

**PERIODIC SAFETY FACTOR ASSESSMENT  
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) and the State of Alabama’s ADEM Admin. Code Chapter 335-13-15, require the owner or operator of an existing CCR surface impoundment to conduct periodic safety factor assessments. Per §257.73(e) and ADEM Admin. Code r. 335-13-15-.04(4)(e), the owner or operator must document that the minimum safety factors outlined in §257.73(e)(1)(i) through (iv) and ADEM Admin. Code r. 335-13-15-.04(4)(e)(1)(i) through (iv) for the critical embankment section are achieved. In addition, §257.73(f)(3) and ADEM Admin. Code r. 335-13-15-.04(4)(f)3. require a subsequent assessment be performed within 5 years of the previous assessment.

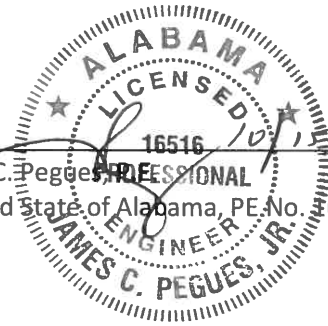
The CCR surface impoundment located at Alabama Power Company’s Plant Gorgas also referred to as the Plant Gorgas Gypsum Pond is located on Plant Gorgas property, southeast from Parrish, Alabama. The CCR surface impoundment is formed by an engineered cross-valley embankment. The Plant Gorgas Gypsum Pond is currently undergoing closure by removal and a substantial portion of the gypsum has been removed. However, the cross-section has been modeled for maximum storage conditions as all gypsum has not yet been removed and surface elevations within the unit vary. The critical section of this CCR unit had previously been determined to be located, and remains, 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 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	2.1	1.0

The embankments are constructed of silts, clays, clean sands and riprap 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. §257.73 (e)(1) and ADEM Admin. Code r. 335-13-15-.04(4)(e)(1).

  
James C. Pegues, Professional Engineer, License No. 16516  
Licensed State of Alabama, PE No. 16516



## Technical and Project Solutions Calculation

**Calculation Number:**  
TV-GO-APC962011-002

<b>Project/Plant:</b> Plant Gorgas Gypsum Pond	<b>Unit(s):</b> --	<b>Discipline/Area:</b> Env. Solutions
<b>Title/Subject:</b> Periodic Factor of Safety Assessment for CCR Rule		
<b>Purpose/Objective:</b> Determine the Factor of Safety of the Gypsum Pond Dike		
<b>System or Equipment Tag Numbers:</b> n/a	<b>Originator:</b> Jacob A. Jordan, P.E.	

### Contents

Topic	Page	Attachments <small>(Computer Printouts, Tech. Papers, Sketches, Correspondence)</small>	# of Pages
Purpose of Calculation	2	Attachment A - Boring Location Plan	1
Summary of Conclusions	2	Attachment B - Boring Logs	32
Methodology	2	Attachment C - Laboratory Analyses	1
Criteria and Assumptions	2	Attachment D - Critical Section Profile Used in Analysis	1
Design Inputs/References	3		
Body of Calculation	4-7		
Total # of pages including cover sheet & attachments:		47	

### Revision Record

Rev. No.	Description	Originator Initial / Date	Reviewer Initial / Date	Approver Initial / Date
0	Issued for Information	JAJ/07-12-21	JCP/07-13-21	JCP/07-13-21

### Notes:

## Purpose of Calculation

Plant Gorgas was a coal-fired electric generating facility, consisting of 10 units over its lifetime. The Plant Gorgas Gypsum Pond was 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 was wet-sluciced to the gypsum storage area, where it was either allowed to settle in the pond or was dewatered and stacked. The last operating units at the plant, Units 8-10, were shut down in April 2019, along with the Gypsum Pond.

Stability analyses were previously performed in 2016 for the CCR Rule. The purpose of this calculation is to update the 2016 stability analysis of Gypsum Pond.

## Summary of Conclusions

The following table lists the factors of safety for various slope stability failure conditions. All conditions are steady state except where noted. Construction cases were not considered. The analyses indicate that in all cases the factor of safety is at or above the require minimum.

Load Conditions	Computed Factor of Safety	Required Minimum Factor of Safety
Long-term Maximum Storage (Static)	2.5	1.5
Maximum Surcharge Pool (Static)	2.5	1.4
Seismic	2.1	1.0

## Methodology

The calculation was performed using the following methods and software:

- GeoStudio 2021 R2 version 11.1.1.22085 Copyright 1991-2021, GEO-SLOPE International, Ltd.
- Strata (Version 0.8.0), University of Texas, Austin
- Morgenstern-Price analytical method

## 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 2014 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 0.080g for use as a horizontal acceleration in the stability analysis.
- The current required minimum criteria (factors of safety) were taken from the Structural Integrity Criteria for existing CCR surface impoundment from 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 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.
- The Gypsum Pond is currently undergoing closure by removal, with the gypsum being reclaimed for beneficial use purposes. However, the facility was modeled for maximum storage as all gypsum has not been removed and surface elevations vary.

### 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.

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

### Design Inputs/References

- SCS Calculation TV-GO-APC389153-002
- USGS Earthquake Hazards website, [earthquake.usgs.gov/hazards/interactive](http://earthquake.usgs.gov/hazards/interactive)
- US Corps of Engineers Manual EM 1110-2-1902, October 2003
- 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

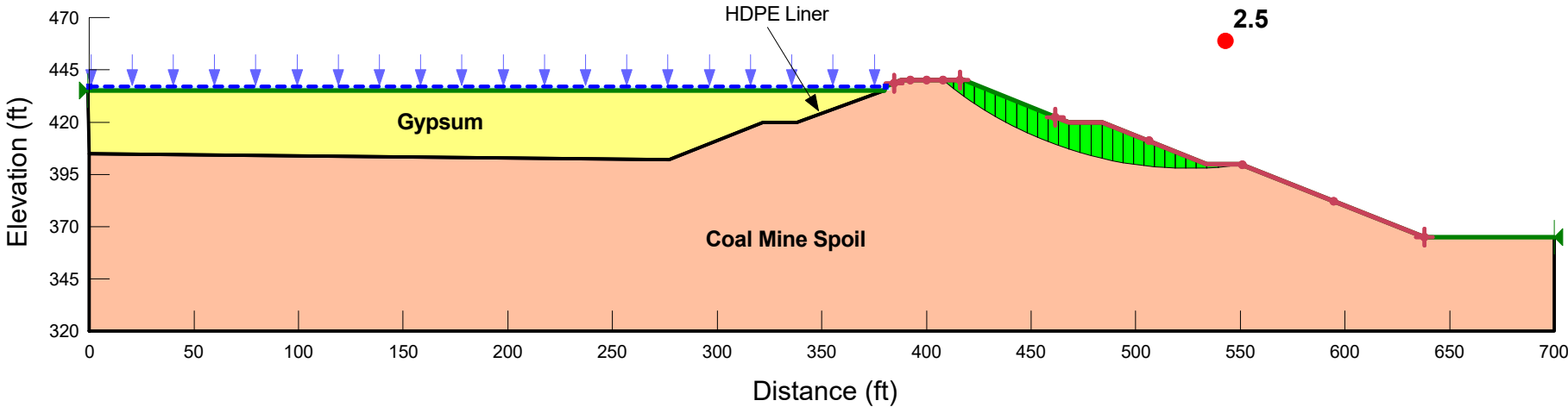
## **Body of Calculation**

SLOPE/W modeling attached.

# Plant Gorgas Gypsum Pond Factor of Safety Assessment

## Maximum Storage

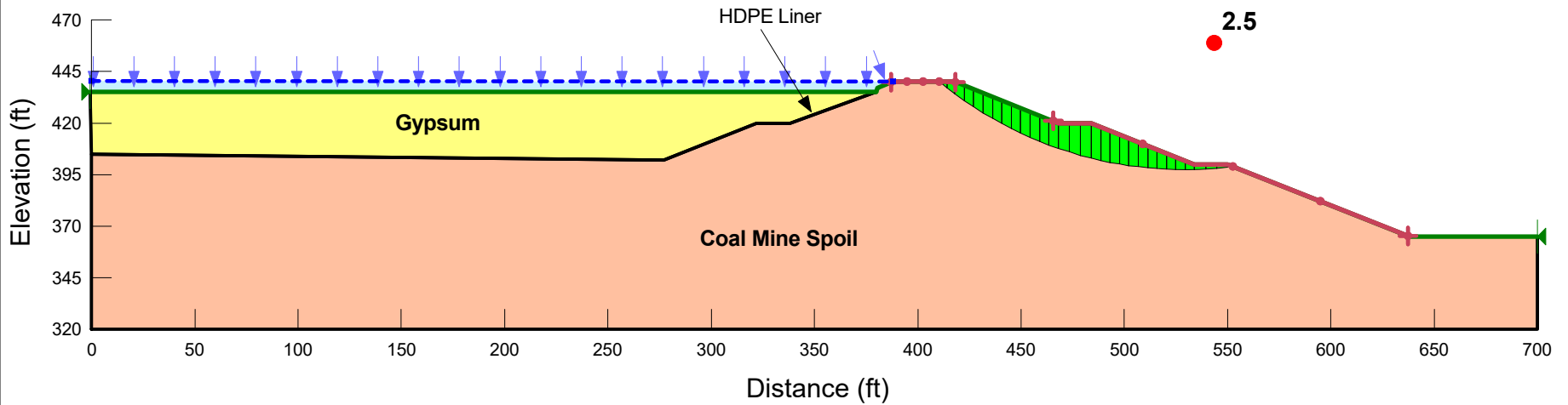
Color	Name	Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
Orange	Coal Mine Spoil	Mohr-Coulomb	104	0	36
Yellow	Gypsum	Mohr-Coulomb	100	100	34



**Plant Gorgas Gypsum Pond  
Factor of Safety Assessment**

**Maximum Surcharge Pool**

Color	Name	Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
Orange	Coal Mine Spoil	Mohr-Coulomb	104	0	36
Yellow	Gypsum	Mohr-Coulomb	100	100	34

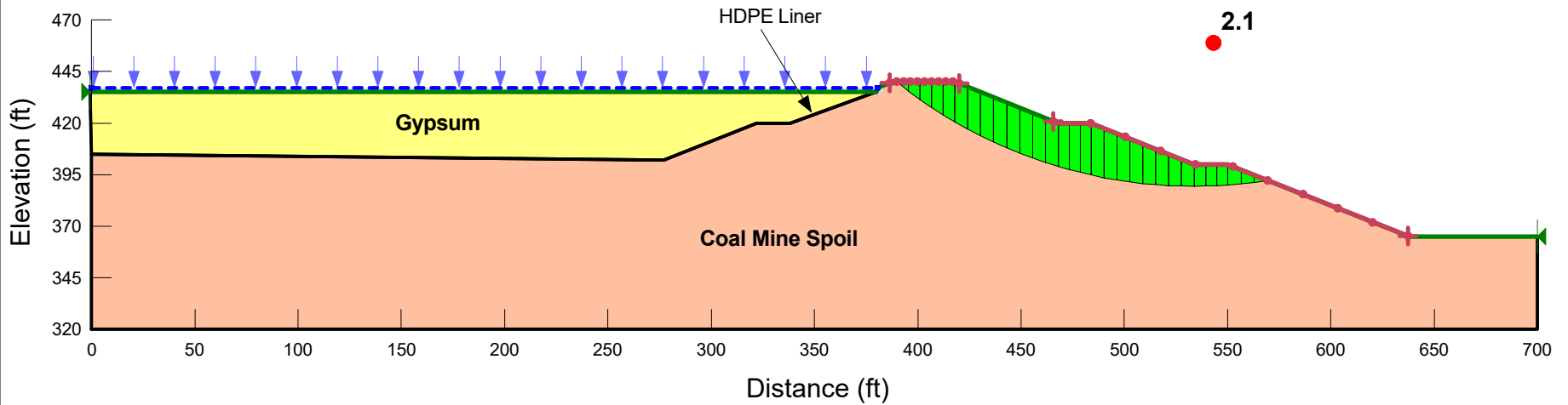




**Plant Gorgas Gypsum Pond  
Factor of Safety Assessment**

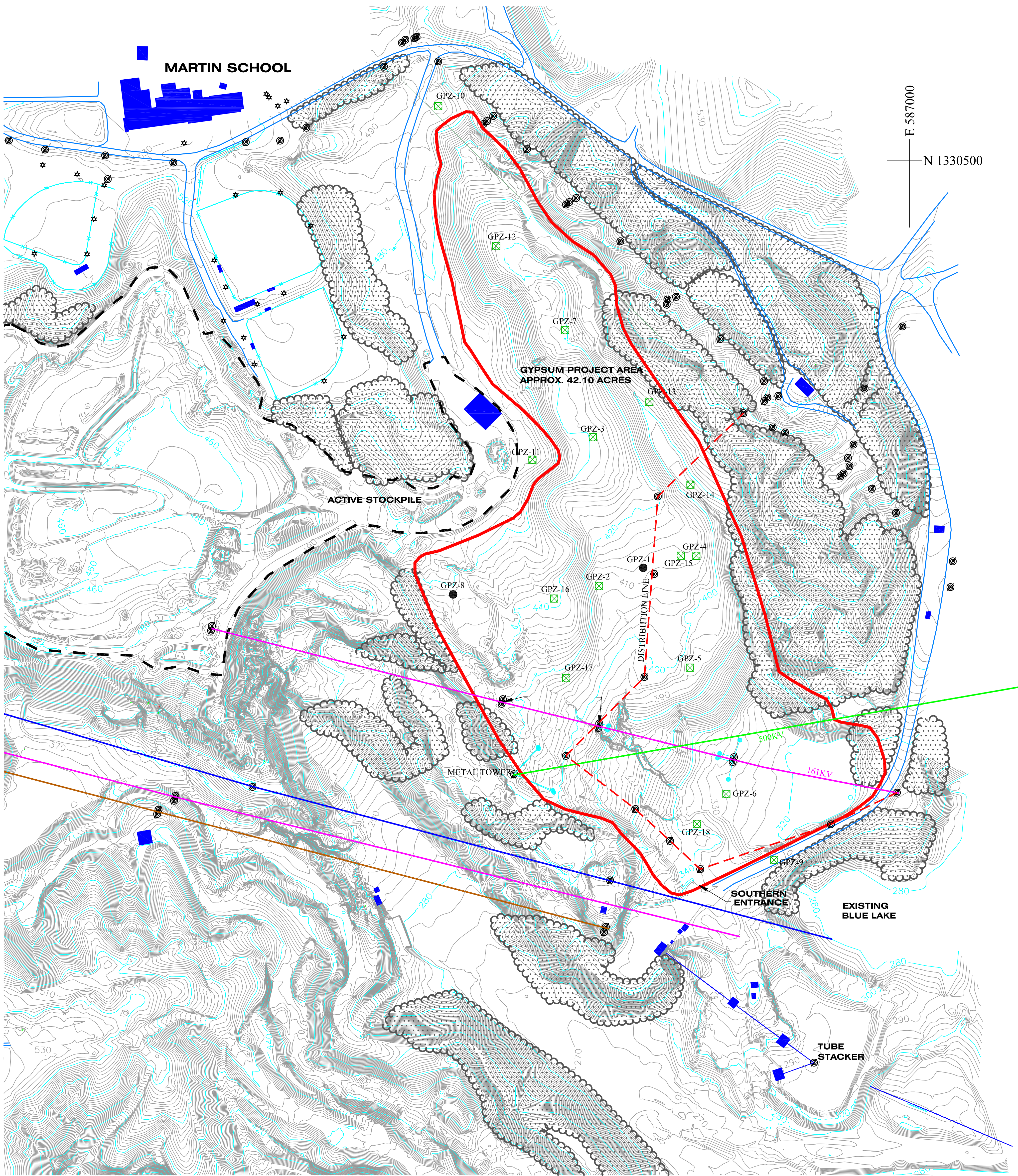
**Seismic Loading  
Horizontal Coefficient: 0.08g**

Color	Name	Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
Orange	Coal Mine Spoil	Mohr-Coulomb	104	0	36
Yellow	Gypsum	Mohr-Coulomb	100	100	34



**Attachment A**

Boring Location Plan

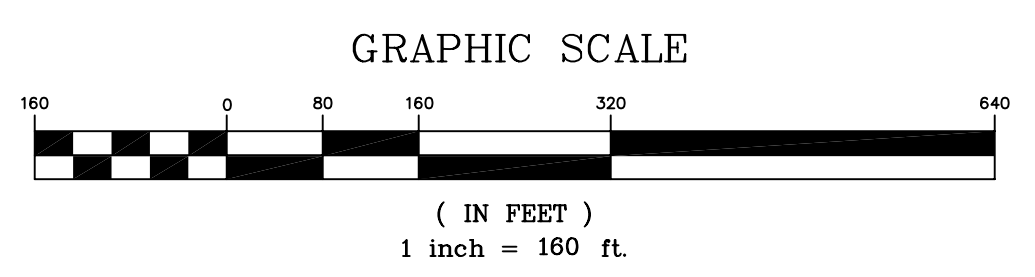


E 587000  
N 1330500

**LEGEND**

- GPZ-1 ● **BORING**
- GPZ-6 ☒ **PIEZOMETER**
- ⊙ **POWER POLE**
- ⊛ **GUY WIRE**
- ☆ **LIGHT POLE**
- — — **FENCE**
- - - **ACTIVE STOCKPILE AREA**
- — — **ROADS**
- **STRUCTURES**
- ☁ **AREAS OF DENSE VEGETATION**
- — — **PROPOSED GYPSUM STORAGE AREA BOUNDARY**
- - - **DISTRIBUTION LINE**
- — — **161KV TRANSMISSION LINE**
- — — **500KV TRANSMISSION LINE**

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



**PHOTOGRAMMETRIC SURVEY  
GRID COORDINATES NAD 27  
ALABAMA STATE PLANE  
WEST ZONE**

- NOTES:**
- 1) DATE OF AERIAL PHOTOGRAPHY 04/02/2003
  - 2) PHOTOGRAMMETRIC DATA COLLECTED 05/13/2003
  - 3) CONTOURS WERE PRODUCED BY DIGITAL TERRAIN MODEL
  - 4) CONTOUR INTERVAL 2 FEET
  - 5) CONTOURS APPROXIMATE IN AREAS OF DENSE VEGETATION
  - 6) RASTER OVERLAY OF GOODSPRINGS 7 1/2 Min. USGS QUAD SHEET
  - 7) DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE.

Southern Company Generation  
for  
**ALABAMA POWER COMPANY**

**FIGURE 2  
PLANT GORGAS  
GYPSUM STORAGE AREA  
BORING & PIEZOMETER LOCATIONS**

SCALE: 1:160 ES1341S2

## **Attachment B**

### Boring Logs



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

Hole No. GPZ-1

Sheet 1 of 3

SITE Plant Gorgas Gypsum Disposal Area HOLE DEPTH 66.5' SURF.ELEV. 411

LOCATION North of Plant Gorgas in Coal Mine Spoil Storage Area COORDINATES N \_\_\_\_\_ E \_\_\_\_\_

ANGLE \_\_\_\_\_ BEARING \_\_\_\_\_ CONTRACTOR SCS DRILL NO. \_\_\_\_\_

OVERBURDEN DEPTH \_\_\_\_\_ NO. SAMPLES 13 NO. U.D. SAMPLES \_\_\_\_\_

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

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

TYPE GROUT Auger Spoils QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ DRILLING START DATE 4/29/2003

DRILLER B. Filipovich RECORDER J. Chitwood APPROVED \_\_\_\_\_ DRILLING COMP. DATE 4/29/2003

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments	
				From To	Blows	N			
	0								
	1		Coal Mine Spoils 0 - 66.5' Dark gray-black 10YR3/1 very dark gray						
	2								
	3								
	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								
	21				20.0-21.5	9-3-3	6	4	
	22								
	23								
	24								



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

Hole No. **GPZ-1**

Sheet 2 of 3

SITE **Plant Gorgas Gypsum Disposal Area** TOTAL DEPTH **66.5'** SURF.ELEV. **411**

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments
				From To	Blows	N		
	25		Coal Mine Spoils					
	26			25.0-26.5	11-14-13	27	5	
	27							
	28							
	29							
	30							
	31			30.0-31.5	9-11-13	24	6	
	32							
	33							
	34							
	35							
	36		35.0-36.5	5-7-8	15	7		
	37							
	38							
	39							
	40							
	41		40.0-41.5	6-6-5	11	8		
	42							
	43							
	44							
	45							
	46		45.0-46.5	5-5-6	11	9		
	47							
	48							
	49							
	50							
	51		50.0-51.5	9-7-7	14	10		
	52							
	53							
	54							
	55							
	56		55.0-56.5	4-7-9	16	11		



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

Hole No. **GPZ-1**

Sheet 3 of 3

SITE **Plant Gorgas Gypsum Disposal Area** TOTAL DEPTH **66.5'** SURF.ELEV. **411**

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments	
				From To	Blows	N			
	57		Coal Mine Spoils						
	58								
	59								
	60								
	61				60.0-61.5	4-7-7	14	12	
	62								
	63								
	64								
	65								
	66				65.0-66.5	9-7-6	13	13	
66.5		344.5							
	67		Boring terminated @ 66.5'						
	68		No water encountered. Hole backfilled with auger spoils.						
	69								
	70								
	71								
	72								
	73								
	74								
	75								
	76								
	77								
	78								
	79								
	80								
	81								
	82								
	83								
	84								
	85								
	86								
	87								
	88								



## DRILLING LOG GEOLOGICAL SERVICES

Hole No. **GPZ-2**  
Sheet 1 of 2

SITE **Plant Gorgas Gypsum Disposal Area** HOLE DEPTH **46'** SURF.ELEV. **410**  
 LOCATION **North of Plant Gorgas in Coal Mine Spoil Storage Area** COORDINATES N \_\_\_\_\_ E \_\_\_\_\_  
 ANGLE \_\_\_\_\_ BEARING \_\_\_\_\_ CONTRACTOR **SCS** DRILL NO. \_\_\_\_\_  
 OVERBURDEN DEPTH \_\_\_\_\_ NO. SAMPLES **8** NO. U.D. SAMPLES \_\_\_\_\_  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZE \_\_\_\_\_ TOTAL % REC. \_\_\_\_\_  
 WATER TABLE DEPTH **34** ELEV. **376** TIME AFTER COMP. **48 hrs** DATE TAKEN **5/2/2003**  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ DRILLING START DATE **4/29/2003**  
 DRILLER **B. Filipovich** RECORDER **J. Chitwood** APPROVED \_\_\_\_\_ DRILLING COMP. DATE **4/30/2003**

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments
				From To	Blows	N		
	0							
	1		Coal Mine Spoils 0 - 46'					
	2							
	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	
	12							
	13							
	14							
	15							
	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							





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

Hole No. **GPZ-2**

Sheet 2 of 2

SITE Plant Gorgas Gypsum Disposal Area TOTAL DEPTH 46' SURF.ELEV. 410

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments
				From To	Blows	N		
	25		Coal Mine Spoils					
	26			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							
	36		Saturated @ 36'	35.0-36.5	2-2-3	5	7	
	37							
	38							
	39							
	40							
	41			40.0-41.5	1-1-2	3	8	
	42							
	43							
	44							
	45							
46.0	46	364.00	Boring terminated @ 46' - 10' of auger broke off in the hole. Offset 5' and cored 5' of rock.					
	47							
	48							
	49							
	50							
	51							
	52							
	53							
	54							
	55							
	56							



## DRILLING LOG GEOLOGICAL SERVICES

Hole No. **GPZ-3**

Sheet 1 of 1

SITE **Plant Gorgas Gypsum Disposal Area** HOLE DEPTH **65'** SURF.ELEV. **436**  
 LOCATION **North of Plant Gorgas in Coal Mine Spoil Storage Area** COORDINATES N \_\_\_\_\_ E \_\_\_\_\_  
 ANGLE \_\_\_\_\_ BEARING \_\_\_\_\_ CONTRACTOR **SCS** DRILL NO. \_\_\_\_\_  
 OVERBURDEN DEPTH \_\_\_\_\_ NO. SAMPLES **1** NO. U.D. SAMPLES \_\_\_\_\_  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZE \_\_\_\_\_ TOTAL % REC. \_\_\_\_\_  
 WATER TABLE DEPTH **Dry** ELEV. \_\_\_\_\_ TIME AFTER COMP. **48 hrs** DATE TAKEN **5/2/2003**  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ DRILLING START DATE **4/30/2003**  
 DRILLER **B. Filipovich** RECORDER **H. Hill** APPROVED \_\_\_\_\_ DRILLING COMP. DATE **4/30/2003**

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments	
				From	To	Blows			
	0								
	1								
	2		Coal Mine Spoils 0 - 65' Dark gray-black 10YR3/1 very dark gray						
	3								
	4								
	5								
	6								
	7								
	8								
	9								
	10								
	.								
	.								
	.								
	.								
	.								
	58								
	59								
	60								
	61			60.0-61.5	11-15-24	39	1		
	62								
	63								
	64								
65.0	65	371.00	Boring Terminated @ 65'. Set Piezometer.						



# DRILLING LOG

## GEOLOGICAL SERVICES

Hole No. **GPZ-4**

Sheet 1 of 1

SITE **Plant Gorgas Gypsum Disposal Area** HOLE DEPTH **65'** SURF.ELEV. **406**

LOCATION **North of Plant Gorgas in Coal Mine Spoil Storage Area** COORDINATES N \_\_\_\_\_ E \_\_\_\_\_

ANGLE \_\_\_\_\_ BEARING \_\_\_\_\_ CONTRACTOR **SCS** DRILL NO. \_\_\_\_\_

OVERBURDEN DEPTH \_\_\_\_\_ NO. SAMPLES \_\_\_\_\_ NO. U.D. SAMPLES \_\_\_\_\_

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

WATER TABLE DEPTH **Dry** ELEV. \_\_\_\_\_ TIME AFTER COMP. **48 hrs** DATE TAKEN **5/2/2003**

TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ DRILLING START DATE **4/30/2003**

DRILLER **B. Filipovich** RECORDER **H. Hill** APPROVED \_\_\_\_\_ DRILLING COMP. DATE **4/30/2003**

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments
				From	To	Blows		
	0							
	1							
	2		Coal Mine Spoils 0 - 65' Dark gray-black 10YR3/1 very dark gray No Rock Encountered. No water.					
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	.							
	.							
	.							
	.							
	.							
	58							
	59							
	60							
	61							
	62							
	63							
	64							
65.0	65	341.00	Boring Terminated @ 65'. Set Piezometer.					



# DRILLING LOG

## GEOLOGICAL SERVICES

Hole No. **GPZ-5**

Sheet 1 of 1

SITE **Plant Gorgas Gypsum Disposal Area** HOLE DEPTH **60'** SURF.ELEV. **399**

LOCATION **North of Plant Gorgas in Coal Mine Spoil Storage Area** COORDINATES N \_\_\_\_\_ E \_\_\_\_\_

ANGLE \_\_\_\_\_ BEARING \_\_\_\_\_ CONTRACTOR **SCS** DRILL NO. \_\_\_\_\_

OVERBURDEN DEPTH \_\_\_\_\_ NO. SAMPLES \_\_\_\_\_ NO. U.D. SAMPLES \_\_\_\_\_

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

WATER TABLE DEPTH **Dry** ELEV. \_\_\_\_\_ TIME AFTER COMP. **24 hrs** DATE TAKEN **5/2/2003**

TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ DRILLING START DATE **5/1/2003**

DRILLER **B. Filipovich** RECORDER **H. Hill** APPROVED \_\_\_\_\_ DRILLING COMP. DATE **5/1/2003**

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments
				From	To	Blows		
	0							
	1							
	2		Coal Mine Spoils 0 - 60' Dark gray-black 10YR3/1 very dark gray Augered through mine spoils No rock encountered. No water.					
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	.							
	.							
	.							
	.							
	.							
	.							
	53							
	54							
	55							
	56							
	57							
	58							
	59							
60.0	60	339.00	Boring Terminated @ 60'. Set Piezometer.					



## DRILLING LOG GEOLOGICAL SERVICES

Hole No. **GPZ-6**

Sheet 1 of 1

SITE **Plant Gorgas Gypsum Disposal Area** HOLE DEPTH **61.5'** SURF.ELEV. **326**  
 LOCATION **North of Plant Gorgas in Coal Mine Spoil Storage Area** COORDINATES N \_\_\_\_\_ E \_\_\_\_\_  
 ANGLE \_\_\_\_\_ BEARING \_\_\_\_\_ CONTRACTOR **SCS** DRILL NO. \_\_\_\_\_  
 OVERBURDEN DEPTH \_\_\_\_\_ NO. SAMPLES **1** NO. U.D. SAMPLES \_\_\_\_\_  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZE \_\_\_\_\_ TOTAL % REC. \_\_\_\_\_  
 WATER TABLE DEPTH **8** ELEV. **318** TIME AFTER COMP. **24 hrs** DATE TAKEN **5/2/2003**  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ DRILLING START DATE **5/1/2003**  
 DRILLER **B. Filipovich** RECORDER **H. Hill** APPROVED \_\_\_\_\_ DRILLING COMP. DATE **5/1/2003**

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments
				From	To	Blows		
	0							
	1							
	2		Coal Mine Spoils 0 - 61'					
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	.		Water encountered around 15'.					
	.							
	.							
	.		Lots of water around 25'.					
	.							
	.							
	55							
	56							
	57							
	58							
	59							
	60							
	61		Tan slightly clayey and sandy silt with Sandstone fragments @ 61'	60.0-61.5	5-13-10	23	1	
62.0	62	264.00	Boring Terminated @ 61.5'. Set Piezometer 30' - 35'.					



# DRILLING LOG

## GEOLOGICAL SERVICES

Hole No. **GPZ-7**

Sheet 1 of 1

SITE **Plant Gorgas Gypsum Disposal Area** HOLE DEPTH **45'** SURF.ELEV. **427**

LOCATION **North of Plant Gorgas in Coal Mine Spoil Storage Area** COORDINATES N \_\_\_\_\_ E \_\_\_\_\_

ANGLE \_\_\_\_\_ BEARING \_\_\_\_\_ CONTRACTOR **SCS** DRILL NO. \_\_\_\_\_

OVERBURDEN DEPTH \_\_\_\_\_ NO. SAMPLES \_\_\_\_\_ NO. U.D. SAMPLES \_\_\_\_\_

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

WATER TABLE DEPTH **18.5** ELEV. **408.5** TIME AFTER COMP. **24 hrs** DATE TAKEN **5/2/2003**

TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ DRILLING START DATE **5/1/2003**

DRILLER **B. Filipovich** RECORDER **H. Hill** APPROVED \_\_\_\_\_ DRILLING COMP. DATE **5/1/2003**

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments
				From	To	Blows		
	0							
	1		Augered through coal mine spoils 0 - 25'					
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10			Moist around 10'.				
	.							
	.							
	25		Original ground around 25'. Refusal @ 28'.					
	.		Cored through rock 28'-45' - Gray Sandstone with weathered layers					
	.							
	.							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
45.0	45	382.00	Boring Terminated @ 45'. Set Piezometer 40-45'					



# DRILLING LOG

## GEOLOGICAL SERVICES

Hole No. **GPZ-8**

Sheet 1 of 1

SITE **Plant Gorgas Gypsum Disposal Area** HOLE DEPTH **50'** SURF.ELEV. **456**

LOCATION **North of Plant Gorgas in Coal Mine Spoil Storage Area** COORDINATES N \_\_\_\_\_ E \_\_\_\_\_

ANGLE \_\_\_\_\_ BEARING \_\_\_\_\_ CONTRACTOR **SCS** DRILL NO. \_\_\_\_\_

OVERBURDEN DEPTH \_\_\_\_\_ NO. SAMPLES \_\_\_\_\_ NO. U.D. SAMPLES \_\_\_\_\_

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

WATER TABLE DEPTH **dry** ELEV. \_\_\_\_\_ TIME AFTER COMP. **tod** DATE TAKEN **5/2/2003**

TYPE GROUT **Backfilled** QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ DRILLING START DATE **5/1/2003**

DRILLER **B. Filipovich** RECORDER **H. Hill** APPROVED \_\_\_\_\_ DRILLING COMP. DATE **5/1/2003**

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments
				From	To	Blows		
	0							
1.0	1	455.00	Coal Mine Spoils (1')					
	2		1' - 30' Gray gravelly silt - weathered SS with intermediate soft Sandstone layers					
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	.							
	.		Tan to brown back to gray around 30'					
	30							
	.							
	.							
	.							
	43		Rock encountered - Auger refusal 45-50' Cored gray SS					
	44							
	45							
	46							
	47							
	48							
	49							
50.0	50	406.00	Boring terminated @ 50'. No water. Hole Backfilled.					



# DRILLING LOG

## GEOLOGICAL SERVICES

Hole No. **GPZ-9**

Sheet 1 of 3

SITE **Plant Gorgas Gypsum Disposal Area** HOLE DEPTH **61.5'** SURF. ELEV. **338**

LOCATION **North of Plant Gorgas in Coal Mine Spoil Storage Area** COORDINATES N \_\_\_\_\_ E \_\_\_\_\_

ANGLE \_\_\_\_\_ BEARING \_\_\_\_\_ CONTRACTOR **SCS** DRILL NO. \_\_\_\_\_

OVERBURDEN DEPTH \_\_\_\_\_ NO. SAMPLES **12** NO. U.D. SAMPLES \_\_\_\_\_

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

WATER TABLE DEPTH **41** ELEV. **297** TIME AFTER COMP. **tod** DATE TAKEN **5/2/2003**

TYPE GROUT **Auger Spoils** QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ DRILLING START DATE **5/2/2003**

DRILLER **B. Filipovich** RECORDER **H. Hill** APPROVED \_\_\_\_\_ DRILLING COMP. DATE **5/2/2003**

Graphic Log	Depth	Elev.	Material Description, Classification and Remarks	Standard Penetration Test			Sample No.	Comments
				From To	Blows	N		
	0							
	1							
	2							
	3							
	4							
	5							
	6		Road base Mine Spoils	5.0-6.5	18-8-8	16	1	
	7							
	8							
	9							
	10							
	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	7-4-3	7	4	
	22		SAA					
	23							
	24							





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

Hole No. **GPZ-9**

Sheet 2 of 3

SITE **Plant Gorgas Gypsum Disposal Area** TOTAL DEPTH **61.5'** SURF.ELEV. **338**

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



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

Hole No. **GPZ-9**

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	Standard Penetration Test			Sample No.	Comments
				From To	Blows	N		
	57							
	58							
	59							
	60							
	61		Coal Mine Spoils					
61.5		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							
	88							



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

Hole No. **GPZ-10**  
Sheet 1 of 2

SITE **GORGAS STEAM PLANT** HOLE DEPTH **56.5'** SURF.ELEV. **487.87**  
 LOCATION **GYPSUM STORAGE** COORDINATES N **1330680.47** E **585426.44**  
 ANGLE **90** BEARING \_\_\_\_\_ CONTRACTOR **Christian Testing Lab.** DRILL NO. **CME-850**  
 DRILLING METHOD \_\_\_\_\_ NO. SAMPLES **12** NO. U.D. SAMPLES **0**  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZE \_\_\_\_\_ TOTAL % REC. \_\_\_\_\_  
 WATER TABLE DEPTH **NA** ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ DRILLING START DATE **3/28/2005**  
 DRILLER **Billy Spivey** RECORDER **S. Sprayberry** APPROVED \_\_\_\_\_ DRILLING COMP. DATE **3/28/2005**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
0.0	487.87								
1		Coal Mine spoils (0-45')	SS-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									
13									
14									
15									
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									

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

Hole No. GPZ-10

Sheet 2 of 2

SITE **GORGAS STEAM PLANT** TOTAL DEPTH **56.5'** SURF.ELEV. **487.87**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
25		SAA	SS-6	25-26.5	6-6-7	13			
26									
27									
28									
29		SAA	SS-7	30-31.5	6-6-7	13			
30									
31									
32									
33		SAA	SS-8	35-36.5	6-4-3	7			
34									
35									
36									
37		SAA	SS-9	40-41.5	6-9-11	20			
38									
39									
40									
41		Tan to gray, moist, stiff, silty CLAY (CL) with SANDSTONE and SHALE fragments, FILL	SS-10	45-46.5	4-5-6	11			
42									
43									
44									
45	442.87	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			
46									
47									
48									
49		SAA	SS-12	55-56.5	50/3"	50+			
50	437.87								
51									
52									
53		Boring Terminated @ 56.5'							
54									
55									
56									



**DRILLING LOG  
GEOLOGICAL SERVICES**

Hole No. **GPZ-11**  
Sheet 1 of 3

**SITE** GORGAS STEAM PLANT **HOLE DEPTH** 76.5 **SURF.ELEV.** 473.36  
**LOCATION** GYPSUM STORAGE **COORDINATES N** 1329499.75 **E** 585740.85  
**ANGLE** 90 **BEARING** \_\_\_\_\_ **CONTRACTOR** Christian Testing Lab. **DRILL NO.** CME-850  
**DRILLING METHOD** \_\_\_\_\_ **NO. SAMPLES** 16 **NO. U.D. SAMPLES** 0  
**CASING SIZE** \_\_\_\_\_ **LENGTH** \_\_\_\_\_ **CORE SIZE** \_\_\_\_\_ **TOTAL % REC.** \_\_\_\_\_  
**WATER TABLE DEPTH** NA **ELEV.** \_\_\_\_\_ **TIME AFTER COMP.** \_\_\_\_\_ **DATE TAKEN** \_\_\_\_\_  
**TYPE GROUT** \_\_\_\_\_ **QUANTITY** \_\_\_\_\_ **MIX** \_\_\_\_\_ **DRILLING START DATE** 3/24/2005  
**DRILLER** Billy Spivey **RECORDER** S. Sprayberry **APPROVED** \_\_\_\_\_ **DRILLING COMP. DATE** 3/24/2005

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
0.0	473.36								
1		Coal Mine spoils (0-63')	SS-1	0-1.5	2-2-7	9			
2									
3									
4									
5									
6		SAA	SS-2	5-6.5	6-6-13	19			
7									
8									
9									
10									
11		SAA	SS-3	10-11.5	6-6-8	14			
12									
13									
14									
15									
16		SAA	SS-4	15-16.5	3-8-19	27			
17									
18									
19									
20									
21		SAA	SS-5	20-21.5	10-12-13	25			
22									
23									
24									

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

Hole No. **GPZ-11**

Sheet 2 of 3

SITE **GORGAS STEAM PLANT** TOTAL DEPTH **76.5** SURF.ELEV. **473.36**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
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			
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									
56		SAA	SS-12	55-56.5	7-13-14	27			



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

Hole No. **GPZ-11**

Sheet 3 of 3

SITE **GORGAS STEAM PLANT** TOTAL DEPTH **76.5** SURF.ELEV. **473.36**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
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	403.36								
71		Tan, soft to medium hard, weathered SANDSTONE	SS-15	70-71.5	9-13-14	27			
72									
73									
74									
75									
76		SAA	SS-16	75-76.5	9-14-16	30			
76.5	396.86	Boring Terminated @ 76.5' (Not Auger Refusal)							
77									
78									
79									
80									
81									
82									
83									
84									
85									
86									
87									
88									



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

Hole No. **GPZ-12**  
Sheet 1 of 1

**SITE** GORGAS STEAM PLANT **HOLE DEPTH** 24 **SURF.ELEV.** 421.61  
**LOCATION** GYPSUM STORAGE **COORDINATES** N 1330213.32 E 585619.97  
**ANGLE** 90 **BEARING** \_\_\_\_\_ **CONTRACTOR** Christian Testing Lab. **DRILL NO.** CME-850  
**DRILLING METHOD** \_\_\_\_\_ **NO. SAMPLES** 5 **NO. U.D. SAMPLES** 0  
**CASING SIZE** \_\_\_\_\_ **LENGTH** \_\_\_\_\_ **CORE SIZE** \_\_\_\_\_ **TOTAL % REC.** \_\_\_\_\_  
**WATER TABLE DEPTH** NA **ELEV.** \_\_\_\_\_ **TIME AFTER COMP.** \_\_\_\_\_ **DATE TAKEN** \_\_\_\_\_  
**TYPE GROUT** \_\_\_\_\_ **QUANTITY** \_\_\_\_\_ **MIX** \_\_\_\_\_ **DRILLING START DATE** 3/28/2005  
**DRILLER** Billy Spivey **RECORDER** S. Sprayberry **APPROVED** \_\_\_\_\_ **DRILLING COMP. DATE** 3/28/2005

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
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 residuum	SS-4	15-16.5	10-12-50/3'	50+			
	17								
	18								
	19								
20.0	20	401.61							
	21	SAA	SS-5	20-21.5	50/2"	50+			
	22								
	23								
	24	Auger Refusal @ 24'							





**DRILLING LOG  
GEOLOGICAL SERVICES**

Hole No. **GPZ-13**  
Sheet 1 of 1

**SITE** GORGAS STEAM PLANT **HOLE DEPTH** 15 **SURF.ELEV.** 402.64  
**LOCATION** GYPSUM STORAGE **COORDINATES** N 1329692.8 E 586131.45  
**ANGLE** 90 **BEARING** \_\_\_\_\_ **CONTRACTOR** Christian Testing Lab. **DRILL NO.** CME-850  
**DRILLING METHOD** \_\_\_\_\_ **NO. SAMPLES** 4 **NO. U.D. SAMPLES** 0  
**CASING SIZE** \_\_\_\_\_ **LENGTH** \_\_\_\_\_ **CORE SIZE** \_\_\_\_\_ **TOTAL % REC.** \_\_\_\_\_  
**WATER TABLE DEPTH** NA **ELEV.** \_\_\_\_\_ **TIME AFTER COMP.** \_\_\_\_\_ **DATE TAKEN** \_\_\_\_\_  
**TYPE GROUT** \_\_\_\_\_ **QUANTITY** \_\_\_\_\_ **MIX** \_\_\_\_\_ **DRILLING START DATE** 3/28/2005  
**DRILLER** Billy Spivey **RECORDER** S. Sprayberry **APPROVED** \_\_\_\_\_ **DRILLING COMP. DATE** 3/28/2005

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
0.0	0	402.64							
	1	Coal Mine spoils (0-5')	SS-1	0-1.5	2-3-2	5			
	2								
	3								
	4								
5.0	5	397.64							
	6	Red, Coal Mine spoils (5-10')	SS-2	5-6.5	9-10-8	18			
	7								
	8								
	9								
10.0	10	392.64							
	11	Tan to gray, moist to wet, stiff, silty CLAY (CL) with weathered SANDSTONE residuum	SS-3	10-11.5	2-5-5	10			
	12								
	13								
	14								
15.0	15	387.64							
	16	Auger Refusal @ 15'	SS-4	15-16.5	50/2"	50+			
	17								
	18								
	19								
	20								
	21								
	22								
	23								
	24								



**DRILLING LOG  
GEOLOGICAL SERVICES**

Hole No. **GPZ-14**  
Sheet 1 of 2

SITE **GORGAS STEAM PLANT** HOLE DEPTH **35** SURF.ELEV. **394.93**  
 LOCATION **GYPSUM STORAGE** COORDINATES N **1329416.45** E **586268.34**  
 ANGLE **90** BEARING \_\_\_\_\_ CONTRACTOR **Christian Testing Lab.** DRILL NO. **CME-850**  
 DRILLING METHOD \_\_\_\_\_ NO. SAMPLES **8** NO. U.D. SAMPLES **0**  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZE \_\_\_\_\_ TOTAL % REC. \_\_\_\_\_  
 WATER TABLE DEPTH **NA** ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ DRILLING START DATE **3/28/2005**  
 DRILLER **Billy Spivey** RECORDER **S. Sprayberry** APPROVED \_\_\_\_\_ DRILLING COMP. DATE **3/28/2005**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
0.0	0	394.93							
	1	Gray, moist, medium stiff to stiff, silty CLAY (CL) with SANDSTONE fragments, FILL	SS-1	0-1.5	4-3-5	8			
	2								
	3								
	4								
	5								
	6	SAA	SS-2	5-6.5	6-6-5	11			
	7								
	8								
	9								
	10								
	11	SAA	SS-3	10-11.5	6-7-5	12			
	12								
13.0	13	381.93							
	14	Gray to tan, moist, stiff, silty CLAY (CL) with SANDSTONE and SHALE fragments, FILL							
	15								
	16		SS-4	15-16.5	3-4-6	10			
	17								
	18								
	19								
	20								
	21		SAA	SS-5	20-21.5	4-5-6	11		
	22								
	23								
	24								

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

Hole No. GPZ-14

Sheet 2 of 2

SITE **GORGAS STEAM PLANT** TOTAL DEPTH **35** SURF.ELEV. **394.93**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
25		SAA	SS-6	25-26.5	5-8-6	14			
26									
27									
28									
29									
30.0	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									
33									
34									
35.0	359.93								
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									



**DRILLING LOG  
GEOLOGICAL SERVICES**

Hole No. **GPZ-15**  
Sheet 1 of 4

**SITE** GORGAS STEAM PLANT **HOLE DEPTH** 101.5 **SURF.ELEV.** 411.18  
**LOCATION** GYPSUM STORAGE **COORDINATES N** 1329179.05 **E** 586236.28  
**ANGLE** 90 **BEARING** \_\_\_\_\_ **CONTRACTOR** SCS **DRILL NO.** CME-550  
**DRILLING METHOD** \_\_\_\_\_ **NO. SAMPLES** 21 **NO. U.D. SAMPLES** 0  
**CASING SIZE** \_\_\_\_\_ **LENGTH** \_\_\_\_\_ **CORE SIZE** \_\_\_\_\_ **TOTAL % REC.** \_\_\_\_\_  
**WATER TABLE DEPTH** NA **ELEV.** \_\_\_\_\_ **TIME AFTER COMP.** \_\_\_\_\_ **DATE TAKEN** \_\_\_\_\_  
**TYPE GROUT** \_\_\_\_\_ **QUANTITY** \_\_\_\_\_ **MIX** \_\_\_\_\_ **DRILLING START DATE** 3/29/2005  
**DRILLER** B. Filipovich **RECORDER** S. Sprayberry **APPROVED** \_\_\_\_\_ **DRILLING COMP. DATE** 3/30/2005

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
0	411.18								
1		Coal Mine spoils (0-101')	SS-1	0-1.5	4-11-10	21			
2									
3									
4									
5									
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									
16		SAA	SS-4	15-16.5	4-9-12	21			
17									
18									
19									
20									
21		SAA	SS-5	20-21.5	7-16-13	29			
22									
23									
24									

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

Hole No. GPZ-15

Sheet 2 of 4

SITE **GORGAS STEAM PLANT** TOTAL DEPTH **101.5** SURF.ELEV. **411.18**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
25									
26		SAA	SS-6	25-26.5	4-16-33	49			
27									
28									
29									
30									
31		SAA	SS-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									
56		SAA	SS-12	55-56.5	3-4-7	11			

SITE **GORGAS STEAM PLANT** TOTAL DEPTH **101.5** SURF.ELEV. **411.18**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
57									
58									
59									
60									
61		SAA	SS-13	60-61.5	5-5-6	11			
62									
63									
64									
65		SAA							
66			SS-14	65-66.5	5-6-6	12			
67									
68									
69									
70		SAA							
71			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									





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

Hole No. **GPZ-16**  
Sheet 1 of 2

SITE **GORGAS STEAM PLANT** HOLE DEPTH **55.5** SURF.ELEV. **440.65**  
 LOCATION **GYPSUM STORAGE** COORDINATES N **1329035.86** E **585813.17**  
 ANGLE **90** BEARING \_\_\_\_\_ CONTRACTOR **Christian Testing Lab.** DRILL NO. **CME-850**  
 DRILLING METHOD \_\_\_\_\_ NO. SAMPLES **12** NO. U.D. SAMPLES **0**  
 CASING SIZE \_\_\_\_\_ LENGTH \_\_\_\_\_ CORE SIZE \_\_\_\_\_ TOTAL % REC. \_\_\_\_\_  
 WATER TABLE DEPTH **NA** ELEV. \_\_\_\_\_ TIME AFTER COMP. \_\_\_\_\_ DATE TAKEN \_\_\_\_\_  
 TYPE GROUT \_\_\_\_\_ QUANTITY \_\_\_\_\_ MIX \_\_\_\_\_ DRILLING START DATE **3/24/2005**  
 DRILLER **Billy Spivey** RECORDER **S. Sprayberry** APPROVED \_\_\_\_\_ DRILLING COMP. DATE **3/24/2005**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
0.0	440.65								
1		Coal Mine spoils (0-43')	SS-1	0-1.5	6-10-12	22			
2									
3									
4									
5									
6		SAA	SS-2	5-6.5	22-25-33	58			
7									
8									
9									
10									
11		SAA	SS-3	10-11.5	4-6-10	16			
12									
13									
14									
15									
16		SAA	SS-4	15-16.5	3-7-7	14			
17									
18									
19									
20									
21		SAA	SS-5	20-21.5	4-9-10	19			
22									
23									
24									





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

Hole No. **GPZ-16**

Sheet 2 of 2

SITE **GORGAS STEAM PLANT** TOTAL DEPTH **55.5** SURF.ELEV. **440.65**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
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									
43.0	397.65								
44									
45									
46		Gray, soft, weathered SHALE residuum	SS-10	45-46.5	18-50/4"	50+			
47									
48									
49									
50.0	390.65								
51		Tan, soft to medium hard, weathered SANDSTONE	SS-11	50-51.5	50/3"	50+			
52									
53									
54									
55									
55.5	385.15								
56		Boring Terminated @ 55.5' (Not Auger refusal)	SS-12	55-55.5'	50/3"	50+			



**DRILLING LOG  
GEOLOGICAL SERVICES**

Hole No. **GPZ-17**  
Sheet 1 of 2

SITE <b>GORGAS STEAM PLANT</b>		HOLE DEPTH <b>30.5</b>	SURF.ELEV. <b>414.27</b>
LOCATION <b>GYPSUM STORAGE</b>		COORDINATES N <b>1328770.35</b>	E <b>585853.67</b>
ANGLE <b>90</b>	BEARING _____	CONTRACTOR <b>Christian Testing Lab.</b>	DRILL NO. <b>CME-850</b>
DRILLING METHOD _____		NO. SAMPLES <b>7</b>	NO. U.D. SAMPLES <b>0</b>
CASING SIZE _____	LENGTH _____	CORE SIZE _____	TOTAL % REC. _____
WATER TABLE DEPTH <b>NA</b>	ELEV. _____	TIME AFTER COMP. _____	DATE TAKEN _____
TYPE GROUT _____		QUANTITY _____	MIX _____
DRILLER <b>Billy Spivey</b>		RECORDER <b>S. Sprayberry</b>	APPROVED _____
		DRILLING START DATE <b>3/23/2005</b>	DRILLING COMP. DATE <b>3/23/2005</b>

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
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 residuum	SS-2	5-6.5	26-26-36	62			
	7								
	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) with weathered SANDSTONE	SS-4	15-16.5	25-50/3"	50+			
	17								
	18								
	19								
	20								
	21	Tan, soft, weathered SANDSTONE	SS-5	20-21.5	27-29-50	79			
	22								
	23								
	24								

SITE **GORGAS STEAM PLANT** TOTAL DEPTH **30.5** SURF.ELEV. **414.27**

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
25.0	389.27								
26		Gray, soft, weathered SHALE	SS-6	25-26.5	19-50/4"	50+			
27									
28									
29									
30									
30.5	383.77	SAA							
31		Boring Terminated @ 30.5' (not auger refusal)	SS-7	30-31.5	50/3"	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									



**DRILLING LOG  
GEOLOGICAL SERVICES**

Hole No. **GPZ-18**  
Sheet 1 of 1

SITE <b>GORGAS STEAM PLANT</b>		HOLE DEPTH <b>15.5</b>	SURF.ELEV. <b>338.02</b>
LOCATION <b>GYPSUM STORAGE</b>		COORDINATES N <b>1328283.18</b>	E <b>586290.18</b>
ANGLE <b>90</b>	BEARING _____	CONTRACTOR <b>Christian Testing Lab.</b>	DRILL NO. <b>CME-850</b>
DRILLING METHOD _____		NO. SAMPLES <b>4</b>	NO. U.D. SAMPLES <b>0</b>
CASING SIZE _____	LENGTH _____	CORE SIZE _____	TOTAL % REC. _____
WATER TABLE DEPTH <b>NA</b>	ELEV. _____	TIME AFTER COMP. _____	DATE TAKEN _____
TYPE GROUT _____		QUANTITY _____	MIX _____
DRILLER <b>Billy Spivey</b>		RECORDER <b>S. Sprayberry</b>	APPROVED _____
		DRILLING START DATE <b>3/23/2005</b>	DRILLING COMP. DATE <b>3/23/2005</b>

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	%Rec	RQD
				From To	Blows	N			
0	338.02								
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	333.02								
6		Tan to gray, moist, very hard, clayey SILT (ML) with highly weathered SHALE residuum	SS-2	5-6.5	30-26-50	76			
7									
8									
9									
10									
11		SAA	SS-3	10-11.5	31-50/5"	50+			
12									
13									
14									
15									
16	322.52	Auger Refusal @ 15.5'	SS-4	15-16.5	50+/6"	50+			
17									
18									
19									
20									
21									
22									
23									
24									



**Attachment C**  
Laboratory Analyses

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



**Table 1**  
**Laboratory Results for Coal Mine Spoils**

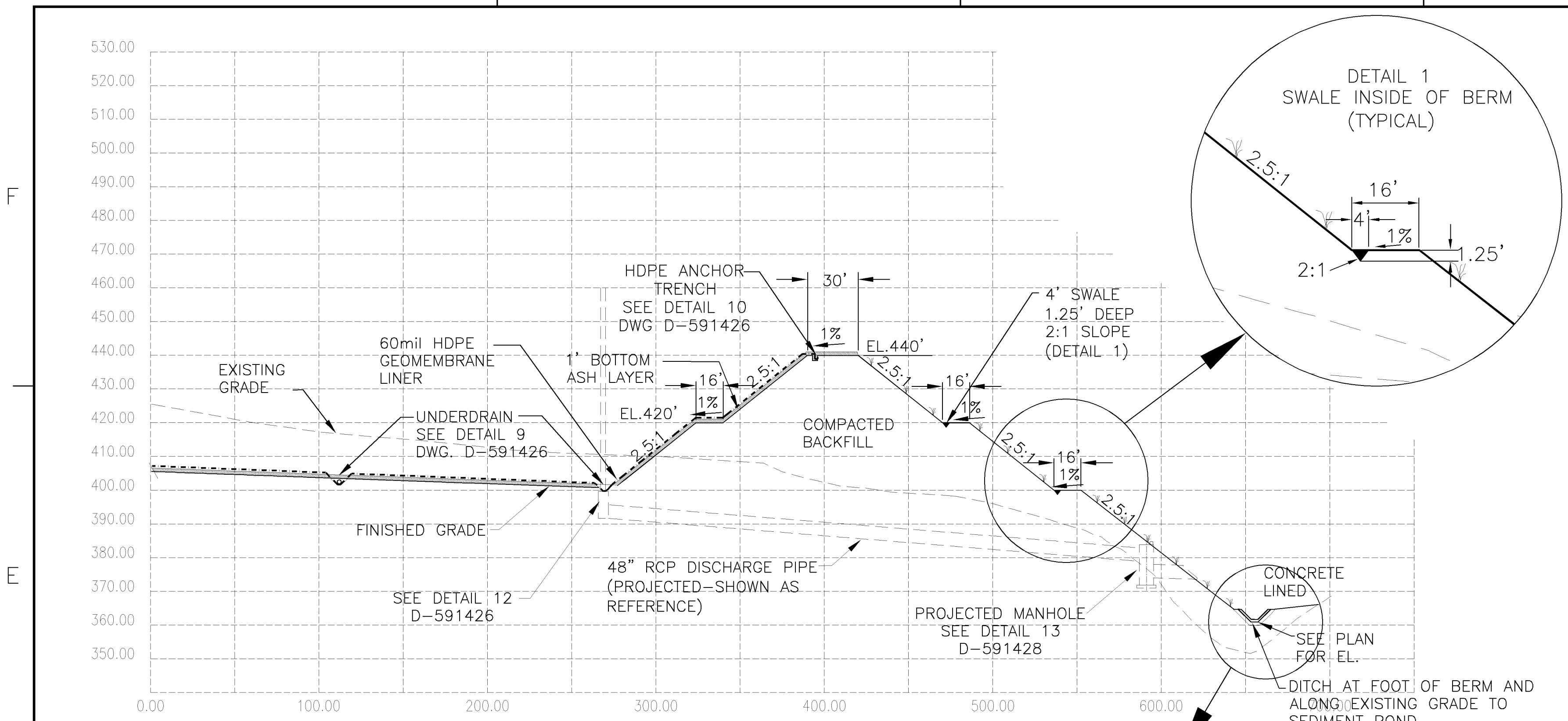
<i>Sample</i>	<i>Grain Size</i>			<i>Max Dry Density (pcf)</i>	<i>Optimum Moisture (%)</i>
	<i>% Gravel</i>	<i>% Sand</i>	<i>% Fines</i>		
Mine Spoil #1	45.3	31.8	22.9	105.8	13.0
Mine Spoil #2	37.5	31.7	30.8	103.3	12.6
Mine Spoil #3	39.0	34.2	26.8	103.9	14.0
#3 Recompact*	21.0	40.6	38.4	103.9	14.0

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

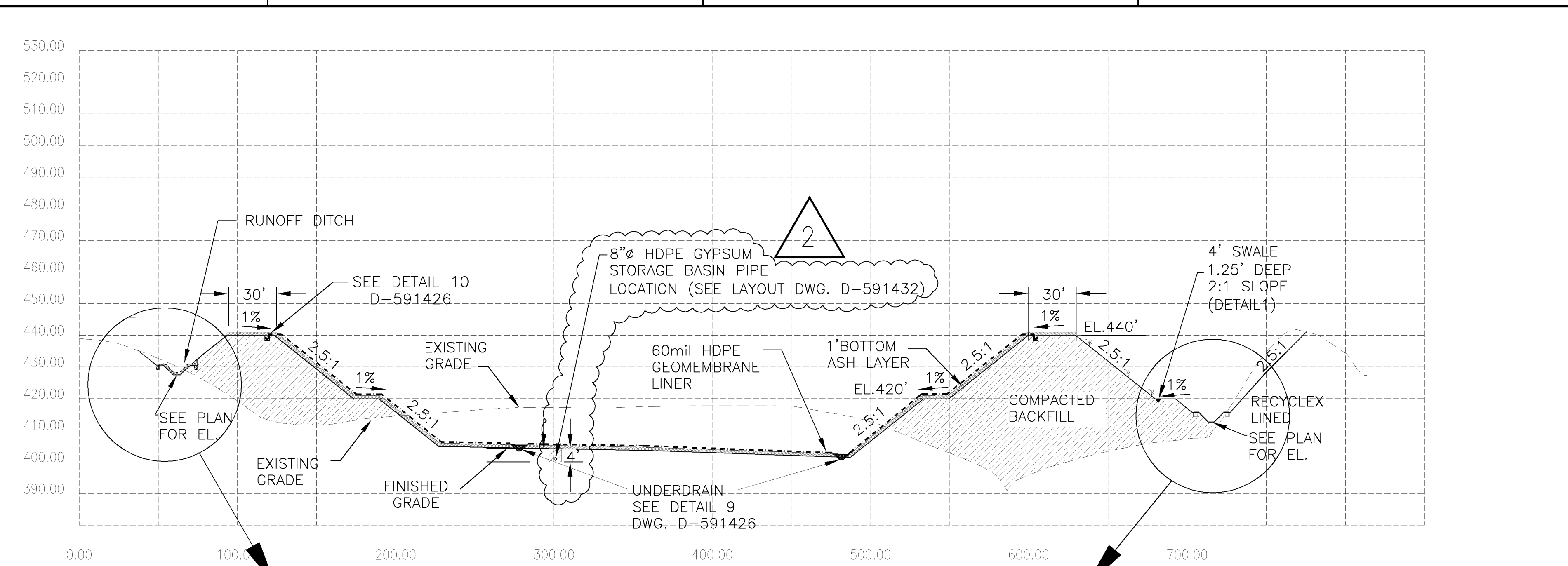
## **Attachment D**

Critical Section Profile Used in Analysis

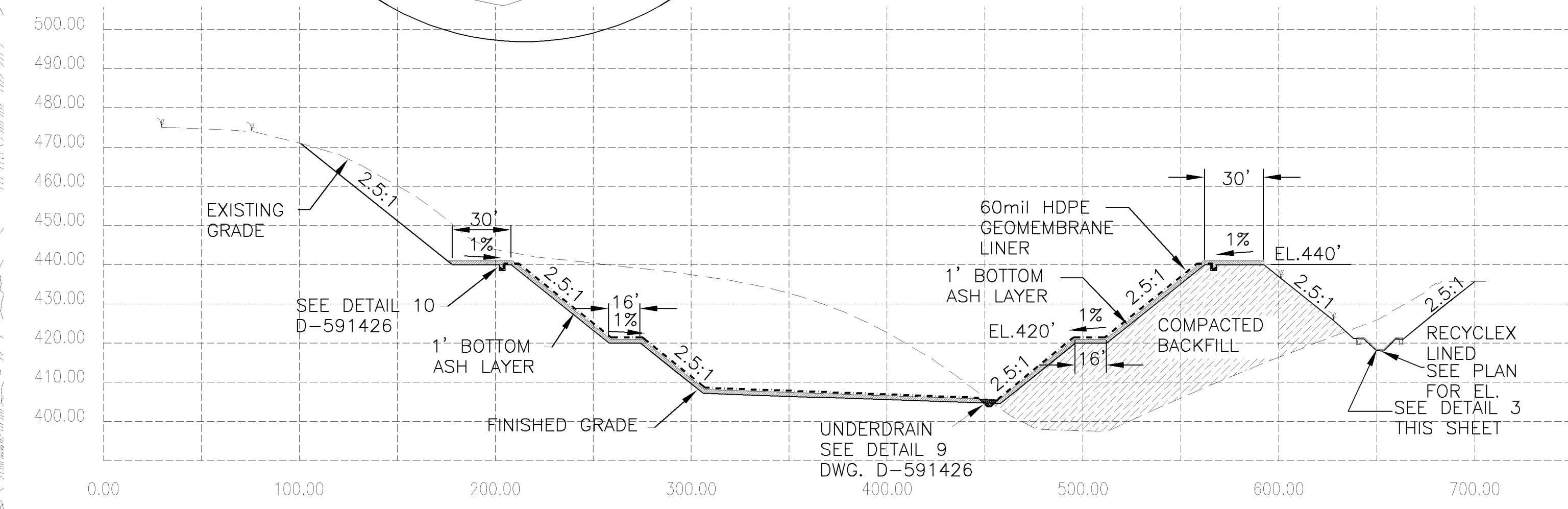
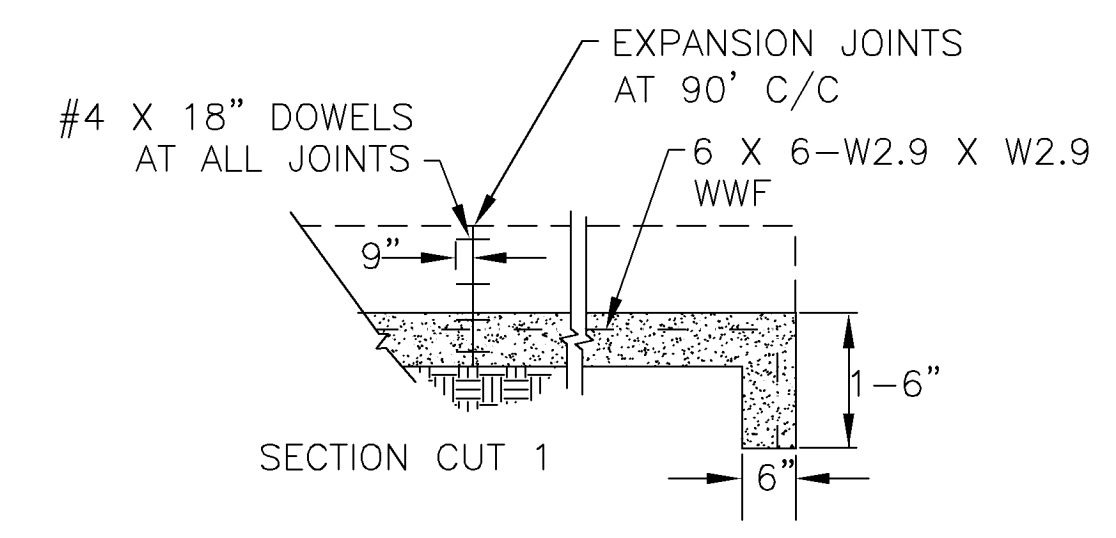
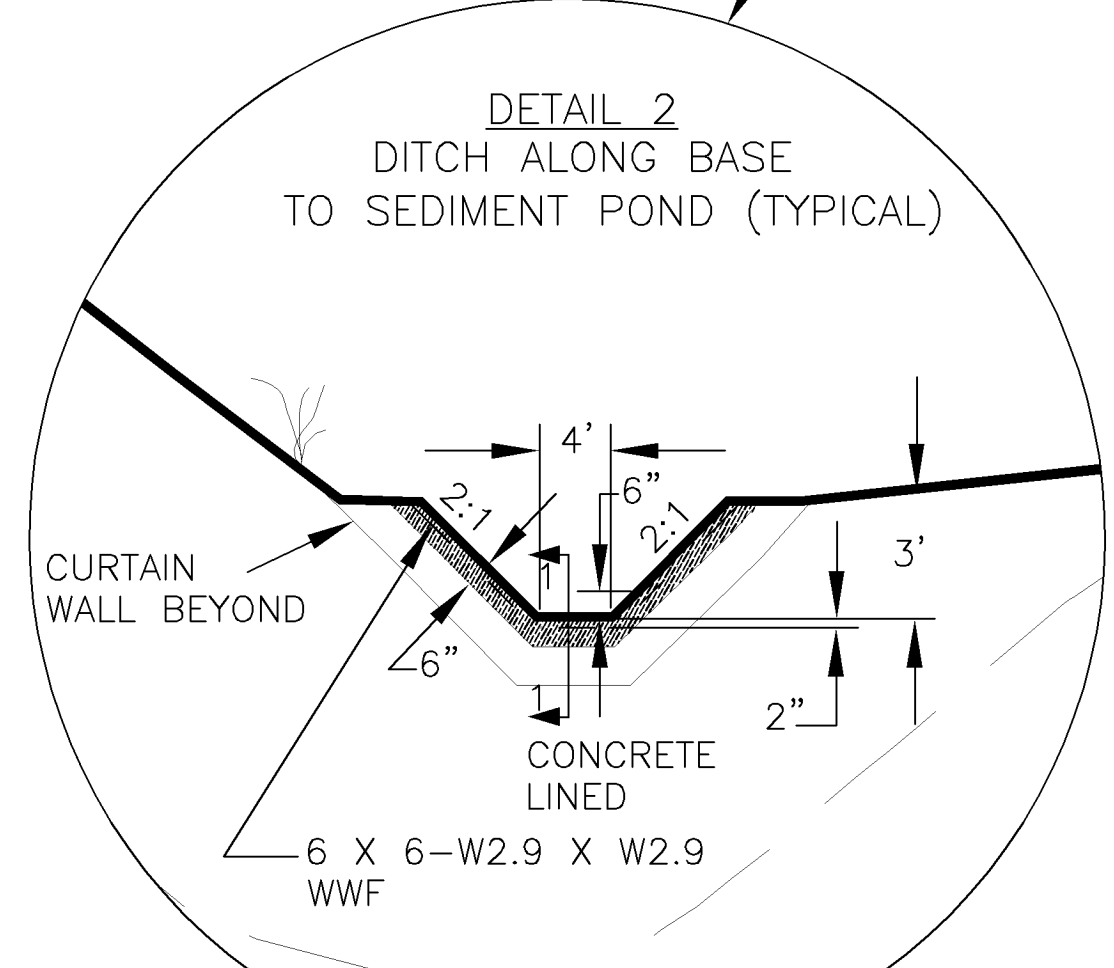
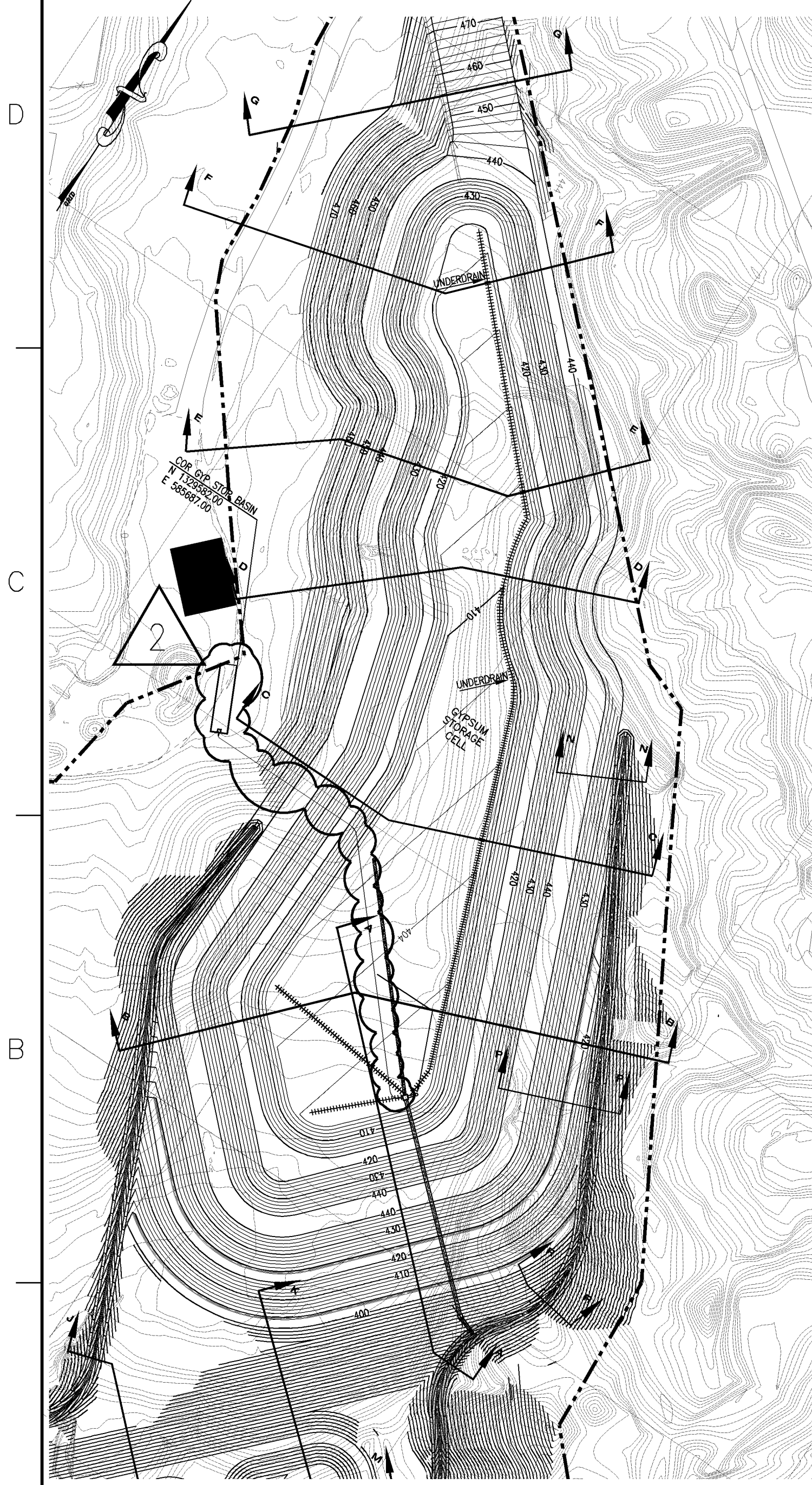




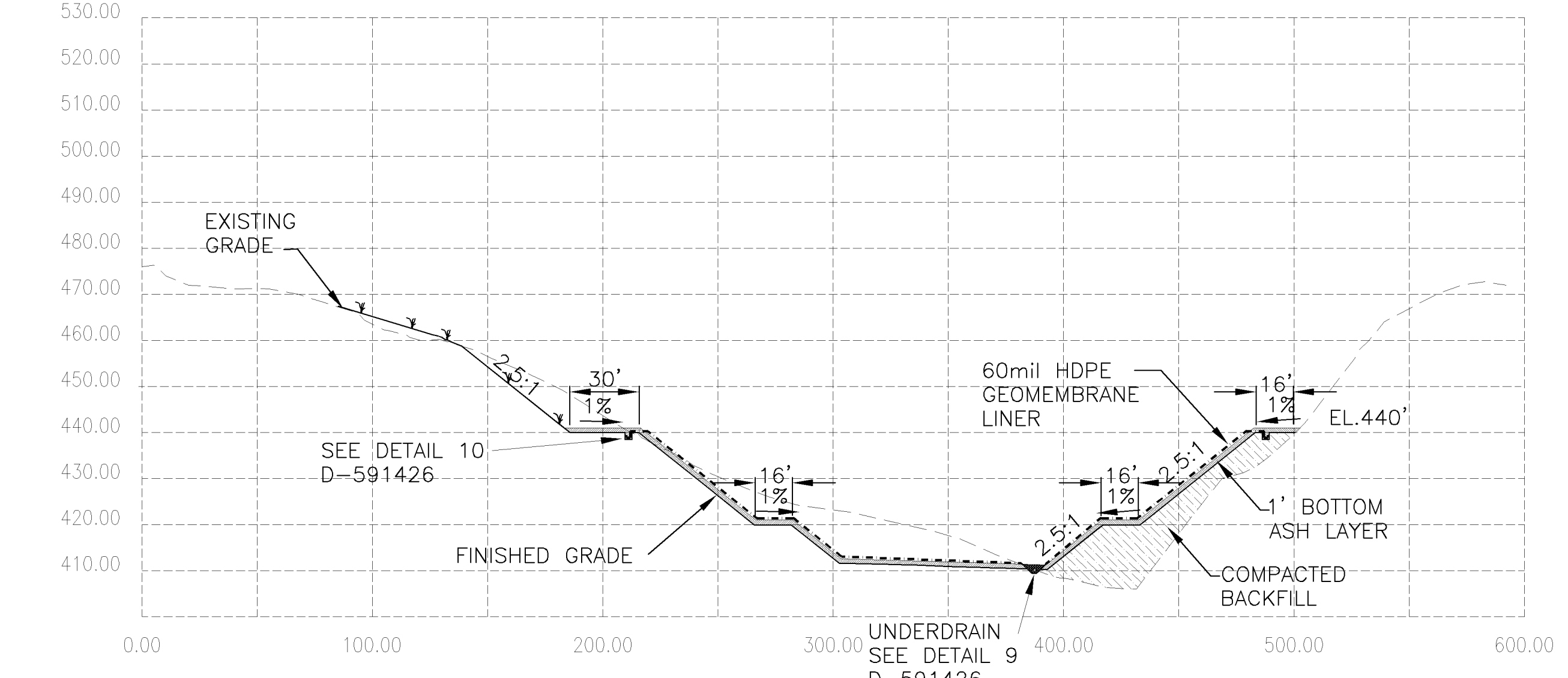
SECTION A-A  
Scale: Horz. 1" = 50'  
Vert. 1" = 25'



SECTION B-B  
Scale: Horz. 1" = 50'  
Vert. 1" = 25'



SECTION C-C  
Scale: Horz. 1" = 50'  
Vert. 1" = 25'



SECTION D-D  
Scale: Horz. 1" = 50'  
Vert. 1" = 25'

- LEGEND:
- RECYCLEX DITCH LINING
  - CONCRETE DITCH LINING
  - HDPE DITCH LINING

- LEGEND
- 1' BOTTOM ASH
  - COMPACTED BACKFILL
  - EXISTING GRADE CONTOURS
  - FINAL GRADE CONTOURS
  - FINAL GRADE CONTOUR AREAS TO RECEIVE TOPSOIL AND GRASSING
  - RECYCLEX DITCH LINING
  - CONCRETE DITCH LINING
  - HDPE LINING

- NOTES:
- 1) DATE OF AERIAL PHOTOGRAPHY 04/02/2003
  - 2) PHOTOGRAMMETRIC DATA COLLECTED 05/13/2003
  - 3) CONTOURS WERE PRODUCED BY DIGITAL TERRAIN MODEL
  - 4) CONTOUR INTERVAL 2 FEET
  - 5) CONTOURS APPROXIMATE IN AREAS OF DENSE VEGETATION
  - 6) RASTER OVERLAY OF GOODSPPRINGS 7 1/2 Min. USGS QUAD SHEET
  - 7) DRAWING IS ACCURATE ONLY AT ORIGINAL SCALE.
  - 8) FOR REFERENCE DRAWINGS AND GENERAL NOTES SEE DRAWING NUMBER D-591420.
  - 9) FINISHED GRADE CONTOURS REPRESENT BOTTOM OF 1' ASH LAYER WHEN ASH LAYER IS SHOWN ON SECTIONS.
  - 10) FINISHED GRADE CONTOURS REPRESENT TOP OF TOPSOIL WHERE TOPSOIL IS REQUIRED AND NO ASH IS PRESENT.

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Southern Company Services, Inc.  
FOR

REVISION	DATE	REVISION	DATE	REVISION	DATE	REVISION	DATE	REVISION 2	DATE 03/15/2007	REVISION 1	DATE 09/21/2006	REVISION 0	DATE 05/12/2006	<p><b>Alabama Power Company</b></p> <p>Plant Gorgas Units 8, 9 &amp; 10 FGD Project GYPSUM STORAGE AREA GRADING PLAN INITIAL SITE DEVELOPMENT CELL SECTIONS &amp; DETAILS SHEET 1</p>																								
								ADDED GYPSUM STORAGE BASIN AND PIPE LOCATIONS		NO REVISION THIS SHEET		ISSUED FOR CONSTRUCTION																										
								EWO 2119	GO-05001	EWO 2119	GO-05001	EWO 2119	GO-05001																									
BY	CHK'D	CIVL APPR	ELECT APPR	I/C APPR	MECH APPR	MGR APPR	BY	CHK'D	CIVL APPR	ELECT APPR	I/C APPR	MECH APPR	MGR APPR	BY	CHK'D	CIVL APPR	ELECT APPR	I/C APPR	MECH APPR	MGR APPR	BY	CHK'D	CIVL APPR	ELECT APPR	I/C APPR	MECH APPR	MGR APPR	SCALE	PROJ. ID.	DRAWING NUMBER	SH	CONT'D	REV					
								ASF	SSS	AMW/RCB	JPS	RDP	DEK	KaM	ASF	SSS	HLH	KaM	RCE	JPS	RDP	DEK	MDS	ASF	SSS	HLH	KaM	RCE	JPS	RDP	DEK	MDS	AS SHOWN	210100	<b>D-591423</b>	1	FINAL	2