PLANT GORGAS GYPSUM POND ALABAMA POWER COMPANY

EPA's "Disposal of Coal Combustion Residuals from Electric Utilities Final Rule (40 C.F.R. Part 257 and Part 261), §257.73(e), requires the owner or operator of an existing CCR surface impoundment to conduct periodic safety factor assessments. The owner or operator must document that the minimum safety factors outlined in §257.73(e)(1)(i) through (iv) for the critical embankment section are achieved.

The CCR surface impoundment located at Alabama Power Company's Plant Gorgas also referred to as the Plant Gorgas Gypsum Pond is located on Plant Gorgas property, southeast from Parrish, Alabama. The CCR surface impoundment is formed by an engineered cross-valley embankment. The critical section of this CCR unit has been determined to be located at the highest portion of the embankment in the area holding sluiced gypsum.

The analyses used to determine the minimum safety factor for the critical section resulted in the following minimum safety factors:

Loading Condition	Minimum Calculated	Minimum Required
	Safety Factor	Safety Factor
Long-term Maximum Storage Pool (Static)	2.5	1.5
Maximum Surcharge Pool (Static)	2.5	1.4
Seismic	2.3	1.0

The embankments are constructed of silts, clays, clean sands and rip-rap that are not susceptible to liquefaction. Therefore, a minimum liquefaction safety factor determination was not required.

I hereby certify that the safety factor assessment was conducted in accordance with 40 C.F.R. Part

257.73 (e)(1).

James C Pegues, P.E.

Licensed State of Alabama, Pt No. 16516



Engineering and Construction Services Calculation

Calculation Number: TV-GO-APC389153-002

Project/Plant:	Unit(s):	Discipline/Area:
Plant Gorgas Gypsum Pond	Units 6-7	ESFS
Title/Subject:		
Slope Stability Analysis of Plant Gorgas Gypsum	n Pond Dam	
Purpose/Objective:		
Analyze slope stability of the Plant Gorgas Gyps	um Pond Dam	
System or Equipment Tag Numbers:	Originator:	
NA NA	Stacey H.	Simpson, P.E.

Contents

Topic	Page	Attachments (Computer Printouts, Tech. Papers, Sketches, Correspondence)	# of Pages
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Total # of pages including	49		

cover sheet & attachments: 49

Revision Record

Rev. No.	Description	Originator Initial / Date	Reviewer Initial / Date	Approver Initial / Date
0	Issued for Information	SHS 10/06/16	JAL 10/10/16	JCP 10/10/16

Notes:

Purpose of Calculation

The William C. Gorgas Electric Generating Plant is a 5-unit electric generating facility, all of which are coal-fired units. The Plant Gorgas Gypsum Pond is designed to receive and store coal combustion residuals (gypsum) produced during the electric generating process at Plant Gorgas. The gypsum slurry from the flue gas desulfurization operation is wet-sluiced to the gypsum storage area. The gypsum is allowed to settle and the water decants to the sedimentation pond.

The purpose of this calculation is to provide a slope stability assessment of the Plant Gorgas Gypsum Pond dam under conditions prescribed by the EPA CCR rule.

Methodology

The calculation was performed using the following methods and software:

GeoStudio 2012 (Version 8.15.5.11777), August 2015 Release, Copyright 1991-2016, GEO-SLOPE International, Ltd.

Strata (Version alpha, Revision 0.2.0), Geotechnical Engineering Center, Department of Civil, Architectural, and Environmental Engineering, University of Texas.

The Morgenstern-Price analytical method with an entry-exit slip surface was used for slope stability calculation.

Criteria and Assumptions

The slope stability models were run using the following assumptions and design criteria:

- Seismic site response was determined using a one-dimensional equivalent linear site response analysis. The analysis was performed using Strata and utilizing random vibration theory. The input motion consisted of the USGS published 2008 Uniform Hazard Response Spectrum (UHRS) for Site Class B/C at a 2% Probability of Exceedance in 50 years. The UHRS was converted to a Fourier Amplitude Spectrum, and propagated through a representative one dimensional soil column using linear wave propagation with strain-dependent dynamic soil properties. The input soil properties and layer thickness were randomized based on defined statistical distributions to perform Monte Carlo simulations for 100 realizations, which were used to generate a median estimate of the surface ground motions.
- The median surface ground motions were then used to calculate a pseudostatic seismic coefficient for utilization in the stability analysis using the approach suggested by Bray and Tavasarou (2009). The procedure calculates the seismic coefficient for an allowable seismic displacement and a probability exceedance of the displacement. For this analysis, an allowable displacement of 0.5 ft, and a probability of exceedance of 16% were conservatively selected, providing a seismic coefficient of 0.053g for use as a horizontal acceleration in the stability analysis.

- The Corps of Engineers (COE) EM 1110-2-1902 standard, October 2003, allows the use of the phreatic surface established for the maximum storage condition (normal pool) in the analysis for the maximum surcharge loading condition. This is based on the short term duration of the surcharge loading relative to the permeability of the embankment and the foundation materials. This method is used in the analysis for the impoundments at this facility with surcharge loading.
- The current required minimum criteria (factors of safety) were taken from the Structural Integrity Criteria for Existing CCR Surface Impoundments, 40 CFR 257.73, published April 17, 2015.
- The critical section was selected at the location having the apparent maximum dam height and gypsum storage. The cross-section of the Plant Gorgas Gypsum Pond dam was modeled using the following sources:
 - 1) Alabama Power Company (APC) Drawing D-591423, Plant Gorgas Gypsum Storage Area Cell, Sections and Details Sheet 1.
- A phreatic surface within the dam was not modeled because the cell is lined with 60-mil HDPE, which for purposes of this analysis is considered to be impermeable.

Input Data

- Soil Properties: The soil properties (unit weight, phi angle, and cohesion) of coal mine spoils comprising the dam used in the analysis were conservatively estimated from evaluating average blow counts of the material encountered during drilling operations, and from laboratory testing of the coal mine spoils.
- The soil properties (unit weight, phi angle, and cohesion) of the gypsum were derived from laboratory testing of gypsum similar to what is produced and stored at Plant Gorgas.

		Effective Stress Parameters				
Soil Description	Unit Weight, pcf	Cohesion, psf	Phi Angle, degrees			
Gypsum	100	100	34			
Coal Mine Spoil	104	0	36			

Summary of Conclusions

The following table summarizes the factors of safety resulting from the slope stability analyses. The results indicate the safety factors of the Plant Gorgas Gypsum Pond dam meet or exceed the minimum criteria set forth in the structural integrity criteria for existing CCR surface impoundments, 40 CFR 257.73.

Factor of Safety Summary Table

Loading Condition	Minimum Calculated Safety Factor	Minimum Required Safety Factor
Long-term Maximum Storage Pool (Static)	2.5	1.5
Maximum Surcharge Pool (Static)	2.5	1.4
Seismic	2.3	1.0

Design Inputs/References

- Bray, J. D. and Travasarou, T., *Pseudostatic Coefficient for Use in Simplified Seismic Slope Stability Evaluation*, Journal of Geotechnical and Environmental Engineering, American Society of Civil Engineers, September 2009
- D-591423, Plant Gorgas Gypsum Storage Area Cell Sections and Details Sheet 1, 2006
- Subsurface Investigation Report, Gypsum Storage Area at Alabama Power Company's Gorgas Steam Plant, Southern Company Technical Services, 2005

Body of Calculation

Name: Gypsum Unit Weight: 100 pcf Cohesion': 100 psf

Phi': 34 °

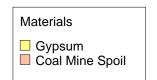
Name: Coal Mine Spoil Unit Weight: 104 pcf Cohesion': 0 psf

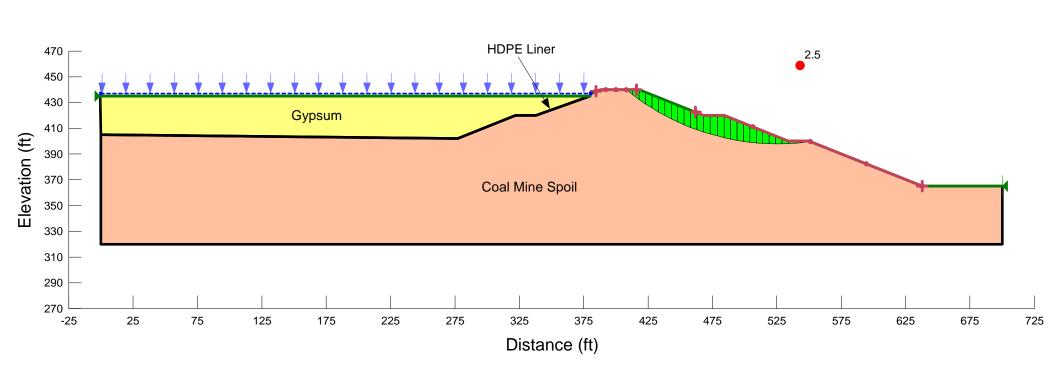
Phi': 36 °

Plant Gorgas

Gypsum Storage Pond

Long Term Maximum Storage





Name: Gypsum Unit Weight: 100 pcf Cohesion': 100 psf Phi': 34 °

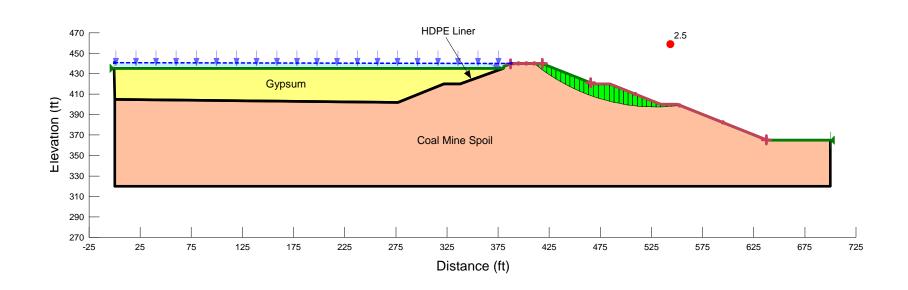
Name: Coal Mine Spoil Unit Weight: 104 pcf Cohesion': 0 psf Phi': 36 °

Plant Gorgas

Gypsum Storage Pond

Maximum Surcharge





Name: Gypsum Unit Weight: 100 pcf Cohesion': 100 psf

Phi': 34 °

Name: Coal Mine Spoil Unit Weight: 104 pcf Cohesion': 0 psf

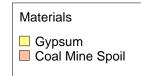
Phi': 36 °

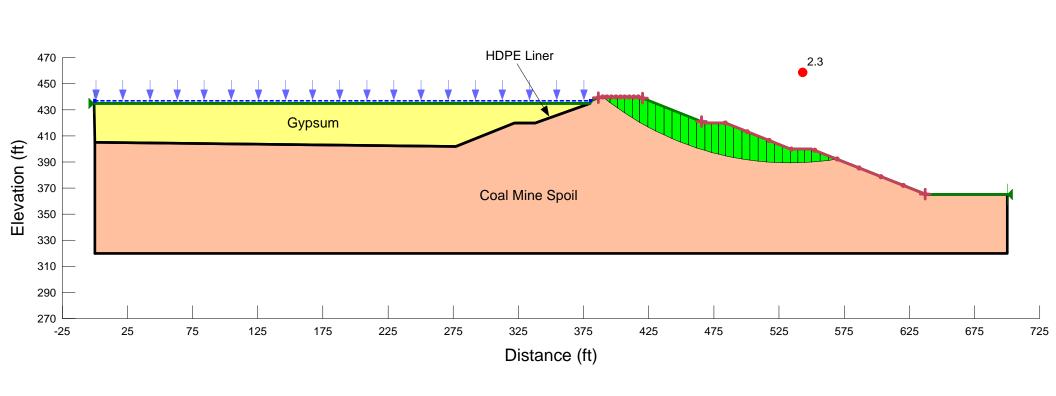
Plant Gorgas

Gypsum Storage Pond

Seismic

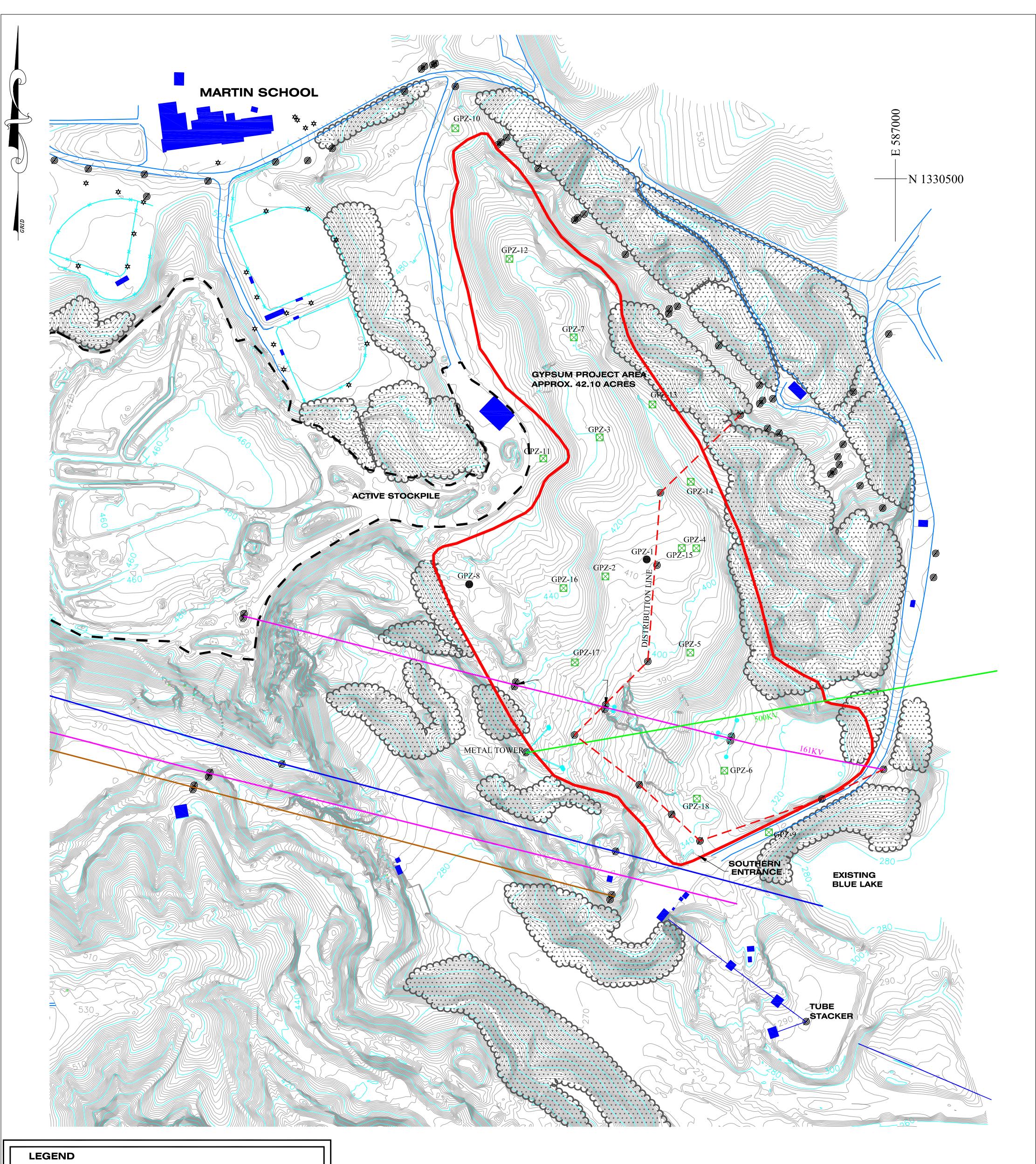
Horizontal Seismic Coefficient.: 0.053

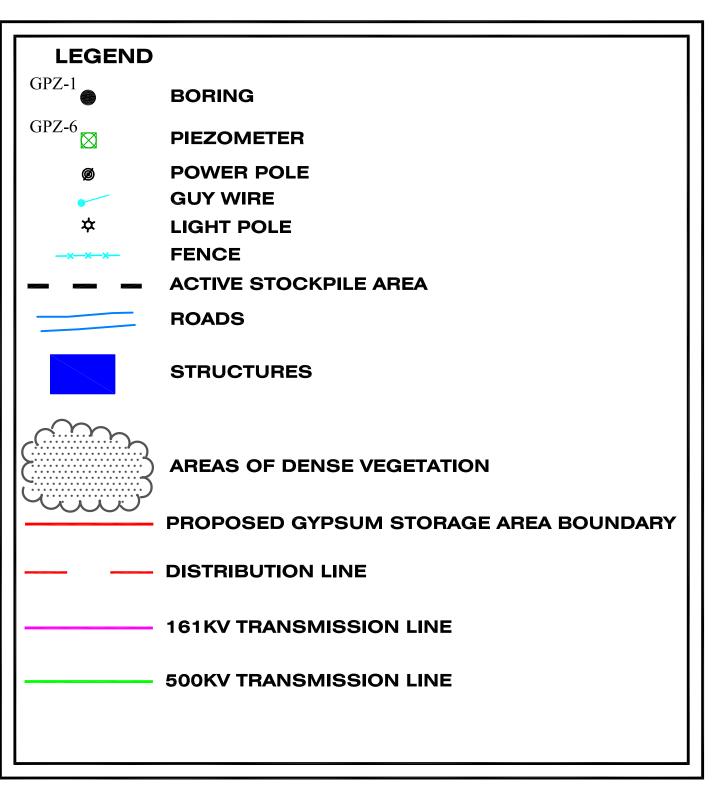




ATTACHMENTS

Attachment A - Boring Location Plan





Hole	Surf. Elev	NORTHING	EASTING
GPZ-1	411.178	1329138.532	586110.801
GPZ-2	409.046	1329077.785	585962.932
GPZ-3	439.133	1329575.014	585942.474
GPZ-4	411.275	1329178.652	586288.212
GPZ-5	392.77	1328805.159	586266.769
GPZ-6	327.628	1328383.099	586388.351
GPZ-7	420.215	1329932.761	585850.253
GPZ-8	456.921	1329049.647	585475.962
GPZ-9	336.852	1328162.636	586547.693
GPZ-10	487.87	1330608.47	585426.44
GPZ-11	473.36	1329499.75	585740.85
GPZ-12	421.61	1330213.32	585619.97
GPZ-13	402.64	1329692.80	586131.45
GPZ-14	394.93	1329416.45	586268.34
GPZ-15	411.18	1329179.05	586236.28
GPZ-16	440.65	1329035.86	585813.17
GPZ-17	414.27	1328770.35	585853.67
GPZ-18	338.02	1328283.18	586290.18

Southern Company Generation

ALABAMA POWER COMPANY

GRAPHIC SCALE

(IN FEET) 1 inch = 160 ft.

PHOTOGRAMMETRIC SURVEY

GRID COORDINATES NAD 27

ALABAMA STATE PLANE

WEST ZONE

FIGURE 2 PLANT GORGAS GYPSUM STORAGE AREA

ES1341S2

6) RASTER OVERLAY OF GOODSPRINGS 7 1/2 Min. USGS QUAD SHEET 7) DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE.

3) CONTOURS WERE PRODUCED BY DIGITAL TERRAIN MODEL

5) CONTOURS APPROXIMATE IN AREAS OF DENSE VEGETATION

1) DATE OF AERIAL PHOTOGRAPHY 04/02/2003

4) CONTOUR INTERVAL 2 FEET

2) PHOTOGRAMMETRIC DATA COLLECTED 05/13/2003

NOTES:

BORING & PIEZOMETER LOCATIONS

SCALE: 1:160

Attachment B - Boring Logs

SOUT	THERI	NA.	DRILLING LOG			Hole No).	GPZ-1
Energy 1	o Serve Y	our World					Sheet	
_			Plant Gorgas Gypsum Disposal Area	HOLE DEPTH	66.5'		SURF.ELEV.	411
	_		Plant Gorgas in Coal Mine Spoil Storage Area COORDINATES N					
			BEARING CONTRACTOR					
OVERB	URDEN D	EPTH _	NO. SAMPLES 13	NO.	. U.D. SAMPI	LES		
			LENGTH CORE SIZE					
			Backfilled Hole ELEV TIME AFTER COMP		DATE	TAKEN _		
			uger Spoils QUANTITY MIX		LLING STAR	_	4 /	29/2003
		B. Filipo	ovich RECORDER J. Chitwood APPROVED		LLING COMF	_		29/2003
Graphic Log		Elev.	Material Description, Classification and Remarks	From To	rd Penetration Blows	l est N	Sample No.	Comments
	0							
	4							
	1							
	2		Coal Mine Spoils 0 - 66.5' Dark gray-black 10YR3/1 very dark gray					
	3		Dark gray black for its it very dark gray					
	4							
	5							
	6			5.0-6.5	2-34-7	41	1	
	7							
	8							
	9							
	10							
	11			10.0-11.5	23-11-7	18	2	
	12							
	13							
	14							
	15							
	16			15.0-16.5	13-19-10	29	3	
	17							
	18							
	19							
	20							
				62.2.2.	0.0.0	_	_	
	21			20.0-21.5	9-3-3	6	4	
	22							
	23							
						Ī	1	

DRILLING LOG GEOLOGICAL SERVICES

Hole No.

Sheet 2 of 3

GPZ-1

Plant Gorgas Gypsum Disposal Area 66.5 SITE TOTAL DEPTH SURF.ELEV. Graphic Material Description, Sample Log Classification and Remarks Comments Coal Mine Spoils 25.0-26.5 11-14-13 30.0-31.5 9-11-13 35.0-36.5 5-7-8 6-6-5 40.0-41.5 45.0-46.5 5-5-6 50.0-51.5 9-7-7 55.0-56.5 4-7-9

Form GS9902 4/10/2003

Form GS9902 4/10/2003

DRILLING LOG GEOLOGICAL SERVICES

Hole No. GPZ-1

Sheet 3 of 3

Plant Gorgas Gypsum Disposal Area 66.5 SITE TOTAL DEPTH SURF.ELEV. 411 Graphic Material Description, Sample Log From To Comments 57 58 59 60 Coal Mine Spoils 60.0-61.5 4-7-7 14 61 12 62 63 64 65 65.0-66.5 9-7-6 66 13 13 66.5 344.5 67 Boring terminated @ 66.5' No water encountered. Hole backfilled with auger spoils. 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87

SOUT	HER	PANY	DRILLING LOG			Hole N	lo.	GPZ-2
		PANY our World	GEOLOGICAL SERVICES				Sheet	
				HOLE DEPTH	46'		SURF.ELEV.	410
LOCATION	ON	North o	of Plant Gorgas in Coal Mine Spoil Storage Area COORDINATES N			E _		
ANGLE			BEARING CONTRACTOR	SCS	DF	RILL NO.		
			LENGTH CORE SIZE					/2/2003
			34 ELEV. 376 TIME AFTER COMP					29/2003
			QUANTITY MIX		ILLING STAF			30/2003
Graphic		Б. ГІІІРІ	ovich RECORDER J. Chitwood APPROVED	Standa				
Log	Depth	Elev.	Classification and Remarks	From To	Blows	N	No.	Comments
	0							
	1							
	2		Coal Mine Spoils 0 - 46'					
	3							
	4							
	5							
	6			5.0-6.5	2-2-3	5	1	
	7							
	8							
	9							
	10							
	11			10.0-11.5	2-2-2	4	2	
				10.0 11.0				
	12							
	13							
	14							
	15			45.0.40.5	0.00		_	
	16			15.0-16.5	2-2-2	4	3	
	17							
	18							
	19							
	20							
	21			20.0-21.5	5-4-4	8	4	
	22							
	23							
	24						1	

DRILLING LOG GEOLOGICAL SERVICES

Hole No.

GPZ-2

Sheet 2 of 2

SITE _		ī.	Plant Gorgas Gypsum Disposal Area	TOTAL DEPTH	46'		SURF.ELEV.	410
Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standa From To	ard Penetration Blows	Test N	Sample No.	Comme
	25							
	26		Coal Mine Spoils	25.0-26.5	2-4-3	7	5	
	27							
	28							
	29							
	30							
	31			30.0-31.5	2-20-20	40	6	
	32							
	33							
	34		Wet around 34'					
	35		vvet around 54					
	36		Saturated @ 36'	35.0-36.5	2-2-3	5	7	
	37		Saturated © 30	33.0 30.3	223	,	,	
	38							
	39							
	40							
				40.0-41.5	1-1-2	3	0	
	41			40.0-41.5	1-1-2	3	8	
	42							
	44 45							
		204.00	Desire the resident of @ 4Cl 40l of average backs off in the hole					
	46 47	304.00	Boring terminated @ 46' - 10' of auger broke off in the hole. Offset 5' and cored 5' of rock.					
	48	 						
	49							
	50							
	51							
	52							
	53							
	54	-						
	55							

SOUTHER	IPANY	DRILLING LOG			Hole N	0.	GPZ-3
Energy to Serve 1	Your World"					Sheet	
		Plant Gorgas Gypsum Disposal Area					
LOCATION _	North of	Plant Gorgas in Coal Mine Spoil Storage Area COORDINATES	N		E _		
ANGLE		BEARING CONTRACTOR	SCS	DR	ILL NO.		
OVERBURDEN I	DEPTH _	NO. SAMPLES1	NC	D. U.D. SAMP			
		LENGTH CORE SIZE					
		Dry ELEV TIME AFTER COMP					
		QUANTITY MIX					30/2003
DRILLER Graphic	B. Filip	Ovich RECORDER H. Hill APPROVED Material Description,	DR	ILLING COMF ard Penetration	P. DATE	Sample	50/2003
Log Depth	Elev.	Material Description, Classification and Remarks	From To	Blows	N		Comments
0							
1							
2		Coal Mine Spoils					
3	ļ	, , ,					
4							
5							
6							
7							
8							
9							
10							
10							
- ·	<u> </u>						
58							
59							
60							
	1		00 0 04 5	44.45.01	00		
61	+		60.0-61.5	11-15-24	39	1	
62							
63							
64							
65 Form GS9901 4/10		Boring Terminated @ 65'. Set Piezometer.					

SOUTHERN		DRILLING LOG			Hole N	0.	GPZ-
COMP Energy to Serve You	ır World™	GEOLOGICAL SERVICES				Sheet 1	
SITE	P	Plant Gorgas Gypsum Disposal Area	HOLE DEPTH	65'		SURF.ELEV.	406
LOCATION	North of Pla	ant Gorgas in Coal Mine Spoil Storage Area COORDINATES N	_		E _		
ANGLE		BEARING CONTRACTOR NO. SAMPLES	SCS	DR	RILL NO.		
OVERBURDEN DE	PTH	NO. SAMPLES	NC	D. U.D. SAMP	LES		
		LENGTH CORE SIZE					2/2003
		Dry ELEV TIME AFTER COMP					60/2003 60/2003
		QUANTITY MIX Ch RECORDER H. Hill APPROVED		ILLING STAR			0/2003
Graphic		Material Description,	Standa	ard Penetration			
Log Depth	Elev.	Classification and Remarks	From To	Blows	N	No.	Commen
0							
1							
2	Co	oal Mine Spoils 0 - 65'					
3	Da	ark gray-black 10YR3/1 very dark gray o Rock Encountered. No water.					
	INC	5 NOOK Encountered. 140 water.					
4							
5							
6							
7							
8							
9							
10							
+ +							
- -							
_ .							
58							
59							
60							
61							
62							
63							
64							
65 Form GS9901 4/10/20		oring Terminated @ 65'. Set Piezometer.					

SOUTHERN COMP		DRILLING LOG				0.	
Energy to Serve Yoi	ur World"	GEOLOGICAL SERVICES				Sheet 1	
SITE		Plant Gorgas Gypsum Disposal Area	HOLE DEPTH	60'		SURF.ELEV.	399
LOCATION	North of I	Plant Gorgas in Coal Mine Spoil Storage Area COORDINATES	N		E _		
ANGLE		BEARING CONTRACTOR	SCS	DRI	LL NO.		
OVERBURDEN DE	PTH _	NO. SAMPLES	NO	D. U.D. SAMPL	.ES		
		LENGTH CORE SIZE					
		Dry ELEV TIME AFTER COMP					2/2003
		QUANTITY MIX					1/2003
	B. Filipo	vich recorder H. Hill approved	DR	RILLING COMP			1/2003
Graphic Log Depth	Elev.	Material Description, Classification and Remarks	Standa From To	ard Penetration Blows	Test N		Commer
0	+					† †	
1							
2		Coal Mine Spoils 0 - 60'					
3		Dark gray-black 10YR3/1 very dark gray Augered through mine spoils					
		No rock encountered. No water.					
4	-						
5							
6							
7							
	$\neg \neg$						
8							
9							
10							
+++							
1 1							
53							
54							
55							
56							
57							
58							
59							
60 orm GS9901 4/10/20		Boring Terminated @ 60'. Set Piezometer.					

SOUTHER CON	NANV.	DRILLING LOG			Hole N	lo.	GPZ-
Energy to Serve	Your World	GLOLOGICAL SLIVICLS				Sheet 1	
		Plant Gorgas Gypsum Disposal Area					
LOCATION _	North o	f Plant Gorgas in Coal Mine Spoil Storage Area COORDINATES N			E		
ANGLE		BEARING CONTRACTOR	SCS	DR	ILL NO.		
OVERBURDEN	DEPTH _	NO. SAMPLES1	No	D. U.D. SAMPI	LES		
CASING SIZE		LENGTH CORE SIZE		TOTAL	% REC.		
		8 ELEV. 318 TIME AFTER COMP					2/2003
TYPE GROUT		QUANTITY MIX	DF	RILLING STAR	T DATE		1/2003
DRILLER	B. Filip	OVICH RECORDER H. HIII APPROVED Material Description,	DF	RILLING COMF	P. DATE	5/	1/2003
Graphic Log Depth	Elev.	Material Description, Classification and Remarks	Stand From To	ard Penetration Blows	Test N	Sample No.	Commer
0							
0							
1							
2		Coal Mine Spoils 0 - 61'					
3							
,							
4							
5							
6							
7							
8							
8							
9							
10							
		Water encountered around 15'.					
		Lots of water around 25'.					
55							
56							
57							
58							
59							
60		Top eligibility clayou and conducility with Conductors from onto @ C41					
61		Tan slightly clayey and sandy silt with Sandstone fragments @ 61'	60.0-61.5	5-13-10	23	1	
62	1	Boring Terminated @ 61.5'. Set Piezometer 30' - 35'.				\bot	

DEPTH _ B. Filipo	Plant Gorgas Gypsum Disposal Area Plant Gorgas in Coal Mine Spoil Storage Area BEARING CONTRACTOR NO. SAMPLES LENGTH LENGTH CORE SIZE 18.5 ELEV. QUANTITY MIX DVICH Material Description.	SCS N 24 hrs DI	DR O. U.D. SAMPI TOTAL DATE	EEILL NOLES % RECTAKENT DATEP. DATE	5/2 5/2 5/2	427
DEPTH _ B. Filipo	Plant Gorgas in Coal Mine Spoil Storage Area BEARING CONTRACTOR NO. SAMPLES LENGTH CORE SIZE 18.5 BLEV. QUANTITY MIX DVICH RECORDER H. Hill APPROVED Material Description.	SCS N 24 hrs DI Stance	DR O. U.D. SAMPI TOTAL DATE RILLING STAR RILLING COMB	EEILL NO LES % REC TAKEN T DATE TOATE Test	5/2 5/2 5/2	2/2003
DEPTH _ B. Filipo	BEARING CONTRACTOR NO. SAMPLES LENGTH CORE SIZE 18.5 ELEV. 408.5 TIME AFTER COMP. QUANTITY MIX DVICH RECORDER H. Hill APPROVED Material Description.	SCS N 24 hrs DI Stance	O. U.D. SAMPI TOTAL DATE RILLING STAR RILLING COMB	HILL NOLES	5/2 5/- 5/-	2/2003 1/2003
DEPTH _ B. Filipo	BEARING CONTRACTOR NO. SAMPLES LENGTH CORE SIZE 18.5 ELEV. 408.5 TIME AFTER COMP. QUANTITY MIX DVICH RECORDER H. Hill APPROVED Material Description.	SCS N 24 hrs DI Stance	O. U.D. SAMPI TOTAL DATE RILLING STAR RILLING COMB	HILL NOLES	5/2 5/- 5/-	2/2003 1/2003
B. Filipo	LENGTH CORE SIZE 18.5 ELEV. 408.5 TIME AFTER COMP. QUANTITY MIX Dvich RECORDER H. Hill APPROVED Material Description.	24 hrs DI Stand	TOTAL DATE RILLING STAR RILLING COMP	% REC TAKEN _ T DATE _ P. DATE _ Test	5/2 5/- 5/-	2/2003
B. Filipo	18.5 ELEV. 408.5 TIME AFTER COMP	24 hrs Di Stand	DATE RILLING STAR RILLING COMP	TAKEN _ T DATE _ P. DATE _ Test	5/2 5/ ⁻ 5/-	2/2003
B. Filipo	QUANTITY MIX DVICH RECORDER H. Hill APPROVED Material Description.	Di Stano	RILLING STAR RILLING COMP	T DATE	5/ ⁻	1/2003
B. Filipo	DVICH RECORDER H. Hill APPROVED Material Description.	DI	RILLING COMF	P. DATE _	5/	
Elev.	Material Description.	Stand	dard Penetration	Test		1/2003
	Classification and Remarks					
					No.	Comment
	A					
	Augered through coal mine spoils 0 - 25'					
	Moist around 10'.					
		Moist around 10'. Original ground around 25'. Refusal @ 28'. Cored through rock 28'-45' - Gray Sandstone with weathered layers	Original ground around 25'. Refusal @ 28'. Cored through rock 28'-45' - Gray Sandstone with weathered layers	Original ground around 25'. Refusal @ 28'. Cored through rock 28'-45' - Gray Sandstone with weathered layers	Original ground around 25'. Refusal @ 28'. Cored through rock 28'-45' - Gray Sandstone with weathered layers	Original ground around 25'. Refusal @ 28'. Cored through rock 28'-45' - Gray Sandstone with weathered layers

SOUT	HER	N #2 PANY		DRILLING LOG			Hole I	No.	GPZ-
		our World"		GEOLOGICAL SERVICI				Sheet 1	
SITE _			Plant Gorgas Gypsum	n Disposal Area	HOLE DEPTH	50'		SURF.ELEV.	456
LOCATIO	NC	North o	f Plant Gorgas in Coal Mine Sp	oil Storage Area COORDINATE	S N		E		
ANGLE			BEARING	CONTRACTOR	SCS	DF	RILL NO.		
OVERBL	JRDEN D	EPTH _		NO. SAMPLES		NO. U.D. SAMP	LES		
				CORE SIZE					
				TIME AFTER COMP.		DATE	TAKEN	5/2	2/2003
TYPE GI	ROUT		Backfilled QUANTITY	MIX		DRILLING STAR	T DATE	5/	1/2003
				Hill APPROVED		DRILLING COM	P. DATE	5/	1/2003
Graphic Log	Depth	Elev.		laterial Description, sification and Remarks	S From To	tandard Penetration	Test	Sample No.	Commer
Log	Бериі	LIEV.	Cias	silication and Nemarks	T TOTAL TO	Diows	IN	NO.	Commen
	0								
	1	455.00	Coal Mine Spoils (1')						
	2								
			1						
	3		1' - 30' Gray gravely silt - wea Sandstone layers	thered SS with intermediate soft					
	4		- Canadionio layoro						
	5								
			1						
	6		1						
	7		_						
	8								
	9		1						
	9		†						
	10								
	30		Tan to brown back to gray are	ound 30'					
 									
]						
	•		1						
	43		4						
	44]						
]	45		Rock encountered - Auger ref	usal					
			45-50' Cored gray SS						
	46		-						
	47								
	48								
			1						
	49		-						
	50	406.00	Boring terminated @ 50'. No	water. Hole Backfilled.					

SOUT	HER	PANY		DRILLING LOG			Hole N	0.	GPZ-9
Energy t	o Serve Y	our World™		GEOLOGICAL SERVIC				Sheet	
				Disposal Area					
LOCATI	ON	North of	Plant Gorgas in Coal Mine Spo	il Storage Area COORDINATI	ES N		E _		
ANGLE				CONTRACTOR					
	URDEN D			NO. SAMPLES					
				CORE SIZE					
				297 TIME AFTER COMP					/2/2003
				MIX		RILLING STAR			/2/2003
	R	B. Filipe		ill APPROVED		RILLING COM	•	5.	/2/2003
Graphic Log	Depth	Elev.		terial Description, ication and Remarks	Stan From To	dard Penetration Blows	Test N	Sample No.	Comments
	0								
	_								
	1								
	2								
	3								
	4								
	5		Road base						
	6		Mine Spoils		5.0-6.5	18-8-8	16	1	
	7								
	8								
	9								
	10					1	-		
	11		Coal mine spoils		10.0-11.5	7-4-3	7	2	
	12						-		
	13								
	14								
	15								
	16		SAA		15.0-16.5	10-4-3	7	3	
	17								
	18								
	19								
	20								
	21				20.0-21.5	5 7-4-3	7	4	
			SAA		20.0 21.0	1	<u> </u>		
	22								
	23								
	24								
Form GS9	901 4/10/2	2003		·					

SOUTHERN AS
En annu de Canna Verna Ward J

DRILLING LOG GEOLOGICAL SERVICES

Hole No. GPZ-9

Sheet 2 of 3

Plant Gorgas Gypsum Disposal Area 61.5' SITE TOTAL DEPTH SURF.ELEV. 338 Material Description, Classification and Remarks Graphic Log Standard Penetration Test Sample No. Depth Elev. From To Blows Comments 25 25.0-26.5 3-3-3 6 5 26 Coal Mine Spoils 27 28 29 30 30.0-31.5 4-3-3 6 6 31 SAA 32 33 34 35 35.0-36.5 2-3-4 7 7 36 SAA 37 38 39 40 SAA - Wet @ 41' 40.0-41.5 2-3-4 7 8 41 42 43 44 45 46 Wet Coal Mine Spoils 45.0-46.5 1-1-5 6 9 47 48 49 50 SAA 50.0-51.5 woh-3-5 8 51 10 52 53 54 55 55.0-56.5 2-4-6 11

SOUTHERN A
Energy to Serve Your World"

DRILLING LOG

Hole No. GPZ-9

			our World"	GEOLOGICAL SERVICES				Sheet	3 of 3	
	SITE _			Plant Gorgas Gypsum Disposal Area	TOTAL	DEPTH	61.5'		SURF.ELEV.	338
	Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	I	Standar From To	rd Penetration Blows	Test N	Sample No.	0
	Log		Elev.	Ciassilication and Pethans		FIGHT TO	Diows	IN	NO.	Comments
		57								
		58								
		59								
		60								
				Coal Mine Spoils	ŀ			_		
61.5		61	276.5	Boring terminated @ 61.5'. Piezometer set.		60.0-61.5	1-2-4	6	12	
		62								
		63								
		64								
		65								
		66								
		67								
		68								
		69								
		70								
		71								
		72								
		73								
		74								
		75								
		76								
		77								
		78								
		79								
		80								
		81								
		82								
		83								
		84								
		85								
		86								
		87								
	Earne CSO	88 902 4/10/2	2002							

	i		PANY _	LLING LO				Hole No	O	GPZ-	10
		o Serve You		GICAL SERV			F0 F	<u> </u>	Sheet 1		
			GORGAS STEAM PLANT								
				COORDINA						426.44	
			90 BEARING								
			NO. SAN)	
		SIZE	LENGTH								
			PTH NA ELEV.				D.	ATE TAKEN	2/2	0/2005	
			QUANTITY				DRILLING S	TART DATE	3/2	9/2005	
	DRILLEI	R	Billy Spivey RECORDER S. Sprayberry A	PPROVED		ard Penetration		OMP. DATE	3/2	1	ı
	Depth	Elev.	Material Description, Classification and Remarks	Sample No.		Blows	N	Comi	ments	%Rec	RQD
0.0	0	487.87									
	4		Cool Mine angile (0.451)	SS-1	0-1.5	4-5-5	10				
	1		Coal Mine spoils (0-45')	33-1	0-1.5	4-5-5	10				
	2										
	3										
	4										
	5										
	6		SAA	SS-2	5-6.5	3-7-9	16				
	7										
	8										
	9										
	10										
	11		SAA	SS-3	10-11.5	7-17-21	38				
	12			<u> </u>							
	12										
	13										
	14										
	15										
				00.4	15 40 5	E F 7	10				
	16		SAA	SS-4	15-16.5	5-5-7	12				
	17										
	18										
	19										
	20										
	21		SAA	SS-5	20-21.5	10-10-8	18				
	22			 							
	23										
	24	901 7-26-20									

56

Form GS9901 7-26-2004

Boring Terminated @ 56.5'

DRILLING LOG GEOLOGICAL SERVICES

Hole No.

GPZ-10

Sheet 2 of 2

GORGAS STEAM PLANT 56.5 487.87 SITE TOTAL DEPTH SURF.ELEV. RQD Depth Elev Material Description, Classification and Remarks From To Sample No Blows Ν Comments %Rec 25 SS-6 26 SAA 25-26.5 6-6-7 13 27 28 29 30 SS-7 30-31.5 31 SAA 6-6-7 13 32 33 34 35 36 SAA SS-8 35-36.5 6-4-3 7 37 38 39 40 SS-9 40-41.5 6-9-11 20 41 SAA 42 43 44 442.87 45.0 45 SS-10 45-46.5 46 4-5-6 11 Tan to gray, moist, stiff, silty CLAY (CL) with SANDSTONE and SHALE fragments, FILL 47 48 49 50.0 50 437.87 Tan to gray, moist, very stiff to very hard, silty CLAY (CL) with weathered SANDSTONE residuum SS-11 50-51.5 4-7-14 21 51 52 53 54 55 SAA

SS-12

55-56.5

50/3"

50+

	SOUT	THERN COMF	PANY _	DRILLING					Hole No		GPZ-	11
		o Serve Yor		GEOLOGICAL				70.5	<u> </u>	Sheet 1		
			GORGAS STEAM									3.36
			GYPSUM STORAGE	CC							740.85	
			90 BEARING									
			D)	
		SIZE	LENGTH									
			PTH NA ELEV.									
		ROUT	QUANTITY _					DRILLING S	TART DATE	3/2	4/2005	
	DRILLE	R	Billy Spivey RECORDER S. Sprayb	erry APPROVE	D		rd Penetration		OMP. DATE	3/2	4/2003	I
	Depth	Elev.	Material Description, Classification and Re	emarks Sa	ample No.	From To	Blows	N	Comm	nents	%Rec	RQD
0.0	0	473.36										
	4		Cool Mine on sile (O.CO)		SS-1	0-1.5	2-2-7	9				
	1		Coal Mine spoils (0-63')		33-1	0-1.5	2-2-1	9				
	2		-									
	3											
	4											
			1									
	5		1									
	6		SAA		SS-2	5-6.5	6-6-13	19				
	7											
	8											
			1									
	9		-									
	10			_								
	11		SAA		SS-3	10-11.5	6-6-8	14				
	12											
			1									
	13		-									
	14		_									
	15											
	16		SAA		SS-4	15-16.5	3-8-19	27				
			JAA .		JU-4	10-10.0	5-0-18	۷۱				
	17		-									
	18											
	19											
			1									
	20		-	-								
	21		SAA		SS-5	20-21.5	10-12-13	25				
	22											
	23											
			1									
	24	901 7-26-20										

DRILLING LOG GEOLOGICAL SERVICES

Hole No.

GPZ-11

Sheet 2 of 3

	o Serve Yo	GEOLOGIC GORGAS STEAM PLANT	AL SLIN			76.	Sheet 2 of 3		
SITE _	ı	GORGAS STEAM FLANT	1		TOTAL DEPTH		SURF.ELEV.	473	3.36
Depth	Elev.	Material Description, Classification and Remarks	Sample No.	From To	Blows	N N	Comments	%Rec	RQD
25									
26		SAA	SS-6	25-26.5	2-6-13	19			
27									
28									
29									
30									
31		SAA	SS-7	30-31.5	10-14-12	26			
32									
33									
34									
35									
36		SAA	SS-8	35-36.5	8-17-32	49			
37									
38									
39									
40									
41		SAA	SS-9	40-41.5	5-9-10	19			
		onn		40-41.5	3-3-10	13			
42									
43									
44									
45									
46		SAA	SS-10	45-46.5	4-8-10	18			
47									
48									
49									
50									
51		SAA	SS-11	50-51.5	2-8-9	17			
52									
53									
54									
55									
			SC 40	EE F0 F	7 10 14	27			
56	901 7-26-20	SAA	SS-12	55-56.5	7-13-14	27		Щ	

DRILLING LOG GEOLOGICAL SERVICES

Hole No.

GPZ-11

GEOLOGICAL SERVICES Sheet 3 of 3

	Energy t	o Serve You	r World* GEOLOGICA	AL SERV	ICES			Sheet 3 of 3			
	SITE _		GORGAS STEAM PLANT			OTAL DEPTH	76	SURF.ELEV.	473	3.36	
	Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standa From To	ard Penetration T Blows	est N	Comments	%Rec	RQD	
	57										
	58										
	59										
	60										
	61		SAA	SS-13	60-61.5	14-19-17	36				
	62										
63.0		410.36									
	64										
	65										
	66		Tan to gray, moist, very stiff, clayey SILT (ML) with highly weathered SHALE residuum	SS-14	65-66.5	11-15-14	29				
	67										
	68										
	69										
70.0	70	403.36									
	71		Tan, soft to medium hard, weathered SANDSTONE	SS-15	70-71.5	9-13-14	27				
	72										
	73										
	74										
	75										
76.5	76	396.86	SAA	SS-16	75-76.5	9-14-16	30				
70.5	77	390.00	Boring Terminated @ 76.5' (Not Auger Refusal)								
	78										
	79										
	80										
	81										
	82										
	83										
	84										
	85										
	86										
	87										
	88 Form GS9	901 7-26-20	04								

	SOUT	HERN COMP	PANY _						D.	GPZ-	12
	Energy to	o Serve You	r World" GEOLOGIC				= -		Sheet 1		
			GORGAS STEAM PLANT								.61
			GYPSUM STORAGE							619.97	
			90 BEARING								
		G METHOI									
			LENGTH TII								
									3/2		
	DRILLE	2	Billy Spivey RECORDER S. Sprayberry APPRO	WED.		-	DRILLING	OMP DATE	3/2	8/2005	
					Standa	rd Penetration	Test				
	Depth	Elev.	Material Description, Classification and Remarks	Sample No.	From To	Blows	N	Comi	nents	%Rec	RQD
0.0	0	421.61									
	1		Coal Mine spoils (0-15')	SS-1	0-1.5	2-3-2	5				
	2										
	3										
	4										
	5										
	6		SAA	SS-2	5-6.5	2-2-2	4				
	7										
	8										
	9										
	10										
	11		SAA	SS-3	10-11.5	2-3-3	6				
	12										
	13										
	14										
15.0	15	406.61									
	16		Tan to gray, moist, very hard, silty CLAY (CL) to clayey SILT (ML) with weathered SANDSTONE	SS-4	15-16.5	10-12-50/3'	50+				
	17		residuum								
	18										
	19										
20.0	20	401.61									
	21		SAA	SS-5	20-21.5	50/2"	50+				
	22										
	23										
			Auger Petucal @ 24								
	24 Form GS9	901 7-26-20	Auger Refusal @ 24'	<u> </u>		<u> </u>				<u> </u>	

	SOUTHERN Z		PANY _	DRILLING LOG					D.	GPZ-	13
			ur World" GEOLOGIC	GEOLOGICAL SERVICES					Sheet 1 of 1		
	SITE		GORGAS STEAM PLANT								2.64
			GYPSUM STORAGE							131.45	
			90 BEARING								
			D NO. SAMPLE)	
			LENGTH								
			PTH NA ELEV T							8/2005	
	TYPE GI	ROUI	QUANTITY	MIX				COMP. DATE	-	8/2005	
	DRILLER		Billy Spivey RECORDER S. Sprayberry APPRO		Standa	ard Penetration		OMP. DATE			<u> </u>
	Depth	Elev.	Material Description, Classification and Remarks	Sample No.	From To	Blows	N	Comr	nents	%Rec	RQD
0.0	0	402.64									
	1		Coal Mine spoils (0-5')	SS-1	0-1.5	2-3-2	5				
	2				-						
ŀ	2										
	3										
	4										
5.0	5	397.64									
	6		Red, Coal Mine spoils (5-10')	SS-2	5-6.5	9-10-8	18				
•			red, coal wine spons (5 10)		0 0.0	0 10 0					
	7										
	8										
	9										
10.0	10	392.64									
				SS 2	10-11.5	255	10				
•	11		Tan to gray, moist to wet, stiff, silty CLAY (CL) with weathered SANDSTONE residuum	33-3	10-11.5	2-0-0	10				
	12										
ļ	13										
	14										
15.0	15	387.64									
. 5.0		307.04	Auger Refusal @ 15'	00.1	45.40.5	F0/0"	F0:				
	16			SS-4	15-16.5	50/2"	50+				
}	17]						
	18										
	19										
ŀ	20										
ŀ	21										
	22										
	23										
Ī	24										
L		901 7-26-20	1		1	<u> </u>					

ļ	SOUTHERN Z		ANY _	DRILLING LOG							GPZ-1	14
	Energy to	Serve You	ırWorld™	GEOLOGICAL SI					Sheet 1 of 2			
			GORGAS STEAM P									.93
				COOF							268.34	
			90 BEARING									
)									
			LENGTH PTH NAELEV									
			QUANTITY						TART DATE	_	3/2005	
	DRILLER	1	Billy Spivey RECORDER S. Spraybe	erry APPROVED	=				OMP. DATE		3/2005	
			Material Description, Classification and Rem			Standar From To	d Penetration	Test N	Comm	ents	%Rec	RQD
0.0		394.93									701100	-
0.0					24	0.4.5	4.0.5	0				
	1		Gray, moist, medium stiff to stiff, silty CLAY with SANDSTONE fragments, FILL	(CL) SS	S-1	0-1.5	4-3-5	8				
	2											
	3											
	4											
	5											
	6		SAA	SS	S-2	5-6.5	6-6-5	11				
	7			<u> </u>								
	8											
	9											
	10			<u> </u>								
	11		SAA	SS	S-3	10-11.5	6-7-5	12				
	12											
13.0	13	381.93										
	14											
	15											
	16		Gray to tan, moist, stiff, silty CLAY (CL) wit SANDSTONE and SHALE fragments, FILL	h . SS	S-4	15-16.5	3-4-6	10				
	17											
•	18											
	19											
	20						ا ا					
	21		SAA	SS	S-5	20-21.5	4-5-6	11				
	22											
	23											
	24 Form GS99	101 7 24 22										

DRILLING LOG GEOLOGICAL SERVICES

Hole No.

GPZ-14

GEOLOGICAL SERVICES Sheet 2 of 2

	Energy t	o Serve You	r World" GEOLOGICA	AL SERV	/ICES		Sheet 2 of 2	Sheet 2 of 2			
	SITE		GORGAS STEAM PLANT			FOTAL DEPTH		SURF.ELEV.	394	394.93	
	Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Stand: From To	ard Penetration 1 Blows	Test N	Comments	%Rec	RQD	
	25										
	26		SAA	SS-6	25-26.5	5-8-6	14				
	27										
	28										
	29										
30.0	30	364.93									
	31		Gray, moist, stiff, silty CLAY (CL/CH) with highly weathered SANDSTONE residuum	SS-7	30-31.5	4-5-8	13				
	32		weatnered SANDSTONE residuum								
	33										
	34										
35.0	35	359.93	Augus Dafaral @ 251								
	36		Auger Refusal @ 35'	SS-8	35-36.5	10-50/2"	50+				
	37										
	38										
	39										
	40										
	41										
	42										
	43										
	44										
	45										
	46										
	47										
	48										
	49										
	50										
	51										
	52										
	53										
	54										
	55										
	56										

OU 1	THERN	DR			Hole No) .	GPZ-	15		
	o Serve You		OGICAL SERVI					Sheet 1		
SITE _		GORGAS STEAM PLANT							411	.18
		GYPSUM STORAGE							236.28	
ANGLE		90 BEARING	CONTRACTO	OR	SCS		DRILL NO.	CN	IE-550	
DRILLIN	IG METHOI									
	SIZE	LENGTH								
		PTH NA ELEV.					START DATE			
	ROUT	B. Filipovich RECORDER S. Sprayberry					COMP. DATE		0/2005	
JKILLL		B. I ilipovicit Recorded G. Oprayborry	AFFROVED		dard Penetration		COMF. DATE			
Depth	Elev.	Material Description, Classification and Remarks	Sample No.	From To	Blows	N	Comr	nents	%Rec	RQD
0	411.18									
1		Coal Mine spoils (0-101')	SS-1	0-1.5	4-11-10	21				
2										
3										
4										
5			20.0							
6		SAA	SS-2	5-6.5	21-22-19	41				
7										
8										
9										
10										
11		SAA	SS-3	10-11.5	7-11-25	36				
12										
13										
14										
15			00.4	45.40.5	4.0.40	04				
16		SAA	SS-4 	15-16.5	4-9-12	21				
17										
18										
19										
20		SAA	SS-5	20-21.5	7-16-13	29				
21		- John		20-21.3	1-10-13	23				
22										
23										

SOUTHERN 🕰
COMPANY _
Energy to Serve Your World™

DRILLING LOG GEOLOGICAL SERVICES

Hole No.

GPZ-15

Sheet 2 of 4

SITE _		GORGAS STEAM PLANT			TOTAL DEPTH		1.5 SURF.ELEV.	411	.18
Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Stand From To	ard Penetration Blows	Test N	Comments	%Rec	RQD
25									
26		SAA	SS-6	25-26.5	4-16-33	49			
27									
28									
29									
30			SS-7	20.24.5	44 40 47	20			
31		SAA	33-7	30-31.5	11-13-17	30			
32									
33									
34									
35									
36		SAA	SS-8	35-36.5	6-5-6	11			
37									
38									
39									
40									
41		SAA	SS-9	40-41.5	3-4-5	9			
42									
43									
44									
45									
46		SAA	SS-10	45-46.5	3-5-6	11			
47									
48									
49									
50									
51		SAA	SS-11	50-51.5	2-5-5	10			
52									
53									
54									
55									
		544	SS 40	55_56 F	3-4-7	11			
56		SAA	SS-12	55-56.5	3-4-7	11			

SOUTHERN A
COMPANY _
Energy to Serve Your World™

DRILLING LOG GEOLOGICAL SERVICES

Hole No.

GPZ-15

Sheet 3 of 4

SITE _		GORGAS STEAM PLANT			TOTAL DEPTH		1.5 SURF.ELEV.	411	1.18
Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standa From To	ard Penetration T Blows	est N	Comments	%Rec	RQD
57								701100	
58									
59									
60									
61		SAA	SS-13	60-61.5	5-5-6	11			
62									
63									
64									
65									
66		SAA	SS-14	65-66.5	5-6-6	12			
67									
68									
69									
70		544							
71		SAA	SS-15	70-71.5	5-6-9	15			
72									
73									
74									
75									
76		SAA	SS-16	75-76.5	WOR-3-7	10			
77									
78									
79									
80									
81		SAA	SS-17	80-81.5	6-8-15	23			
82									
83									
84									
85									
86		SAA	SS-18	85-86.5	6-8-13	21			
87									
88									1

DRILLING LOG Hole No. GPZ-15 SOUTHERN COMPANY
Energy to Serve Your World **GEOLOGICAL SERVICES** Sheet 4 of 4 **GORGAS STEAM PLANT** 101.5 SITE TOTAL DEPTH SURF.ELEV. 411.18 Standard Penetration Test Depth Elev. Material Description, Classification and Remarks Comments RQD Sample No. From To %Rec 89 90 SAA SS-19 90-91.5 5-8-9 17 91 92 93 94 95 96 SAA SS-20 95-96.5 WOR WOR 97 98 99 100 101.0 101.5 101 310.18 SS-21 100-101.5 6-9-12 21 309.68 Tan, moist, stiff, sandy SILT (ML) 102 Boring Terminated @ 101.5' 103 104 105

Form GS9901 7-26-200

:		COME	PANY _	DRILLING					Hole No	١.	GPZ-1	16
ŀ		o Serve Yo	ur World"	GEOLOGICAL						Sheet 1		
	SITE _			M PLANT		H	OLE DEPTH	55.5		SURF.ELEV.	440	.65
			GYPSUM STORAGE			_					813.17	
	ANGLE		90 BEARING	cc	ONTRACT	OR Chris	stian Testir	ng Lab.	DRILL NO.	CN	IE-850	
	DRILLIN	IG METHO	D	NO. SAMPLES		12		NO. U.D. SA	MPLES	()	
ı	CASING	SIZE	LENGTH		CORE S	IZE		тот	TAL % REC.			
	WATER	TABLE DE	PTH NA ELEV.	TIME A	AFTER CC	MP		D	ATE TAKEN			
	TYPE G	ROUT							TART DATE		4/2005	
	DRILLE	R	Billy Spivey RECORDER S. Spra	ayberry APPROVED				DRILLING C	OMP. DATE	3/2	4/2005	
ľ	Depth	Elev.	Material Description, Classification an	d Remarks Sa	ample No	Standa From To	rd Penetration Blows	Test N	Comm	nents	%Rec	RQD
	·										761100	
0	0	440.65		-								
L	1		Coal Mine spoils (0-43')		SS-1	0-1.5	6-10-12	22				
	2			F								
ľ			1									
ŀ	3		1									
ļ	4		_									
	5											
Ī	0		1		SS-2	F 0 F	00.05.00	50				
ŀ	6		SAA		SS-2	5-6.5	22-25-33	58				
Ļ	7		4									
	8											
	0											
ŀ	9		-									
ŀ	10		4	L								
	11		SAA		SS-3	10-11.5	4-6-10	16				
	12			<u> </u>								
ŀ			1									
L	13		-									
ļ	14											
	15											
ľ			1		00.4	15.10.5	0.7.7					
ŀ	16		SAA		SS-4	15-16.5	3-7-7	14				
-	17											
	18											
Ī	10											
ŀ	19		1									
-	20		-	L								
	21		SAA		SS-5	20-21.5	4-9-10	19				
ſ	22			L								
┢	22		-									
-	23		-									
	24											
1	Form GS0	901 7-26-20	2004									_

SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG GEOLOGICAL SERVICES

Hole No.

GPZ-16

Sheet 2 of 2

SITE		GORGAS STEAM PLANT	GORGAS STEAM PLANT			TOTAL DEPTH 55.5			SURF.ELEV. 440.65		
				Standard Penetration Test		Comments					
Depth	Elev.	Material Description, Classification and Remarks	Sample No.	From To	Blows	N	Comments	%Rec			
25											
26		SAA	SS-6	25-26.5	4-9-11	20					
27											
28											
29											
30											
31		SAA	SS-7	30-31.5	5-6-12	18					
32											
33											
34											
35											
36		SAA	SS-8	35-36.5	9-14-19	33					
37											
38											
39											
40											
41		SAA	SS-9	40-41.5	10-11-23	34					
42											
43	397.65		4								
44											
45											
46		Gray, soft, weathered SHALE residuum	SS-10	45-46.5	18-50/4"	50+					
47											
48											
49											
50	390.65										
51		Tan, soft to medium hard, weathered SANDSTONE	SS-11	50-51.5	50/3"	50+					
52											
53											
54											
55	385.15										
56	901 7-26-20	Boring Terminated @ 55.5' (Not Auger refusal)	SS-12	55-55.5'	50/3"	50+					

	SOUT	THERN	DRILLI	NG LO	G			Hole No	Э.	GPZ-	17
		o Serve You	r World GEOLOGICA						Sheet 1		
	SITE _		GORGAS STEAM PLANT								
			GYPSUM STORAGE								
	ANGLE		90 BEARING	CONTRACT	ror Chris	stian Testir	ig Lab.	DRILL NO.	CN		
	DRILLIN	IG METHOI								0	
			LENGTH								
			PTH NA ELEV TIP				D	ATE TAKEN	3/2	3/2005	
		ROUT	QUANTITY					OMP. DATE	3/2	3/2005	
	DRILLE	K	Billy Spivey RECORDER S. Sprayberry APPRO	VED		rd Penetration		OMP. DATE		1	1
	Depth	Elev.	Material Description, Classification and Remarks	Sample No.	From To	Blows	N	Comn	nents	%Rec	RQD
0.0	0	414.27									
	1		Coal Mine spoils (0-5')	SS-1	0-1.5	8-8-9	17				
	2										
	3										
	4										
5.0	5	409.27									
	6		Tan to gray, moist, very stiff to very hard, clayey SILT (ML) with highly weathered SHALE and SANDSTONE	SS-2	5-6.5	26-26-36	62				
	7		residuum								
	8										
	9										
	10										
	11		SAA	SS-3	10-11.5	9-9-14	23				
	12										
	13										
	14										
15.0	15	399.27									
	16		Tan, dry to moist, very hard, clayey SILT (ML)	SS-4	15-16.5	25-50/3"	50+				
	17		with weathered SANDSTONE								
	18										
	19										
	20										
	21		Tan, soft, weathered SANDSTONE	SS-5	20-21.5	27-29-50	79				
	22										
	23										

SOUTHERN COMPANY

DRILLING LOG GEOLOGICAL SERVICES

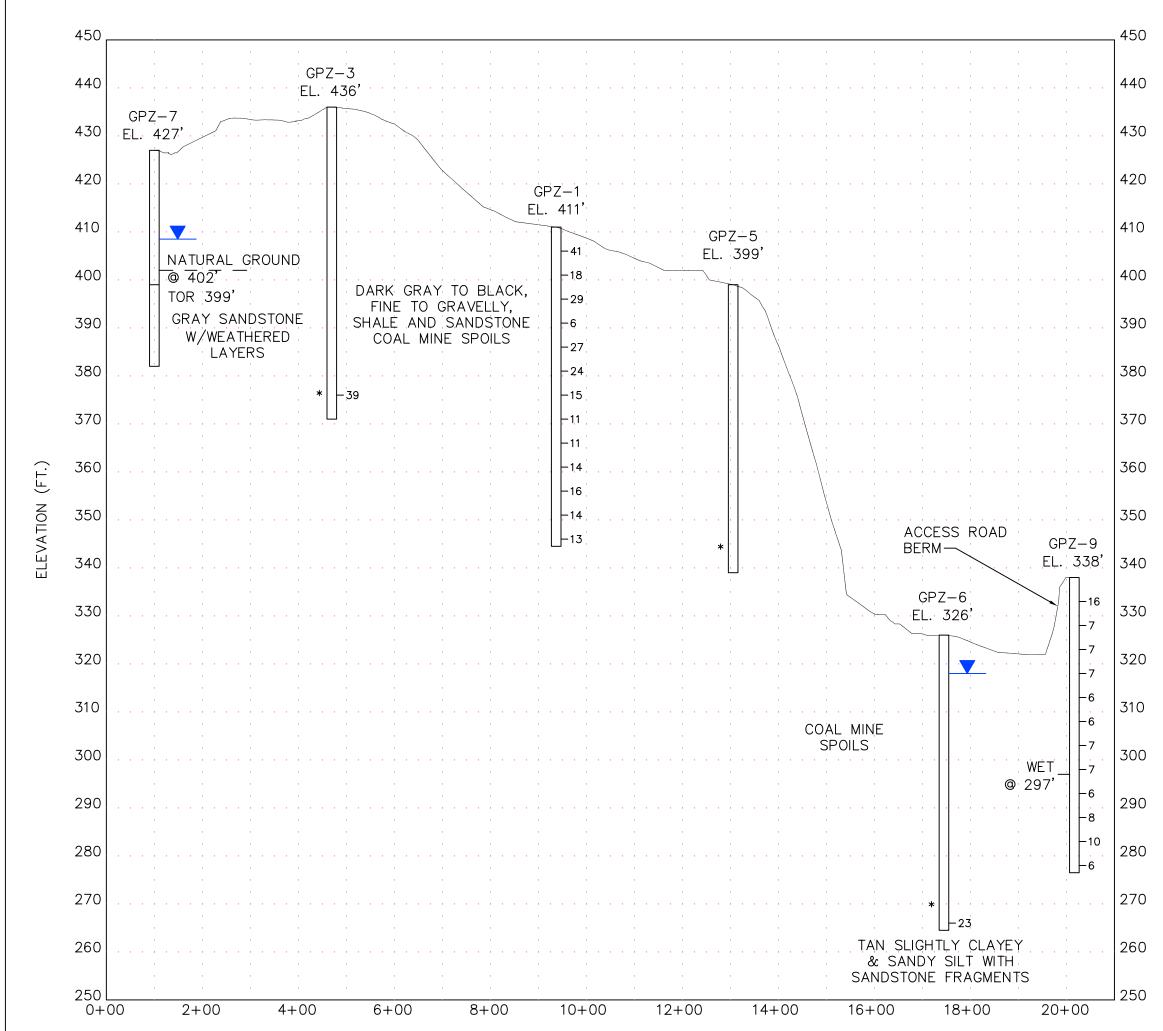
Hole No.

GPZ-17

Sheet 2 of 2

GORGAS STEAM PLANT 30.5 414.27 SURF.ELEV. TOTAL DEPTH Standard Penetration Test RQD Depth Elev Material Description, Classification and Remarks Sample No Comments %Rec 25.0 25 389.27 SS-6 25-26.5 26 Gray, soft, weathered SHALE 19-50/4" 50+ 27 28 29 30 30.5 383.77 SAA SS-7 30-31.5 50/3" 31 Boring Terminated @ 30.5' (not auger refusal) 50+ 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56

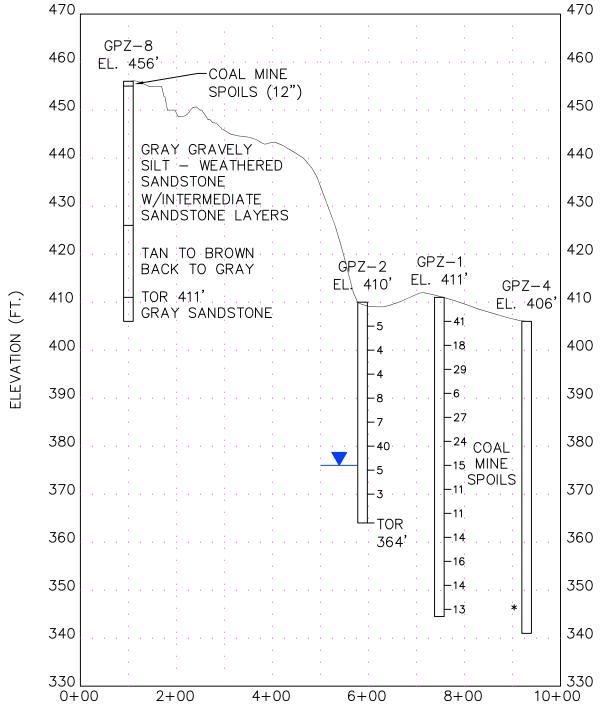
	SOUT	THERN COMP	PANY _	LING LO).	GPZ-	18
	Energy t	o Serve Yor	ur World" GEOLOGI	ICAL SERV					Sheet 1		
			GORGAS STEAM PLANT GYPSUM STORAGE								.02
					· ·					290.18	
		IG METHOI	90 BEARING NO. SAMP								
			LENGTH								
			PTH NA ELEV.								
			QUANTITY	MIX			DRILLING S	TART DATE	3/2	3/2005	
			Billy Spivey RECORDER S. Sprayberry APP				DRILLING C	OMP. DATE		3/2005	
	Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standa From To	ard Penetration Blows	Test N	Comn	nents	%Rec	RQD
	0	338.02									
	-	330.02		00.4	0.4.5	5.5.0	40				
	1		Coal Mine spoils (0-1')	SS-1	0-1.5	5-5-8	13				
	2		Tan to brown, moist, stiff, clayey SILT (ML)								
	3										
	4										
5.0	5	333.02									
	6		Tan to gray, moist, very hard, clayey SILT (ML)	SS-2	5-6.5	30-26-50	76				
	7		with highly weathered SHALE residuum								
	8										
	9										
	10										
	11		SAA	SS-3	10-11.5	31-50/5"	50+				
	12										
	13										
	14										
15.5	15	322.52									
	16		Auger Refusal @ 15.5'	SS-4	15-16.5	50+/6"	50+				
	17										
	18										
	19										
	20										
	21										
	22										
	23										
	24	901 7-26-20									



NORTH - SOUTH CROSS SECTION

HORIZONTAL SCALE: 1"= 200' VERTICAL SCALE: 1"= 20'

* GPZ-4&5 WERE DRILLED WITH NO STANDARD PENETRATION VALUES TAKEN. GPZ-3&6 WERE DRILLED WITH SPT VALUES TAKEN AT 60' - 61.5' BELOW GROUND SURFACE.



WEST - EAST CROSS SECTION

HORIZONTAL SCALE: 1"= 200' VERTICAL SCALE: 1"= 20'

> INTERPRETATIONS OF RESIDUAL SOILS, ROCK TYPES, ROCK CHARACTERISTICS, AND DEGREE OF WEATHERING ARE TRUE ONLY AT THE BORING LOCATION. PROFESSIONAL JUDGEMENT HAS BEEN USED TO EVALUATE THE DATA COLLECTED. HOWEVER, ANY INTERPOLATION OF CONDITIONS BETWEEN BORINGS IS CONJECTURE AND THE ACCURACY OF SUCH INTERPOLATION IS NOT GUARANTEED. THE LINES DESIGNATING THE INTERFACES BETWEEN VARIOUS STRATA ARE APPROXIMATE ONLY, AS TRANSITIONS BETWEEN MATERIALS MAY BE GRADUAL.

Southern Company Services, Inc.

FIGURE 8 PLANT GORGAS PROPOSED GYPSUM STORAGE AREA GEOLOGICAL CROSS SECTIONS NORTH - SOUTH & WEST - EAST

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ES1218S8

Attachment C - Laboratory Analyses

Testing results of the coal mine spoil samples are summarized below.

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Table 1 Laboratory Results for Coal Mine Spoils

Sample		Grain Size	Max Dry Density	Optimum Moisture	
	% Gravel	% Sand	% Fines	(pcf)	(%)
Mine Spoil #1	45.3	31.8	22.9	105.8	13.0
Mine Spoil #2	37.5	31.7	30.8	103.3	12.6
Mine Spoil #3	39.0	34.2	26.8	103.9	14.0
#3 Recompacted*	21.0	40.6	38.4	103.9	14.0

^{*} Mine Spoil #3 was retested after the proctor test to determine how much the material would break down in the compacting and placement process.

Attachment D – Drawing Used to Develop Critical Section Profile

