### INITIAL SAFETY FACTOR ASSESSMENT 40 C.F.R. PART 257.73 PLANT YATES ASH POND B' (AP-B') GEORGIA 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 initial and periodic safety factor assessments. The owner or operator of the CCR unit must conduct an assessment and document whether the minimum safety factors outlined in §257.73(e)(1)(i) through (iv) for the critical cross section of the embankment are achieved.

The CCR surface impoundment known as Plant Yates AP-B' is located on Plant Yates property, northwest of Newnan, Georgia. AP-B' is formed by an engineered cross-valley embankment. The critical section of AP-B' has been determined to be at the midpoint of the cross-valley embankment.

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)	2.7	1.5
Maximum Surcharge Pool (Static)	2.7	1.4
Seismic	2.3	1.0

The embankments of AP-B' are constructed of compacted clayey sands that are not susceptible to liquefaction. Therefore, a minimum liquefaction safety factor determination was not required. This assessment is supported by appropriate engineering calculations which are attached.

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

257.73 (e)(1).

James . Pegues, P.E.

Licensed State of Georgia, PE No.



# **Engineering and Construction Services Calculation**

Calculation Number: TV-YT-GPC603884-003

Project/Plant:	Unit(s):	Discipline/Area:
Plant Yates Ash Pond B'	Units 6-7	ESFS
Title/Subject:		
Slope Stability Analyses of Ash Pond B' Dam		
Purpose/Objective:		
Analyze slope stability of the Ash Pond B' Dam		
System or Equipment Tag Numbers:	Originator:	
NA NA	Stacey H.	Simpson, P.E.

#### Contents

Торіс	Page	Attachments (Computer Printouts, Tech. Papers, Sketches, Correspondence)	# of Pages
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Total # of pages including cover sheet & attachments:	72		

#### **Revision Record**

Rev. No.	Description	Originator Initial / Date	Reviewer Initial / Date	Approver Initial / Date
0	Issued for Information	SHS 10/05/16	JAL 10/10/16	JCP 10/10/16

Notes:

#### **Purpose of Calculation**

The Eugene A. Yates Power Plant (Plant Yates) was once a seven unit, coal fired, power generation facility. Currently Plant Yates Units 1-5 are in the process of demolition and Plant Yates Units 6 and 7 have been converted to natural gas. AP-B' was designed to receive and store coal combustion residuals produced during the electric power generating process at Plant Yates. In 1977, the southern portion of AP-B' began to be used as an ash dewatering facility for coal combustion residuals dredged from Ash Pond 2. In 2015, B' ceased operation as a dewatering facility and ash was removed for placement in the dry ash landfill. No ash has been removed since October 2015, and the pond is dormant.

The purpose of this calculation is to provide a slope stability assessment of the Plant Yates Ash Pond B' 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 0.043g for use as a horizontal acceleration in the stability analysis.

- During March 2010, two borings were performed at the top of the dike, and one was performed at the downstream bench.
- The soil properties used for the analysis (unit weight, phi angle, and cohesion) were obtained from triaxial shear testing performed on undisturbed Shelby tube samples of the dam fill and foundation soils obtained during drilling. Soil testing was performed according to applicable ASTM standards.
- The ash properties used for the analysis (unit weight, phi angle, and cohesion) were based on laboratory testing performed on undisturbed and remolded samples of ash from various plants and on engineering judgment.
- Piezometer readings were used to obtain water elevations within the dike and the foundation soils.
- 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 location having the apparent maximum dam height. The cross-section of the Ash Pond B' dam was modeled using the following sources:
  - A 2010 level profile survey extending from the pond surface on the upstream face of the dam to the river surface on the downstream face of the dam performed by Southern Company Services (SCS).

#### **Input Data**

 Soil Properties: Three consolidated, undrained triaxial tests were performed on Shelby tube samples recovered from borings performed at Ash Pond B' to provide total and effective shear strength values of embankment and foundation soils. Soil classification testing, and unit weight and moisture content determination were also performed on the samples. The results of the laboratory analyses are included in attachments to this calculation. A compacted ash sample obtained from the B' dike for triaxial testing was judged too disturbed to provide accurate test results. Ash properties were instead based on laboratory testing performed on remolded samples of ash from various plants and on past experience. The following effective stress values were used in the analyses.

		Effective St	ress Parameters
Soil Description	Unit Weight, pcf	Cohesion, psf	Phi Angle, degrees
Compacted Ash	ted Ash 105		28
Clayey Sand Fill	125	115	33
Residuum	127	72	35
Ash	98	0	28

- Phreatic Surface: Piezometers were installed at the following locations:
  - Dike Crest Two piezometers were installed in the borings performed at the top of the dike.
  - Lower Bench One piezometer was installed at the lower downstream bench in foundation soils.

# **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 Ash Pond B' dam meet or exceed the minimum criteria set forth in the structural integrity criteria for existing CCR surface impoundments, 40 CFR 257.73.

Eactor	٥f	Safaty	Summary	Table
Factor	OT	Saretv	Summarv	lable

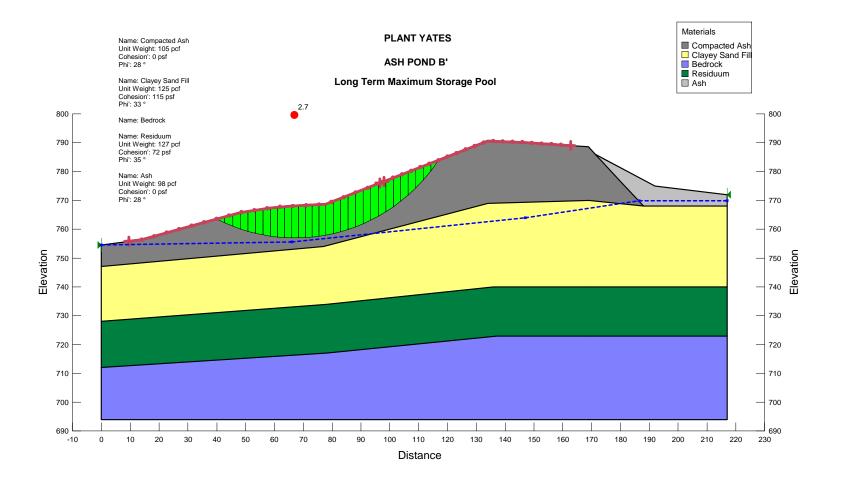
Loading Condition	Minimum Calculated Safety Factor	Minimum Required Safety Factor
Long-term Maximum Storage Pool (Static)	2.7	1.5
Maximum Surcharge Pool (Static)	2.7	1.4
Seismic	2.3	1.0

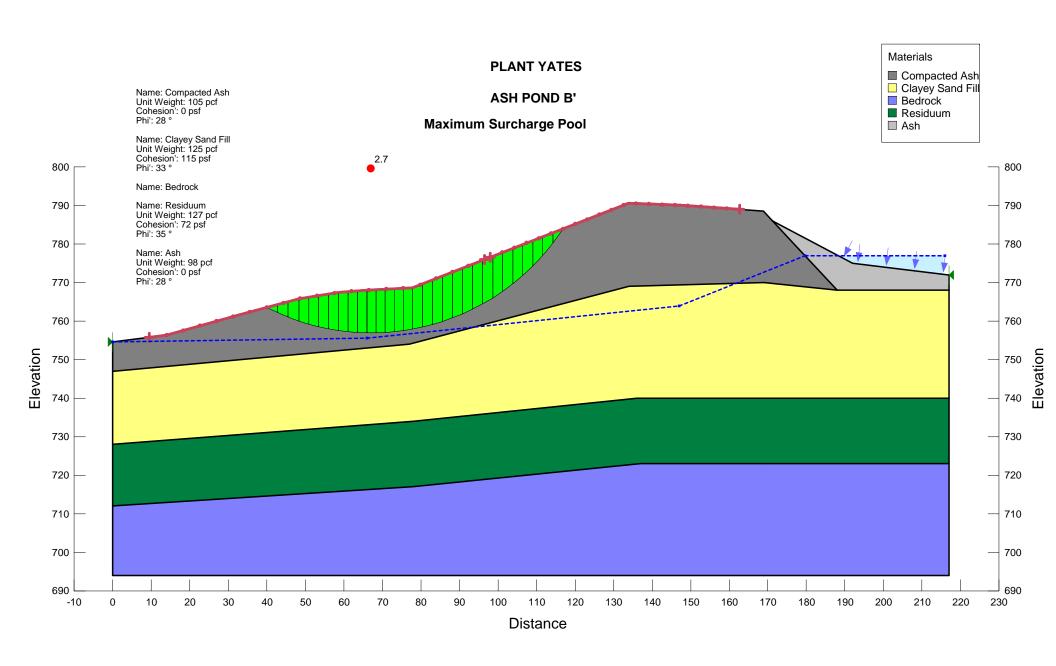
# **Design Inputs/References**

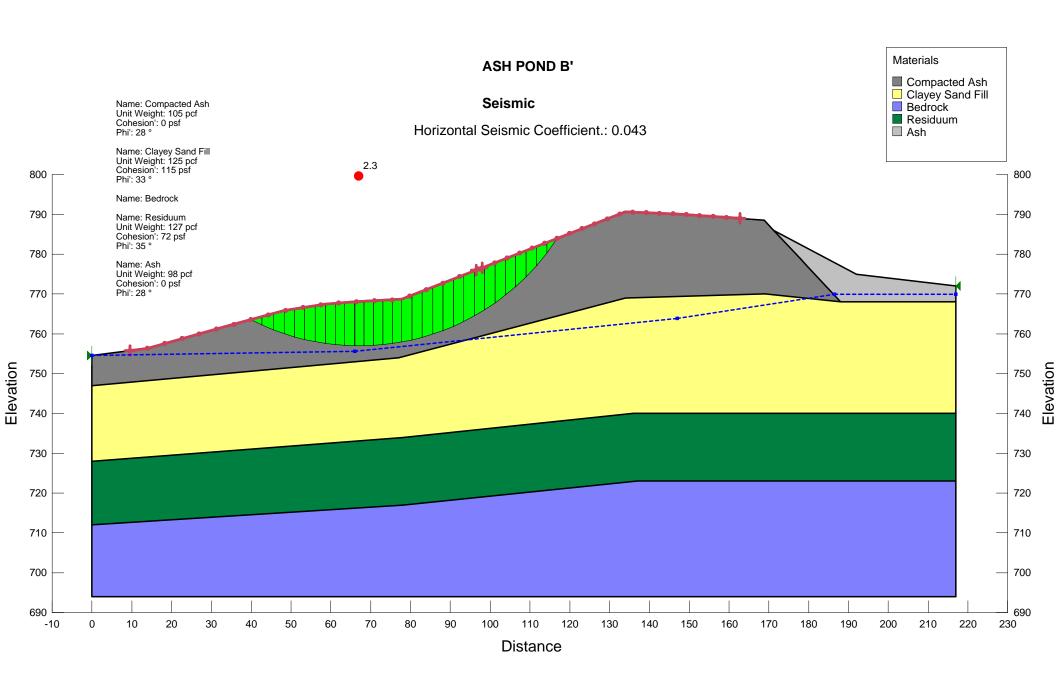
- Bray, J. D. and Travasarou, T., Pseudostatic Coefficient for Use in Simplified Seismic Slope Stability Evaluation, Journal of Geotechnical and Environmental Engineering, American Society of Civil Engineers, September 2009
- Atlanta Testing & Engineering Report, Subsurface Exploration Modifications to B' Dike and Pond, April 19, 1977

- SCS Drawing ES1836S1A Pond and Cross-section Layouts
- SCS Drawing ES1836S1B Plant Yates Ash Pond Dike Cross-Sections
- SCS ES1836S2 Piezometer and Boring Layout
- SCS 2010 Boring and Piezometer Logs
- 2010 Laboratory Analyses

# **Body of Calculation**

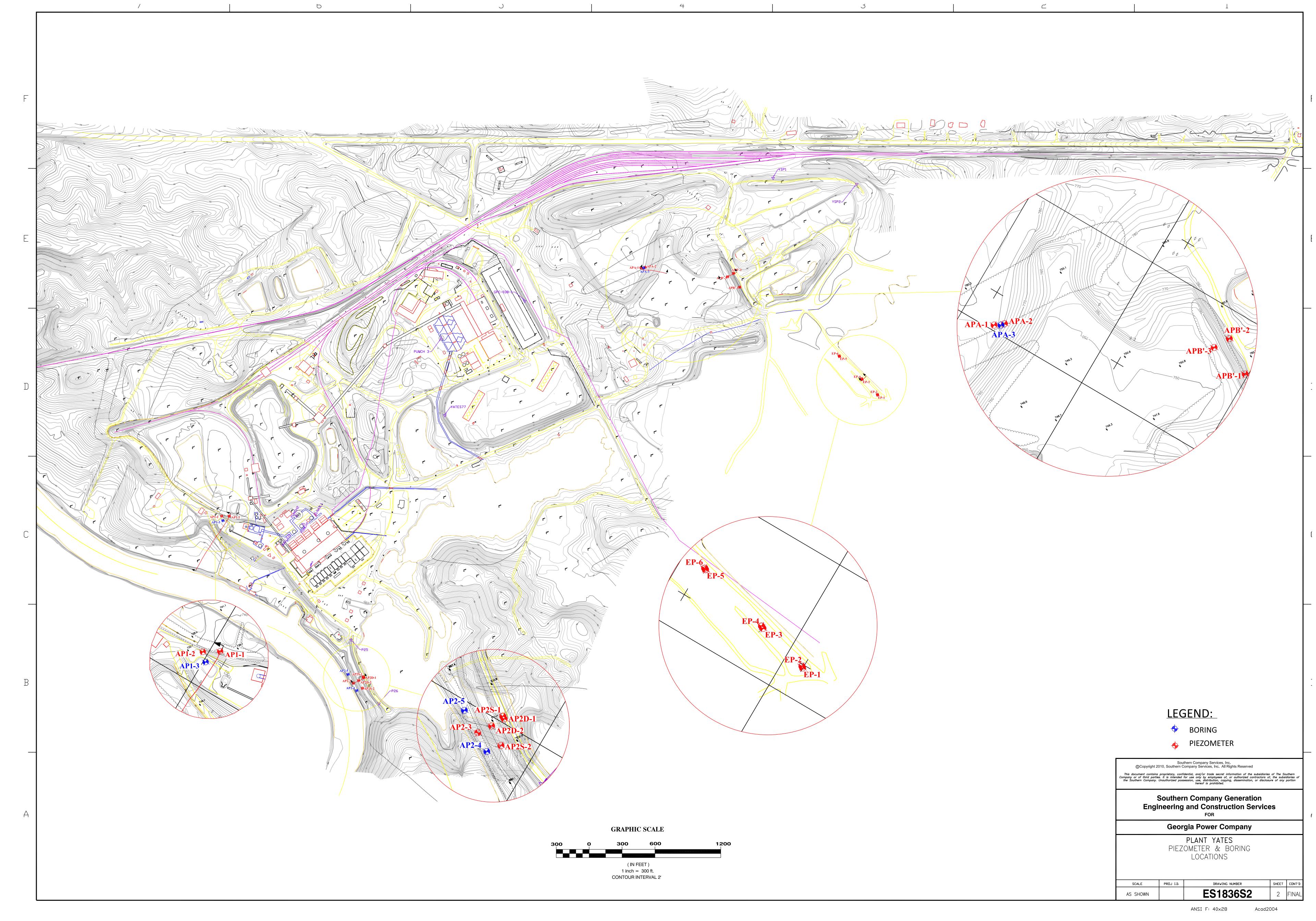






# **ATTACHMENTS**

# **Attachment A - Boring Location Plan**



# **Attachment B - Boring and Piezometer Logs**

#### BORING APB'-1 PAGE 1 OF 3



### **LOG OF TEST BORING**

SOUTHERN COMPANY SERVICES, INC.

EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

LOCATION Plant Yates

l		RTED         3/16/2010         COMPLETED         3/16/2010         S           OR         SCS Field Services         EQUIPMENT						N 1,258,084.49 E 2,075,198.96
DRILI		Y _T. Milam LOGGED BY _R. Mudd						LE BEARING
BORI		PTH 66 ft. GROUND WATER DEPTH: DURI						
NOTE		p of Ash Pond B' Dike, South Side Well installed. Refe						
To   To   To   To   To   To   To   To	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	COMMENTS
		ML - gray, moist, soft, low plasticity, ASH						
5				ss	4500	WH-1-1		
				SS -1	4.5-6.0	(2)		
								(MC = 27.9%; PL=NP; FC = 77.8%;
10				SS -2	9.5-	2-2-1		Gravel = 0.2%)
				-2	11.0	(3)		
15				SS -3	14.5- 16.0	2-1-1		
					10.0	(2)		
20		SM - red and medium and dark gray, moist, low	<u>769.7</u>					(MC = 17.6%; LL = 46; PI=17; FC = 42.8%; Gravel = 2.4%)
<del>- = -</del>		plasticity, fine to medium grain, probable fill		SS -4	19.5- 21.0	2-3-3 (6)		1. 5 42.070, Stavot - 2.470)
		material				. ,		
25							100	



## **LOG OF TEST BORING**

**PROJECT** Yates Ash Pond Dikes

	SOUTHERN COMPANY SERVICES, INC. EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING					Yates Ash Pond Dikes				
EA	LIKTI SCILICE AND ENVIRONMENTAL ENGINEERING					LOCATION Plant Yates				
GEOTECH ENGINEERING LOGS - ESEE DATABASE GOT - 5/4/10 14:5/ - 17:ESEE MAJOK PROJECT SYPROJECT SY	(2.)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	SAMPLE TYPE	NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	COMMENTS
AIES ASH PC			SM - red and medium and dark gray, moist, low plasticity, fine to medium grain, probable fill material (Con't)			UD -1	24.5- 26.5		100	
OKMAIION/Y										
30					Y	SS -5	29.5- 31.0	3-3-3 (6)		(MC = 20.9%; FC = 41%)
								· · ·		
			Ā							
35 35 35 35 35 35 35 35 35 35 35 35 35 3					X	SS -6	34.5- 36.0	3-4-8 (12)		
IES/YAIES										
KOJECI SVYA										
40 40 30 40 40						SS -7	39.5- 41.0	4-4-4 (8)		
MAJOCAM										
45 45	- :					SS	44.5-	2-4-4		More clay, slightly darker in color, more grays and black, silver mica. (MC = 28.3%; FC = 55.4%;
. 01/4/c - 10/6						-8	46.0	(8)		Gravel = 0.2%)
JAI ABASE.C										
50			SM - light orange and gray presenting in layers, moist, medium dense, fine to medium grain, residuum	<u>739.7</u>		SS -9	49.5- 51.0	4-5-9 (14)		Beginning of residuum material. (MC = 54.7%; FC = 32.4%; Gravel = 0.9%)
INEEKING C										
										Possible water table.
55	ľ		SM - light gray and medium orange and white,							



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ESEE DATABASE.GDT

# **LOG OF TEST BORING**

SOUTHERN COMPANY SERVICES, INC.
FARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Yates Ash Pond Dikes

			CIENCE AND ENVIRONMENTAL ENGINEERING	LO	CATION	Plant Y	'ates		
OND DIKES.GPJ	DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	COMMENTS
SH PC			wet, dense, fine grain, weathered in place parent rock structure evident, white section less		SS -10	54.5- 56.0	4-9-17 (26)		
ATESYATES 2010/EPA ASH POND INSPECTIONS/BORING INFORMATION/YATES ASH POND DIKES.GPJ			weathered than rest of sample, several medium angular pebbles in sample, especially in white portion, probable water table <b>SM</b> - light orange and gray presenting in layers, moist, medium dense, fine to medium grain, residuum (Con't)				(=0)		
INFOR			residualii (Ooniy						(MC = 13.3%; FC = 31%)
S/BORING	60		<b>SM</b> - very dense, very fine grain, no pebbles, predominantly gray and dark tan, with some white		SS -11	59.5- 60.9	18-30-50/5" (100+)	50	
NSPECTION									
SH POND									
010\EPA A	65		<b>SM</b> - light orange and white, moist, very dense, very fine grain, parent rock structure evident	723.2	SS -12	64.5- 64.8	50/4" (100+)		
TES 2			Bottom of borehole at 66.0 feet.						
TES/Y4									
4									

#### BORING APB'-2 PAGE 1 OF 2



## **LOG OF TEST BORING**

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

LOCATION Plant Yates

EAF	(1113	CIENCE AND ENVIRONMENTAL ENGINEERING	LC	CATION	Plant Y	ates		
l		COMPLETED 3/16/2010 SI						N 1,258,197.60 E 2,075,279.61
l		OR SCS Field Services EQUIPMENT						
l		Y _T. MilamLOGGED BY _R. Mudd						
l		PTH 46 ft. GROUND WATER DEPTH: DURIN					_ DELA	25.1 ft. after 48 hrs.
NOTE	:S <u>10</u>	p of Ash Pond B', North Side Well installed. Refer to w	eli data	sneet.				
					I _ I			
DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N VALUE)	RECOVERY % (RQD)	COMMENTS
		ML - dark gray, moist, no plasticity, fill, ASH						
5								(MC = 20.6%; PL=NP; FC = 56.2%; Gravel = 4.8%)
				SS -1	4.5-6.0	3-2-2 (4)		,
	•							
l				UD -1	7.5-9.5		100	
10								(MC = 25.7%; PL=NP; FC = 56.4%; Gravel = 3.9%)
				SS -2	9.5- 11.0	2-1-1 (2)		
	-							
	+				40			
l				UD -2	12.5- 14.5		100	
15			774.0					
<del>``</del>	//,	SC - orange and yellow and tan, moist, fine to		SS -3	14.5- 16.0	1-1-3 (4)		
		medium grain, <i>fill</i>						
20		SC - light tan, gray and red, fill, isolated layers						
20		of sandy CLAY (CL) that is stiff		SS -4	19.5- 21.0	1-3-3 (6)		
						(-)		
				UD -3	22.5- 24.5		100	
25		SC gray with some top and mattled black						
	1/ /	SC - gray with some tan and mottled black (Continued Next Page)					1	



50

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ENGINEERING LOGS .

#### LOG OF TEST BORING

SOUTHERN COMPANY SERVICES, INC.

PROJECT Yates Ash Pond Dikes

EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING **LOCATION** Plant Yates SAMPLE DEPTH (ft.) SAMPLE TYPE NUMBER ELEVATION GRAPHIC LOG RECOVERY (RQD) DEPTH (ft) TYESEE MAJOR PROJECTS/PROJECTS/YATES/YATES 2010/EPA ASH POND INSPECTIONS/BORING INFORMATION/YATES ASH POND DIKES.GPJ MATERIAL DESCRIPTION COMMENTS throughout, moist, fine grain, fill, less clay, isolated layers of (SP-SC) 24.5-3-5-5 -5 26.0 (10)SC - orange and yellow and tan, moist, fine to medium grain, *fill (Con't)* (MC = 16.6%; LL = 50; PI=23; FC = 45.5%; Gravel = 0.2%) 30 SC - orange and tannish gray, moist, fine to SS 29.5-4-5-5 medium grain, fill, micaceous, very clayey -6 31.0 (10)35 SC - fill, slightly less clayey SS 34.5-3-3-4 36.0 (7) (MC = 26%; LL = 55; PI=25; FC = 47.2%40 SS 39.5-1-3-3 -8 41.0 (6) 45 SS 2-3-5 44.5-46.0 (8) Bottom of borehole at 46.0 feet. GDT.

#### BORING APB'-3 PAGE 1 OF 2



## **LOG OF TEST BORING**

SOUTHERN COMPANY SERVICES, INC.
EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING
LOCATION Plant Yates

Yates Ash Pond Dikes

LOCATION Plant Yates

1		TED 3/16/2010 COMPLETED 3/17/2010 SU						N 1,258,228.40 E 2,075,224.62		
1		OR         SCS Field Services         EQUIPMENT           Y         T. Milam         LOGGED BY         R. Mudd						I F BFARING		
1		PTH 51 ft. GROUND WATER DEPTH: DURIN								
NOTES _Toe of Ash Pond B' Well installed. Refer to well data sheet.										
			-							
			z	H T	H.		%			
DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	SAMPLE TYPE NUMBER	SAMPLE DEPTH (ft.)	BLOW COUNTS (N VALUE)	RECOVERY 9 (RQD)	COMMENTS		
5		ML - dark gray, moist, no plasticity, ASH		SS -1	4.5-6.0	1-1-2 (3)				
10	-	ML - very wet, very soft, ASH		▼ ss	9.5-	WH-WH-WH		(MC = 35.1%; PL=NP; FC = 89%; Gravel = 0.2%)		
				-2	11.0	(0)				
		¥								
			<u>754.1</u>					(MC = 24.1%; LL = 54; PI=23;		
15		SC - red, orange and gray, wet, medium grain, Probable fill		SS -3	14.5- 16.0	2-2-2 (4)		FC = 34.8%; Gravel = 0.4%)		
				UD -1	17.5- 19.5		100			
20		SC - tan, red and gray, very wet, loose, medium to fine grain, Possible residuum, layers of CH in sample		SS -4	19.5- 21.0	WH-2-2 (4)				
		Sample								
25		SC - red, yellow, and orange mottled, moist,								
		(Continued Next Page)								



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#### LOG OF TEST BORING

PROJECT Yates Ash Pond Dikes

SOUTHERN COMPANY SERVICES, INC. EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING **LOCATION** Plant Yates SAMPLE DEPTH (ft.) SAMPLE TYPE NUMBER ELEVATION GRAPHIC LOG RECOVERY (RQD) DEPTH (ft) 2010\EPA ASH POND INSPECTIONS\BORING INFORMATION\YATES ASH POND DIKES.GPJ MATERIAL DESCRIPTION COMMENTS 1-4-5 medium dense, fine grain, very high clay content, 24.5plastic fines 26.0 -5 (9)**SC** - red, orange and gray, wet, medium grain, Probable fill (*Con't*) (MC = 20.3%; LL = 45; PI=24;FC = 39.7%; Gravel = 6.2%) 30 SS 29.5-1-2-4 SC - gray, wet, loose, medium to high plasticity, -6 31.0 (6) fine to medium grain, high clay content, fines have medium to high plasticity 734.1 35 SP - light tan and white with dark brown veins, SS 34.5-8-9-5 moist, medium dense, fine to medium grain, 36.0 (14)parent rock structure evident MAJOR PROJECTS/PROJECTS/YATES/YATES (MC = 29.3%; FC = 27.2%)40 SP - predominately white with dark brown veins SS 39.5-3-6-8 41.0 -8 (14)45 SP - dense, one orange-red clayey sand seam 44.5-7-16-14 SS running vertically through sample 46.0 (30)GDT. 50 SP - tand and medium brown, very dense SS 49.5-8-18-27 ENGINEERING LOGS . 51.0 (45)717.6 Boring Terminated. Bottom of borehole at 51.0 feet.

# **BORING APB'-1**

GRAPHIC LOG

DEPTH (ft)

10

15

# LOG OF TEST BORING

SOUTHERN COMPANY SERVICES, INC. EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

ML - gray, moist, soft, low plasticity, ASH

MATERIAL DESCRIPTION

AND WELL PROJECT Yates Ash Pond Dikes **LOCATION** Plant Yates DATE STARTED 3/16/2010 COMPLETED 3/16/2010 SURF. ELEV. 789.2 COORDINATES: N 1,258,084.49 E 2,075,198.96 CONTRACTOR SCS Field Services EQUIPMENT CME 55 METHOD Hollow Stem Auger ANGLE BEARING DRILLED BY \_T. Milam \_\_\_\_LOGGED BY \_R. Mudd \_\_\_\_\_ CHECKED BY \_\_ BORING DEPTH 66 ft. GROUND WATER DEPTH: DURING COMP. DELAYED 32.7 ft. after 48 hrs. NOTES Top of Ash Pond B' Dike, South Side Well installed. Refer to well data sheet. GROUNDWATER OBSERVATIONS WELL DATA ELEVATION -Riser only, no protector -Single piezometer -Top of Casing Elev.=792.74 SM - red and medium and dark gray, moist, low plasticity, fine to

Bentonite chips

medium grain, probable fill material

# BORING APB'-1 PAGE 2 OF 3



### **LOG OF TEST BORING AND WELL**

SOUTHERN COMPANY SERVICES, INC.

PROJECT Yates Ash Pond Dikes

EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING **LOCATION** Plant Yates 3ROUNDWATER 3BSERVATIONS **WELL DATA** GRAPHIC LOG ELEVATION DEPTH (ft) MATERIAL DESCRIPTION -Riser only, no protector -Single piezometer -Top of Casing Elev.=792.74 TYESEE MAJOR PROJECTSIPROJECTSIYATESIYATES 2010\\ PASH POND INSPECTIONS\\ BORING INFORMATIONIYATES ASH POND DIKES. GPJ **SM** - red and medium and dark gray, moist, low plasticity, fine to medium grain, probable fill material (*Con't*) 30 3/18/2010 35 40 - 2" ID PVC Riser (SCH 40) 45 ESEE DATABASE.GDT **SM** - light orange and gray presenting in layers, moist, medium dense, fine to medium grain, residuum 50 GEOTECH WITH WELL LOG -SM - light gray and medium orange and white, wet, dense, fine grain,





# LOG OF TEST BORING AND WELL

SOUTHERN COMPANY SERVICES, INC. EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Yates Ash Pond Dikes

LOCATION Plant Yates

MATERIAL DESCRIPTION	""	CIII SC	TENCE AND ENVIRONMENTAL ENGINEERING	LOCATION Plant	i raies	-
weathered in place parent rock structure evident, white script is water than the set of sample, serveral medium angular pebbles in sample, especially in white portion, probable water table.  Simple, especially in white probable wat	DIKES.GPJ DEPTH (ft)	GRAPHIC LOG			GROUNDWATER OBSERVATIONS	-Riser only, no protector -Single piezometer -Top of Casing Elev.=792.74
SM - very dense, very fine grain, no pebbles, predominantly gray and dark tan, with some white  SM - light orange and white, moist, very dense, very fine grain, parent rock structure evident  Bottom of borehole at 66.0 feet.	MATION(YATES ASH POND		weathered in place parent rock structure evident, white sweathered than rest of sample, several medium angular sample, especially in white portion, probable water table SM - light orange and gray presenting in layers, moist, n fine to medium grain, residuum (Con't)	section less pebbles in nedium dense,		
SM - light orange and white, moist, very dense, very fine grain, parent rock structure evident  Bottom of borehole at 66.0 feet.	INSPECTIONS/BORING INFOR		<b>SM</b> - very dense, very fine grain, no pebbles, predomina dark tan, with some white	ntly gray and		
Bottom of porenole at 66.0 Teet.	0)EPA ASH POND		rock structure evident	grain, parent		
70 	201		Bottom of dorenole at 66.0 feet.			
70 004 004 004 005 005 005 005 005 005 00	<u>မျို</u>					
20 70 70 70 70 70 70 70 70 70 70 70 70 70	 					
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80 80 85 85	- TOS					
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	일 85					

# **BORING APB'-2**



GRAPHIC LOG

DEPTH (ft)

10

15

that is stiff

## LOG OF TEST BORING AND WELL

SOUTHERN COMPANY SERVICES, INC. EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

ML - dark gray, moist, no plasticity, fill, ASH

MATERIAL DESCRIPTION

PROJECT Yates Ash Pond Dikes **LOCATION** Plant Yates DATE STARTED 3/16/2010 COMPLETED 3/16/2010 SURF. ELEV. 789.0 COORDINATES: N 1,258,197.60 E 2,075,279.61 CONTRACTOR SCS Field Services EQUIPMENT CME 55 METHOD Hollow Stem Auger \_\_ ANGLE \_\_\_\_\_ BEARING DRILLED BY T. Milam LOGGED BY R. Mudd CHECKED BY BORING DEPTH 46 ft. GROUND WATER DEPTH: DURING COMP. DELAYED 25.1 ft. after 48 hrs. NOTES Top of Ash Pond B', North Side Well installed. Refer to well data sheet. GROUNDWATER OBSERVATIONS WELL DATA ELEVATION -Riser only, no protector -Single piezometer -Top of Casing Elev.=793.21 Bentonite chips SC - orange and yellow and tan, moist, fine to medium grain, fill - 2" ID PVC Riser (SCH 40) SC - light tan, gray and red, fill, isolated layers of sandy CLAY (CL)

> SC - gray with some tan and mottled black throughout, moist, fine (Continued Next Page)



# LOG OF TEST BORING AND WELL

BORING APB'-2 PAGE 2 OF 2

SOUTHERN COMPANY SERVICES, INC. EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Yates Ash Pond Dikes

LOCATION Plant Yates

LAN	(1115)	CIENCE AND ENVIRONMENTAL ENGINEERING LOCATIO	n Plan	it rates
DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	WELL DATA  WELL DATA  PRISER only, no protector  Single piezometer  Top of Casing Elev.=793.21  CONTINUED)
30 35 40 45 50		grain, fill, less clay, isolated layers of (SP-SC) SC - orange and yellow and tan, moist, fine to medium grain, fill (Con't)  SC - orange and tannish gray, moist, fine to medium grain, fill, micaceous, very clayey		3/18/2010
35		SC - fill, slightly less clayey		9 bags silica sand filter
40				2" ID PVC Screen (SCH 40)
45		Bottom of borehole at 46.0 feet.		
50				
50				
55				

# BORING APB'-3



# LOG OF TEST BORING AND WELL

PROJECT Yates Ash Pond Dikes SOUTHERN COMPANY SERVICES, INC. EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING **LOCATION** Plant Yates DATE STARTED 3/16/2010 COMPLETED 3/17/2010 SURF. ELEV. 768.6 COORDINATES: N 1,258,228.40 E 2,075,224.62 CONTRACTOR SCS Field Services EQUIPMENT CME 55 METHOD Hollow Stem Auger \_\_ ANGLE \_\_\_\_\_ BEARING \_ DRILLED BY T. Milam LOGGED BY R. Mudd CHECKED BY BORING DEPTH 51 ft. GROUND WATER DEPTH: DURING COMP. DELAYED 13.2 ft. after 24 hrs. **NOTES** Toe of Ash Pond B' Well installed. Refer to well data sheet. GROUNDWATER OBSERVATIONS WELL DATA ELEVATION GRAPHIC LOG DEPTH (ft) MATERIAL DESCRIPTION -Riser only, no protector -Single piezometer -Top of Casing Elev.=770.73 5 ML - dark gray, moist, no plasticity, ASH 10 ML - very wet, very soft, ASH  $\mathbf{I}$ 3/18/2010 SC - red, orange and gray, wet, medium grain, Probable fill Bentonite chips - 2" ID PVC Riser (SCH 40)  ${\bf SC}$  - tan, red and gray, very wet, loose, medium to fine grain, Possible residuum, layers of CH in sample

(Continued Next Page)

SC - red, yellow, and orange mottled, moist, medium dense, fine grain,





# LOG OF TEST BORING AND WELL

SOUTHERN COMPANY SERVICES, INC. EARTH SCIENCE AND ENVIRONMENTAL ENGINEERING

PROJECT Yates Ash Pond Dikes

LOCATION Plant Yates

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION	GROUNDWATER OBSERVATIONS	WELL DATA  -Riser only, no protector -Single piezometer -Top of Casing Elev.=770.73 (CONTINUED)
		very high clay content, plastic fines SC - red, orange and gray, wet, medium grain, Probable 1	fill <i>(Con't)</i>		
30		SC - gray, wet, loose, medium to high plasticity, fine to m high clay content, fines have medium to high plasticity	edium grain,		
35	<u>//</u> _	SP - light tan and white with dark brown veins, moist, med fine to medium grain, parent rock structure evident	dium dense,		
40		SP - predominately white with dark brown veins			- Silica sand filter
45		<b>SP</b> - dense, one orange-red clayey sand seam running ve through sample	ertically		2" ID ABS Screen (SCH 40)
50		SP - tand and medium brown, very dense  Bottom of borehole at 51.0 feet.			
55		bottom of borefiole at 31.0 feet.			

# **Attachment C - Laboratory Analyses**

Project:

Plant Yates Ash Pond

Project Number

6189-10-9008

Date Performed

4/2/2010

Date Sampled

Dry wt. W/ Can

Percent Moisture

Moisture Content Calculation: (WetWt-DryWt)/(DryWt-can wt)

APA-2	APA-2	APA-2	APA-2	APB-1	APB-1	APB-1	APB-1	APB-1	APB-1
4	5	6	8	2	4	5	8	9	11
19.5-21	24.5-26	29.5-31	39.5-41	9.5-11	19.5-21	29.5-31	44.5-46	49.5-51	59.5-61
55.6	54.57	55.68	54.94	50.18	54.38	54.75	52.08	54.86	54.72
165.36	218.03	223.21	228.36	171.67	208.71	197.61	170.79	197.96	166.95
140.95	171.67	179.27	191.37	145.14	185.56	172.91	144.58	174.33	153.78
28.6%	39.6%	35.6%	27.1%	27.9%	17.6%	20.9%	28.3%	54.7%	13.3%
APB-2	APB-2	APB-2	APB-2	APB-3	APB-3	APB-3	APB-3		
1	2	6	8	2	3	6	8	nera vara vara vara vara vara vara vara v	
4.5-6	9.5-11	29.5-31	39.5-41	9.5-11	14.5-16	29.5-31	39.5-41		
50.78	49.08	51.91	50.67	56.07	54.6	57.02	52.67		,
158.56	168.62	168.74	166.87	114.61	192.13	201.87	145.59		
	4 19.5-21 55.6 165.36 140.95 28.6% APB-2 1 4.5-6	4 5 19.5-21 24.5-26 55.6 54.57 165.36 218.03 140.95 171.67 28.6% 39.6% APB-2 APB-2 1 2 4.5-6 9.5-11 50.78 49.08	4       5       6         19.5-21       24.5-26       29.5-31         55.6       54.57       55.68         165.36       218.03       223.21         140.95       171.67       179.27         28.6%       39.6%       35.6%         APB-2       APB-2       APB-2         1       2       6         4.5-6       9.5-11       29.5-31         50.78       49.08       51.91	4       5       6       8         19.5-21       24.5-26       29.5-31       39.5-41         55.6       54.57       55.68       54.94         165.36       218.03       223.21       228.36         140.95       171.67       179.27       191.37         28.6%       39.6%       35.6%       27.1%         APB-2       APB-2       APB-2       APB-2         1       2       6       8         4.5-6       9.5-11       29.5-31       39.5-41         50.78       49.08       51.91       50.67	4       5       6       8       2         19.5-21       24.5-26       29.5-31       39.5-41       9.5-11         55.6       54.57       55.68       54.94       50.18         165.36       218.03       223.21       228.36       171.67         140.95       171.67       179.27       191.37       145.14         28.6%       39.6%       35.6%       27.1%       27.9%         APB-2       APB-2       APB-2       APB-3         1       2       6       8       2         4.5-6       9.5-11       29.5-31       39.5-41       9.5-11         50.78       49.08       51.91       50.67       56.07	4       5       6       8       2       4         19.5-21       24.5-26       29.5-31       39.5-41       9.5-11       19.5-21         55.6       54.57       55.68       54.94       50.18       54.38         165.36       218.03       223.21       228.36       171.67       208.71         140.95       171.67       179.27       191.37       145.14       185.56         28.6%       39.6%       35.6%       27.1%       27.9%       17.6%         APB-2       APB-2       APB-2       APB-3       APB-3         1       2       6       8       2       3         4.5-6       9.5-11       29.5-31       39.5-41       9.5-11       14.5-16         50.78       49.08       51.91       50.67       56.07       54.6	4       5       6       8       2       4       5         19.5-21       24.5-26       29.5-31       39.5-41       9.5-11       19.5-21       29.5-31         55.6       54.57       55.68       54.94       50.18       54.38       54.75         165.36       218.03       223.21       228.36       171.67       208.71       197.61         140.95       171.67       179.27       191.37       145.14       185.56       172.91         28.6%       39.6%       35.6%       27.1%       27.9%       17.6%       20.9%         APB-2       APB-2       APB-2       APB-3       APB-3       APB-3         1       2       6       8       2       3       6         4.5-6       9.5-11       29.5-31       39.5-41       9.5-11       14.5-16       29.5-31         50.78       49.08       51.91       50.67       56.07       54.6       57.02	4       5       6       8       2       4       5       8         19.5-21       24.5-26       29.5-31       39.5-41       9.5-11       19.5-21       29.5-31       44.5-46         55.6       54.57       55.68       54.94       50.18       54.38       54.75       52.08         165.36       218.03       223.21       228.36       171.67       208.71       197.61       170.79         140.95       171.67       179.27       191.37       145.14       185.56       172.91       144.58         28.6%       39.6%       35.6%       27.1%       27.9%       17.6%       20.9%       28.3%         APB-2       APB-2       APB-2       APB-3       APB-3       APB-3       APB-3         1       2       6       8       2       3       6       8         4.5-6       9.5-11       29.5-31       39.5-41       9.5-11       14.5-16       29.5-31       39.5-41         50.78       49.08       51.91       50.67       56.07       54.6       57.02       52.67	4       5       6       8       2       4       5       8       9         19.5-21       24.5-26       29.5-31       39.5-41       9.5-11       19.5-21       29.5-31       44.5-46       49.5-51         55.6       54.57       55.68       54.94       50.18       54.38       54.75       52.08       54.86         165.36       218.03       223.21       228.36       171.67       208.71       197.61       170.79       197.96         140.95       171.67       179.27       191.37       145.14       185.56       172.91       144.58       174.33         28.6%       39.6%       35.6%       27.1%       27.9%       17.6%       20.9%       28.3%       54.7%         APB-2       APB-2       APB-3       APB-3       APB-3       APB-3       APB-3         1       2       6       8       2       3       6       8         4.5-6       9.5-11       29.5-31       39.5-41       9.5-11       14.5-16       29.5-31       39.5-41         50.78       49.08       51.91       50.67       56.07       54.6       57.02       52.67

152.15

16.6%

144.2

25.7%

140.15

20.6%

142.89

26.0%

165.42

24.1%

99.41

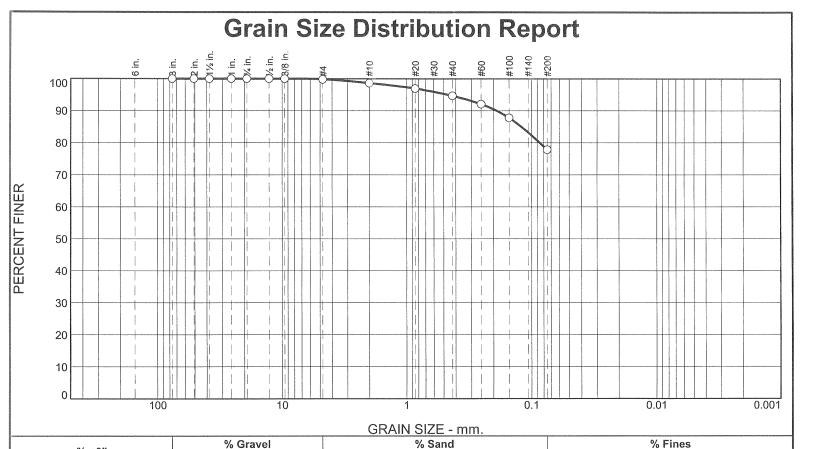
35.1%

177.47

20.3%

124.54

29.3%



Medium

3.9

Fine

16.9

Test Results (ASTM D 422 & ASTM D 1140)									
Opening	Percent	Spec.*	Pass?						
Size	Finer	(Percent)	(X=Fail)						
3"	100.0								
2"	100.0								
1.5"	100.0								
1"	100.0								
3/4"	100.0								
1/2"	100.0	***************************************							
3/8"	100.0								
#4	99.8								
#10	98.6								
#20	96.9								
#40	94.7								
#60	92.0								
#100	87.8								
#200	77.8								

Coarse

0.0

Fine

0.2

Coarse

1.2

# **Material Description** Dark Gray Fly Ash Atterberg Limits (ASTM D 4318) PL= NP USCS (D 2487)= ML Classification **AASHTO (M 145)=** A-4(0) Coefficients $D_{90} = 0.1887$ D<sub>60</sub>= D<sub>15</sub>= C<sub>c</sub>= $D_{85} = 0.1204$ D<sub>50</sub>= D<sub>10</sub>= D<sub>30</sub>= C<sub>u</sub>= Remarks Date Received: 4-2-10 Date Tested: 4-8-10 Tested By: MC Checked By: Title:

Silt

77.8

Clay

(no specification provided)

**Source of Sample:** Boring No.: APB-1 **Sample Number:** 2

% +3"

0.0

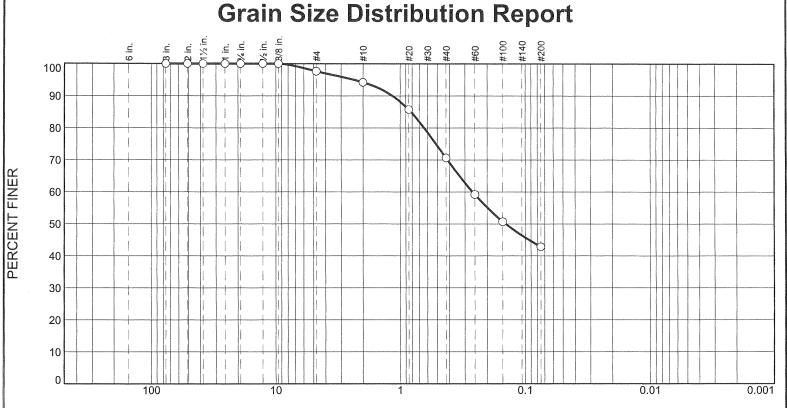
**Depth:** 9.5'-11.0'

Date Sampled:

MACTEC ENGINEERING. AND CONSULTING, INC.

**Client:** Southern Company Project: Plant Yates Ash Pond

Project No: 6189109008



GRAIN SIZE - mm.

0/ ±2"	% G	ravel	% Sand			% Fines		
76 +3	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay	
0.0	0.0	2.4	3.4	23.6	27.8	42.8		

Test I	Results (ASTM D	422 & ASTM D	1140)
Opening	Opening Percent		Pass?
Size	Finer	(Percent)	(X=Fail)
3"	100.0		
2"	100.0		
1.5"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	97.6		
#10	94.2		
#20	85.7		
#40	70.6		
#60	59.2		
#100	50.7		
#200	42.8		

#### **Material Description** Light Reddish Brown Medium to Fine SAND with Silt Atterberg Limits (ASTM D 4318) LL= 46 PL= 29 PI= 17 Classification USCS (D 2487)= SM **AASHTO** (M 145)= A-7-6(4) Coefficients D<sub>90</sub>= 1.1532 D<sub>50</sub>= 0.1425 D<sub>10</sub>= **D<sub>60</sub>=** 0.2608 $D_{85} = 0.8159$ D<sub>30</sub>= Remarks Date Received: 4-2-10 Date Tested: 4-8-10 Tested By: MC Checked By: Title:

Source of Sample: Boring No.: APB-1

Sample Number: 4

Depth: 19.5'-21.0'

**Date Sampled:** 

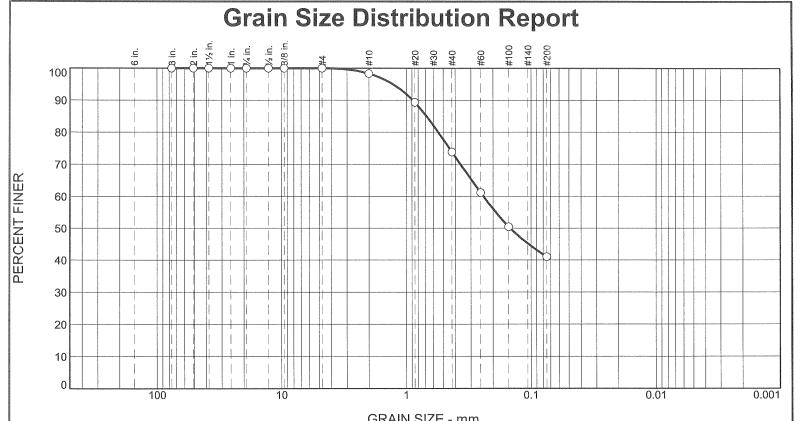
MACTEC ENGINEERING. AND CONSULTING, INC.

Client: Southern Company

Project: Plant Yates Ash Pond

**Project No:** 6189109008

<sup>(</sup>no specification provided)



OIVAIN SIZL - IIIII.									
0/ 120	% G	ravel	% Sand			% Fines			
% ÷3"	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay		
0.0	0.0	0.0	1.7	24.5	32.8	41.0			

Test R	Test Results (ASTM D 422 & ASTM D 1140)									
Opening	Percent	Spec.*	Pass?							
Size	Finer	(Percent)	(X=Fail)							
3"	100.0									
2"	100.0									
1.5"	100.0	,								
1"	100.0									
3/4"	100.0									
1/2"	100.0									
3/8"	100.0									
#4	100.0									
#10	98.3									
#20	89.3									
#40	73.8									
#60	61.2									
#100	50.4									
#200	41.0									
000000000000000000000000000000000000000										

Material Description							
Light Reddish Bro	own Medium to Fine S	SAND with Silt					
PL=	erberg Limits (AST	IM D 4318) PI=					
F 6	Base Reco	• •					
USCS (D 2487)=	Classification SM AASHT	o <u>n</u> O (M 145)=					
03C3 (D 2407)-		` ,					
D - 0.9925	Coefficients						
<b>D<sub>90</sub>=</b> 0.8835 <b>D<sub>50</sub>=</b> 0.1465	D <sub>85</sub> = 0.6829 D <sub>30</sub> =	D <sub>60</sub> = 0.2378 D <sub>15</sub> =					
D <sub>10</sub> =	$c_{u}^{3}$	C°=					
	Remarks						
Date Received:	4-2-10 <b>Date</b>	e Tested: 4-8-10					
Tested By:	MC						
Checked By:							
· ·							
Title:							

\* (no specification provided)

Source of Sample: Boring No.: APB-1 Sample Number: 5

Depth: 29.5'-31.0'

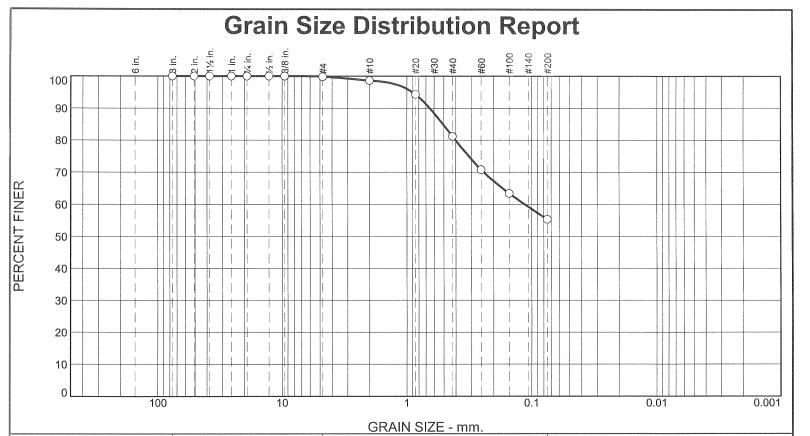
**Date Sampled:** 

MACTEC ENGINEERING. AND CONSULTING, INC.

Client: Southern Company

Project: Plant Yates Ash Pond

Project No: 6189109008



% +3"	% Gr	avel		% Sand		% Fines	
70 +3	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	1.2	17.4	25.8	55.4	
Test Results (ASTM D 422 & ASTM D 1140)					Materi	al Description	

Test R	Test Results (ASTM D 422 & ASTM D 1140)								
Opening	Percent	Spec.*	Pass?						
Size	Finer	(Percent)	(X=Fail)						
3"	100.0								
2"	100.0								
1.5"	100.0								
1"	100.0	Total Control of the							
3/4"	100.0								
1/2"	100.0								
3/8"	100.0								
#4	99.8								
#10	98.6								
#20	94.4								
#40	81.2								
#60	70.8								
#100	63.4								
#200	55.4								
*									

Material Description					
Light Reddish Brown SILT with Medium to Fine SAND					
Atterberg Limits (ASTM D 4318) PL= LL= PI=					
E Book	stead sector	• •			
USCS (D 2487)=	Classifica ML AAS	<u>cation</u> SHTO (M 145)=			
D <sub>90</sub> = 0.6484 D <sub>50</sub> = D <sub>10</sub> =	Coefficie D <sub>85</sub> = 0.5070 D <sub>30</sub> = C <sub>u</sub> =				
	Remar	rks			
Date Received: 4-2-10 Date Tested: 4-8-10					
Tested By: MC					
Checked By:					
Title:					

\* (no specification provided)

Source of Sample: Boring No.: APB-1 Sample Number: 8

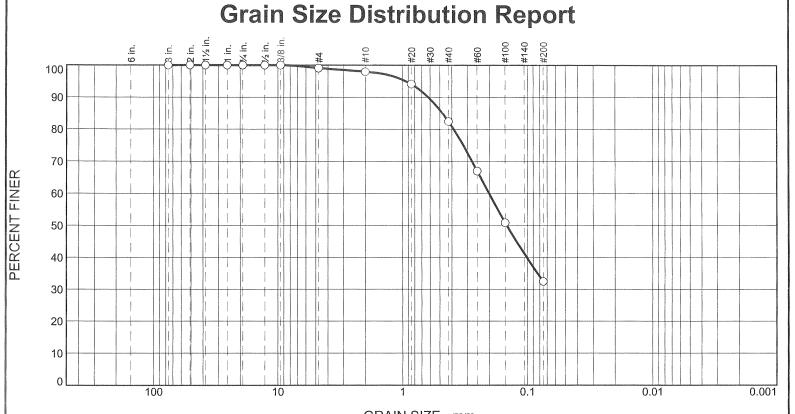
Depth: 44.5'-46.0'

**Date Sampled:** 

MACTEC ENGINEERING. AND CONSULTING, INC.

Client: Southern Company Project: Plant Yates Ash Pond

Project No: 6189109008



	B/I m alicens	Prit to a	0:14	
% Sand			% Fines	
	<u> GRAIN SIZE -</u>	111111.		

% +3"	% Gr	% Gravel		% Sand		% Fines	
76 <del>+</del> 3	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.9	1.1	15.6	50.0	32.4	
_							

Test Results (ASTM D 422 & ASTM D 1140)				
Opening	Percent	Spec.*	Pass?	
Size	Finer	(Percent)	(X=Fail)	
3"	100.0			
2"	100.0			
1.5"	100.0			
1"	100.0			
3/4"	100.0			
1/2"	100.0			
3/8"	100.0			
#4	99.1			
#10	98.0			
#20	94.1			
#40	82.4			
#60	67.0			
#100	50.8			
#200	32.4			

<b>Material Description</b>					
Light Reddish Brown Medium to Fine SAND with Silt					
Atterberg Limits (ASTM D 4318) PL=					
	Classifi	ication			
USCS (D 2487)=		ASHTO (M 145)=			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$					
Date Received: 4-2-10 Date Tested: 4-8-10 Tested By: MC Checked By:					
Title:					

**Source of Sample:** Boring No.: APB-1 **Sample Number:** 9

Depth: 49.5'-51.0'

**Date Sampled:** 

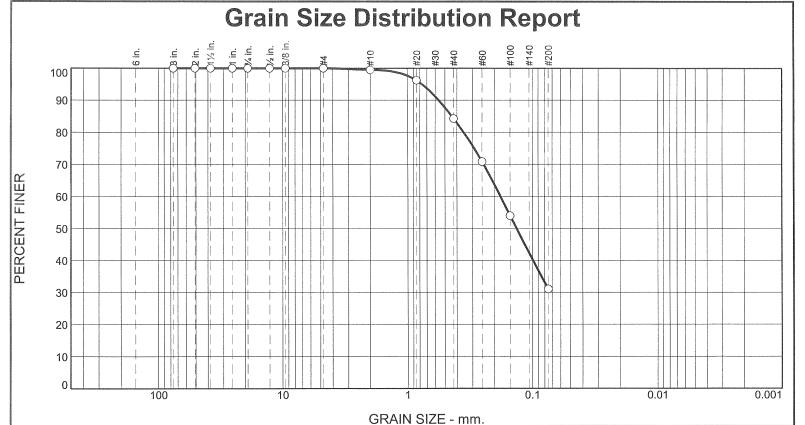
MACTEC ENGINEERING. AND CONSULTING, INC.

Client: Southern Company

Project: Plant Yates Ash Pond

**Project No:** 6189109008

<sup>(</sup>no specification provided)



% Fines % Gravel % Sand % +3" Medium Fine Silt Clay Coarse Fine Coarse 0.0 0.0 0.0 0.5 15.2 53.3 31.0

Test Results (ASTM D 422 & ASTM D 1140)			
Opening	Percent	Spec.*	Pass?
Size	Finer	(Percent)	(X=Fail)
3"	100.0		
2"	100.0		
1.5"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	100.0		
#10	99.5		
#20	96.2		
#40	84.3		
#60	70.8		
#100	53.9		
#200	31.0		

Material Description Light Brown medium to fine SAND with silt				
PL=	erberg Limits (AS LL=	TM D 4318) PI=		
USCS (D 2487)=	SM Classificati	<u>on</u> TO (M 145)=		
D <sub>90</sub> = 0.5615 D <sub>50</sub> = 0.1335 D <sub>10</sub> =	Coefficient D <sub>85</sub> = 0.4394 D <sub>30</sub> = C <sub>u</sub> =	ts D <sub>60</sub> = 0.1791 D <sub>15</sub> = C <sub>c</sub> =		
	Remarks			
Date Received:	4-2-10 <b>Da</b> t	te Tested: 4-8-10		
Tested By:	MC			
Checked By:				
Title:				

(no specification provided)

Source of Sample: Boring No.: APB-1 Sample Number: 11

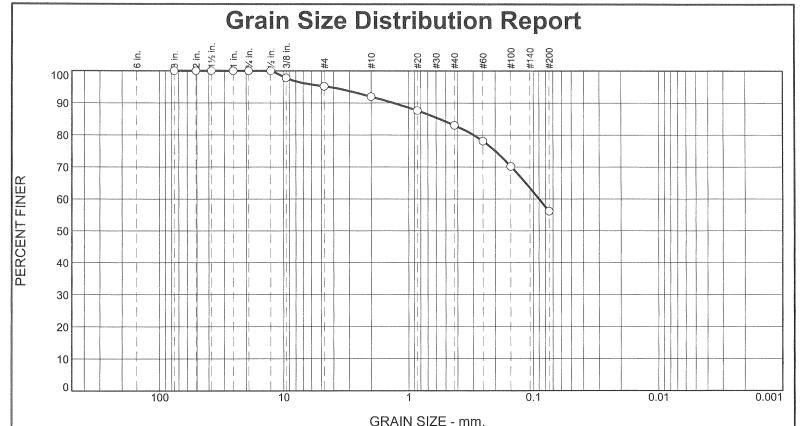
Depth: 59.5'-61.0'

Date Sampled:

MACTEC ENGINEERING. AND CONSULTING, INC.

Client: Southern Company Project: Plant Yates Ash Pond

**Project No:** 6189109008



% +3"	% Gravel		avel % Sand		% Fines		
% +3	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.8	3.2	9.0	26.8	56.2	

Test R	esults (ASTM D	422 & ASTM D	1140)
Opening	Percent	Spec.*	Pass?
Size	Finer	(Percent)	(X=Fail)
3"	100.0		
2"	100.0		
1.5"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	97.8		
#4	95.2		
#10	92.0		
#20	87.6		
#40	83.0		
#60	78.1		
#100	70.2		
#200	56.2		

	Material Description	
Dark Gray Fly As	n	
A 44	arbone Limite (ACTM D 4240)	
PL= NP	erberg Limits (ASTM D 4318) LL= NP PI= NP	
USCS (D 2487)=	ML Classification AASHTO (M 145)= A-4(0	))
D <sub>90</sub> = 1.3231 D <sub>50</sub> = D <sub>10</sub> =	Coefficients  D <sub>85</sub> = 0.5602  D <sub>30</sub> =  C <sub>u</sub> =  D <sub>60</sub> = 0.0899  D <sub>15</sub> =  C <sub>c</sub> =	
	Remarks	
Date Received:		)
Tested By:	MC	
Checked By:		
Title:		

(no specification provided)

**Source of Sample:** Boring No.: APB-2 **Sample Number:** 1

**Depth:** 4.5'-6.0'

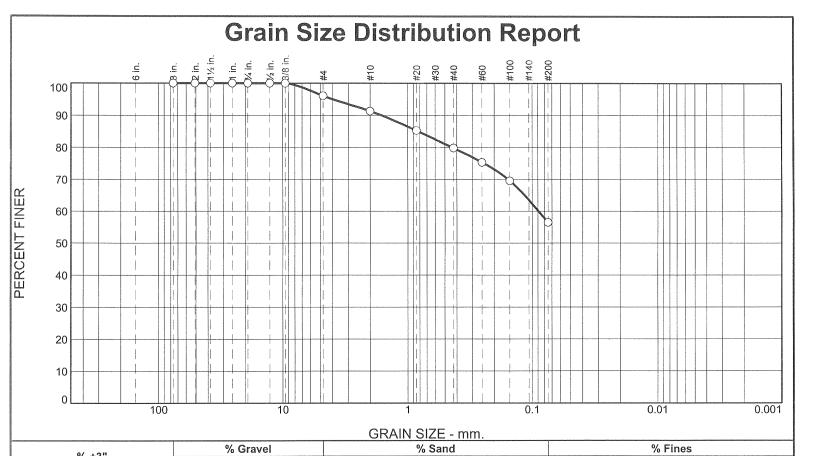
Date Sampled:

MACTEC ENGINEERING.
AND CONSULTING, INC.

Client: Southern Company

Project: Plant Yates Ash Pond

Project No: 6189109008



Medium

11.5

Fine

23.4

Test R	esults (ASTM D	422 & ASTM D	1140)
Opening	Percent	Spec.*	Pass?
Size	Finer	(Percent)	(X=Fail)
3"	100.0		
2"	100.0		
1.5"	100.0		
1"	100.0		
3/4"	100.0		
1/2"	100.0		
3/8"	100.0		
#4	96.1		
#10	91.3		
#20	85.3		
#40	79.8		
#60	75.4		
#100	69.6		
#200	56.4		
L			onbourned on the property of the second seco

Coarse

0.0

Fine

3.9

Coarse

4.8

<u>Material Description</u> Dark Gray Fly Ash
PL= NP
USCS (D 2487)= ML
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Remarks
Date Received: 4-2-10 Date Tested: 4-8-10 Tested By: MC
Checked By:
Title:

Silt

56.4

(no specification provided)

Source of Sample: Boring No.: APB-2

Sample Number: 2

% +3"

0.0

Depth: 9.5'-11.0'

**Date Sampled:** 

MACTEC ENGINEERING. AND CONSULTING, INC.

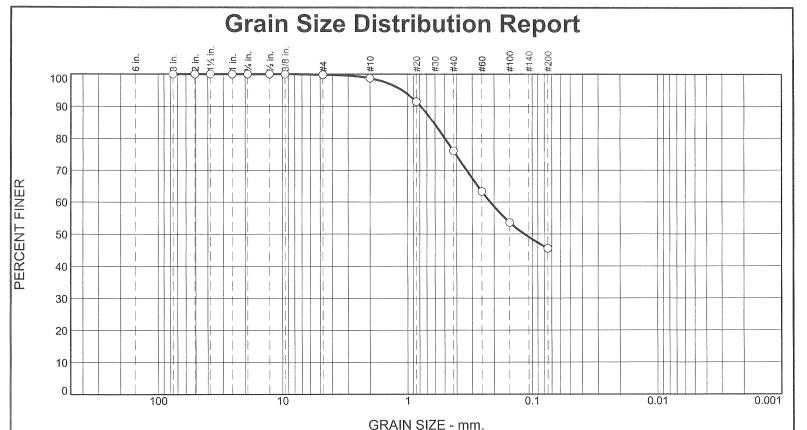
Client: Southern Company

Project: Plant Yates Ash Pond

Project No: 6189109008

Jax FL

Clay



0/ -638	% Gr	avel	% Sand			% Fines	
% +3"	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	1.1	22.6	30.6	45.5	

Test R	Test Results (ASTM D 422 & ASTM D 1140)								
Opening	Percent	Spec.*	Pass?						
Size	Finer	(Percent)	(X=Fail)						
3"	100.0		Deliver the second seco						
2"	100.0								
1.5"	100.0								
1"	100.0								
3/4"	100.0								
1/2"	100.0								
3/8"	100.0								
#4	99.8								
#10	98.7								
#20	91.4								
#40	76.1								
#60	63.3								
#100	53.6								
#200	45.5								

Material Description
Light Brown Medium to Fine SAND with Clay
PL= 27 Atterberg Limits (ASTM D 4318) LL= 50 Pl= 23
USCS (D 2487)= SC Classification AASHTO (M 145)= A-7-6(7)
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Remarks
Date Received: 4-2-10 Date Tested: 4-8-10
Tested By: MC
Checked By:
Title:

(no specification provided)

**Source of Sample:** Boring No.: APB-2 **Sample Number:** 6

Depth: 29.5'-31.0'

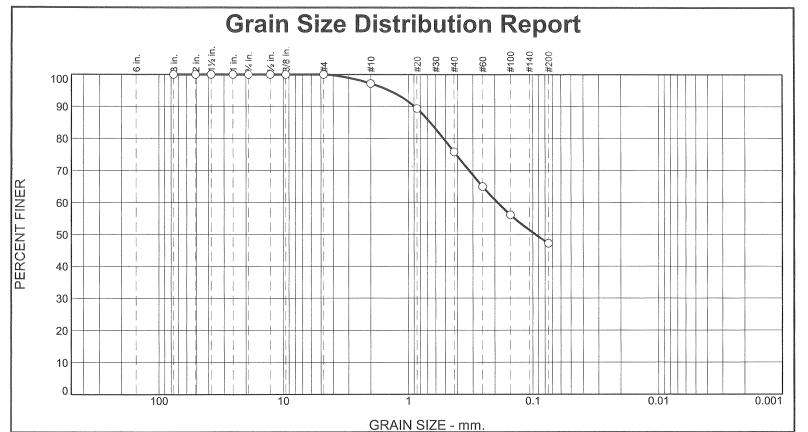
**Date Sampled:** 

MACTEC ENGINEERING. AND CONSULTING, INC.

Client: Southern Company

Project: Plant Yates Ash Pond

Project No: 6189109008



9/ : 211	% Gr	avel		% Sand		% Fines	
% +3"	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	2.8	21.4	28.6	47.2	

Opening         Percent         Spec.*         Pass?           3"         100.0         (Y=Fail)           2"         100.0         (X=Fail)           1.5"         100.0         (X=Fail)           1"         100.0         (X=Fail)           3/4"         100.0         (X=Fail)           3/4"         100.0         (X=Fail)           1"         100.0         (X=Fail)           3/4"         100.0         (X=Fail)           4/2"         100.0         (X=Fail)           1"         100.0         (X=Fail)           4"         100.0         (X=Fail)           44         100.0         (X=Fail)           44         100.0         (X=Fail)           440         47.2         (X=Fail)           440         47.2         (X=Fail)	Test Results (ASTM D 422 & ASTM D 1140)							
3" 100.0 2" 100.0 1.5" 100.0 1" 100.0 3/4" 100.0 1/2" 100.0 3/8" 100.0 #4 100.0 #4 100.0 #40 97.2 #20 89.3 #40 75.8 #60 65.0 #100 56.1	Opening	Percent	Spec.*	Pass?				
2" 100.0 1.5" 100.0 1" 100.0 3/4" 100.0 1/2" 100.0 3/8" 100.0 #4 100.0 #10 97.2 #20 89.3 #40 75.8 #60 65.0 #100 56.1	Size	Finer	(Percent)	(X=Fail)				
1.5" 100.0 1" 100.0 3/4" 100.0 1/2" 100.0 3/8" 100.0 #4 100.0 #10 97.2 #20 89.3 #40 75.8 #60 65.0 #100 56.1	3"	100.0						
1" 100.0 3/4" 100.0 1/2" 100.0 3/8" 100.0 #4 100.0 #10 97.2 #20 89.3 #40 75.8 #60 65.0 #100 56.1	2"	100.0						
3/4" 100.0 1/2" 100.0 3/8" 100.0 #4 100.0 #10 97.2 #20 89.3 #40 75.8 #60 65.0 #100 56.1	1.5"	100.0						
1/2"     100.0       3/8"     100.0       #4     100.0       #10     97.2       #20     89.3       #40     75.8       #60     65.0       #100     56.1	1"	100.0						
3/8" 100.0 #4 100.0 #10 97.2 #20 89.3 #40 75.8 #60 65.0 #100 56.1	3/4"	100.0						
#4 100.0 #10 97.2 #20 89.3 #40 75.8 #60 65.0 #100 56.1	1/2"	100.0						
#10 97.2 #20 89.3 #40 75.8 #60 65.0 #100 56.1	3/8"	100.0						
#20 89.3 #40 75.8 #60 65.0 #100 56.1	#4	100.0						
#40 75.8 #60 65.0 #100 56.1	#10	97.2						
#60 #100 65.0 56.1	#20	89.3						
#100 56.1	#40	75.8						
	1							
#200 47.2	#100	56.1						
	#200	47.2						
	Laboratoria de la companya de la com							
	NO.							

<u>Material Description</u>
Orange Brown Medium to Fine SAND with Silt
Atterberg Limits (ASTM D 4318)
PL= 30
USCS (D 2487)= SM
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$
Remarks
Date Received: 4-2-10 Date Tested: 4-8-10
Tested By: MC
Checked By:
Title:

\* (no specification provided)

Source of Sample: Boring No.: APB-2 Sample Number: 8

Client: Southern Company

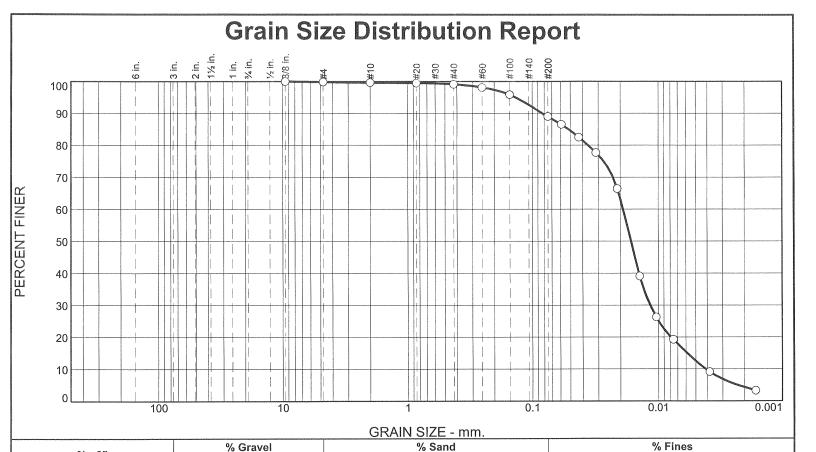
MACTEC ENGINEERING. AND CONSULTING, INC.

Project: Plant Yates Ash Pond

Project No: 6189109008

Jax FL.

**Date Sampled:** 



Medium

0.5

Fine

10.1

Opening	Percent	Spec.*	Pass?
Size	Finer	(Percent)	(X=Fail)
3/8"	100.0		
#4	99.8		
#10	99.6		
#20	99.5		
#40	99.1		
#60	98.1		
#100	95.8		
#200	89.0		
0.0588 mm.	86.5		
0.0428 mm.	82.5		
0.0313 mm.	77.6		
0.0212 mm.	66.4		
0.0140 mm.	39.1		
0.0104 mm.	26.3		
0.0075 mm.	19.2		
0.0038 mm.	9.1		
0.0016 mm.	3.3		

### **Material Description** Dark Gray Fly Ash Atterberg Limits (ASTM D 4318) PL= NP LL= NP PI= NP **Classification** USCS (D 2487)= ML **AASHTO (M 145)=** A-4(0)Coefficients **D**<sub>90</sub>= 0.0830 **D**<sub>50</sub>= 0.0165 **D**<sub>10</sub>= 0.0041 $\mathbf{D_{60}} = 0.0190$ $\mathbf{D_{15}} = 0.0059$ $\mathbf{C_c} = 1.72$ D<sub>85</sub>= 0.0517 D<sub>30</sub>= 0.0116 **C**<sub>u</sub>= 4.61 Remarks Specific gravity: 2.174 Date Received: 4-2-10 Date Tested: 4-8-10 Tested By: MC Checked By: Title:

Silt

76.4

Clay

12.6

(no specification provided)

% +3"

0.0

Source of Sample: Boring No.: APB-3

Sample Number: 2

**Depth:** 9.5'-11.0'

Fine

0.2

Coarse

0.0

Coarse

0.2

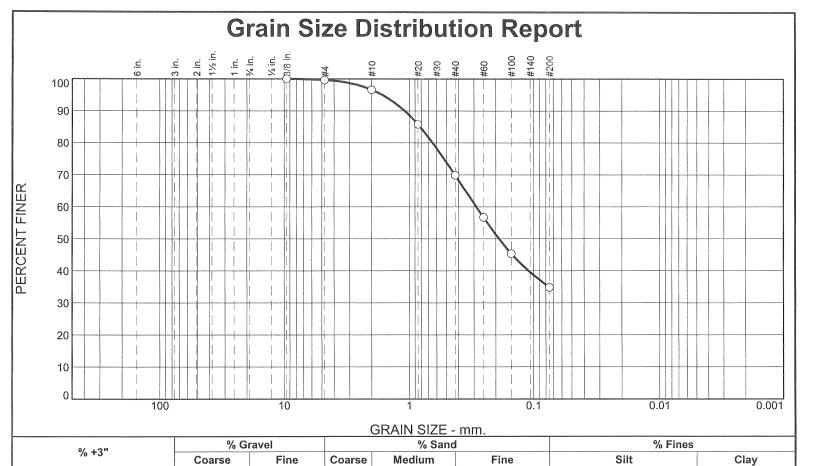
**Date Sampled:** 

MACTEC ENGINEERING. AND CONSULTING, INC.

**Client:** Southern Company

Project: Plant Yates Ash Pond

6189109008 Project No:



26.8

35.0

Test Results (ASTM D 422 & ASTM D 1140)						
Opening	Percent	Spec.*	Pass?			
Size	Finer	(Percent)	(X=Fail)			
3/8"	100.0					
#4	99.6					
#10	96.6					
#20	85.8					
#40	69.8					
#60	56.7					
#100 #200	45.3 34.8					
#200	34.0					
*	ecification provided					

0.0

0.4

3.0

Material Description							
Light Brown Medium to Fine SAND with Silt							
Atterberg Limits (ASTM D 4318)							
PL= 31							
USCS (D 2487)= SM							
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$							
Remarks							
Date Received: 4-2-10 Date Tested: 4-8-10							
Tested By: MC							
Checked By:							
Title:							

(no specification provided)

0.0

**Source of Sample:** Boring No.: APB-3 **Sample Number:** 3

**Depth:** 14.5'-16.0'

**Date Sampled:** 

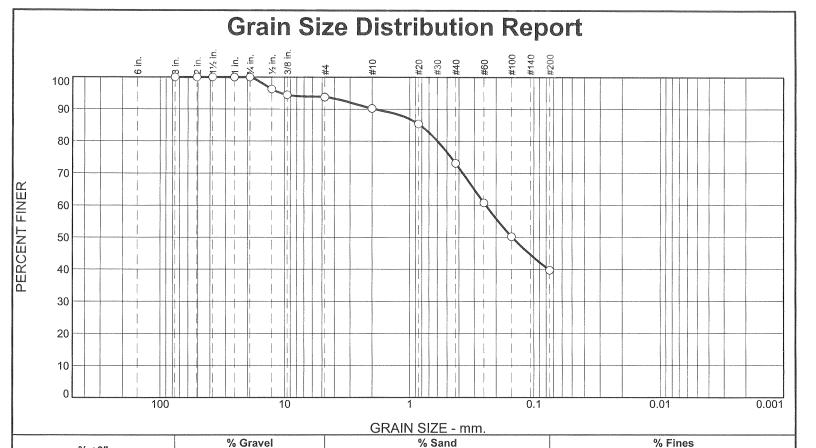
MACTEC ENGINEERING. AND CONSULTING, INC.

Client: Southern Company

Project: Plant Yates Ash Pond

Project No: 6189109008 Jax FL.

34.8



Medium

17.1

Fine

33.4

Test Results (ASTM C 136 & ASTM D 1140)						
Opening	Percent	Spec.*	Pass?			
Size	Finer	(Percent)	(X=Fail)			
3"	100.0					
2"	100.0					
1.5"	100.0					
1"	100.0					
3/4"	100.0					
1/2"	96.3					
3/8"	94.4					
#4	93.8					
#10	90.2					
#20	85.4					
#40	73.1					
#60	60.8					
#100	50.2					
#200	39.7	-				
* (no spe	ecification provided	)				

Coarse

0.0

Fine

6.2

Coarse

3.6

### **Material Description** Light Brown Medium to Fine SAND with Clay **Atterberg Limits (ASTM D 4318) PL=** 21 LL= 45 PI= 24 Classification SC **AASHTO (M 145)=** A-7-6(5) USCS (D 2487)= Coefficients **D<sub>60</sub>=** 0.2415 **D<sub>90</sub>=** 1.9069 D<sub>85</sub>= 0.8241 $D_{50} = 0.1485$ D<sub>15</sub>= C<sub>c</sub>= D<sub>30</sub>= $D_{10} =$ Remarks Date Received: 4-2-10 Date Tested: 4-8-10 Tested By: MC Checked By: Title:

Silt

39.7

Clay

**Source of Sample:** Boring No.: APB-3 **Sample Number:** 6

% +3"

0.0

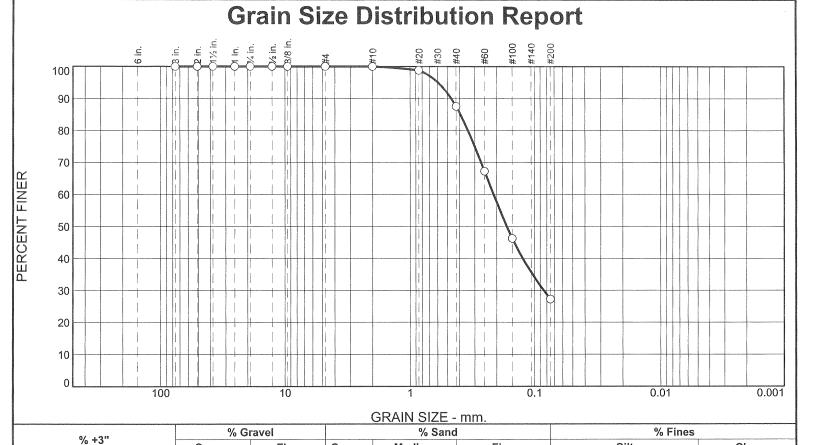
**Depth:** 29.5'-31.0'

**Date Sampled:** 

MACTEC ENGINEERING. AND CONSULTING, INC. Client: Southern Company

Project: Plant Yates Ash Pond

Project No: 6189109008



Medium

12.4

Fine

60.4

Test Results (ASTM D 422 & ASTM D 1140)						
Opening	Percent	Spec.*	Pass?			
Size	Finer	(Percent)	(X=Fail)			
3"	100.0					
2"	100.0					
1.5"	100.0					
1"	100.0					
3/4"	100.0					
1/2"	100.0					
3/8"	100.0					
#4	100.0					
#10	100.0					
#20	98.8		l			
#40	87.6					
#60	67.3					
#100	46.3					
#200	27.2					

Coarse

0.0

Fine

0.0

Coarse

0.0

Material Description						
Tan Medium to Fi	ne SAND with Silt					
8.44		999 N. S. 199. 4 A.				
Att PL=	erberg Limits (AS LL=	PI=				
il Bos —	emo com	• •				
USCS (D 2487)=	Classification SM AASH	<u>on</u> ГО (М 145)=				
D <sub>90</sub> = 0.4642 D <sub>50</sub> = 0.1659 D <sub>10</sub> =	Coefficient D <sub>85</sub> = 0.3913 D <sub>30</sub> = 0.0844 C <sub>u</sub> =	D <sub>60</sub> = 0.2114 D <sub>15</sub> = C <sub>c</sub> =				
	Remarks					
D / D	40.10					
Date Received: Tested By:		te Tested: 4-8-10				
Checked By:						
Title:						

Silt

27.2

Clay

0.0

**Source of Sample:** Boring No.: APB-3 **Sample Number:** 8

Depth: 39.5'-41.0'

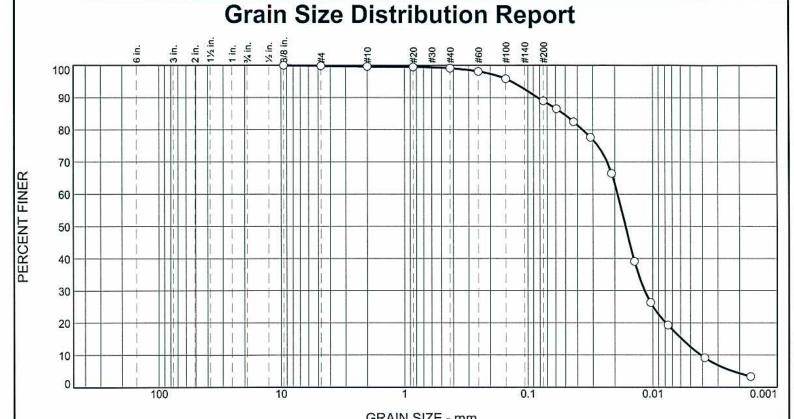
**Date Sampled:** 

MACTEC ENGINEERING. AND CONSULTING, INC.

Client: Southern Company Project: Plant Yates Ash Pond

**Project No:** 6189109008

<sup>(</sup>no specification provided)



	GRAIN SIZE - MIIII.						
0/ 121	% Gr	avel		% Sand		% Fin	es
% +3"	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.2	0.5	10.1	76.4	12.6

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3/8"	SOUTH SEAR	(Fercent)	(A-I all)
	100.0 99.8		
#4 #10	99.6		
#20	99.5		
#40	99.1		
#60	98.1		
#100	95.8		
#200	89.0		
0.0588 mm.	86.5		
0.0428 mm.	82.5		
0.0313 mm.	77.6		
0.0212 mm.	66.4		
0.0140 mm.	39.1		
0.0104 mm.	26.3		
0.0075 mm.	19.2		
0.0038 mm.	9.1		
0.0016 mm.	3.3		

	Material Descripti	on
Dark Gray Fly Ash	į	
Δtte	erberg Limits (ASTM	D 4318)
PL= NP	LL= NP	PI= NP
	Classification	
USCS (D 2487)=	ML AASHTO	(M 145)= A-4(0)
	Coefficients	
D <sub>90</sub> = 0.0830 D <sub>50</sub> = 0.0165 D <sub>10</sub> = 0.0041	D <sub>85</sub> = 0.0517 D <sub>30</sub> = 0.0116	D <sub>60</sub> = 0.0190 D <sub>15</sub> = 0.0059
D <sub>10</sub> = 0.0041	C <sub>u</sub> = 4.61	C <sub>c</sub> = 1.72
	Remarks	
Specific gravity: 2	.174	
Date Received:	4-2-10 <b>Date T</b>	Cested: 4-8-10
Tested By:	MC	
Checked By:		
Title:		

(no specification provided)

Source of Sample: Boring No.: APB-3 Sample Number: 2 Depth: 9.5'-11.0'

**Date Sampled:** 

MACTEC ENGINEERING. AND CONSULTING, INC.

Client: Southern Company

Project: Plant Yates Ash Pond

Project No: 6189109008

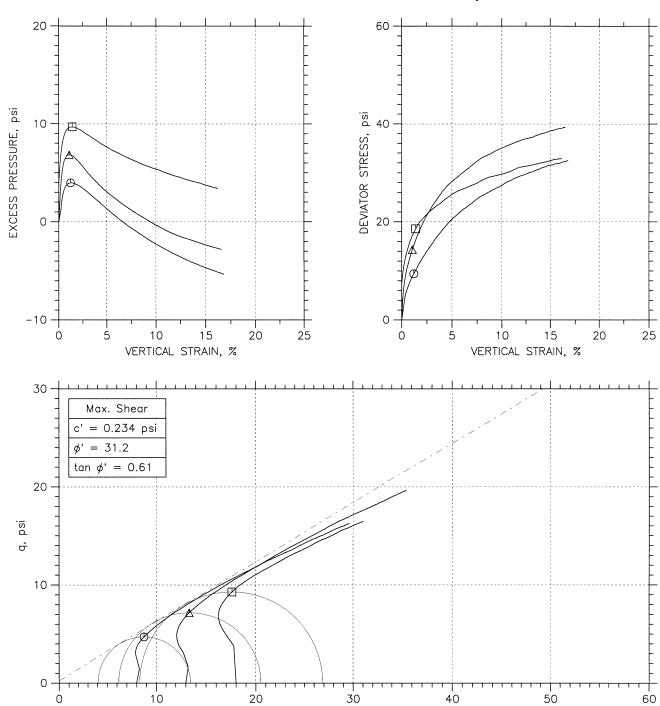
### CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767 Max. Shear = 0.234 psi $\phi' = 31.2$ $\tan \phi' = 0.61$ 20 psi 10 10 20 30 40 50 60 p', psi Symbol Φ Δ Sample No. IS-1 IS-1 IS-1 70 Test No. 10101.1 10101.2 10101.3 Depth 24.5-26.5tx4.5-26.5tx4.5-26.5f Diameter, in 2.87 2.866 2.879 60 5.967 5.962 5.962 Height, in Water Content, % 17.6 15.8 21.3 50 Dry Density, pcf 110.4 115. 104.7 psi Saturation, % 94.3 96.2 97.9 DEVIATOR STRESS, Void Ratio 0.492 0.433 0.575 40 Water Content, % 16.3 18.3 19.1 Dry Density, pcf 111.2 115.1 109.6 30 Saturation\*, % 100.0 100.0 100.0 Void Ratio 0.483 0.432 0.504 Back Press., psi 99.99 120. 130. 20 Ver. Eff. Cons. Stress, psi 7.998 13.01 18.01 Shear Strength, psi 4.708 7.161 9.281 10 Strain at Failure, % 1.22 1.07 1.41 Strain Rate, %/min 0.05 0.05 0.05 B-Value 0.96 0.97 0.88 0 10 20 Measured Specific Gravity 2.64 2.64 2.64 VERTICAL STRAIN, % Liquid Limit 43 43 43 Plastic Limit 21 21 21 Project: Plant Yates Ash Pond Location: APB-1

Location: APB-1
Project No.: 6189109008
Boring No.: APB-1
Sample Type: Undisturbed

Description: Brown Clayey Sand

Remarks: ASTM D4767-04. Strain at failure based on peak excess pore pressure.

Phase calculations based on start and end of test.



	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
0	IS-1	10101.1	24.5-26.5ft	JW	4/2/10			10101.1a_2580.dat
Δ	IS-1	10101.2	24.5-26.5ft	JW	4/2/10			10101.2a_2547.dat
	IS-1	10101.3	24.5-26.5ft	JW	4/2/10			10101.3a_2546.dat

p', psi

100	Project: Plant Yates Ash Pond	Location: APB-1	Project No.: 6189109008			
MACTEC	Project: Plant Yates Ash Pond Boring No.: APB-1	Sample Type: Undisturbed				
	Description: Brown Clayey Sand					
	Remarks: ASTM D4767-04. Strain at failure based on peak excess pore pressure.					

#### CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767 Max. Shear c = 0.789 psi $\phi = 18.3$ $tan \phi = 0.33$ 20 psi ó 10 0 -10 20 50 30 40 60 p, psi Symbol Φ Δ IS-1 IS-1 Sample No. IS-1 70 Test No. 10101.3 10101.1 10101.2 Depth 24.5-26.5tk4.5-26.5tk4.5-26.5fk 2.87 2.866 2.879 Diameter, in 60 5.967 5.962 5.962 Height, in Water Content, % 17.6 15.8 21.3 50 Dry Density, pcf 110.4 115. 104.7 psi Saturation, % 94.3 96.2 97.9 DEVIATOR STRESS, Void Ratio 0.492 0.433 0.575 40 Water Content, % 18.3 16.3 19.1 Shear Dry Density, pcf 111.2 115.1 109.6 30 Saturation\*, % 100.0 100.0 100.0 Before Void Ratio 0.483 0.432 0.504 Back Press., psi 99.99 120. 130. 20 Ver. Eff. Cons. Stress, psi 7.998 13.01 18.01 Shear Strength, psi 4.708 7.161 9.281 10 Strain at Failure, % 1.22 1.07 1.41 Strain Rate, %/min 0.05 0.05 0.05 B-Value 0.96 0.97 0.88 0 10 20 Measured Specific Gravity 2.64 2.64 2.64 VERTICAL STRAIN, % Liquid Limit 43 43 43 Plastic Limit 21 21 21 Project: Plant Yates Ash Pond Location: APB-1 Project No.: 6189109008 **MACTEC** Boring No.: APB-1

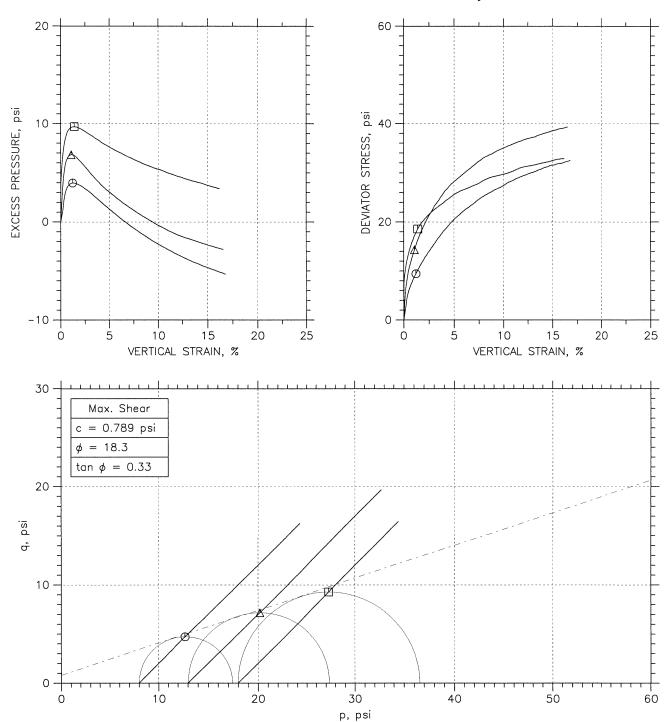
Description: Brown Clayey Sand

Remarks: ASTM D4767-04. Strain at failure based on peak excess pore pressure.

Sample Type: Undisturbed

Phase calculations based on start and end of test.

\* Saturation is set to 100% for phase calculations.



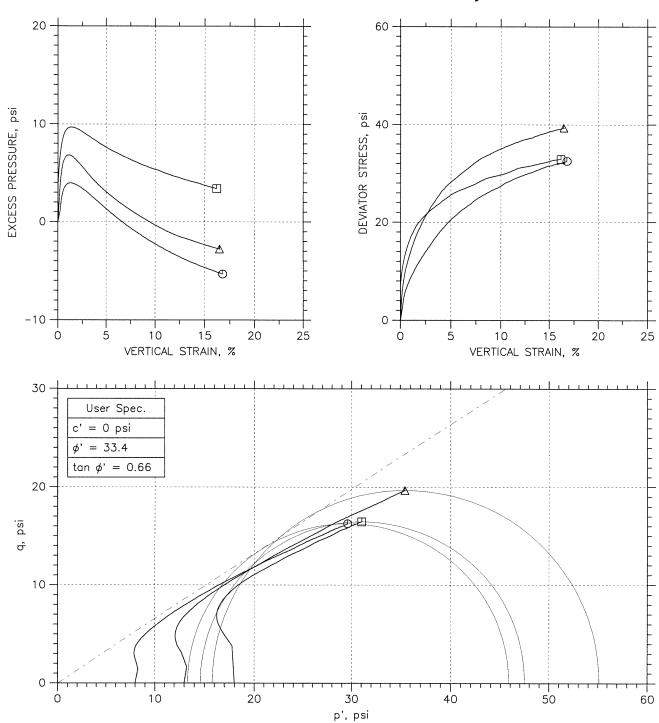
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
Ф	IS-1	10101.1	24.5-26.5ft	JW	4/2/10			10101.1a_2580.dat
Δ	IS-1	10101.2	24.5-26.5ft	JW	4/2/10			10101.2a_2547.dat
	IS-1	10101.3	24.5-26.5ft	JW	4/2/10			10101.3a_2546.dat

	Project: Plant Yates Ash Pond	Location: APB-1	Project No.: 6189109008			
#MACTEC	Boring No.: APB-1	Sample Type: Undisturbed				
	Description: Brown Clayey Sand					
	Remarks: ASTM D4767-04. Strain at failure based on peak excess pore pressure.					

### CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767 User Spec. = 0 psi $\phi' = 33.4$ $\tan \phi' = 0.66$ 20 psi σ 10 0 10 20 30 40 50 60 p', psi Symbol Ф Δ Sample No. IS-1 IS-1 IS-1 70 Test No. 10101.1 10101.2 10101.3 24.5-26.5**1**24.5-26.5**1**24.5-26.5f Depth 2.87 2.879 60 Diameter, in 2.866 5.967 5.962 5.962 Height, in 17.6 Water Content, % 15.8 21.3 50 Dry Density, pcf 110.4 115. 104.7 psi Saturation, % 94.3 96.2 97.9 DEVIATOR STRESS, Void Ratio 0.492 0.433 0.575 40 Water Content, % 18.3 16.3 19.1 Dry Density, pcf 111.2 115.1 109.6 30 Saturation\*, % 100.0 100.0 100.0 Void Ratio 0.483 0.432 0.504 Back Press., psi 99.99 120. 130. 20 18.01 Ver. Eff. Cons. Stress, psi 7.998 13.01 Shear Strength, psi 16.26 19.66 16.45 10 Strain at Failure, % 16.5 16.2 16.8 Strain Rate, %/min 0.05 0.05 0.05 B-Value 0.96 0.97 0.88 0 10 20 Measured Specific Gravity 2.64 2.64 2.64 VERTICAL STRAIN, % Liquid Limit 43 43 43 Plastic Limit 21 21 21 Project: Plant Yates Ash Pond Location: APB-1 Project No.: 6189109008 **MACTEC** Boring No.: APB-1 Sample Type: Undisturbed Description: Brown Clayey Sand

Phase calculations based on start and end of test.

Remarks: ASTM D4767-04.



	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
Ф	IS-1	10101.1	24.5-26.5ft	JW	4/2/10			10101.1a_2580.dat
Δ	IS-1	10101.2	24.5-26.5ft	JW	4/2/10			10101.2a_2547.dat
	IS-1	10101.3	24.5-26.5ft	JW	4/2/10			10101.3a_2546.dat

442	Project: Plant Yates Ash Pond	Location: APB-1	Project No.: 6189109008	
<b>MACTEC</b>	Boring No.: APB-1	Sample Type: Undisturbed		
	Description: Brown Clayey Sand			
	Remarks: ASTM D4767-04.			

### CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767 Max. Obliquity = 2.48 psi $\phi' = 27.5$ $\tan \phi' = 0.52$ 20 psi σ̈́ 10 0 20 40 50 60 10 30 p', psi Symbol IS-1 IS-1 IS-1 Sample No. 70 10101.2 10101.3 Test No. 10101.1 24.5-26.5\$4.5-26.5\$4.5-26.5\$ Depth Diameter, in 2.87 2.866 2.879 60 Height, in 5.967 5.962 5.962 Water Content, % 17.6 15.8 21.3 50 104.7 115. Dry Density, pcf 110.4 psi Saturation, % 94.3 96.2 97.9 DEVIATOR STRESS, 0.433 0.575 Void Ratio 0.492 40 16.3 19.1 18.3 Water Content, % Shear Dry Density, pcf 111.2 115.1 109.6 30 100.0 100.0 Saturation\*, % 100.0 0.483 0.432 0.504 Void Ratio Back Press., psi 120. 130. 99.99 20 18.01 Ver. Eff. Cons. Stress, psi 7.998 13.01 Shear Strength, psi 16.26 19.66 16.45 10 16.8 16.5 16.2 Strain at Failure, % 0.05 0.05 0.05 Strain Rate, %/min 0.97 0.88 B-Value 0.96 0 Measured Specific Gravity 2.64 2.64 10 20 2.64 VERTICAL STRAIN, % Liquid Limit 43 43 43 21 21 21 Plastic Limit Project: Plant Yates Ash Pond Location: APB-1 Project No.: 6189109008 **MACTEC** Boring No.: APB-1

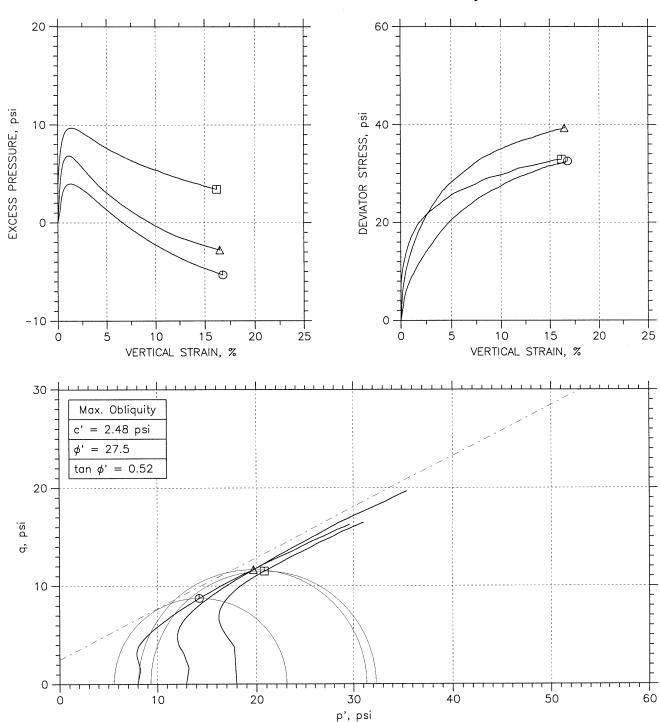
Phase calculations based on start and end of test.

\* Saturation is set to 100% for phase calculations.

Sample Type: Undisturbed

Description: Brown Clayey Sand

Remarks: ASTM D4767-04

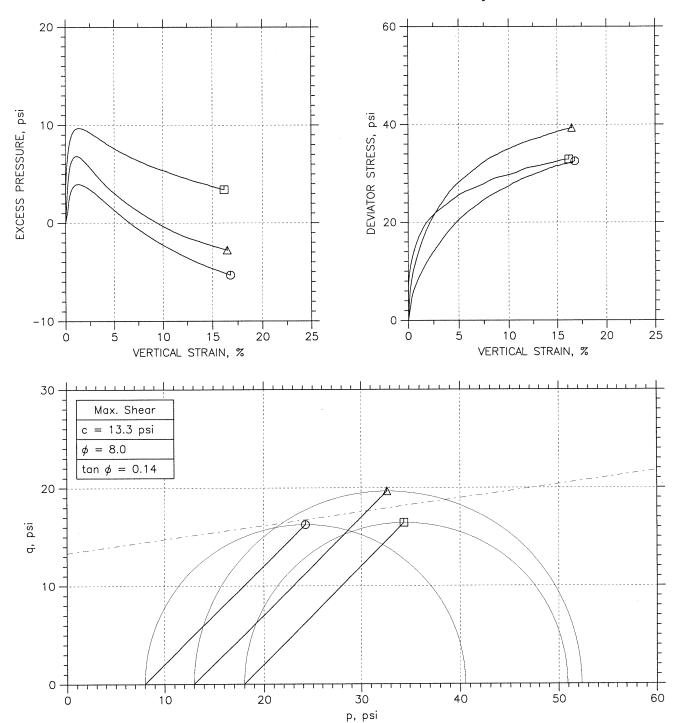


	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
0	IS-1	10101.1	24.5-26.5ft	JW	4/2/10			10101.1a_2580.dat
Δ	IS-1	10101.2	24.5-26.5ft	JW	4/2/10			10101.2a_2547.dat
	IS-1	10101.3	24.5-26.5ft	JW	4/2/10			10101.3a_2546.dat

// <b>!!!!</b>	Project: Plant Yates Ash Pond	Location: APB-1	Project No.: 6189109008
<b>MACTEC</b>	Boring No.: APB-1	Sample Type: Undisturbed	
	Description: Brown Clayey Sand		
	Remarks: ASTM D4767-04		

### CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767 Max. Shear c = 13.3 psi $\phi = 8.0$ $tan \phi = 0.14$ 20 psi Ġ 10 10 20 30 40 50 60 p, psi Symbol Φ IS-1 IS-1 IS-1 Sample No. 70 10101.1 10101.2 10101.3 Test No. 24.5-26.5td4.5-26.5td4.5-26.5fl Depth Diameter, in 2.87 2.866 2.879 60 Height, in 5.967 5.962 5.962 Water Content, % 17.6 15.8 21.3 50 104.7 Dry Density, pcf 110.4 115. psi. Saturation, % 94.3 96.2 97.9 DEVIATOR STRESS, 0.575 Void Ratio 0.492 0.433 40 19.1 Water Content, % 18.3 16.3 Shear 109.6 Dry Density, pcf 111.2 115.1 30 100.0 100.0 100.0 Saturation\*, % Before 0.504 Void Ratio 0.483 0.432 Back Press., psi 130. 99.99 120. 20 18.01 Ver. Eff. Cons. Stress, psi 7.998 13.01 Shear Strength, psi 19.66 16.45 16.26 10 Strain at Failure, % 16.8 16.5 16.2 Strain Rate, %/min 0.05 0.05 0.05 B-Value 0.96 0.97 0.88 0 10 20 Measured Specific Gravity 2.64 2.64 2.64 VERTICAL STRAIN, % 43 Liquid Limit 43 43 Plastic Limit 21 21 21 Project: Plant Yates Ash Pond Location: APB-1 Project No.: 6189109008 **MACTEC** Boring No.: APB-1 Sample Type: Undisturbed Description: Brown Clayey Sand Remarks: ASTM D4767-04

Phase calculations based on start and end of test.



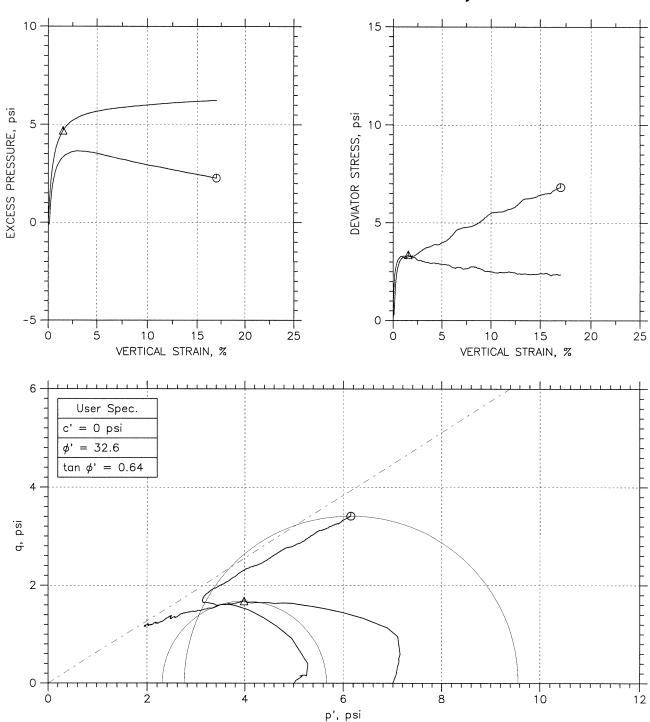
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
0	IS-1	10101.1	24.5-26.5ft	JW	4/2/10			10101.1a_2580.dat
Δ	IS-1	10101.2	24.5-26.5ft	JW	4/2/10			10101.2a_2547.dat
	IS-1	10101.3	24.5-26.5ft	JW	4/2/10			10101.3a_2546.dat

	Project: Plant Yates Ash Pond	Location: APB-1	Project No.: 6189109008
<b>MACTEC</b>	Project: Plant Yates Ash Pond Boring No.: APB-1	Sample Type: Undisturbed	
	Description: Brown Clayey Sand		
	Remarks: ASTM D4767-04		

### CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767 User Spec. c' = 0 psi $\phi' = 32.6$ $\tan \phi' = 0.64$ psi 2 8 10 6 p', psi Symbol Φ Δ IS-1 IS-1 Sample No. Test No. 10102.2 10102.3 Depth 7.9-9.5 ft|7.5-9.5 ft Diameter, in 2.846 2.866 6 Height, in 5.995 5.934 Water Content, % 30.3 33.9 5 Dry Density, pcf 62.58 56.72 psi Saturation, % 55.5 52.1 DEVIATOR STRESS, Void Ratio 1.21 1.44 Water Content, % 49.9 51.7 Shear Dry Density, pcf 65.73 64.52 Saturation\*, % 100.0 100.0 Before Void Ratio 1.11 1.15 Back Press., psi 140. 134. 2 Ver. Eff. Cons. Stress, psi 7. 5.014 Shear Strength, psi 3.41 1.682 1 Strain at Failure, % 17 1.52 Strain Rate, %/min 0.05 0.05 B-Value 0.86 0.95 0 10 20 Measured Specific Gravity 2.22 2.22 VERTICAL STRAIN, % Liquid Limit NP NP Plastic Limit NP NP Project: Plant Yates Ash Pond Location: APB-2 Project No.: 6189109008 **MACTEC** Boring No.: APB-2 Sample Type: Undisturbed Description: Dark Gray Sandy Silt (Fly Ash)

Phase calculations based on start and end of test.

Remarks: ASTM D4767-04



	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
Ф	IS-1	10102.2	7.9-9.5 ft	JW	4/6/10			10102.2_2546.dat
Δ	IS-1	10102.3	7.5-9.5 ft	JW	4/6/10			10102.3_2547.dat

WAAA OTEO	Project: Plant Yates Ash Pond	Location: APB-2	Project No.: 6189109008			
#MACTEC	Boring No.: APB-2	Sample Type: Undisturbed				
	Description: Dark Gray Sandy Silt (Fly Ash)					
	Remarks: ASTM D4767-04					

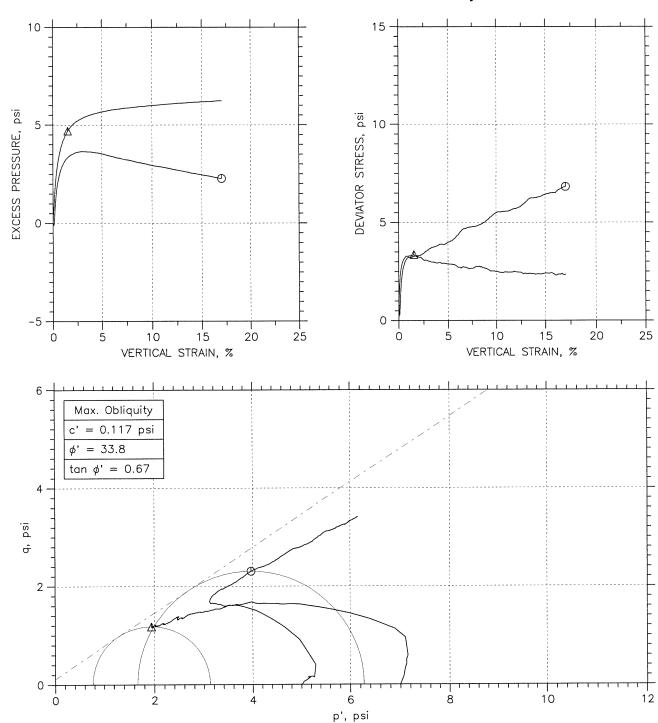
### CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767 Max. Obliquity c' = 0.117 psi $\phi' = 33.8$ $tan \phi' = 0.67$ psi σ 2 0 10 p', psi Symbol IS-1 Sample No. IS-1 10102.3 Test No. 10102.2 7.9-9.5 ft 7.5-9.5 ft Depth Diameter, in 2.846 2.866 6 Height, in 5.995 5.934 Water Content, % 30.3 33.9 5 Dry Density, pcf 62.58 56.72 psi Saturation, % 55.5 52.1 DEVIATOR STRESS, Void Ratio 1.21 1.44 51.7 Water Content, % 49.9 Shear Dry Density, pcf 65.73 64.52 3 100.0 Saturation\*, % 100.0 1.15 Void Ratio 1.11 Back Press., psi 134. 140. 2 7. Ver. Eff. Cons. Stress, psi 5.014 Shear Strength, psi 3.41 1.682 1 Strain at Failure, % 17 1.52 Strain Rate, %/min 0.05 0.05 B-Value 0.86 0.95 0 10 20 2.22 Measured Specific Gravity 2.22 VERTICAL STRAIN, % Liquid Limit NP NΡ NP NP Plastic Limit Project: Plant Yates Ash Pond Location: APB-2 Project No.: 6189109008 **MACTEC** Boring No.: APB-2

Phase calculations based on start and end of test.

Description: Dark Gray Sandy Silt (Fly Ash)

Sample Type: Undisturbed

Remarks: ASTM D4767-04



	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
0	IS-1	10102.2	7.9-9.5 ft	JW	4/6/10			10102.2_2546.dat
Δ	IS-1	10102.3	7.5-9.5 ft	JW	4/6/10			10102.3_2547.dat

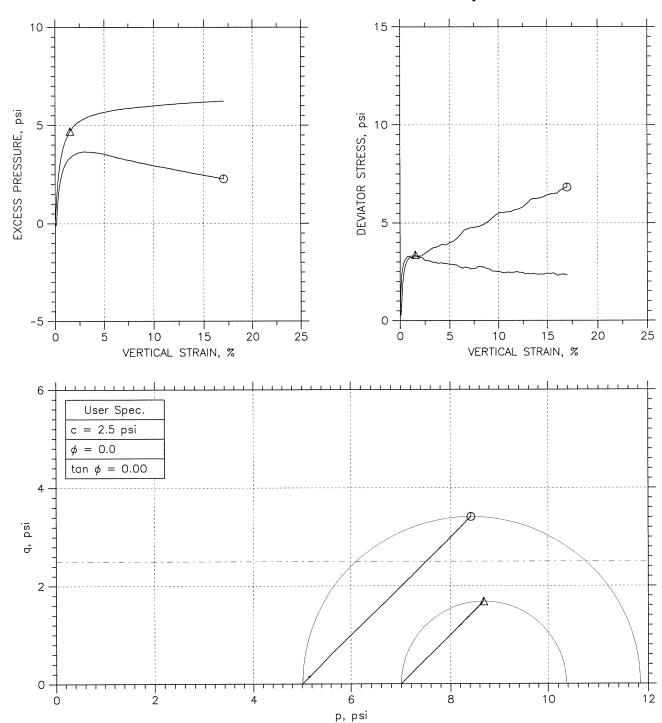
/// A A OTEO	Project: Plant Yates Ash Pond	Location: APB-2	Project No.: 6189109008			
<b>MACTEC</b>	Boring No.: APB-2	Sample Type: Undisturbed				
	Description: Dark Gray Sandy Silt (Fly Ash)					
	Remarks: ASTM D4767-04					

### CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767 User Spec. c = 2.5 psi $\phi = 0.0$ $tan \phi = 0.00$ psi ô 12 8 10 p, psi Symbol Φ Δ Sample No. IS-1 IS-1 7 Test No. 10102.2 10102.3 Depth 7.9-9.5 ft 7.5-9.5 ft Diameter, in 2.846 2.866 6 5.934 Height, in 5.995 Water Content, % Dry Density 33.9 30.3 5 62.58 56.72 psi Saturation, % 52.1 55.5 DEVIATOR STRESS, 1.21 1.44 Void Ratio 49.9 51.7 Water Content, % Shear Dry Density, pcf 65.73 64.52 3 100.0 Saturation\*, % 100.0 1.15 Void Ratio 1.11 Back Press., psi 140. 134. 2 Ver. Eff. Cons. Stress, psi 5.014 7. Shear Strength, psi 3.41 1.682 1 Strain at Failure, % 17 1.52 Strain Rate, %/min 0.05 0.05 B-Value 0.86 0.95 0 10 20 Measured Specific Gravity 2.22 2.22 VERTICAL STRAIN, % NΡ Liquid Limit NΡ Plastic Limit NP NΡ Project: Plant Yates Ash Pond Location: APB-2 Project No.: 6189109008 **MACTEC** Boring No.: APB-2 Sample Type: Undisturbed

Phase calculations based on start and end of test.

Description: Dark Gray Sandy Silt (Fly Ash)

Remarks: ASTM D4767-04

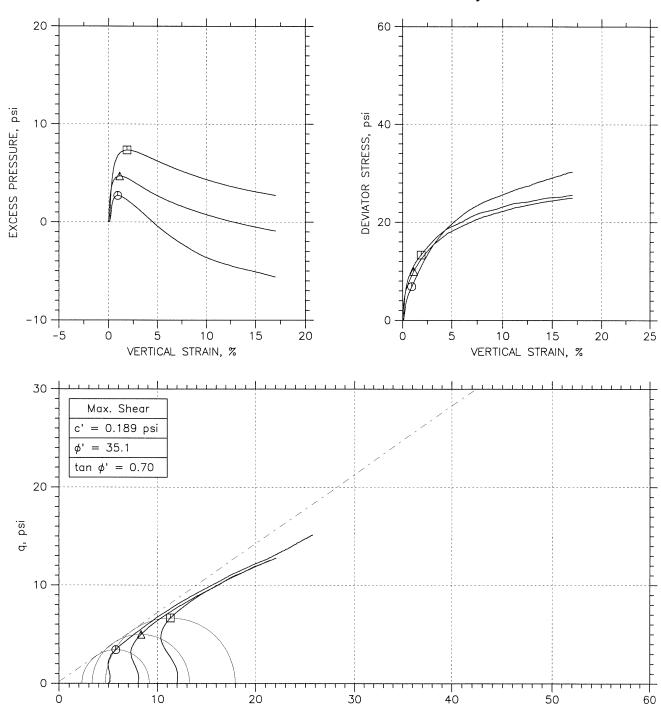


	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
0	IS-1	10102.2	7.9-9.5 ft	JW	4/6/10			10102.2_2546.dat
Δ	IS-1	10102.3	7.5-9.5 ft	JW	4/6/10			10102.3_2547.dat

	Project: Plant Yates Ash Pond	Location: APB-2	Project No.: 6189109008			
<b>MACTEC</b>	Boring No.: APB-2	Sample Type: Undisturbed				
	Description: Dark Gray Sandy Silt (Fly Ash)					
	Remarks: ASTM D4767-04					

#### CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767 Max. Shear = 0.189 psi $\phi' = 35.1$ $\tan \phi' = 0.70$ 20 psi ó 10 20 10 30 40 50 60 p', psi Symbol Φ Δ IS-1 IS-1 Sample No. IS-135 Test No. 10103.1 10103.2 10103.3 Depth 7.5-19.5ft7.5-19.5ft7.5-19.5f 2.875 Diameter, in 2.864 2.857 30 5.958 5.958 Height, in 5.953 Water Content, % 20.7 21.8 27.4 25 Dry Density, pcf 103.1 95.56 101.1 psi. Saturation, % 87.9 97.6 100.7 DEVIATOR STRESS, Void Ratio 0.712 0.618 0.586 20 Water Content, % 22.4 22.1 27.0 Shear Dry Density, pcf 103.6 95.74 103.1 15 Saturation\*, % 100.0 100.0 100.0 Void Ratio 0.587 0.579 0.708 Back Press., psi 140. 116. 108. 10 Ver. Eff. Cons. Stress, psi 7.996 4.996 12. Shear Strength, psi 3.423 4.974 6.643 5 Strain at Failure, % 0.93 1.13 1.87 0.05 Strain Rate, %/min 0.05 0.05 B-Value 0.97 0.96 0.97 0 20 0 10 Measured Specific Gravity 2.62 2.62 2.62 VERTICAL STRAIN, % Liquid Limit 42 42 42 Plastic Limit 25 25 25 Project: Plant Yates Ash Pond Location: APB-3 Project No.: 6189109008 **MACTEC** Boring No.: APB-3 Sample Type: Undisturbed Description: Brown Clayey Sand Remarks: ASTM D4767-04. Strains at failure based on peak excess pore pressure.

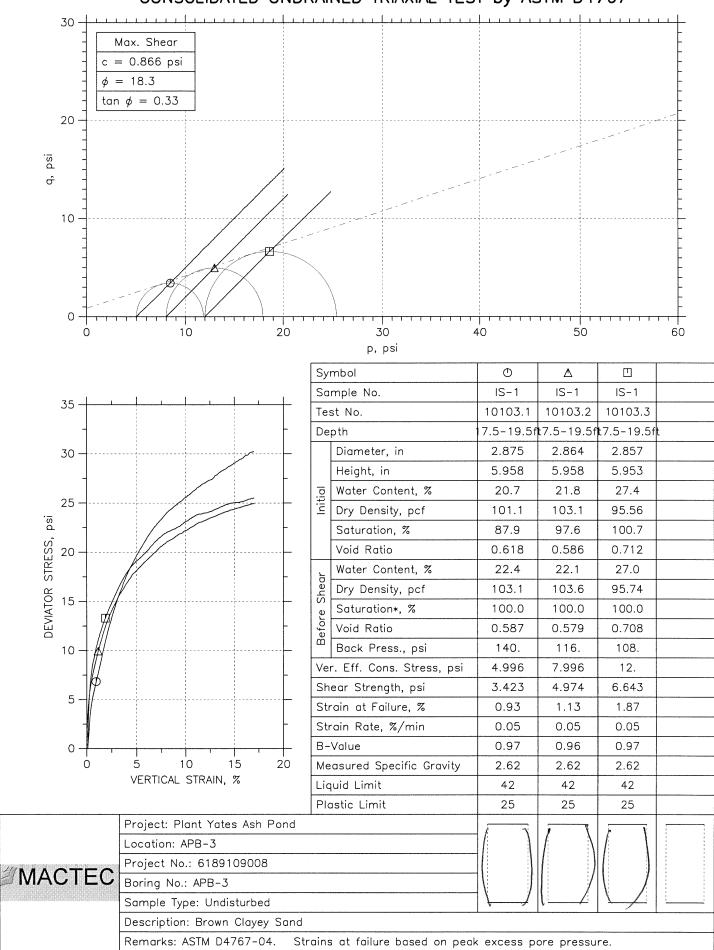
Phase calculations based on start and end of test.



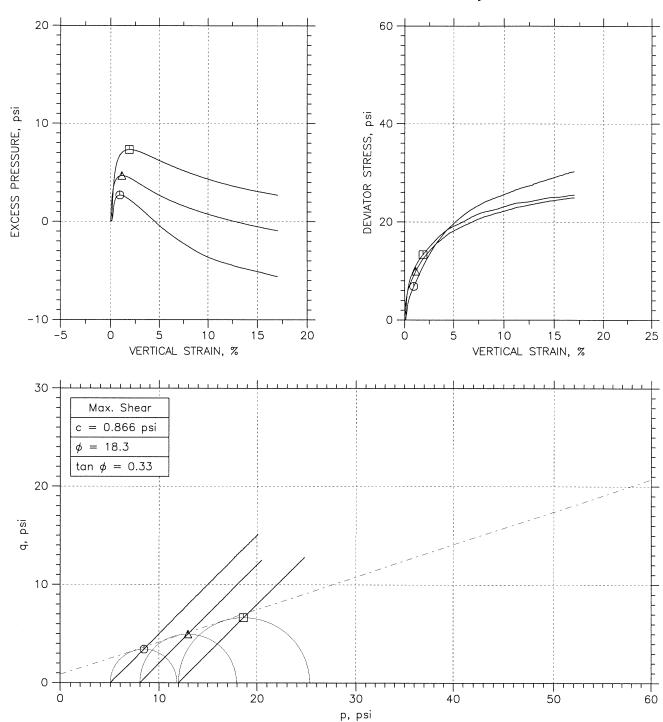
	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
0	IS-1	10103.1	17.5-19.5ft	JW	4/8/10			10103.1_2581.dat
Δ	IS-1	10103.2	17.5-19.5ft	JW	4/8/10			10103.2_2582.dat
	IS-1	10103.3	17.5-19.5ft	JW	4/8/10			10103.3_2583.dat

p', psi

// N N N O T F O	Project: Plant Yates Ash Pond	Location: APB-3	Project No.: 6189109008			
MACTEC	Project: Plant Yates Ash Pond Boring No.: APB-3	Sample Type: Undisturbed				
	Description: Brown Clayey Sand					
	Remarks: ASTM D4767-04. Strains at failure based on peak excess pore pressure.					



Phase calculations based on start and end of test.



	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
Ф	IS-1	10103.1	17.5-19.5ft	JW	4/8/10			10103.1_2581.dat
Δ	IS-1	10103.2	17.5-19.5ft	JW	4/8/10			10103.2_2582.dat
	IS-1	10103.3	17.5-19.5ft	JW	4/8/10			10103.3_2583.dat

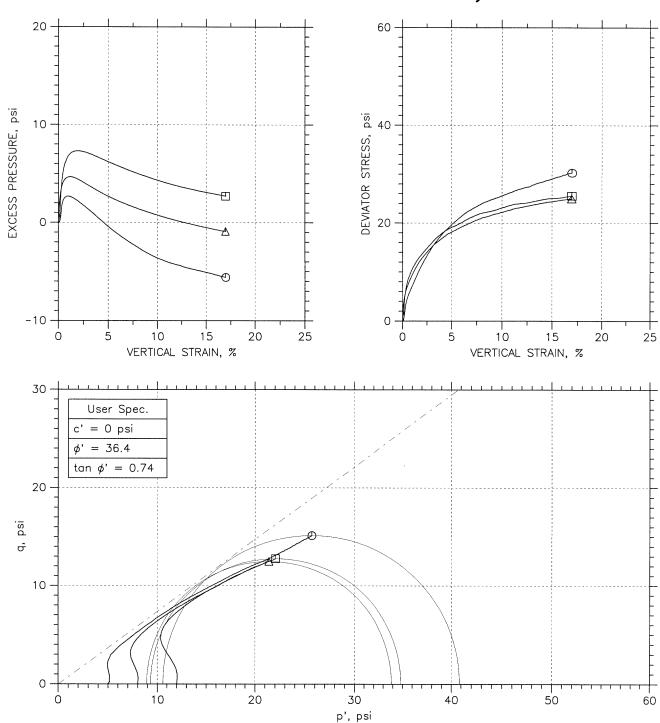
	Project: Plant Yates Ash Pond	Location: APB-3	Project No.: 6189109008			
#MACTEC	Boring No.: APB-3	Sample Type: Undisturbed				
	Description: Brown Clayey Sand					
	Remarks: ASTM D4767-04. Strains at failure based on peak excess pore pressure.					

#### CONSOLIDATED UNDRAINED TRIAXIAL TEST by ASTM D4767 User Spec. c' = 0 psi $\phi' = 36.4$ $tan \phi' = 0.74$ 20 psi ò 10 0 20 10 40 50 30 60 p', psi Symbol Φ Δ П IS-1 IS-1 Sample No. IS-135 Test No. 10103.3 10103.1 10103.2 Depth 7.5-19.5ft7.5-19.5ft7.5-19.5ft Diameter, in 2.875 2.864 2.857 30 5.958 Height, in 5.958 5.953 Water Content, % 27.4 20.7 21.8 25 95.56 Dry Density, pcf 101.1 103.1 psi Saturation, % 87.9 97.6 100.7 DEVIATOR STRESS, Void Ratio 0.618 0.586 0.712 20 Water Content, % 22.4 22.1 27.0 Shear Dry Density, pcf 103.1 103.6 95.74 15 Saturation\*, % 100.0 100.0 100.0 Before Void Ratio 0.587 0.579 0.708 140. Back Press., psi 108. 116. 10 Ver. Eff. Cons. Stress, psi 4.996 7.996 12. 12.47 12.76 Shear Strength, psi 15.12 5 Strain at Failure, % 17 17 17 Strain Rate, %/min 0.05 0.05 0.05 B-Value 0.97 0.96 0.97 0 10 20 Measured Specific Gravity 2.62 2.62 2.62 VERTICAL STRAIN, % 42 Liquid Limit 42 42 Plastic Limit 25 25 25 Project: Plant Yates Ash Pond Location: APB-3 Project No.: 6189109008 **MACTEC** Boring No.: APB-3

Phase calculations based on start and end of test.

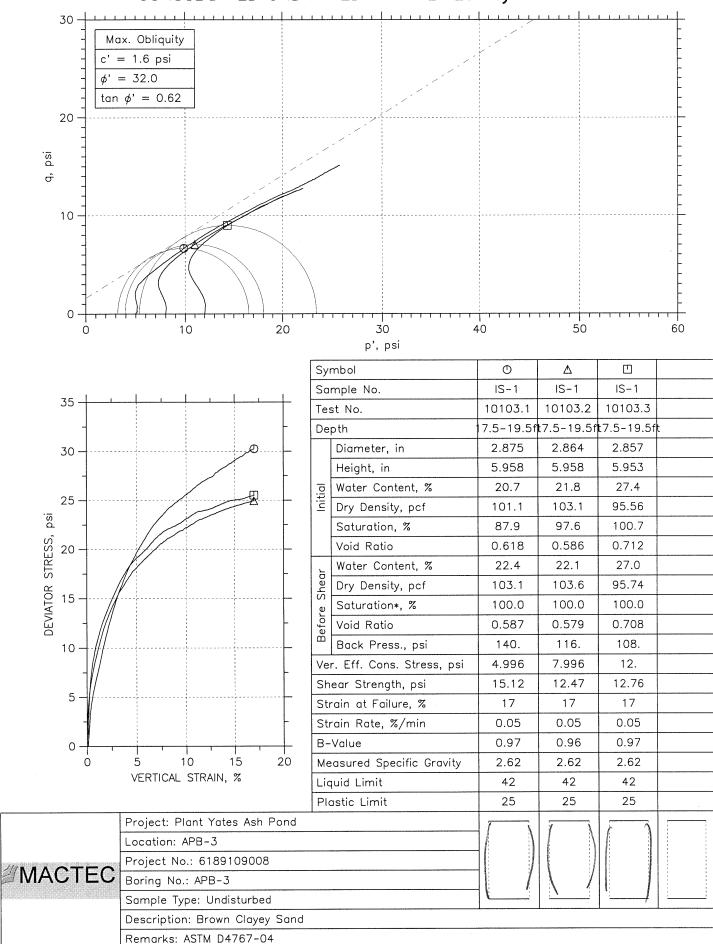
Sample Type: Undisturbed

Description: Brown Clayey Sand
Remarks: ASTM D4767-04.

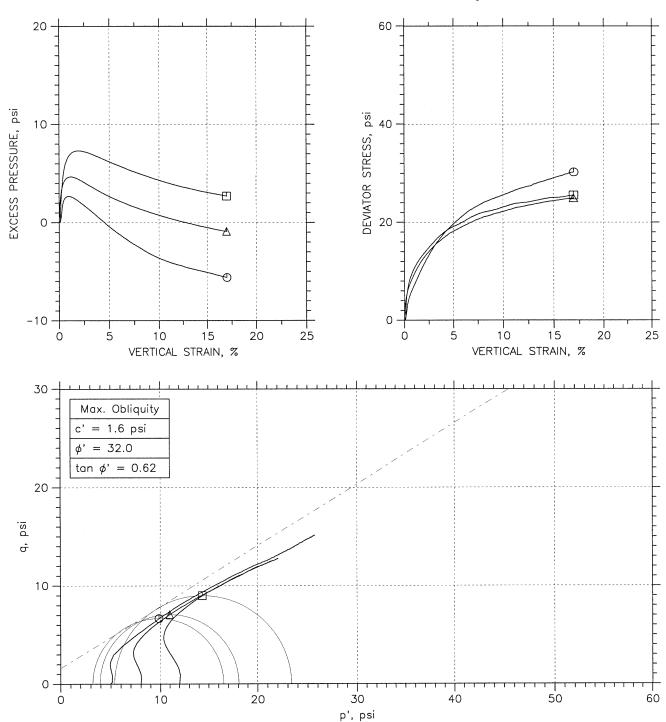


	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
Ф	IS-1	10103.1	17.5-19.5ft	JW	4/8/10			10103.1_2581.dat
Δ	IS-1	10103.2	17.5-19.5ft	JW	4/8/10			10103.2_2582.dat
	IS-1	10103.3	17.5-19.5ft	JW	4/8/10			10103.3_2583.dat

MAAAATEA	Project: Plant Yates Ash Pond	Location: APB-3	Project No.: 6189109008			
#MACTEC	Boring No.: APB-3	Sample Type: Undisturbed				
	Description: Brown Clayey Sand					
	Remarks: ASTM D4767-04.					

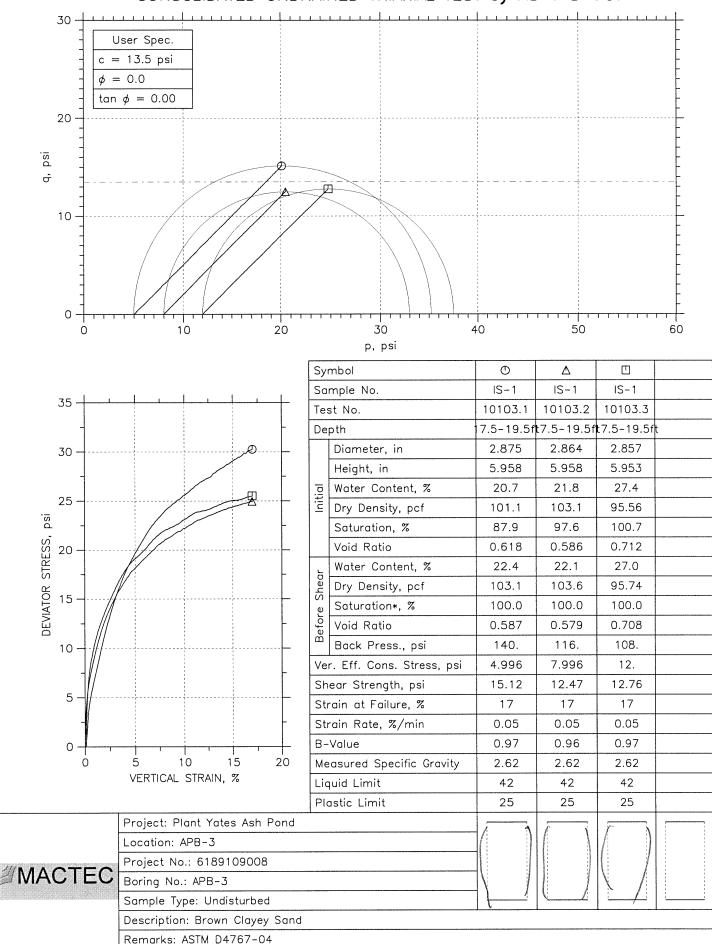


Phase calculations based on start and end of test.

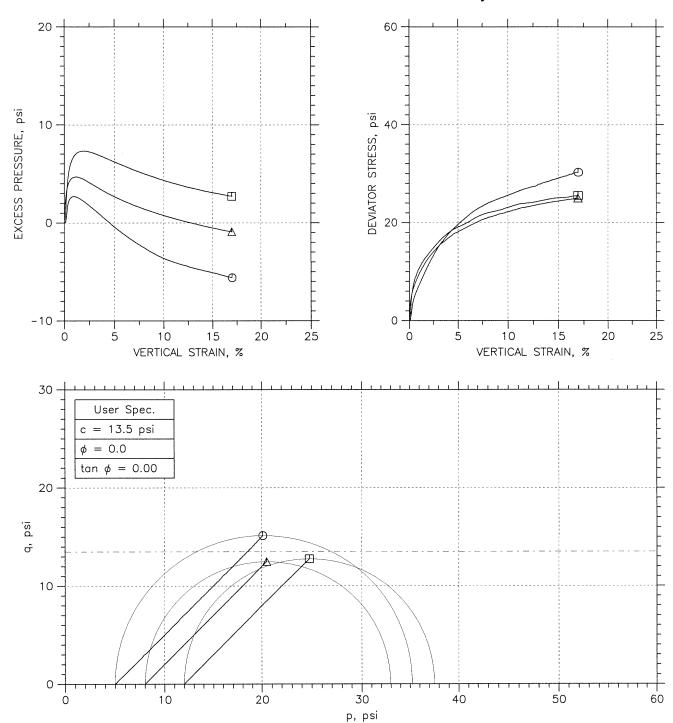


	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
0	IS-1	10103.1	17.5-19.5ft	JW	4/8/10			10103.1_2581.dat
Δ	IS-1	10103.2	17.5-19.5ft	JW	4/8/10			10103.2_2582.dat
	IS-1	10103.3	17.5-19.5ft	JW	4/8/10			10103.3_2583.dat

	Project: Plant Yates Ash Pond	Location: APB-3	Project No.: 6189109008				
<b>MACTEC</b>	Boring No.: APB-3	Sample Type: Undisturbed					
	Description: Brown Clayey Sand						
	Remarks: ASTM D4767-04						



Phase calculations based on start and end of test.



	Sample No.	Test No.	Depth	Tested By	Test Date	Checked By	Check Date	Test File
Ф	IS-1	10103.1	17.5-19.5ft	JW	4/8/10			10103.1_2581.dat
Δ	IS-1	10103.2	17.5-19.5ft	JW	4/8/10			10103.2_2582.dat
	IS-1	10103.3	17.5-19.5ft	JW	4/8/10			10103.3_2583.dat

MAAAATEA	Project: Plant Yates Ash Pond	Location: APB-3	Project No.: 6189109008				
#MACTEC	Boring No.: APB-3	Sample Type: Undisturbed					
	Description: Brown Clayey Sand						
	Remarks: ASTM D4767-04						

### Attachment D - Critical Section Profile Used in Analysis

