELD DECONTAMINATION: PUMP Y N TUBING Y N (replaced) | DUPLICATE: Y N |
|------------------------------------------------------------|----------------|

| SAMPLE CONTAINER SPECIFICATION | | | | SAMPLE PRESERVATION | | | INTENDED ANALYSIS AND/OR METHOD | SAMPLING EQUIPMENT CODE | SAMPLE PUMP FLOW RATE (mL per minute) |
|--------------------------------|--------------|---------------|--------|---------------------|-------------------------------|----------|---------------------------------|-------------------------|---------------------------------------|
| SAMPLE ID CODE | # CONTAINERS | MATERIAL CODE | VOLUME | PRESERVATIVE USED | TOTAL VOL ADDED IN FIELD (mL) | FINAL pH | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

REMARKS: Well Development

MATERIAL CODES: AG = Amber Glass; CG = Clear Glass; PE = Polyethylene; PP = Polypropylene; S = Silicone; T = Teflon; O = Other (Specify)

SAMPLING EQUIPMENT CODES: APP = After Peristaltic Pump; B = Bailor; BP = Bladder Pump; ESP = Electric Submersible Pump; RFP = Reverse Flow Peristaltic Pump; SM = Straw Method (Tubing Gravity Drain); O = Other (Specify)

NOTES: 1. The above do not constitute all of the information required by Chapter 62-160, F.A.C.
2. STABILIZATION CRITERIA FOR RANGE OF VARIATION OF LAST THREE CONSECUTIVE READINGS (SEE FS 2212, SECTION 3)
pH: ± 0.2 units Temperature: ± 0.2 °C Specific Conductance: $\pm 5\%$ Dissolved Oxygen: all readings $\leq 20\%$ saturation (see Table FS 2200-2); optionally, ± 0.2 mg/L or $\pm 10\%$ (whichever is greater) Turbidity: all readings ≤ 20 NTU; optionally ± 5 NTU or $\pm 10\%$ (whichever is greater)

**Civil Field Services
Daily Calibration Log**

Site ID _____ Plant Gorgas
 Site Location _____ Parrish, AI

| Analysis Equipment Used | Equipment S. Number |
|-------------------------|---------------------|
| YSI556 | 09L101038 |
| Lamotte 20/20 | 13446 |
| | |

Instrument Calibration

| Day 1 | | Day 2 | | Day 3 | | Day 4 | | Day 5 | | Day 6 | | Day 7 | |
|-----------------------|------------------|-----------------------|------------------|-----------------------|------------------|-----------------------|-------|-----------------------|-------|-----------------------|-------|-----------------------|-------|
| pH | | pH | | pH | | pH | | pH | | pH | | pH | |
| 4.01= | <u>3.98</u> | 4.01= | <u>4.10</u> | 4.01= | <u>4.00</u> | 4.01= | _____ | 4.01= | _____ | 4.01= | _____ | 4.01= | _____ |
| 7.00= | <u>6.99</u> | 7.00= | <u>7.05</u> | 7.00= | <u>6.98</u> | 7.00= | _____ | 7.00= | _____ | 7.00= | _____ | 7.00= | _____ |
| 10.00= | <u>9.92</u> | 10.00= | <u>9.88</u> | 10.00= | <u>9.93</u> | 10.00= | _____ | 10.00= | _____ | 10.00= | _____ | 10.00= | _____ |
| Conductivity | | Conductivity | | Conductivity | | Conductivity | | Conductivity | | Conductivity | | Conductivity | |
| 4.49 mS/cm = | <u>4.46</u> | 4.49 mS/cm = | <u>4.39</u> | 4.49 mS/cm = | <u>4.46</u> | 4.49 mS/cm = | _____ |
| DO | | DO | | DO | | DO | | DO | | DO | | DO | |
| % Saturation | _____ | % Saturation | _____ | % Saturation | _____ | % Saturation | _____ | % Saturation | _____ | % Saturation | _____ | % Saturation | _____ |
| Barometric Pressure | _____ | Barometric Pressure | _____ | Barometric Pressure | _____ | Barometric Pressure | _____ | Barometric Pressure | _____ | Barometric Pressure | _____ | Barometric Pressure | _____ |
| Turbidity Zero (NTUs) | | Turbidity Zero (NTUs) | | Turbidity Zero (NTUs) | | Turbidity Zero (NTUs) | | Turbidity Zero (NTUs) | | Turbidity Zero (NTUs) | | Turbidity Zero (NTUs) | |
| 0.00 = | <u>0.00</u> | 0.00 = | <u>0.00</u> | 0.00 = | <u>0.00</u> | 0.00 = | _____ | 0.00 = | _____ | 0.00 = | _____ | 0.00 = | _____ |
| 1.00 = | _____ | 1.00 = | _____ | 1.00 = | _____ | 1.00 = | _____ | 1.00 = | _____ | 1.00 = | _____ | 1.00 = | _____ |
| 10.00 = | <u>10.00</u> | 10.00 = | <u>10.00</u> | 10.00 = | <u>10.00</u> | 10.00 = | _____ | 10.00 = | _____ | 10.00 = | _____ | 10.00 = | _____ |
| 100.00 = | _____ | 100.00 = | _____ | 100.00 = | _____ | 100.00 = | _____ | 100.00 = | _____ | 100.00 = | _____ | 100.00 = | _____ |
| Date: | <u>2/20/2012</u> | Date: | <u>2/21/2012</u> | Date: | <u>2/22/2012</u> | Date: | _____ | Date: | _____ | Date: | _____ | Date: | _____ |
| Time: | <u>1230</u> | Time: | <u>700</u> | Time: | <u>700</u> | Time: | _____ | Time: | _____ | Time: | _____ | Time: | _____ |

Alabama Power
 General Test Laboratory
 P.O. Box 2641
 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

Customer: Mr. Greg Dyer
 Gorgas Background Sampling

Customer Account : WGORGWS1
 Sample Date : 22-Oct-12
 Customer ID :
 Delivery Date : 24-Oct-12

Description: Gorgas Groundwater S-1

Laboratory ID Number: AS25329

| Name | Analyst | Test Date | Reference | Vio Spec | MDL | Results | Units |
|---------------------------------------|---------|------------|-----------|----------|-------|--------------|-------|
| <i>Metals, Cyanide, Total Phenols</i> | | | | | | | |
| Aluminum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | 0.059 | mg/l |
| Antimony, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.003 | 0.004 | mg/l |
| Arsenic, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.004 | 0.010 | mg/l |
| Barium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.010 | mg/l |
| Beryllium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | Not Detected | mg/l |
| Boron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | 0.061 | mg/l |
| Cadmium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Calcium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.10 | 435. | mg/l |
| Chromium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Cobalt, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Copper, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Iron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | 0.130 | mg/l |
| Lead, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Magnesium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.05 | 677. | mg/l |
| Manganese, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.013 | mg/l |
| Molybdenum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.01 | Not Detected | mg/l |
| Nickel, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.011 | mg/l |
| Potassium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.012 | 9.93 | mg/l |
| Selenium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.020 | mg/l |
| Silicon, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.02 | 6.12 | mg/l |
| Silver, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Sodium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 46.1 | mg/l |
| Strontium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.551 | mg/l |

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Comments:

cc:

Quality Control _____ Supervision _____

Date: 31-Oct-12

Alabama Power
 General Test Laboratory
 P.O. Box 2641
 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

cc: Mr. Greg Dyer
 Gorgas Background Sampling

Customer Account : WGORGWS1
 Sample Date : 22-Oct-12
 Customer ID :
 Delivery Date : 24-Oct-12

Description: Gorgas Groundwater S-1

Laboratory ID Number: AS25329

| Name | Analyst | Test Date | Reference | Vio Spec | MDL | Results | Units |
|---------------------------------------|---------|------------|--------------|----------|-------|--------------|------------|
| Metals, Cyanide, Total Phenols | | | | | | | |
| Thallium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | 0.005 | mg/l |
| Tin, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | Not Detected | mg/l |
| Titanium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Vanadium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.067 | mg/l |
| Zinc - Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.021 | mg/l |
| General Characteristics | | | | | | | |
| pH | CHM | 10/29/2012 | SM 4500H+ B | | 0.00 | 7.31 | SU |
| Alkalinity, Total as CaCO3 | CHM | 10/29/2012 | SM 2320 B | | 0.1 | 188.0 | mg/l-CaCO3 |
| Bicarbonate Alkalinity, as CaCO3 | CHM | 10/29/2012 | SM 4500CO2 D | | 0.1 | 187.6 | mg/l-CaCO3 |
| Chloride | KRC | 10/30/2012 | EPA 300.0 | | 0.03 | Not Detected | mg/l |
| Sulfate | KRC | 10/30/2012 | EPA 300.0 | | 30.0 | 2982 | mg/l |

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 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

Customer Account : WGORGWS2
 Sample Date : 24-Oct-12
 Customer ID :
 Delivery Date : 24-Oct-12

cc: Mr. Greg Dyer
 Gorgas Background Sampling

Description: Gorgas Groundwater S-2

Laboratory ID Number: AS25330

| Name | Analyst | Test Date | Reference | Vio Spec | MDL | Results | Units |
|---------------------------------------|---------|------------|-----------|----------|-------|--------------|-------|
| <i>Metals, Cyanide, Total Phenols</i> | | | | | | | |
| Aluminum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | 0.588 | mg/l |
| Antimony, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.003 | 0.003 | mg/l |
| Arsenic, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.004 | 0.005 | mg/l |
| Barium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.032 | mg/l |
| Beryllium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | Not Detected | mg/l |
| Boron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | 0.061 | mg/l |
| Cadmium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Calcium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.10 | 110. | mg/l |
| Chromium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Cobalt, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.311 | mg/l |
| Copper, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Iron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | 3.14 | mg/l |
| Lead, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Magnesium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.05 | 184. | mg/l |
| Manganese, Total | HRG | 10/31/2012 | EPA 200.7 | | 0.01 | 26.5 | mg/l |
| Molybdenum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.01 | Not Detected | mg/l |
| Nickel, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.072 | mg/l |
| Potassium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.012 | 5.68 | mg/l |
| Selenium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.009 | mg/l |
| Silicon, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.02 | 9.22 | mg/l |
| Silver, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Sodium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.05 | 101. | mg/l |
| Strontium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.331 | mg/l |

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 General Test Laboratory
 P.O. Box 2641
 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

Customer: Mr. Greg Dyer
 Gorgas Background Sampling

Customer Account : WGORGWS2
 Sample Date : 24-Oct-12
 Customer ID :
 Delivery Date : 24-Oct-12

Description: Gorgas Groundwater S-2

Laboratory ID Number: AS25330

| Name | Analyst | Test Date | Reference | Vio Spec | MDL | Results | Units |
|---------------------------------------|---------|------------|--------------|----------|-------|--------------|------------|
| Metals, Cyanide, Total Phenols | | | | | | | |
| Thallium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | Not Detected | mg/l |
| Tin, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | Not Detected | mg/l |
| Titanium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.029 | mg/l |
| Vanadium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.058 | mg/l |
| Zinc - Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.077 | mg/l |
| General Characteristics | | | | | | | |
| pH | CHM | 10/29/2012 | SM 4500H+ B | | 0.00 | 6.18 | SU |
| Alkalinity, Total as CaCO3 | CHM | 10/29/2012 | SM 2320 B | | 0.1 | 61.2 | mg/l-CaCO3 |
| Bicarbonate Alkalinity, as CaCO3 | CHM | 10/29/2012 | SM 4500CO2 D | | 0.1 | 61.2 | mg/l-CaCO3 |
| Chloride | KRC | 10/30/2012 | EPA 300.0 | | 0.03 | 12.3 | mg/l |
| Sulfate | KRC | 10/30/2012 | EPA 300.0 | | 30.0 | 962 | mg/l |

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 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

Customer: Mr. Greg Dyer
 Gorgas Background Sampling

Customer Account : WGORGWD1
 Sample Date : 22-Oct-12
 Customer ID :
 Delivery Date : 24-Oct-12

Description: Gorgas Groundwater D-1

Laboratory ID Number: AS25331

| Name | Analyst | Test Date | Reference | Vio Spec | MDL | Results | Units |
|---------------------------------------|---------|------------|-----------|----------|-------|--------------|-------|
| Metals, Cyanide, Total Phenols | | | | | | | |
| Aluminum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | Not Detected | mg/l |
| Antimony, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.003 | Not Detected | mg/l |
| Arsenic, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.004 | 0.009 | mg/l |
| Barium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.039 | mg/l |
| Beryllium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | Not Detected | mg/l |
| Boron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | 0.193 | mg/l |
| Cadmium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Calcium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.10 | 240. | mg/l |
| Chromium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Cobalt, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Copper, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Iron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | 3.86 | mg/l |
| Lead, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Magnesium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.05 | 136. | mg/l |
| Manganese, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.288 | mg/l |
| Molybdenum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.01 | Not Detected | mg/l |
| Nickel, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.006 | mg/l |
| Potassium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.012 | 8.28 | mg/l |
| Selenium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Silicon, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.02 | 8.89 | mg/l |
| Silver, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Sodium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.05 | 377. | mg/l |
| Strontium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 3.91 | mg/l |

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Date: 31-Oct-12

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 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

Customer: Mr. Greg Dyer
 Gorgas Background Sampling

Customer Account : WGORGWD1
 Sample Date : 22-Oct-12
 Customer ID :
 Delivery Date : 24-Oct-12

Description: Gorgas Groundwater D-1

Laboratory ID Number: AS25331

| Name | Analyst | Test Date | Reference | Vio Spec | MDL | Results | Units |
|---------------------------------------|---------|------------|--------------|----------|-------|--------------|------------|
| Metals, Cyanide, Total Phenols | | | | | | | |
| Thallium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | 0.004 | mg/l |
| Tin, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | Not Detected | mg/l |
| Titanium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Vanadium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.053 | mg/l |
| Zinc - Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.011 | mg/l |
| General Characteristics | | | | | | | |
| pH | CHM | 10/29/2012 | SM 4500H+ B | | 0.00 | 7.62 | SU |
| Alkalinity, Total as CaCO3 | CHM | 10/29/2012 | SM 2320 B | | 0.1 | 359.4 | mg/l-CaCO3 |
| Bicarbonate Alkalinity, as CaCO3 | CHM | 10/29/2012 | SM 4500CO2 D | | 0.1 | 358.0 | mg/l-CaCO3 |
| Chloride | KRC | 10/30/2012 | EPA 300.0 | | 0.03 | Not Detected | mg/l |
| Sulfate | KRC | 10/30/2012 | EPA 300.0 | | 30.0 | 1388 | mg/l |

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CERTIFICATE OF ANALYSIS

o: Mr. Greg Dyer
 Gorgas Background Sampling

Customer Account : WGORGWD9
 Sample Date : 23-Oct-12
 Customer ID :
 Delivery Date : 24-Oct-12

Description: Gorgas Groundwater D-9

Laboratory ID Number: AS25332

| Name | Analyst | Test Date | Reference | Vio Spec | MDL | Results | Units |
|---------------------------------------|---------|------------|-----------|----------|-------|--------------|-------|
| <i>Metals, Cyanide, Total Phenols</i> | | | | | | | |
| Aluminum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | 0.042 | mg/l |
| Antimony, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.003 | Not Detected | mg/l |
| Arsenic, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.004 | 0.005 | mg/l |
| Barium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.048 | mg/l |
| Beryllium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | Not Detected | mg/l |
| Boron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | 0.063 | mg/l |
| Cadmium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Calcium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.10 | 222. | mg/l |
| Chromium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Cobalt, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Copper, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Iron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | 4.45 | mg/l |
| Lead, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Magnesium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.05 | 130. | mg/l |
| Manganese, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.368 | mg/l |
| Molybdenum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.01 | Not Detected | mg/l |
| Nickel, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.004 | mg/l |
| Potassium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.012 | 3.06 | mg/l |
| Selenium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Silicon, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.02 | 15.7 | mg/l |
| Silver, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Sodium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 48.0 | mg/l |
| Strontium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.715 | mg/l |

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Comments:

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Quality Control _____ Supervision _____

Date: 31-Oct-12

Alabama Power
 General Test Laboratory
 P.O. Box 2641
 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

Customer Account : WGORGWD9
 Sample Date : 23-Oct-12
 Customer ID :
 Delivery Date : 24-Oct-12

Mr. Greg Dyer
 Gorgas Background Sampling

Description: Gorgas Groundwater D-9

Laboratory ID Number: AS25332

| Name | Analyst | Test Date | Reference | Vio Spec | MDL | Results | Units |
|---------------------------------------|---------|------------|--------------|----------|-------|--------------|------------|
| Metals, Cyanide, Total Phenols | | | | | | | |
| Thallium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | 0.004 | mg/l |
| Tin, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | Not Detected | mg/l |
| Titanium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Vanadium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.052 | mg/l |
| Zinc - Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.009 | mg/l |
| General Characteristics | | | | | | | |
| pH | CHM | 10/29/2012 | SM 4500H+ B | | 0.00 | 7.24 | SU |
| Alkalinity, Total as CaCO3 | CHM | 10/29/2012 | SM 2320 B | | 0.1 | 220.0 | mg/l-CaCO3 |
| Bicarbonate Alkalinity, as CaCO3 | CHM | 10/29/2012 | SM 4500CO2 D | | 0.1 | 219.6 | mg/l-CaCO3 |
| Chloride | KRC | 10/30/2012 | EPA 300.0 | | 0.03 | 11.0 | mg/l |
| Sulfate | KRC | 10/30/2012 | EPA 300.0 | | 30.0 | 715 | mg/l |

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 General Test Laboratory
 P.O. Box 2641
 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

To: Mr. Greg Dyer
 Gorgas Background Sampling

Customer Account : WGORGWDUP
 Sample Date : 23-Oct-12
 Customer ID :
 Delivery Date : 24-Oct-12

Description: Gorgas Groundwater DUP-01

Laboratory ID Number: AS25333

| Name | Analyst | Test Date | Reference | Vio Spec | MDL | Results | Units |
|---------------------------------------|---------|------------|-----------|----------|-------|--------------|-------|
| <i>Metals, Cyanide, Total Phenols</i> | | | | | | | |
| Aluminum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | 0.052 | mg/l |
| Antimony, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.003 | Not Detected | mg/l |
| Arsenic, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.004 | Not Detected | mg/l |
| Barium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.049 | mg/l |
| Beryllium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | Not Detected | mg/l |
| Boron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | 0.060 | mg/l |
| Cadmium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Calcium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.10 | 222. | mg/l |
| Chromium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Cobalt, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Copper, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Iron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | 4.78 | mg/l |
| Lead, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Magnesium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.05 | 130. | mg/l |
| Manganese, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.375 | mg/l |
| Molybdenum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.01 | Not Detected | mg/l |
| Nickel, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | 0.001 | mg/l |
| Potassium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.012 | 3.14 | mg/l |
| Selenium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Silicon, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.02 | 16.1 | mg/l |
| Silver, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Sodium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 49.1 | mg/l |
| Strontium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.732 | mg/l |

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Date: 31-Oct-12

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 General Test Laboratory
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 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

To: Mr. Greg Dyer
 Gorgas Background Sampling

Customer Account : WGORGWDUP
 Sample Date : 23-Oct-12
 Customer ID :
 Delivery Date : 24-Oct-12

Description: Gorgas Groundwater DUP-01

Laboratory ID Number: AS25333

| Name | Analyst | Test Date | Reference | Vio Spec | MDL | Results | Units |
|---------------------------------------|---------|------------|--------------|----------|-------|--------------|------------|
| Metals, Cyanide, Total Phenols | | | | | | | |
| Thallium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | 0.006 | mg/l |
| Tin, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | Not Detected | mg/l |
| Titanium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Vanadium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.052 | mg/l |
| Zinc - Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.009 | mg/l |
| General Characteristics | | | | | | | |
| pH | CHM | 10/29/2012 | SM 4500H+ B | | 0.00 | 7.08 | SU |
| Alkalinity, Total as CaCO3 | CHM | 10/29/2012 | SM 2320 B | | 0.1 | 225.4 | mg/l-CaCO3 |
| Bicarbonate Alkalinity, as CaCO3 | CHM | 10/29/2012 | SM 4500CO2 D | | 0.1 | 225.1 | mg/l-CaCO3 |
| Chloride | KRC | 10/30/2012 | EPA 300.0 | | 0.03 | 11.0 | mg/l |
| Sulfate | KRC | 10/30/2012 | EPA 300.0 | | 30.0 | 726 | mg/l |

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 General Test Laboratory
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 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

Customer: Mr. Greg Dyer
 Gorgas Background Sampling

Customer Account : WGORIEB01
 Sample Date : 22-Oct-12
 Customer ID :
 Delivery Date : 24-Oct-12

Description: Gorgas DI Water EB-01

Laboratory ID Number: AS25334

| Name | Analyst | Test Date | Reference | Vio Spec | MDL | Results | Units |
|---------------------------------------|---------|------------|-----------|----------|-------|--------------|-------|
| Metals, Cyanide, Total Phenols | | | | | | | |
| Aluminum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | Not Detected | mg/l |
| Antimony, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.003 | Not Detected | mg/l |
| Arsenic, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.004 | Not Detected | mg/l |
| Barium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | Not Detected | mg/l |
| Beryllium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | Not Detected | mg/l |
| Boron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | 0.014 | mg/l |
| Cadmium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Calcium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | 0.043 | mg/l |
| Chromium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Cobalt, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Copper, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Iron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | 0.038 | mg/l |
| Lead, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Magnesium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.017 | mg/l |
| Manganese, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | Not Detected | mg/l |
| Molybdenum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.01 | Not Detected | mg/l |
| Nickel, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | Not Detected | mg/l |
| Potassium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.012 | 0.029 | mg/l |
| Selenium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Silicon, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | 0.011 | mg/l |
| Silver, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Sodium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.047 | mg/l |
| Strontium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |

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Date: 31-Oct-12

Alabama Power
 General Test Laboratory
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 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

To: Mr. Greg Dyer
 Gorgas Background Sampling

Customer Account : WGORRPEB02
 Sample Date : 23-Oct-12
 Customer ID :
 Delivery Date : 24-Oct-12

Description: Gorgas Rinsed Pump EB-02

Laboratory ID Number: AS25335

| Name | Analyst | Test Date | Reference | Vio Spec | MDL | Results | Units |
|---------------------------------------|---------|------------|-----------|----------|-------|--------------|-------|
| Metals, Cyanide, Total Phenols | | | | | | | |
| Aluminum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | 0.017 | mg/l |
| Antimony, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.003 | Not Detected | mg/l |
| Arsenic, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.004 | Not Detected | mg/l |
| Barium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | Not Detected | mg/l |
| Beryllium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | Not Detected | mg/l |
| Boron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | Not Detected | mg/l |
| Cadmium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Calcium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.010 | 0.046 | mg/l |
| Chromium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Cobalt, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Copper, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Iron, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | 0.016 | mg/l |
| Lead, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Magnesium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.008 | mg/l |
| Manganese, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | Not Detected | mg/l |
| Molybdenum, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.01 | Not Detected | mg/l |
| Nickel, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.001 | Not Detected | mg/l |
| Potassium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.012 | Not Detected | mg/l |
| Selenium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Silicon, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | 0.015 | mg/l |
| Silver, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Sodium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.015 | mg/l |
| Strontium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |

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Date: 31-Oct-12

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 General Test Laboratory
 P.O. Box 2641
 Birmingham, Alabama 35291
 (205) 664 - 6032 or 6171
 FAX (205) 257-1654



CERTIFICATE OF ANALYSIS

Customer: Mr. Greg Dyer
 Gorgas Background Sampling

Customer Account : WGORRPEB02
 Sample Date : 23-Oct-12
 Customer ID :
 Delivery Date : 24-Oct-12

Description: Gorgas Rinsed Pump EB-02

Laboratory ID Number: AS25335

| Name | Analyst | Test Date | Reference | Vio Spec | MDL | Results | Units |
|---------------------------------------|---------|------------|--------------|----------|-------|--------------|------------|
| Metals, Cyanide, Total Phenols | | | | | | | |
| Thallium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | Not Detected | mg/l |
| Tin, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.002 | Not Detected | mg/l |
| Titanium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Vanadium, Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | Not Detected | mg/l |
| Zinc - Total | HRG | 10/26/2012 | EPA 200.7 | | 0.005 | 0.005 | mg/l |
| General Characteristics | | | | | | | |
| pH | CHM | 10/29/2012 | SM 4500H+ B | | 0.00 | 5.60 | SU |
| Alkalinity, Total as CaCO3 | CHM | 10/29/2012 | SM 2320 B | | 0.1 | 1.8 | mg/l-CaCO3 |
| Bicarbonate Alkalinity, as CaCO3 | CHM | 10/29/2012 | SM 4500CO2 D | | 0.1 | 1.8 | mg/l-CaCO3 |
| Chloride | KRC | 10/30/2012 | EPA 300.0 | | 0.03 | Not Detected | mg/l |
| Sulfate | KRC | 10/30/2012 | EPA 300.0 | | 0.30 | Not Detected | mg/l |

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Comments:

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Quality Control _____ Supervision _____

Date: 31-Oct-12

APPENDIX 4

**BOUNDARY SURVEY
&
DESIGN AND CONSTRUCTION
DRAWINGS**

CCB CELL DRAWINGS

ALABAMA POWER COMPANY PLANT GORGAS - UNITS 8 THRU 10 BAGHOUSE BYPRODUCT STORAGE FACILITY WALKER COUNTY, ALABAMA

DRAWING INDEX

- E8C11600 - TITLE SHEET & DRAWING INDEX
- E8C11601 - GENERAL NOTES & SPECIFICATIONS
- E8C11602 - EXISTING TOPOGRAPHIC & BORING/PIEZOMETER LOCATION MAP
- E8C11603 - OVERALL LANDFILL LAYOUT AND CELL DIVISIONS
- E8C11604 - GENERAL SITE DEVELOPMENT & CELL LAYOUT
- E8C11605 - CELL 1 BASE GRADING PLAN
- E8C11606 - CELL 1 STACKING PLAN
- E8C11607 - CELL 2 BASE GRADING PLAN
- E8C11608 - CELL 2 STACKING PLAN
- E8C11609 - CELL ACCESS ROAD PLAN & DETAILS
- E8C11610 - OVERALL LAYOUT LINER PLAN
- E8C11611 - CELL 1 STACK SECTIONS
- E8C11612 - CELL 2 STACK SECTIONS
- E8C11613 - TYPICAL DIKE SECTIONS
- E8C11614 - TYPICAL SECTIONS & DETAILS SHEET 1
- E8C11615 - TYPICAL SECTIONS & DETAILS SHEET 2
- E8C11616 - BOTTOM ASH STORAGE CELL LAYOUT
- E8C11617 - C&D STORAGE CELL LAYOUT
- E8C11618 - GROUNDWATER MONITORING NARRATIVE
- E8C11619 - GEOLOGIC CROSS SECTIONS
- E8C11620 - POTENTIOMETRIC SURFACE BEDROCK
- E8C11621 - POTENTIOMETRIC SURFACE OVERBURDEN
- E8C11622 - GROUNDWATER WELL LOCATIONS
- E8C11623 - FLOOD ZONE MAP
- E8C11624 - PROPERTY MAP AND LEGAL DESCRIPTION

RESPONSIBLE OFFICIAL

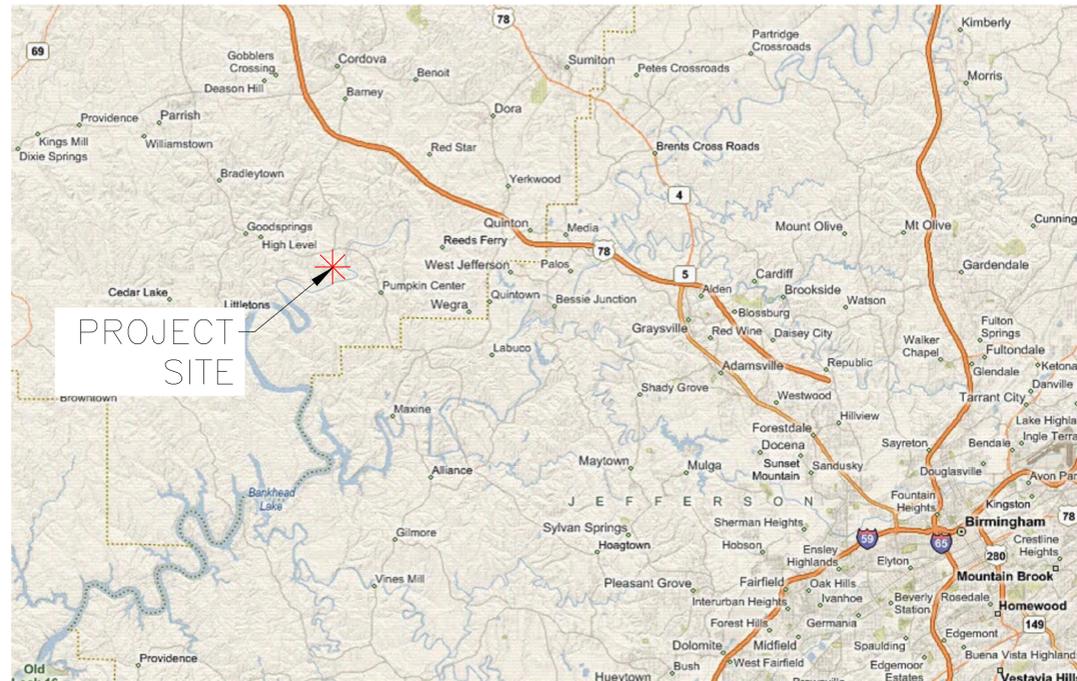
MR. MIKE GODFREY
ENVIRONMENTAL AFFAIRS MANAGER
ENVIRONMENTAL AFFAIRS
600 N 18TH STREET
BIRMINGHAM, AL 35203
(205) 257-6131

PROPERTY OWNER

ALABAMA POWER COMPANY
600 NORTH 18TH STREET
BIRMINGHAM, AL 35203

CONSULTANT

SOUTHERN COMPANY GENERATION
JIM PEGUES
BIN B426
42 INVERNESS CENTER PARKWAY
BIRMINGHAM, AL 35242
(205) 992-6002



VICINITY MAP
N.T.S.



PROJECT LOCATION
N.T.S.

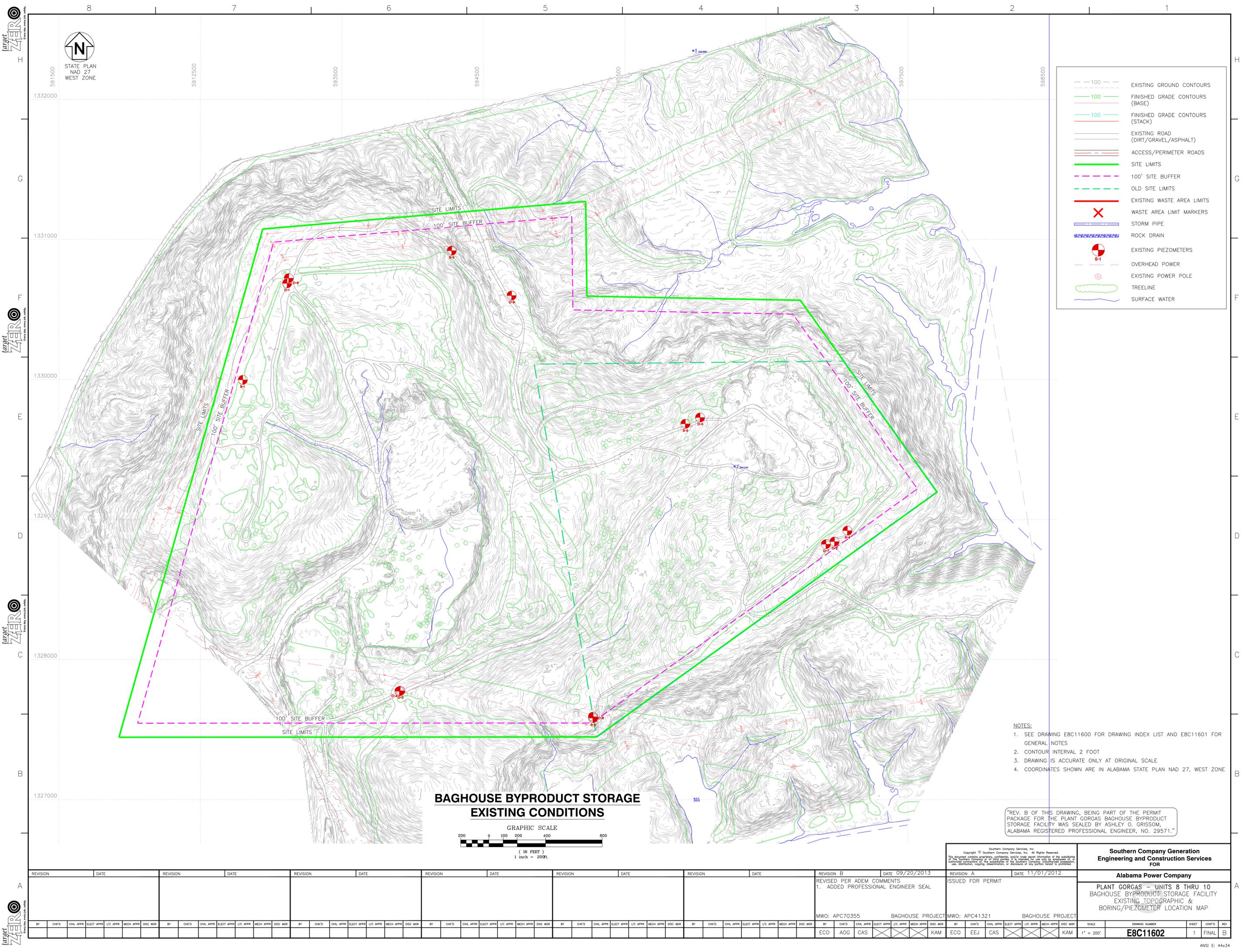
"REV. B OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS BAGHOUSE BYPRODUCT STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

| REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | | |
|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|---------------|------|------------------|------|---------------|------|------------------|------|-----|--|
| | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | REVISION B | | DATE 09/20/2013 | | REVISION A | | DATE 11/01/2012 | | | |
| | | | | | | | | | | | | MWO: APC70355 | | BAGHOUSE PROJECT | | MWO: APC41321 | | BAGHOUSE PROJECT | | | |
| | | | | | | | | | | | | ECO AOG CAS | | KAM | | ECO EEJ CAS | | KAM | | | |
| | | | | | | | | | | | | SCALE | | DRAWING NUMBER | | SHEET | | CONT'D | | REV | |
| | | | | | | | | | | | | NONE | | E8C11600 | | 1 | | FINAL | | B | |

**Southern Company Generation
Engineering and Construction Services
FOR**

Alabama Power Company

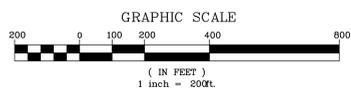
PLANT GORGAS - UNITS 8 THRU 10
BAGHOUSE BYPRODUCT STORAGE FACILITY
TITLE SHEET & DRAWING INDEX



STATE PLAN
NAD 27
WEST ZONE

| | | |
|--|-----|-------------------------------------|
| | 100 | EXISTING GROUND CONTOURS |
| | 100 | FINISHED GRADE CONTOURS (BASE) |
| | 100 | FINISHED GRADE CONTOURS (STACK) |
| | | EXISTING ROAD (DIRT/GRAVEL/ASPHALT) |
| | | ACCESS/PERIMETER ROADS |
| | | SITE LIMITS |
| | | 100' SITE BUFFER |
| | | OLD SITE LIMITS |
| | | EXISTING WASTE AREA LIMITS |
| | | WASTE AREA LIMIT MARKERS |
| | | STORM PIPE |
| | | ROCK DRAIN |
| | | EXISTING PIEZOMETERS |
| | | OVERHEAD POWER |
| | | EXISTING POWER POLE |
| | | TREELINE |
| | | SURFACE WATER |

**BAGHOUSE BYPRODUCT STORAGE
EXISTING CONDITIONS**

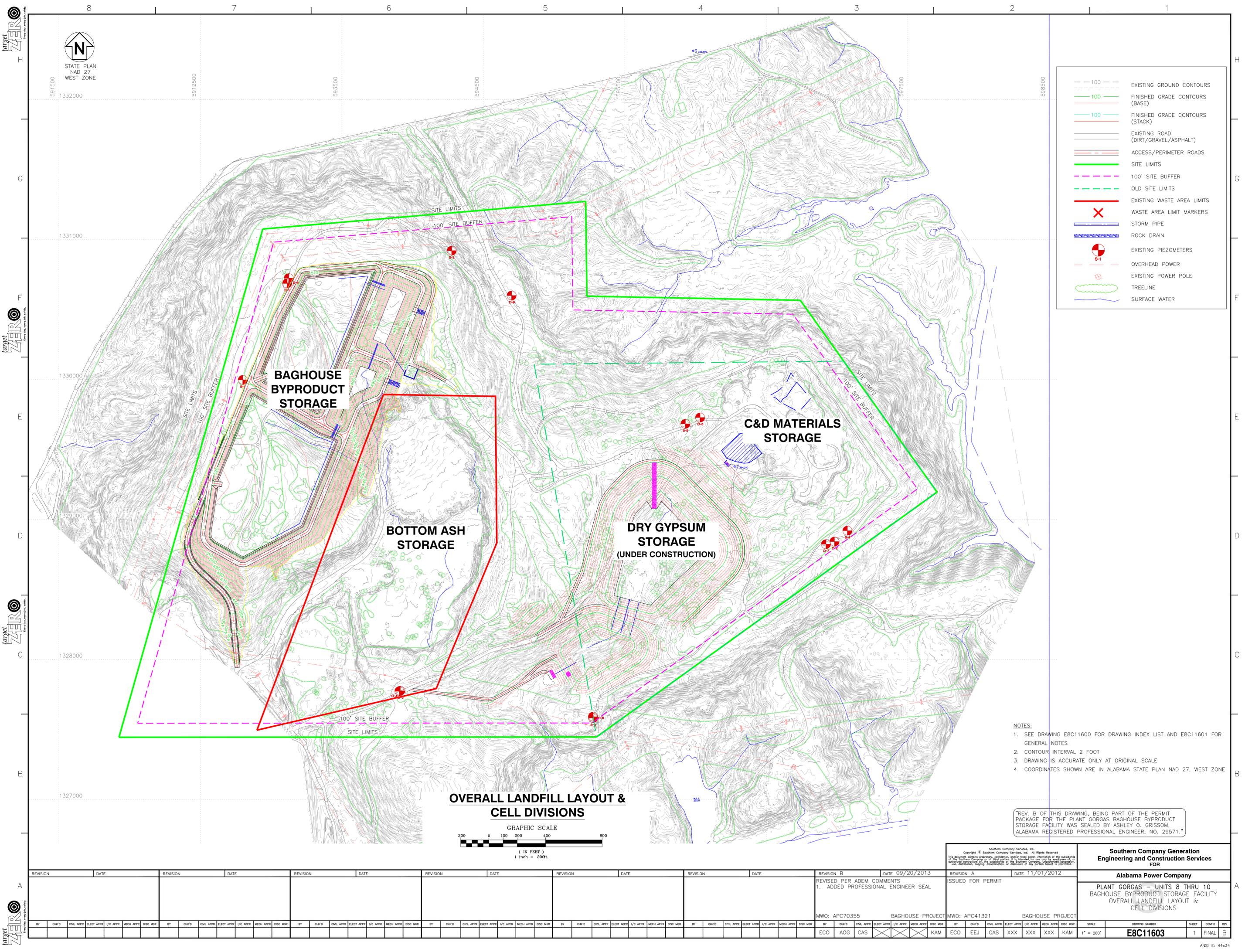


- NOTES:
- SEE DRAWING E8C11600 FOR DRAWING INDEX LIST AND E8C11601 FOR GENERAL NOTES
 - CONTOUR INTERVAL 2 FOOT
 - DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 - COORDINATES SHOWN ARE IN ALABAMA STATE PLAN NAD 27, WEST ZONE

"REV. B OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS BAGHOUSE BYPRODUCT STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

| | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
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| Alabama Power Company | | Alabama Power Company | |
| PLANT GORGAS - UNITS 8 THRU 10 BAGHOUSE BYPRODUCT STORAGE FACILITY EXISTING TOPOGRAPHIC & BORING/PIEZOMETER LOCATION MAP | | PLANT GORGAS - UNITS 8 THRU 10 BAGHOUSE BYPRODUCT STORAGE FACILITY EXISTING TOPOGRAPHIC & BORING/PIEZOMETER LOCATION MAP | |
| REVISION B DATE 09/20/2013 REVISED PER ADEM COMMENTS 1. ADDED PROFESSIONAL ENGINEER SEAL | REVISION A DATE 11/01/2012 ISSUED FOR PERMIT | MWO: APC70355 BAGHOUSE PROJECT | MWO: APC41321 BAGHOUSE PROJECT |
| ECO AOG CAS | BY DKD CAS | BY DKD ECO EEJ CAS | BY DKD ECO EEJ CAS |
| SCALE 1" = 200' | DRAWING NUMBER E8C11602 | SHEET 1 | CONT'D B |

| REVISION | DATE |
|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|
| | | | | | | | | | | | |

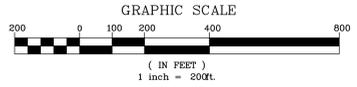


| | | |
|--|-----|-------------------------------------|
| | 100 | EXISTING GROUND CONTOURS |
| | 100 | FINISHED GRADE CONTOURS (BASE) |
| | 100 | FINISHED GRADE CONTOURS (STACK) |
| | | EXISTING ROAD (DIRT/GRAVEL/ASPHALT) |
| | | ACCESS/PERIMETER ROADS |
| | | SITE LIMITS |
| | | 100' SITE BUFFER |
| | | OLD SITE LIMITS |
| | | EXISTING WASTE AREA LIMITS |
| | | WASTE AREA LIMIT MARKERS |
| | | STORM PIPE |
| | | ROCK DRAIN |
| | | EXISTING PIEZOMETERS |
| | | OVERHEAD POWER |
| | | EXISTING POWER POLE |
| | | TREELINE |
| | | SURFACE WATER |

- NOTES:
- SEE DRAWING E8C11600 FOR DRAWING INDEX LIST AND E8C11601 FOR GENERAL NOTES
 - CONTOUR INTERVAL 2 FOOT
 - DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 - COORDINATES SHOWN ARE IN ALABAMA STATE PLAN NAD 27, WEST ZONE

"REV. B OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS BAGHOUSE BYPRODUCT STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

OVERALL LANDFILL LAYOUT & CELL DIVISIONS

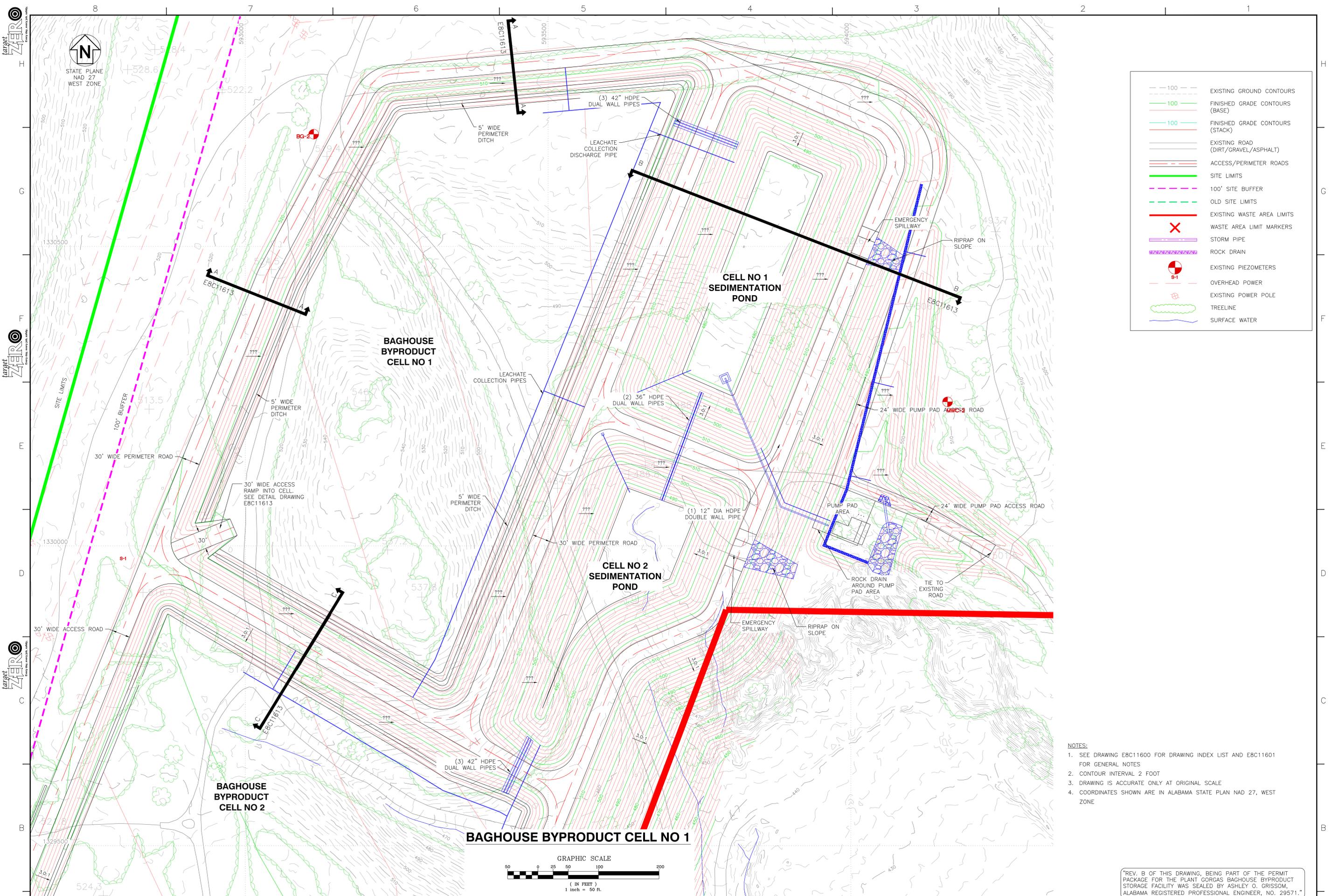


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|----------|-------|-----------|------------|----------|-----------|----------|------|----------|-----------|------------|---------|-------------------------------------|-------------------|---------------|------------------|-----------|----------------|---------|-----------|-----------------|----|-------|-----------|------------|---------|-----------|----------|--|
| REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION B | DATE 09/20/2013 | REVISION A | DATE 11/01/2012 | | | | | | | | | | | | | |
| | | | | | | | | | | | | REVISED PER ADEM COMMENTS | ISSUED FOR PERMIT | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | 1. ADDED PROFESSIONAL ENGINEER SEAL | | | | | | | | | | | | | | | | |
| BY | CHK'D | CIVL APPR | ELECT APPR | VC APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | VC APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | VC APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | VC APPR | MECH APPR | DISC MGR | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | MWO: APC70355 | BAGHOUSE PROJECT | MWO: APC41321 | BAGHOUSE PROJECT | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV | | | | | | | | |
| | | | | | | | | | | | | ECO | AOG | CAS | XXX | XXX | XXX | KAM | 1" = 200' | E8C11603 | 1 | FINAL | B | | | | | |

Southern Company Generation Engineering and Construction Services FOR

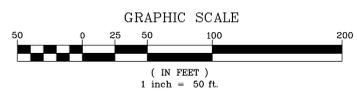
Alabama Power Company

PLANT GORGAS - UNITS 8 THRU 10
BAGHOUSE BYPRODUCT STORAGE FACILITY
OVERALL LANDFILL LAYOUT & CELL DIVISIONS



| | |
|--|-------------------------------------|
| | EXISTING GROUND CONTOURS |
| | FINISHED GRADE CONTOURS (BASE) |
| | FINISHED GRADE CONTOURS (STACK) |
| | EXISTING ROAD (DIRT/GRAVEL/ASPHALT) |
| | ACCESS/PERIMETER ROADS |
| | SITE LIMITS |
| | 100' SITE BUFFER |
| | OLD SITE LIMITS |
| | EXISTING WASTE AREA LIMITS |
| | WASTE AREA LIMIT MARKERS |
| | STORM PIPE |
| | ROCK DRAIN |
| | EXISTING PIEZOMETERS |
| | OVERHEAD POWER |
| | EXISTING POWER POLE |
| | TREELINE |
| | SURFACE WATER |

- NOTES:**
- SEE DRAWING E8C11600 FOR DRAWING INDEX LIST AND E8C11601 FOR GENERAL NOTES
 - CONTOUR INTERVAL 2 FOOT
 - DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 - COORDINATES SHOWN ARE IN ALABAMA STATE PLAN NAD 27, WEST ZONE



"REV. B OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS BAGHOUSE BYPRODUCT STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

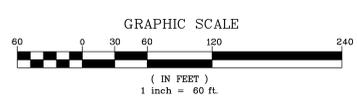
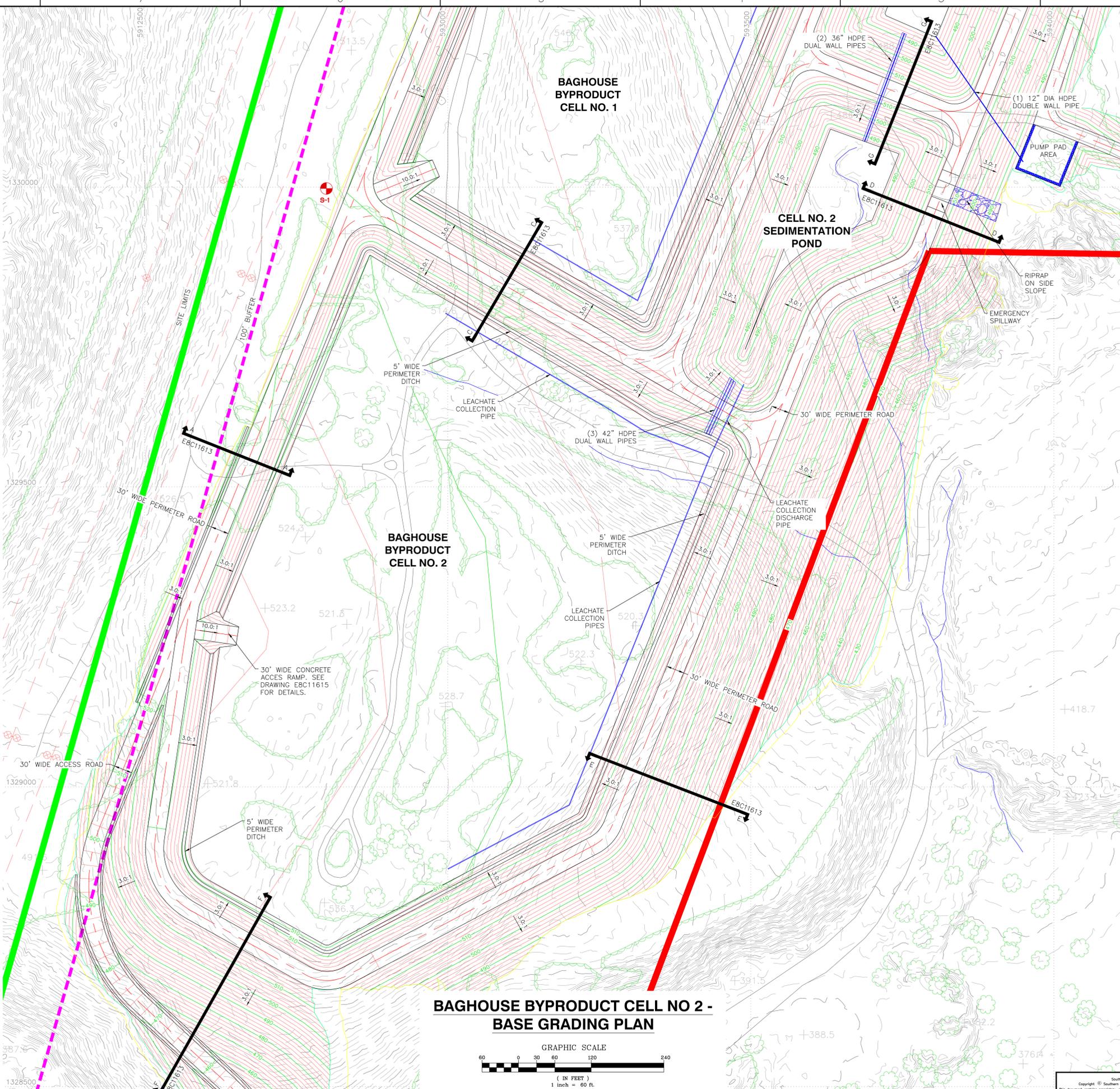
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|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------|--------------------------------|
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| Alabama Power Company | | Alabama Power Company | |
| PLANT GORGAS - UNITS 8 THRU 10 BAGHOUSE BYPRODUCT STORAGE FACILITY CELL NO. 1 BASE GRADING PLAN | | PLANT GORGAS - UNITS 8 THRU 10 BAGHOUSE BYPRODUCT STORAGE FACILITY CELL NO. 1 BASE GRADING PLAN | |
| REVISION B DATE 09/20/2013 REVISED PER ADEM COMMENTS 1. ADDED PROFESSIONAL ENGINEER SEAL | REVISION A DATE 11/01/2012 ISSUED FOR PERMIT | MWO: APC70355 BAGHOUSE PROJECT | MWO: APC41321 BAGHOUSE PROJECT |
| BY CHW'D ECO | BY CHW'D EEJ | BY CHW'D CAS | BY CHW'D KAM |
| SCALE 1"=50' | DRAWING NUMBER E8C11605 | SHEET 1 | CONT'D B |

| REVISION | DATE |
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| | | | | | | | | | | | | | |



STATE PLANE
NAD 27
WEST ZONE

| | | |
|--|-----|-------------------------------------|
| | 100 | EXISTING GROUND CONTOURS |
| | 100 | FINISHED GRADE CONTOURS (BASE) |
| | 100 | FINISHED GRADE CONTOURS (STACK) |
| | | EXISTING ROAD (DIRT/GRAVEL/ASPHALT) |
| | | ACCESS/PERIMETER ROADS |
| | | SITE LIMITS |
| | | 100' SITE BUFFER |
| | | OLD SITE LIMITS |
| | | EXISTING WASTE AREA LIMITS |
| | | WASTE AREA LIMIT MARKERS |
| | | STORM PIPE |
| | | ROCK DRAIN |
| | | EXISTING PIEZOMETERS |
| | | OVERHEAD POWER |
| | | EXISTING POWER POLE |
| | | TREELINE |
| | | SURFACE WATER |



- NOTES:**
- SEE DRAWING E8C11600 FOR DRAWING INDEX LIST AND E8C11601 FOR GENERAL NOTES
 - CONTOUR INTERVAL 2 FOOT
 - DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 - COORDINATES SHOWN ARE IN ALABAMA STATE PLAN NAD 27, WEST ZONE

"REV. B OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS BAGHOUSE BYPRODUCT STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

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Southern Company Generation Engineering and Construction Services FOR

Alabama Power Company

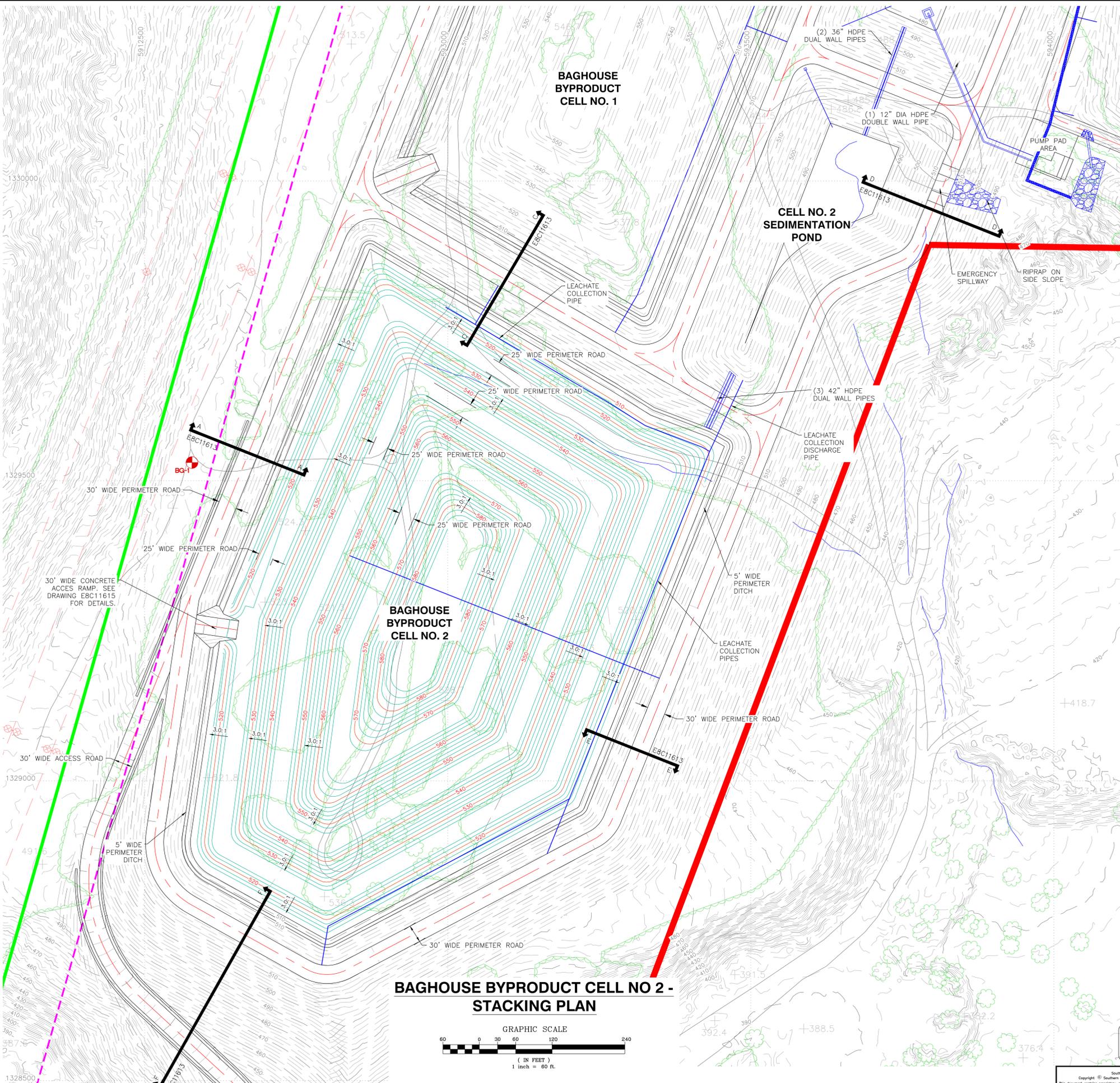
PLANT GORGAS - UNITS 8 THRU 10
BAGHOUSE BYPRODUCT STORAGE FACILITY
CELL NO. 2
BASE GRADING PLAN

| REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | | | | | | | | | | | | | | | | | | | | |
|----------|-------|----------|------------|----------|-----------|----------|------|----------|----------|------------|----------|-------------------------------------|------------------|---------------|------------------|----------|------------|----------|-----------|----------|----|-------|----------|------------|----------|-----------|----------|----|-------|----------|------------|----------|-----------|----------|----------|----------------|-------|--------|-----|
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | REVISION B | DATE 09/20/2013 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | REVISED PER ADEM COMMENTS | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | 1. ADDED PROFESSIONAL ENGINEER SEAL | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | REVISION A | DATE 11/01/2012 | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | ISSUED FOR PERMIT | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | MWO: APC70355 | BAGHOUSE PROJECT | MWO: APC41321 | BAGHOUSE PROJECT | | | | | | | | | | | | | | | | | | | | | | | | |
| BY | CHK'D | CNL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CNL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CNL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CNL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CNL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1"=60' | E8C11607 | 1 | FINAL | B | |

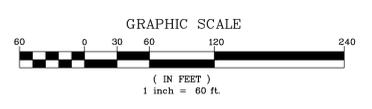


STATE PLANE
NAD 27
WEST ZONE

| | |
|--|-------------------------------------|
| | EXISTING GROUND CONTOURS |
| | FINISHED GRADE CONTOURS (BASE) |
| | FINISHED GRADE CONTOURS (STACK) |
| | EXISTING ROAD (DIRT/GRAVEL/ASPHALT) |
| | ACCESS/PERIMETER ROADS |
| | SITE LIMITS |
| | 100' SITE BUFFER |
| | OLD SITE LIMITS |
| | EXISTING WASTE AREA LIMITS |
| | WASTE AREA LIMIT MARKERS |
| | STORM PIPE |
| | ROCK DRAIN |
| | EXISTING PIEZOMETERS |
| | OVERHEAD POWER |
| | EXISTING POWER POLE |
| | TREELINE |
| | SURFACE WATER |



**BAGHOUSE BYPRODUCT CELL NO 2 -
STACKING PLAN**

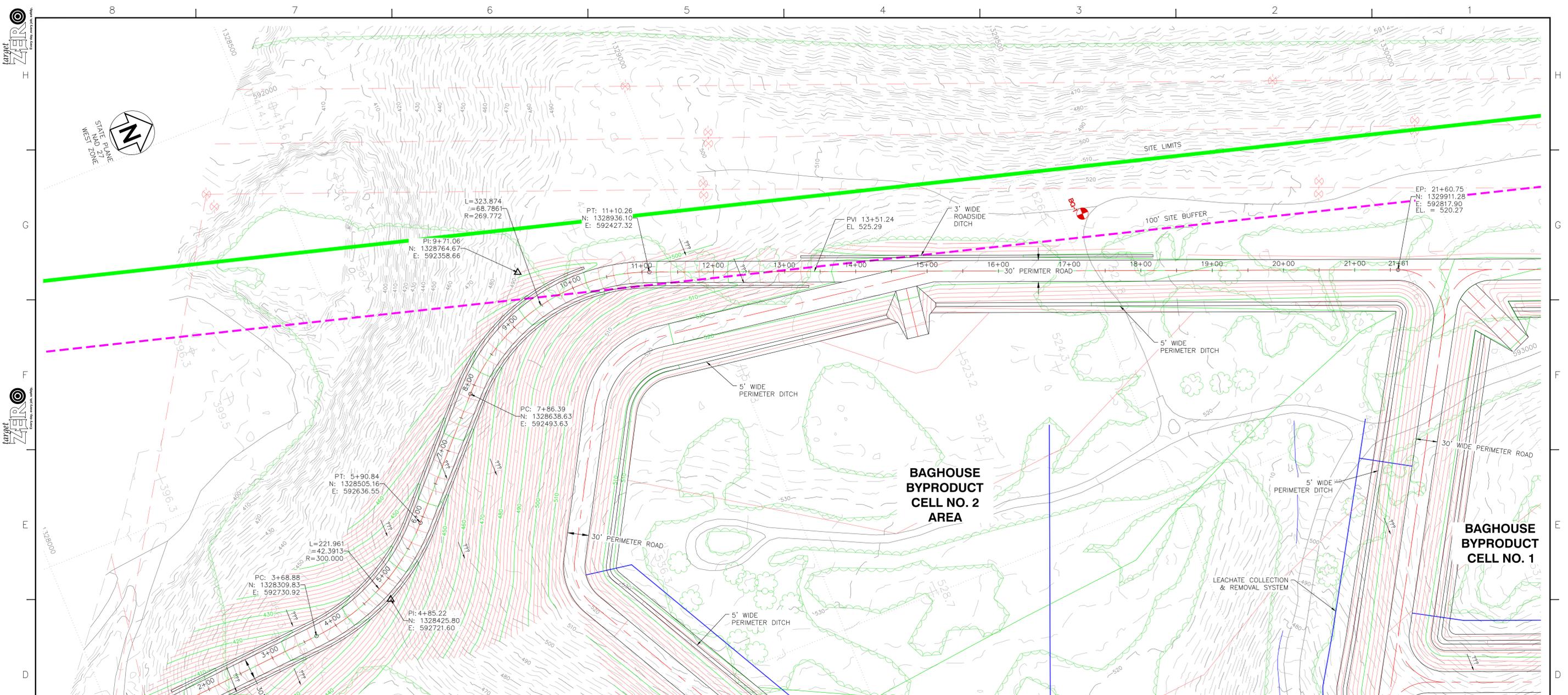


- NOTES:**
- SEE DRAWING E8C11600 FOR DRAWING INDEX LIST AND E8C11601 FOR GENERAL NOTES
 - CONTOUR INTERVAL 2 FOOT
 - DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 - COORDINATES SHOWN ARE IN ALABAMA STATE PLAN NAD 27, WEST ZONE

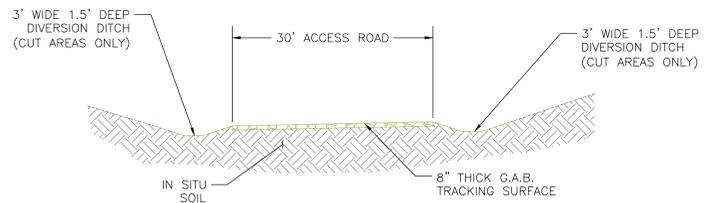
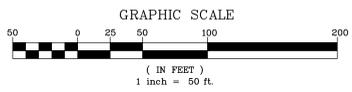
"REV. B OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS BAGHOUSE BYPRODUCT STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

| | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------|
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| Alabama Power Company | | Alabama Power Company | |
| PLANT GORGAS - UNITS 8 THRU 10 BAGHOUSE BYPRODUCT STORAGE FACILITY CELL NO. 2 STACKING PLAN | | PLANT GORGAS - UNITS 8 THRU 10 BAGHOUSE BYPRODUCT STORAGE FACILITY CELL NO. 2 STACKING PLAN | |
| REVISION B REVISED PER ADEM COMMENTS 1. ADDED PROFESSIONAL ENGINEER SEAL DATE 09/20/2013 | REVISION A ISSUED FOR PERMIT DATE 11/01/2012 | MWO: APC70355 BAGHOUSE PROJECT | MWO: APC41321 BAGHOUSE PROJECT |
| BY: ECO CHK'D: AOG CIVL APPR: CAS ELECT APPR: KAM | BY: EEJ CHK'D: ECO CIVL APPR: RCB ELECT APPR: KAM | SCALE: 1"=60' DRAWING NUMBER: E8C11608 | SHEET: 1 CONT'D: B REV: B |

| REVISION | DATE |
|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|
| | | | | | | | | | | | |



**BAGHOUSE BYPRODUCT CELL NO 1
ACCESS ROAD**



**ACCESS ROAD
TYPICAL SECTION**
N.T.S.

NOTES:

- SEE DRAWING E8C11600 FOR DRAWING INDEX LIST AND E8C11601 FOR GENERAL NOTES
- CONTOUR INTERVAL 2 FOOT
- DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
- COORDINATES SHOWN ARE IN ALABAMA STATE PLAN NAD 27, WEST ZONE

"REV. B OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS BAGHOUSE BYPRODUCT STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

| | |
|--|-------------------------------------|
| | EXISTING GROUND CONTOURS |
| | FINISHED GRADE CONTOURS (BASE) |
| | FINISHED GRADE CONTOURS (STACK) |
| | EXISTING ROAD (DIRT/GRAVEL/ASPHALT) |
| | ACCESS/PERIMETER ROADS |
| | SITE LIMITS |
| | 100' SITE BUFFER |
| | OLD SITE LIMITS |
| | EXISTING WASTE AREA LIMITS |
| | WASTE AREA LIMIT MARKERS |
| | STORM PIPE |
| | ROCK DRAIN |
| | EXISTING PIEZOMETERS |
| | OVERHEAD POWER |
| | EXISTING POWER POLE |
| | TREELINE |
| | SURFACE WATER |

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**Southern Company Generation
Engineering and Construction Services
FOR**

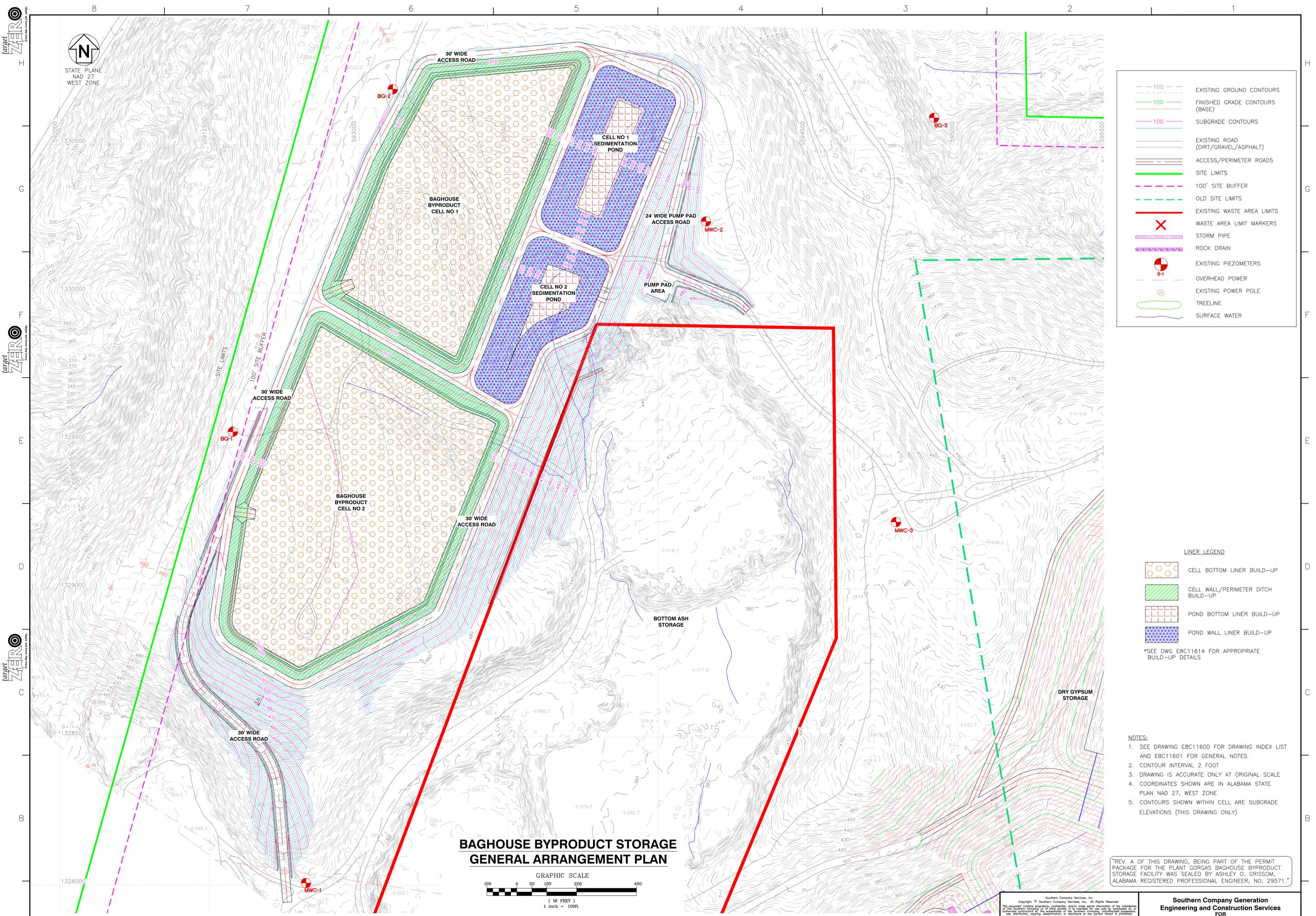
Alabama Power Company
PLANT GORGAS - UNITS 8 THRU 10
BAGHOUSE BYPRODUCT STORAGE FACILITY
ACCESS ROAD PLAN & DETAILS

| REVISION | DATE |
|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|
| | | | | | | | | | | | | | | | |

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|------------------------------------------------------------------|------------------|
| REVISION B | DATE 09/20/2013 |
| REVISED PER ADEM COMMENTS 1. ADDED PROFESSIONAL ENGINEER SEAL | |
| MWO: APC70355 | BAGHOUSE PROJECT |
| ECO | AOG CAS |

| | |
|-------------------|------------------|
| REVISION A | DATE 11/01/2012 |
| ISSUED FOR PERMIT | |
| MWO: APC41321 | BAGHOUSE PROJECT |
| EEJ | ECO CAS |

| | | | | |
|--------|----------------|-------|--------|-----|
| SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
| 1"=50' | E8C11609 | 1 | FINAL | B |



| | | |
|--|-----|-------------------------------------|
| | 100 | EXISTING GROUND CONTOURS |
| | 100 | FINISHED GRADE CONTOURS (BASE) |
| | 100 | SUBGRADE CONTOURS |
| | | EXISTING ROAD (DIRT/GRAVEL/ASPHALT) |
| | | ACCESS/PERIMETER ROADS |
| | | SITE LIMITS |
| | | 100' SITE BUFFER |
| | | OLD SITE LIMITS |
| | | EXISTING WASTE AREA LIMITS |
| | | WASTE AREA LIMIT MARKERS |
| | | STORM PIPE |
| | | ROCK DRAIN |
| | | EXISTING PIEZOMETERS |
| | | OVERHEAD POWER |
| | | EXISTING POWER POLE |
| | | TREELINE |
| | | SURFACE WATER |

LINER LEGEND

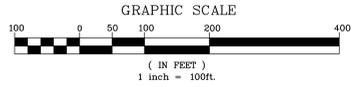
| | |
|--|------------------------------------|
| | CELL BOTTOM LINER BUILD-UP |
| | CELL WALL/PERIMETER DITCH BUILD-UP |
| | POND BOTTOM LINER BUILD-UP |
| | POND WALL LINER BUILD-UP |

*SEE DWG EBC11614 FOR APPROPRIATE BUILD-UP DETAILS

- NOTES:**
- SEE DRAWING EBC11600 FOR DRAWING INDEX LIST AND EBC11601 FOR GENERAL NOTES
 - CONTOUR INTERVAL 2 FOOT
 - DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 - COORDINATES SHOWN ARE IN ALABAMA STATE PLAN NAD 27, WEST ZONE
 - CONTOURS SHOWN WITHIN CELL ARE SUBGRADE ELEVATIONS (THIS DRAWING ONLY)

"REV. A OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS BAGHOUSE BYPRODUCT STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

**BAGHOUSE BYPRODUCT STORAGE
GENERAL ARRANGEMENT PLAN**



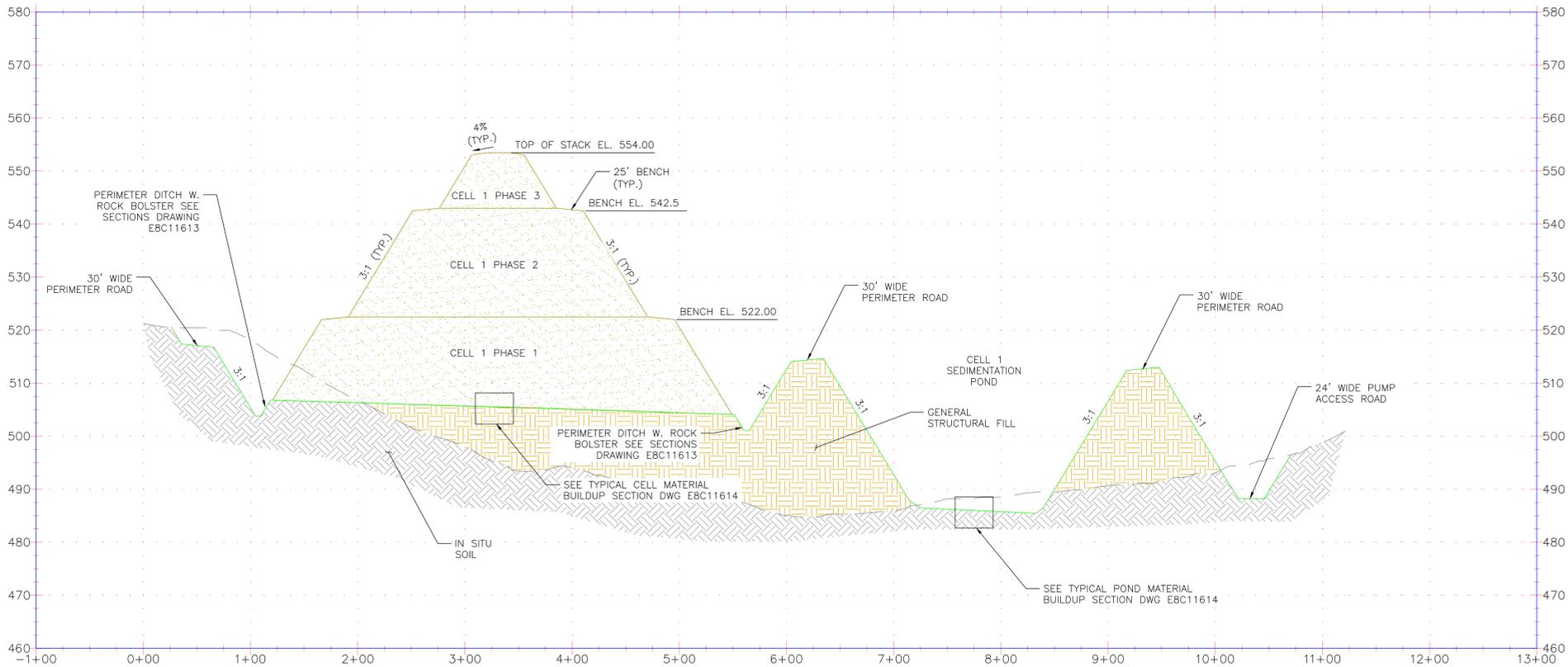
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**Southern Company Generation
Engineering and Construction Services
FOR**

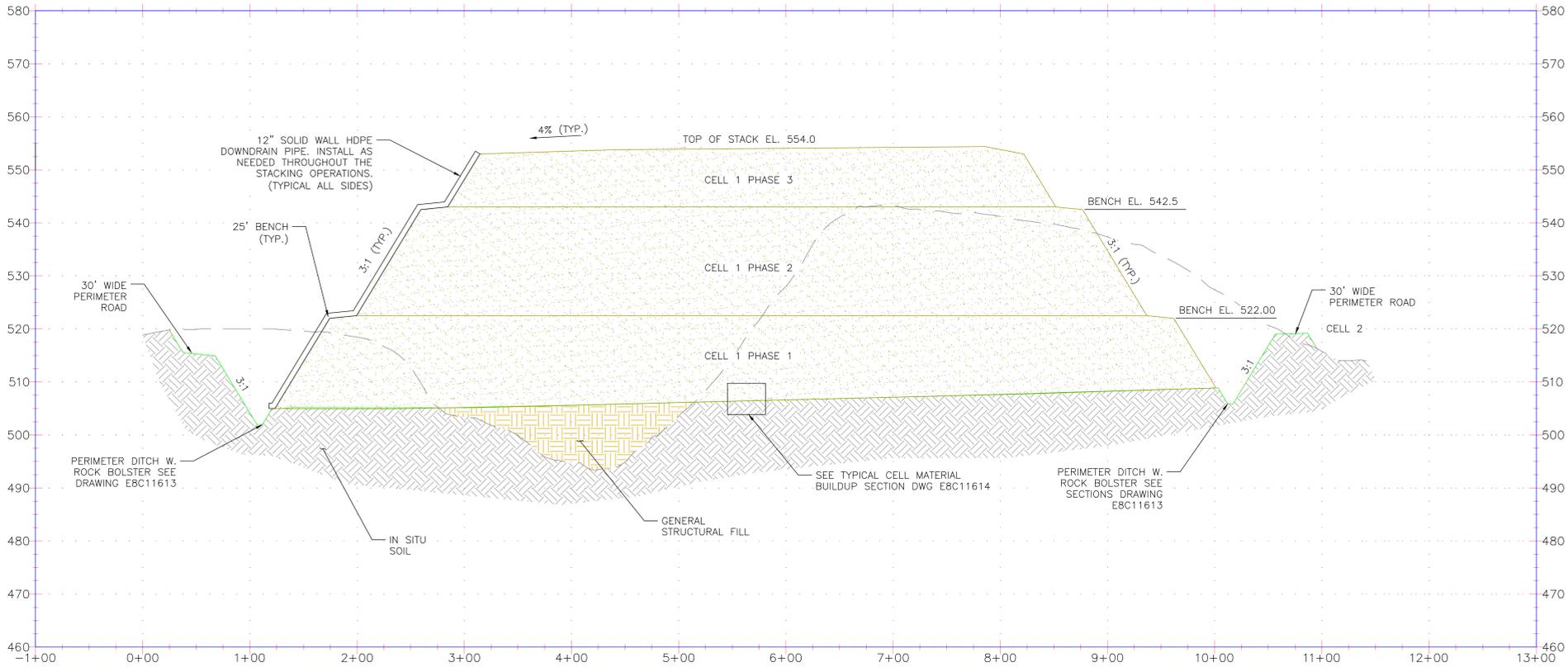
Alabama Power Company
PLANT GORGAS - UNITS 8 THRU 10
BAGHOUSE BYPRODUCT STORAGE FACILITY
OVERALL LINER PLAN

| REVISION | DATE |
|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|
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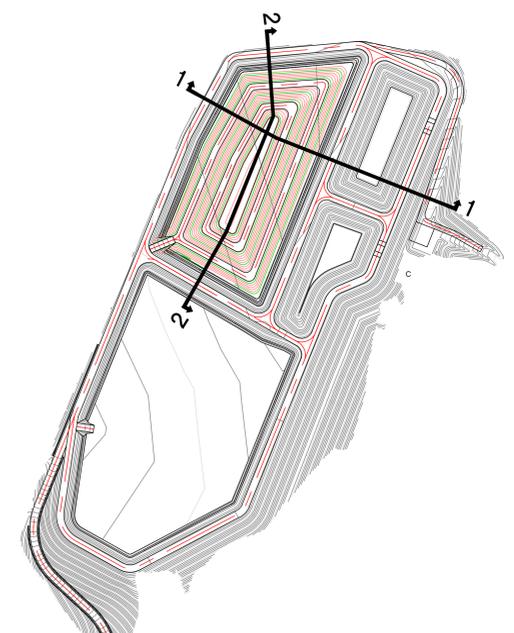
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| REVISION A | DATE 09/20/2013 | | | | | | | | | | | | | | |
| ISSUED FOR PERMIT | | | | | | | | | | | | | | | |
| MWO: APC70355 | BAGHOUSE PROJECT | | | | | | | | | | | | | | |
| BY ECO | CHKD AOG | ENGR CAS | ENGR XAP |
| SCALE 1" = 100' | DRAWING NUMBER E8C11610 | SHEET 1 | CONT'D | REV A | | | | | | | | | | | |



SECTION 1-1
V: 1" = 10'
H: 1" = 50'



SECTION 2-2
V: 1" = 10'
H: 1" = 50'

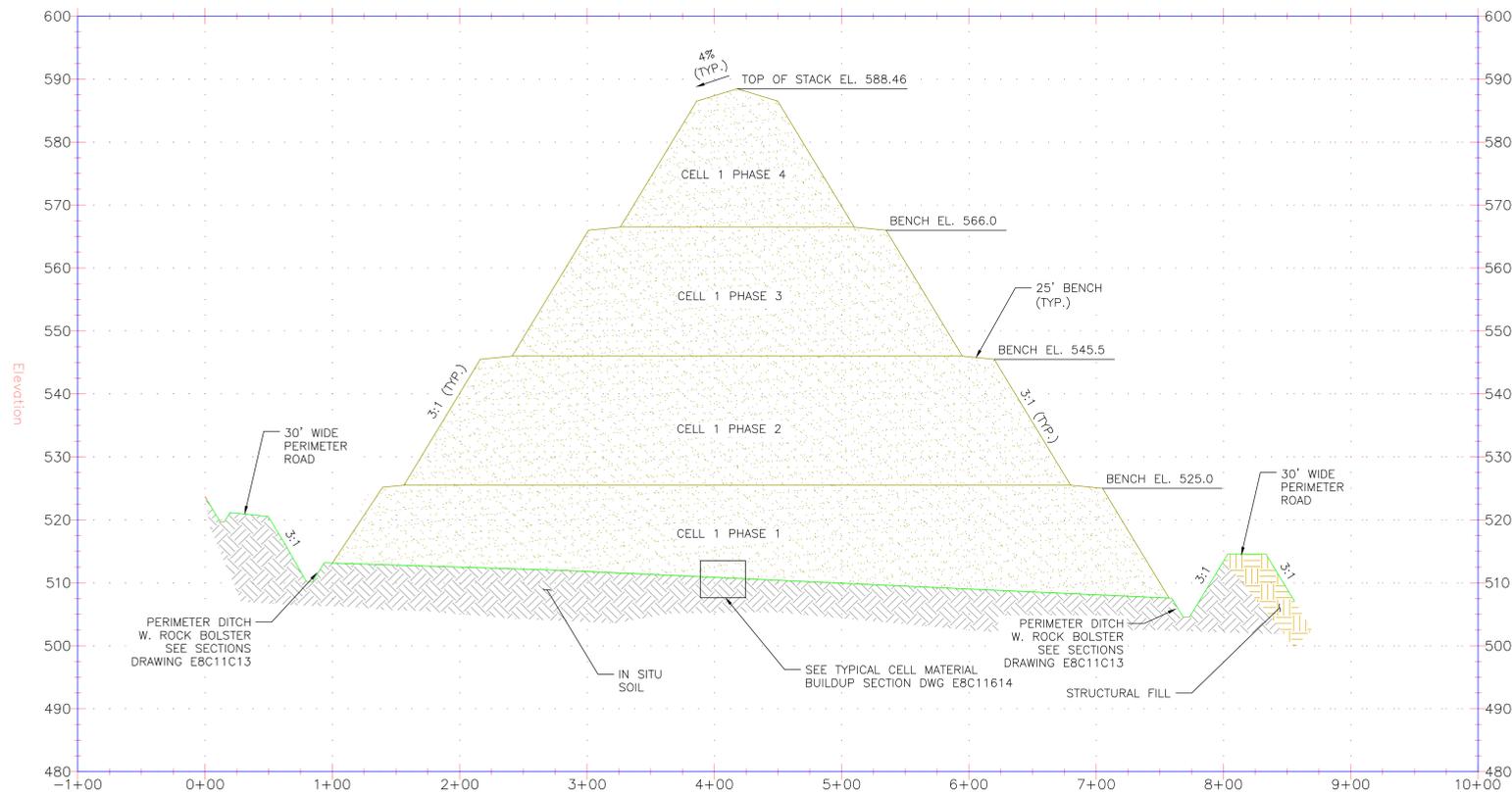


PLAN VIEW
N.T.S.

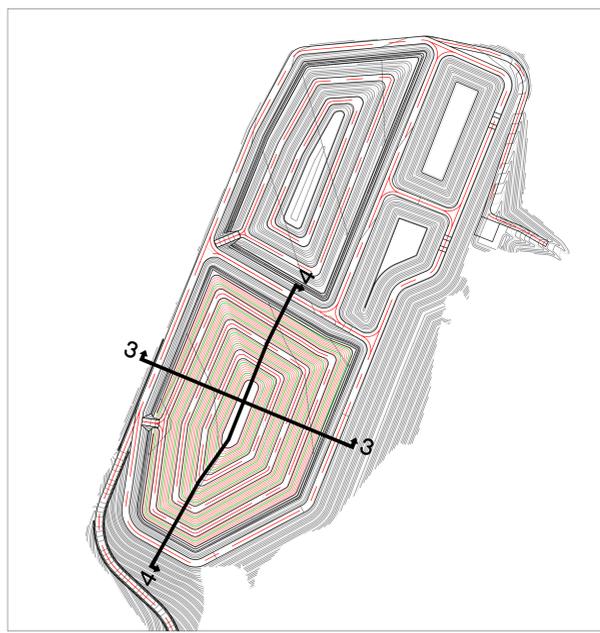
NOTES:
1. SEE DRAWING EBC11600 FOR DRAWING INDEX AND EBC11601 FOR GENERAL NOTES

"REV. B OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS BAGHOUSE BYPRODUCT STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

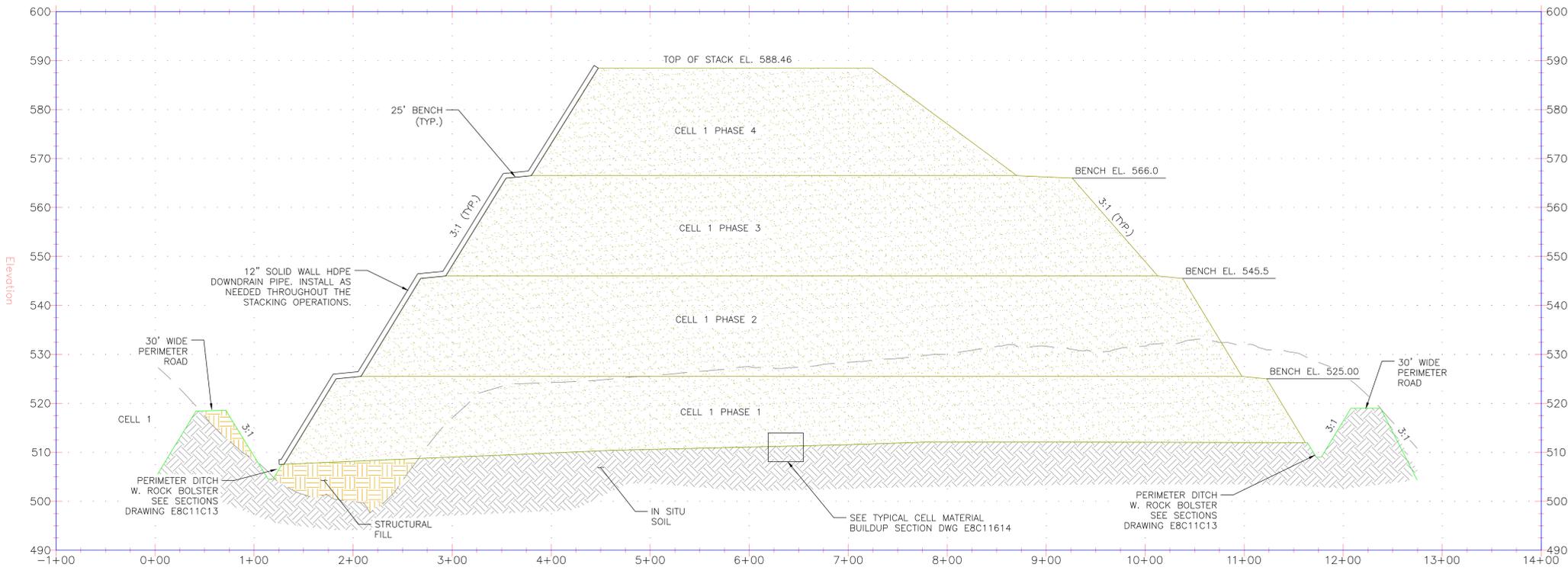
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| REVISION | | DATE | | REVISION | | DATE | | REVISION | | DATE | | REVISION | | DATE | | REVISION B | | DATE 09/20/2013 | | REVISION A | | DATE 11/01/2012 | | Southern Company Generation Engineering and Construction Services FOR Alabama Power Company PLANT GORGAS - UNITS 8 THRU 10 BAGHOUSE BYPRODUCT STORAGE FACILITY CELL 1 STACK SECTIONS | | | | | | | | |
| | | | | | | | | | | | | | | | | REVISED PER ADEM COMMENTS | | ISSUED FOR PERMIT | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | MWO: APC70355 | | BAGHOUSE PROJECT | | MWO: APC41321 | | BAGHOUSE PROJECT | | | | | | | | | | |
| BY | CHK'D | CNL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CNL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CNL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CNL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | AS NOTED | EBC11611 | 1 | FINAL | B | |



SECTION 3-3
V: 1" = 10'
H: 1" = 50'



PLAN VIEW
NTS

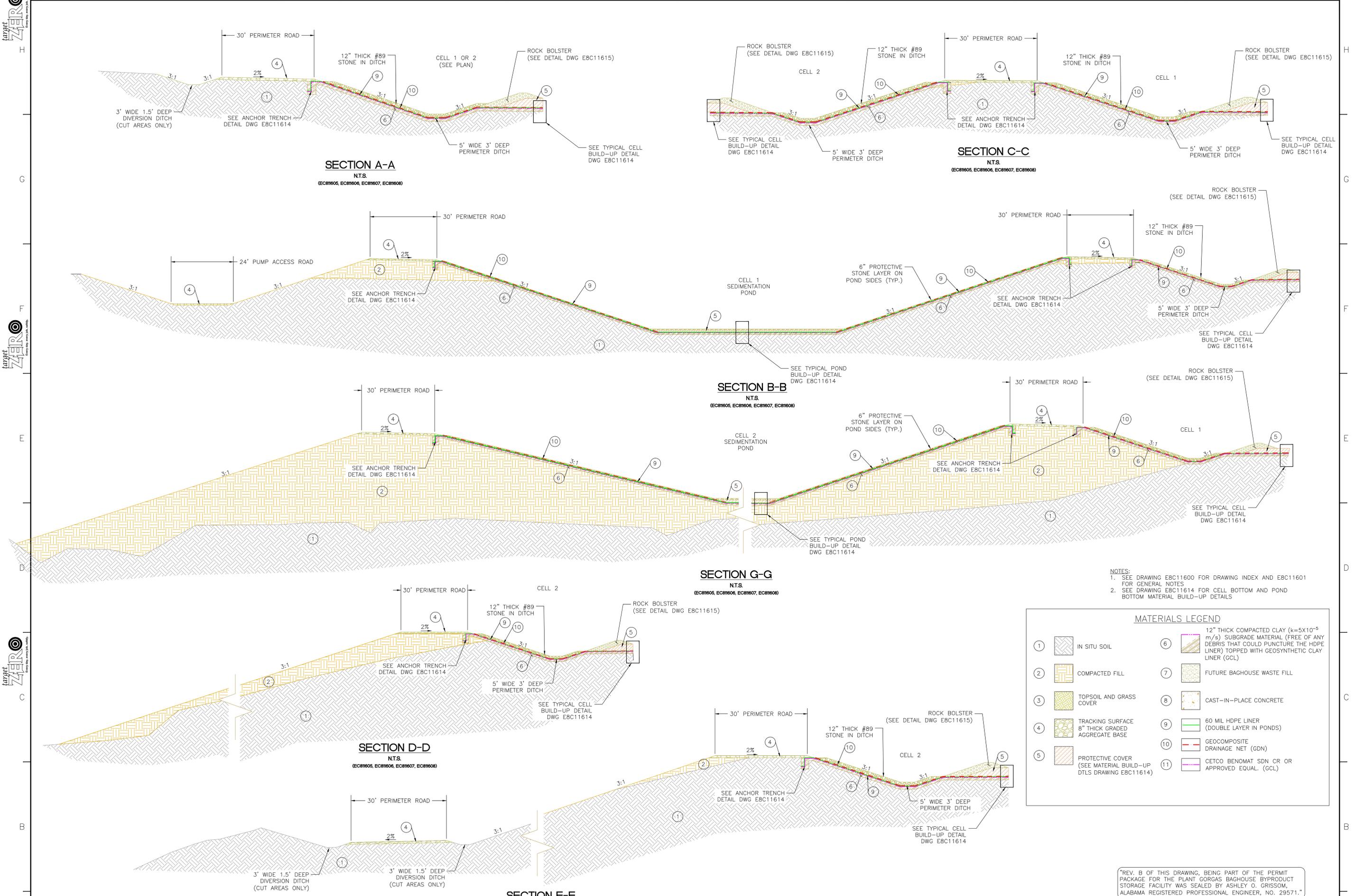


SECTION 4-4
V: 1" = 10'
H: 1" = 50'

- NOTES:**
- SEE DRAWING EBC11600 FOR DRAWING INDEX AND EBC11601 FOR GENERAL NOTES

"REV. B OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS BAGHOUSE BYPRODUCT STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
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| Alabama Power Company | | Alabama Power Company | |
| PLANT GORGAS - UNITS 8 THRU 10 BAGHOUSE BYPRODUCT STORAGE FACILITY CELL 2 STACK SECTIONS | | PLANT GORGAS - UNITS 8 THRU 10 BAGHOUSE BYPRODUCT STORAGE FACILITY CELL 2 STACK SECTIONS | |
| REVISION B DATE 09/20/2013 REVISED PER ADEM COMMENTS 1. ADDED PROFESSIONAL ENGINEER SEAL | REVISION A DATE 11/01/12 ISSUED FOR PERMIT | MWO: APC70355 BAGHOUSE PROJECT | MWO: APC41321 BAGHOUSE PROJECT |
| BY: ECO CHK'D: AOG CIVL APPR: CAS ELECT APPR: X U/C APPR: X MECH APPR: X DISC MGR: KAM | BY: EEO CHK'D: EEJ CIVL APPR: CAS ELECT APPR: X U/C APPR: X MECH APPR: X DISC MGR: KAM | SCALE: AS NOTED | DRAWING NUMBER: E8C11612 SHEET: 1 CONT'D: B REV: B |



- NOTES:**
- SEE DRAWING EBC11600 FOR DRAWING INDEX AND EBC11601 FOR GENERAL NOTES
 - SEE DRAWING EBC11614 FOR CELL BOTTOM AND POND BOTTOM MATERIAL BUILD-UP DETAILS

MATERIALS LEGEND

| | | | |
|---|-------------------------------------------------------------------|----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | IN SITU SOIL | 6 | 12" THICK COMPACTED CLAY (k=5x10 ⁻⁵ m/s) SUBGRADE MATERIAL (FREE OF ANY DEBRIS THAT COULD PUNCTURE THE HDPE LINER) TOPPED WITH GEOSYNTHETIC CLAY LINER (GCL) |
| 2 | COMPACTED FILL | 7 | FUTURE BAGHOUSE WASTE FILL |
| 3 | TOPSOIL AND GRASS COVER | 8 | CAST-IN-PLACE CONCRETE |
| 4 | TRACKING SURFACE 8" THICK GRADED AGGREGATE BASE | 9 | 60 MIL HDPE LINER (DOUBLE LAYER IN PONDS) |
| 5 | PROTECTIVE COVER (SEE MATERIAL BUILD-UP DETAILS DRAWING EBC11614) | 10 | GEOCOMPOSITE DRAINAGE NET (GDN) |
| | | 11 | CETCO BENOMAT SDN CR OR APPROVED EQUAL (GCL) |

"REV. B OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS BAGHOUSE BYPRODUCT STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

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Southern Company Generation Engineering and Construction Services FOR

Alabama Power Company

PLANT GORGAS - UNITS 8 THRU 10
 BAGHOUSE BYPRODUCT STORAGE FACILITY
 TYPICAL DIKE SECTIONS

REVISION B DATE 09/20/2013
 REVISED PER ADEM COMMENTS
 1. ADDED PROFESSIONAL ENGINEER SEAL

MWO: APC70355 BAGHOUSE PROJECT

REVISION A DATE 11/01/2012
 ISSUED FOR PERMIT

MWO: APC41321 BAGHOUSE PROJECT

BY: ECO AOG CAS KAM

SCALE: AS NOTED

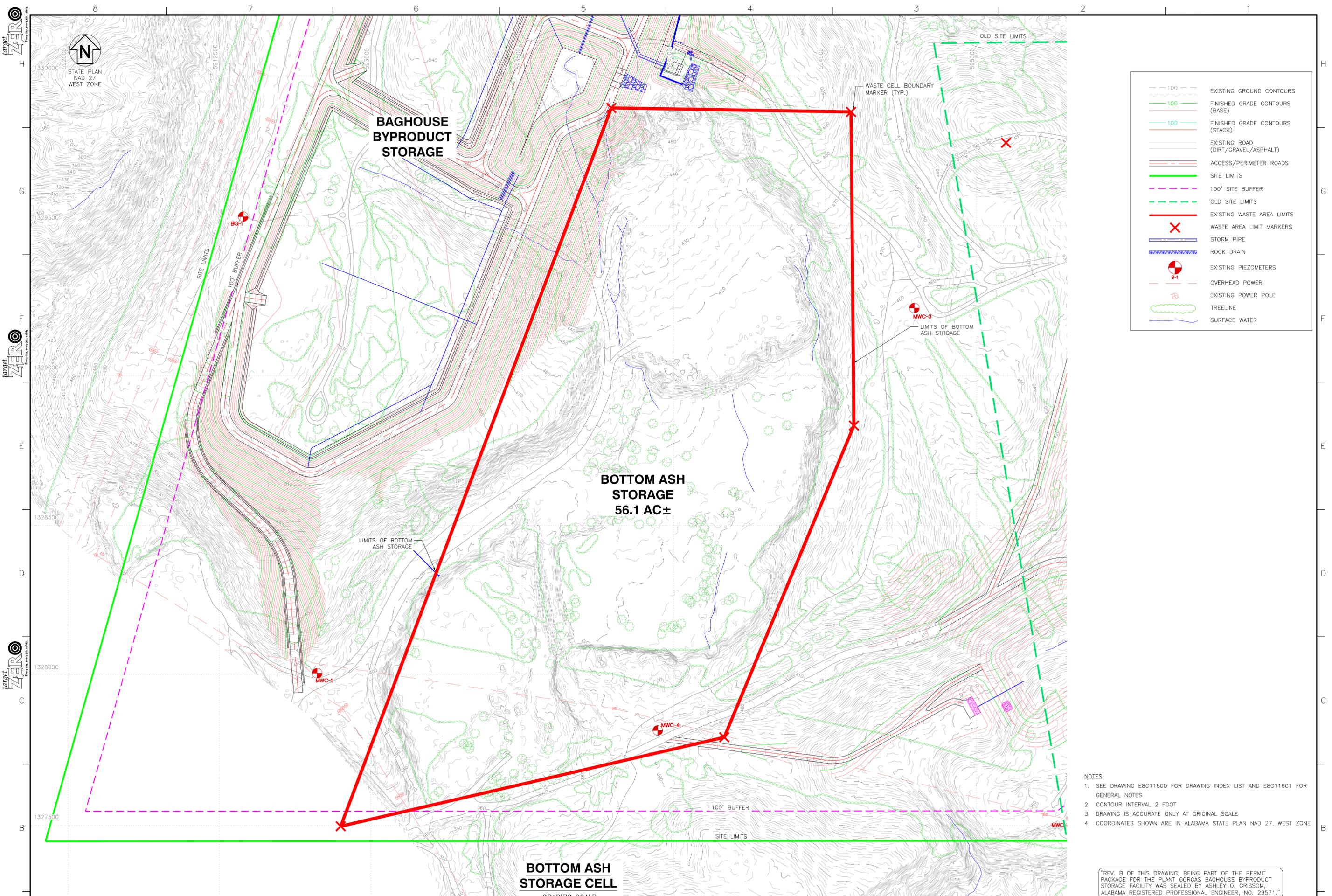
DRAWING NUMBER: **EBC11613**

SHEET: 1

CONT'D: B

REV: B

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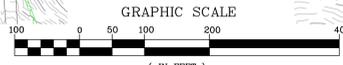


| | | |
|--|-----|-------------------------------------|
| | 100 | EXISTING GROUND CONTOURS |
| | 100 | FINISHED GRADE CONTOURS (BASE) |
| | 100 | FINISHED GRADE CONTOURS (STACK) |
| | | EXISTING ROAD (DIRT/GRAVEL/ASPHALT) |
| | | ACCESS/PERIMETER ROADS |
| | | SITE LIMITS |
| | | 100' SITE BUFFER |
| | | OLD SITE LIMITS |
| | | EXISTING WASTE AREA LIMITS |
| | | WASTE AREA LIMIT MARKERS |
| | | STORM PIPE |
| | | ROCK DRAIN |
| | | EXISTING PIEZOMETERS |
| | | OVERHEAD POWER |
| | | EXISTING POWER POLE |
| | | TREELINE |
| | | SURFACE WATER |

- NOTES:
- SEE DRAWING E8C11600 FOR DRAWING INDEX LIST AND E8C11601 FOR GENERAL NOTES
 - CONTOUR INTERVAL 2 FOOT
 - DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 - COORDINATES SHOWN ARE IN ALABAMA STATE PLAN NAD 27, WEST ZONE

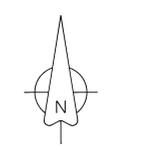
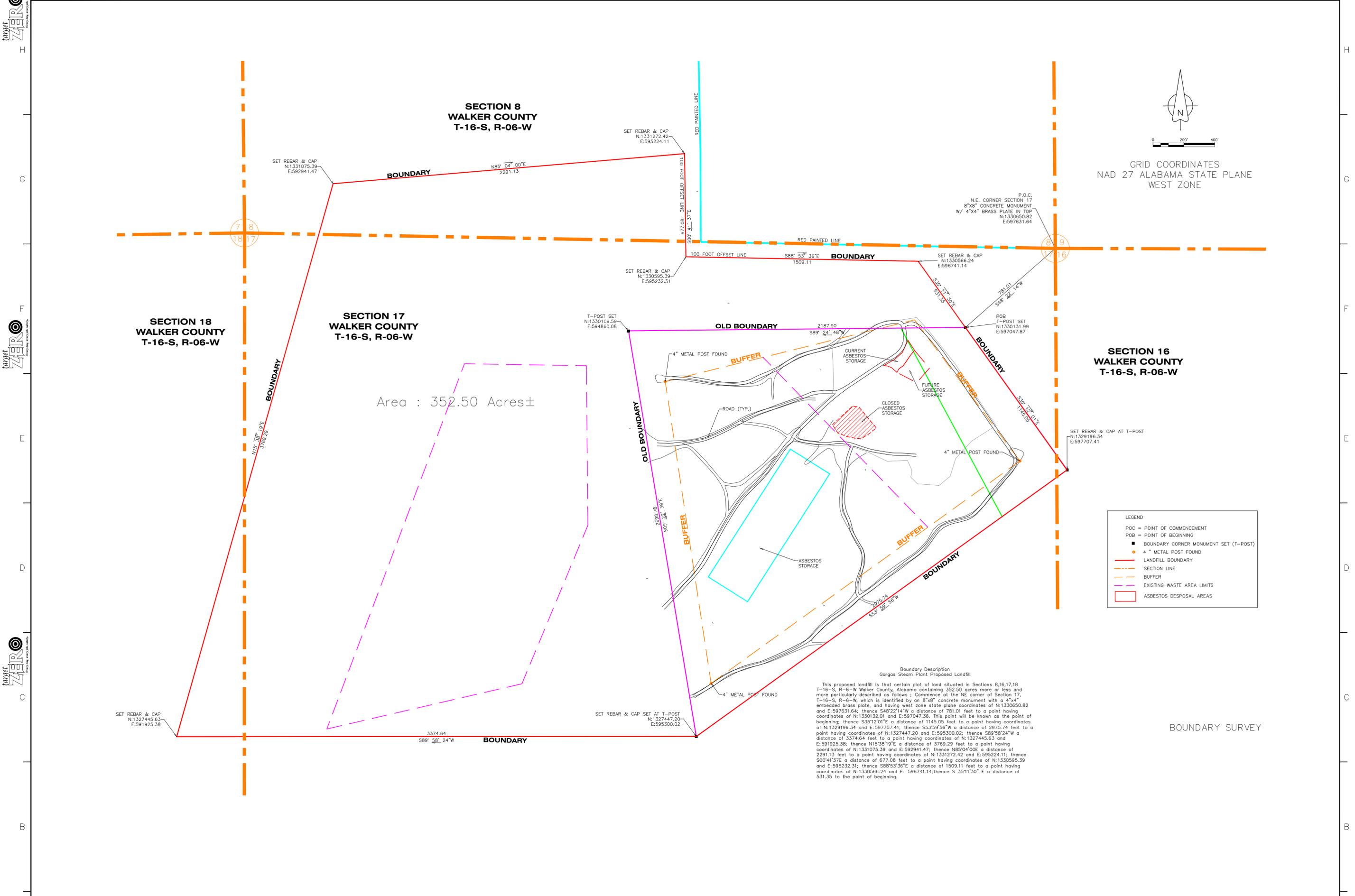
"REV. B OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS BAGHOUSE BYPRODUCT STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

BOTTOM ASH STORAGE CELL



| | | | |
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| Alabama Power Company | | Alabama Power Company | |
| PLANT GORGAS - UNITS 8 THRU 10 BAGHOUSE BYPRODUCT STORAGE FACILITY BOTTOM ASH STORAGE CELL | | PLANT GORGAS - UNITS 8 THRU 10 BAGHOUSE BYPRODUCT STORAGE FACILITY BOTTOM ASH STORAGE CELL | |
| REVISION B REVISED PER ADEM COMMENTS 1. ADDED PROFESSIONAL ENGINEER SEAL | DATE 09/20/2013 | REVISION A ISSUED FOR PERMIT | DATE 11/01/2012 |
| MWO: APC70355 BAGHOUSE PROJECT | MWO: APC41321 BAGHOUSE PROJECT | ECO AOG CAS KAM | ECO EEJ CAS KAM |
| SCALE 1" = 100' | DRAWING NUMBER E8C11616 | SHEET 1 | CONT'D B |

| REVISION | DATE |
|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|
| | | | | | | | | | | | |



GRID COORDINATES
NAD 27 ALABAMA STATE PLANE
WEST ZONE

LEGEND

- POC = POINT OF COMMENCEMENT
- POB = POINT OF BEGINNING
- BOUNDARY CORNER MONUMENT SET (T-POST)
- 4" METAL POST FOUND
- LANDFILL BOUNDARY
- - - SECTION LINE
- - - BUFFER
- - - EXISTING WASTE AREA LIMITS
- ▭ ASBESTOS DISPOSAL AREAS

| REVISION | DATE |
|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|
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Southern Company Generation Engineering and Construction Services FOR

Alabama Power Company

PLANT GORGAS - UNITS 8 THRU 10
INDUSTRIAL LANDFILL
PROPERTY MAP AND
LEGAL DESCRIPTION

ISSUED FOR PERMIT

MWO: APC41321 BAGHOUSE PROJECT

| | | | | | | | | | | | |
|-----|-------|------------|------------|----------|-----------|----------|-----------|-----------------|-------|--------|-----|
| BY | CHK'D | CIVIL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
| ECO | EEJ | CAS | XXX | XXX | XXX | KAM | 1" = 200' | E8C11624 | 1 | FINAL | A |

GYPSUM CELL DRAWINGS

DRAWING INDEX

- D-587887 - DRAWING INDEX, VICINITY MAP, NOTES, & SPECIFICATIONS
- D-587888 - EXISTING CONDITIONS
- D-587889 - LINER PLAN
- D-587890 - GRADING PLAN
- D-587891 - SECTIONS AND DETAILS - SHEET 1
- D-587892 - SECTIONS AND DETAILS - SHEET 2
- D-587893 - SECTIONS AND DETAILS - SHEET 3
- D-587894 - SECTIONS AND DETAILS - SHEET 4
- D-587895 - COORDINATE PLAN
- D-587896 - BMP PLAN
- D-587897 - POND ACCESS & NORTHERN SUMP DETAIL PLAN
- D-587898 - RISER STRUCTURE FOUNDATION PLAN & DETAILS
- D-587899 - STACKING PLAN
- D-587900 - LONGITUDINAL AND TRANSVERSE SECTIONS

GENERAL CONSTRUCTION NOTES:

1. THE CONTRACTOR SHALL OBTAIN FROM THE PURCHASER DESIGNATED ACCESS DIRECTIONS ACROSS THE PLANT PROPERTY.
2. EXISTING ACCESS AND PLANT ROADS SHALL BE MAINTAINED AND REPAIRED IF NECESSARY DURING CONSTRUCTION BY THE CONTRACTOR TO THE SATISFACTION OF THE PURCHASER'S REPRESENTATIVE.
3. THE CONTRACTOR IS RESPONSIBLE FOR IMPLEMENTING HIS OWN STANDARD QUALITY CONTROL AND QUALITY ASSURANCE PROGRAM OR PRACTICES AND SHALL INSTITUTE ANY ADDITIONAL CONTROLS OR PROCEDURES IN ACCORDANCE WITH PROVEN INDUSTRY PRACTICE TO ASSUME COMPLIANCE WITH THESE DRAWINGS AND SPECIFICATIONS.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PLANNING AND OPERATING ANY DEWATERING, SURFACE WATER RUNOFF CONTROL, PROVISIONS FOR DRAINAGE FOR EXCAVATIONS, AND FOR THE PLACEMENT OF MATERIALS. CONTRACTOR TO COORDINATE WITH PURCHASER'S REPRESENTATIVE PRIOR TO DISCHARGING ANY WATER. SUCH DEWATERING WORK SHALL BE AT NO ADDITIONAL EXPENSE TO THE PURCHASER.
5. ALL GRADE ELEVATIONS SHOWN ON DRAWINGS ARE TOP OF FINISH SURFACE (LINER, TRACKING SURFACE, ETC.).
6. COORDINATE SYSTEM IS ALABAMA STATE PLANE (NAD 27, WEST ZONE). CONTRACTOR SHALL COORDINATE AND VERIFY CONTROL MONUMENT LOCATIONS AND ELEVATIONS WITH PURCHASER'S REPRESENTATIVE PRIOR TO COMMENCING ANY SURVEY WORK.
7. ALL WORK SHALL CONFORM TO A.L.D.O.T. STANDARD SPECIFICATION FOR ROAD AND BRIDGE CONSTRUCTION (CURRENT EDITION).
8. SEE A.L.D.O.T. STANDARD SPECIFICATION FOR HIGHWAY CONSTRUCTION (CURRENT EDITION) SECTION 825 "CRUSHED AGGREGATE BASE MATERIALS" FOR SPECIFICATIONS ON AGGREGATE BASE TO BE PLACED ON ROADWAY. TYPE "A" MATERIAL TO BE USED.
9. STONE MATERIAL TO BE COMPACTED TO 90% MODIFIED PROCTOR DENSITY OR AS APPROVED BY PURCHASER'S REPRESENTATIVE.
10. SUBGRADE IN CUT AREAS AND EXISTING GRADE IN FILL AREAS TO BE PROOF ROLLED AND VERIFIED BY PURCHASER'S REPRESENTATIVE TO BE SUFFICIENTLY COMPACTED PRIOR TO ANY EARTH FILL AND/OR STONE FILL BEING PLACED UPON IT.
11. ANY NECESSARY EARTH FILL SHALL BE FREE OF ORGANICS, DEBRIS, AND VEGETATION. THE FILL SHALL CONSIST OF CLEAN SAND, SILT OR CLAY MIXTURES. EARTH FILL SHALL BE PLACED IN UNIFORM LAYERS OF 8 TO 10 INCHES, NOMINAL THICKNESS. LOOSE MEASUREMENT. FILL MATERIAL TO BE COMPACTED TO 95% STANDARD PROCTOR DENSITY OR AS APPROVED BY PURCHASER'S REPRESENTATIVE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL REQUIRED BORROW EXCAVATION MATERIAL. PRIOR TO PLACING OF FILL MATERIAL, SCARIFY SURFACE OF GROUND TO A DEPTH OF 6". MOISTURE CONTENT OF LOOSENED MATERIAL SHALL BE SUCH THAT IT WILL BOND TO THE FIRST LAYER OF FILL MATERIAL.
12. ALL SURFACE STONE MATERIALS AND SELECT FILL BASE SHALL BE PLACED UNIFORMLY SUCH THAT AFTER COMPACTION IT WILL MEET THE WIDTH AND THICKNESS REQUIREMENTS SHOWN ON THE DRAWINGS.
13. PRIOR TO ANY OTHER CONSTRUCTION, A STABILIZED CONSTRUCTION ENTRANCE SHALL BE CONSTRUCTED AT THE POINT OF ENTRY TO THE SITE. CONSTRUCTION ENTRANCE SHALL BE A MINIMUM OF 20' IN WIDTH AND 50' IN LENGTH. STONE SIZE SHALL BE IN ACCORDANCE WITH NATIONAL STONE ASSOCIATION R-2 (1.5 - 3.5 INCH STONE). CONSTRUCTION ENTRANCE SHALL HAVE A MINIMUM PAD THICKNESS OF 6 INCHES.
14. CONTRACTOR TO USE CAUTION WHEN WORKING UNDER OR NEAR TRANSMISSION LINES. REQUIRED CLEARANCES FROM EQUIPMENT AND PERSONNEL PERFORMING WORK NEAR HIGH VOLTAGE POWER LINES ARE SPECIFIED IN OSHA 1910.333.
15. SLOPE PAVED HEADWALLS TO BE PER A.L.D.O.T. DRAWING HW-614-SP.
16. ALL CUT AND FILL SLOPES SHALL BE 3 HORIZONTAL TO 1 VERTICAL EXCEPT WHERE NOTED ON PLANS.

EROSION AND SEDIMENT CONTROL NOTES:

1. PRIOR TO CONSTRUCTION, ANY NECESSARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE CONSTRUCTED AND PUT INTO PLACE, AND ANY REQUIRED DIVERSION BERMS, DITCHES AND OTHER STORM WATER MANAGEMENT STRUCTURES SHALL BE CONSTRUCTED AS NEEDED. THESE AND OTHER APPROPRIATE MEASURES SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.
2. ALL EROSION AND SEDIMENT CONTROL AT THE SITE SHALL BE PERFORMED IN ACCORDANCE WITH THE ALABAMA HANDBOOK FOR EROSION CONTROL, SEDIMENT CONTROL AND STORMWATER MANAGEMENT ON CONSTRUCTION SITES AND URBAN AREAS, LATEST EDITION.
3. AT LOCATIONS WHERE CLASS I RIP RAP IS USED FOR SLOPE PROTECTION, USE MIRAFI 180N OR APPROVED EQUAL FOR UNDERLYING FILTER FABRIC.

EARTHWORK AND CONSTRUCTED FILL NOTES:

1. EARTH FILL MATERIAL SHALL BE OBTAINED FROM APPROVED BORROW AREAS AS DESIGNATED OR APPROVED BY THE PURCHASER.
2. ALL EARTHWORK CONSTRUCTION SHALL BE DONE TO THE LINES, GRADES, AND CROSS SECTIONS SHOWN ON THE DRAWINGS. THE CONTRACTOR WILL ESTABLISH ALL NECESSARY BENCHMARKS AND BASE LINES REQUIRED FOR THE WORK.

HIGH DENSITY POLYETHYLENE (HDPE) LINER NOTES:

1. THE BOTTOM OF THE CELLS AND PONDS SHALL BE LINED WITH 60 MIL TEXTURED HDPE CARBON BLACK LINER AS SHOWN ON THE DRAWINGS.
2. THE HDPE LINER SHALL BE STORED, HANDLED AND INSTALLED PER THE MANUFACTURER'S GUIDELINES AND INSTRUCTIONS.
3. FOR ALL PENETRATIONS TO LINER REFER TO DETAIL DRAWINGS AND MANUFACTURER'S REQUIREMENTS.

GEOCOMPOSITE DRAINAGE NET NOTES:

1. A GEOCOMPOSITE DRAINAGE NET SHALL BE INSTALLED ABOVE THE HDPE LINER ACROSS THE BOTTOM AREA OF THE CELLS AS SHOWN ON THE DRAWINGS.
2. THE GEOCOMPOSITE DRAINAGE NET SHALL CONSIST OF ONE LAYER OF HDPE DRAINAGE NET BONDED TO A GEOTEXTILE TO CREATE A GEOCOMPOSITE. THE GEOTEXTILE SHALL BE A NON-WOVEN NEEDLE PUNCHED POLYETHYLENE. GSE FABRINET UF SINGLE-SIDED OR APPROVED EQUAL SHALL BE USED.
3. THE GEOCOMPOSITE DRAINAGE NET SHALL BE STORED, HANDLED AND INSTALLED PER THE MANUFACTURER'S GUIDELINES AND INSTRUCTIONS.
4. THE GEOCOMPOSITE DRAINAGE NET WILL BE REFERRED TO AS "GDN".

CONCRETE NOTES:

1. DESIGN MATERIAL AND WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE FOLLOWING LATEST STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE MODIFIED ON THE DESIGN DRAWINGS:
 - ACI-318 BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE
 - ACI-315 MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES
 - ACI-347R RECOMMENDED PRACTICE FOR CONCRETE FORMWORK
 - CRSI RECOMMENDED PRACTICE FOR PLACING REINFORCING STEEL
2. ALL CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4000 PSI IN 28 DAYS, UNLESS OTHERWISE NOTED.
3. USE TYPE I/II PORTLAND CEMENT AND W/C RATIO OF .45.
4. CONCRETE SHALL HAVE A FLY ASH CONTENT EQUAL TO 15-30% OF THE TOTAL CEMENTITIOUS MATERIAL, UNLESS OTHERWISE APPROVED BY THE DESIGNING ENGINEER. FLY ASH SHALL CONFORM TO REQUIREMENTS OF ASTM C618, CLASS F.
5. IF READY-MIX CONCRETE IS USED FROM AN APPROVED SUPPLIER, ALL CONCRETE SHALL BE PLACED WITHIN 1 1/2 HOURS AFTER MIXING.
6. CONCRETE SLABS SHALL HAVE A STEEL TROWEL FINISH.
7. REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A615, GRADE 60. WELDED STEEL WIRE FABRIC SHALL BE ASTM A185 PLAIN TYPE.
8. CHAMFER ALL EXPOSED EXTERNAL CORNERS OF CONCRETE 3/4" WITH A 45 DEGREE CHAMFER, UNLESS OTHERWISE NOTED.
9. ALL REINFORCING SHALL HAVE 2" MINIMUM COVER OF CONCRETE WHERE FORMS ARE USED AND 3" MINIMUM COVER WHEN POURED AGAINST THE GROUND.
10. EMBEDMENT AND SPICE LENGTHS FOR REINFORCING STEEL SHALL CONFORM TO ACI-318, UNLESS OTHERWISE NOTED.
11. ALL REINFORCING BAR HOOKS SHOWN ON DRAWINGS SHALL BE ACI STANDARD 90 DEGREE HOOKS, UNLESS OTHERWISE NOTED.
12. REBAR FABRICATOR SHALL OBTAIN APPROVAL OF HIS DETAIL DRAWINGS BEFORE BEGINNING FABRICATION, UNLESS OTHERWISE NOTED IN PURCHASE ORDER.

CONCRETE LINING SYSTEM:

1. ALL CONCRETE THAT WILL BE EXPOSED TO OR IN CONTACT WITH GYPSUM SHALL BE COATED WITH CHEMPRUF 2410 LINING SYSTEM BY ATLAS MINERALS & CHEMICALS, INC. OR APPROVED EQUAL.
2. THE LINING SYSTEM MATERIALS SHALL BE STORED, HANDLED AND APPLIED PER MANUFACTURER'S GUIDELINES AND INSTRUCTIONS.
3. THE LINING SYSTEM SHALL BE APPLIED BY A KNOWLEDGEABLE AND EXPERIENCED SPECIALTY CONTRACTOR.

FLOWABLE FILL NOTES:

1. FLOWABLE FILL MIX SHALL CONSIST OF THE FOLLOWING:
 - 2000 LBS OF CLASS "F" FLY ASH
 - 150 LBS OF CEMENT
 - 200 LBS OF CONCRETE SAND (OPTIONAL)
 - 87 GALLONS OF WATER (POTABLE)
2. ALL FLOWABLE FILL TO SET 72 HOURS PRIOR TO PLACING COMPACTED SOIL BACKFILL ON FLOWABLE FILL.

PIPES:

1. PIPES SHALL BE HANCOB BLUE SEAL OR ADS N-12 HDPE WTIB DUAL WALL PIPE OR APPROVED EQUAL. THE PIPES SHALL HAVE A SMOOTH INTERIOR WALL AND ANGULAR EXTERIOR CORRUGATIONS. ALL JOINTING, INSTALLATION, TRENCHING AND BEDDING SHALL CONFORM TO MANUFACTURER'S GUIDELINES.
2. TO MINIMIZE JOINTS AND JOINT INSTALLATION, PIPE SHALL BE FURNISHED IN THE MAXIMUM NON-CUSTOM LENGTHS.
3. PIPE JOINTS SHALL BE WATERTIGHT ACCORDING TO THE MANUFACTURER'S GUIDELINES AND INSTRUCTIONS, AND SHALL CONTAIN A REINFORCED BELL.
4. ALL PIPES AND ASSOCIATED APPURTENANCES SHALL BE INSTALLED AND JOINED ACCORDINGLY TO MANUFACTURER'S GUIDELINES AND INSTRUCTIONS.

GRASSING - PERMANENT/TEMPORARY SEEDING:

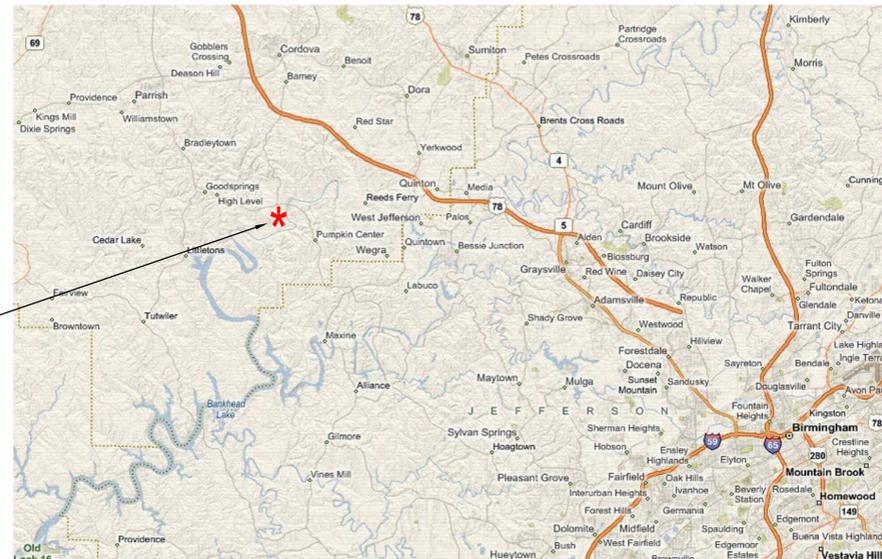
1. ALL DISTURBED AND/OR EXPOSED AREAS THAT WILL REMAIN EXPOSED FOR MORE THAN THIRTEEN DAYS SHALL BE SEEDED, MULCHED AND FERTILIZED UPON REACHING FINAL GRADES.
2. AREAS OF STRUCTURAL FILL SHALL BE GRASSED UPON REACHING FINAL GRADES AT NO ADDITIONAL COST TO THE PURCHASER.
3. TOPSOIL SHALL BE PLACED TO A FINAL COVER THICKNESS OF 4 INCHES TO 6 INCHES ON AREAS RECEIVING GRASSING.
4. THE FOLLOWING SCHEDULE INDICATES THE RECOMMENDED SPECIES, PLANTING DATES, AND SEEDING RATES. THE AREAS SHALL BE SEEDED ACCORDING TO THE BEST MIX FOR PLANT GORGAS VICINITY DURING THE TIME OF YEAR SEEDING APPLICATION SHALL OCCUR. REFERENCE THE ALABAMA HANDBOOK FOR EROSION CONTROL, SEDIMENT CONTROL AND STORMWATER MANAGEMENT ON CONSTRUCTION SITES AND URBAN AREAS, LATEST EDITION FOR FURTHER INFORMATION. UNLESS OTHERWISE SPECIFIED THE CONTRACTOR SHALL SUBMIT A PROPOSED MIX TO THE PURCHASER FOR APPROVAL BEFORE GRASSING OPERATIONS BEGIN. THE FOLLOWING VEGETATION SCHEDULE IS RECOMMENDED FOR PLANT GORGAS:

| VARIETY | SEEDING RATE (LBS/AC) | SEEDING DATES |
|------------------------------------|-----------------------|--------------------------|
| COMMON BERMUDA GRASS | 10 | APRIL 1 - JULY 1 |
| BERMUDA GRASS, HYBRID (LAWN TYPES) | SOLID SOD | ANYTIME |
| BERMUDA GRASS, HYBRID (LAWN TYPES) | SPRIGS 1/SQ FT | MARCH 1 - AUGUST 1 |
| FESCUE, TALL | 40-50 | SEPTEMBER 1 - NOVEMBER 1 |
| SERICA | 40-60 | MARCH 15 - JULY 15 |
| SERICA & COMMON BERMUDA GRASS | 40-60 | MARCH 15 - JULY 15 |
| | 10 | |

IN THE ABSENCE OF SOIL TEST DATA, THE FOLLOWING FERTILIZATION RATES SHALL BE USED:

| VEGETATION | N-P-K | FERTILIZER RATES PER ACRE |
|----------------------|---------|---------------------------|
| GRASS ALONE | 8-24-24 | 400 LBS |
| GRASS-LEGUME MIXTURE | 8-24-24 | 400 LBS |
| LEGUME ALONE | 0-20-20 | 500 LBS |

5. WATER REQUIRED TO PROMOTE A SATISFACTORY GROWTH SHALL BE FURNISHED BY THE PURCHASER AND APPLIED BY THE CONTRACTOR.
6. ALL DITCHES LOCATED OUTSIDE THE CELLS WILL BE GRASSED.



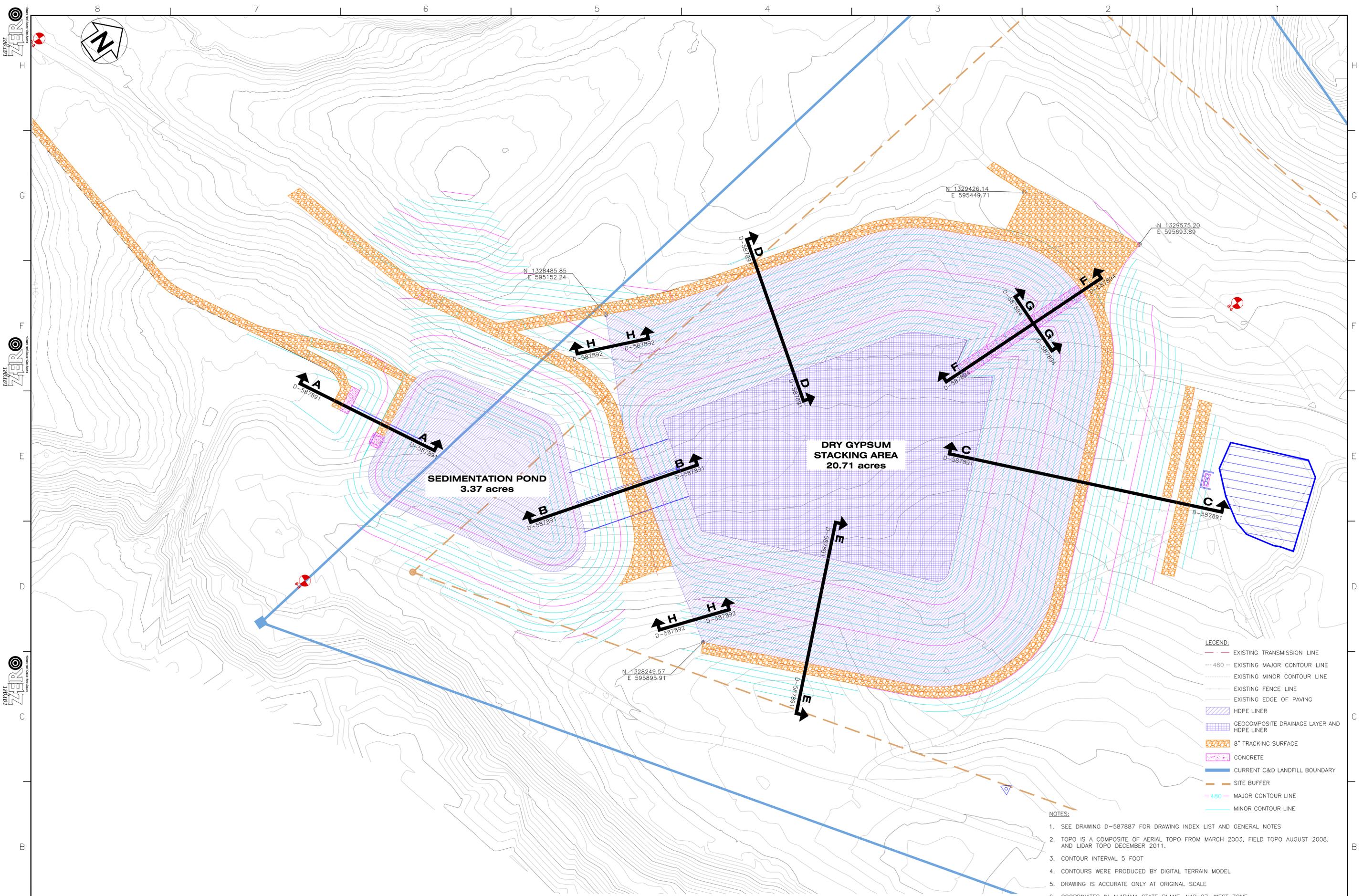
VICINITY MAP



PROJECT LOCATION MAP

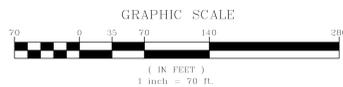
"REV. 2 OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS DRY GYPSUM STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

| | | | | | | | | | | | | | | | | | | | | | | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------|------------|----------|----------|-----|-------|-----------|------------|----------|----------|-----|-------|-----------|------------|----------|----------|-------|----------------|-----------------|-------|-------|---|
| Southern Company Services, Inc. <small>Copyright © Southern Company Services, Inc. All Rights Reserved. This document contains proprietary, confidential, and/or trade secret information of the Southern Company or of third parties. It is intended for use only by employees of, or authorized contractors of, the Southern Company. Further disclosure, distribution, copying, dissemination, or disclosure of any portion thereof is prohibited.</small> | | Southern Company Generation Engineering and Construction Services FOR | | | | | | | | | | | | | | | | | | | | | |
| REVISION 2 DATE 9/20/2013 REVISED PER ADEM COMMENTS A. ADDED PROFESSIONAL ENGINEER SEAL B. ADDED DRAWINGS D-587899 & D-587900 TO DRAWING INDEX MWO: ECS18932 DRY STACK FACILITY | | REVISION 1 DATE 8/27/2012 ADDED DRAWINGS D-587897 & D-587898 TO DRAWING INDEX MWO: ECS18932 DRY STACK FACILITY | | | | | | | | | | | | | | | | | | | | | |
| REVISION 0 DATE 12/5/2011 ISSUED FOR CONSTRUCTION MWO: ECS18932 DRY STACK FACILITY | | Alabama Power Company PLANT GORGAS DRY GYPSUM STORAGE FACILITY DRAWING INDEX, VICINITY MAP, NOTES & SPECIFICATIONS | | | | | | | | | | | | | | | | | | | | | |
| BY | CHK'D | CIVL APPR | ELECT APPR | MCH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | MCH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | MCH APPR | DISC MGR | SCALE | DRAWING NUMBER | SHEET | CONTD | REV | |
| ECO | AOG | RCB | | | | ECO | AOG | RCB | | | | JPH | AOG | RCB | WJR | HME | WCM | JBS | NONE | D-587887 | 1 | FINAL | 2 |



- LEGEND:**
- EXISTING TRANSMISSION LINE
 - 480 --- EXISTING MAJOR CONTOUR LINE
 - EXISTING MINOR CONTOUR LINE
 - EXISTING FENCE LINE
 - EXISTING EDGE OF PAVING
 - HDPE LINER
 - GEOCOMPOSITE DRAINAGE LAYER AND HDPE LINER
 - 8" TRACKING SURFACE
 - CONCRETE
 - CURRENT C&D LANDFILL BOUNDARY
 - SITE BUFFER
 - 480 --- MAJOR CONTOUR LINE
 - MINOR CONTOUR LINE

- NOTES:**
1. SEE DRAWING D-587887 FOR DRAWING INDEX LIST AND GENERAL NOTES
 2. TOPO IS A COMPOSITE OF AERIAL TOPO FROM MARCH 2003, FIELD TOPO AUGUST 2008, AND LIDAR TOPO DECEMBER 2011.
 3. CONTOUR INTERVAL 5 FOOT
 4. CONTOURS WERE PRODUCED BY DIGITAL TERRAIN MODEL
 5. DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 6. COORDINATES IN ALABAMA STATE PLANE, NAD 27, WEST ZONE
 7. SIDE SLOPES OF STACKING AREA AND SEDIMENTATION POND TO BE COVERED WITH A PROTECTIVE LAYER OF HDPE LINER. SEE LINER BUILD-UP DETAILS DRAWING D-587892



"REV. 4 OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS DRY GYPSUM STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

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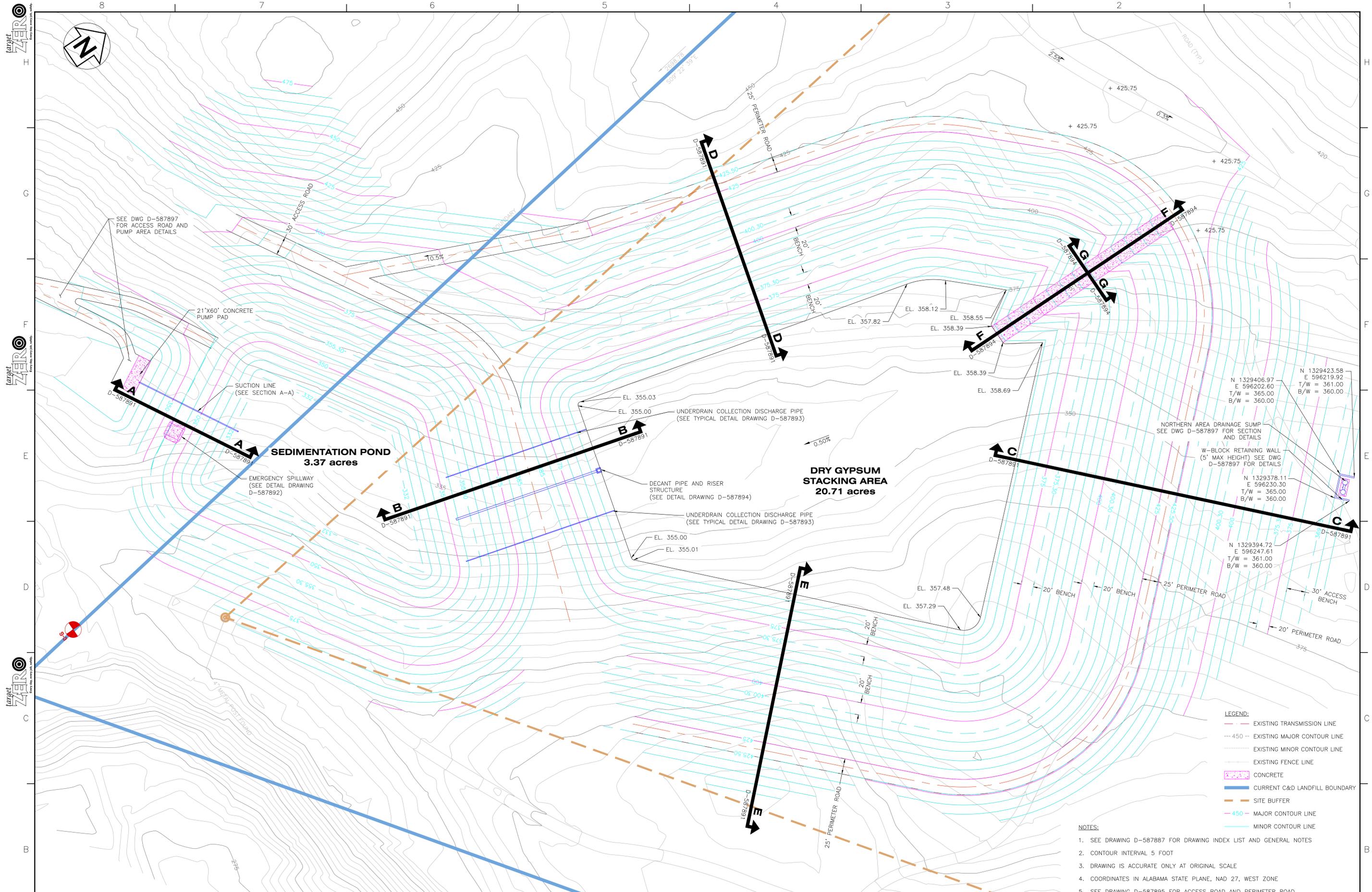
Southern Company Generation Engineering and Construction Services FOR

| REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE |
|----------|------|----------|------|----------------------------------------------|----------|------------------------------------------------------------------|---------|--------------------------------------------------------------------------|---------|----------------------------------------------------------------------|---------|-------------------------|---------|
| | | | | 4 | 11/14/14 | 3 | 9/20/13 | 2 | 8/27/12 | 1 | 1/27/12 | 0 | 12/5/11 |
| | | | | REVISED PER ADEM COMMENTS A. ADDED NOTE 7 | | REVISED PER ADEM COMMENTS A. ADDED PROFESSIONAL ENGINEER SEAL | | A. REVISED PUMP PAD AND PUMP PAD ACCESS B. REVISED NORTHERN SUMP AREA | | GENERAL REVISION REVISION TO STACKING AREA AND SEDIMENTATION POND | | ISSUED FOR CONSTRUCTION | |

Alabama Power Company

PLANT GORGAS
 DRY GYPSUM STORAGE FACILITY
 LINER PLAN

| BY | CHK'D | CIVL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
|-----|-------|-----------|------------|----------|-----------|----------|-----|-------|-----------|------------|----------|-----------|----------|-----|-------|-----------|------------|----------|-----------|----------|-----|-------|-----------|------------|----------|-----------|----------|-----|-------|-----------|------------|----------|-----------|----------|----------|----------------|-------|--------|-----|
| ECO | AOG | RCB | | | | | ECO | AOG | RCB | | | | | ECO | AOG | RCB | WJR | HME | WCM | KAM | ECO | AOG | RCB | WJR | HME | WCM | KAM | JPH | AOG | RCB | WJR | HME | WCM | JBS | 1" = 70' | D-587889 | 1 | FINAL | 4 |



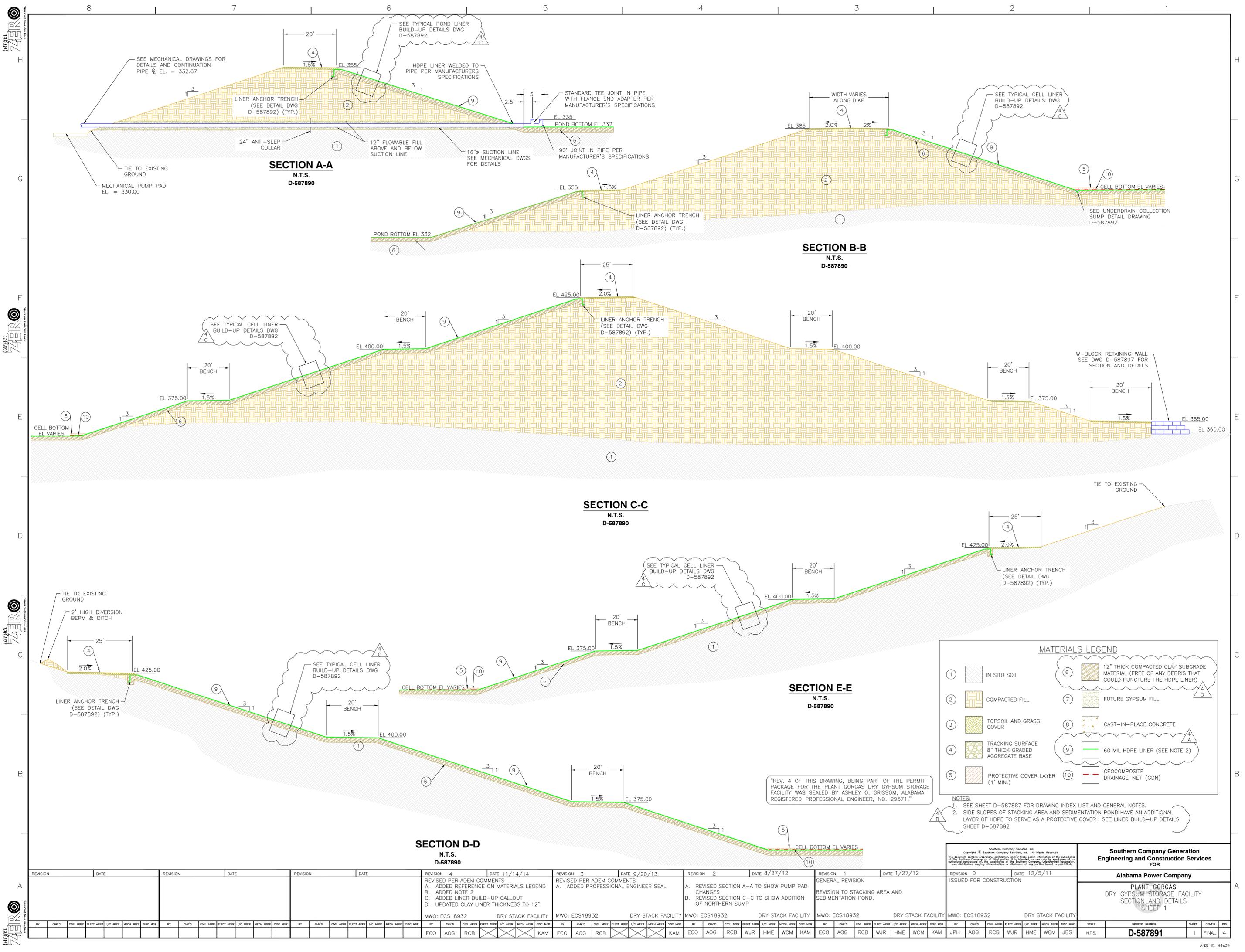
| REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION 3 | DATE 9/20/13 | REVISION 2 | DATE 8/27/12 | REVISION 1 | DATE 1/27/12 | REVISION 0 | DATE 12/5/11 | | | | | | | | | | | | | |
|----------|-------|-----------|------------|----------|-----------|----------|------|------------------------------------------------------------------|--------------------|---------------------------------------------------------------------------------|--------------------|------------------|-------------------------|---------------|--------------------|----------|-----------------|------------|----------|-----------|----------|-----|-------|-----------|------------|----------|-----------|----------|
| | | | | | | | | REVISED PER ADEM COMMENTS A. ADDED PROFESSIONAL ENGINEER SEAL | | A. REVISED PUMP PAD LOCATION AND ACCESS ROAD B. ADDED NORTHERN SUMP LOCATION | | GENERAL REVISION | ISSUED FOR CONSTRUCTION | | | | | | | | | | | | | | | |
| | | | | | | | | MWO: ECS18932 | DRY STACK FACILITY | MWO: ECS18932 | DRY STACK FACILITY | MWO: ECS18932 | DRY STACK FACILITY | MWO: ECS18932 | DRY STACK FACILITY | | | | | | | | | | | | | |
| BY | CHK'D | CIVL APPR | ELECT APPR | U/C APPR | MECH APPR | DISC MGR | | BY | CHK'D | CIVL APPR | ELECT APPR | U/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | U/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | U/C APPR | MECH APPR | DISC MGR |
| ECO | AOG | RCB | | | | | | ECO | AOG | RCB | WJR | HME | WCM | KAM | ECO | AOG | RCB | WJR | HME | WCM | KAM | JPH | AOG | RCB | WJR | HME | WCM | JBS |
| | | | | | | | | | | | | | | | | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV | | | | | | | | |
| | | | | | | | | | | | | | | | | 1" = 50' | D-587890 | 1 | FINAL | 3 | | | | | | | | |

Southern Company Generation Engineering and Construction Services FOR

Alabama Power Company

**PLANT GORGAS
DRY GYPSUM STORAGE FACILITY
Grading Plan**

Record



SECTION A-A
N.T.S.
D-587890

SECTION B-B
N.T.S.
D-587890

SECTION C-C
N.T.S.
D-587890

SECTION E-E
N.T.S.
D-587890

SECTION D-D
N.T.S.
D-587890

MATERIALS LEGEND

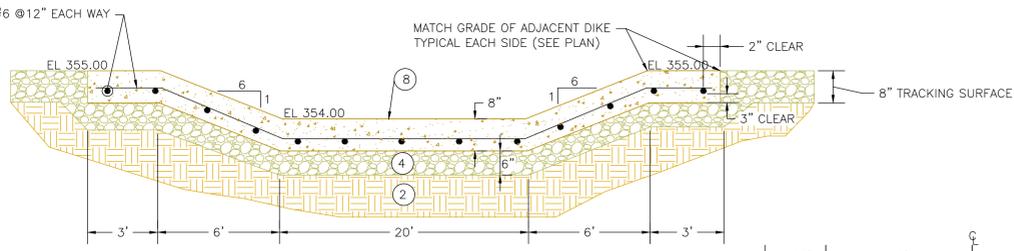
| | | | |
|---|-------------------------------------------------|----|----------------------------------------------------------------------------------------------------|
| 1 | IN SITU SOIL | 6 | 12" THICK COMPACTED CLAY SUBGRADE MATERIAL (FREE OF ANY DEBRIS THAT COULD PUNCTURE THE HDPE LINER) |
| 2 | COMPACTED FILL | 7 | FUTURE GYPSUM FILL |
| 3 | TOPSOIL AND GRASS COVER | 8 | CAST-IN-PLACE CONCRETE |
| 4 | TRACKING SURFACE 8" THICK GRADED AGGREGATE BASE | 9 | 60 MIL HDPE LINER (SEE NOTE 2) |
| 5 | PROTECTIVE COVER LAYER (1" MIN.) | 10 | GEOCOMPOSITE DRAINAGE NET (GDN) |

NOTES:
 1. SEE SHEET D-587887 FOR DRAWING INDEX LIST AND GENERAL NOTES.
 2. SIDE SLOPES OF STACKING AREA AND SEDIMENTATION POND HAVE AN ADDITIONAL LAYER OF HDPE TO SERVE AS A PROTECTIVE COVER. SEE LINER BUILD-UP DETAILS SHEET D-587892

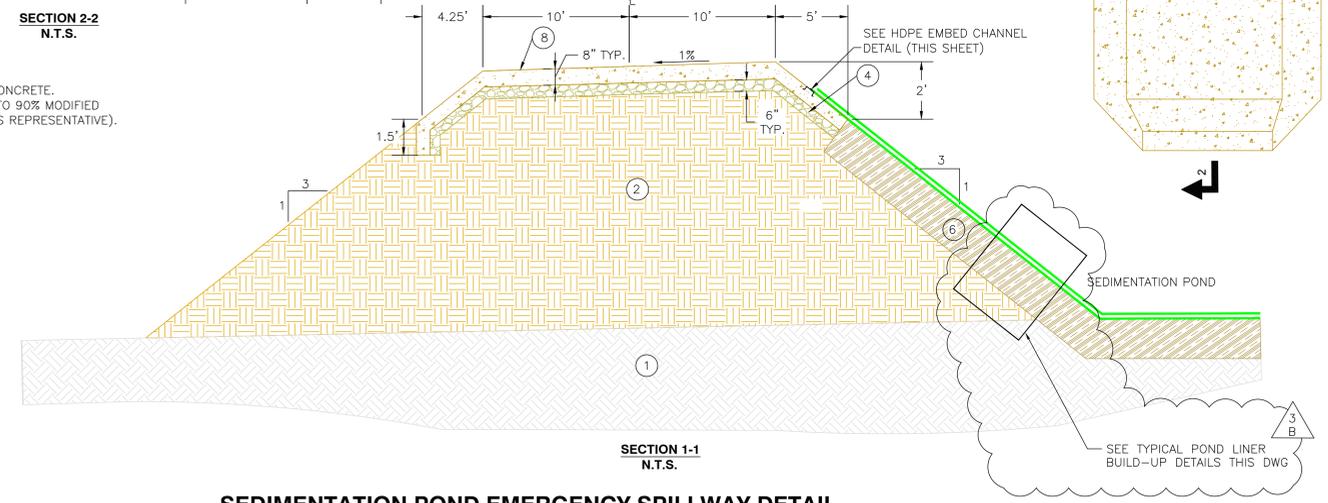
"REV. 4 OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS DRY GYPSUM STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

| REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | | | | | | | | | | | | | | | | | | | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------|-----------|-----------------------------------------------------------------------|---------|----------------------------------|----------|------------|----------|----------------------------------|----------|----------|-------|----------------------------------|------------|----------|-----------|----------|-----|-------|----------|------------|----------|-----------|----------|-----|-------|----------|------------|----------|-----------|----------|--------|----------------|-------|--------|-----|
| 4 | 11/14/14 | 3 | 9/20/13 | 2 | 8/27/12 | 1 | 1/27/12 | 0 | 12/5/11 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| REVISED PER ADEM COMMENTS A. ADDED REFERENCE ON MATERIALS LEGEND B. ADDED NOTE 2 C. ADDED LINER BUILD-UP CALLOUT D. UPDATED CLAY LINER THICKNESS TO 12" | | REVISED PER ADEM COMMENTS A. ADDED PROFESSIONAL ENGINEER SEAL | | A. REVISED SECTION A-A TO SHOW PUMP PAD CHANGES B. REVISED SECTION C-C TO SHOW ADDITION OF NORTHERN SUMP | | GENERAL REVISION REVISION TO STACKING AREA AND SEDIMENTATION POND. | | ISSUED FOR CONSTRUCTION | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MWO: ECS18932 DRY STACK FACILITY | | | | MWO: ECS18932 DRY STACK FACILITY | | | | MWO: ECS18932 DRY STACK FACILITY | | | | MWO: ECS18932 DRY STACK FACILITY | | | | MWO: ECS18932 DRY STACK FACILITY | | | | | | | | | | | | | | | | | | | | | | | |
| BY | CHK'D | CNL APPR | ELECT APPR | VIC APPR | MECH APPR | DISC MGR | BY | CHK'D | CNL APPR | ELECT APPR | VIC APPR | MECH APPR | DISC MGR | BY | CHK'D | CNL APPR | ELECT APPR | VIC APPR | MECH APPR | DISC MGR | BY | CHK'D | CNL APPR | ELECT APPR | VIC APPR | MECH APPR | DISC MGR | BY | CHK'D | CNL APPR | ELECT APPR | VIC APPR | MECH APPR | DISC MGR | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
| ECO | AOG | RCB | | | | KAM | ECO | AOG | RCB | | | | KAM | ECO | AOG | RCB | WJR | HME | WCM | KAM | ECO | AOG | RCB | WJR | HME | WCM | KAM | JPH | AOG | RCB | WJR | HME | WCM | JBS | N.T.S. | D-587891 | 1 | FINAL | 4 |

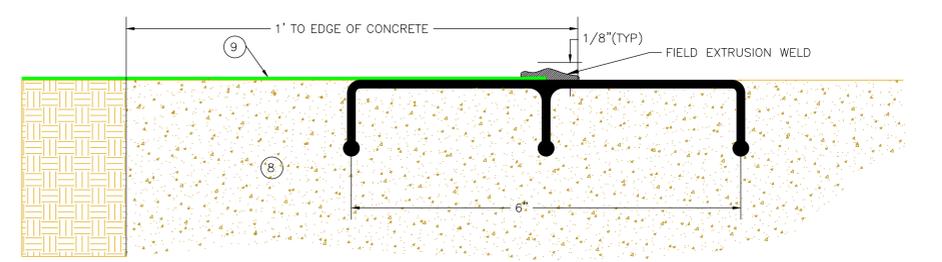
Southern Company Generation Engineering and Construction Services FOR
Alabama Power Company
 PLANT GORGAS DRY GYPSUM STORAGE FACILITY SECTION AND DETAILS SHEET 1



- NOTES:
1. FLUME LAYOUT TO BE AS SHOWN ON PLAN.
 2. ELEVATIONS SHOWN ARE TO TOP OF FINISHED CONCRETE.
 3. AGGREGATE BASE TO BE TYPE "B" (COMPACTED TO 90% MODIFIED PROCTOR DENSITY OR AS APPROVED BY OWNER'S REPRESENTATIVE).
 4. PROVIDE CLASS B LAP SPICES AS NECESSARY
 5. SURFACE TO BE BROOM FINISHED.

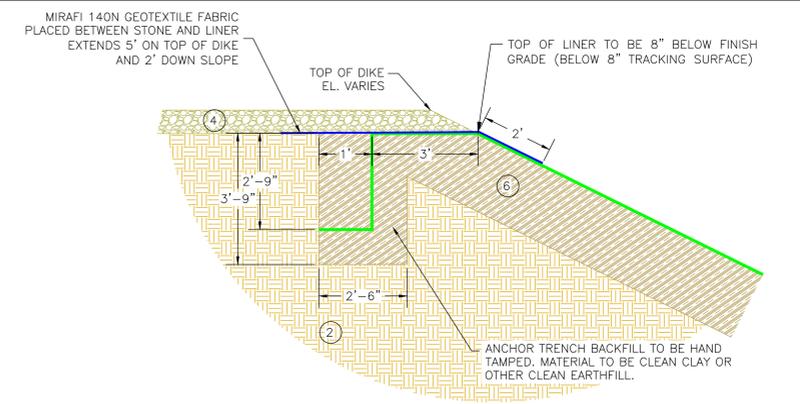


SEDIMENTATION POND EMERGENCY SPILLWAY DETAIL
N.T.S.

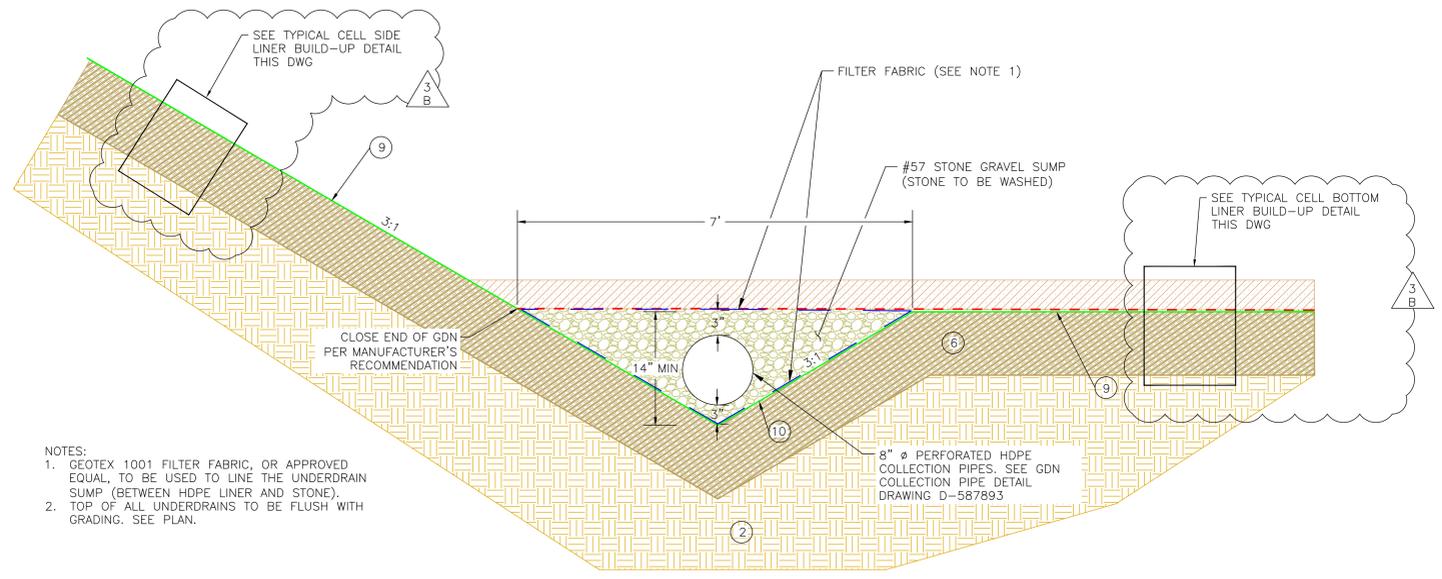


GSE POLYLOCK EMBED CHANNEL INSTALLATION DETAIL
N.T.S.

EMBED CHANNELS ARE TO BE WELDED TOGETHER LONGITUDINALLY TO ENSURE NO LEAKING WHERE THE LINER CONNECTS TO THE CONCRETE.

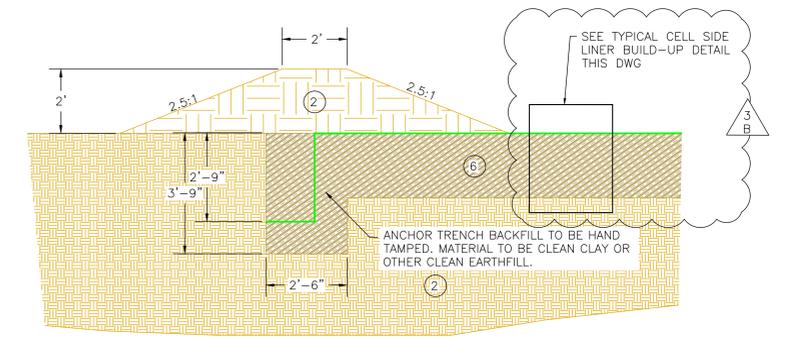


ANCHOR TRENCH DETAIL
N.T.S.



UNDERDRAIN COLLECTION SUMP DETAIL
N.T.S.

- NOTES:
1. GEOTEX 1001 FILTER FABRIC, OR APPROVED EQUAL, TO BE USED TO LINE THE UNDERDRAIN SUMP (BETWEEN HDPE LINER AND STONE).
 2. TOP OF ALL UNDERDRAINS TO BE FLUSH WITH GRADING. SEE PLAN.

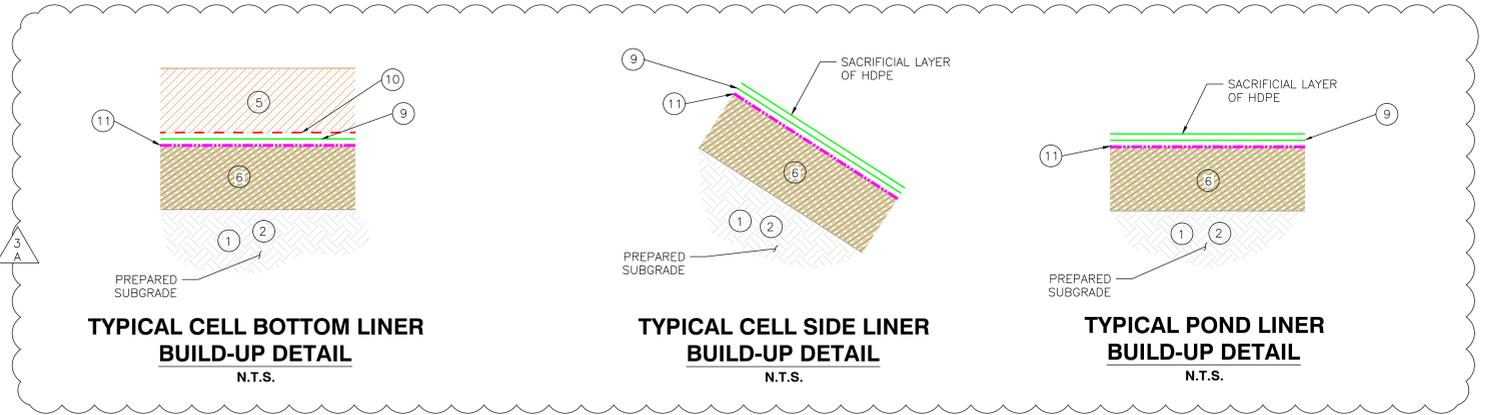


SECTION H-H
N.T.S.
D-587889

| MATERIALS LEGEND | |
|------------------|----------------------------------------------------------------------------------------------------|
| 1 | IN SITU SOIL |
| 2 | COMPACTED FILL |
| 3 | TOPSOIL AND GRASS COVER |
| 4 | TRACKING SURFACE 8" THICK GRADED AGGREGATE BASE |
| 5 | PROTECTIVE COVER LAYER (1' MIN.) |
| 6 | 12" THICK COMPACTED CLAY SUBGRADE MATERIAL (FREE OF ANY DEBRIS THAT COULD PUNCTURE THE HDPE LINER) |
| 7 | FUTURE GYPSUM FILL |
| 8 | CAST-IN-PLACE CONCRETE |
| 9 | 60 MIL HDPE LINER (SEE NOTE 2) |
| 10 | GEOCOMPOSITE DRAINAGE NET (GDN) |
| 11 | GEOSYNTHETIC CLAY LINER (GCL) |

- NOTES:
1. SEE SHEET D-587887 FOR DRAWING INDEX LIST AND GENERAL NOTES.
 2. SIDE SLOPES OF STACKING AREA AND SEDIMENTATION POND HAVE AN ADDITIONAL LAYER OF HDPE TO SERVE AS A PROTECTIVE COVER. SEE LINER BUILD-UP DETAILS SHEET D-587892

"REV. 3 OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS DRY GYPSUM STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."



TYPICAL CELL BOTTOM LINER BUILD-UP DETAIL
N.T.S.

TYPICAL CELL SIDE LINER BUILD-UP DETAIL
N.T.S.

TYPICAL POND LINER BUILD-UP DETAIL
N.T.S.

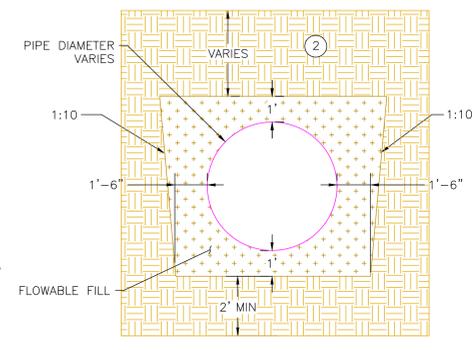
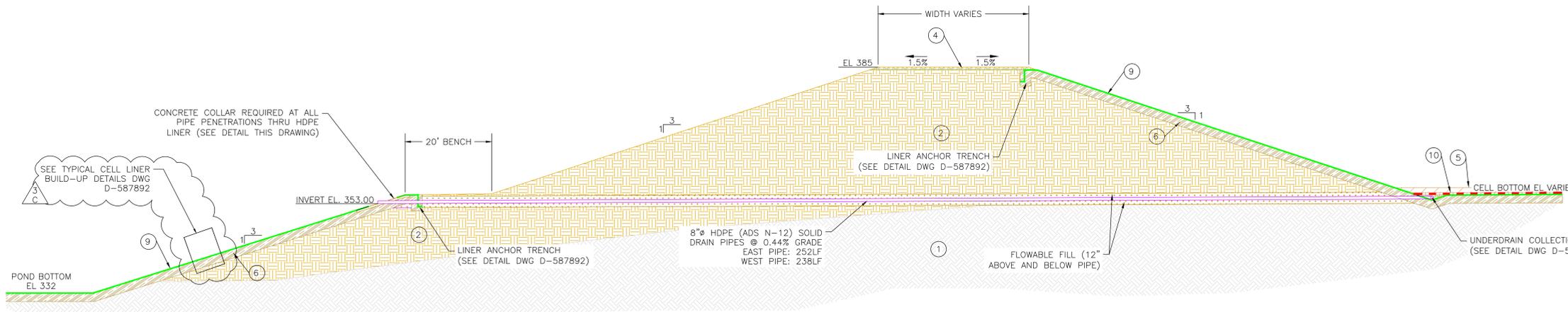
| REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE |
|---------------------------------------|---------------|-------------------------------------------------------------------------|---------------|-------------------------------------------------------------------------|---------------|-------------------------------------|--------------|-----------------------------------------------|----------------|----------------------------------|----------------|----------|-------|----------|------|
| REVISION 3 | DATE 11/14/14 | REVISION 3 | DATE 11/14/14 | REVISION 3 | DATE 11/14/14 | REVISION 2 | DATE 9/20/13 | REVISION 1 | DATE 1/27/2012 | REVISION 0 | DATE 12/5/2011 | | | | |
| REVISED PER ADEM COMMENTS CONT'D | | REVISED PER ADEM COMMENTS | | REVISED PER ADEM COMMENTS | | REVISED PER ADEM COMMENTS | | A. REVISED UNDERDRAIN COLLECTION SUMP SECTION | | ISSUED FOR CONSTRUCTION | | | | | |
| E. ADDED REFERENCE ON MATERIAL LEGEND | | A. ADDED TYPICAL LINER BUILD-UP DETAILS | | A. ADDED TYPICAL LINER BUILD-UP DETAILS | | A. ADDED PROFESSIONAL ENGINEER SEAL | | B. REVISED EMBED CHANNEL DETAIL | | | | | | | |
| F. ADDED NOTE 2 | | C. UPDATED MATERIALS LEGEND TO INCLUDE GEOSYNTHETIC CLAY LINER | | C. UPDATED MATERIALS LEGEND TO INCLUDE GEOSYNTHETIC CLAY LINER | | | | C. RAISED SPILLWAY ELEVATIONS | | | | | | | |
| | | D. UPDATED CLAY LINER THICKNESS TO 12" MWO: ECS18932 DRY STACK FACILITY | | D. UPDATED CLAY LINER THICKNESS TO 12" MWO: ECS18932 DRY STACK FACILITY | | MWO: ECS18932 DRY STACK FACILITY | | MWO: ECS18932 DRY STACK FACILITY | | MWO: ECS18932 DRY STACK FACILITY | | | | | |
| BY | CHK'D | DATE | BY | CHK'D | DATE | BY | CHK'D | DATE | BY | CHK'D | DATE | BY | CHK'D | DATE | BY |
| ECO | AOG | RCB | ECO | AOG | RCB | ECO | AOG | RCB | ECO | AOG | RCB | ECO | AOG | RCB | ECO |

Southern Company Generation Engineering and Construction Services FOR

Alabama Power Company

PLANT GORGAS DRY GYPSUM STORAGE FACILITY SECTIONS AND DETAILS SHEET 2

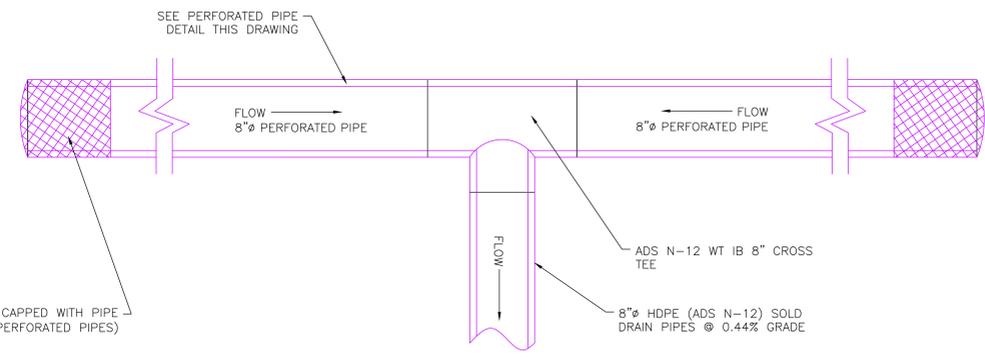
SCALE: N.T.S. DRAWING NUMBER: D-587892 SHEET: 1 OF 1 CONT'D: 3



TYPICAL PIPE SECTION
N.T.S.

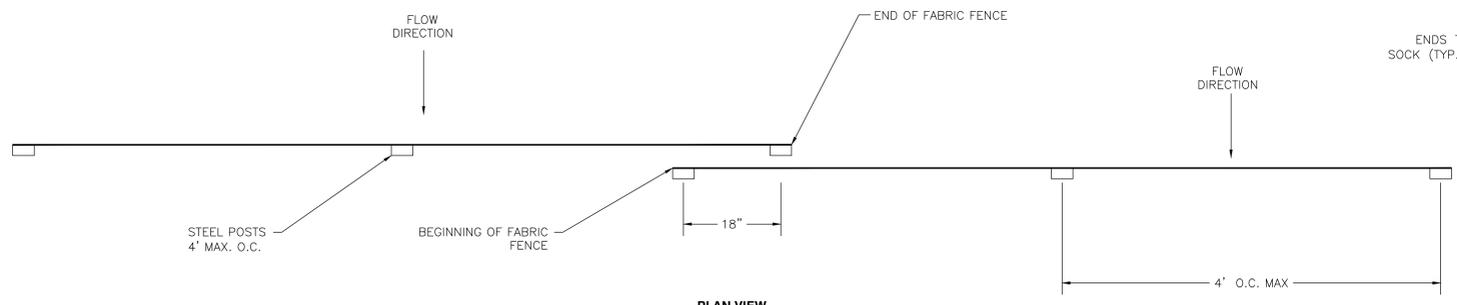
UNDERDRAIN COLLECTION DISCHARGE PIPE TYPICAL SECTION

N.T.S.
D-587890
(TYPICAL 2 PLACES)

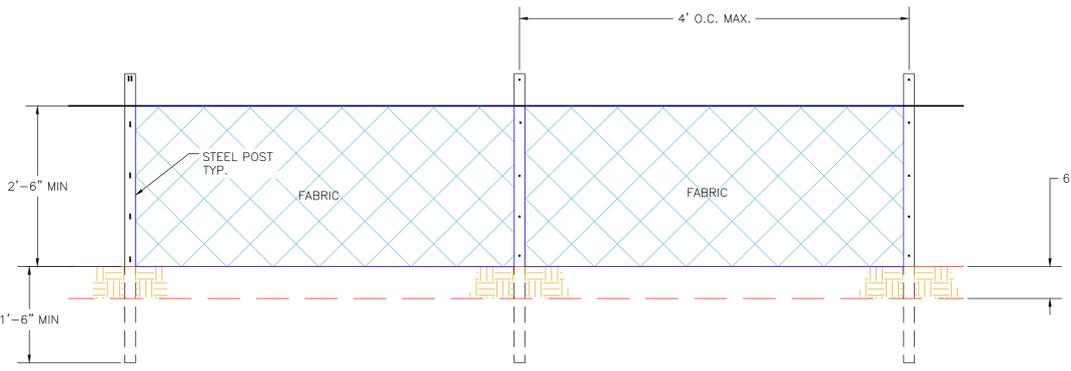


UNDERDRAIN COLLECTOR PIPE JUNCTION DETAIL

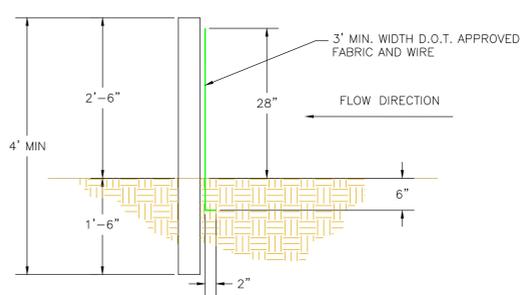
N.T.S.



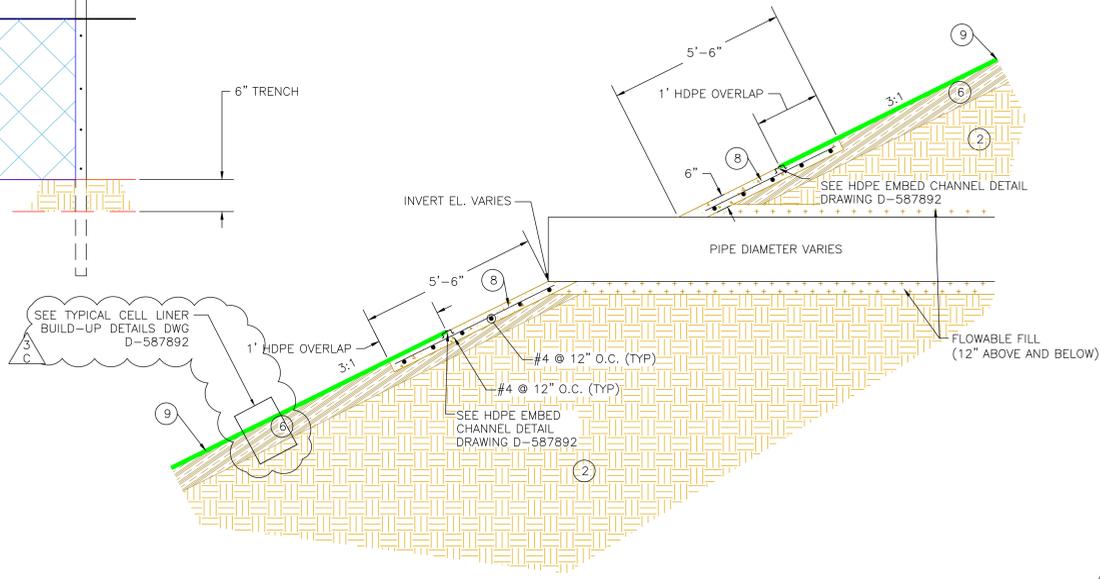
PLAN VIEW
N.T.S.



FRONT VIEW
N.T.S.

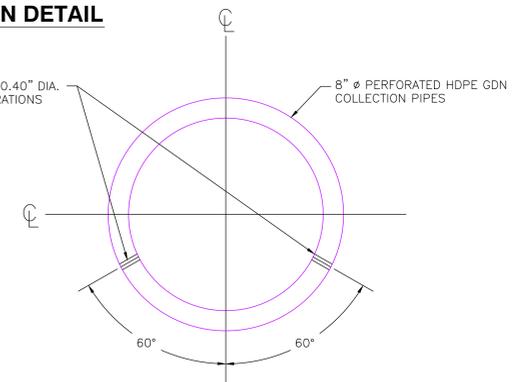


TYPICAL SILT FENCE DETAIL
N.T.S.



TYPICAL CONCRETE COLLAR DETAIL

N.T.S.



PERFORATED PIPE DETAIL

N.T.S.

NOTE:
AASHTO CLASS 1 PERFORATION FOR 8" PIPE-6 ROWS OF PERFORATIONS REQ'D (TOTAL 12 PER FT OF PIPE. EACH PERFORATION 0.4" CIRCULAR.)

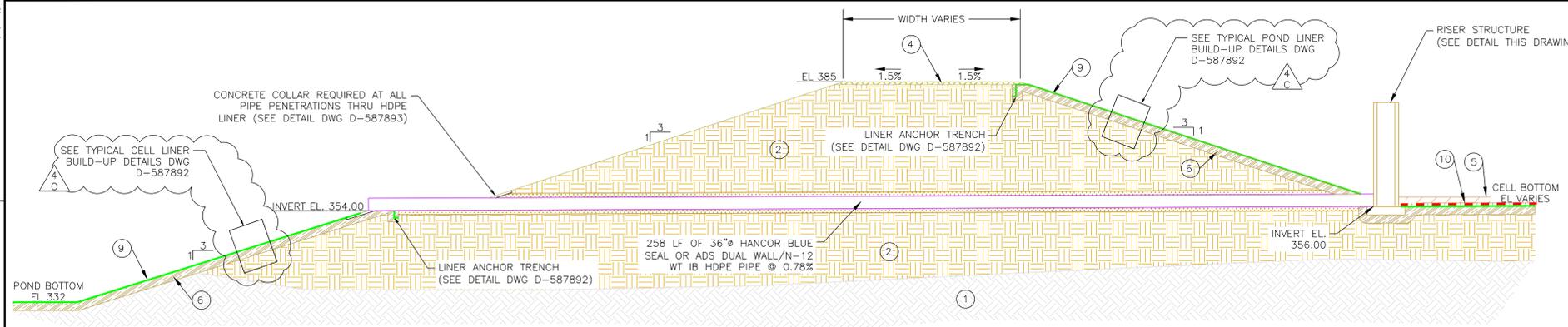
MATERIALS LEGEND

| | | | |
|---|-------------------------------------------------|----|----------------------------------------------------------------------------------------------------|
| 1 | IN SITU SOIL | 6 | 12" THICK COMPACTED CLAY SUBGRADE MATERIAL (FREE OF ANY DEBRIS THAT COULD PUNCTURE THE HDPE LINER) |
| 2 | COMPACTED FILL | 7 | FUTURE GYPSUM FILL |
| 3 | TOPSOIL AND GRASS COVER | 8 | CAST-IN-PLACE CONCRETE |
| 4 | TRACKING SURFACE 8" THICK GRADED AGGREGATE BASE | 9 | 60 MIL HDPE LINER |
| 5 | PROTECTIVE COVER LAYER (1" MIN.) | 10 | GEOCOMPOSITE DRAINAGE NET (GDN) |

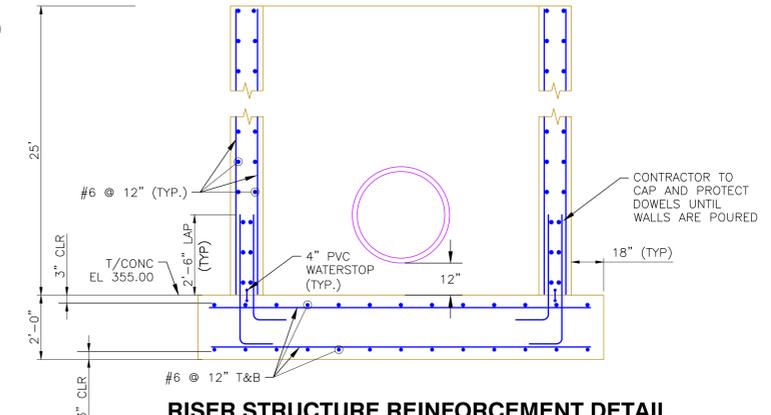
NOTES:
1. SEE SHEET D-587887 FOR DRAWING INDEX LIST AND GENERAL NOTES.
2. SIDE SLOPES OF STACKING AREA AND SEDIMENTATION POND HAVE AN ADDITIONAL LAYER OF HDPE TO SERVE AS A PROTECTIVE COVER. SEE LINER BUILD-UP DETAILS SHEET D-587892

"REV. 3 OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS DRY GYPSUM STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

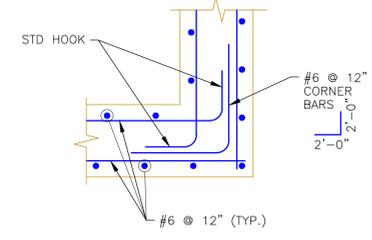
| REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | | | | | | | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|---------|----------|-----------|----------|-----------|----------|------|----------|------|------------------------------------------------------------------|------|----------|--------------------------------------------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|--|--|--------|-----------------|-------|--------|-----|
| 3 | 11/14/14 | 2 | 9/20/13 | 1 | 1/27/2012 | 0 | 12/5/2011 | | | | | | | | | | Southern Company Generation Engineering and Construction Services FOR Alabama Power Company PLANT GORGAS DRY GYPSUM STORAGE FACILITY SECTIONS AND DETAILS SHEET 3 | | | | | | | | |
| REVISED PER ADEM COMMENTS A. ADDED REFERENCE ON MATERIALS LEGEND B. ADDED NOTE 2 C. ADDED LINER BUILD-UP CALLOUT D. UPDATED CLAY LINER THICKNESS TO 12" | | | | | | | | | | | | REVISED PER ADEM COMMENTS A. ADDED PROFESSIONAL ENGINEER SEAL | | | A. REMOVED DECANT PIPE AND RISER SECTIONS B. ADDED UNDERDRAIN COLLECTION SECTIONS AND DETAILS | | | ISSUED FOR CONSTRUCTION | | | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
| MWQ: ECS18932 DRY STACK FACILITY ECO AOG RCB | | | | | | | | | | | | MWQ: ECS18932 DRY STACK FACILITY ECO AOG RCB | | | MWQ: ECS18932 DRY STACK FACILITY ECO AOG RCB WJR HME WCM KAM | | | MWQ: ECS18932 DRY STACK FACILITY ECO AOG RCB WJR HME WCM JBS | | | N.T.S. | D-587893 | 1 | FINAL | 3 |



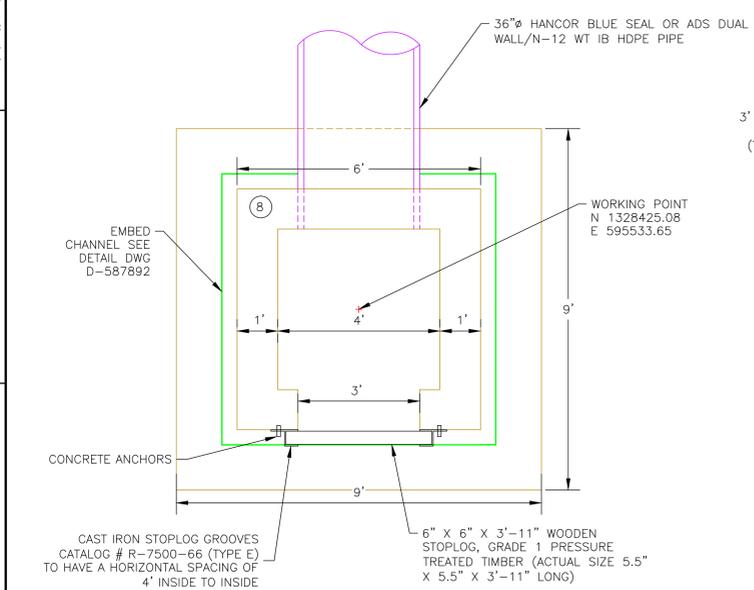
**DECANT PIPE AND RISER STRUCTURE
TYPICAL SECTION**
N.T.S.
D-587890



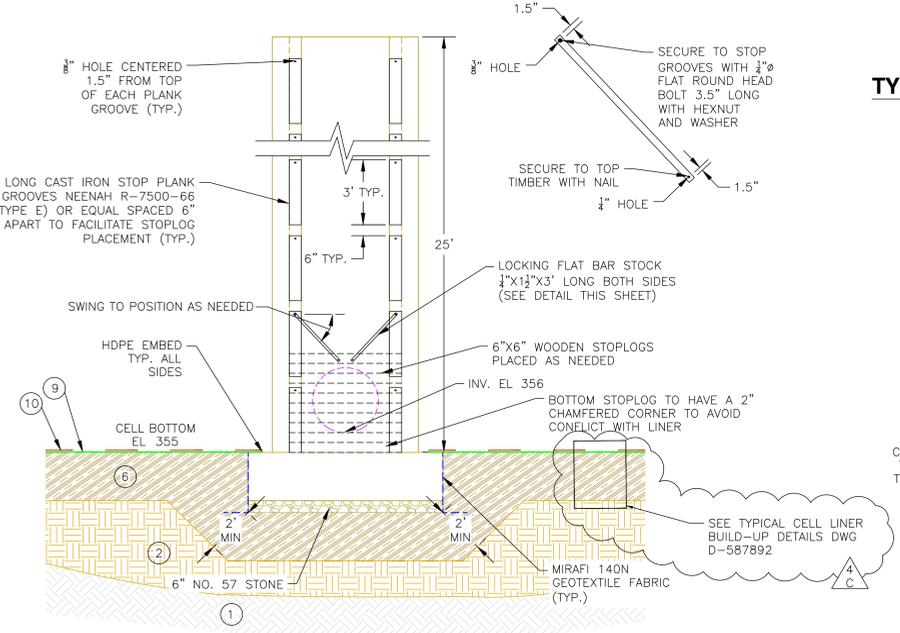
RISER STRUCTURE REINFORCEMENT DETAIL
N.T.S.



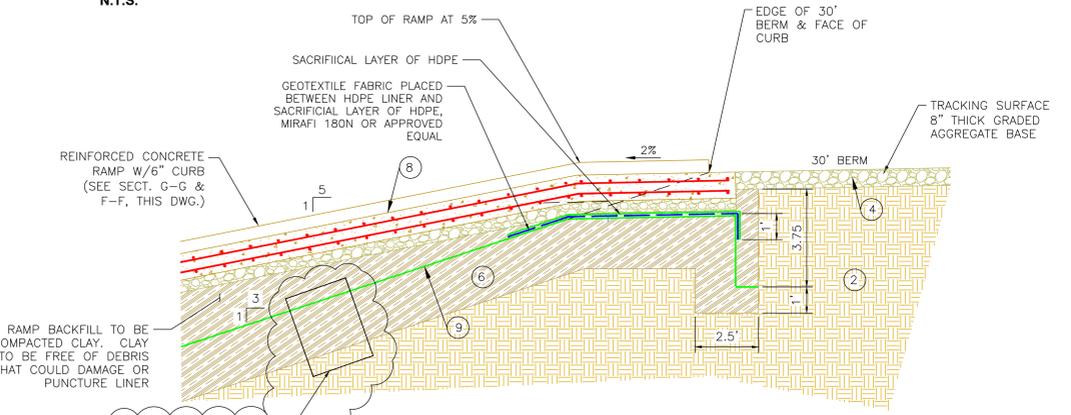
TYP. CORNER BAR DETAIL
N.T.S.



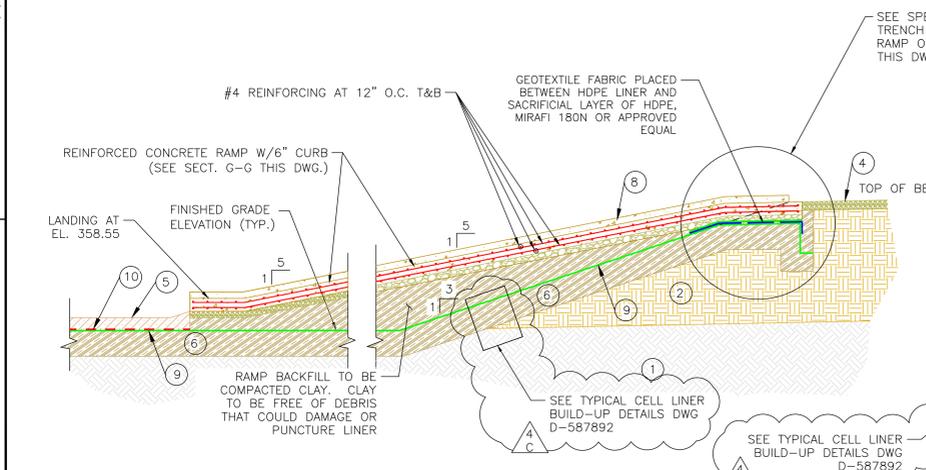
RISER STRUCTURE SECTION
N.T.S.



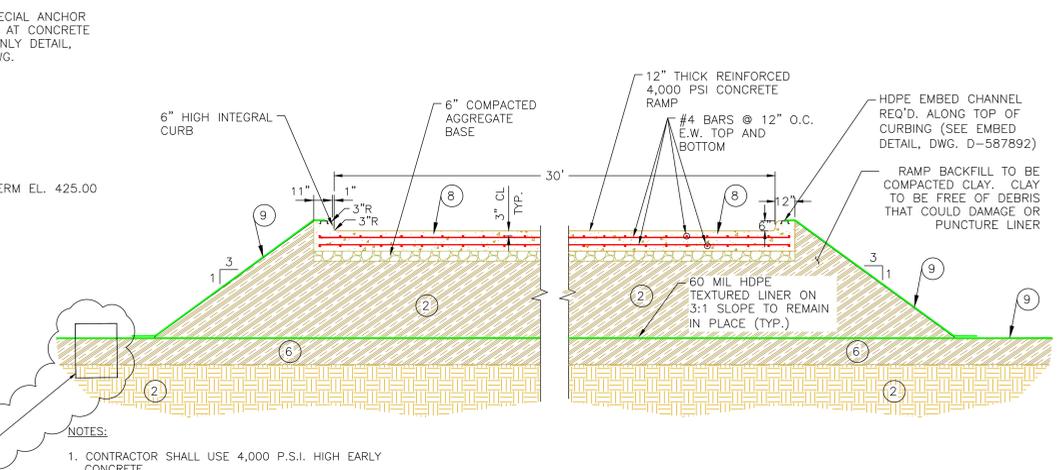
**SPECIAL ANCHOR TRENCH AT REINFORCED
CONCRETE RAMP ONLY DETAIL**
N.T.S.



REINFORCED CONCRETE RAMP W/6\"/>



**SECTION F-F
REINFORCED CONCRETE RAMP W/6\"/>**



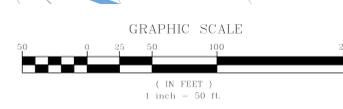
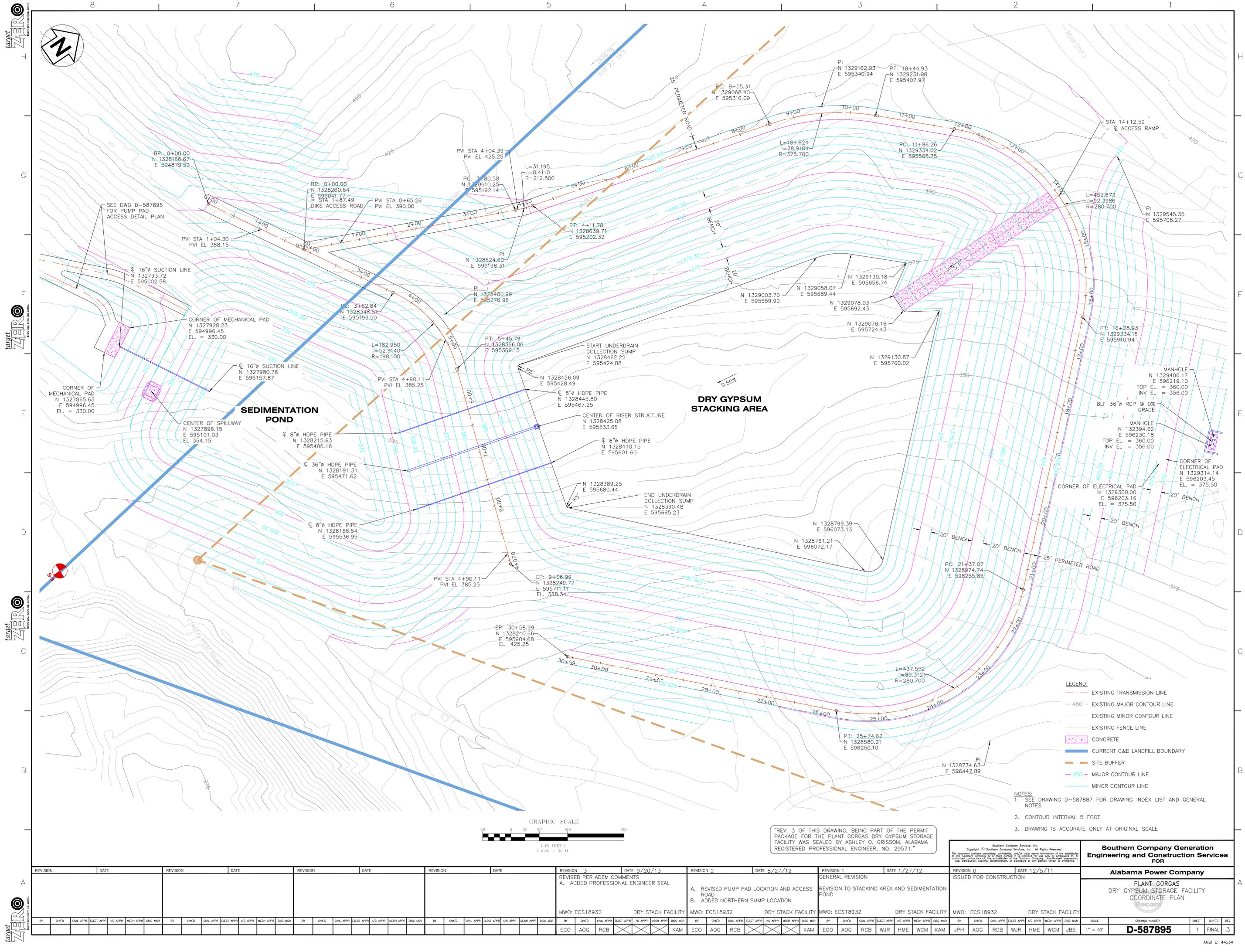
**SECTION G-G
REINFORCED CONCRETE RAMP W/6\"/>**

| MATERIALS LEGEND | |
|------------------|---------------------------------|
| 1 | IN SITU SOIL |
| 2 | COMPACTED FILL |
| 3 | TOPSOIL AND GRASS COVER |
| 4 | TRACKING SURFACE 8\"/> |
| 5 | PROTECTIVE COVER LAYER (1\"/> |
| 6 | 12\"/> |
| 7 | FUTURE GYPSUM FILL |
| 8 | CAST-IN-PLACE CONCRETE |
| 9 | 60 MIL HDPE LINER |
| 10 | GEOCOMPOSITE DRAINAGE NET (GDN) |

- NOTES:**
- SEE SHEET D-587887 FOR DRAWING INDEX LIST AND GENERAL NOTES.
 - CONCRETE STRUCTURE AND REINFORCING DETAILS ON THIS SHEET ARE FOR REFERENCE ONLY. SEE SHEET D-587898 FOR FOUNDATION PLAN AND DETAILS.
 - TO PREVENT POSSIBLE FLOTATION OF STOPLOGS, USE LOCKING FLAT BAR STOCK AS SHOWN (2 SETS REQUIRED FOR ALTERNATING PLACEMENT). SHIM STOPLOGS AGAINST GROOVES TO PREVENT MOVEMENT. JOIN STOPLOGS TO EACH PRECEDING LOG AS NEEDED.
 - SIDE SLOPES OF STACKING AREA AND SEDIMENTATION POND HAVE AN ADDITIONAL LAYER OF HDPE TO SERVE AS A PROTECTIVE COVER. SEE LINER BUILD-UP DETAILS SHEET D-587892

"REV. 4 OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS DRY GYPSUM STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

| REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | | | | | | | | | | | | | |
|----------|-------|-----------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------------|---------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------------------------------------------------------------------|----------|-------------------------|----------|-----------------------|-------|--------------------------------------------------------------------------------|------------|----------|-----------|----------|----|-------|-----------|------------|----------|-----------|----------|----------|----------------|-------|--------|-----|
| | | | | 4 | 11/14/14 | 3 | 9/20/13 | 2 | 8/27/12 | 1 | 1/27/11 | 0 | 12/5/11 | | | | | | | | | | | | | | | | | | | |
| | | | | REVISED PER ADEM COMMENTS A. ADDED REFERENCE ON MATERIALS LEGEND B. ADDED NOTE 4 C. ADDED LINER BUILD-UP CALLOUT D. UPDATED CLAY LINER THICKNESS TO 12" | | REVISED PER ADEM COMMENTS A. ADDED PROFESSIONAL ENGINEER SEAL | | A. CORRECTED BERM ELEVATION ON SECTION F-F B. ADDED SACRIFICIAL LAYER OF HDPE AND CHANGED RAMP BACKFILL TO COMPACTED CLAY C. MODIFIED NOTE 2 | | GENERAL REVISION REVISION TO STACKING AREA AND SEDIMENTATION POND | | ISSUED FOR CONSTRUCTION | | Alabama Power Company | | Plant GORGAS DRY GYPSUM STORAGE FACILITY SECTIONS AND DETAILS SHEET 4 | | | | | | | | | | | | | | | | |
| BY | CHK'D | CIVL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | AS SHOWN | D-587894 | 1 | FINAL | 4 |



- LEGEND:**
- EXISTING TRANSMISSION LINE
 - 480' EXISTING MAJOR CONTOUR LINE
 - EXISTING MINOR CONTOUR LINE
 - EXISTING FENCE LINE
 - CONCRETE
 - CURRENT C&D LANDFILL BOUNDARY
 - SITE BUFFER
 - MAJOR CONTOUR LINE
 - MINOR CONTOUR LINE

- NOTES:**
1. SEE DRAWING D-587887 FOR DRAWING INDEX LIST AND GENERAL NOTES
 2. CONTOUR INTERVAL 5 FOOT
 3. DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE

"REV. 3 OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS DRY GYPSUM STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

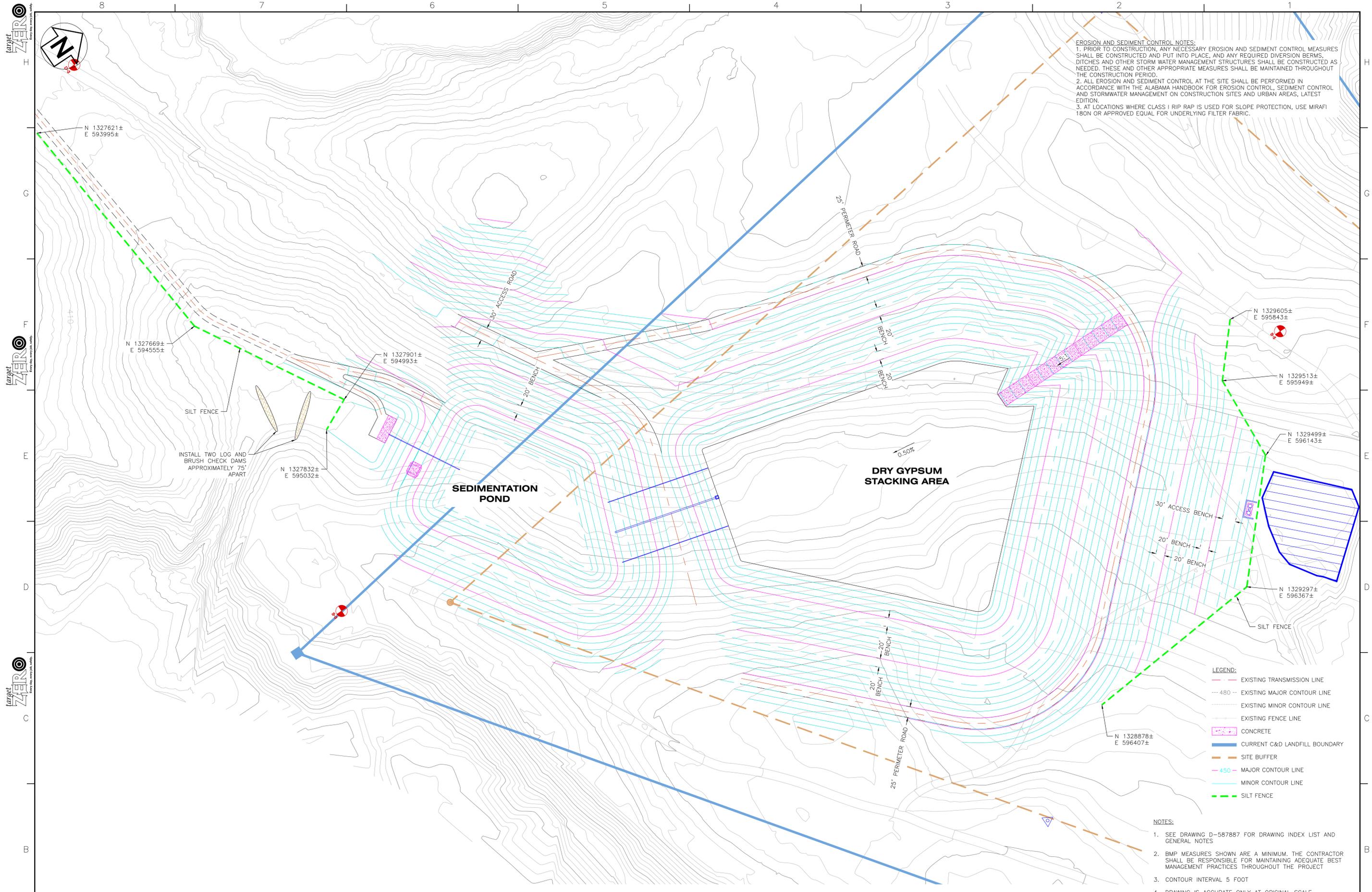
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Southern Company Generation Engineering and Construction Services FOR

Alabama Power Company

PLANT GORGAS
 DRY GYPSUM STORAGE FACILITY
 COORDINATE PLAN

| REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | REVISION | DATE | | | | | | | | | | | | | |
|----------|-------|------------|------------|----------|-----------|------------------------------------------------------------------|--------------|---------------------------------------------------------------------------------|--------------|--------------------------------------------------|--------------|----------------------------------|--------------|----------------|-------|------------|------------|----------|-----------|----------|----|-------|------------|------------|----------|-----------|----------|--|
| | | | | | | REVISION 3 | DATE 9/20/13 | REVISION 2 | DATE 8/27/12 | REVISION 1 | DATE 1/27/12 | REVISION 0 | DATE 12/5/11 | | | | | | | | | | | | | | | |
| | | | | | | REVISED PER ADEM COMMENTS A. ADDED PROFESSIONAL ENGINEER SEAL | | A. REVISED PUMP PAD LOCATION AND ACCESS ROAD B. ADDED NORTHERN SUMP LOCATION | | REVISION TO STACKING AREA AND SEDIMENTATION POND | | ISSUED FOR CONSTRUCTION | | | | | | | | | | | | | | | | |
| | | | | | | MWO: ECS18932 DRY STACK FACILITY | | MWO: ECS18932 DRY STACK FACILITY | | MWO: ECS18932 DRY STACK FACILITY | | MWO: ECS18932 DRY STACK FACILITY | | | | | | | | | | | | | | | | |
| BY | CHK'D | CIVIL APPR | ELECT APPR | U/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVIL APPR | ELECT APPR | U/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVIL APPR | ELECT APPR | U/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CIVIL APPR | ELECT APPR | U/C APPR | MECH APPR | DISC MGR | |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | SCALE | DRAWING NUMBER | | SHEET | | CONT'D | REV | | | | | | | | | |
| | | | | | | | | | | | | | 1" = 50' | D-587895 | | 1 | | FINAL | 3 | | | | | | | | | |



EROSION AND SEDIMENT CONTROL NOTES:
 1. PRIOR TO CONSTRUCTION, ANY NECESSARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE CONSTRUCTED AND PUT INTO PLACE, AND ANY REQUIRED DIVERSION BERMS, DITCHES AND OTHER STORM WATER MANAGEMENT STRUCTURES SHALL BE CONSTRUCTED AS NEEDED. THESE AND OTHER APPROPRIATE MEASURES SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD.
 2. ALL EROSION AND SEDIMENT CONTROL AT THE SITE SHALL BE PERFORMED IN ACCORDANCE WITH THE ALABAMA HANDBOOK FOR EROSION CONTROL, SEDIMENT CONTROL AND STORMWATER MANAGEMENT ON CONSTRUCTION SITES AND URBAN AREAS, LATEST EDITION.
 3. AT LOCATIONS WHERE CLASS 1 RIP RAP IS USED FOR SLOPE PROTECTION, USE MIRAFI 180N OR APPROVED EQUAL FOR UNDERLYING FILTER FABRIC.

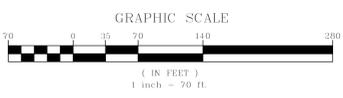
SILT FENCE
 INSTALL TWO LOG AND BRUSH CHECK DAMS APPROXIMATELY 75' APART

SEDIMENTATION POND

DRY GYPSUM STACKING AREA

- LEGEND:**
- - - EXISTING TRANSMISSION LINE
 - 480 --- EXISTING MAJOR CONTOUR LINE
 - EXISTING MINOR CONTOUR LINE
 - - - EXISTING FENCE LINE
 - CONCRETE
 - CURRENT C&D LANDFILL BOUNDARY
 - SITE BUFFER
 - 450 MAJOR CONTOUR LINE
 - MINOR CONTOUR LINE
 - SILT FENCE

- NOTES:**
1. SEE DRAWING D-587887 FOR DRAWING INDEX LIST AND GENERAL NOTES
 2. BMP MEASURES SHOWN ARE A MINIMUM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ADEQUATE BEST MANAGEMENT PRACTICES THROUGHOUT THE PROJECT
 3. CONTOUR INTERVAL 5 FOOT
 4. DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 5. COORDINATES SHOWN ON SILT FENCE ARE FOR GENERAL LOCATION AND MAY BE ADJUSTED AS REQUIRED TO MEET ACTUAL FIELD CONDITIONS.



"REV. 3 OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS DRY GYPSUM STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

Southern Company Generation Engineering and Construction Services FOR

Alabama Power Company

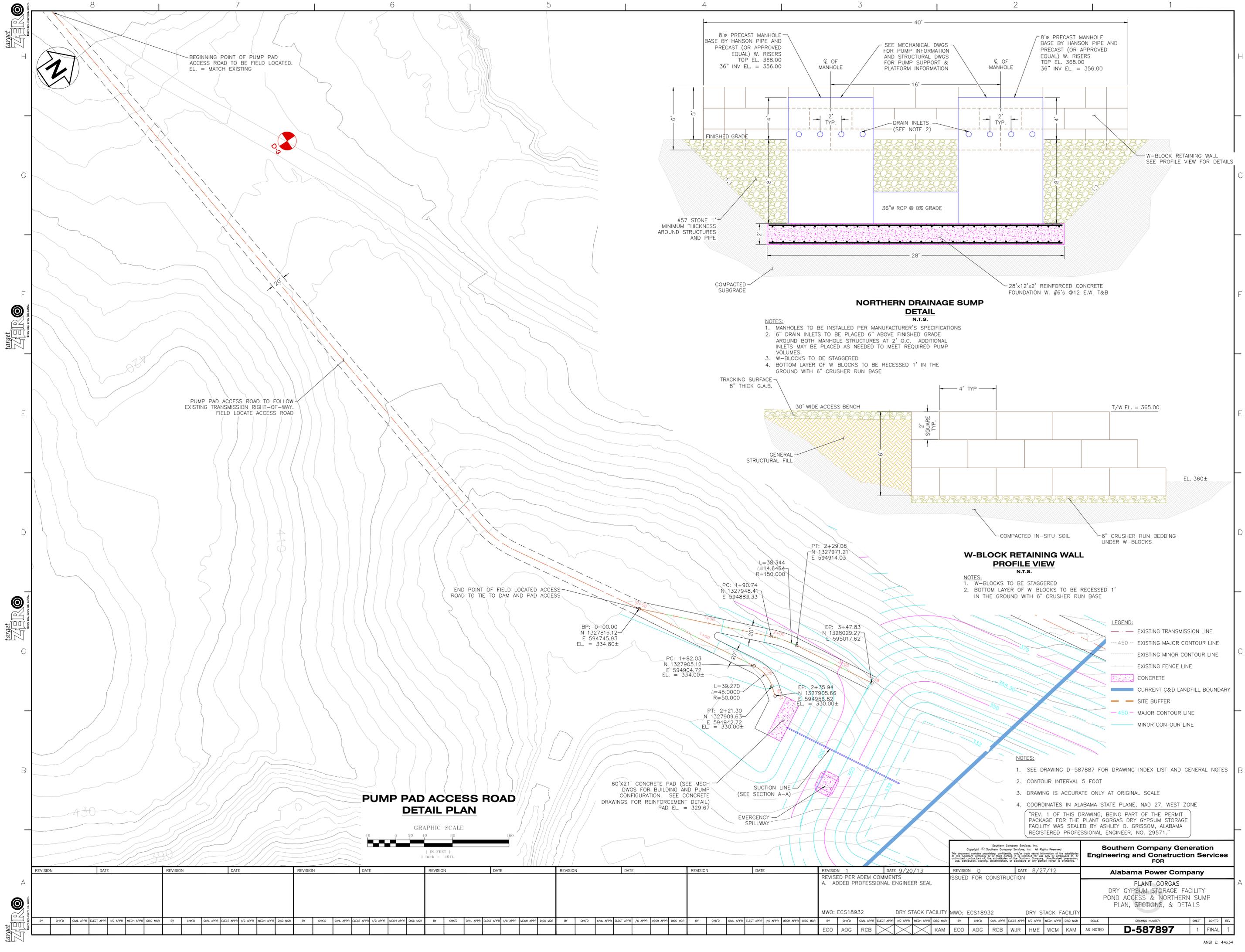
PLANT GORGAS DRY GYPSUM STORAGE FACILITY BMP PLAN

Record

| | |
|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| REVISION 3 DATE 9/20/13 REVISED PER ADEM COMMENTS A. ADDED PROFESSIONAL ENGINEER SEAL MWO: ECS18932 DRY STACK FACILITY | REVISION 2 DATE 8/27/12 REVISED SILT FENCE LIMITS MWO: ECS18932 DRY STACK FACILITY |
| REVISION 1 DATE 1/27/12 GENERAL REVISION REVISED STACKING AREA AND SEDIMENTATION POND MWO: ECS18932 | REVISION 0 DATE 12/5/11 ISSUED FOR CONSTRUCTION MWO: ECS18932 |

| | | | | | | |
|-----|-------|-----------|------------|----------|-----------|----------|
| BY | CHK'D | CIVL APPR | ELECT APPR | U/C APPR | MECH APPR | DISC MGR |
| ECO | AOG | RCB | | | | KAM |

| REVISION | DATE |
|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|
| | | | | | | | | | | | | | | | |

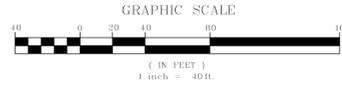


BEGINNING POINT OF PUMP PAD ACCESS ROAD TO BE FIELD LOCATED. EL. = MATCH EXISTING

PUMP PAD ACCESS ROAD TO FOLLOW EXISTING TRANSMISSION RIGHT-OF-WAY. FIELD LOCATE ACCESS ROAD

END POINT OF FIELD LOCATED ACCESS ROAD TO TIE TO DAM AND PAD ACCESS

PUMP PAD ACCESS ROAD DETAIL PLAN



60'x21' CONCRETE PAD (SEE MECH DWGS FOR BUILDING AND PUMP CONFIGURATION. SEE CONCRETE DRAWINGS FOR REINFORCEMENT DETAIL) PAD EL. = 329.67

SUCTION LINE (SEE SECTION A-A)

EMERGENCY SPILLWAY

BP: 0+00.00
N 1327816.12
E 594745.93
EL. = 334.80±

PC: 1+82.03
N 1327905.12
E 594904.72
EL. = 334.00±

L=39.270
Δ=45.0000
R=50.000

PT: 2+21.30
N 1327909.63
E 594942.72
EL. = 330.00±

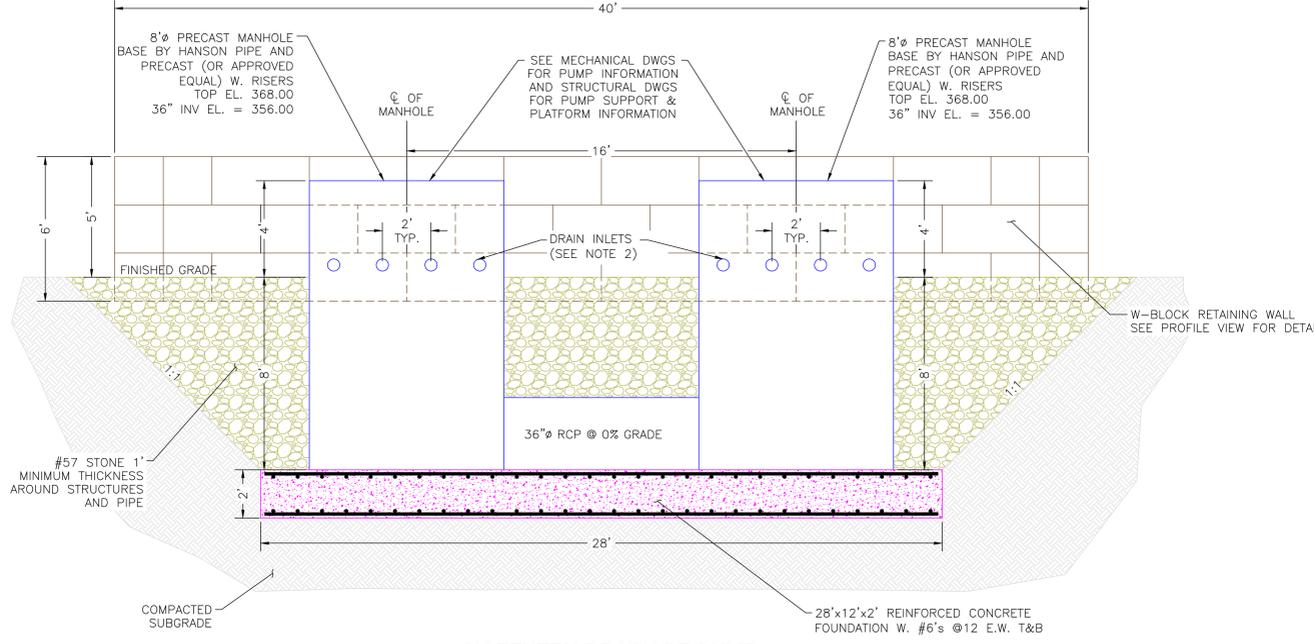
PC: 1+90.74
N 1327948.41
E 594883.33

L=38.344
Δ=14.6464
R=150.000

PT: 2+29.08
N 1327971.21
E 594914.03

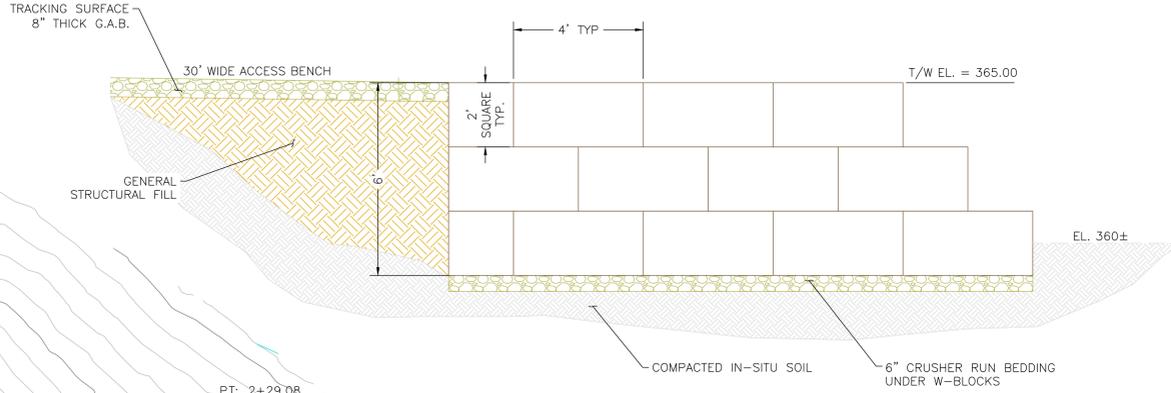
EP: 3+47.83
N 1328029.27
E 595017.62

EP: 2+35.94
N 1327905.66
E 594956.82
EL. = 330.00±



NORTHERN DRAINAGE SUMP DETAIL
N.T.S.

- NOTES:
- MANHOLES TO BE INSTALLED PER MANUFACTURER'S SPECIFICATIONS
 - 6" DRAIN INLETS TO BE PLACED 6" ABOVE FINISHED GRADE AROUND BOTH MANHOLE STRUCTURES AT 2' O.C. ADDITIONAL INLETS MAY BE PLACED AS NEEDED TO MEET REQUIRED PUMP VOLUMES.
 - W-BLOCKS TO BE STAGGERED
 - BOTTOM LAYER OF W-BLOCKS TO BE RECESSED 1' IN THE GROUND WITH 6" CRUSHER RUN BASE



W-BLOCK RETAINING WALL PROFILE VIEW
N.T.S.

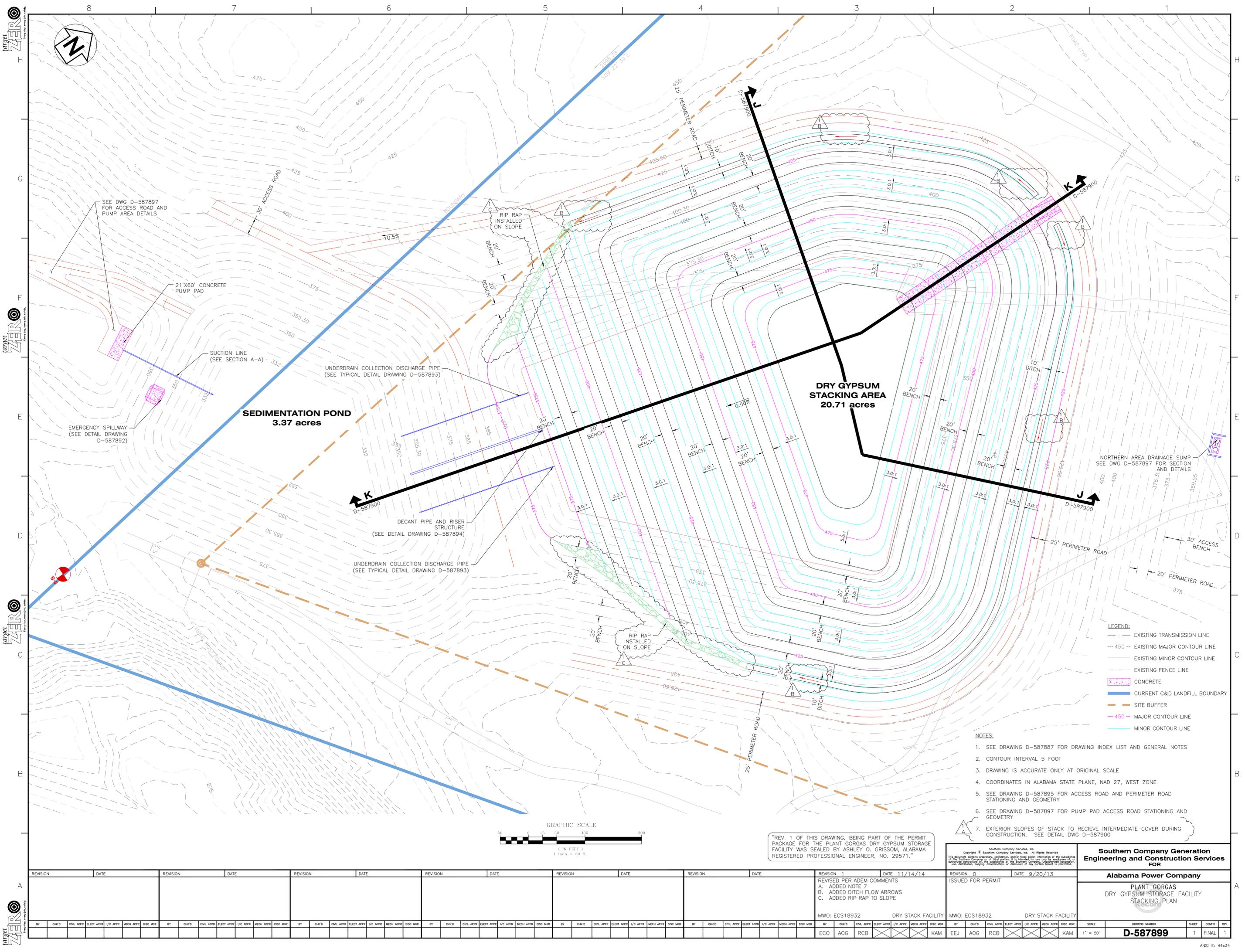
- NOTES:
- W-BLOCKS TO BE STAGGERED
 - BOTTOM LAYER OF W-BLOCKS TO BE RECESSED 1' IN THE GROUND WITH 6" CRUSHER RUN BASE

- LEGEND:
- EXISTING TRANSMISSION LINE
 - EXISTING MAJOR CONTOUR LINE
 - EXISTING MINOR CONTOUR LINE
 - EXISTING FENCE LINE
 - CONCRETE
 - CURRENT C&D LANDFILL BOUNDARY
 - SITE BUFFER
 - MAJOR CONTOUR LINE
 - MINOR CONTOUR LINE

- NOTES:
- SEE DRAWING D-587887 FOR DRAWING INDEX LIST AND GENERAL NOTES
 - CONTOUR INTERVAL 5 FOOT
 - DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 - COORDINATES IN ALABAMA STATE PLANE, NAD 27, WEST ZONE

"REV. 1 OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS DRY GYPSUM STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

| | | | |
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| Southern Company Services, Inc. Copyright © Southern Company Services, Inc. All Rights Reserved. <small>This document contains proprietary, confidential, and/or trade secret information of the subsidiaries of the Southern Company or of third parties. It is intended for use only by employees of, or authorized contractors of, the subsidiaries of the Southern Company. No disclosure, copying, dissemination, or distribution of any portion hereof is permitted.</small> | | Southern Company Generation Engineering and Construction Services FOR | |
| Alabama Power Company | | PLANT GORGAS DRY GYPSUM STORAGE FACILITY POND ACCESS & NORTHERN SUMP PLAN, SECTIONS, & DETAILS | |
| REVISION 1 | DATE 9/20/13 | REVISION 0 | DATE 8/27/12 |
| REVISED PER ADEM COMMENTS A. ADDED PROFESSIONAL ENGINEER SEAL | | ISSUED FOR CONSTRUCTION | |
| MWO: ECS18932 DRY STACK FACILITY | | MWO: ECS18932 DRY STACK FACILITY | |
| BY | CHK'D | BY | CHK'D |
| ECO | AOG | ECO | AOG |
| RCB | | RCB | |
| | | WJR | |
| | | HME | |
| | | WCM | |
| | | KAM | |
| SCALE | AS NOTED | DRAWING NUMBER | SHEET |
| | | D-587897 | 1 |
| | | CONT'D | REV |
| | | | 1 |

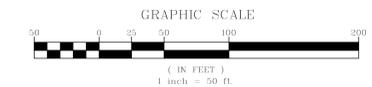


SEDIMENTATION POND
3.37 acres

DRY GYPSUM STACKING AREA
20.71 acres

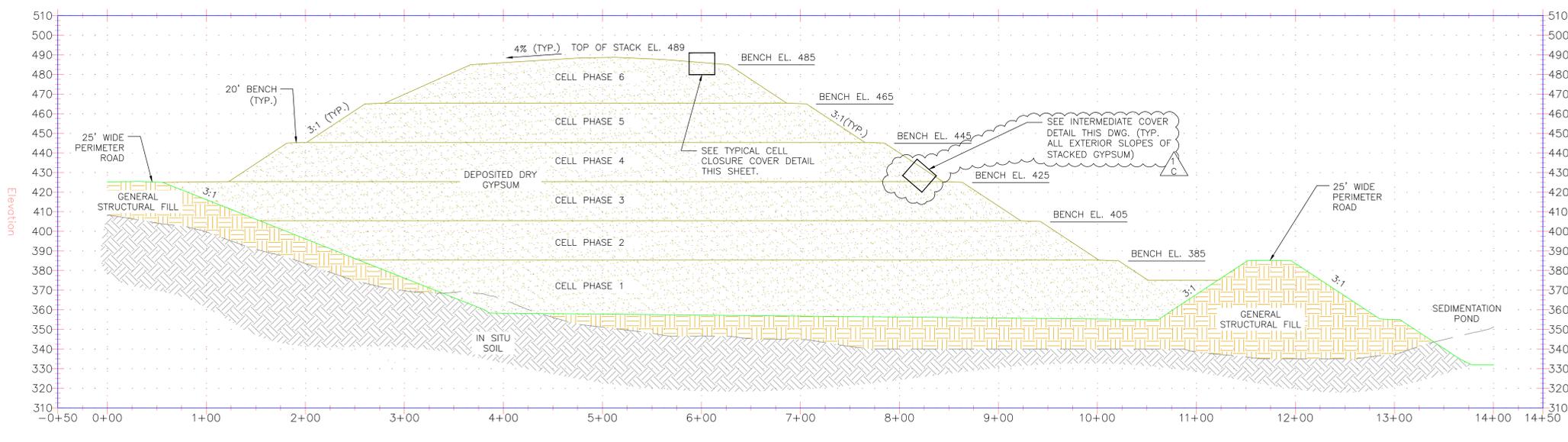
- LEGEND:**
- - - EXISTING TRANSMISSION LINE
 - - - EXISTING MAJOR CONTOUR LINE
 - - - EXISTING MINOR CONTOUR LINE
 - - - EXISTING FENCE LINE
 - CONCRETE
 - CURRENT C&D LANDFILL BOUNDARY
 - SITE BUFFER
 - MAJOR CONTOUR LINE
 - MINOR CONTOUR LINE

- NOTES:**
1. SEE DRAWING D-587887 FOR DRAWING INDEX LIST AND GENERAL NOTES
 2. CONTOUR INTERVAL 5 FOOT
 3. DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 4. COORDINATES IN ALABAMA STATE PLANE, NAD 27, WEST ZONE
 5. SEE DRAWING D-587895 FOR ACCESS ROAD AND PERIMETER ROAD STATIONING AND GEOMETRY
 6. SEE DRAWING D-587897 FOR PUMP PAD ACCESS ROAD STATIONING AND GEOMETRY
 7. EXTERIOR SLOPES OF STACK TO RECEIVE INTERMEDIATE COVER DURING CONSTRUCTION. SEE DETAIL DWG D-587900

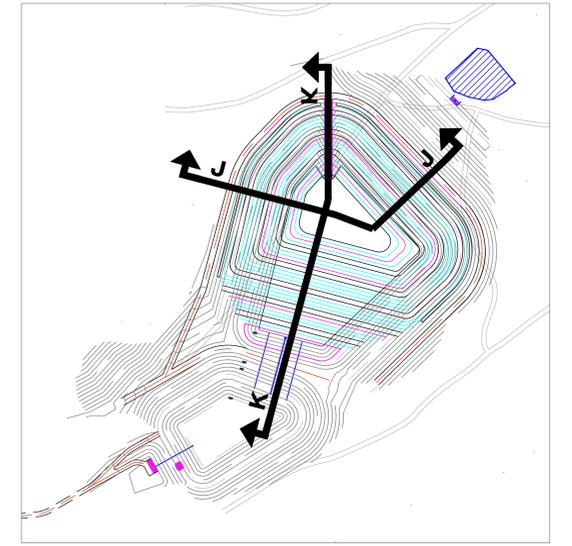


"REV. 1 OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS DRY GYPSUM STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

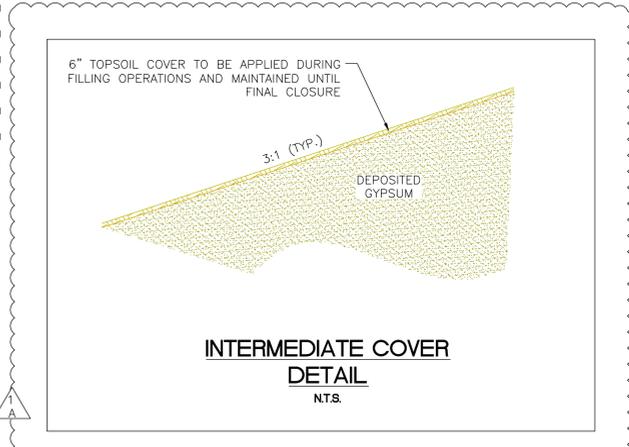
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|----------------------------------|---------------|------------|--------------|----------|-----------|----------|------|----------|----------|------------|----------|----------------------------------|----------|----------|-------|----------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|-------|----------------|-------|--------|-----|
| REVISION 1 | DATE 11/14/14 | REVISION 0 | DATE 9/20/13 | | | | | | | | | | | | | | | | | | | | | | |
| REVISED PER ADEM COMMENTS | | | | | | | | | | | | ISSUED FOR PERMIT | | | | | | Southern Company Generation Engineering and Construction Services FOR Alabama Power Company PLANT GORGAS DRY GYPSUM STORAGE FACILITY STACKING PLAN | | | | | | | |
| A. ADDED NOTE 7 | | | | | | | | | | | | | | | | | | | | | | | | | |
| B. ADDED DITCH FLOW ARROWS | | | | | | | | | | | | | | | | | | | | | | | | | |
| C. ADDED RIP RAP TO SLOPE | | | | | | | | | | | | | | | | | | | | | | | | | |
| MWO: ECS18932 DRY STACK FACILITY | | | | | | | | | | | | MWO: ECS18932 DRY STACK FACILITY | | | | | | SCALE 1" = 50' | | | | | | | |
| BY | CHK'D | CHL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CHL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | BY | CHK'D | CHL APPR | ELECT APPR | V/C APPR | MECH APPR | DISC MGR | SCALE | DRAWING NUMBER | SHEET | CONT'D | REV |
| | | | | | | | | | | | | | | | | | | | | | | D-587899 | 1 | FINAL | 1 |



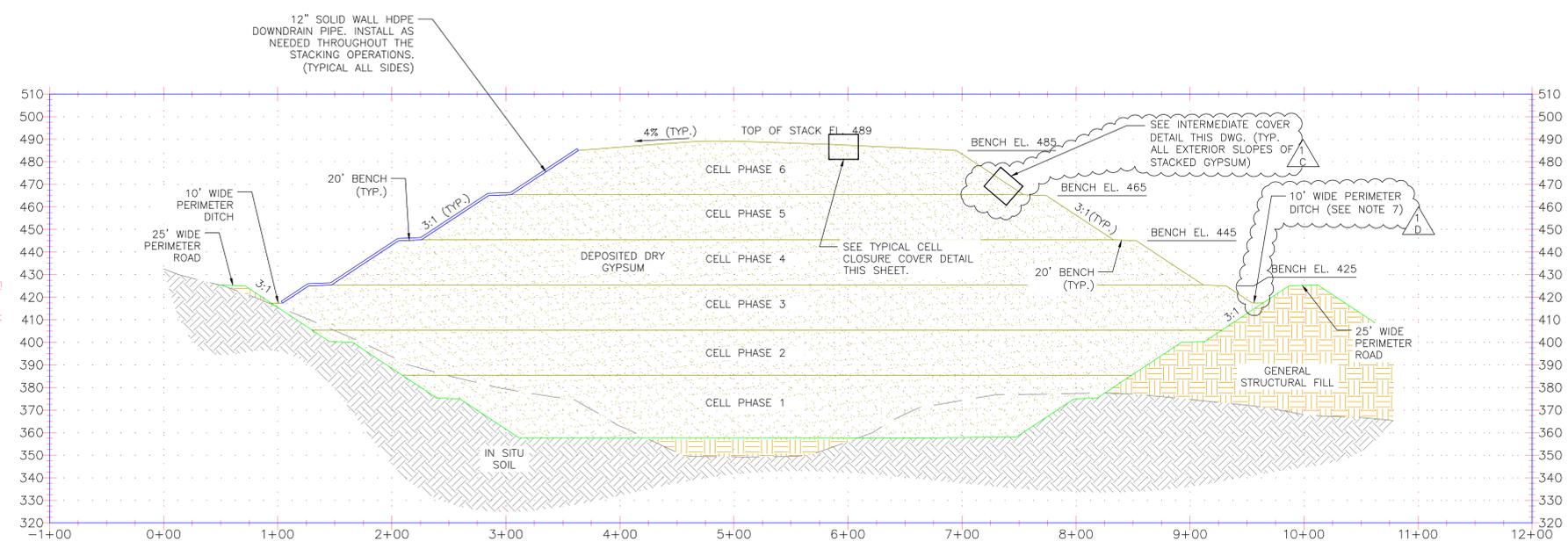
SECTION K-K
V: 1" = 2'
H: 1" = 50'



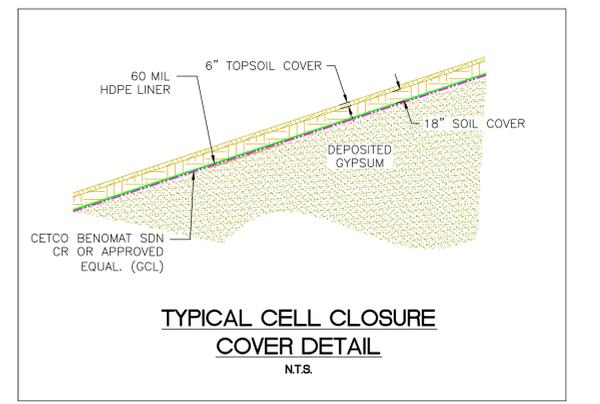
KEY PLAN
NTS



INTERMEDIATE COVER DETAIL
NTS



SECTION J-J
V: 1" = 2'
H: 1" = 50'



TYPICAL CELL CLOSURE COVER DETAIL
NTS

- NOTES:**
- SEE DRAWING D-587887 FOR DRAWING INDEX LIST AND GENERAL NOTES
 - CONTOUR INTERVAL 5 FOOT
 - DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE
 - COORDINATES IN ALABAMA STATE PLANE, NAD 27, WEST ZONE
 - SEE DRAWING D-587895 FOR ACCESS ROAD AND PERIMETER ROAD STATIONING AND GEOMETRY
 - SEE DRAWING D-587897 FOR PUMP PAD ACCESS ROAD STATIONING AND GEOMETRY
 - PERIMETER DITCH TO BE CONSTRUCTED AND MAINTAINED DURING FILLING OPERATIONS. CONTRACTOR TO ENSURE PROPER DRAINAGE TO RISER STRUCTURE.

"REV. 1 OF THIS DRAWING, BEING PART OF THE PERMIT PACKAGE FOR THE PLANT GORGAS DRY GYPSUM STORAGE FACILITY WAS SEALED BY ASHLEY O. GRISSOM, ALABAMA REGISTERED PROFESSIONAL ENGINEER, NO. 29571."

| REVISION | DATE |
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| REVISION 1 ISSUED FOR PERMIT | DATE 11/11/14 | REVISION 0 ISSUED FOR PERMIT | DATE 9/20/13 |
| REVISED PER ADEM COMMENTS A. ADDED INTERMEDIATE COVER DETAIL B. ADDED NOTE 7 C. ADDED INTERMEDIATE COVER DETAIL CALLOUT D. ADDED "SEE NOTE 7" TO DITCH CALLOUT MWO: ECS18932 | | DRY STACK FACILITY MWO: ECS18932 | |
| BY ECO CHK'D AOG | CHL APPR AOG ELECT APPR RCB V/C APPR RCB | BY EEJ CHK'D AOG CHL APPR RCB ELECT APPR RCB V/C APPR RCB | MECH APPR KAM DISC MWR KAM |
| SCALE AS SHOWN | DRAWING NUMBER D-587900 | SHEET 1 | CONTD 1 |

**APPENDIX 5
ENGINEERING CALCULATIONS**

**SEDIMENTATION BASIN & RUN-ON/RUN-OFF CALCULATIONS
LEACHATE CALCULATIONS
SLOPE STABILITY CALCULATIONS**

**RUN-ON AND RUN-OFF CONTROL PLAN
PLANT GORGAS GYPSUM LANDFILL
ALABAMA POWER COMPANY**

Section 257.81 of EPA's regulations requires the owner or operator of an existing or new CCR landfill or any lateral expansion of a CCR landfill to prepare a run-on and run-off control system plan to document how these control systems have been designed and constructed to meet the applicable requirements of this section of the rule. Each plan is to be supported by appropriate engineering calculations.

The Gypsum Landfill is located at Alabama Power Company's Plant Gorgas within the permitted boundaries of the Plant's overall landfill facility. While permitted for a variety of CCR, this facility will primarily store dry gypsum. The Gypsum Landfill covers approximately 15 acres.

The storm water flows have been calculated using the Natural Resources Conservation Service method (also known as the Soil Conservation Service (SCS)) method using 24 hour storm events. The storm water detention system has been designed in accordance with the Alabama Soil and Water Conservation Committee requirements as well as other local, city, and government codes. The post developed storm water discharge was designed to be less than the pre-developed storm water discharge in accordance with the requirements of the State of Alabama.

Runoff curve number data was determined using Table 2-2A from the Urban Hydrology for Small Watersheds (TR-55). Appendix A and B from the TR-55 were used to determine the rainfall distribution methodology. Precipitation values were determined from NOAA's Precipitation Frequency Data Server (Atlas-14).

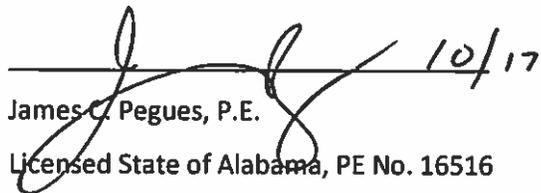
The NRCS provided information on the soil characteristics and hydrologic groups present at the site. It was determined that the site contains areas with hydrological soil groups "A" and "D". A composite curve number was created based on the land use and soil type of the entire drainage area. This information was placed into Hydraflow Hydrographs and used to generate appropriate precipitation curves and storm basin runoff values.

The Plant Gorgas Gypsum Landfill is designed and constructed with perimeter berms and drainage ditches around the cell that prevent stormwater run-on from surrounding areas during the peak discharge of a 24-hr, 25-yr storm from flowing onto the active portion of the landfill.

The leachate/runoff pond collects and controls the calculated amount of leachate generated from the leachate collection system of the disposal cell as well as the quantity of rainfall from a 24-hr, 100-yr storm event that falls directly into the leachate/runoff pond. The water collected in the leachate/runoff pond is pumped back to the plant for reuse.

The facility is operated subject to and in accordance with § 257.3-3 of EPA's regulations.

I hereby certify that the run-on and run-off control system plan meets the requirements of 40 C.F.R. Part 257.81.


James C. Pegues, P.E.
Licensed State of Alabama, PE No. 16516



**Run-on and Run-off Control System Plan for Landfills:
Calculation Summary**

for

Plant Gorgas Dry Gypsum Storage Facility

Prepared by:

Southern Company Services
Technical Services

Originator: Curtis R. Upchurch 10/6/16
Curtis R. Upchurch Date

Reviewer: Jason S. Wilson 10/11/16
Jason S. Wilson Date

Approval: James C. Pegues 10/12/16
James C. Pegues Date

1.0 Purpose of Calculation

The purpose of this report is to demonstrate the run-on and run-off controls of the subject CCR landfill in order to prepare a run-on and run-off control system plan as required by the United States Environmental Protection Agency's (EPA) final rule for Disposal of CCR from Electric Utilities (EPA 40 CFR 257).

2.0 Summary of Conclusions

2.1 Site Overview

The Plant Gorgas Dry Gypsum Storage Facility is located approximately 9 miles west of Birmingham, Alabama on Plant Gorgas property northeast of the plant. The total area occupied by the landfill is approximately 48.6 acres. The landfill has one storage cell with a drainage area of approximately 30.3 acres and a Sedimentation Pond with a drainage area of approximately 18.3 acres. There is a single concrete stop log riser in the low point of the cell which conveys water to a sediment basin downstream via a 36 inch diameter HDPE pipe. Water collected in the Sedimentation Pond is pumped back to the Plant for reuse and is not released. The sediment pond does have a spillway with an outfall to the Black Warrior River basin south of the site, however this structure is only to maintain dam integrity in the unlikely case of an overflow condition. The Sedimentation Pond drainage area is approximately 18.3 acres and receives only runoff from the gypsum storage cell and the sloped areas around the pond up to the surrounding ridge lines.

An overview of the Cell and Sedimentation Pond is provided in Table 1 below.

Table 1 - Landfill site characteristics

| Pond Description | Cell | Sedimentation Pond |
|------------------|------------------------------------------------------------------------------|---------------------------|
| Size (Acres) | 20.7 | 3.4 |
| Outlet Type | Concrete stop log riser 6'x6', Ht=25', Crest L=3.0' with 36" HDPE pipe | 16" suction line to pump |
| Outlets To | Sedimentation Pond | Pumped to Plant for reuse |

2.2 Run-on Control System Plan

There is no stormwater run-on into the Cell or Sedimentation Pond other than flow from surrounding slopes at the perimeter of the cell and pond. Run-off from these areas has been included in these calculations. Note that any others areas where run-off was directed to the landfill area was diverted by the initial design which now prevents any water encroachment. For further information on this hydraulic design, see SCS Calculation No. DC-GOR-ECS18932-001, Plant Gorgas Dry Gypsum Storage Facility Plans, Stormwater Management Calculations, 12/26/12

2.3 Run-off Control System Plan

A hydrologic and hydraulic model was developed for the Plant Gorgas Dry Gypsum Storage Facility Sedimentation Pond to determine the hydraulic capacity of the Cell and Sedimentation Pond. The design storm for the purposes of run-off control system plans is the 24-hour, 25-year rainfall event. The results of routing the design storm event through the landfill are presented in Table 2 below:

Table 2 - Flood Routing Results for Plant Gorgas Dry Gypsum Storage Facility Sedimentation Pond

| Plant Gorgas | Normal Pool El (ft) | Top of embankment El (ft) | Peak Water Surface Elevation (ft) | Freeboard* (ft) | Peak Inflow (cfs) | Peak Outflow (cfs) |
|--------------------|---------------------|---------------------------|-----------------------------------|-----------------|-------------------|--------------------|
| Cell | 359.0 | 385.0 | 360.7 | 24.3 | N/A | 4 |
| Sedimentation Pond | 335.0 | 355.0 | 345.8 | 9.2 | 65 | 0 |

*Freeboard is measured from the top of embankment to the peak water surface elevation

3.0 Methodology

3.1 HYDROLOGIC ANALYSES

The design storm for all run-on/run-off analyses is a 24-hour, 25-year rainfall event. A summary of the design storm parameters and rainfall distribution methodology for these calculations is summarized below in Table 3.

Table 3 - Plant Gorgas Dry Gypsum Sedimentation Pond Design Storm Distribution

| Return Frequency (years) | Storm Duration (hours) | Rainfall Total (Inches) | Rainfall Source | Storm Distribution |
|--------------------------|------------------------|-------------------------|-----------------|--------------------|
| 25 | 24 | 7.15 | NOAA Atlas 14 | SCS Type III |

The drainage area for the Plant Gorgas Dry Gypsum Sedimentation Pond was determined based on a composite of Aerial Topo from March 2003, Field Topo August 2008 and Lidar Topo December 2011. Run-off characteristics were developed based on the Soil Conservation Service (SCS) methodologies as outlined in TR-55. An overall SCS curve number for the drainage area was developed based on methods prescribed in TR-55. Soil types were obtained from the Natural Resources Conservation Service. Land use areas were delineated based on aerial photography. Times of Concentration were also developed based on methodologies prescribed in TR-55.

A table of the pertinent basin characteristics of the landfill is provided below in Tables 4(a) and 4(b):

Table 4(a)—Landfill Hydrologic Information (Gypsum Cell)

| | |
|---------------------------------|-----------------------|
| Drainage Basin Area (acres) | 30.32 |
| Hydrologic Curve Number, CN | 94 |
| Hydrologic Methodology | SCS Method |
| Time of Concentration (minutes) | 17.7 |
| Hydrologic Software | Hydraflow Hydrographs |

Table 4(b)—Landfill Hydrologic Information (Sedimentation Pond)

| | |
|---------------------------------|-----------------------|
| Drainage Basin Area (acres) | 18.25 |
| Hydrologic Curve Number, CN | 74 |
| Hydrologic Methodology | SCS Method |
| Time of Concentration (minutes) | 22.3 |
| Hydrologic Software | Hydraflow Hydrographs |

Run-off values were determined by importing the characteristics developed above into a hydrologic model in Hydraflow Hydrographs Extension of AutoCad Civil 3D, 2013.

3.2 HYDRAULIC ANALYSES

Storage values for the Sedimentation Pond were determined by developing a stage-storage relationship utilizing contour data. The spillway system at the Plant Gorgas Dry Gypsum Sedimentation Pond consists of one primary spillway in the cell and in the sedimentation pond. The primary spillway in the cell is a 6 foot square stop log riser with a 3 foot crest section. In the Sedimentation Pond, the primary spillway is a trapezoidal weir located on the west dike. It is a reinforced concrete spillway with a 2-foot wide crest with a depth of 1-foot deep with 6:1 slopes on either end providing access along the perimeter dike. The spillway conveys flow to an existing downstream drainage channel. A summary of spillway information is presented below in Tables 5(a) and (b).

Table 5(a) – Cell Spillway Attribute Table

| Spillway Component | US Invert El (feet) | DS Invert El (feet) | Dimension (ft) | Slope (ft/ft) | Length (ft) | Spillway Capacity (cfs) |
|-----------------------------------------------------|---------------------|---------------------|---------------------------------------------------------------------------|---------------|-------------|-------------------------|
| Primary Spillway Stop log riser 8 foot square | 356.0 | 354.0 | Weir L = 3.0 ft., Weir EL 359.0 Outlet pipe = 36” diameter, HDPE | 0.078 | 258 | N/A* |

Table 5(b) – Sedimentation Pond Spillway Attribute Table

| Spillway Component | US Invert El (feet) | DS Invert El (feet) | Dimension (ft) | Slope (ft/ft) | Length (ft) | Spillway Capacity (cfs) |
|--------------------|---------------------|---------------------|--------------------------------------------------------|---------------|-------------|-------------------------|
| Primary Spillway | 354.0 | 353.8 | Trapezoidal (Concrete), Crest L=20’, 6:1 S.S. | 0.010 | 26.0 | N/A* |

*N/A = Not available

Based on the spillway attributes listed above, a rating curve was developed and inserted into Hydraflow Hydrographs software to analyze pond performance during the design storm. Results are shown in Table 2.

4.0 SUPPORTING INFORMATION

4.1 CURVE NUMBER

4.1.1 GYPSUM CELL

The screenshot shows a dialog box titled "Composite CN" with a close button (X) in the top right corner. The dialog is organized into two columns of input fields. The left column contains "Area 1", "Area 2", and "Area 3", while the right column contains "Area 4", "Area 5", and "Area 6". Each area section has two fields: "Area (ac)" and "Curve No. CN . =". The "Composite CN" section at the bottom left has a single field "Curve No. CN . =" containing the value "94". At the bottom right, there are three buttons: "Ok", "Clear", and "Exit".

| Area | Area (ac) | Curve No. CN . = |
|--------------|-----------------|------------------|
| Area 1 | 2.11 | 91 |
| Area 2 | 7.50 | 89 |
| Area 3 | 20.71 | 96 |
| Area 4 | 0.00 | 0 |
| Area 5 | 0.00 | 0 |
| Area 6 | 0.00 | 0 |
| Composite CN | | 94 |

4.1.2 SEDIMENTATION POND AREA

Composite CN ✕

| | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Area 1</p> <p>Area (ac) = <input style="width: 100px;" type="text" value="0.87"/></p> <p>Curve No. CN . = <input style="width: 100px;" type="text" value="72"/></p> | <p>Area 4</p> <p>Area (ac) = <input style="width: 100px;" type="text" value="0.00"/></p> <p>Curve No. CN . = <input style="width: 100px;" type="text" value="0"/></p> |
| <p>Area 2</p> <p>Area (ac) = <input style="width: 100px;" type="text" value="14.01"/></p> <p>Curve No. CN . = <input style="width: 100px;" type="text" value="68"/></p> | <p>Area 5</p> <p>Area (ac) = <input style="width: 100px;" type="text" value="0.00"/></p> <p>Curve No. CN . = <input style="width: 100px;" type="text" value="0"/></p> |
| <p>Area 3</p> <p>Area (ac) = <input style="width: 100px;" type="text" value="3.37"/></p> <p>Curve No. CN . = <input style="width: 100px;" type="text" value="96"/></p> | <p>Area 6</p> <p>Area (ac) = <input style="width: 100px;" type="text" value="0.00"/></p> <p>Curve No. CN . = <input style="width: 100px;" type="text" value="0"/></p> |
| <p>Composite CN</p> <p>Curve No. CN . = <input style="width: 100px; background-color: #ffffcc;" type="text" value="73"/></p> | |

4.2 STAGE-STORAGE TABLE

4.2.1 SEDIMENTATION POND

| Pond Name <input style="float: right;" type="text" value="Sediment Pond"/> | | | | | | |
|----------------------------------------------------------------------------|-------|-----------|--------------|---------------------|---------------|-----------------|
| Row | Stage | Elevation | Contour Area | Incremental Storage | Total Storage | Total Discharge |
| | (ft) | (ft) | (sqft) | (cuft) | (cuft) | (cfs) |
| 0 | 0.00 | 335.00 | 69,661 | 0.000 | 0.000 | 0.000 |
| 1 | 5.00 | 340.00 | 86,860 | 391,303 | 391,303 | 0.000 |
| 2 | 10.00 | 345.00 | 105,472 | 480,830 | 872,133 | 0.000 |
| 3 | 15.00 | 350.00 | 125,499 | 577,428 | 1,449,560 | 0.000 |
| 4 | 19.00 | 354.00 | 142,538 | 536,074 | 1,985,634 | 0.000 |
| 5 | 20.00 | 355.00 | 146,939 | 144,739 | 2,130,373 | 52.00 |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |
| 9 | | | | | | |
| 10 | | | | | | |
| 11 | | | | | | |
| 12 | | | | | | |
| 13 | | | | | | |
| 14 | | | | | | |
| 15 | | | | | | |
| 16 | | | | | | |
| 17 | | | | | | |
| 18 | | | | | | |
| 19 | | | | | | |
| 20 | | | | | | |

4.3 TIME OF CONCENTRATION

4.3.1 GYPSUM CELL AREA

5

TR55 Tc Worksheet

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No. 1

Gyp. Stack Area

| <u>Description</u> | <u>A</u> | <u>B</u> | <u>C</u> | <u>Totals</u> |
|------------------------------------|----------------|----------------------|----------------------|------------------|
| Sheet Flow | | | | |
| Manning's n-value | = 0.150 | 0.011 | 0.011 | |
| Flow length (ft) | = 300.0 | 0.0 | 0.0 | |
| Two-year 24-hr precip. (in) | = 4.00 | 0.00 | 0.00 | |
| Land slope (%) | = 1.80 | 0.00 | 0.00 | |
| Travel Time (min) | = 22.01 | + 0.00 | + 0.00 | = 22.01 |
| Shallow Concentrated Flow | | | | |
| Flow length (ft) | = 130.00 | 0.00 | 0.00 | |
| Watercourse slope (%) | = 20.00 | 0.00 | 0.00 | |
| Surface description | = Unpaved | Paved | Paved | |
| Average velocity (ft/s) | = 7.22 | 0.00 | 0.00 | |
| Travel Time (min) | = 0.30 | + 0.00 | + 0.00 | = 0.30 |
| Channel Flow | | | | |
| X sectional flow area (sqft) | = 0.00 | 0.00 | 0.00 | |
| Wetted perimeter (ft) | = 0.00 | 0.00 | 0.00 | |
| Channel slope (%) | = 0.00 | 0.00 | 0.00 | |
| Manning's n-value | = 0.015 | 0.015 | 0.015 | |
| Velocity (ft/s) | = 0.00 | 0.00 | 0.00 | |
| Flow length (ft) | ((0))0.0 | 0.0 | 0.0 | |
| Travel Time (min) | = 0.00 | + 0.00 | + 0.00 | = 0.00 |
| Total Travel Time, Tc | | | | 22.30 min |

4.3.2 SEDIMENTATION POND AREA

TR55 Tc Worksheet

8

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No. 4

Sediment Pond Area

| <u>Description</u> | <u>A</u> | <u>B</u> | <u>C</u> | <u>Totals</u> |
|------------------------------------|----------------|----------------------|----------------------|------------------|
| Sheet Flow | | | | |
| Manning's n-value | = 0.150 | 0.011 | 0.011 | |
| Flow length (ft) | = 190.0 | 0.0 | 0.0 | |
| Two-year 24-hr precip. (in) | = 4.00 | 0.00 | 0.00 | |
| Land slope (%) | = 1.80 | 0.00 | 0.00 | |
| Travel Time (min) | = 15.28 | + 0.00 | + 0.00 | = 15.28 |
| Shallow Concentrated Flow | | | | |
| Flow length (ft) | = 500.00 | 210.00 | 0.00 | |
| Watercourse slope (%) | = 6.25 | 33.33 | 0.00 | |
| Surface description | = Unpaved | Unpaved | Paved | |
| Average velocity (ft/s) | = 4.03 | 9.32 | 0.00 | |
| Travel Time (min) | = 2.07 | + 0.38 | + 0.00 | = 2.44 |
| Channel Flow | | | | |
| X sectional flow area (sqft) | = 0.00 | 0.00 | 0.00 | |
| Wetted perimeter (ft) | = 0.00 | 0.00 | 0.00 | |
| Channel slope (%) | = 0.00 | 0.00 | 0.00 | |
| Manning's n-value | = 0.015 | 0.015 | 0.015 | |
| Velocity (ft/s) | = 0.00 | 0.00 | 0.00 | |
| Flow length (ft) | (({}))0.0 | 0.0 | 0.0 | |
| Travel Time (min) | = 0.00 | + 0.00 | + 0.00 | = 0.00 |
| Total Travel Time, Tc | | | | 17.70 min |

4.4 RESULTS

4.4.1 GYPSUM CELL AREA

Hydrograph Report

4

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

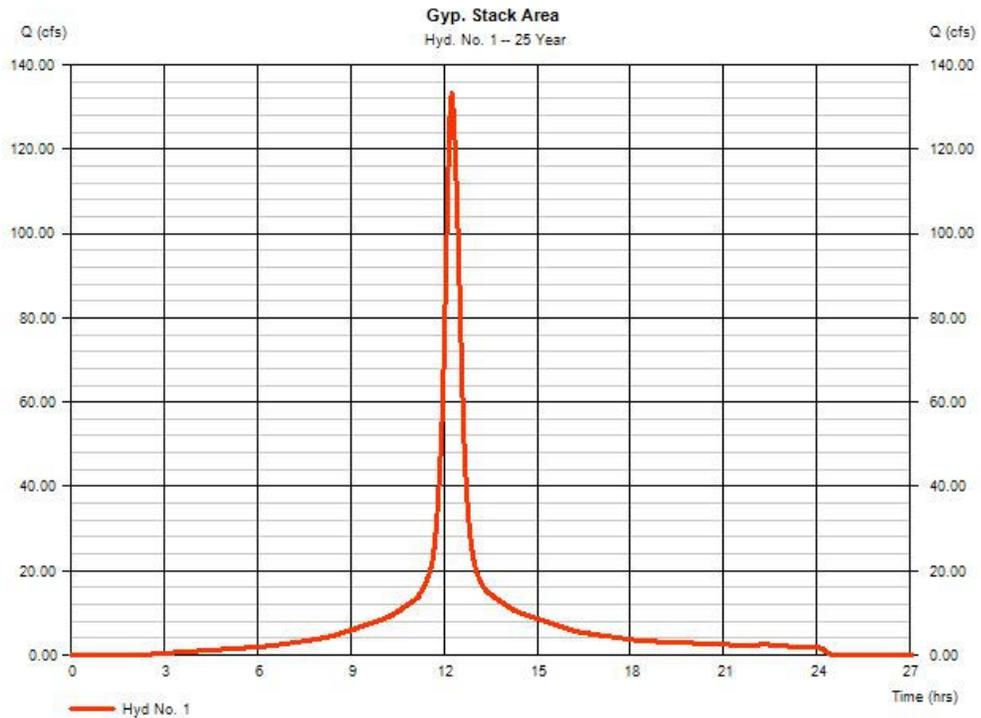
Saturday, 10 / 1 / 2016

Hyd. No. 1

Gyp. Stack Area

| | | | |
|-----------------|--------------|--------------------|----------------|
| Hydrograph type | = SCS Runoff | Peak discharge | = 133.20 cfs |
| Storm frequency | = 25 yrs | Time to peak | = 12.25 hrs |
| Time interval | = 3 min | Hyd. volume | = 690,779 cuft |
| Drainage area | = 30.320 ac | Curve number | = 94* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = TR55 | Time of conc. (Tc) | = 22.30 min |
| Total precip. | = 7.15 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = ((2.110 x 91) + (7.500 x 89) + (20.710 x 98)) / 30.320



4.4.2 GYPSUM CELL ROUTING

Hydrograph Report

6

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

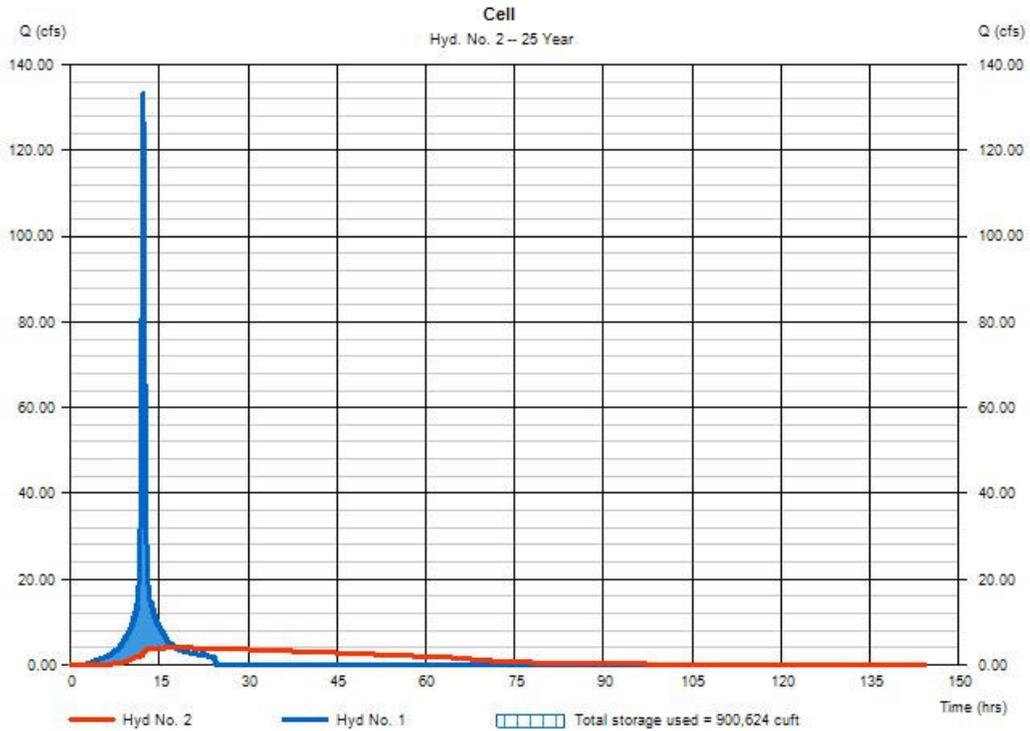
Saturday, 10 / 1 / 2016

Hyd. No. 2

Cell

| | | | |
|-----------------|-----------------------|----------------|----------------|
| Hydrograph type | = Reservoir | Peak discharge | = 3.984 cfs |
| Storm frequency | = 25 yrs | Time to peak | = 17.70 hrs |
| Time interval | = 3 min | Hyd. volume | = 687,808 cuft |
| Inflow hyd. No. | = 1 - Gyp. Stack Area | Max. Elevation | = 360.74 ft |
| Reservoir name | = Gypsum Cell | Max. Storage | = 900,624 cuft |

Storage indication method used: Wet pond routing start elevation = 359.00 ft.



4.4.3 SEDIMENTATION POND AREA

Hydrograph Report

7

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

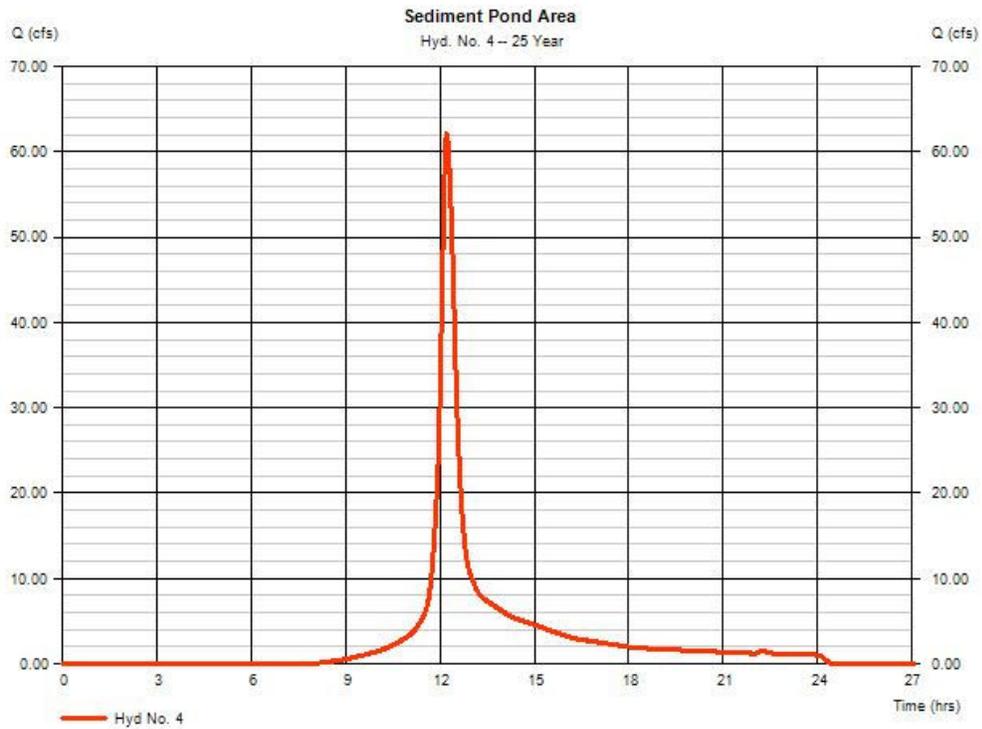
Saturday, 10 / 1 / 2016

Hyd. No. 4

Sediment Pond Area

| | | | |
|-----------------|--------------|--------------------|----------------|
| Hydrograph type | = SCS Runoff | Peak discharge | = 62.16 cfs |
| Storm frequency | = 25 yrs | Time to peak | = 12.20 hrs |
| Time interval | = 3 min | Hyd. volume | = 277,704 cuft |
| Drainage area | = 18.250 ac | Curve number | = 73* |
| Basin Slope | = 0.0 % | Hydraulic length | = 0 ft |
| Tc method | = TR55 | Time of conc. (Tc) | = 17.70 min |
| Total precip. | = 7.15 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(0.870 x 72) + (14.010 x 68) + (3.370 x 96)] / 18.250



4.4.4 SEDIMENTATION POND ROUTING (NO DISCHARGE)

Hydrograph Report

10

Hydroflow Hydrographs: Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

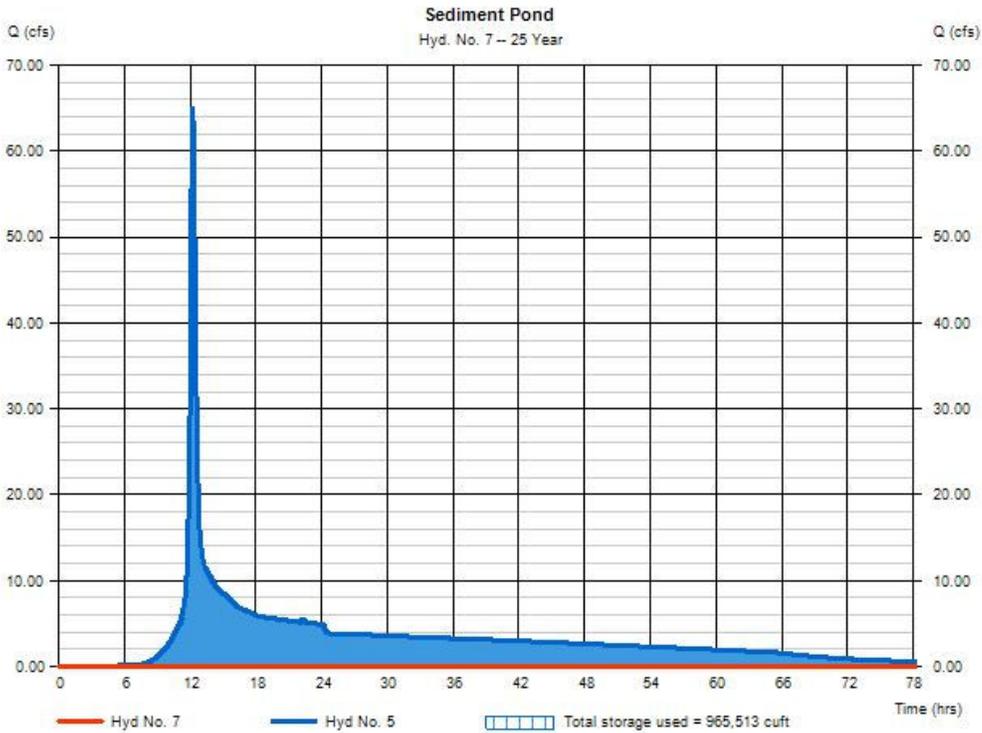
Saturday, 10 / 1 / 2016

Hyd. No. 7

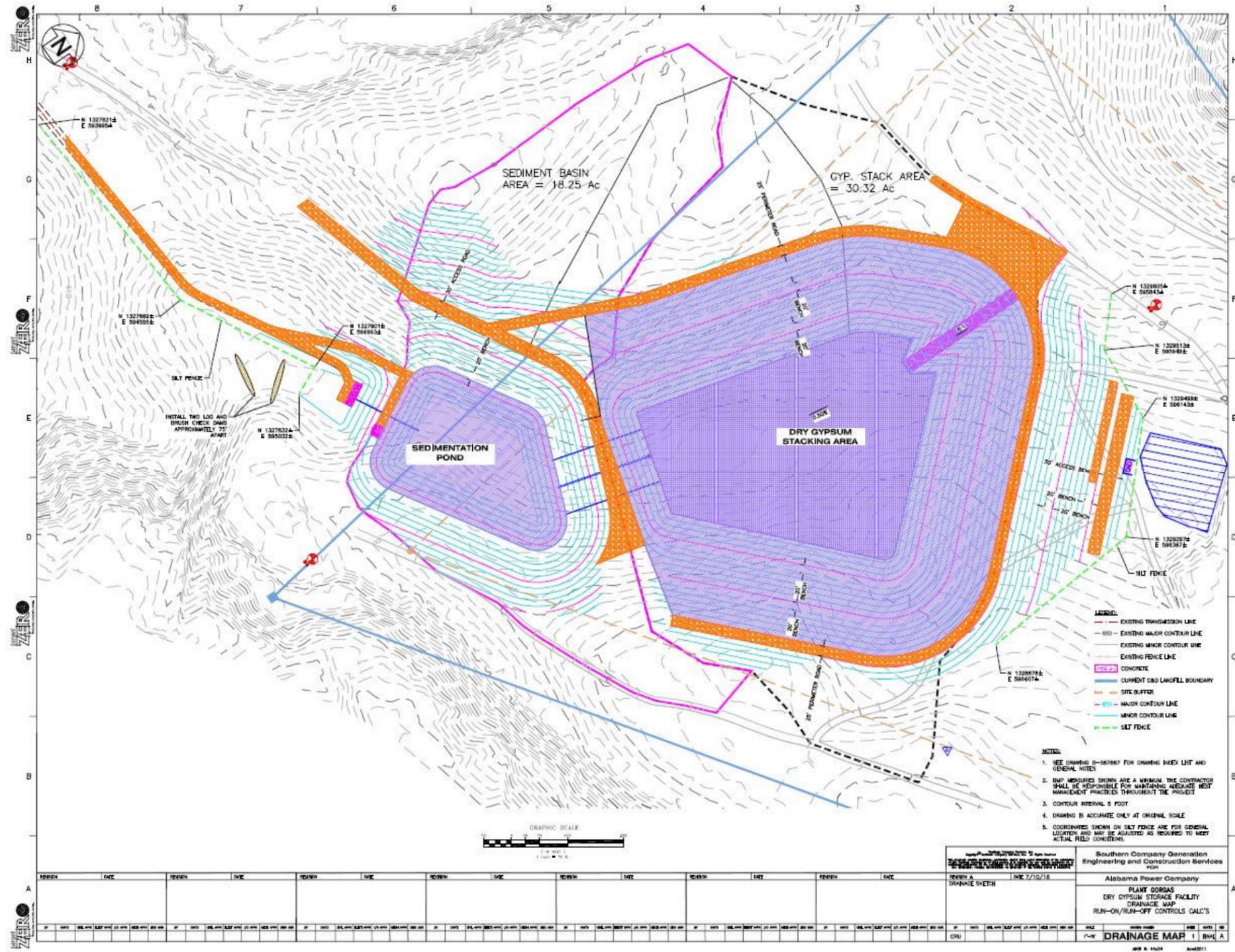
Sediment Pond

| | | | |
|-----------------|-------------------------------|----------------|----------------|
| Hydrograph type | = Reservoir | Peak discharge | = 0.000 cfs |
| Storm frequency | = 25 yrs | Time to peak | = n/a |
| Time interval | = 3 min | Hyd. volume | = 0 cuft |
| Inflow hyd. No. | = 5 - Flow into Sediment Pond | Max. Elevation | = 345.81 ft |
| Reservoir name | = Sediment Pond | Max. Storage | = 965,513 cuft |

Storage Indication method used:



4.5 DRAINAGE BASIN



PLANT GORGAS
DRY GYPSUM STORAGE
FACILITY PLANS

STORMWATER MANAGEMENT CALCULATIONS

FOSSIL AND HYDRO WEST
BIRMINGHAM
CIVIL
SITEWORK

SOUTHERN COMPANY SERVICES
BIRMINGHAM, ALABAMA

December 26, 2012

Prepared by Eric C. O'Neal

Design Calculations

| | | |
|----------------------------------------------|--------------------|------------------|
| Project PLANT GORGAS - DRY GYPSUM STORAGE | Prepared By ECO | Date 12/26/12 |
| Subject/Title FINAL DRAINAGE CALCULATIONS | Reviewed By SES | Date 3/27/13 |
| | Calculation Number | Sheet 1 of 11 |

ASSUMPTIONS

- COMPOSITE CN OF 85 USED FOR ALL 3 DRAINAGE AREAS
- T_c OBTAINED w/ KIRPICH NOMOGRAPH
- TYPE III STORM DISTRIBUTION
- REQUIRED STORAGE VOLUME = 100YR STORM
- DRAINAGE AREA 3 NOT INCLUDED IN POND SIZING. THE AREA WILL BE PUMPED TO THE PREEDE POND AND THEREFOR CONTROLLED.

ATTACHMENTS

- DRAINAGE AREA DEFINITION SKETCH
- KIRPICH NOMOGRAPHS (3)
- HYDROGRAPH SUMMARY REPORTS (3)
- HYDROGRAPH POND REPORT (1)

DRAINAGE AREA CALCULATIONS

• DRAINAGE AREA 1
AREA: 16.43 AL

• CN: 85

$T_c = 5.8 \text{ mins}$ (KIRPICH NOMOGRAPH ATTACHED)

100YR STORM VOL. = 394,020 CF (HYDROGRAPH SUMMARY ATTACHED)

Design Calculations

| | | |
|----------------------------------------------|--------------------|------------------|
| Project PLANT GORGAS - DRY GYPSUM STORAGE | Prepared By ELO | Date 12/26/12 |
| Subject/Title FINAL DRAINAGE CALCULATIONS | Reviewed By EES | Date 3/27/13 |
| | Calculation Number | Sheet 2 of 11 |

• DRAINAGE AREA 2
AREA: 32.59 AC

CN: 85

T_c : 8 mins (KIRPICH NOMOGRAPH ATTACHED)

100YR STORM VOL: 738,935 CF (HYDROGRAPH SUMMARY ATTACHED)

- DRAINAGE AREA 3 (FOR INFORMATION ONLY)
AREA: 46.27 AC

CN: 85

T_c : 7 mins (KIRPICH NOMOGRAPH ATTACHED)

100YR STORM VOL: 1,049,111 CF (HYDROGRAPH SUMMARY ATTACHED)

- TOTAL STORAGE REQUIRED = DA1 + DA2

POND STORAGE

• POND BOTTOM: EL. 332.00

• DEAD STORAGE: 3 AL

• STAGE 0 EL. 335.00 → EMERGENCY SPILLWAY EL 354.00

TOTAL STORAGE PROVIDED: 1,985,620 CF > 1,132,955 CF OK

† HYDROGRAPH POND REPORT ATTACHED †

Design Calculations

| | | |
|----------------------------------------------|--------------------|------------------|
| Project PLANT GORGAS - DRY GYPSUM STORAGE | Prepared By ELO | Date 12/26/12 |
| Subject/Title FINAL DRAINAGE CALCULATIONS | Reviewed By EES | Date 3/27/13 |
| | Calculation Number | Sheet 3 of 11 |

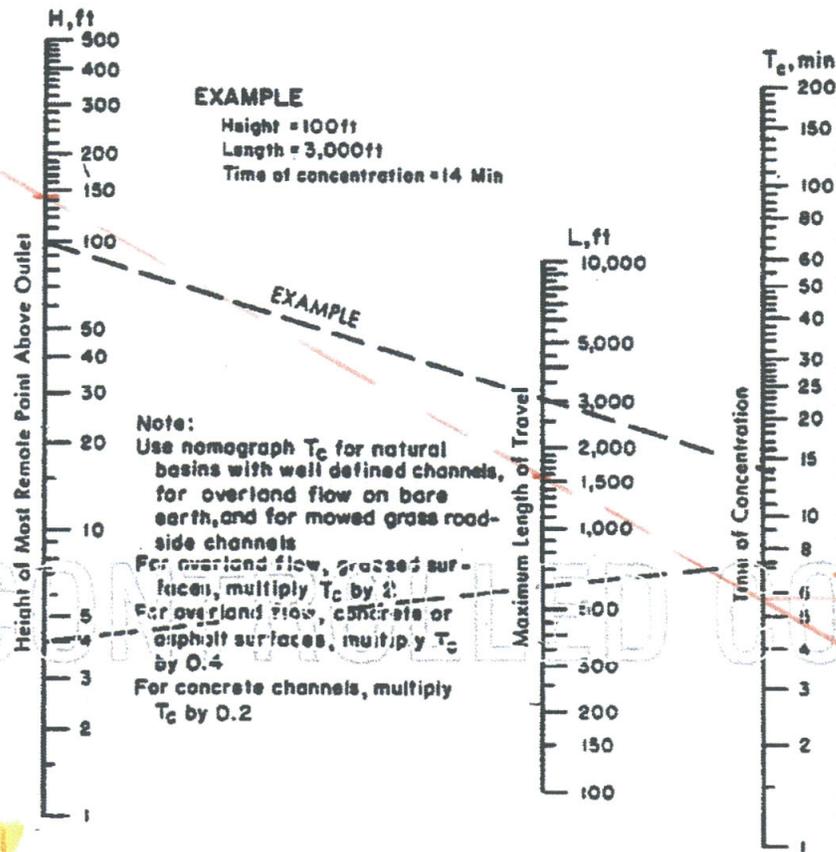
- 100 yr STORM EL & FREE BOARD

| <u>STORAGE</u> | <u>ELEV</u> |
|----------------|-------------|
| 872,125 | 345 |
| 1,132,955 | X |
| 1,449,620 | 350 |

* THROUGH INTERPOLATION · X = 347.26.

· 100 yr STORM EL 347.26

· FREE BOARD = $354 - 347.26 = 6.74$ ft OK



DRAINAGE AREA

+ 475 - 332 = 143 ft
 = 1571 ft.

From *Handbook of Steel Drainage and Highway Construction Products*, 1983
 Used by permission of American Iron and Steel Institute.

Figure 1
 Kirpich Nomograph for
 Time of Concentration of Rainfall on Small Drainage Basins

Hydrograph Plot

Hydraflow Hydrographs by Intellisolve

Thursday, Jan 3 2013, 4:18 PM

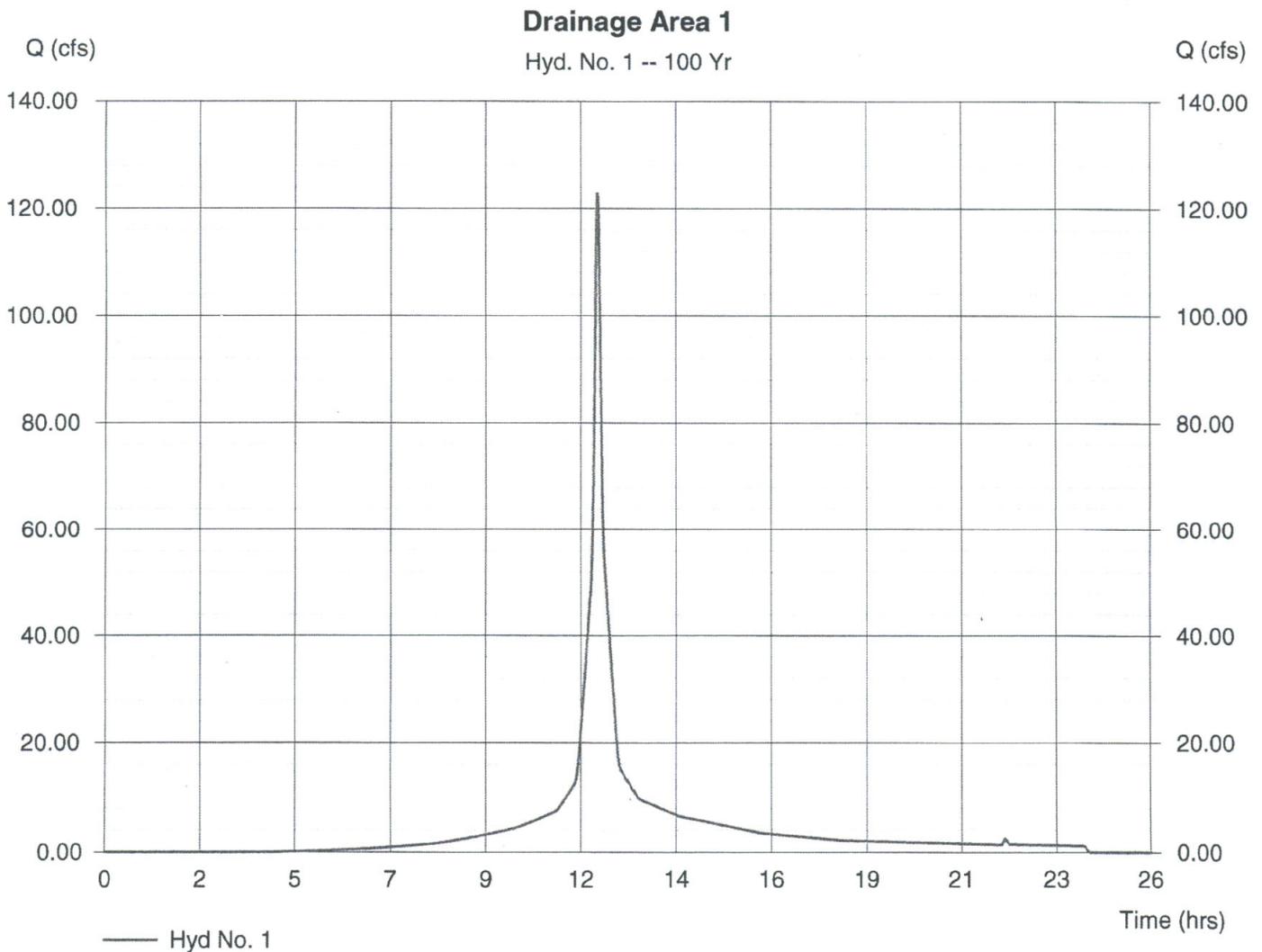
Hyd. No. 1

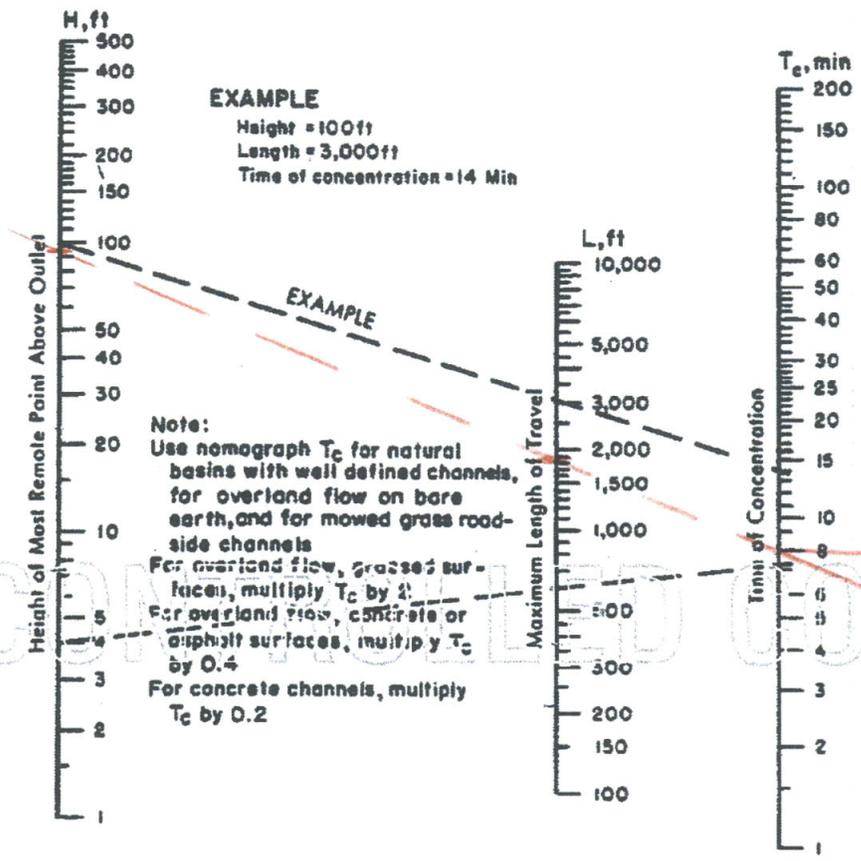
Drainage Area 1

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 16.430 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.20 in
Storm duration = 24 hrs

Peak discharge = 122.80 cfs
Time interval = 1 min
Curve number = 85
Hydraulic length = 0 ft
Time of conc. (Tc) = 5.80 min
Distribution = Type III
Shape factor = 484

Hydrograph Volume = 394,020 cuft





RAINAGE AREA 2

1. 450 - 355 = 95 ft

~ 1828 ft

From *Handbook of Steel Drainage and Highway Construction Products*, 1983
 Used by permission of American Iron and Steel Institute.

Figure 1
 Kirpich Nomograph for
 Time of Concentration of Rainfall on Small Drainage Basins

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Thursday, Jan 3 2013, 4:18 PM

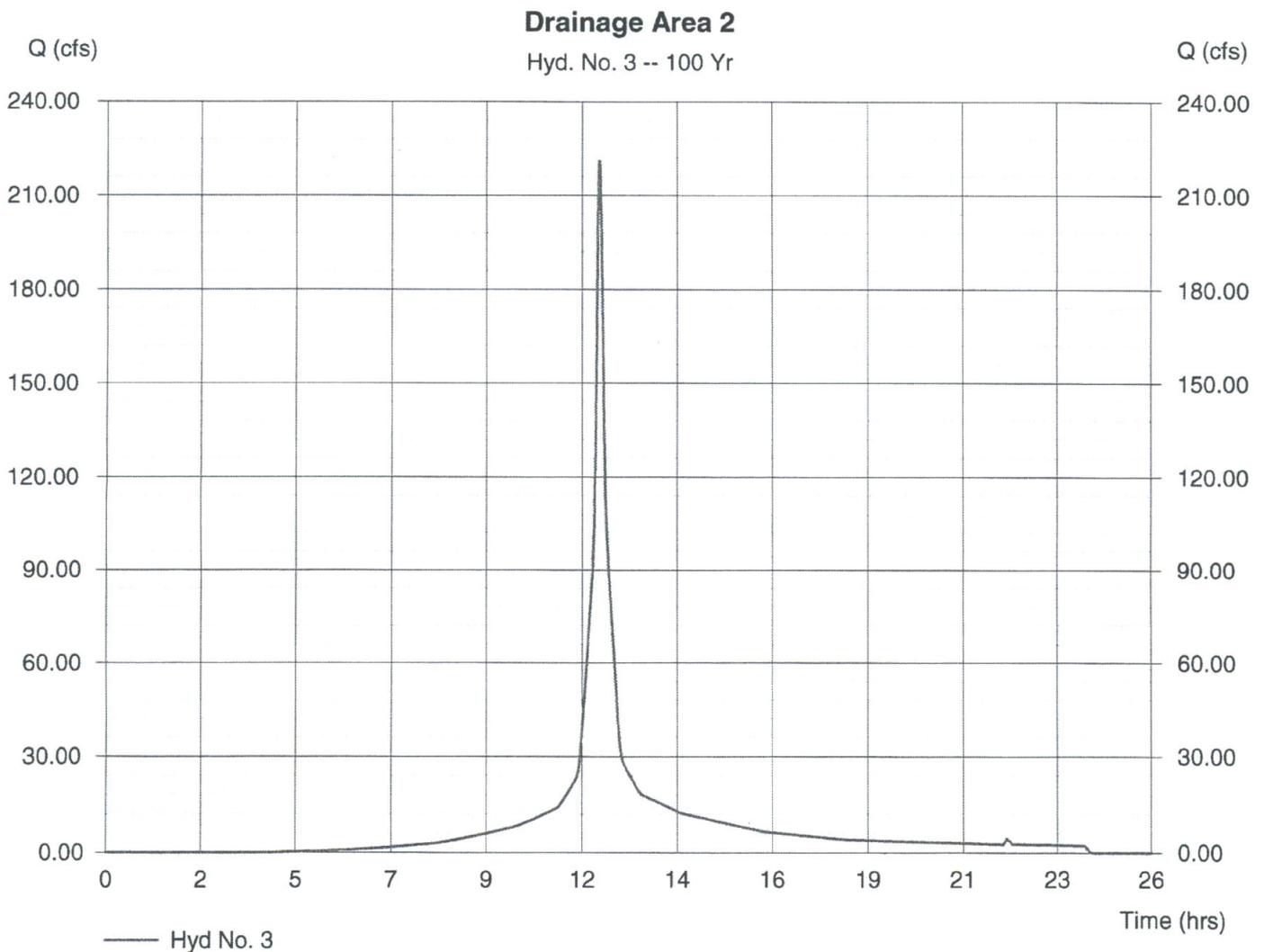
Hyd. No. 3

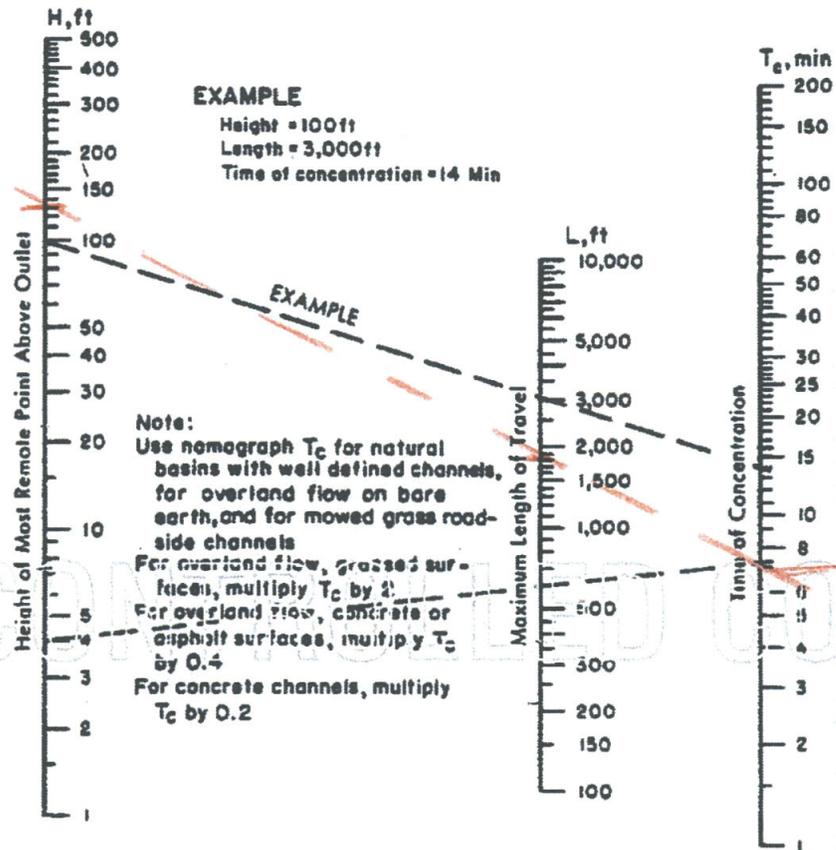
Drainage Area 2

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 32.590 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.20 in
Storm duration = 24 hrs

Peak discharge = 221.07 cfs
Time interval = 1 min
Curve number = 85
Hydraulic length = 0 ft
Time of conc. (Tc) = 8.00 min
Distribution = Type III
Shape factor = 484

Hydrograph Volume = 738,935 cuft





DRAINAGE AREA 3

H: 490 - 360 = 130

L: 1841

T_c : 7.2 min

From Handbook of Steel Drainage and Highway Construction Products, 1983
 Used by permission of American Iron and Steel Institute.

Figure 1
 Kirpich Nomograph for
 Time of Concentration of Rainfall on Small Drainage Basins

Hydrograph Plot

Hydraflow Hydrographs by Intelisolve

Thursday, Jan 3 2013, 4:18 PM

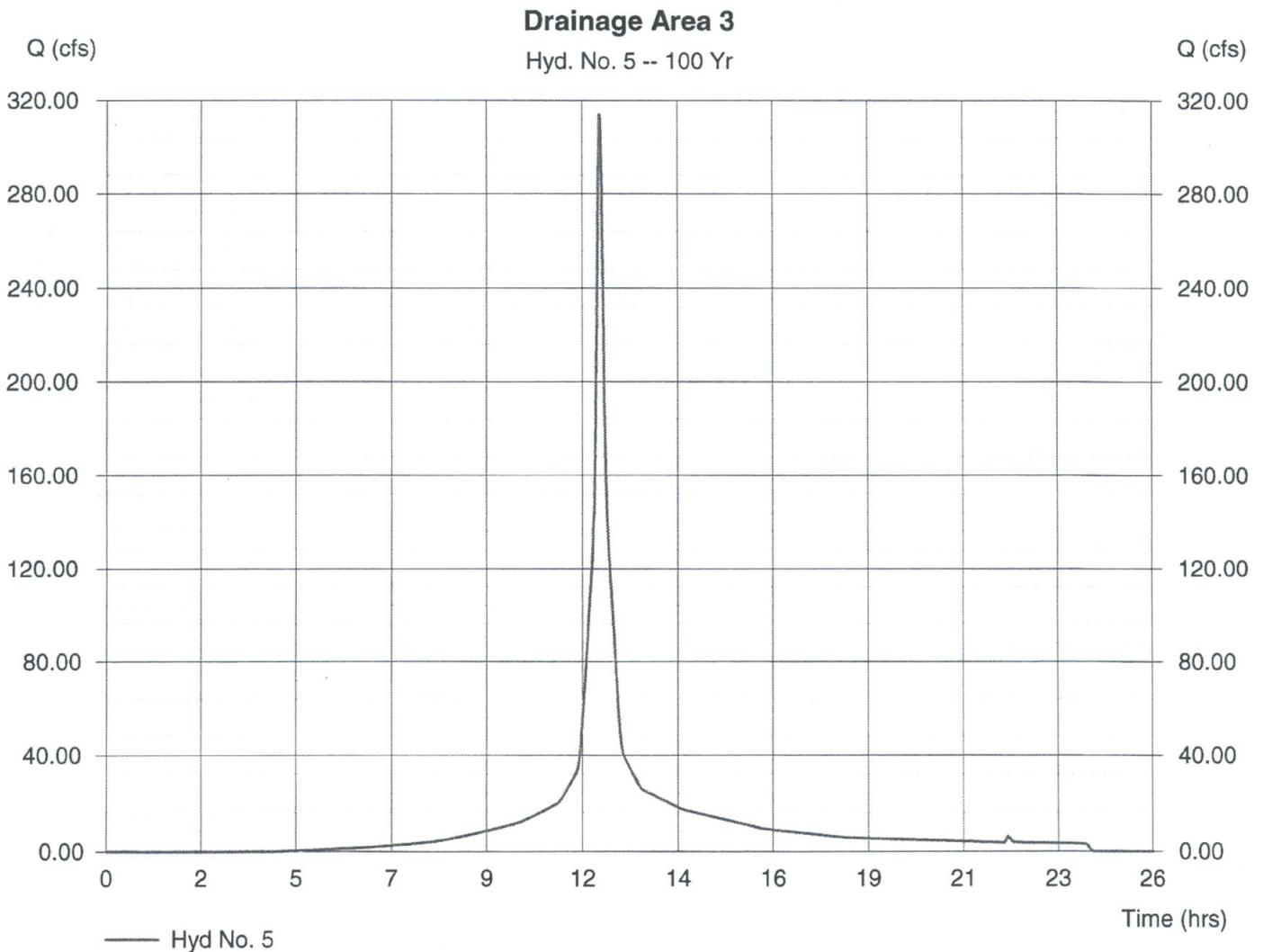
Hyd. No. 5

Drainage Area 3

Hydrograph type = SCS Runoff
Storm frequency = 100 yrs
Drainage area = 46.270 ac
Basin Slope = 0.0 %
Tc method = USER
Total precip. = 8.20 in
Storm duration = 24 hrs

Peak discharge = 313.86 cfs
Time interval = 1 min
Curve number = 85
Hydraulic length = 0 ft
Time of conc. (Tc) = 7.00 min
Distribution = Type III
Shape factor = 484

Hydrograph Volume = 1,049,111 cuft



Pond Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Mar 27 2013, 9:8 AM

Pond No. 5 - Total Storage

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00 | 332.00 | 56,919 | 0 | 0 |
| 2.00 | 334.00 | 66,390 | 123,309 | 123,309 |
| 3.00 | 335.00 | 69,660 | 68,025 | 191,334 |
| 8.00 | 340.00 | 86,859 | 391,298 | 582,632 |
| 13.00 | 345.00 | 105,472 | 480,828 | 1,063,459 |
| 18.00 | 350.00 | 125,498 | 577,425 | 1,640,884 |
| 22.00 | 354.00 | 142,537 | 536,070 | 2,176,954 |

Culvert / Orifice Structures

| | [A] | [B] | [C] | [D] |
|-----------------|--------|------|------|------|
| Rise (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Span (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| No. Barrels | = 0 | 0 | 0 | 0 |
| Invert El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Length (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Slope (%) | = 0.00 | 0.00 | 0.00 | 0.00 |
| N-Value | = .000 | .000 | .000 | .000 |
| Orif. Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = n/a | No | No | No |

Weir Structures

| | [A] | [B] | [C] | [D] |
|----------------|--------|------|------|------|
| Crest Len (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Crest El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Type | = --- | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | Clv D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | Total cfs |
|----------|--------------|--------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|-----------|-----------|
| 0.00 | 0 | 332.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 2.00 | 123,309 | 334.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.00 | 191,334 | 335.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 8.00 | 582,632 | 340.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 13.00 | 1,063,459 | 345.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 18.00 | 1,640,884 | 350.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 22.00 | 2,176,954 | 354.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |

Pond Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Mar 27 2013, 7:58 AM

Pond No. 7 - Sed Pond-3'DS+100yr

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00 | 335.00 | 69,660 | 0 | 0 |
| 5.00 | 340.00 | 86,859 | 391,298 | 391,298 |
| 10.00 | 345.00 | 105,472 | 480,828 | 872,125 |
| 15.00 | 350.00 | 125,498 | 577,425 | 1,449,550 |
| 19.00 | 354.00 | 142,537 | 536,070 | 1,985,620 |

Handwritten notes: 26, 347.78, 1,132,955

Culvert / Orifice Structures

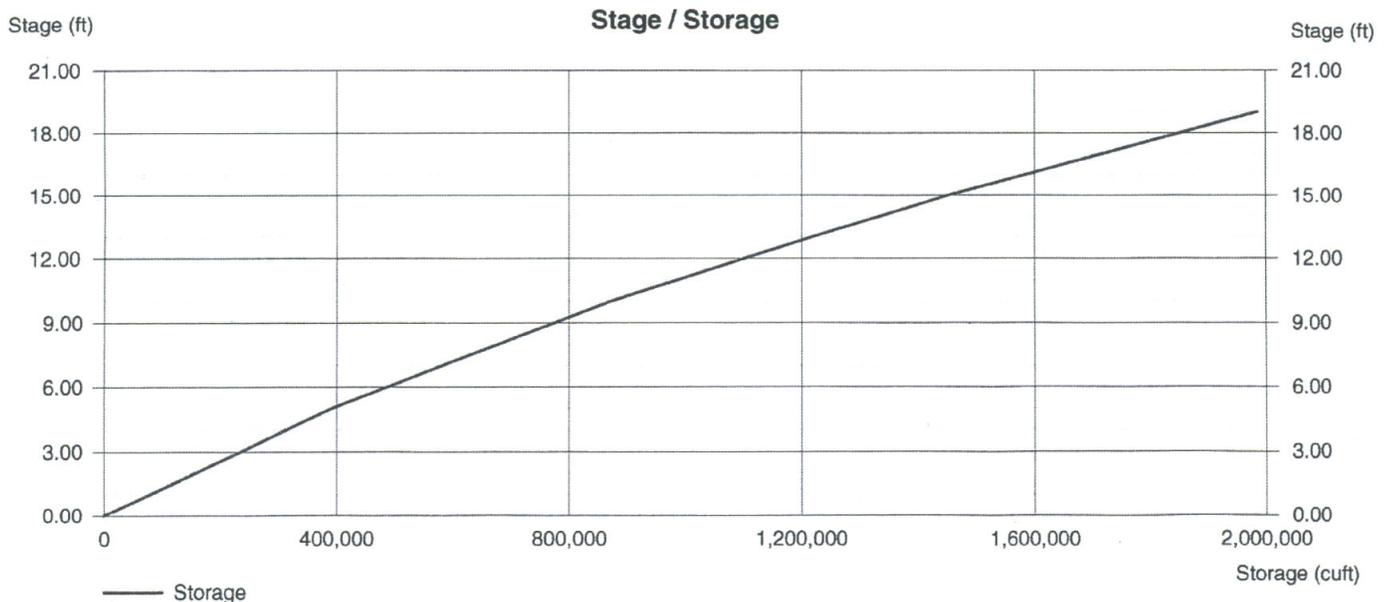
| | [A] | [B] | [C] | [D] |
|-----------------|--------|------|------|------|
| Rise (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Span (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| No. Barrels | = 0 | 0 | 0 | 0 |
| Invert El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Length (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Slope (%) | = 0.00 | 0.00 | 0.00 | 0.00 |
| N-Value | = .000 | .000 | .000 | .000 |
| Orif. Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = n/a | No | No | No |

Weir Structures

| | [A] | [B] | [C] | [D] |
|----------------|--------|------|------|------|
| Crest Len (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Crest El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Type | = --- | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



RUN-ON AND RUN-OFF CONTROL PLAN
PLANT GORGAS CCR LANDFILL
ALABAMA POWER COMPANY

Section 257.81 of EPA's regulations requires the owner or operator of an existing or new CCR landfill or any lateral expansion of a CCR landfill to prepare a run-on and run-off control system plan to document how these control systems have been designed and constructed to meet the applicable requirements of this section of the rule. Each plan is to be supported by appropriate engineering calculations.

The CCR Landfill is located at Alabama Power Company's Plant Gorgas within the permitted boundaries of the Plant's overall landfill facility. While permitted for a variety of CCR, this facility will primarily store dry ash from the baghouse operations at this time. The CCR Landfill includes two adjoining cells covering 14 acres and 9 acres. Each cell has a designated leachate/runoff pond associated with it.

The storm water flows have been calculated using the Natural Resources Conservation Service method (also known as the Soil Conservation Service (SCS)) method using 24 hour storm events. The storm water detention system has been designed in accordance with the Alabama Soil and Water Conservation Committee requirements as well as other local, city, and government codes. The post developed storm water discharge was designed to be less than the pre-developed storm water discharge in accordance with the requirements of the State of Alabama.

Runoff curve number data was determined using Table 2-2A from the Urban Hydrology for Small Watersheds (TR-55). Appendix A and B from the TR-55 were used to determine the rainfall distribution methodology. Precipitation values were determined from NOAA's Precipitation Frequency Data Server (Atlas-14).

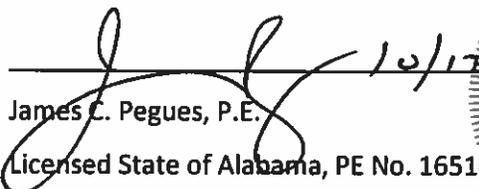
The NRCS provided information on the soil characteristics and hydrologic groups present at the site. It was determined that the site contains areas with hydrological soil groups "A", "B" and "D". A composite curve number was created based on the land use and soil type of the entire drainage area. This information was placed into Hydraflow Hydrographs and used to generate appropriate precipitation curves and storm basin runoff values.

The Plant Gorgas CCR Landfill is designed and constructed with perimeter berms and drainage ditches around the cells that prevent stormwater run-on from surrounding areas during the peak discharge of a 24-hr, 25-yr storm from flowing onto the active portion of the landfill.

The leachate/runoff pond collects and controls the calculated amount of leachate generated from the leachate collection system of the disposal cell as well as the quantity of rainfall from a 24-hr, 100-yr storm event that falls directly into the leachate/runoff pond. The water collected in the leachate/runoff pond is pumped back to the plant for reuse.

The facility is operated subject to and in accordance with § 257.3-3 of EPA's regulations.

I hereby certify that the run-on and run-off control system plan meets the requirements of 40 C.F.R. Part 257.81.


James C. Pegues, P.E.

Licensed State of Alabama, PE No. 16516



**Run-on and Run-off Control System Plan for Landfills:
Calculation Summary**

for

Plant Gorgas Baghouse CCR Landfill

Prepared by:

Southern Company Services
Technical Services

Originator: Curtis R. Upchurch 10/6/16
Date

Reviewer: Jason S. Wilson 10/11/16
Date

Approval: James C. Pegues 10/12/16
Date

**Run-on and Run-off Control System Plan for Landfills:
Calculation Summary**

for

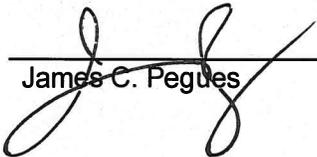
Plant Gorgas Baghouse CCR Landfill

Prepared by:

Southern Company Services
Technical Services

Originator:  10/6/16
Curtis R. Upchurch Date

Reviewer:  10/11/16
Jason S. Wilson Date

Approval:  10/12/16
James C. Pegues Date

1.0 Purpose of Calculation

The purpose of this report is to demonstrate the run-on and run-off controls of the subject CCR landfill in order to prepare a run-on and run-off control system plan as required by the United States Environmental Protection Agency's (EPA) final rule for Disposal of CCR from Electric Utilities (EPA 40 CFR 257).

2.0 Summary of Conclusions

2.1 Site Overview

The Plant Gorgas Baghouse CCR Landfill is located approximately 9 miles west of Birmingham, Alabama on Plant Gorgas property northeast of the plant. The total area occupied by the landfill is approximately 72 acres with additional buffer areas along the perimeter. The landfill is comprised of two ash storage cells along with two sediment ponds. The cells and ponds are lined with a combination of clay and HDPE liner material. There are three 42 inch diameter dual-wall HDPE pipes in each cell which convey water from the cells to their associated sedimentation ponds. The sedimentation ponds are connected with two 36 inch diameter dual-wall HDPE pipes. All runoff eventually drains into Sedimentation Pond 1 where it is pumped back to the Plant for reuse and is not released. The sediment ponds do have spillways which outfall to the Black Warrior River basin south of the site, however the purpose of these structures is only to maintain dam integrity in the unlikely case of an overflow condition.

An overview of Cells 1 and 2, and Sedimentation Ponds 1 and 2 is provided in Table 1 below.

Table 1—Landfill site characteristics

| Pond Description | Cell 1 | Sedimentation Pond 1 | Cell 2 | Sedimentation Pond 2 |
|------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------|
| Size (Acres) | 12.8 | 3.8 | 17.5 | 2.9 |
| Outlet Type | 3 42" dia. HDPE pipes | 8" HDPE solid wall pipe (Horiz. Pumps) 20' Trapezoidal Spillway (Concrete), 6:1 S.S., (Control Structure – No Discharge) | 3 42" dia. HDPE pipes | 3 42" dia. HDPE pipes 20' Trapezoidal Spillway, (Concrete), 6:1 S.S., (Control Structure – No Discharge) |
| Outlets To | Sedimentation Pond 1 | 16" SDR11 / 22" SDR17 HDPE dual contained pumped to Plant, spillway to channel then Black Warrior River | Sedimentation Pond 2 | Pipes to Sedimentation Pond 1 |

2.2 Run-on Control System Plan

There is no stormwater run-on into Cells 1 and 2 or Sedimentation Ponds 1 and 2 due to the construction of perimeter berm/roads at the outer boundaries. Any runoff that was directed to the landfill area was diverted by the initial design which now prevents any water encroachment.

2.3 Run-off Control System Plan

A hydrologic and hydraulic model was developed for the Plant Gorgas Baghouse CCR Landfill to determine the hydraulic capacity of the storage cells and sediment ponds. The design storm for the purposes of run-off control system plans is the 24-hour, 25-year rainfall event. The results of routing the design storm event through the landfill are presented in Table 2 below:

Table 2-Flood Routing Results for Plant Gorgas Baghouse CCR Landfill

| Plant Gorgas | Normal Pool El (ft) | Top of embankment El (ft) | Peak Water Surface Elevation (ft) | Freeboard* (ft) | Peak Inflow (cfs) | Peak Outflow (cfs) |
|-----------------|---------------------|---------------------------|-----------------------------------|-----------------|-------------------|--------------------|
| Cell 1 | No Pool | Varies, Low Pt. @ 512.0 | 501.4 | 10.6 | N/A | 102 |
| Cell 2 | No Pool | Varies, Low Pt. @ 512.5 | 504.4 | 8.1 | N/A | 119 |
| Sediment Pond 1 | 483.0 | 512.0 | 494.2 | 17.8 | 221** | N/A (pumped) |
| Sediment Pond 2 | 483.0 | 512.0 | 494.2 | 17.8 | 221** | N/A (pumped) |

* Freeboard is measured from the top of embankment to the peak water surface elevation

** Combined Cell 1 Sedimentation Pond and Cell 2 Sedimentation Pond

3.0 Methodology

3.1 HYDROLOGIC ANALYSES

The design storm for all run-on/run-off analyses is a 24-hour, 25-year rainfall event. A summary of the design storm parameters and rainfall distribution methodology for these calculations is summarized below in Table 3.

Table 3. Plant Gorgas Baghouse CCR Landfill Design Storm Distribution

| Return Frequency (years) | Storm Duration (hours) | Rainfall Total (Inches) | Rainfall Source | Storm Distribution |
|--------------------------|------------------------|-------------------------|-----------------|--------------------|
| 25 | 24 | 7.15 | NOAA Atlas 14 | SCS Type III |

The drainage area for the Plant Gorgas Baghouse CCR Landfill was delineated based on LiDAR data acquired for the Plant in 2011. Runoff characteristics were developed based on the Soil Conservation Service (SCS) methodologies as outlined in TR-55. An overall SCS curve number for the drainage area was developed based on methods prescribed in TR-55. Soil types were obtained from the Natural Resources Conservation Service. Land use areas were delineated based on aerial photography. Times of Concentration were also developed based on methodologies prescribed in TR-55.

A table of the pertinent basin characteristics of the landfill is provided below in Tables 4(a) and 4(b).

Table 4(a) - Landfill Hydrologic Information (Cell 1 & Sedimentation Pond 1)

| | |
|---------------------------------|-----------------------|
| Drainage Basin Area (acres) | 19.5 |
| Hydrologic Curve Number, CN | 90 |
| Hydrologic Methodology | SCS Method |
| Time of Concentration (minutes) | 10.0 |
| Hydrologic Software | Hydraflow Hydrographs |

Table 4(b) - Landfill Hydrologic Information (Cell 2 & Sedimentation Pond 2)

| | |
|---------------------------------|-----------------------|
| Drainage Basin Area (acres) | 23.1 |
| Hydrologic Curve Number, CN | 89 |
| Hydrologic Methodology | SCS Method |
| Time of Concentration (minutes) | 11.7 |
| Hydrologic Software | Hydraflow Hydrographs |

Runoff values were determined by importing the characteristics developed above into a hydrologic model in Hydraflow Hydrographs Extension of AutoCad Civil 3D, 2013.

3.2 HYDRAULIC ANALYSES

Storage values for the sedimentation ponds were determined by developing a stage-storage relationship utilizing contour data. The spillway system at the Plant Gorgas Baghouse CCR Landfill consists of primary spillways in the cells draining into the sediment ponds and primary trapezoidal weir spillways in each of the sediment ponds outfalling into a grassed drainage channel. The primary spillways for each cell consist of three 42 inch diameter HDPE pipes and the pond weir spillways are reinforced concrete, 20-foot wide crest by 1-foot deep with 6:1 slopes on either end providing access from the top of the pond. A summary of information for each spillway is presented below in Table 5.

Table 5—Spillway Attribute Table

| Spillway | US Invert El (feet) | DS Invert El (feet) | Dimension (ft) | Slope (ft/ft) | Length (ft) | Spillway Capacity (cfs) |
|----------------------|---------------------|---------------------|-----------------------------------------------|---------------|-------------|-------------------------|
| Cell 1 | 499.3 | 498.7 | 3-42 inch diameter, HDPE | 0.005 | 112 | N/A* |
| Cell 2 | 502.4 | 501.0 | 3-42 inch diameter, HDPE | .0144 | 100 | N/A* |
| Sedimentation Pond 1 | 511.0 | 510.7 | Trapezoidal (Concrete), Crest L=20', 6:1 S.S. | 1.0% | 30 | N/A* |
| Sedimentation Pond 2 | 511.0 | 510.7 | Trapezoidal (Concrete), Crest L=20', 6:1 S.S. | 1.0% | 30 | N/A* |

*N/A = Not available

Based on the spillway attributes listed above, a rating curve was developed and inserted into Hydraflow Hydrographs software to analyze pond performance during the design storm. Results are shown in Table 2.

4.0 SUPPORTING INFORMATION

4.1 CURVE NUMBER

4.1.1 CELL 1 AND SEDIMENTATION POND 1 AREA

The screenshot shows a software window titled "Composite CN" with a close button (X) in the top right corner. The window is divided into six sections, each representing a different area. Each section contains two input fields: "Area (ac)" and "Curve No. CN . =".

| Area | Area (ac) | Curve No. CN . = |
|---------------------|-----------------|------------------|
| Area 1 | 3.68 | 98 |
| Area 2 | 12.80 | 89 |
| Area 3 | 3.06 | 85 |
| Area 4 | 0.00 | 0 |
| Area 5 | 0.00 | 0 |
| Area 6 | 0.00 | 0 |
| Composite CN | | 90 |

At the bottom of the window, there are three buttons: "Ok", "Clear", and "Exit".

4.1.2 CELL 2 AND SEDIMENTATION POND 2 AREA

Composite CN X

| | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Area 1</p> <p>Area (ac) = <input style="width: 100px;" type="text" value="2.91"/></p> <p>Curve No. CN . = <input style="width: 100px;" type="text" value="98"/></p> | <p>Area 4</p> <p>Area (ac) = <input style="width: 100px;" type="text" value="0.00"/></p> <p>Curve No. CN . = <input style="width: 100px;" type="text" value="0"/></p> |
| <p>Area 2</p> <p>Area (ac) = <input style="width: 100px;" type="text" value="17.51"/></p> <p>Curve No. CN . = <input style="width: 100px;" type="text" value="89"/></p> | <p>Area 5</p> <p>Area (ac) = <input style="width: 100px;" type="text" value="0.00"/></p> <p>Curve No. CN . = <input style="width: 100px;" type="text" value="0"/></p> |
| <p>Area 3</p> <p>Area (ac) = <input style="width: 100px;" type="text" value="2.72"/></p> <p>Curve No. CN . = <input style="width: 100px;" type="text" value="76"/></p> | <p>Area 6</p> <p>Area (ac) = <input style="width: 100px;" type="text" value="0.00"/></p> <p>Curve No. CN . = <input style="width: 100px;" type="text" value="0"/></p> |
| <p>Composite CN</p> <p>Curve No. CN . = <input style="width: 100px; background-color: yellow;" type="text" value="89"/></p> | |

4.2 STAGE-STORAGE TABLE

4.2.1 SEDIMENTATION POND 1

| Pond Name <input style="float: right;" type="text" value="Pond1"/> | | | | | | |
|--------------------------------------------------------------------|-------|-----------|--------------|---------------------|---------------|-----------------|
| Row | Stage | Elevation | Contour Area | Incremental Storage | Total Storage | Total Discharge |
| | (ft) | (ft) | (sqft) | (cuft) | (cuft) | (cfs) |
| 0 | 0.00 | 483.00 | 41,570 | 0.000 | 0.000 | 0.000 |
| 1 | 1.00 | 484.00 | 44,633 | 43,102 | 43,102 | 0.000 |
| 2 | 3.00 | 486.00 | 51,020 | 95,653 | 138,755 | 0.000 |
| 3 | 5.00 | 488.00 | 57,695 | 108,715 | 247,470 | 0.000 |
| 4 | 7.00 | 490.00 | 64,658 | 122,353 | 369,823 | 0.000 |
| 5 | 9.00 | 492.00 | 71,910 | 136,568 | 506,391 | 0.000 |
| 6 | 11.00 | 494.00 | 79,450 | 151,360 | 657,751 | 0.000 |
| 7 | 13.00 | 496.00 | 87,259 | 166,709 | 824,460 | 0.000 |
| 8 | 15.00 | 498.00 | 95,318 | 182,578 | 1,007,037 | 0.000 |
| 9 | 15.75 | 498.75 | 98,410 | 72,648 | 1,079,685 | 0.000 |
| 10 | 17.00 | 500.00 | 103,673 | 126,301 | 1,205,986 | 0.000 |
| 11 | 19.00 | 502.00 | 112,269 | 215,942 | 1,421,928 | 0.000 |
| 12 | 21.00 | 504.00 | 121,050 | 233,319 | 1,655,247 | 0.000 |
| 13 | 23.00 | 506.00 | 130,058 | 251,108 | 1,906,355 | 0.000 |
| 14 | 25.00 | 508.00 | 139,292 | 269,351 | 2,175,706 | 0.000 |
| 15 | 27.00 | 510.00 | 148,752 | 288,044 | 2,463,750 | 0.000 |
| 16 | 29.00 | 512.00 | 158,438 | 307,190 | 2,770,940 | 52.00 |
| 17 | | | | | | |
| 18 | | | | | | |
| 19 | | | | | | |
| 20 | | | | | | |

4.2.2 SEDIMENTATION POND 2

| Pond Name <input type="text" value="Pond 2"/> | | | | | | |
|-----------------------------------------------|-------|-----------|--------------|---------------------|---------------|-----------------|
| Row | Stage | Elevation | Contour Area | Incremental Storage | Total Storage | Total Discharge |
| | (ft) | (ft) | (sqft) | (cuft) | (cuft) | (cfs) |
| 0 | 0.00 | 487.00 | 21,821 | 0.000 | 0.000 | 0.000 |
| 1 | 1.00 | 488.00 | 24,766 | 23,294 | 23,294 | 0.000 |
| 2 | 3.00 | 490.00 | 30,838 | 55,604 | 78,898 | 0.000 |
| 3 | 5.00 | 492.00 | 37,240 | 68,078 | 146,976 | 0.000 |
| 4 | 7.00 | 494.00 | 43,962 | 81,202 | 228,178 | 0.000 |
| 5 | 9.00 | 496.00 | 50,982 | 94,944 | 323,122 | 0.000 |
| 6 | 11.00 | 498.00 | 58,279 | 109,261 | 432,383 | 0.000 |
| 7 | 13.00 | 500.00 | 65,797 | 124,076 | 556,459 | 0.000 |
| 8 | 15.00 | 502.00 | 73,523 | 139,320 | 695,779 | 0.000 |
| 9 | 17.00 | 504.00 | 81,479 | 155,002 | 850,781 | 0.000 |
| 10 | 19.00 | 506.00 | 89,671 | 171,151 | 1,021,931 | 0.000 |
| 11 | 21.00 | 508.00 | 98,087 | 187,758 | 1,209,689 | 0.000 |
| 12 | 23.00 | 510.00 | 106,724 | 204,811 | 1,414,500 | 0.000 |
| 13 | 25.00 | 512.00 | 115,543 | 222,267 | 1,636,767 | 52.00 |
| 14 | | | | | | |
| 15 | | | | | | |
| 16 | | | | | | |
| 17 | | | | | | |
| 18 | | | | | | |
| 19 | | | | | | |
| 20 | | | | | | |

4.2.3 COMBINED SEDIMENTATION PONDS 1 AND 2

| Pond Name <input type="text" value="Combined Pond Volumes"/> | | | | | | |
|--------------------------------------------------------------|-------|-----------|--------------|---------------------|---------------|-----------------|
| Row | Stage | Elevation | Contour Area | Incremental Storage | Total Storage | Total Discharge |
| | (ft) | (ft) | (sqft) | (cuft) | (cuft) | (cfs) |
| 0 | 0.00 | 483.00 | 41,569 | 0.000 | 0.000 | 0.000 |
| 1 | 1.00 | 484.00 | 44,633 | 43,101 | 43,101 | 0.000 |
| 2 | 3.00 | 486.00 | 51,020 | 95,653 | 138,754 | 0.000 |
| 3 | 4.00 | 487.00 | 75,581 | 63,301 | 202,055 | 0.000 |
| 4 | 5.00 | 488.00 | 82,461 | 79,021 | 281,076 | 0.000 |
| 5 | 7.00 | 490.00 | 95,496 | 177,957 | 459,033 | 0.000 |
| 6 | 9.00 | 492.00 | 109,150 | 204,646 | 663,679 | 0.000 |
| 7 | 11.00 | 494.00 | 123,412 | 232,562 | 896,241 | 0.000 |
| 8 | 13.00 | 496.00 | 138,241 | 261,654 | 1,157,894 | 0.000 |
| 9 | 15.00 | 498.00 | 153,597 | 291,838 | 1,449,732 | 0.000 |
| 10 | 15.75 | 498.75 | 159,453 | 117,393 | 1,567,125 | 0.000 |
| 11 | 17.00 | 500.00 | 169,470 | 205,577 | 1,772,702 | 0.000 |
| 12 | 19.00 | 502.00 | 185,792 | 355,262 | 2,127,964 | 0.000 |
| 13 | 21.00 | 504.00 | 202,529 | 388,321 | 2,516,285 | 0.000 |
| 14 | 23.00 | 506.00 | 219,729 | 422,258 | 2,938,543 | 0.000 |
| 15 | 25.00 | 508.00 | 237,379 | 457,108 | 3,395,651 | 0.000 |
| 16 | 27.00 | 510.00 | 255,476 | 492,855 | 3,888,506 | 0.000 |
| 17 | 29.00 | 512.00 | 273,981 | 529,457 | 4,417,963 | 104.00 |
| 18 | | | | | | |
| 19 | | | | | | |
| 20 | | | | | | |

4.3 TIME OF CONCENTRATION
 4.3.1 CELL 1 TO SEDIMENTATION POND 1

TR55 Tc Worksheet

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No. 1

Area to Cell 1 Pond

| <u>Description</u> | <u>A</u> | <u>B</u> | <u>C</u> | <u>Totals</u> |
|------------------------------------|---------------|---------------|---------------|------------------|
| Sheet Flow | | | | |
| Manning's n-value | = 0.011 | 0.011 | 0.011 | |
| Flow length (ft) | = 300.0 | 0.0 | 0.0 | |
| Two-year 24-hr precip. (in) | = 4.00 | 0.00 | 0.00 | |
| Land slope (%) | = 0.61 | 0.00 | 0.00 | |
| Travel Time (min) | = 4.20 | + 0.00 | + 0.00 | = 4.20 |
| Shallow Concentrated Flow | | | | |
| Flow length (ft) | = 340.00 | 0.00 | 0.00 | |
| Watercourse slope (%) | = 0.61 | 0.00 | 0.00 | |
| Surface description | = Unpaved | Paved | Paved | |
| Average velocity (ft/s) | = 1.26 | 0.00 | 0.00 | |
| Travel Time (min) | = 4.50 | + 0.00 | + 0.00 | = 4.50 |
| Channel Flow | | | | |
| X sectional flow area (sqft) | = 8.00 | 0.00 | 0.00 | |
| Wetted perimeter (ft) | = 11.32 | 0.00 | 0.00 | |
| Channel slope (%) | = 0.50 | 0.00 | 0.00 | |
| Manning's n-value | = 0.030 | 0.015 | 0.015 | |
| Velocity (ft/s) | = 2.78 | 0.00 | 0.00 | |
| Flow length (ft) | ((0))215.0 | 0.0 | 0.0 | |
| Travel Time (min) | = 1.29 | + 0.00 | + 0.00 | = 1.29 |
| Total Travel Time, Tc | | | | 10.00 min |

4.3.2 CELL 2 TO SEDIMENTATION POND 2

TR55 Tc Worksheet

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

Hyd. No. 2

Area To Cell 2 Pond

| <u>Description</u> | <u>A</u> | <u>B</u> | <u>C</u> | <u>Totals</u> |
|------------------------------------|---------------|----------------------|----------------------|------------------|
| Sheet Flow | | | | |
| Manning's n-value | = 0.011 | 0.011 | 0.011 | |
| Flow length (ft) | = 300.0 | 0.0 | 0.0 | |
| Two-year 24-hr precip. (in) | = 4.00 | 0.00 | 0.00 | |
| Land slope (%) | = 0.85 | 0.00 | 0.00 | |
| Travel Time (min) | = 3.68 | + 0.00 | + 0.00 | = 3.68 |
| Shallow Concentrated Flow | | | | |
| Flow length (ft) | = 290.00 | 0.00 | 0.00 | |
| Watercourse slope (%) | = 0.85 | 0.00 | 0.00 | |
| Surface description | = Unpaved | Paved | Paved | |
| Average velocity (ft/s) | = 1.49 | 0.00 | 0.00 | |
| Travel Time (min) | = 3.25 | + 0.00 | + 0.00 | = 3.25 |
| Channel Flow | | | | |
| X sectional flow area (sqft) | = 10.20 | 0.00 | 0.00 | |
| Wetted perimeter (ft) | = 12.53 | 0.00 | 0.00 | |
| Channel slope (%) | = 0.50 | 0.00 | 0.00 | |
| Manning's n-value | = 0.030 | 0.015 | 0.015 | |
| Velocity (ft/s) | = 3.06 | 0.00 | 0.00 | |
| Flow length (ft) | ((0})875.0 | 0.0 | 0.0 | |
| Travel Time (min) | = 4.77 | + 0.00 | + 0.00 | = 4.77 |
| Total Travel Time, Tc | | | | 11.70 min |

4.4 RESULTS
 4.4.1 CELL 1 AND SEDIMENTATION POND 1

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

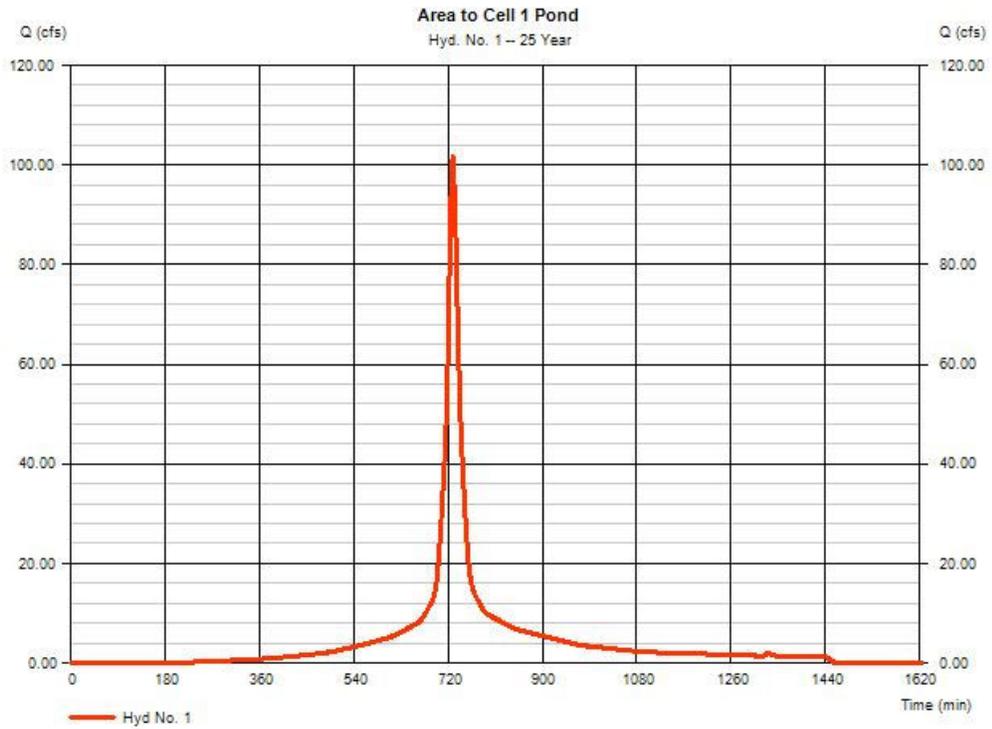
Saturday, 10 / 1 / 2016

Hyd. No. 1

Area to Cell 1 Pond

| | | | |
|-----------------|--------------|--------------------|----------------|
| Hydrograph type | = SCS Runoff | Peak discharge | = 101.69 cfs |
| Storm frequency | = 25 yrs | Time to peak | = 729 min |
| Time interval | = 3 min | Hyd. volume | = 423,470 cuft |
| Drainage area | = 19.540 ac | Curve number | = 90* |
| Basin Slope | = 3.2 % | Hydraulic length | = 1721 ft |
| Tc method | = TR55 | Time of conc. (Tc) | = 10.00 min |
| Total precip. | = 7.15 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(3.680 x 98) + (12.800 x 85) + (3.060 x 85)] / 19.540



4.4.2 CELL 2 AND SEDIMENTATION POND 2

5

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

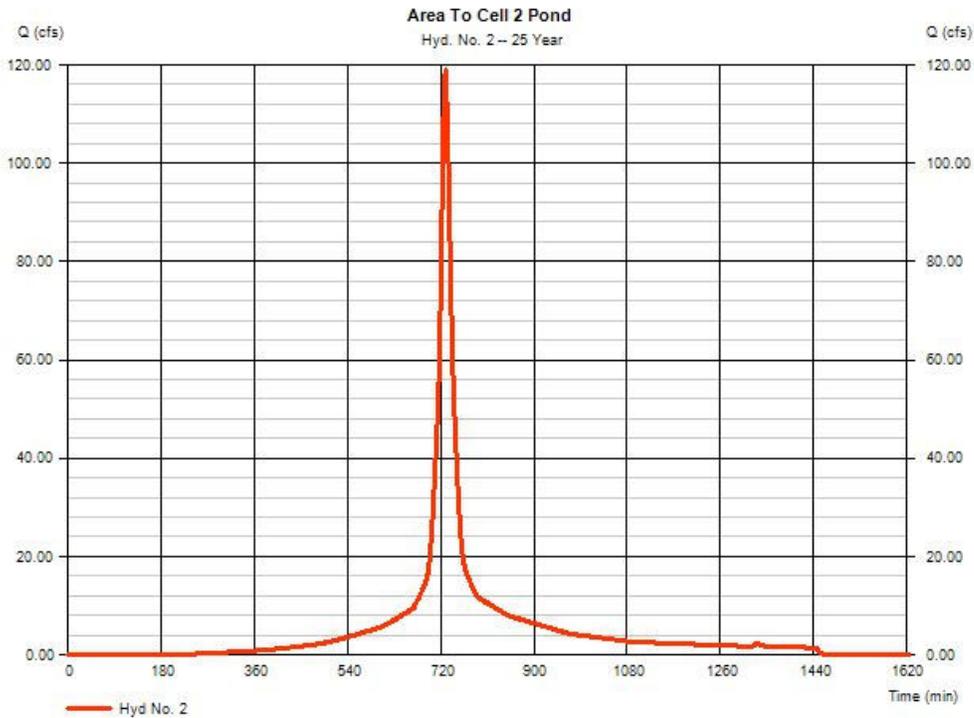
Saturday, 10/1/2016

Hyd. No. 2

Area To Cell 2 Pond

| | | | |
|-----------------|--------------|--------------------|----------------|
| Hydrograph type | = SCS Runoff | Peak discharge | = 118.93 cfs |
| Storm frequency | = 25 yrs | Time to peak | = 729 min |
| Time interval | = 3 min | Hyd. volume | = 491,771 cuft |
| Drainage area | = 23.140 ac | Curve number | = 89* |
| Basin Slope | = 3.9 % | Hydraulic length | = 2150 ft |
| Tc method | = TR55 | Time of conc. (Tc) | = 11.70 min |
| Total precip. | = 7.15 in | Distribution | = Type III |
| Storm duration | = 24 hrs | Shape factor | = 484 |

* Composite (Area/CN) = [(2.910 x 88) + (17.810 x 89) + (2.720 x 76)] / 23.140



4.4.3 SEDIMENTATION POND

Hydrograph Report

Hydroflow Hydrographs Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. v10

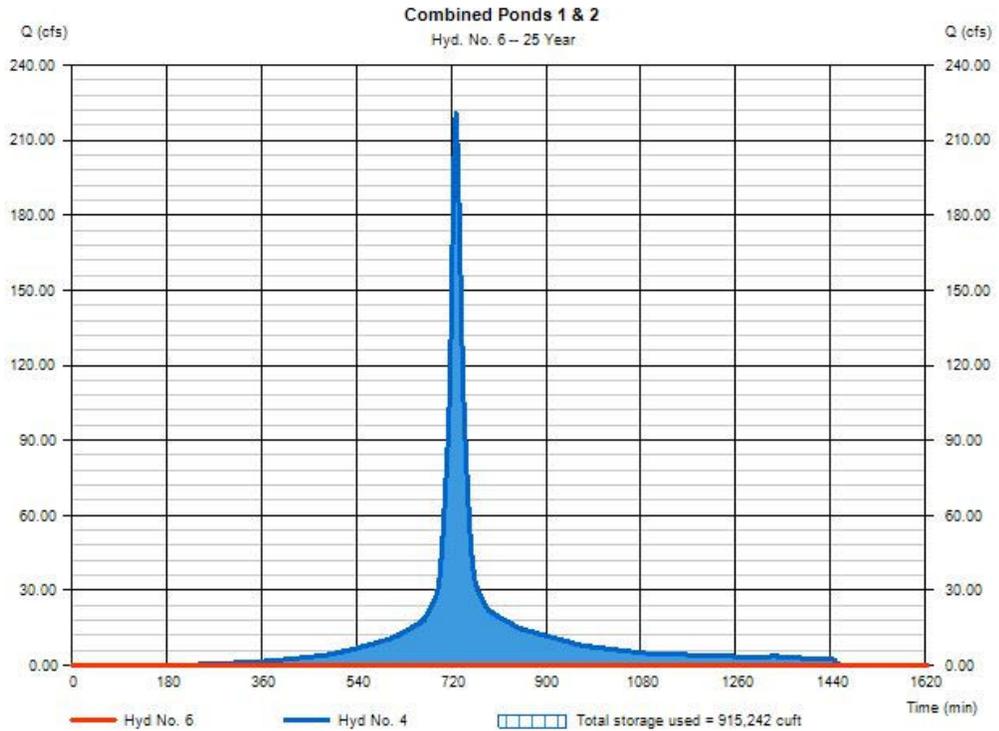
Saturday, 10/1/2016

Hyd. No. 6

Combined Ponds 1 & 2

| | | | |
|-----------------|-------------------------|----------------|----------------|
| Hydrograph type | = Reservoir | Peak discharge | = 0.000 cfs |
| Storm frequency | = 25 yrs | Time to peak | = n/a |
| Time interval | = 3 min | Hyd. volume | = 0 cuft |
| Inflow hyd. No. | = 4 - Total Cells 1 & 2 | Max. Elevation | = 494.15 ft |
| Reservoir name | = Combined Pond Volumes | Max. Storage | = 915,242 cuft |

Storage indication method used:



4.4.4 CELL 1 PRIMARY SPILLWAY OUTLET PIPE

Culvert Report

Hydraflow Express Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc.

Saturday, Jul 16 2016

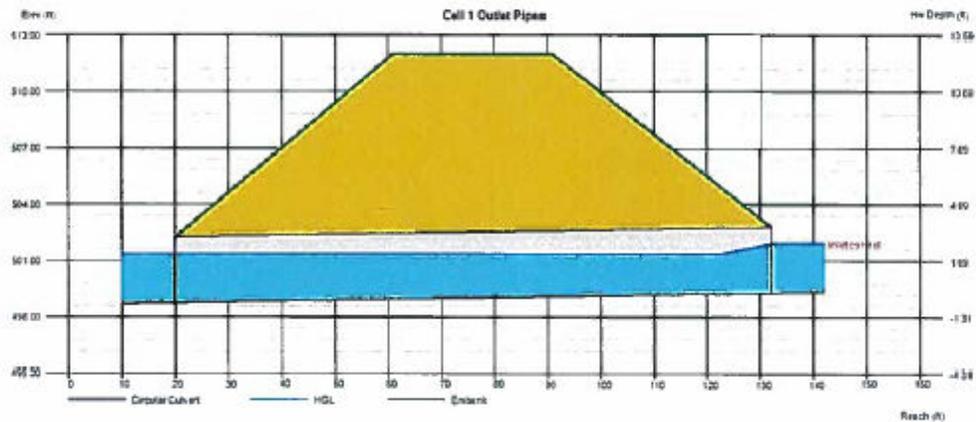
Cell 1 Outlet Pipes

| | |
|---------------------|--------------------------------|
| Invert Elev Dn (ft) | = 498.75 |
| Pipe Length (ft) | = 112.00 |
| Slope (%) | = 0.50 |
| Invert Elev Up (ft) | = 499.31 |
| Rise (in) | = 42.0 |
| Shape | = Circular |
| Span (in) | = 42.0 |
| No. Barrels | = 3 |
| n-Value | = 0.012 |
| Culvert Type | = Circular Concrete |
| Culvert Entrance | = Square edge w/headwall (C) |
| Coeff. K,M,c,Y,k | = 0.0098, 2, 0.0398, 0.67, 0.5 |

| | |
|--------------------|----------|
| Embankment | |
| Top Elevation (ft) | = 512.00 |
| Top Width (ft) | = 30.00 |
| Crest Width (ft) | = 100.00 |

| | |
|---------------------|------------|
| Calculations | |
| Qmin (cfs) | = 101.70 |
| Qmax (cfs) | = 138.10 |
| Tailwater Elev (ft) | = (dc+D)/2 |

| | |
|--------------------|-----------------|
| Highlighted | |
| Qtotal (cfs) | = 101.70 |
| Qpipe (cfs) | = 101.70 |
| Qovertop (cfs) | = 0.00 |
| Veloc Dn (ft/s) | = 4.34 |
| Veloc Up (ft/s) | = 5.75 |
| HGL Dn (ft) | = 501.40 |
| HGL Up (ft) | = 501.37 |
| Hw Elev (ft) | = 501.94 |
| Hw/D (ft) | = 0.75 |
| Flow Regime | = Inlet Control |



4.4.5 CELL 2 PRIMARY SPILLWAY OUTLET PIPE

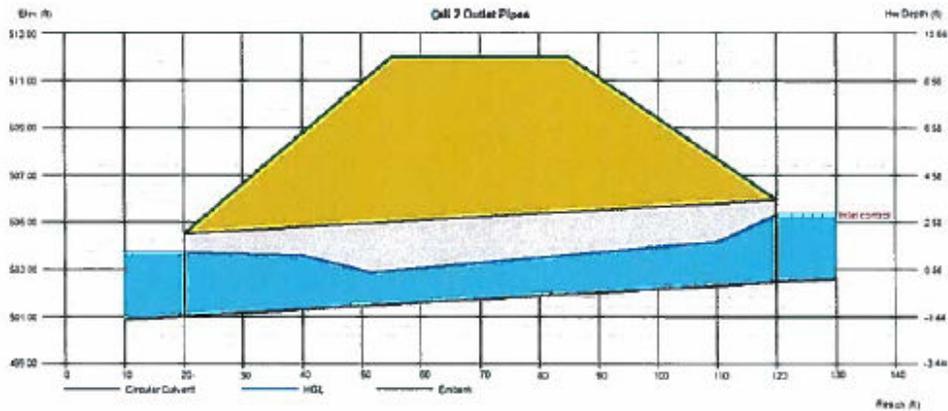
Culvert Report

Hydraulflow Express Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc.

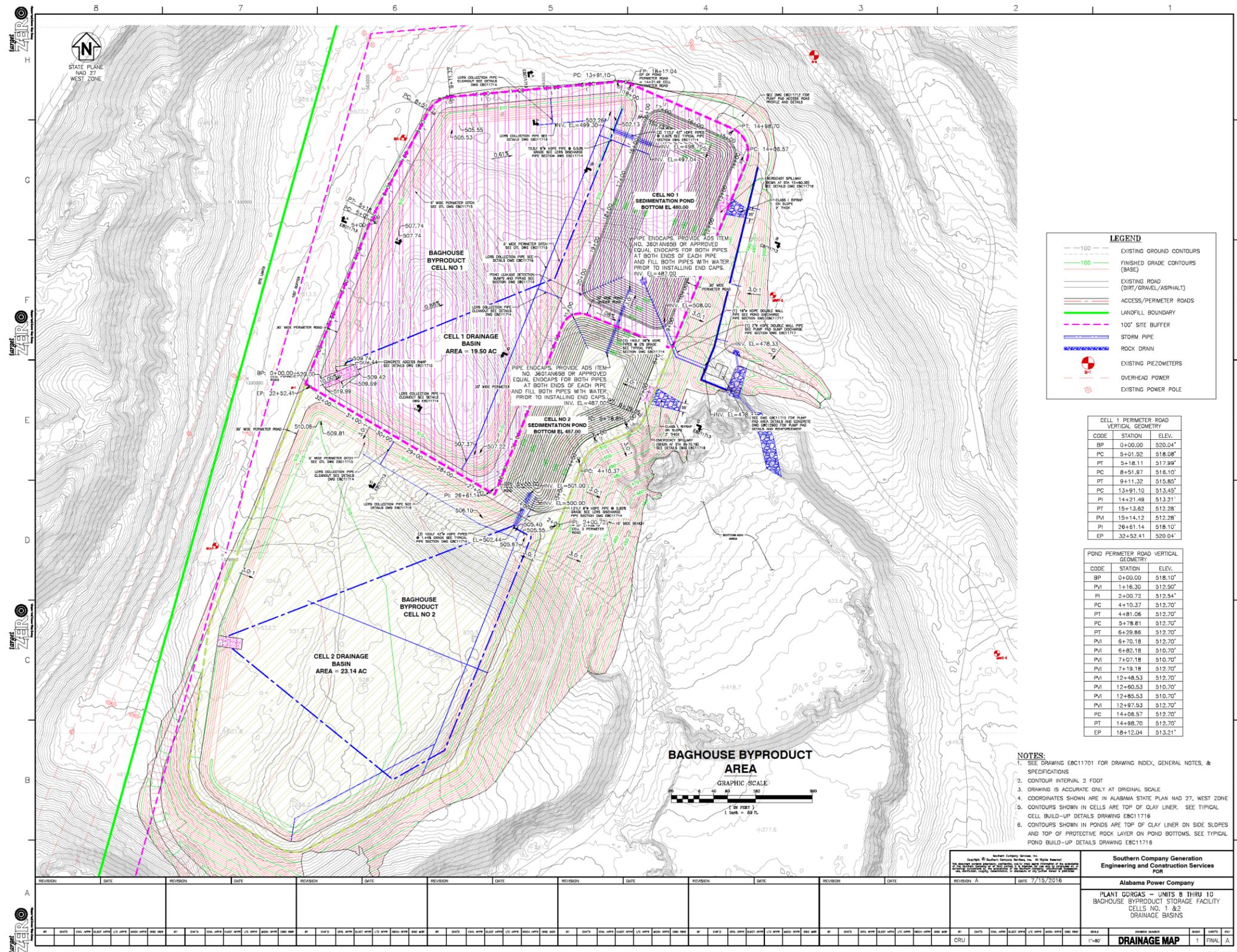
Saturday, Jul 16 2016

Cell 2 Outlet Pipes

| | | | |
|---------------------|--------------------------------|---------------------|-----------------|
| Invert Elev Dn (ft) | = 501.00 | Calculations | |
| Pipe Length (ft) | = 100.00 | Qmin (cfs) | = 118.90 |
| Slope (%) | = 1.44 | Qmax (cfs) | = 162.20 |
| Invert Elev Up (ft) | = 502.44 | Tailwater Elev (ft) | = (dc+D)/2 |
| Rise (in) | = 42.0 | | |
| Shape | = Circular | Highlighted | |
| Span (in) | = 42.0 | Qtotal (cfs) | = 118.90 |
| No. Barrels | = 3 | Qpipe (cfs) | = 118.90 |
| n-Value | = 0.012 | Qovertop (cfs) | = 0.00 |
| Culvert Type | = Circular Concrete | Veloc Dn (ft/s) | = 4.93 |
| Culvert Entrance | = Square edge w/headwall (C) | Veloc Up (ft/s) | = 7.17 |
| Coeff. K,M,c,Y,k | = 0.0098, 2, 0.0398, 0.67, 0.5 | HGL Dn (ft) | = 503.73 |
| | | HGL Up (ft) | = 504.40 |
| Embankment | | Hw Elev (ft) | = 505.34 |
| Top Elevation (ft) | = 512.00 | Hw/D (ft) | = 0.83 |
| Top Width (ft) | = 30.00 | Flow Regime | = Inlet Control |
| Crest Width (ft) | = 100.00 | | |



4.5 DRAINAGE BASIN



PLANT GORGAS
BAGHOUSE BYPRODUCT STORAGE
FACILITY PLANS

STORMWATER MANAGEMENT CALCULATIONS

FOSSIL AND HYDRO WEST
BIRMINGHAM
CIVIL
SITEWORK

SOUTHERN COMPANY SERVICES
BIRMINGHAM, ALABAMA

03.22.2013

Prepared by Eli E. Johnson & Eric C. O'Neal

Design Calculations

| | | |
|----------------------------------------|--------------------|-----------------|
| Project PLANT GORGAS BARRHOUSE CELL | Prepared By ECC | Date 3/20/13 |
| Subject/Title RUNOFF POND SIZING | Reviewed By EES | Date 3/22/13 |
| FINAL CALCULATIONS | Calculation Number | Sheet 1 of |

ASSUMPTIONS FOR ALL CALCULATIONS

- CURVE NUMBERS - CN'S FOR ALL AREAS OTHER THAN POND STORAGE AREAS WHICH HAVE CN100
- TIME OF CONCENTRATION (T_c) - OBTAINED USING KIRPICH NOMOGRAPHS (ATTACHED) + FINAL STAKING ELEVATIONS
- STORAGE VOLUMES REQUIRED: INITIALLY, CELL 1 POND IS SIZED TO RETAIN 100YR STORM VOL PLUS 10YR STORM VOLUME FOR THE CELL 1 POND DRAINAGE AREA (SEE DC-SK-3 FOR DRAINAGE AREAS). CELL 2 POND IS ONLY REQUIRED TO RETAIN THE 10YR STORM VOLUME FOR THE CELL 2 POND DRAINAGE AREA. ONCE CELL 2 BEGINS ACCEPTING BYPRODUCT, THE CONNECTOR PIPE WILL BE OPENED + THE PONDS WILL SHARE VOLUME TO RETAIN THE 100YR STORM VOLUME FOR BOTH DRAINAGE AREAS PLUS THE 10YR STORM VOLUME FOR CELL 2 POND DRAINAGE AREA.

CELL 1 POND (INITIAL)

- * COMPOSITE CN: 88
- * DRAINAGE AREA: 19.50 AC
- * $T_c = 8.5$ (KIRPICH NOMOGRAPH ATTACHED)
- * 10YR STORM VOLUME: 306,977 CF (HYDROGRAPH SUMMARY ATTACHED)
- * 100YR STORM VOLUME: 448,850 CF
755,827 CF TOTAL STORAGE REQUIRED

* POND STAGES:

- POND BOTTOM EL: 480.00
- DEAD STORAGE 2 ft
- NORMAL MIN. OP. LVL. 482.00
- NORMAL MAX OP. LVL. 483.00
- CELL 1 PIPE INV EL 498.75

Design Calculations

| | | |
|----------------------------------------|--------------------|-----------------|
| Project PLANT GORGAS BARNHOUSE CELL | Prepared By ECO | Date 3/20/13 |
| Subject/Title RUNOFF POND SIZING | Reviewed By EES | Date 3/22/15 |
| FINAL CALCULATIONS | | Sheet 2 of |

(CELL 1 POND CONTINUED)

• TOTAL STORAGE PROVIDED (ASSUMING 1 FT OF FREEBOARD)

| ELEVATION | STORAGE |
|-----------|-----------|
| 496.00 | 824,408 |
| 497.50 | X |
| 498.00 | 1,006,975 |

THROUGH INTERPOLATION: X = 961,333 CF PROVIDED STORAGE

961,333 CF > 755,827 CF OK

• REQUIRED STORAGE VOLUME ELEVATION

| STORAGE | ELEV |
|---------|------|
| 657,719 | 494 |
| 755,827 | X |
| 824,408 | 496 |

THROUGH INTERPOLATION: X = 495.18 → 100yr + 10yr STORM ELEV.

• VERIFY FREEBOARD:

CELL 1 PIPE INV. EL: 498.75

100yr + 10yr STORM EL: 495.18

3.57 ft OF FREEBOARD PROVIDED OK

CELL 2 POND (INITIAL)

- COMPOSITE CN: 87
- DRAINAGE AREA: 23.14 AC
- $T_c = 10$ min (KIRPICH NOMOGRAPH ATTACHED)
- 10yr STORM VOLUME: 355,722 CF TOTAL STORAGE REQUIRED

• POND STAGES

- POND BOTTOM EL: 487.00
- CONNECTOR PIPE INV EL: 487.00
- CELL 2 PIPE INV EL: 501.00

Design Calculations

| | | |
|---------------------------------------|--------------------|-----------------|
| Project PLANT GORGAS BAGHOUSE CELL | Prepared By ECO | Date 3/20/13 |
| Subject/Title RUNOFF POND SIZING | Reviewed By CES | Date 3/22/13 |
| FINAL CALCULATIONS | | Sheet 3 of |

(CELL 2 POND CONTINUED)

• TOTAL STORAGE PROVIDED (ASSUMING 1 FT OF FREEBOARD)

- STORAGE EL: 500.00

- STORAGE PROVIDED: 556,055 (CF) (INTERPOLATION NOT REQUIRED)

556,055 > 355,722 OK

• REQUIRED STORAGE VOLUME ELEVATION

| STORAGE | VOLUME |
|---------|--------|
| 322,710 | 496.00 |
| 355,722 | X |
| 431,905 | 498.00 |

THROUGH INTERPOLATION: $X = \frac{496.60}{\text{---}} \rightarrow$ 10_{YR} STORM ELEV.

• VERIFY FREEBOARD

CELL 2 PIPE INV. EL: 501.00

10_{YR} STORM EL: 496.60

4.40 ft OF FREEBOARD PROVIDED OK

- COMBINED POND CALCULATION

• REQUIRED STORAGE VOLUME

100_{YR} STORM VOL CELL 1 & 2 DRAINAGE AREAS: 972,097 CF

10_{YR} STORM VOL CELL 2 DRAINAGE AREA: 355,722 CF
(HYDROGRAPH SUMMARIES ATTACHED)

1,327,819 CF REQ'D

• POND STAGES

- POND BOTTOM EL: 480.00

- DEAD STORAGE 2ft

- NORMAL MIN. OP. LVL: 482.00

- NORMAL MAX. OP. LVL: 483.00

- CELL CONNECTOR PIPE INV. EL: 487.00

- CELL 1 PIPE INV. EL: 498.75

- CELL 2 PIPE INV. EL: 501.00

Design Calculations

| | | |
|--------------------------------------|--------------------|---------------|
| Project PLANT GORGAS BARRAGE CELL | Prepared By ECO | Date |
| Subject/Title RUNOFF POND SIZING | Reviewed By | Date |
| FINAL CALCULATIONS | Calculation Number | Sheet 4 of |

(COMBINED POND CONTINUED)

* TOTAL STORAGE PROVIDED (ASSUMING 1 FT OF FREEBOARD)

| <u>ELEVATION</u> | <u>STORAGE</u> |
|------------------|----------------|
| 496.00 | 1,157,435 |
| 497.75 | X |
| 498.75 | 1,566,626 |

THROUGH INTERPOLATION X = 1,417,829 CF PROVIDED STORAGE

1,417,829 > 1,327,819 CF OK

* REQUIRED STORAGE VOLUME ELEVATION

| <u>STORAGE</u> | <u>ELEV</u> |
|----------------|-------------|
| 1,157,435 | 496 |
| 1,327,819 | X |
| 1,417,829 | 497.75 |

THROUGH INTERPOLATION X = 497.15 TOTAL REQ'D STORAGE ELEV.

* VERIFY FREEBOARD

CELL 1 PIPE INV. EL: 498.75

REQ'D STORAGE EL: 497.15

1.60 FT OF FREEBOARD PROVIDED OK

-CONNECTOR PIPE

* ASSUME 25YR FLOW FROM HYDROFLOW OUTPUT: 100.41 CFS

* INV EL ON: 487.00

INV EL UP: 487.00

LENGTH ≈ 192 FT

GRADE: 0%

* HYDROFLOW EXPRESS OUTPUT ATTACHED.

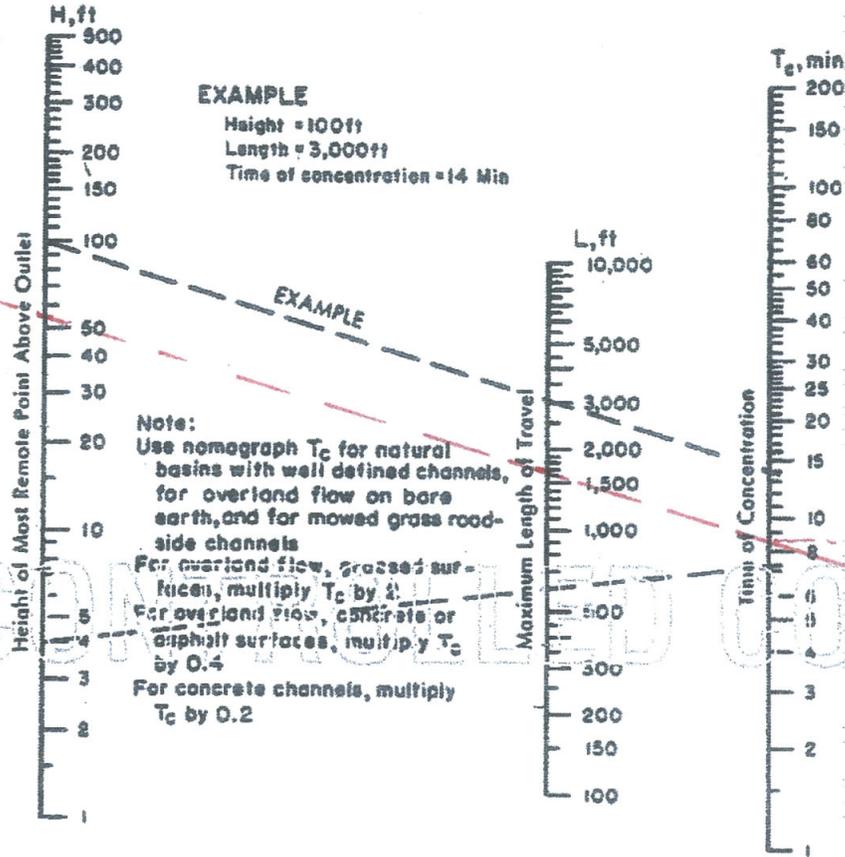
V = 7.10 FPS OK

* PIPE USED TO CONVEY POND 2 WATER TO POND 1 FOR RELEASE

* PIPE WILL ALSO ALLOW PUMPS TO EQUALIZE TO ACCOMMODATE ENTIRE 100YR STORM VOLUME.

CELL 1 POND T_c

AH = 55.08
 L = 1,721 ft



UNCONTROLLED COPY

From *Handbook of Steel Drainage and Highway Construction Products*, 1983
 Used by permission of American Iron and Steel Institute.

Figure 1
 Kirpich Nomograph for
 Time of Concentration of Rainfall on Small Drainage Basins

Hydrograph Summary Report

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description | |
|--------------------------|--------------------------|-----------------|---------------------|--------------------|------------------------|---------------|----------------------------------|------------------------|------------------------|--|
| 1 | SCS Runoff | 74.21 | 5 | 730 | 306,977 | ---- | ----- | ----- | Area to Cell 1 Pond | |
| 2 | SCS Runoff | 86.52 | 5 | 730 | 355,722 | ---- | ----- | ----- | Area To Cell 2 Pond | |
| 4 | Combine | 160.74 | 5 | 730 | 662,700 | 1, 2, | ----- | ----- | Total 100yr Area | |
| GorgasBaghouse-Ponds.gpw | | | | | Return Period: 10 Year | | Wednesday, Mar 20 2013, 10:11 AM | | | |

Hydrograph Summary Report

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description | |
|--------------------------|--------------------------|-----------------|---------------------|--------------------|-------------------------|---------------|----------------------------------|------------------------|------------------------|--|
| 1 | SCS Runoff | 106.18 | 5 | 730 | 448,850 | --- | ----- | ----- | Area to Cell 1 Pond | |
| 2 | SCS Runoff | 124.58 | 5 | 730 | 523,247 | --- | ----- | ----- | Area To Cell 2 Pond | |
| 4 | Combine | 230.76 | 5 | 730 | 972,097 | 1, 2, | ----- | ----- | Total 100yr Area | |
| GorgasBaghouse-Ponds.gpw | | | | | Return Period: 100 Year | | Wednesday, Mar 20 2013, 10:11 AM | | | |

Pond Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Mar 20 2013, 10:20 AM

Pond No. 1 - Pond1 (100yr+PumpLevels)

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00 | 483.00 | 41,569 | 0 | 0 |
| 1.00 | 484.00 | 44,633 | 43,101 | 43,101 |
| 3.00 | 486.00 | 51,013 | 95,646 | 138,747 |
| 5.00 | 488.00 | 57,695 | 108,708 | 247,455 |
| 7.00 | 490.00 | 64,657 | 122,352 | 369,807 |
| 9.00 | 492.00 | 71,903 | 136,560 | 506,367 |
| 11.00 | 494.00 | 79,449 | 151,352 | 657,719 |
| 13.00 | 496.00 | 87,240 | 166,689 | 824,408 |
| 15.00 | 498.00 | 95,327 | 182,567 | 1,006,975 |
| 15.75 | 498.75 | 98,407 | 72,650 | 1,079,625 |

495.18
755,327 AREA

Culvert / Orifice Structures

| | [A] | [B] | [C] | [D] |
|-----------------|--------|------|------|------|
| Rise (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Span (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| No. Barrels | = 0 | 0 | 0 | 0 |
| Invert El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Length (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Slope (%) | = 0.00 | 0.00 | 0.00 | 0.00 |
| N-Value | = .000 | .000 | .000 | .000 |
| Orif. Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = n/a | No | No | No |

Weir Structures

| | [A] | [B] | [C] | [D] |
|----------------|--------|------|------|------|
| Crest Len (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Crest El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Type | = --- | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

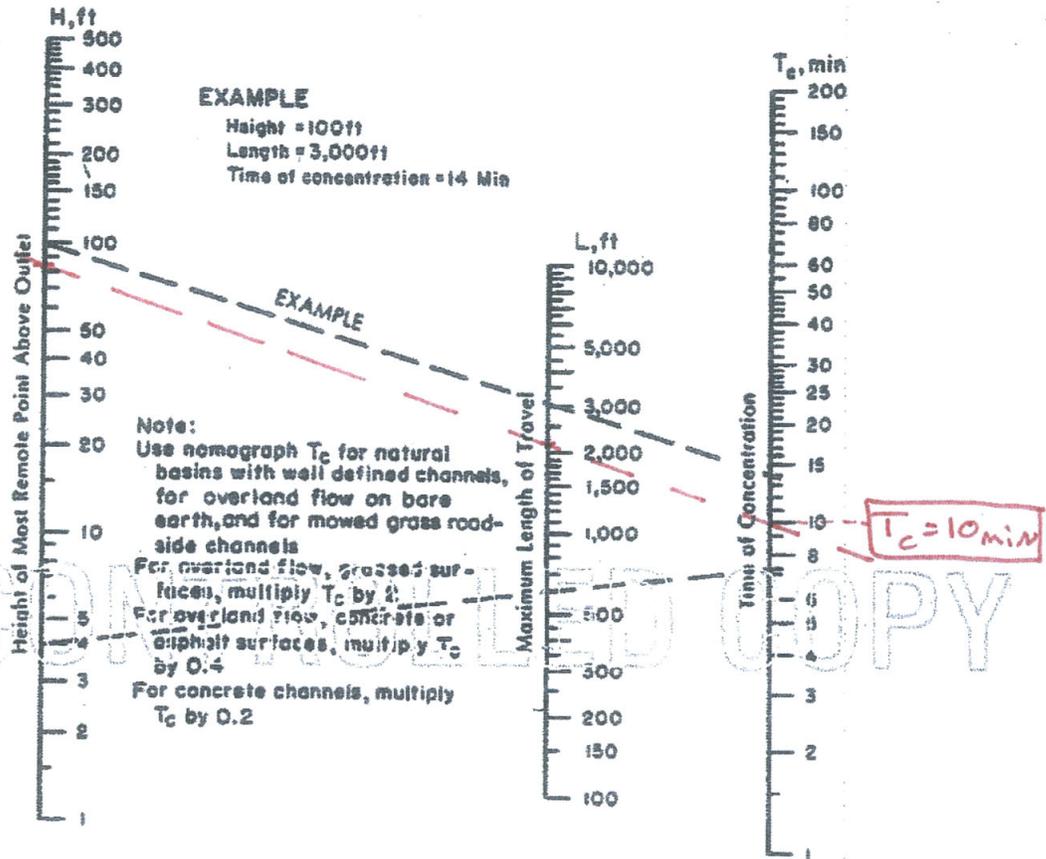
Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

| Stage ft | Storage cuft | Elevation ft | Clv A cfs | Clv B cfs | Clv C cfs | Clv D cfs | Wr A cfs | Wr B cfs | Wr C cfs | Wr D cfs | Exfil cfs | Total cfs |
|----------|--------------|--------------|-----------|-----------|-----------|-----------|----------|----------|----------|----------|-----------|-----------|
| 0.00 | 0 | 483.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 1.00 | 43,101 | 484.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 3.00 | 138,747 | 486.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 5.00 | 247,455 | 488.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 7.00 | 369,807 | 490.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 9.00 | 506,367 | 492.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 11.00 | 657,719 | 494.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 13.00 | 824,408 | 496.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 15.00 | 1,006,975 | 498.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |
| 15.75 | 1,079,625 | 498.75 | --- | --- | --- | --- | --- | --- | --- | --- | --- | 0.00 |

CELL 2 POND T_c

$H = 84.06 \text{ ft}$
 $L = 2,150 \text{ ft}$



From *Handbook of Steel Drainage and Highway Construction Products*, 1983
 Used by permission of American Iron and Steel Institute.

Figure 1
 Kirpich Nomograph for
 Time of Concentration of Rainfall on Small Drainage Basins

Hydrograph Summary Report

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description | |
|--------------------------|--------------------------|-----------------|---------------------|--------------------|------------------------|---------------|-------------------------------|------------------------|------------------------|--|
| 1 | SCS Runoff | 73.64 | 5 | 730 | 304,616 | --- | ----- | ----- | Area to Cell 1 Pond | |
| 2 | SCS Runoff | 86.52 | 5 | 730 | 355,722 | --- | ----- | ----- | Area To Cell 2 Pond | |
| 4 | Combine | 160.17 | 5 | 730 | 660,338 | 1, 2, | ----- | ----- | Total 100yr Area | |
| GorgasBaghouse-Ponds.gpw | | | | | Return Period: 10 Year | | Tuesday, Mar 19 2013, 3:47 PM | | | |

Pond Report

Pond No. 2 - Pond2 (10yrReq'dOnly)

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00 | 487.00 | 21,821 | 0 | 0 |
| 1.00 | 488.00 | 24,759 | 23,290 | 23,290 |
| 3.00 | 490.00 | 30,836 | 55,595 | 78,885 |
| 5.00 | 492.00 | 37,207 | 68,043 | 146,928 |
| 7.00 | 494.00 | 43,872 | 81,079 | 228,007 |
| 9.00 | 496.00 | 50,831 | 94,703 | 322,710 |
| 11.00 | 498.00 | 58,364 | 109,195 | 431,905 |
| 13.00 | 500.00 | 65,786 | 124,150 | 556,055 |

Culvert / Orifice Structures

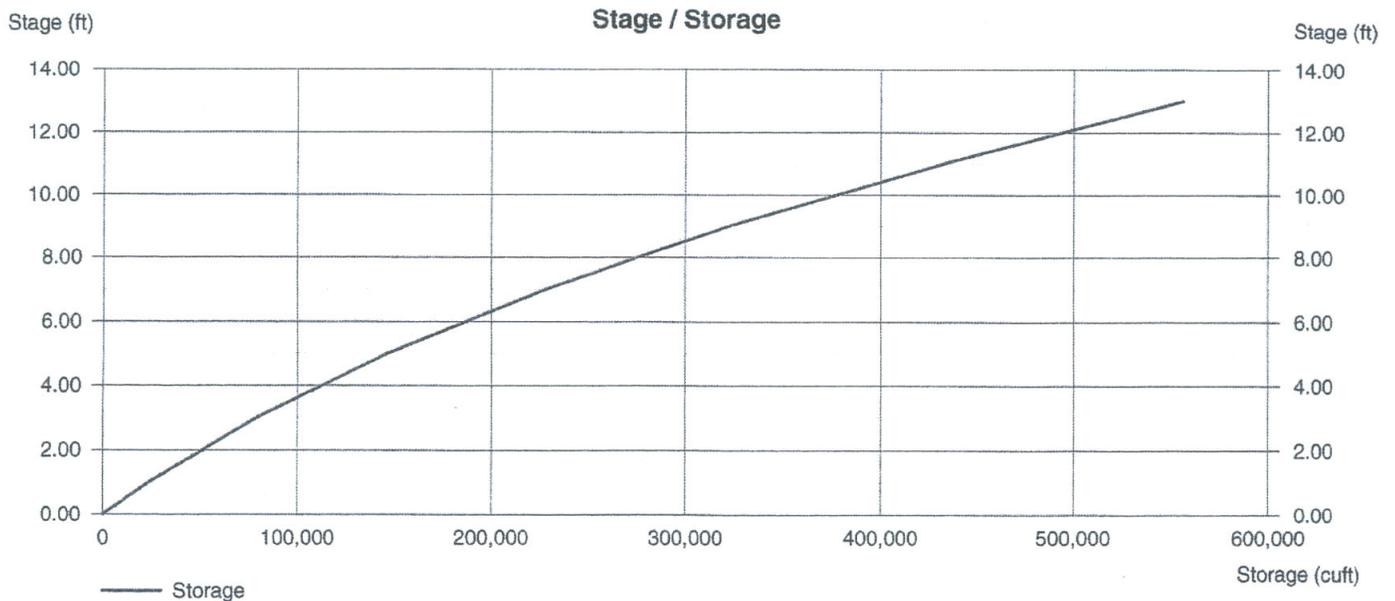
| | [A] | [B] | [C] | [D] |
|-----------------|--------|------|------|------|
| Rise (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Span (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| No. Barrels | = 0 | 0 | 0 | 0 |
| Invert El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Length (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Slope (%) | = 0.00 | 0.00 | 0.00 | 0.00 |
| N-Value | = .000 | .000 | .000 | .000 |
| Orif. Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = n/a | No | No | No |

Weir Structures

| | [A] | [B] | [C] | [D] |
|----------------|--------|------|------|------|
| Crest Len (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Crest El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Type | = --- | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Summary Report

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description | |
|--------------------------|--------------------------|-----------------|---------------------|--------------------|-------------------------|---------------|----------------------------------|------------------------|------------------------|--|
| 1 | SCS Runoff | 106.18 | 5 | 730 | 448,850 | --- | ----- | ----- | Area to Cell 1 Pond | |
| 2 | SCS Runoff | 124.58 | 5 | 730 | 523,247 | --- | ----- | ----- | Area To Cell 2 Pond | |
| 4 | Combine | 230.76 | 5 | 730 | 972,097 | 1, 2, | ----- | ----- | Total 100yr Area | |
| GorgasBaghouse-Ponds.gpw | | | | | Return Period: 100 Year | | Wednesday, Mar 20 2013, 11:28 AM | | | |

Hydrograph Summary Report

| Hyd. No. | Hydrograph type (origin) | Peak flow (cfs) | Time interval (min) | Time to peak (min) | Volume (cuft) | Inflow hyd(s) | Maximum elevation (ft) | Maximum storage (cuft) | Hydrograph description | |
|--------------------------|--------------------------|-----------------|---------------------|--------------------|------------------------|---------------|----------------------------------|------------------------|------------------------|--|
| 1 | SCS Runoff | 74.21 | 5 | 730 | 306,977 | ---- | ----- | ----- | Area to Cell 1 Pond | |
| 2 | SCS Runoff | 86.52 | 5 | 730 | 355,722 | ---- | ----- | ----- | Area To Cell 2 Pond | |
| 4 | Combine | 160.74 | 5 | 730 | 662,700 | 1, 2, | ----- | ----- | Total 100yr Area | |
| GorgasBaghouse-Ponds.gpw | | | | | Return Period: 10 Year | | Wednesday, Mar 20 2013, 11:28 AM | | | |

Pond Report

Hydraflow Hydrographs by Intelisolve

Wednesday, Mar 20 2013, 11:33 AM

Pond No. 4 - CombinedPondVolumes

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

| Stage (ft) | Elevation (ft) | Contour area (sqft) | Incr. Storage (cuft) | Total storage (cuft) |
|------------|----------------|---------------------|----------------------|----------------------|
| 0.00 | 483.00 | 41,569 | 0 | 0 |
| 1.00 | 484.00 | 44,633 | 43,101 | 43,101 |
| 3.00 | 486.00 | 51,013 | 95,646 | 138,747 |
| 4.00 | 487.00 | 75,581 | 63,297 | 202,044 |
| 5.00 | 488.00 | 82,454 | 79,018 | 281,062 |
| 7.00 | 490.00 | 95,493 | 177,947 | 459,009 |
| 9.00 | 492.00 | 109,110 | 204,603 | 663,612 |
| 11.00 | 494.00 | 123,321 | 232,431 | 896,043 |
| 13.00 | 496.00 | 138,071 | 261,392 | 1,157,435 |
| 15.00 | 498.00 | 153,691 | 291,762 | 1,449,197 |
| 15.75 | 498.75 | 159,453 | 117,429 | 1,566,626 |

497.15

1,327,819

Culvert / Orifice Structures

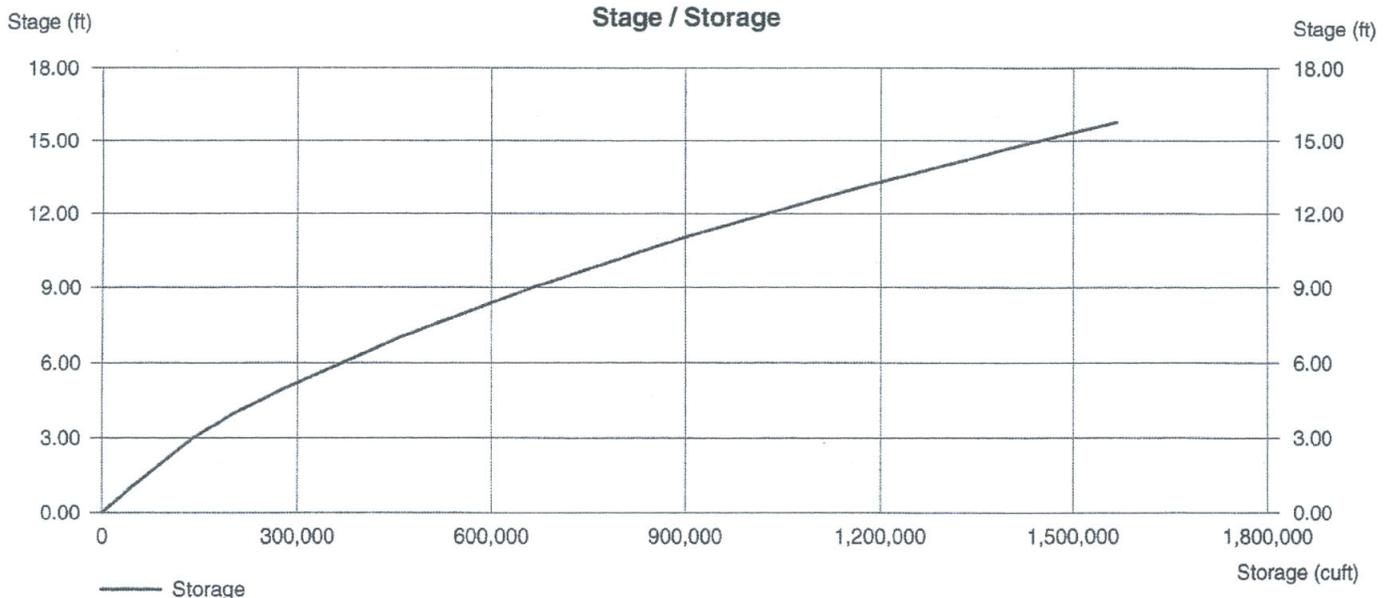
| | [A] | [B] | [C] | [D] |
|-----------------|--------|------|------|------|
| Rise (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Span (in) | = 0.00 | 0.00 | 0.00 | 0.00 |
| No. Barrels | = 0 | 0 | 0 | 0 |
| Invert El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Length (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Slope (%) | = 0.00 | 0.00 | 0.00 | 0.00 |
| N-Value | = .000 | .000 | .000 | .000 |
| Orif. Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Multi-Stage | = n/a | No | No | No |

Weir Structures

| | [A] | [B] | [C] | [D] |
|----------------|--------|------|------|------|
| Crest Len (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Crest El. (ft) | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Coeff. | = 0.00 | 0.00 | 0.00 | 0.00 |
| Weir Type | = --- | --- | --- | --- |
| Multi-Stage | = No | No | No | No |

Exfiltration = 0.000 in/hr (Wet area) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.





Engineering and Construction Services Calculation

**Calculation Number:
TV-GO-APC70355-002**

| | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------|
| Project/Plant: Plant Gorgas Baghouse Byproduct Storage Facility | Unit(s): 8-10 | Discipline/Area: TS-ES&FS-ES&EE |
| Title/Subject: Leachate Collection System (LCS) Design | | |
| Purpose/Objective: To design a drainage system to keep pressure head build-up less than 30 cm on top of the HDPE liner in the bottom of the cells. | | |
| System or Equipment Tag Numbers: NA | Originator: Joshua A. Lippert | |

Contents

| Topic | Page | Attachments <small>(Computer Printouts, Tech. Papers, Sketches, Correspondence)</small> | # of Pages |
|-------------------------------------------------------|------|--------------------------------------------------------------------------------------------|------------|
| Purpose of Calculation | 2 | Attachment 1 – GDN Product Data Sheet | 1 |
| Summary of Conclusions | 2 | Attachment 2 – Geocomposite Comparison | 1 |
| Methodology | 2 | | |
| Assumptions | 2 | | |
| Criteria | 3 | | |
| Design Inputs/References | 4 | | |
| Body of Calculation | 4-9 | | |
| Total # of pages including cover sheet & attachments: | 11 | | |

Revision Record

| Rev. No. | Description | Originator Initial / Date | Reviewer Initial / Date | Approver Initial / Date |
|----------|----------------------|---------------------------|-------------------------|-------------------------|
| 0 | Submitted for Permit | JAL/6-7-13 | THH/6-7-13 | JCP/6-7-13 |
| | | | | |
| | | | | |

Notes:

Purpose of Calculation

Alabama Power Company (APC) is currently constructing a baghouse at Plant Gorgas, the byproduct of which will be stored in an on-site storage facility. The storage facility is being constructed to comply with the Alabama Department of Environmental Management (ADEM) Solid Waste Program. Section 335-13-4-.18(2) of this program requires that new facilities be constructed with a leachate collection system (LCS) capable of maintaining less than 30 cm of head on the composite liner. The purpose of this calculation is to demonstrate that the designed LCS at the Plant Gorgas baghouse byproduct storage facility will be adequate to keep the pressure head on the liner below 30 cm as required by ADEM regulations.

Summary of Conclusions

A summary of the maximum pressure head on the liner from each analysis is given below. In each case, the pressure head on the HDPE is less than the 30 cm maximum allowed by ADEM regulations. The maximum pressure heads calculated were 0.86 ft. (26 cm) for Cell 1 and 0.56 ft. (17 cm) for Cell 2.

| Stacking Height (ft) | Max. Pressure Head (ft) | Location of Max. Press. Head in Model (x, ft) |
|----------------------|-------------------------|-----------------------------------------------|
| Cell 1 | | |
| 0 | 0.82 | 267 |
| 20 | 0.85 | 262 |
| 40 | 0.85 | 262 |
| 60 | 0.86 | 262 |
| Cell 2 | | |
| 0 | 0.55 | 523 |
| 20 | 0.55 | 523 |
| 40 | 0.55 | 523 |
| 60 | 0.55 | 525 |
| 80 | 0.56 | 524 |

Methodology

The modeling was performed using SEEP/W version 8.0.10 finite element seepage analysis program by GEO-SLOPE International Ltd. A steady-state seepage model was used for this calculation.

Assumptions

1. The HDPE liner is impermeable.
2. The baghouse byproduct is assumed to be homogeneous and isotropic.

3. The hydraulic properties of the baghouse byproduct are assumed to be similar to the hydraulic properties of FGD gypsum. The hydraulic conductivity is assumed to be 1×10^{-4} cm/s, or 3.3×10^{-6} ft/s.
4. The hydraulic conductivity of the sandy cover was assumed to be 1×10^{-3} cm/s.
5. The annual precipitation was assumed to be 58.7 inches, or 1.55×10^{-7} ft/s.
6. Properties of the geocomposite drainage material were based on GSE Fabrinet UF 300 mil double-sided geocomposite, and were adjusted for gradient and normal loads based on research by Qian, et al.

Criteria

The storage facility will consist of a 12.8 acre Cell 1 and a 17.5 acre Cell 2, along with associated sedimentation ponds. Baghouse byproduct will be stacked in the storage cells with benches 20 feet in width spaced every 20 vertical feet on the slopes. The bottom of Cell 1 will be sloped to drain at 0.88% for most of its area, with the northern end sloped at approximately 0.61%. Cell 2 will be sloped on the bottom at between 0.87% and 1.1%. The bottom of each cell will be lined with geocomposite drainage net (GDN) overlain by a minimum of 12 inches of protective sandy soil cover. An additional 12 inches of stone will be placed on top of the sand; however, it is assumed that the baghouse byproduct will infiltrate this stone layer with the resulting combination have hydraulic properties similar to the baghouse byproduct. Thus, the stone layer was not modeled separately from the baghouse byproduct in this calculation.

Leachate that infiltrates the stack is designed to enter the GDN and flow to collection pipes located in sumps around the down-slope perimeter of the stack. These collection pipes will then transport the leachate flow to the sedimentation ponds. In addition to the perimeter collection sumps, Cell 2 is designed to have collection pipe in a sump running under the middle of the cell and connecting to the perimeter sump on the eastern side of the stack. A perimeter ditch between the toe of the dike and the toe of the stack, supported by a rock bolster, will direct stormwater runoff into the sedimentation ponds. See Figure 2 for a detail of the stack perimeter.

The cross sections used for the SEEP/W analyses were cut parallel to the maximum bottom cell gradients based the longest flow path within the cells. SEEP/W analyses were run at stacking heights of 0, 20, 40, and 60 feet for Cell 1, and 0, 20, 40, 60, and 80 feet for Cell 2. The pressure head on the finite element nodes located on the HDPE liner was recorded for the bottom and sides of the cells.

A note on the geocomposite drainage net properties used: Research has shown that transmissivity in a GDN increases as the normal load decreases and as the gradient decreases. The transmissivity of the GDN was tested by the manufacturer at a normal load of 10,000 psf and a gradient of 0.1, in conformance with standard industry practice. Based on research by Qian et al. (2001), we have adjusted the transmissivity based on a gradient of 0.02. Because the gypsum cell has a gradient of 0.005 on the cell bottom, the modeled transmissivity is still likely to be highly conservative.

Design Inputs/References

Plant Gorgas Design Drawing No. E8C11703 – Baghouse Byproduct Storage Facility, General Arrangement Plan

Qian, Xuede, et al, 2001, Geotechnical Aspects of Landfill Design and Construction, Prentice Hall, 717 pp.

Body of Calculation

See below for seepage calculation.

Attachments

Attachment 1 – GDN Product Data Sheets

Attachment 2 – Spreadsheet showing equivalent hydraulic conductivities of various drainage geocomposite materials based on published data regarding transmissivity, thickness and loading.

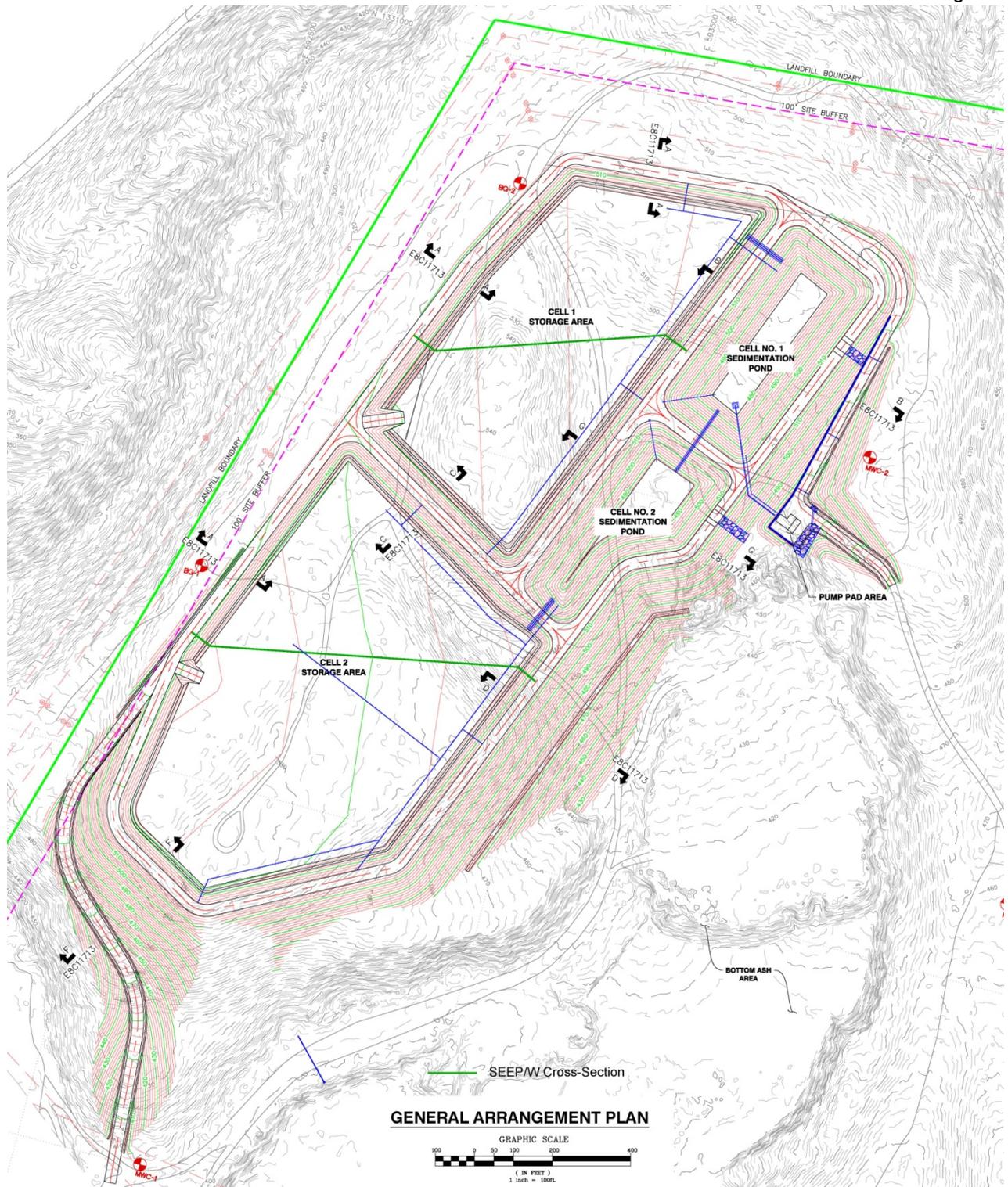


Figure 1: Baghouse Byproduct Storage Facility Layout

Plant Gorgas Baghouse Byproduct Storage Facility
Cell 1 - 60 Ft. Stack

Materials:

Name: Baghouse Byproduct
K-Function: Baghouse Byproduct
Name: Baghouse Byproduct
K-Saturation: 3.3e-006

Name: Sand Drainage Layer
K-Function: Sand
Vol. WC. Function: Sand
K-Saturation: 3.3e-005

Name: Geocomposite Drainage Layer
K-Transpoe: 0.66 ft/sec
K-Normal: 0.167 ft/sec

Unit Flux (Precipitation):
58.7 inches/year

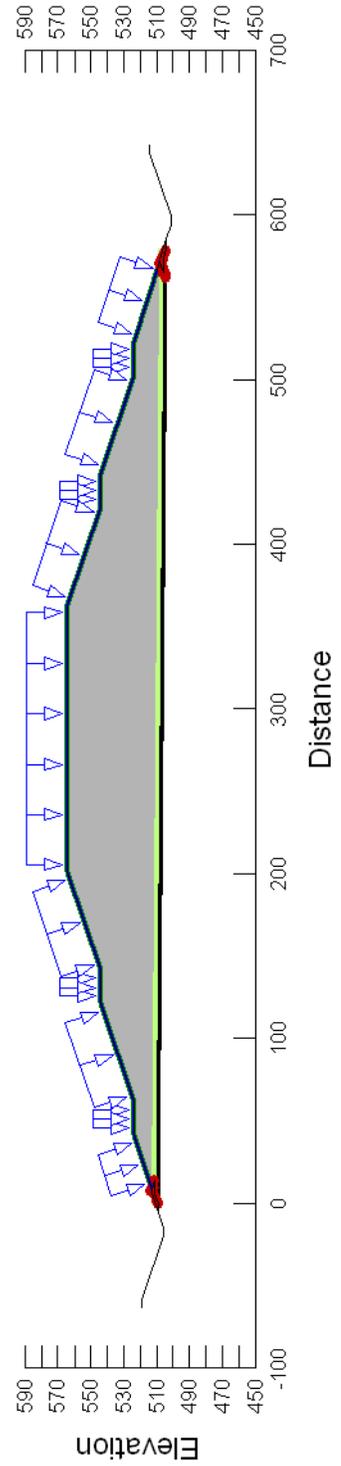


Figure 2: Example Cell 1 SEEP/W input diagram

**Plant Gorgas Baghouse Byproduct Storage Facility
Cell 2 - 80 Ft. Stack**

Materials:

Name: Baghouse Byproduct
 K-Function: Baghouse Byproduct
 Vol. WC. Function: Baghouse Byproduct
 K-Saturation: 3.3e-006

Name: Sand Drainage Layer
 K-Function: Sand
 Vol. WC. Function: Sand
 K-Saturation: 3.3e-005

Name: Geocomposite Drainage Layer
 K-Transpose: 0.66 ft/sec
 K-Normal: 0.21 ft/sec

Unit Flux (Precipitation):
 58.7 inches/year

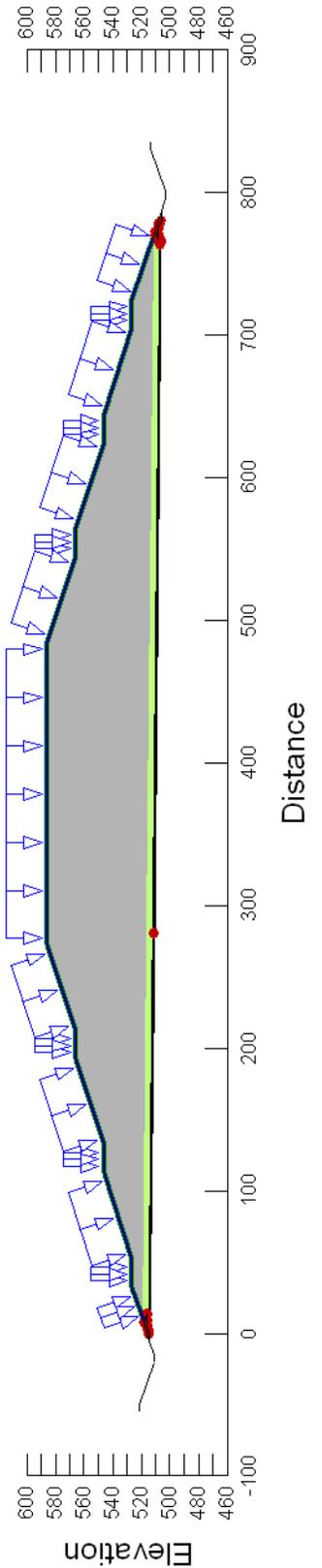


Figure 3: Example Cell 2 SEEP/W input diagram

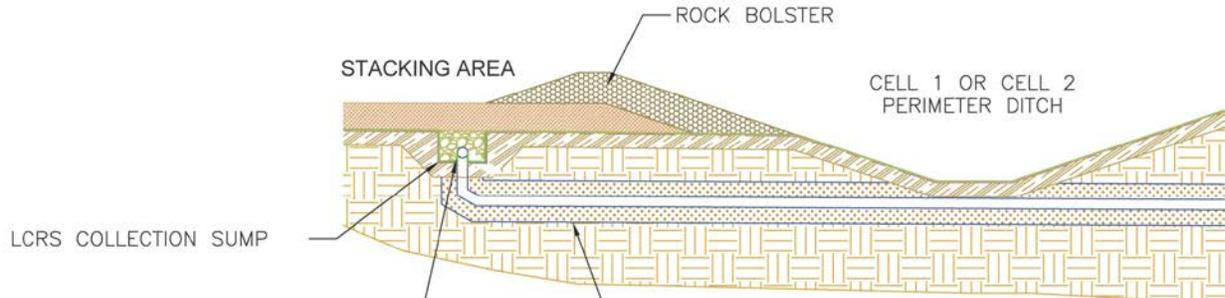


Figure 4: Stack perimeter detail

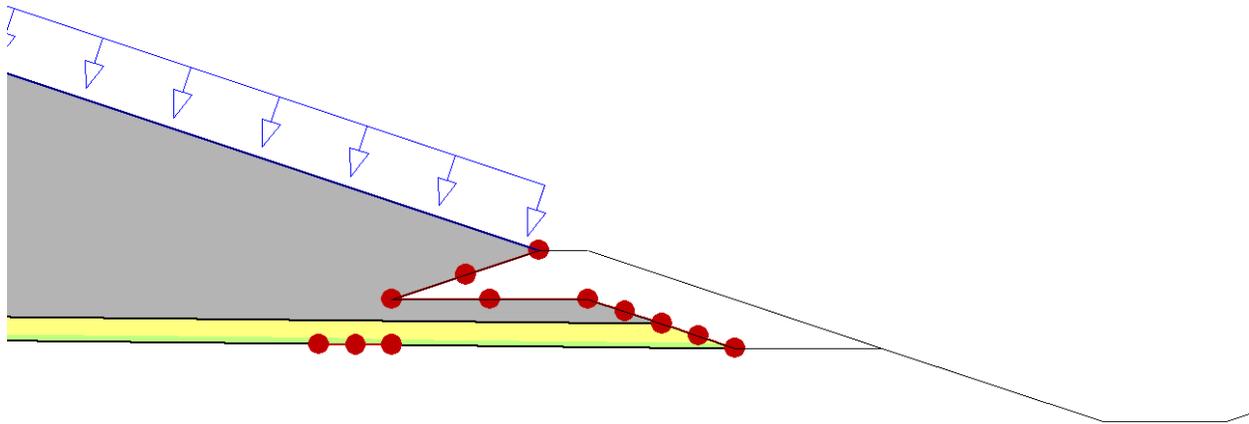
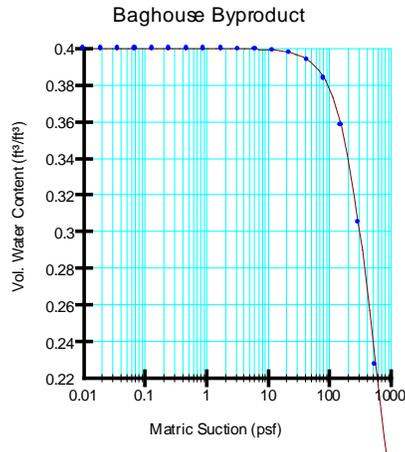
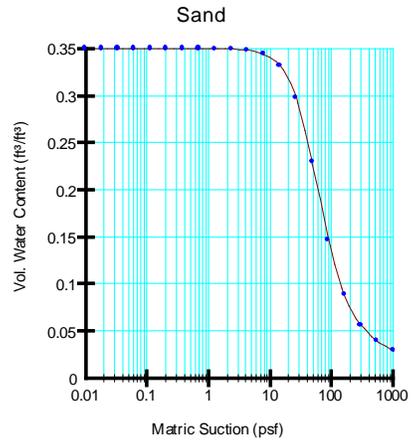


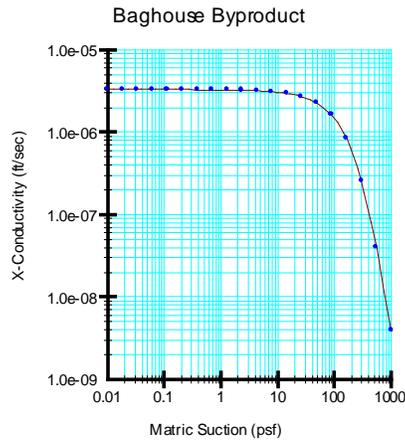
Figure 5: Toe of stack as modeled showing baghouse byproduct (gray), sand (yellow), and geocomposite (green). Boundary conditions are precipitation (blue arrows) and zero pressure nodes (red dots).



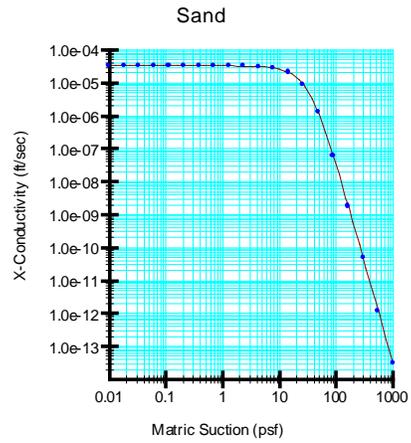
Baghouse Byproduct
Volumetric Water Content



Sand Volumetric Water Content



Baghouse Byproduct
Hydraulic Conductivity



Sand Hydraulic Conductivity

Figure 6: Volumetric water content and hydraulic conductivity functions

PRODUCT DATA SHEET

GSE FabriNet UF Geocomposite

GSE FabriNet UF geocomposite consists of a 300 mil thick GSE HyperNet UF geonet heat-laminated on one or both sides with a GSE nonwoven needlepunched geotextile. The geotextile is available in mass per unit area range of 6 oz/yd² to 16 oz/yd². The geocomposite is designed and formulated to perform drainage function under a range of anticipated site loads, gradients and boundary conditions.



AT THE CORE:
A 300 mil thick GSE HyperNet UF geonet heat-laminated on one or both sides with a nonwoven needlepunched geotextile.

Product Specifications

| Tested Property | Test Method | Frequency | Minimum Average Roll Value ⁽¹⁾ | | |
|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|---------------------------|-------------------------------------------------------------|-------------------------------------------------------------|------------------------------------------------------------|
| Geocomposite | | | 6 oz/yd ² | 8 oz/yd ² | 10 oz/yd ² |
| Transmissivity ⁽²⁾ , gal/min/ft (m ² /sec) Double-Sided Composite Single-Sided Composite | ASTM D 4716 | 1/540,000 ft ² | 4.3 (9 x 10 ⁻⁴) 14.5 (3 x 10 ⁻⁵) | 4.3 (9 x 10 ⁻⁴) 14.5 (3 x 10 ⁻⁵) | 3.4 (7 x 10 ⁻⁴) 9.6 (2 x 10 ⁻⁵) |
| Ply Adhesion, lb/in | ASTM D 7005 | 1/50,000 ft ² | 1.0 | 1.0 | 1.0 |
| Geonet Core ⁽³⁾ - GSE HyperNet UF | | | | | |
| Transmissivity ⁽²⁾ , gal/min/ft (m ² /sec) | ASTM D 4716 | | 38.6 (8 x 10 ⁻³) | 38.6 (8 x 10 ⁻³) | 38.6 (8 x 10 ⁻³) |
| Density, g/cm ³ | ASTM D 1505 | 1/50,000 ft ² | 0.94 | 0.94 | 0.94 |
| Tensile Strength (MD), lb/in | ASTM D 5035/7179 | 1/50,000 ft ² | 75 | 75 | 75 |
| Carbon Black Content, % | ASTM D 1603 ⁽⁶⁾ /4218 | 1/50,000 ft ² | 2.0 | 2.0 | 2.0 |
| Geotextile ⁽⁴⁾ | | | | | |
| Mass per Unit Area, oz/yd ² | ASTM D 5261 | 1/90,000 ft ² | 6 | 8 | 10 |
| Grab Tensile, lb | ASTM D 4632 | 1/90,000 ft ² | 160 | 220 | 260 |
| Puncture Strength, lb | ASTM D 4833 | 1/90,000 ft ² | 90 | 120 | 165 |
| AOS, US sieve (mm) | ASTM D 4751 | 1/540,000 ft ² | 70 (0.212) | 80 (0.180) | 100 (0.150) |
| Permittivity, sec ² | ASTM D 4491 | 1/540,000 ft ² | 1.5 | 1.3 | 1.0 |
| Flow Rate, gpm/ft ² | ASTM D 4491 | 1/540,000 ft ² | 110 | 95 | 75 |
| UV Resistance, % retained | ASTM D 4355 (after 500 hours) | per formulation | 70 | 70 | 70 |
| NOMINAL ROLL DIMENSIONS | | | | | |
| Geonet Core Thickness, mil | ASTM D 5199 | 1/50,000 ft ² | 300 | 300 | 300 |
| Roll Width ⁽⁵⁾ , ft | | | 15 | 15 | 15 |
| Roll Length ⁽⁵⁾ , ft | Double-Sided Composite Single-Sided Composite | | 180 220 | 170 220 | 160 200 |
| Roll Area, ft ² | Double-Sided Composite Single-Sided Composite | | 2,700 3,300 | 2,550 3,300 | 2,400 3,000 |

[Product specifications continued on back]

[DURABILITY RUNS DEEP]



| Drainage Geocomposite | Product Data | | | | | Published Test Data | | | Adjusted Data ¹ (Normalized to 10,000 psf load, 0.02 gradient) | | | Hydraulic Conductivity | |
|-----------------------------|--------------|--------------|-------------|---------------------|--------------------|---------------------|---------------|-----------------------------------------|------------------------------------------------------------------------------|----------------------------|---------------------------------------------|------------------------|--------|
| | Single Sided | Double Sided | Geonet Only | Net Thickness (mil) | Net Thickness (ft) | Test Load (psf) | Test Gradient | Test Transmissivity (m ² /s) | Load Adjustment Factor | Gradient Adjustment Factor | Adjusted Transmissivity (m ² /s) | (m/s) | (ft/s) |
| Cetco TexDrain 200 Geonet | | | X | 200 | 0.017 | 15000 | 1 | 0.001 | 1.27 | 3.61 | 0.004585 | 0.9025 | 2.9609 |
| Cetco TexDrain 200 SS 6 | X | | | 200 | 0.017 | 15000 | 1 | 0.0002 | 1.27 | 3.61 | 0.000917 | 0.1805 | 0.5922 |
| Cetco TexDrain 200 DS 6 | | X | | 200 | 0.017 | 15000 | 1 | 0.0001 | 1.27 | 3.61 | 0.000458 | 0.0903 | 0.2961 |
| Cetco TexDrain 200 SS 8 | X | | | 200 | 0.017 | 15000 | 1 | 0.0001 | 1.27 | 3.61 | 0.000458 | 0.0903 | 0.2961 |
| Cetco TexDrain 200 DS 8 | | X | | 200 | 0.017 | 15000 | 1 | 0.00004 | 1.27 | 3.61 | 0.000183 | 0.0361 | 0.1184 |
| Cetco TexDrain 250 Geonet | | | X | 250 | 0.021 | 15000 | 1 | 0.0015 | 1.27 | 3.61 | 0.008777 | 1.0830 | 3.5531 |
| Cetco TexDrain 250 SS 6 | X | | | 250 | 0.021 | 15000 | 1 | 0.00045 | 1.27 | 3.61 | 0.002063 | 0.3249 | 1.0659 |
| Cetco TexDrain 250 DS 6 | | X | | 250 | 0.021 | 15000 | 1 | 0.0003 | 1.27 | 3.61 | 0.001375 | 0.2166 | 0.7106 |
| Cetco TexDrain 250 SS 8 | X | | | 250 | 0.021 | 15000 | 1 | 0.00025 | 1.27 | 3.61 | 0.001146 | 0.1805 | 0.5922 |
| Cetco TexDrain 250 DS 8 | | X | | 250 | 0.021 | 15000 | 1 | 0.000175 | 1.27 | 3.61 | 0.000802 | 0.1284 | 0.4145 |
| Poly-Flex GN-200 | | | X | 200 | 0.017 | 10000 | 1 | 0.001 | 1.00 | 3.61 | 0.003610 | 0.7106 | 2.3315 |
| Poly-Flex GC-06S-2.0 | X | | | 200 | 0.017 | 10000 | 1 | 0.00025 | 1.00 | 3.61 | 0.000903 | 0.1777 | 0.5829 |
| Poly-Flex GC-06D-2.0 | | X | | 200 | 0.017 | 10000 | 1 | 0.00008 | 1.00 | 3.61 | 0.000289 | 0.0569 | 0.1865 |
| Poly-Flex GC-08S-2.0 | X | | | 200 | 0.017 | 10000 | 1 | 0.0002 | 1.00 | 3.61 | 0.000722 | 0.1421 | 0.4663 |
| Poly-Flex GC-08D-2.0 | | X | | 200 | 0.017 | 10000 | 1 | 0.00004 | 1.00 | 3.61 | 0.000144 | 0.0284 | 0.0933 |
| Poly-Flex GN-250 | | | X | 250 | 0.021 | 10000 | 1 | 0.0015 | 1.00 | 3.61 | 0.005415 | 0.8528 | 2.7977 |
| Poly-Flex GC-06S-2.5 | X | | | 250 | 0.021 | 10000 | 1 | 0.0005 | 1.00 | 3.61 | 0.001805 | 0.2843 | 0.9326 |
| Poly-Flex GC-06D-2.5 | | X | | 250 | 0.021 | 10000 | 1 | 0.0002 | 1.00 | 3.61 | 0.000722 | 0.1137 | 0.3730 |
| Poly-Flex GC-08S-2.5 | X | | | 250 | 0.021 | 10000 | 1 | 0.00029 | 1.00 | 3.61 | 0.001047 | 0.1649 | 0.5409 |
| Poly-Flex GC-08D-2.5 | | X | | 250 | 0.021 | 10000 | 1 | 0.0001 | 1.00 | 3.61 | 0.000361 | 0.0569 | 0.1865 |
| GSE HyperNet | | | X | 200 | 0.017 | 10000 | 0.1 | 0.002 | 1.00 | 1.70 | 0.003400 | 0.6693 | 2.1958 |
| GSE FabriNet SS 6oz | X | | | 200 | 0.017 | 10000 | 0.1 | 0.001 | 1.00 | 1.70 | 0.001700 | 0.3346 | 1.0979 |
| GSE FabriNet SS 8oz | X | | | 200 | 0.017 | 10000 | 0.1 | 0.001 | 1.00 | 1.70 | 0.001700 | 0.3346 | 1.0979 |
| GSE FabriNet SS 10oz | X | | | 200 | 0.017 | 10000 | 0.1 | 0.0009 | 1.00 | 1.70 | 0.001530 | 0.3012 | 0.9861 |
| GSE FabriNet DS 6oz | | X | | 200 | 0.017 | 10000 | 0.1 | 0.0001 | 1.00 | 1.70 | 0.000170 | 0.0335 | 0.1098 |
| GSE FabriNet DS 8oz | | X | | 200 | 0.017 | 10000 | 0.1 | 0.0001 | 1.00 | 1.70 | 0.000170 | 0.0335 | 0.1098 |
| GSE FabriNet DS 10oz | | X | | 200 | 0.017 | 10000 | 0.1 | 0.00009 | 1.00 | 1.70 | 0.000153 | 0.0301 | 0.0988 |
| GSE HyperNet HF | | | X | 250 | 0.021 | 10000 | 0.1 | 0.003 | 1.00 | 1.70 | 0.005100 | 0.8031 | 2.6350 |
| GSE FabriNet HF SS 6oz | X | | | 250 | 0.021 | 10000 | 0.1 | 0.0015 | 1.00 | 1.70 | 0.002550 | 0.4016 | 1.3175 |
| GSE FabriNet HF SS 8oz | X | | | 250 | 0.021 | 10000 | 0.1 | 0.0015 | 1.00 | 1.70 | 0.002550 | 0.4016 | 1.3175 |
| GSE FabriNet HF SS 10oz | X | | | 250 | 0.021 | 10000 | 0.1 | 0.001 | 1.00 | 1.70 | 0.001700 | 0.2677 | 0.8783 |
| GSE FabriNet HF DS 6oz | | X | | 250 | 0.021 | 10000 | 0.1 | 0.0005 | 1.00 | 1.70 | 0.000850 | 0.1339 | 0.4392 |
| GSE FabriNet HF DS 8oz | | X | | 250 | 0.021 | 10000 | 0.1 | 0.0005 | 1.00 | 1.70 | 0.000850 | 0.1339 | 0.4392 |
| GSE FabriNet HF DS 10oz | | X | | 250 | 0.021 | 10000 | 0.1 | 0.0005 | 1.00 | 1.70 | 0.000850 | 0.1339 | 0.4392 |
| GSE HyperNet HS | | | X | 275 | 0.023 | 10000 | 0.1 | 0.006 | 1.00 | 1.70 | 0.010200 | 1.4603 | 4.7909 |
| GSE FabriNet HS SS 6oz | X | | | 275 | 0.023 | 10000 | 0.1 | 0.002 | 1.00 | 1.70 | 0.003400 | 0.4868 | 1.5970 |
| GSE FabriNet HS SS 8oz | X | | | 275 | 0.023 | 10000 | 0.1 | 0.002 | 1.00 | 1.70 | 0.003400 | 0.4868 | 1.5970 |
| GSE FabriNet HS SS 10oz | X | | | 275 | 0.023 | 10000 | 0.1 | 0.001 | 1.00 | 1.70 | 0.001700 | 0.2434 | 0.7985 |
| GSE FabriNet HS DS 6oz | | X | | 275 | 0.023 | 10000 | 0.1 | 0.0007 | 1.00 | 1.70 | 0.001190 | 0.1704 | 0.5589 |
| GSE FabriNet HS DS 8oz | | X | | 275 | 0.023 | 10000 | 0.1 | 0.0007 | 1.00 | 1.70 | 0.001190 | 0.1704 | 0.5589 |
| GSE FabriNet HS DS 10oz | | X | | 275 | 0.023 | 10000 | 0.1 | 0.0007 | 1.00 | 1.70 | 0.001190 | 0.1704 | 0.5589 |
| GSE HyperNet UF | | | X | 300 | 0.025 | 10000 | 0.1 | 0.008 | 1.00 | 1.70 | 0.013600 | 1.7848 | 5.8555 |
| GSE FabriNet UF SS 6oz | X | | | 300 | 0.025 | 10000 | 0.1 | 0.003 | 1.00 | 1.70 | 0.005100 | 0.6693 | 2.1958 |
| GSE FabriNet UF SS 8oz | X | | | 300 | 0.025 | 10000 | 0.1 | 0.003 | 1.00 | 1.70 | 0.005100 | 0.6693 | 2.1958 |
| GSE FabriNet UF SS 10oz | X | | | 300 | 0.025 | 10000 | 0.1 | 0.002 | 1.00 | 1.70 | 0.003400 | 0.4462 | 1.4639 |
| GSE FabriNet UF DS 6oz | | X | | 300 | 0.025 | 10000 | 0.1 | 0.0009 | 1.00 | 1.70 | 0.001530 | 0.2008 | 0.6587 |
| GSE FabriNet UF DS 8oz | | X | | 300 | 0.025 | 10000 | 0.1 | 0.0009 | 1.00 | 1.70 | 0.001530 | 0.2008 | 0.6587 |
| GSE FabriNet UF DS 10oz | | X | | 300 | 0.025 | 10000 | 0.1 | 0.0009 | 1.00 | 1.70 | 0.001530 | 0.2008 | 0.6587 |
| SKAPS Transnet 330-1-10 | X | | | 300 | 0.025 | 10000 | 0.1 | 0.003 | 1.00 | 1.70 | 0.005100 | 0.6693 | 2.1958 |
| Syrtec Tendrain II 770-1 SS | X | | | 300 | 0.025 | 10000 | 0.1 | 0.0025 | 1.00 | 1.70 | 0.004250 | 0.5577 | 1.8299 |
| Tenax Tendrain 370-2 | | X | | 250 | 0.021 | 10000 | 0.1 | 0.001 | 1.00 | 1.70 | 0.001700 | 0.2677 | 0.8783 |
| Tenax Tendrain 770-2 | | X | | 300 | 0.025 | 15000 | 0.1 | 0.002 | 1.27 | 1.70 | 0.004318 | 0.5667 | 1.8591 |
| Tenax Tendrain 7100-2 | | X | | 300 | 0.025 | 15000 | 0.1 | 0.002 | 1.27 | 1.70 | 0.004318 | 0.5667 | 1.8591 |

K = T/b

¹ Adjustment factors calculated from Table 8.9, P. 271 of "Geotechnical Aspects of Landfill Design and Construction" by Qian, Xuede et al., 2002



Engineering and Construction Services Calculation

**Calculation Number:
TV-GO-APC70355-004**

| | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------|
| Project/Plant: Plant Gorgas Dry Gypsum Storage Facility | Unit(s): 8-10 | Discipline/Area: TS-ES&FS-ES&EE |
| Title/Subject: Leachate Collection System (LCS) Design | | |
| Purpose/Objective: To design a drainage system to keep pressure head build-up less than 30 cm on top of the HDPE liner in the bottom of the cell. | | |
| System or Equipment Tag Numbers: NA | Originator: Joshua A. Lippert | |

Contents

| Topic | Page | Attachments <small>(Computer Printouts, Tech. Papers, Sketches, Correspondence)</small> | # of Pages |
|-------------------------------------------------------|------|--------------------------------------------------------------------------------------------|------------|
| Purpose of Calculation | 2 | Attachment 1 – GDN Product Data Sheet | 1 |
| Summary of Conclusions | 2 | Attachment 2 – Geocomposite Comparison | 1 |
| Methodology | 2 | | |
| Assumptions | 2 | | |
| Criteria | 3 | | |
| Design Inputs/References | 4 | | |
| Body of Calculation | 4-10 | | |
| Total # of pages including cover sheet & attachments: | 12 | | |

Revision Record

| Rev. No. | Description | Originator Initial / Date | Reviewer Initial / Date | Approver Initial / Date |
|----------|----------------------|---------------------------|-------------------------|-------------------------|
| 0 | Submitted for Permit | JAL/5-31-13 | THH/5-31-13 | JCP/5-31-13 |
| | | | | |
| | | | | |
| | | | | |

Notes:

Purpose of Calculation

Alabama Power Company (APC) is currently constructing FGD scrubbers at Plant Gorgas, the principal byproduct of which is FGD gypsum. The FGD gypsum will be dewatered prior to transport to an on-site storage facility. The storage facility is being constructed to comply with the Alabama Department of Environmental Management (ADEM) Solid Waste Program. Section 335-13-4-.18(2) of this program requires that new facilities be constructed with a leachate collection system (LCS) capable of maintaining less than 30 cm of head on the composite liner. The purpose of this calculation is to demonstrate that the LCS at the Plant Gorgas dry gypsum storage facility is adequate to keep the pressure head on the liner below 30 cm as required by ADEM regulations.

Summary of Conclusions

A summary of the maximum pressure head on the liner from each analysis is given below. In each case, the pressure head on the HDPE is less than the 30 cm maximum allowed by ADEM regulations. The maximum pressure head calculated for any stacking configuration was 0.72 ft, or approximately 22 cm.

| Stacking Height (ft) | Max. Pressure Head (ft) | Location of Max. Press. Head (x, ft) | Location Description |
|----------------------|-------------------------|--------------------------------------|----------------------|
| 20 | 0.10 | 62 | Collection Sump |
| 40 | 0.13 | 62 | Collection Sump |
| 60 | 0.30 | 849 | EL375 Bench |
| 70 | 0.61 | 849 | EL375 Bench |
| 90 | 0.67 | 849 | EL375 Bench |
| 110 | 0.71 | 849 | EL375 Bench |
| 130 | 0.72 | 849 | EL375 Bench |

Methodology

The modeling was performed using SEEP/W version 8.0.10 finite element seepage analysis program by GEO-SLOPE International Ltd. A steady-state seepage model was used for this calculation.

Assumptions

1. The HDPE liner is impermeable.
2. The FGD gypsum is assumed to be homogeneous and isotropic.
3. The grain-size of the gypsum is based on composited gypsum data from Plants Yates and Scholz.

4. The hydraulic conductivity of the gypsum material is based on laboratory tests run on Plant Scholz gypsum samples including the following: sedimented – consolidation samples, cast and sedimented triaxial samples, cast gypsum samples, and in-situ on sedimented gypsum.
5. The hydraulic conductivity of the sandy cover was assumed to be 5×10^{-5} cm/s. This is based on estimates from the grain size distribution of the sand, which show it to be a clayey sand with approximately 40% fines.
6. The annual precipitation was assumed to be 58.7 inches, or 1.55×10^{-7} ft/sec. A stormwater collection system consisting of a decant pipe with a riser structure is located on the south side of the storage cell and is designed to drain stormwater runoff that is collected in a perimeter ditch incorporated into the stacking plan. The stormwater collection system was designed to handle the runoff from the 25 year storm event at Plant Gorgas. While some infiltration of rainfall through the stack will still occur, it is expected that much of the precipitation will be diverted into the stormwater collection system. For the purpose of this calculation it was estimated that 25% of the stormwater would be collected by the stormwater collection system. This estimate of the stormwater collection system performance was chosen to represent a conservative scenario for stormwater infiltration into the stack. Actual infiltration under normal operating conditions will likely be less than is modeled here.
7. Properties of the geocomposite drainage material were based on SKAPS Transnet 330-1-10 single-sided geocomposite with 10 oz/yd² fabric as provided by the manufacturer and adjusted for gradient and normal loads based on research by Qian, et al.

Criteria

The site consists of a 20.7 acre dry gypsum storage cell and a 3.4 acre sedimentation pond. FGD gypsum will be stacked in the storage cell to a planned height of approximately 130 feet (EL 485). Benches 20 feet in width will be spaced every 20 vertical feet on the slopes. The bottom of the cell is approximately 7 acres in size and is graded at 0.5% draining downward to a collection sump trench on the south side. This trench collects the leachate into pipes which convey it into the sedimentation pond. The cell bottom is covered with SKAPS Transnet 330-1-10 geocomposite drainage net (GDN) overlain by a minimum of 12 inches of protective sandy soil cover.

The cross section used for the SEEP/W analyses was cut parallel to the maximum bottom cell gradient based the longest flow path within the cell. SEEP/W analyses were run at stacking heights of 20, 40, 60, 70, 90, 110, and 130 feet, coinciding with the height of the stack benches. The pressure head on the finite element nodes located on the HDPE liner was recorded for the bottom and sides of the cells.

A note on the geocomposite drainage net properties used: Research has shown that transmissivity in a GDN increases as the normal load decreases and as the gradient decreases. The transmissivity of the GDN was tested by the manufacturer at a normal load of 10,000 psf and a gradient of 0.1, in conformance with standard industry practice. Based on research by Qian et al. (2001), we have adjusted the transmissivity based on a gradient of 0.02. Because the gypsum cell has a gradient of 0.005 on the cell bottom, the modeled transmissivity is still likely to be highly conservative.

Design Inputs/References

Plant Gorgas Design Drawing No. D-587889 – Dry Gypsum Storage Facility, Liner Plan

Qian, Xuede, et al, 2001, Geotechnical Aspects of Landfill Design and Construction, Prentice Hall, 717 pp.

Body of Calculation

See below for seepage calculation.

Attachments

Attachment 1 – GDN Product Data Sheets

Attachment 2 – Spreadsheet showing equivalent hydraulic conductivities of various drainage geocomposite materials based on published data regarding transmissivity, thickness and loading.

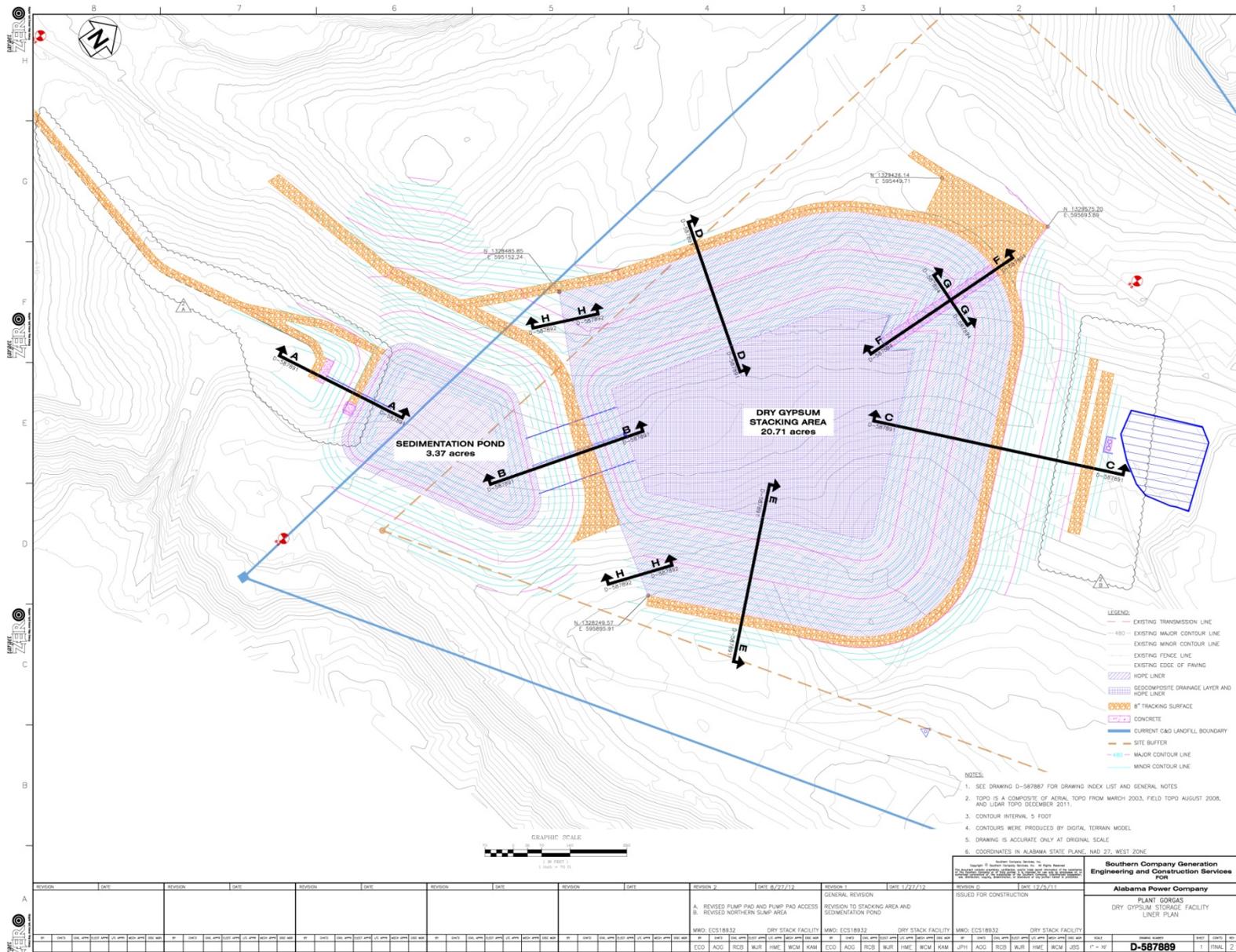


Figure 1: Gypsum Area Layout

[Rev 0]
5/31/13

Plant Gorgas Dry Gypsum Storage Area 130 Ft. Stack

Materials:

Name: FGD Gypsum
K-Function: Gypsum
Vol. WC. Function: Gypsum (grain-size)
K-Saturation: 3.3e-005 ft/sec

Name: 12" Sand Cover (5x10⁻⁵ cm/s)
K-Function: Sand
Vol. WC. Function: Sand
K-Saturation: 1.64e-006 ft/sec

Name: #57 Stone in Sump
K-Function: Gravel
Vol. WC. Function: Gravel
K-Saturation: 0.00033 ft/sec

Name: Geocomposite Drainage Layer
K-Transpose: 2.1958 ft/sec
K-Normal: 0.167 ft/sec

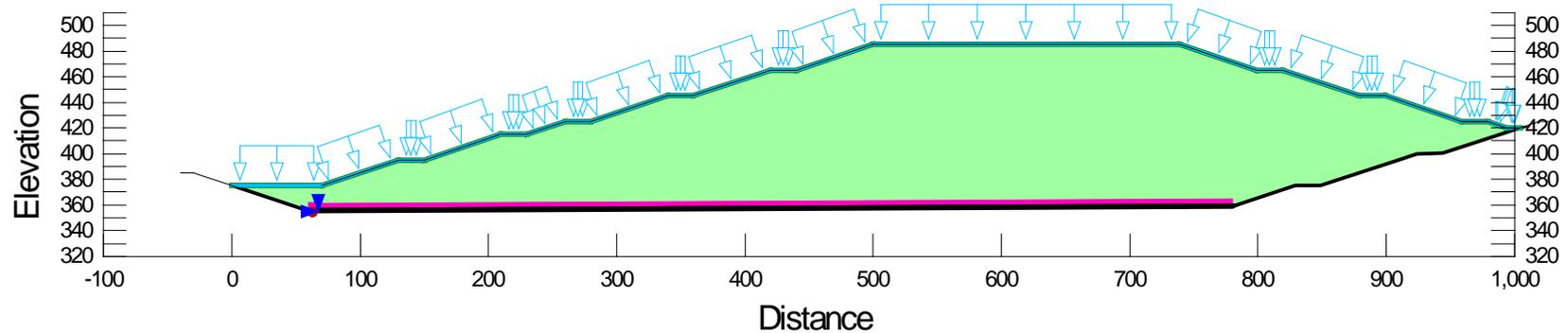


Figure 2: Example SEEP/W input diagram

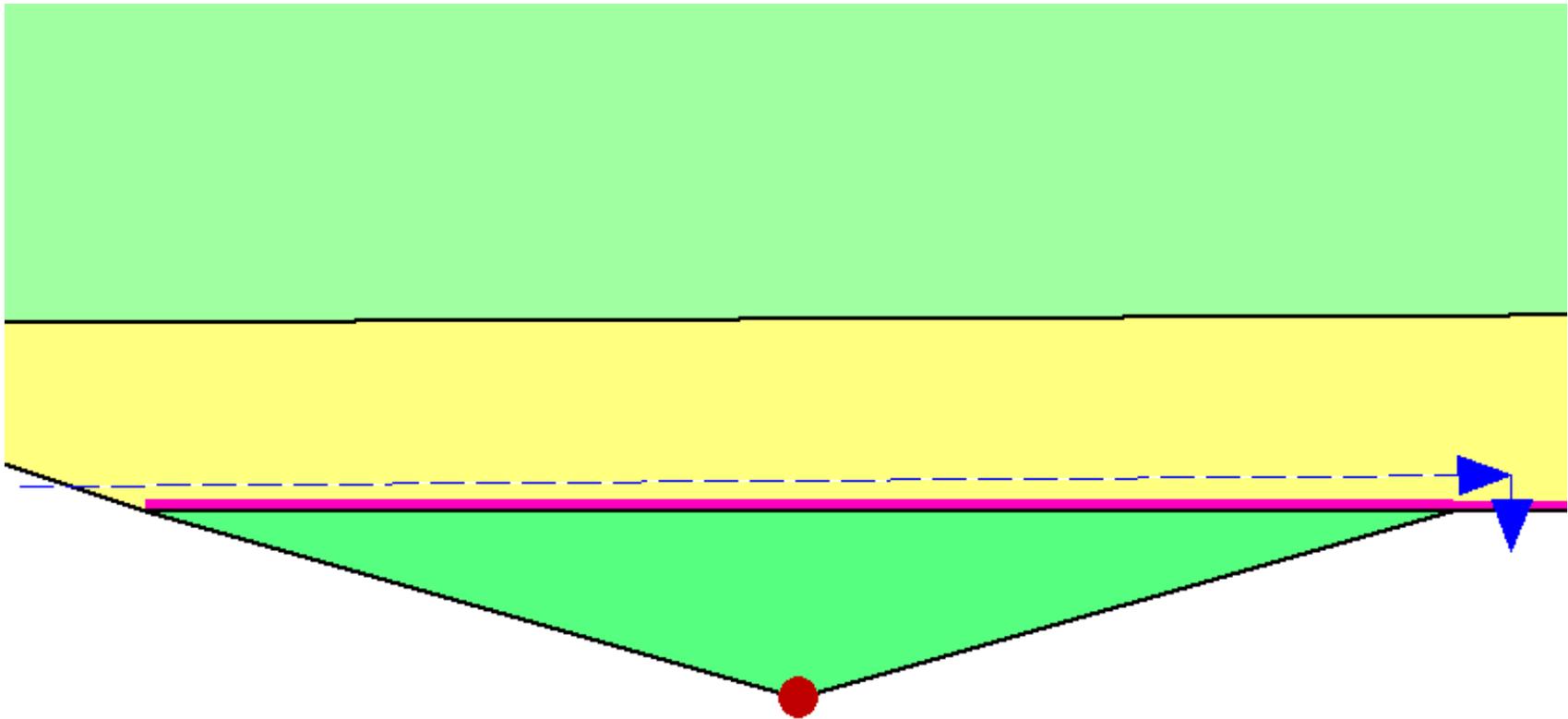


Figure 3: Detail of collection sump and drain at down-gradient toe of stack showing gypsum (light green), sand (yellow), geocomposite (pink), #57 stone (dark green), and zero pressure drain (red dot) with blue flux section arrows.

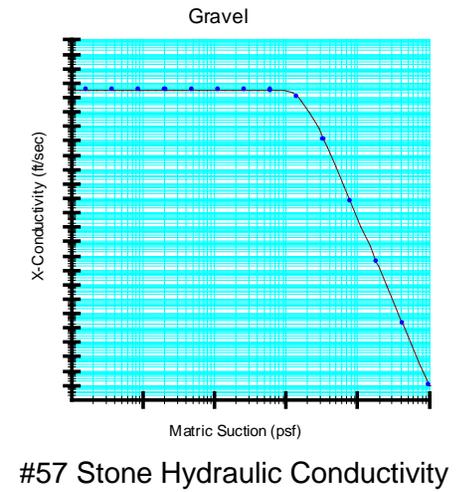
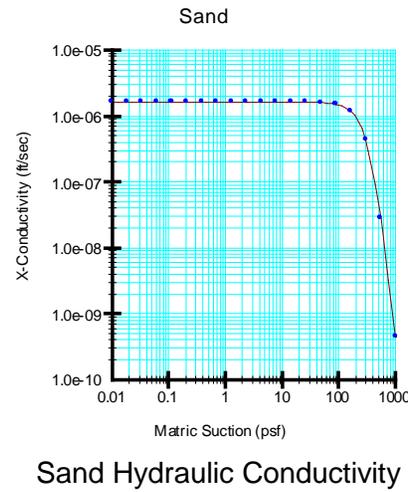
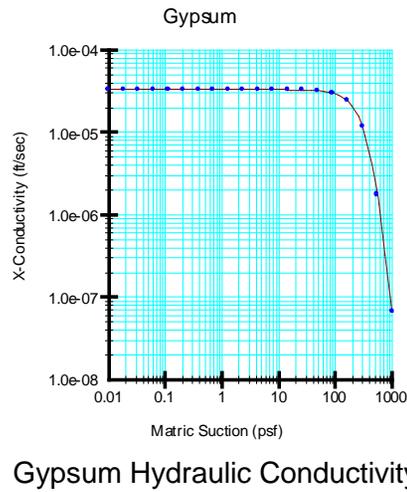
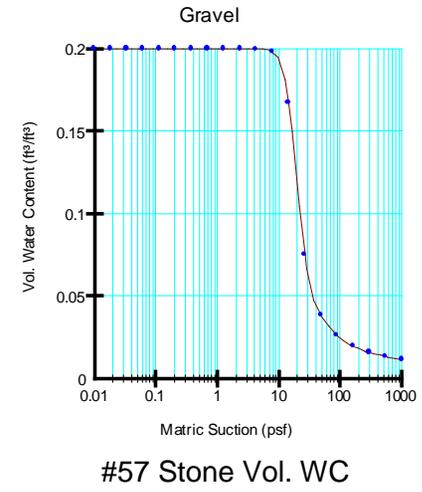
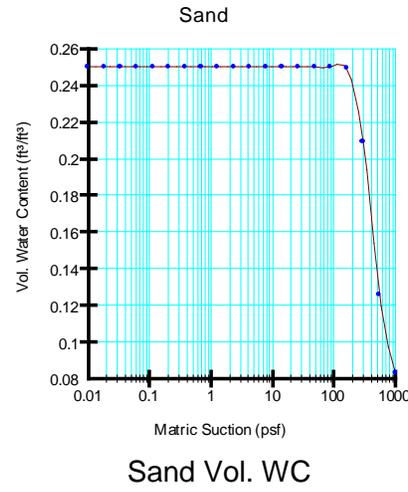
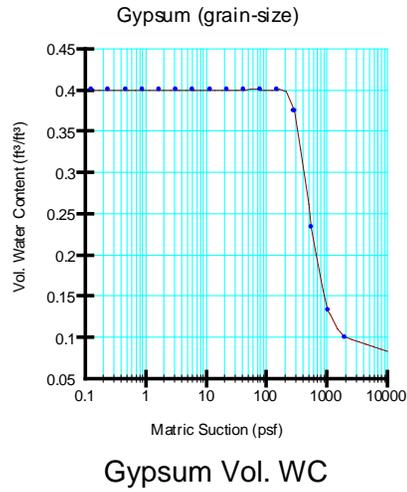


Figure 4: Volumetric water content and hydraulic conductivity functions

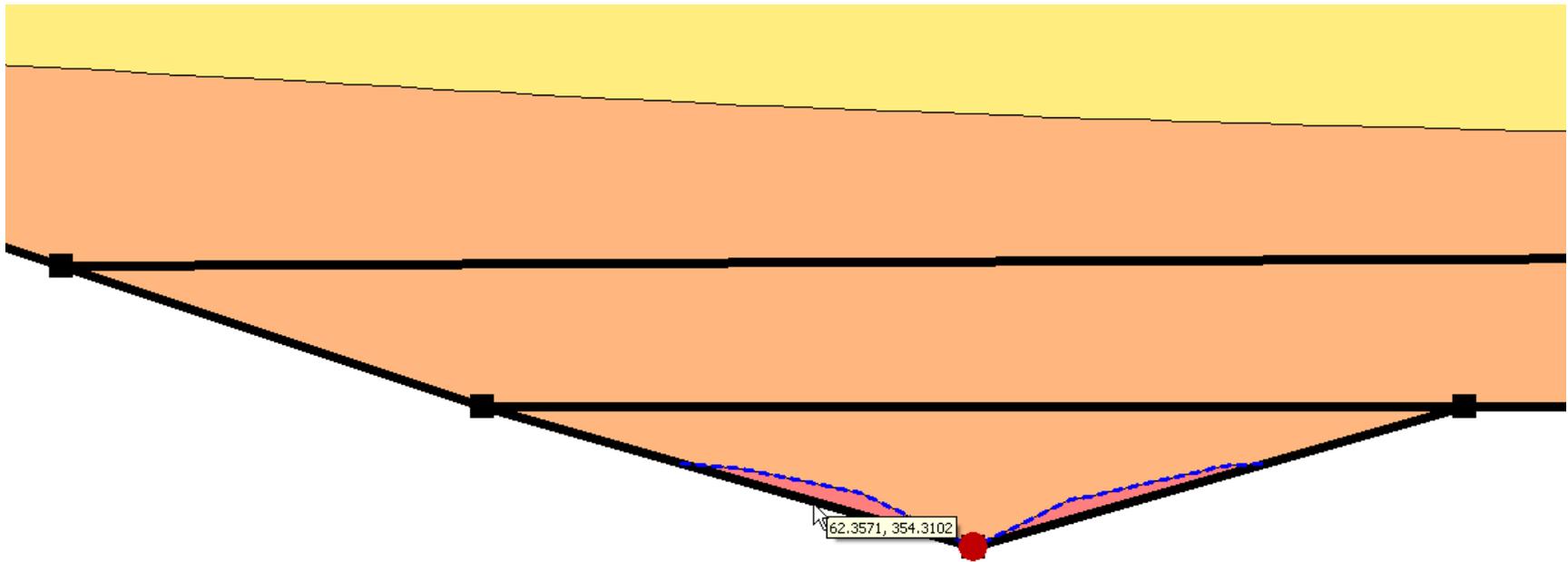


Figure 5: Location of maximum pressure head on liner for 20 ft. and 40 ft. stacking heights.

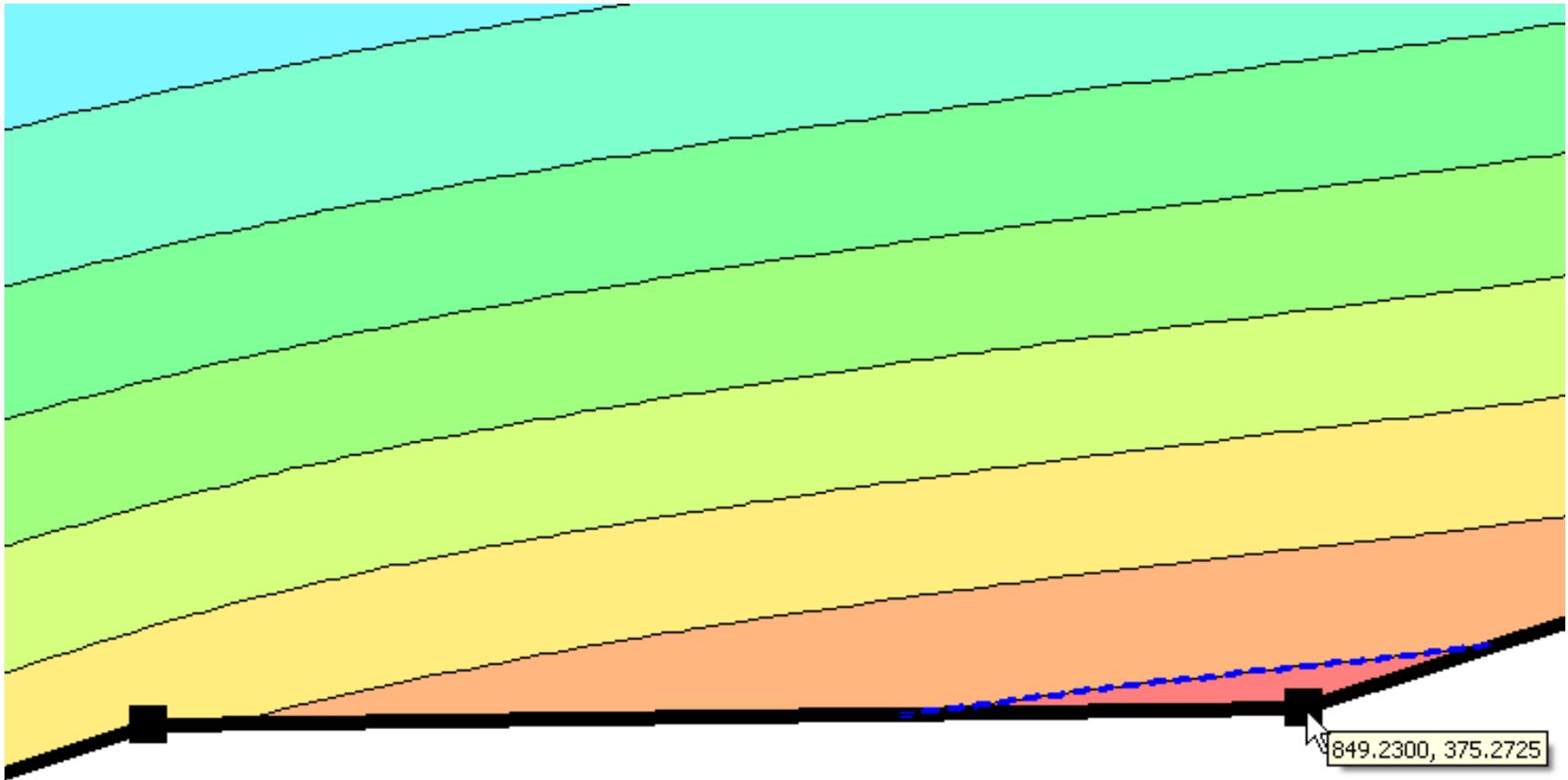


Figure 6: Location of maximum pressure head on liner at EL375 bench (x=849 ft) for 60 ft., 70 ft., 90 ft., 110 ft., and 130 ft. stacking heights



February 16, 2012
 Plastic Fusion Fabricators, Inc.
 3455 Stanwood Blvd
 Huntsville, AL 35811

Ref. : Gorgas Steam Plant, AL
Customer P.O. # P13909
Product : TN 330-1-10

We certify that the TN 330-1-10 drainage geocomposite, meets the project requirements as stated in the specifications. The properties listed in this section are:

| Property | Test Method | Unit | Required Value | Qualifier |
|---------------------------------|--------------------------|---------------------|------------------------|-------------------|
| Geonet¹ | | | | |
| Mass per Unit Area | ASTM D 5261 | lbs/ft ² | 0.300 | Minimum |
| Thickness | ASTM D 5199 | mil | 300 | Minimum |
| Carbon Black | ASTM D 4218 | % | 2.0 | Minimum |
| Tensile Strength | ASTM D 5035 | lbs/in | 75 | Minimum |
| Melt Flow | ASTM D 1238 ³ | g/10 min | 1.0 | Maximum |
| Density | ASTM D 1505 | g/cm ³ | 0.94 | Minimum |
| Transmissivity ¹ | ASTM D 4716 | m ² /sec | 8.0 x 10 ⁻³ | MARV ⁶ |
| Composite | | | | |
| Ply Adhesion | ASTM D 7005 | lb/n | 1.0 | MARV |
| Transmissivity ² | ASTM D 4716 | m ² /sec | 3.0 x 10 ⁻³ | MARV |
| Geotextile^{4,5} | | | | |
| Fabric Weight | ASTM D 5261 | oz/yd ² | 10.0 | MARV |
| Grab Strength | ASTM D 4632 | lbs | 260 | MARV |
| Grab Elongation | ASTM D 4632 | % | 50 | MARV |
| Puncture Resistance | ASTM D 4833 | lbs | 165 | MARV |
| Water Flow Rate | ASTM D 4491 | gpm/ft ² | 75 | MARV |
| Permittivity | ASTM D 4491 | sec ⁻¹ | 1.00 | MARV |
| AOS | ASTM D 4751 | US Sieve | 100 | MARV |
| UV Resistance | ASTM D 4355 | %/hrs | 70/500 | MARV |

Notes:

- 1 Transmissivity measured using water at 21 ± 2 °C (70 ± 4 °F) with a gradient of 0.1 and a confining pressure of 10,000 psf between steel plates after 15 minutes.
- 2 Transmissivity measured using water at 21 ± 2 °C (70 ± 4 °F) with a gradient of 0.1 and a confining pressure of 10,000 psf between steel plates after 15 minutes.
- 3 Condition 190/2.16
- 4 Geotextile and Geonet properties are prior to lamination.
- 5 Geotextile data is provided by the supplier.
- 6 MARV is statistically defined as mean minus two standard deviations and it is the value which is exceeded by 97.5% of all the test data.

Sincerely,
Nilay Patel
 Nilay Patel
 QA Manager



571 Industrial Parkway, Commerce, GA 30529 Ph : 706-336-7000 Fax : 706-336-7007 Email : info@skaps.com

| Drainage Geocomposite | Product Data | | | | | Published Test Data | | | Adjusted Data ¹ (Normalized to 10,000 psf load, 0.02 gradient) | | | Hydraulic Conductivity | |
|-----------------------------|--------------|--------------|-------------|---------------------|--------------------|---------------------|---------------|-----------------------------------------|------------------------------------------------------------------------------|----------------------------|---------------------------------------------|------------------------|--------|
| | Single Sided | Double Sided | Geonet Only | Net Thickness (mil) | Net Thickness (ft) | Test Load (psf) | Test Gradient | Test Transmissivity (m ² /s) | Load Adjustment Factor | Gradient Adjustment Factor | Adjusted Transmissivity (m ² /s) | (m/s) | (ft/s) |
| Cetco TexDrain 200 Geonet | | | X | 200 | 0.017 | 15000 | 1 | 0.001 | 1.27 | 3.61 | 0.004585 | 0.9025 | 2.9609 |
| Cetco TexDrain 200 SS 6 | X | | | 200 | 0.017 | 15000 | 1 | 0.0002 | 1.27 | 3.61 | 0.000917 | 0.1805 | 0.5922 |
| Cetco TexDrain 200 DS 6 | | X | | 200 | 0.017 | 15000 | 1 | 0.0001 | 1.27 | 3.61 | 0.000458 | 0.0903 | 0.2961 |
| Cetco TexDrain 200 SS 8 | X | | | 200 | 0.017 | 15000 | 1 | 0.0001 | 1.27 | 3.61 | 0.000458 | 0.0903 | 0.2961 |
| Cetco TexDrain 200 DS 8 | | X | | 200 | 0.017 | 15000 | 1 | 0.00004 | 1.27 | 3.61 | 0.000183 | 0.0361 | 0.1184 |
| Cetco TexDrain 250 Geonet | | | X | 250 | 0.021 | 15000 | 1 | 0.0015 | 1.27 | 3.61 | 0.008777 | 1.0830 | 3.5531 |
| Cetco TexDrain 250 SS 6 | X | | | 250 | 0.021 | 15000 | 1 | 0.00045 | 1.27 | 3.61 | 0.002063 | 0.3249 | 1.0659 |
| Cetco TexDrain 250 DS 6 | | X | | 250 | 0.021 | 15000 | 1 | 0.0003 | 1.27 | 3.61 | 0.001375 | 0.2166 | 0.7106 |
| Cetco TexDrain 250 SS 8 | X | | | 250 | 0.021 | 15000 | 1 | 0.00025 | 1.27 | 3.61 | 0.001146 | 0.1805 | 0.5922 |
| Cetco TexDrain 250 DS 8 | | X | | 250 | 0.021 | 15000 | 1 | 0.000175 | 1.27 | 3.61 | 0.000802 | 0.1284 | 0.4145 |
| Poly-Flex GN-200 | | | X | 200 | 0.017 | 10000 | 1 | 0.001 | 1.00 | 3.61 | 0.003610 | 0.7106 | 2.3315 |
| Poly-Flex GC-06S-2.0 | X | | | 200 | 0.017 | 10000 | 1 | 0.00025 | 1.00 | 3.61 | 0.000903 | 0.1777 | 0.5829 |
| Poly-Flex GC-06D-2.0 | | X | | 200 | 0.017 | 10000 | 1 | 0.00008 | 1.00 | 3.61 | 0.000289 | 0.0569 | 0.1865 |
| Poly-Flex GC-08S-2.0 | X | | | 200 | 0.017 | 10000 | 1 | 0.0002 | 1.00 | 3.61 | 0.000722 | 0.1421 | 0.4663 |
| Poly-Flex GC-08D-2.0 | | X | | 200 | 0.017 | 10000 | 1 | 0.00004 | 1.00 | 3.61 | 0.000144 | 0.0284 | 0.0933 |
| Poly-Flex GN-250 | | | X | 250 | 0.021 | 10000 | 1 | 0.0015 | 1.00 | 3.61 | 0.005415 | 0.8528 | 2.7977 |
| Poly-Flex GC-06S-2.5 | X | | | 250 | 0.021 | 10000 | 1 | 0.0005 | 1.00 | 3.61 | 0.001805 | 0.2843 | 0.9326 |
| Poly-Flex GC-06D-2.5 | | X | | 250 | 0.021 | 10000 | 1 | 0.0002 | 1.00 | 3.61 | 0.000722 | 0.1137 | 0.3730 |
| Poly-Flex GC-08S-2.5 | X | | | 250 | 0.021 | 10000 | 1 | 0.00029 | 1.00 | 3.61 | 0.001047 | 0.1649 | 0.5409 |
| Poly-Flex GC-08D-2.5 | | X | | 250 | 0.021 | 10000 | 1 | 0.0001 | 1.00 | 3.61 | 0.000361 | 0.0569 | 0.1865 |
| GSE HyperNet | | | X | 200 | 0.017 | 10000 | 0.1 | 0.002 | 1.00 | 1.70 | 0.003400 | 0.6693 | 2.1958 |
| GSE FabriNet SS 6oz | X | | | 200 | 0.017 | 10000 | 0.1 | 0.001 | 1.00 | 1.70 | 0.001700 | 0.3346 | 1.0979 |
| GSE FabriNet SS 8oz | X | | | 200 | 0.017 | 10000 | 0.1 | 0.001 | 1.00 | 1.70 | 0.001700 | 0.3346 | 1.0979 |
| GSE FabriNet SS 10oz | X | | | 200 | 0.017 | 10000 | 0.1 | 0.0009 | 1.00 | 1.70 | 0.001530 | 0.3012 | 0.9861 |
| GSE FabriNet DS 6oz | | X | | 200 | 0.017 | 10000 | 0.1 | 0.0001 | 1.00 | 1.70 | 0.000170 | 0.0335 | 0.1098 |
| GSE FabriNet DS 8oz | | X | | 200 | 0.017 | 10000 | 0.1 | 0.0001 | 1.00 | 1.70 | 0.000170 | 0.0335 | 0.1098 |
| GSE FabriNet DS 10oz | | X | | 200 | 0.017 | 10000 | 0.1 | 0.00009 | 1.00 | 1.70 | 0.000153 | 0.0301 | 0.0988 |
| GSE HyperNet HF | | | X | 250 | 0.021 | 10000 | 0.1 | 0.003 | 1.00 | 1.70 | 0.005100 | 0.8031 | 2.6350 |
| GSE FabriNet HF SS 6oz | X | | | 250 | 0.021 | 10000 | 0.1 | 0.0015 | 1.00 | 1.70 | 0.002550 | 0.4016 | 1.3175 |
| GSE FabriNet HF SS 8oz | X | | | 250 | 0.021 | 10000 | 0.1 | 0.0015 | 1.00 | 1.70 | 0.002550 | 0.4016 | 1.3175 |
| GSE FabriNet HF SS 10oz | X | | | 250 | 0.021 | 10000 | 0.1 | 0.001 | 1.00 | 1.70 | 0.001700 | 0.2677 | 0.8783 |
| GSE FabriNet HF DS 6oz | | X | | 250 | 0.021 | 10000 | 0.1 | 0.0005 | 1.00 | 1.70 | 0.000850 | 0.1339 | 0.4392 |
| GSE FabriNet HF DS 8oz | | X | | 250 | 0.021 | 10000 | 0.1 | 0.0005 | 1.00 | 1.70 | 0.000850 | 0.1339 | 0.4392 |
| GSE FabriNet HF DS 10oz | | X | | 250 | 0.021 | 10000 | 0.1 | 0.0005 | 1.00 | 1.70 | 0.000850 | 0.1339 | 0.4392 |
| GSE HyperNet HS | | | X | 275 | 0.023 | 10000 | 0.1 | 0.006 | 1.00 | 1.70 | 0.010200 | 1.4603 | 4.7909 |
| GSE FabriNet HS SS 6oz | X | | | 275 | 0.023 | 10000 | 0.1 | 0.002 | 1.00 | 1.70 | 0.003400 | 0.4868 | 1.5970 |
| GSE FabriNet HS SS 8oz | X | | | 275 | 0.023 | 10000 | 0.1 | 0.002 | 1.00 | 1.70 | 0.003400 | 0.4868 | 1.5970 |
| GSE FabriNet HS SS 10oz | X | | | 275 | 0.023 | 10000 | 0.1 | 0.001 | 1.00 | 1.70 | 0.001700 | 0.2434 | 0.7985 |
| GSE FabriNet HS DS 6oz | | X | | 275 | 0.023 | 10000 | 0.1 | 0.0007 | 1.00 | 1.70 | 0.001190 | 0.1704 | 0.5589 |
| GSE FabriNet HS DS 8oz | | X | | 275 | 0.023 | 10000 | 0.1 | 0.0007 | 1.00 | 1.70 | 0.001190 | 0.1704 | 0.5589 |
| GSE FabriNet HS DS 10oz | | X | | 275 | 0.023 | 10000 | 0.1 | 0.0007 | 1.00 | 1.70 | 0.001190 | 0.1704 | 0.5589 |
| GSE HyperNet UF | | | X | 300 | 0.025 | 10000 | 0.1 | 0.008 | 1.00 | 1.70 | 0.013600 | 1.7848 | 5.8555 |
| GSE FabriNet UF SS 6oz | X | | | 300 | 0.025 | 10000 | 0.1 | 0.003 | 1.00 | 1.70 | 0.005100 | 0.6693 | 2.1958 |
| GSE FabriNet UF SS 8oz | X | | | 300 | 0.025 | 10000 | 0.1 | 0.003 | 1.00 | 1.70 | 0.005100 | 0.6693 | 2.1958 |
| GSE FabriNet UF SS 10oz | X | | | 300 | 0.025 | 10000 | 0.1 | 0.002 | 1.00 | 1.70 | 0.003400 | 0.4462 | 1.4639 |
| GSE FabriNet UF DS 6oz | | X | | 300 | 0.025 | 10000 | 0.1 | 0.0009 | 1.00 | 1.70 | 0.001530 | 0.2008 | 0.6587 |
| GSE FabriNet UF DS 8oz | | X | | 300 | 0.025 | 10000 | 0.1 | 0.0009 | 1.00 | 1.70 | 0.001530 | 0.2008 | 0.6587 |
| GSE FabriNet UF DS 10oz | | X | | 300 | 0.025 | 10000 | 0.1 | 0.0009 | 1.00 | 1.70 | 0.001530 | 0.2008 | 0.6587 |
| SKAPS Transnet 330-1-10 | X | | | 300 | 0.025 | 10000 | 0.1 | 0.003 | 1.00 | 1.70 | 0.005100 | 0.6693 | 2.1958 |
| Syrtec Tendrain II 770-1 SS | X | | | 300 | 0.025 | 10000 | 0.1 | 0.0025 | 1.00 | 1.70 | 0.004250 | 0.5577 | 1.8299 |
| Tenax Tendrain 370-2 | | X | | 250 | 0.021 | 10000 | 0.1 | 0.001 | 1.00 | 1.70 | 0.001700 | 0.2677 | 0.8783 |
| Tenax Tendrain 770-2 | | X | | 300 | 0.025 | 15000 | 0.1 | 0.002 | 1.27 | 1.70 | 0.004318 | 0.5667 | 1.8591 |
| Tenax Tendrain 7100-2 | | X | | 300 | 0.025 | 15000 | 0.1 | 0.002 | 1.27 | 1.70 | 0.004318 | 0.5667 | 1.8591 |

K = T/b

¹ Adjustment factors calculated from Table 8.9, P. 271 of "Geotechnical Aspects of Landfill Design and Construction" by Qian, Xuede et al., 2002



Engineering and Construction Services Calculation

| |
|---------------------------------------------------------|
| Calculation Number: TV-GO-APC70355-001 |
|---------------------------------------------------------|

| | | |
|---------------------------------------------------------------------------------|------------------------------------|----------------------------------|
| Project/Plant: Plant Gorgas Byproduct Storage Cells | Unit(s): Unit 8-10 | Discipline/Area: ES&EE |
| Title/Subject: Slope Stability Analyses of Byproduct Storage Cells | | |
| Purpose/Objective: Analyze slope stability of Byproduct Storage Cells | | |
| System or Equipment Tag Numbers: NA | Originator: Jacob Jordan | |

Contents

| Topic | Page | Attachments (Computer Printouts, Tech. Papers, Sketches, Correspondence) | # of Pages |
|-------------------------------------------------------|-------------|------------------------------------------------------------------------------------|-------------------|
| Purpose of Calculation | 1 | Attachment A – Figure 1 | 1 |
| Methodology | 1 | | |
| Criteria & Assumptions | 1 | | |
| Summary of Conclusions | 2 | | |
| Design Inputs/References | 2 | | |
| Body of Calculation (print outs) | 2-7 | | |
| Total # of pages including cover sheet & attachments: | | 9 | |

Revision Record

| Rev. No. | Description | Originator Initial / Date | Reviewer Initial / Date | Approver Initial / Date |
|-----------------|------------------------|----------------------------------|--------------------------------|--------------------------------|
| 0 | Issued for Information | JAJ/5-7-13 | JCP/5-24-13 | JCP/5-24-13 |
| | | | | |
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| | | | | |

Notes:

This correspondence/communication was prepared at the direction of legal counsel, and is privileged, protected and confidential under attorney work product doctrine.

Purpose of Calculation

The purpose of this calculation is to determine the stability of the proposed Byproduct Storage Cells slopes.

The cells will store byproduct collected from the baghouse once in operation. The material will be moisture conditioned and placed in the cell which will be designed and operated as a solid waste landfill.

Methodology

The calculation was performed using the following methods and software:

GeoStudio 2012 (Version 8.0.10.6504), Copyright 1991-2012, GEO-SLOPE International, Ltd. Bishop, Ordinary, Janbu, and Morgenstern-Price analytical methods were run. Morgenstern-Price was reported.

Criteria and Assumptions

The slope stability models were run using the following assumptions and design criteria:

- According to a recent site-specific seismic analysis conducted for Plant Gorgas, the peak ground acceleration is 0.08g.
- The soil properties of unit weight, phi angle, and cohesion were obtained from historical laboratory test results (mine spoil, structural fill) and estimated parameters (byproduct material) .Soil stratigraphy and piezometric data was estimated from soil borings done in recent years.

The following soil properties were used in the analyses:

| Soil Description | Moist Unit Weight, pcf | c', psf* | Φ', degrees* |
|-------------------------|-------------------------------|-----------------|-------------------------------------|
| Baghouse Byproduct | 80 | 0 | 28 |
| Structural Fill | 115 | 500 | 28 |
| Mine Spoil | 125 | 150 | 32 |

Summary of Conclusions

The following table lists the factors of safety for each cell in both steady state and seismic conditions.

| Failure Condition | Computed Factor of Safety |
|--------------------------|----------------------------------|
| Cell 1 | |
| Steady State | 1.8 |
| Seismic | 1.4 |
| Cell 2 | |
| Steady State | 1.8 |
| Seismic | 1.4 |

Design Inputs/References

USGS Earthquake Hazards website, <http://www.usgs.gov/hazards/earthquakes/>.
Gorgas Steam Plant Historical Files, Southern Company and/or Alabama Power.

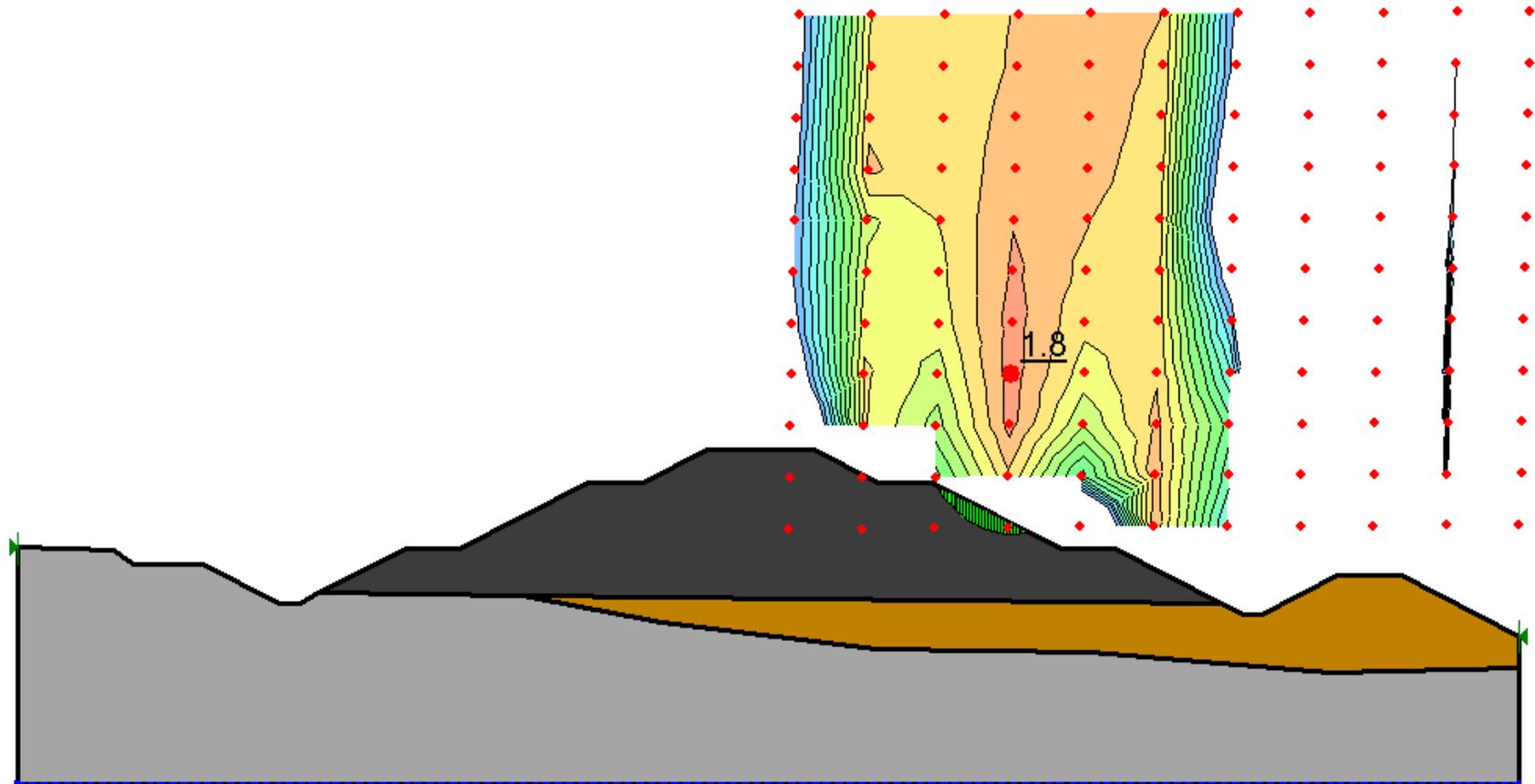
Body of Calculation

Calculation consists of Slope-W modeling attached.

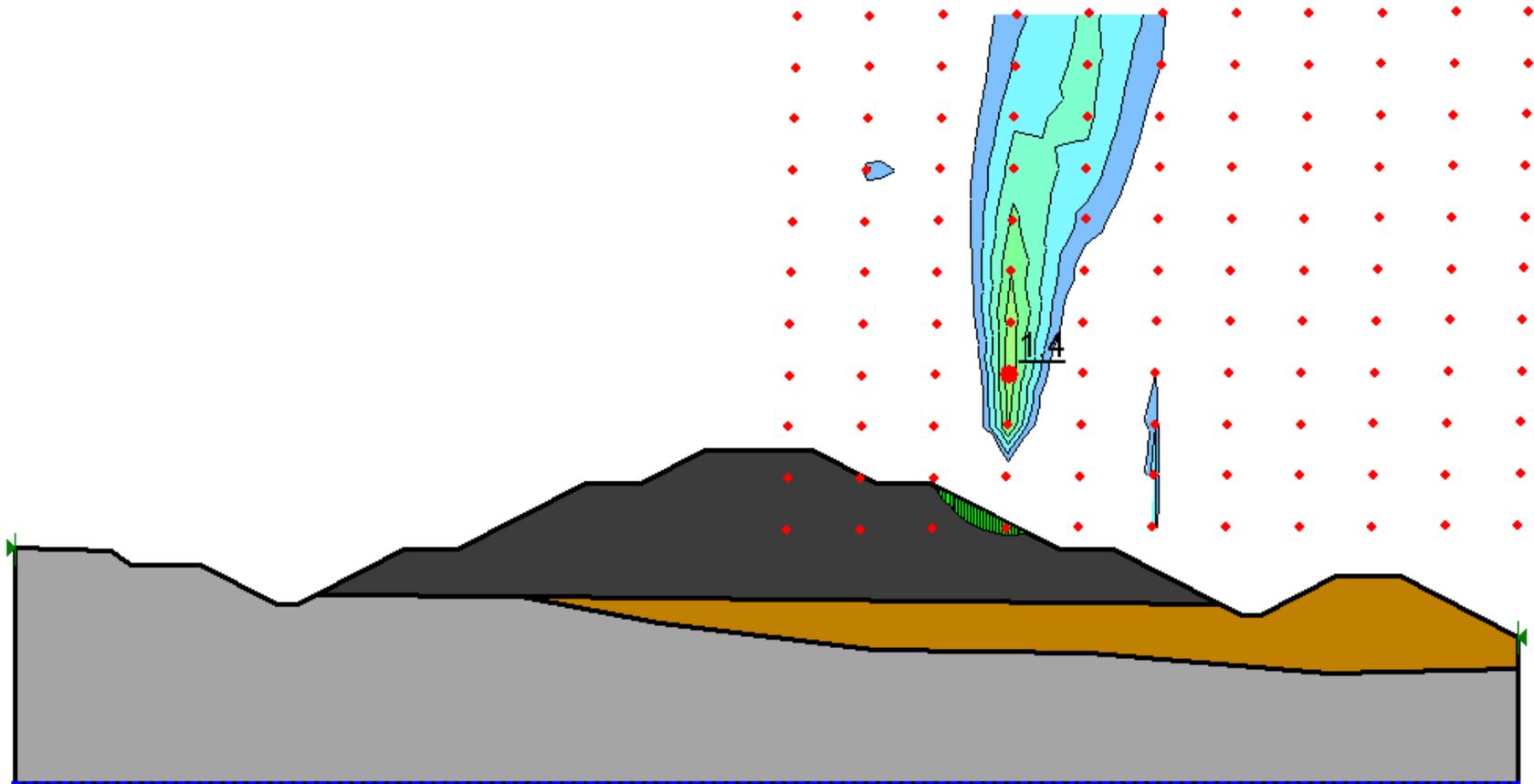
Attachments

Slope/W Analyses

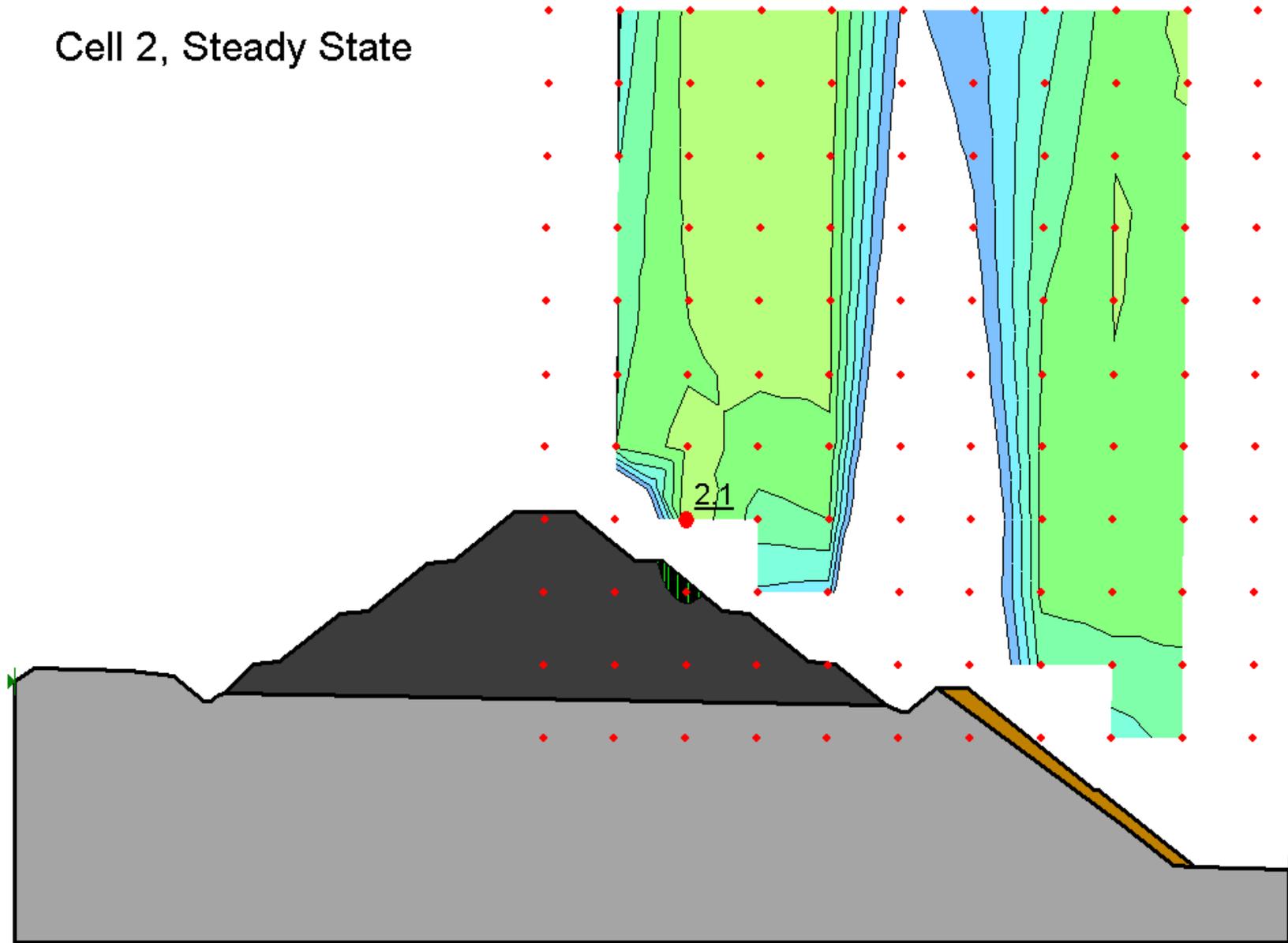
Cell #1, Steady State



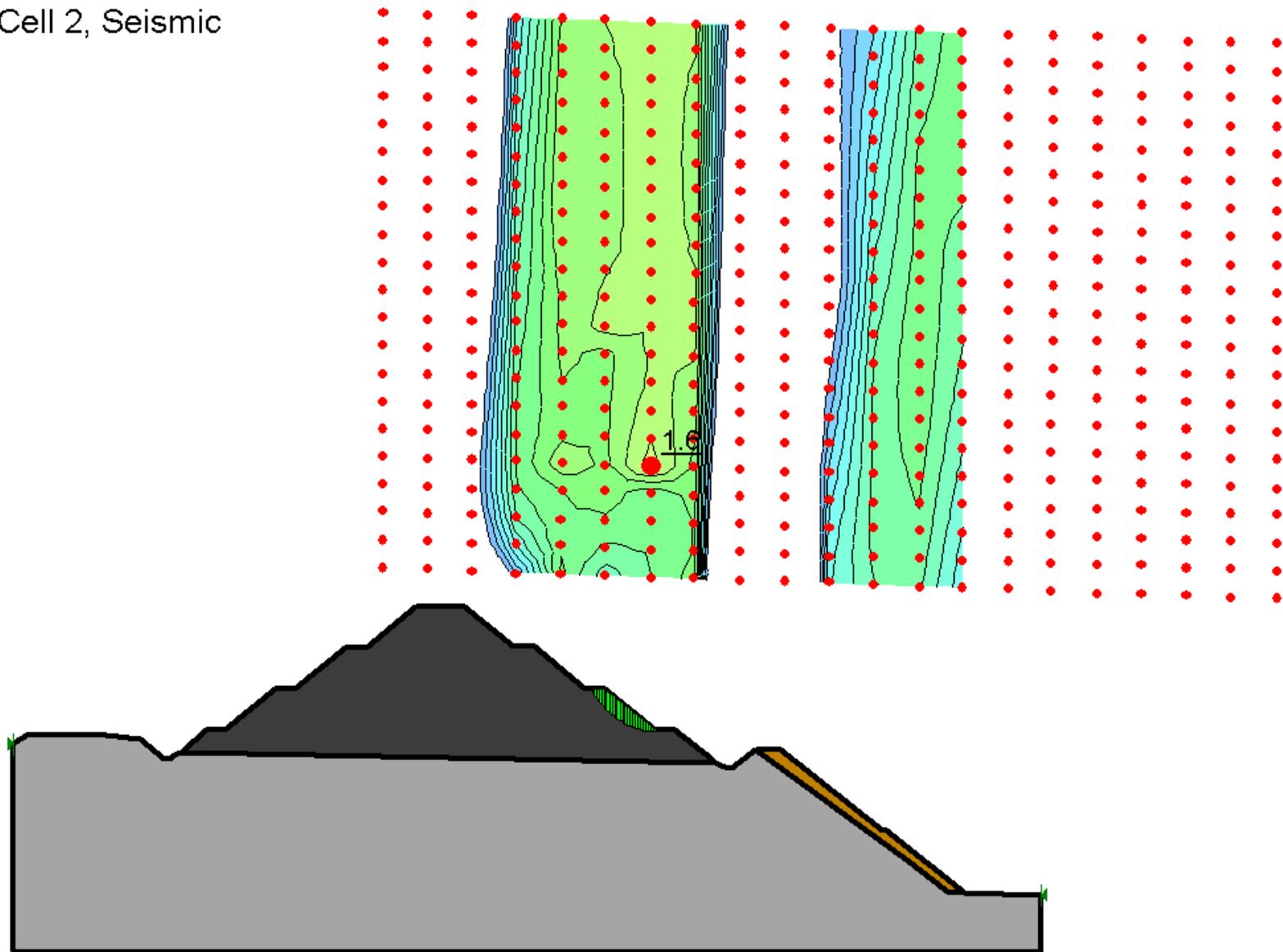
Cell #1, Seismic

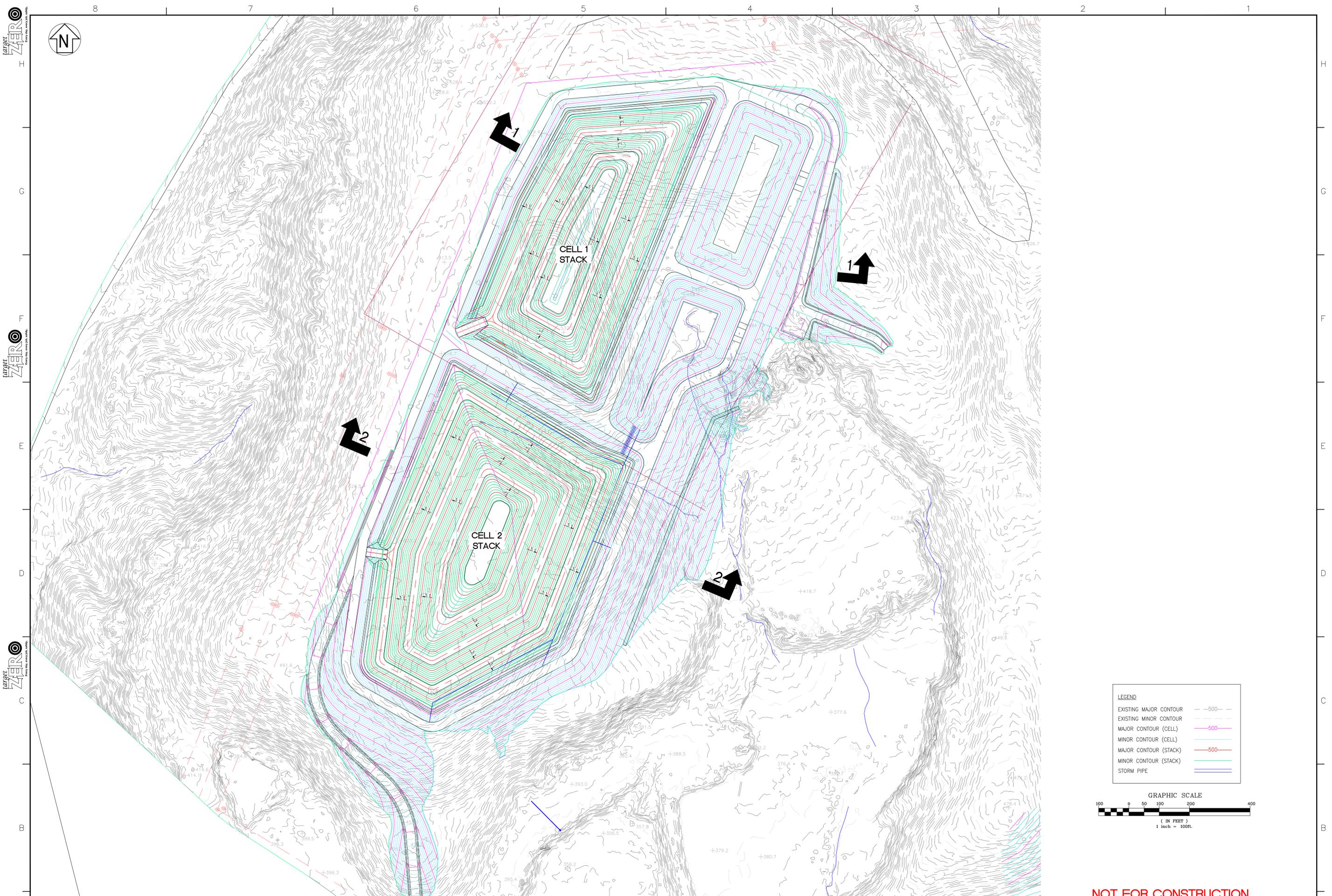


Cell 2, Steady State



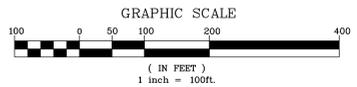
Cell 2, Seismic





LEGEND

| | |
|------------------------|---------|
| EXISTING MAJOR CONTOUR | — 500 — |
| EXISTING MINOR CONTOUR | — — |
| MAJOR CONTOUR (CELL) | — 500 — |
| MINOR CONTOUR (CELL) | — — |
| MAJOR CONTOUR (STACK) | — 500 — |
| MINOR CONTOUR (STACK) | — — |
| STORM PIPE | — — |



NOT FOR CONSTRUCTION

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|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|----------------------------------|
| <small>Copyright © Southern Company Services, Inc. All Rights Reserved. This document contains proprietary, confidential, and/or trade secret information of the subsidiaries of the Southern Company or its wholly owned subsidiaries. It is intended for use only by employees of, or contractors of, the subsidiaries of the Southern Company. Uncontrolled, unauthorized, or use, distribution, copying, dissemination, or disclosure of any portion hereof is prohibited.</small> | | Southern Company Generation Engineering and Construction Services FOR | |
| Alabama Power Company | | PLANT GORGAS - UNITS 8 THRU 10 BAGHOUSE BYPRODUCT STORAGE FACILITY OVERALL LAYOUT SECTION LINES | |
| REVISION A FOR INFORMATION ONLY | DATE 5/24/2013 | TV-CO-APC70355-001 | SCALE 1" = 100' |
| BY ECO CHK'D RCB | CIVL APPR [X] ELECT APPR [X] V/C APPR [X] MECH APPR [X] DISC MGR [X] | DRAWING NUMBER FIGURE 1 | SHEET 1 CONT'D FINAL REV A |

| REVISION | DATE |
|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|----------|------|
| | | | | | | | | | | | | | |



Engineering and Construction Services Calculation

**Calculation Number:
TV-GO-APC70355-003**

| | | |
|-------------------------------------------------------------------------------------|------------------------------------|----------------------------------|
| Project/Plant: Plant Gorgas Dry Gypsum Storage Facility | Unit(s): Unit 8-10 | Discipline/Area: ES&EE |
| Title/Subject: Slope Stability Analyses of Dry Gypsum Storage Facility | | |
| Purpose/Objective: Analyze slope stability of Dry Gypsum Storage Facility | | |
| System or Equipment Tag Numbers: NA | Originator: Jacob Jordan | |

Contents

| Topic | Page | Attachments <small>(Computer Printouts, Tech. Papers, Sketches, Correspondence)</small> | # of Pages |
|-------------------------------------------------------|------|--------------------------------------------------------------------------------------------|------------|
| Purpose of Calculation | 1 | Figure 1 – Gypsum Area Layout | 1 |
| Methodology | 1 | Body of Calculation (print outs) | 4 |
| Criteria & Assumptions | 1 | | |
| Summary of Conclusions | 2 | | |
| Design Inputs/References | 2 | | |
| Attachments | 3-8 | | |
| Total # of pages including cover sheet & attachments: | | 9 | |

Revision Record

| Rev. No. | Description | Originator Initial / Date | Reviewer Initial / Date | Approver Initial / Date |
|----------|------------------------|---------------------------|-------------------------|-------------------------|
| 0 | Issued for Information | JAJ/6-4-13 | JCP | JCP |
| | | | | |
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Notes:

This correspondence/communication was prepared at the direction of legal counsel, and is privileged, protected and confidential under attorney work product doctrine.

Purpose of Calculation

FGD gypsum, a byproduct of FGD scrubbers, will be dewatered prior to transport to an on-site storage facility. The storage facility is being constructed to comply with the Alabama Department of Environmental Management (ADEM) Solid Waste Program. The gypsum will be moisture conditioned and stacked at the facility. The purpose of this calculation is to determine the slope stability of the storage facility embankments and the gypsum stack.

Methodology

The calculation was performed using the following methods and software:

GeoStudio 2012 (Version 8.0.10.6504), Copyright 1991-2012, GEO-SLOPE International, Ltd. Bishop, Ordinary, Janbu, and Morgenstern-Price analytical methods were run. Morgenstern-Price was reported. Section C-C', as shown in Figure 1, was the section utilized for the analyses.

Criteria and Assumptions

The slope stability models were run using the following assumptions and design criteria:

- According to a recent site-specific seismic analysis conducted for Plant Gorgas, the peak ground acceleration is 0.08g.
- The soil properties of unit weight, phi angle, and cohesion were obtained from historical laboratory test results (mine spoil, structural fill) and estimated parameters (gypsum material).

The following soil properties were used in the analyses:

| Soil Description | Moist Unit Weight, pcf | c', psf* | Φ', degrees* |
|-------------------------|-------------------------------|-----------------|-------------------------------------|
| FGD Gypsum | 100 | 0 | 35 |
| Structural Fill | 115 | 500 | 28 |
| Mine Spoil | 125 | 150 | 32 |

Summary of Conclusions

The following table lists the factors of safety for downgradient and upgradient slopes in both steady state and seismic conditions.

| Failure Condition | Computed Factor of Safety |
|---------------------------|----------------------------------|
| Downgradient Steady State | 3.2 |
| Downgradient Seismic | 2.1 |
| Upgradient Steady State | 3.1 |
| Upgradient Seismic | 2.4 |

Design Inputs/References

USGS Earthquake Hazards website, <http://www.usgs.gov/hazards/earthquakes/>.
Gorgas Steam Plant Historical Files, Southern Company and/or Alabama Power.

Body of Calculation

Calculation consists of Slope-W modeling attached.

Attachments

Gypsum Area Layout

Slope/W Analyses

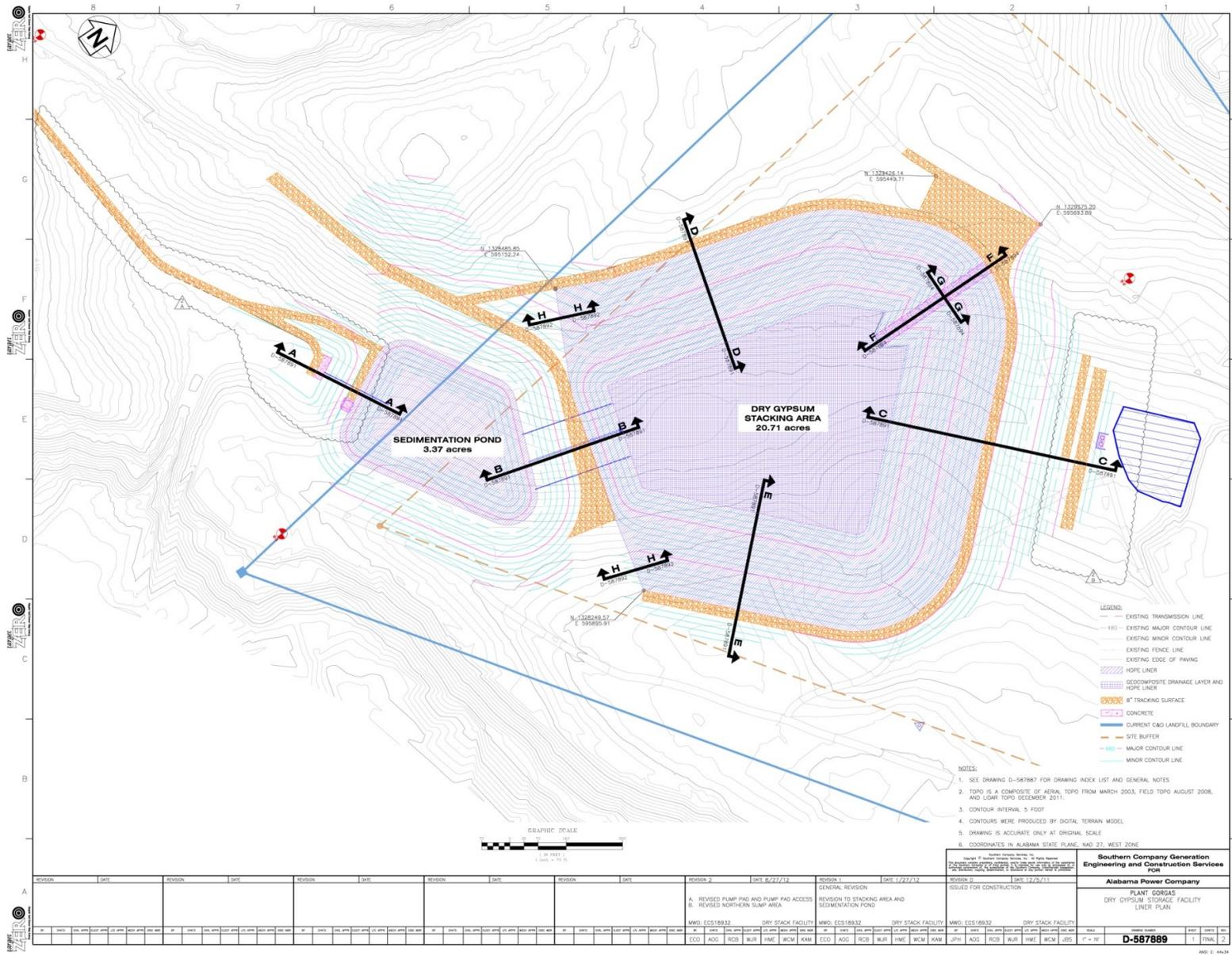
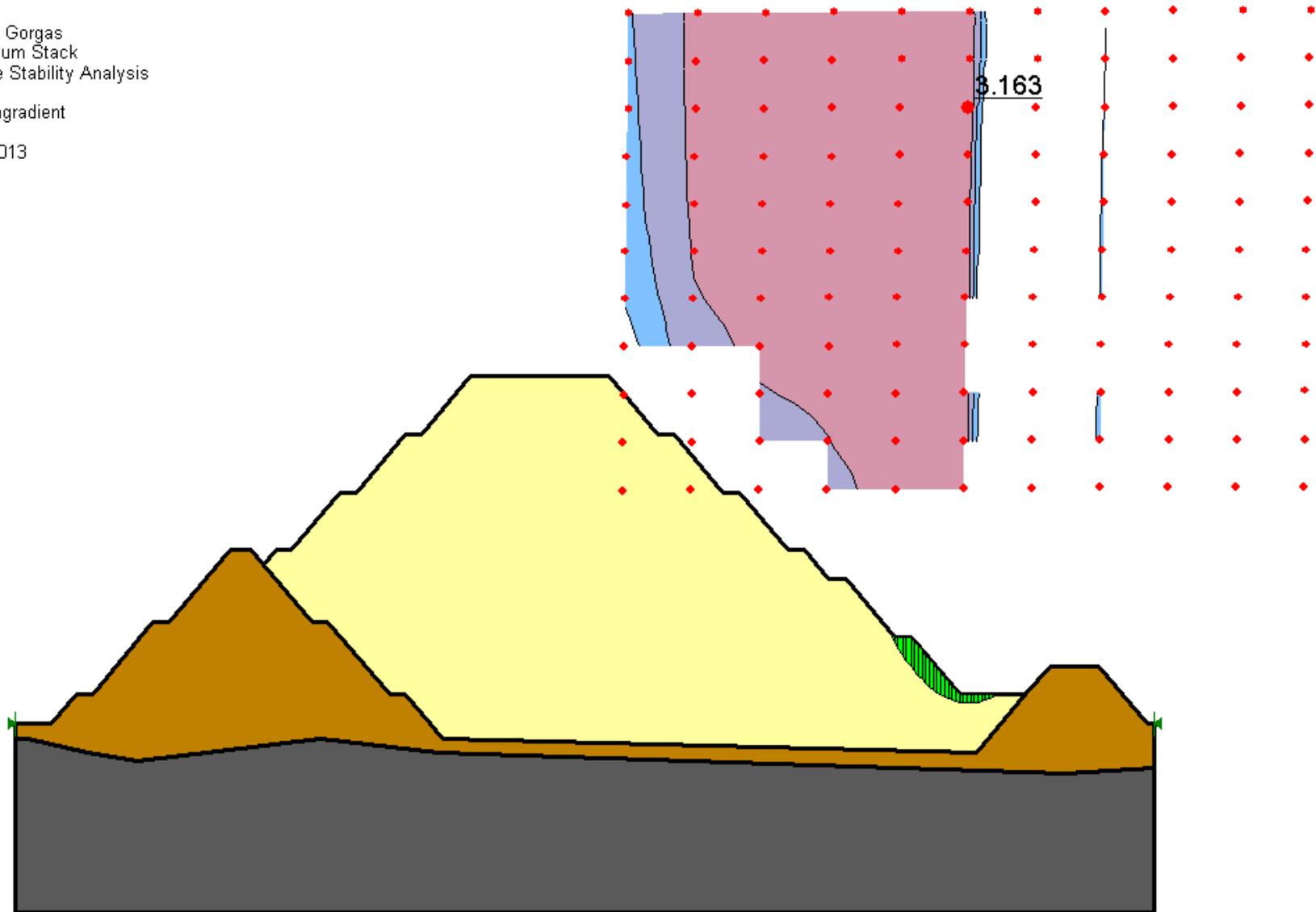


Figure 1: Gypsum Area Layout

Plant Gorgas
Gypsum Stack
Slope Stability Analysis

Downgradient

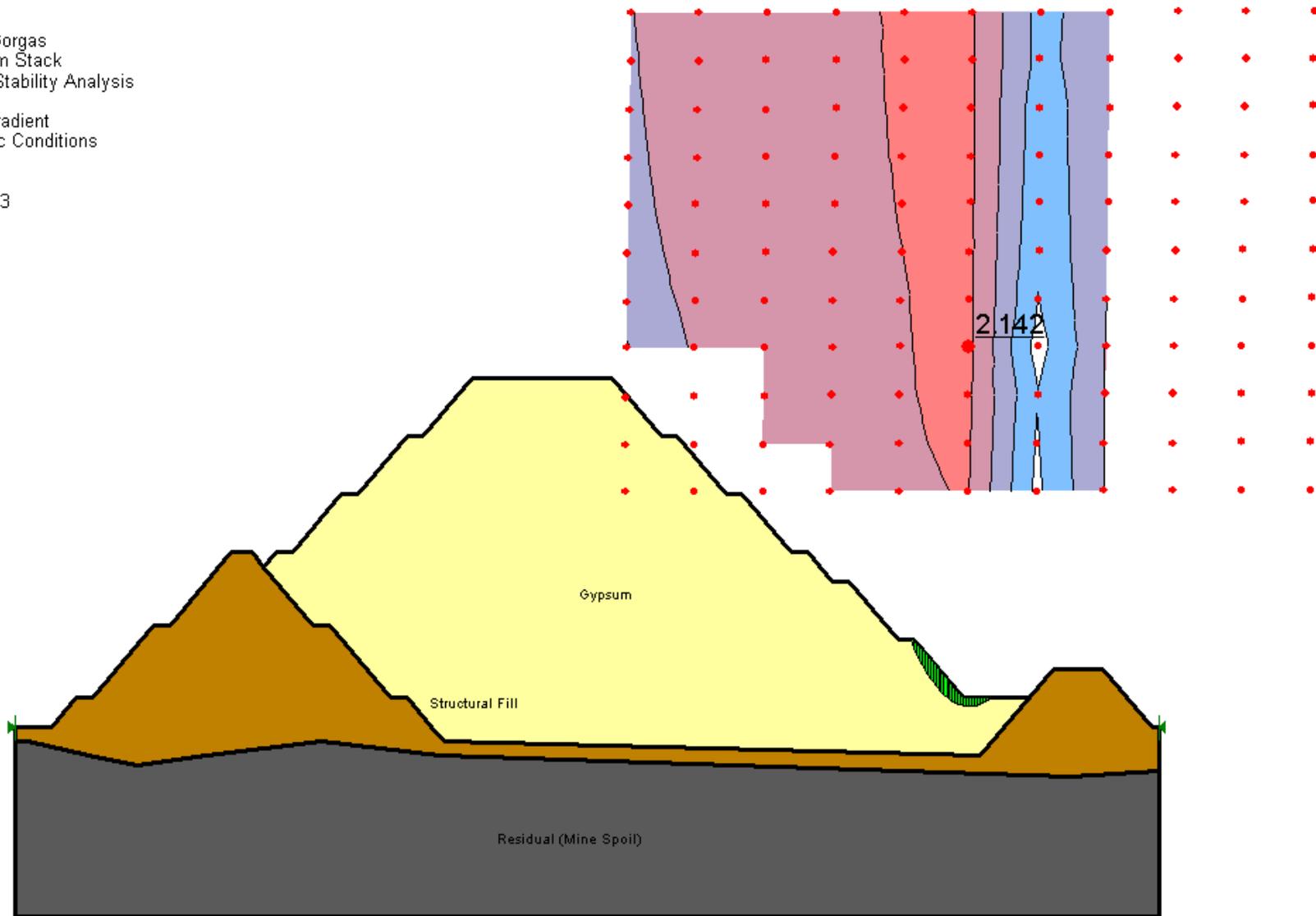
6/4/2013



Plant Gorgas
Gypsum Stack
Slope Stability Analysis

Downgradient
Seismic Conditions

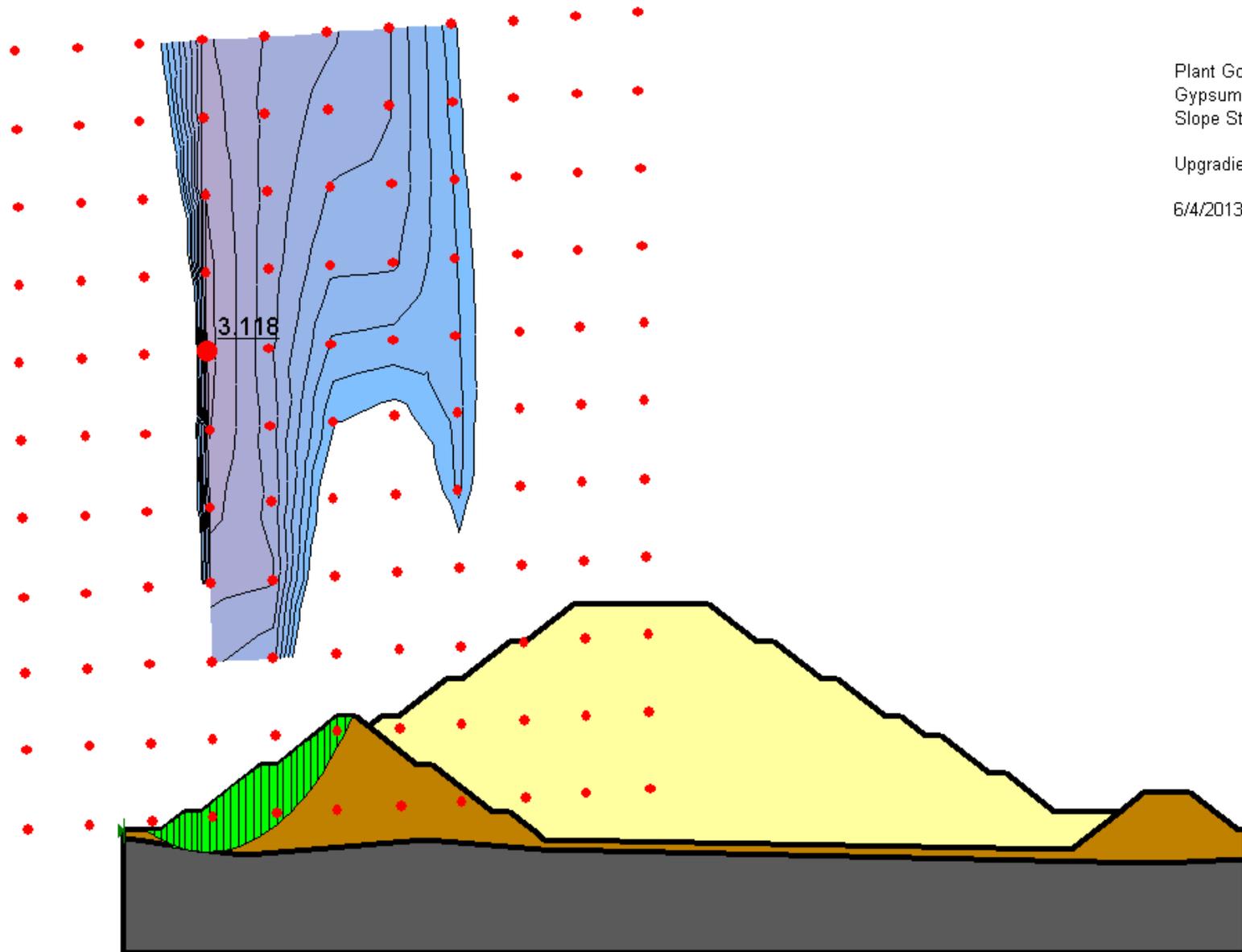
6/4/2013



Plant Gorgas
Gypsum Stack
Slope Stability Analysis

Upgradient

6/4/2013



Plant Gorgas
Gypsum Stack
Slope Stability Analysis

Upgradient
Seismic Conditions

6/4/2013

