

PERIODIC SAFETY FACTOR ASSESSMENT
391-3-4-.10(4) and 40 C.F.R. PART 257.73
PLANT HAMMOND ASH POND 1 (AP-1)
GEORGIA POWER COMPANY

The Federal CCR Rule, and, for Existing Surface Impoundments where applicable, the Georgia CCR Rule (391-3-4-.10) require the owner or operator of a CCR surface impoundment to conduct initial and periodic safety factor assessments. See 40 C.F.R. § 257.73(e); Ga. Comp. R. & Regs. r. 391.3-4-.10(4)(b)¹. The owner or operator must conduct an assessment of the CCR unit and document that the minimum safety factors outlined in § 257.73(e)(1)(i) through (iv) for the critical embankment section are achieved. In addition, the Rules require a subsequent assessment be performed within 5 years of the previous assessment. See 40 C.F.R. § 257.73(f)(3); Ga. Comp. R. & Regs. r. 391.3-4-.10(4)(b)¹.

The CCR surface impoundment located at Georgia Power Company's Plant Hammond and referred to as the Plant Hammond Ash Pond 1 (AP-1) is on Plant Hammond property, in Coosa, Georgia, 1 mile west of the Rome, Georgia city limits in Floyd County. The CCR surface impoundment is formed by an engineered perimeter embankment. The critical section of this CCR unit was previously determined to be located on the south side of the perimeter embankment. Under current conditions, the south side of the perimeter embankment remains the critical section. The Notification of Intent to Initiate Closure was placed in the Operating Record on 8/31/2020 and closure has been designed to have no negative impacts on the stability of the perimeter embankments.

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

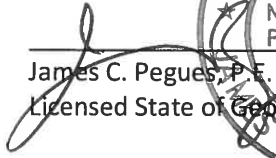
Loading Condition	Minimum Calculated Safety Factor	Minimum Required Safety Factor
Long-term Maximum Storage Pool (Static)	3.9	1.5
Maximum Surcharge Pool (Static)	3.9	1.4
Seismic	2.6	1.0


The embankments are constructed of clays that are not susceptible to liquefaction. Therefore, a minimum liquefaction safety factor determination was not required.

^[1] In a typographical error, 391.3-4.10(4)(b) references the "structural integrity criteria in 40 CFR 247.73," when the reference to such criteria should be 40 CFR 257.73.

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. § 257.73 (e)(1).


James C. Pegues, P.E.
Licensed State of Georgia # PE017419





Technical and Project Solutions Calculation

Calculation Number:
TV-HM- GPC1139403-001

Project/Plant: Plant Hammond AP-1	Unit(s): 1-4	Discipline/Area: Env. Solutions
Title/Subject: Periodic Factor of Safety Assessment for CCR Rule		
Purpose/Objective: Determine the Factor of Safety of the Ash Pond Dike		
System or Equipment Tag Numbers: n/a	Originator: Jacob A. Jordan, P.E.	

Contents

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Total # of pages including cover sheet & attachments:		51	

Revision Record

Rev. No.	Description	Originator Initial / Date	Reviewer Initial / Date	Approver Initial / Date
0	Issued for Information	JAJ/06-04-21	JCP/06-04-21	JCP/06-04-21

Notes:

Purpose of Calculation

Georgia Power Company's Plant Hammond Ash Pond 1 was commissioned in 1952, at the time of plant construction. In the early 1970s, the rail tracks were constructed on the dike. At that time the dike stability was evaluated with train loads by Law Engineering. Original design drawings indicate that the original dike was constructed with an outboard slope of 3 horizontal to 1 vertical. More recent surveys of the dike show that the outboard face of the dike is currently about 4.8 horizontal to 1 vertical.

The stability of this structure was analyzed in 2016 for the CCR Rule. The purpose of this calculation is to update the stability analysis of the dike of Ash Pond 1.

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 above the required minimum.

Load Conditions	Computed Factor of Safety	Required Minimum Factor of Safety
Long-term Maximum Storage (Static)	3.9	1.5
Maximum Surcharge Pool (Static)	3.9	1.4
Seismic	2.6	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 Tavasrou (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 0.092g 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 soil properties of unit weight, phi angle, and cohesion were obtained from triaxial shear testing performed on UD samples of the fill and foundation soils obtained during drilling in March 2010. The testing was performed according to ASTM D 4767.
- Properties for ash were based on laboratory testing performed on undisturbed and remolded samples of ash from various plants and on engineering judgment.
- In March 2010, piezometers were installed in the dike fill, the foundation soils and in the ash. These piezometers, in conjunction with survey data, were used to obtain current water elevations within the dike and the foundation soils.
- The COE EM 1110-2-1902, 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.
- According to the NOAA website, the flood elevation for the Coosa River at Plant Hammond is elevation 570 feet. This elevation is well below the toe of all ash pond dikes. Therefore, flood cases were not evaluated.

Ash Pond 1

- The cross-section of Ash Pond 1 was obtained using the following sources:
 - 1) Original design Drawing No. H-35 for the upstream surface of the dike and the maximum pool elevation.
 - 2) Metro topographic survey drawing from 2000 (post railroad) for the downstream surface of the dike and the toe.
 - 3) Hydrographic survey Drawing H-666-14 from 2006 for the top of ash.
 - 4) Drawing H-30, Plot Plan of Drill Holes, for the approximate top of rock.
- Groundwater elevations through the dike and on the downstream side of the dike were determined from piezometers installed in March 2010. Maximum surcharge pool was based on the SCS Hydro Services 2010 calculation SH-HM10911-02 evaluating the stormwater capacity of Ash Pond 1.

The following soil properties were used in the analyses. This data was obtained from laboratory triaxial testing performed in March 2010 by S&ME. The laboratory testing consisted of classification testing as well as consolidated-undrained triaxial tests with pore pressure measurements in order to provide both total and effective shear strength parameters of the embankment and foundation soils. Sample disturbance during the sampling effort as well as variations in the soil specimens (wide range of void ratios, initial saturation conditions, gravel content, and dry unit weights) resulted in inconsistencies in the test results. This prevented S&ME from reporting the total stresses for five of the tests and to suggest that these inconsistencies be considered when interpreting and applying the data. The laboratory data for

the five tests were reviewed in order to estimate total stress parameters that would conservatively represent the soil types indicated by the classification tests. Failure criteria were established at lower strains occurring near the maximum pore pressures developed during the test procedures. These parameters have been added to the following table and are consistent with the remaining total stress parameters reported by S&ME. The effective stress interpretations provided by S&ME were used in the analyses.

Soil Description	Dry Unit Weight, pcf	Moist Unit Weight, pcf	Effective Stress Parameters		Total Stress Parameters	
			Cohesion, psf	Phi Angle, degrees	Cohesion, psf	Phi Angle, degrees
Sandy Clay Dike Fill	117.6	133	270	32	400	18.5
Sandy Clay Fdn Soil	97.9	123	40	35	500	21.6
Sluiced Ash		80	0	10	0	10

Hydrologic Considerations

The following hydraulic information, based on the calculation package Schnabel Reference 16C17025.00, Hydrologic and Hydraulic Support Services, Coal Combustion Residuals Storage Analyses, dated August 15, 2016, prepared by Schnabel Engineering, was used in the analyses. This calculation states that Ash Pond 1 is capable of handling the 1000-year 24-hour storm event with a maximum surcharge pool elevation of 585.2.

Load Conditions

The impoundment dike at Plant Hammond Ash Pond 1 was evaluated for load conditions consisting of long-term maximum storage, maximum surcharge pool, and seismic.





Design Inputs/References

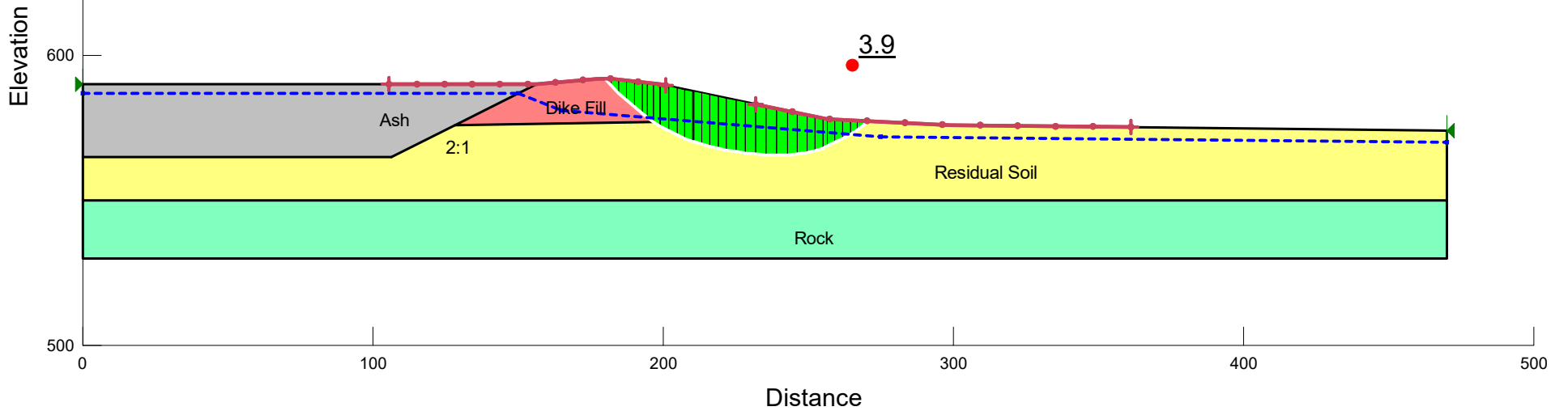
- USGS Earthquake Hazards website, <http://earthquake.usgs.gov/hazards/interactive/>.
- NOAA website, <http://www.srh.noaa.gov/ffc/html/rva.php>.
- E&CS Calculation TV-HM-GPC607582-001
- GPC Drawing H-35, Plant Hammond Units 1 & 2 Ash Basin Area – Excavation and Drainage
- GPC Drawing H-30, Plant Hammond Plot Plan of Drill Holes
- GPC Land Department Drawing H-666-14, Plant Hammond Ash Pond No. 1 – November 2006 Survey
- Metro Topographic Map, Georgia Power Company, Plant Hammond, February 29, 2000
- GPC Drawing H-436, Plant Hammond 1973 Ash Pond Plan and Sections
- Ref. 16C17025.00 Hydrologic and Hydraulic Support Services, Coal Combustion Residuals Storage Analysis, prepared by Schnabel Engineering, August 15, 2016
- 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

Body of Calculation

SLOPE/W modeling attached.

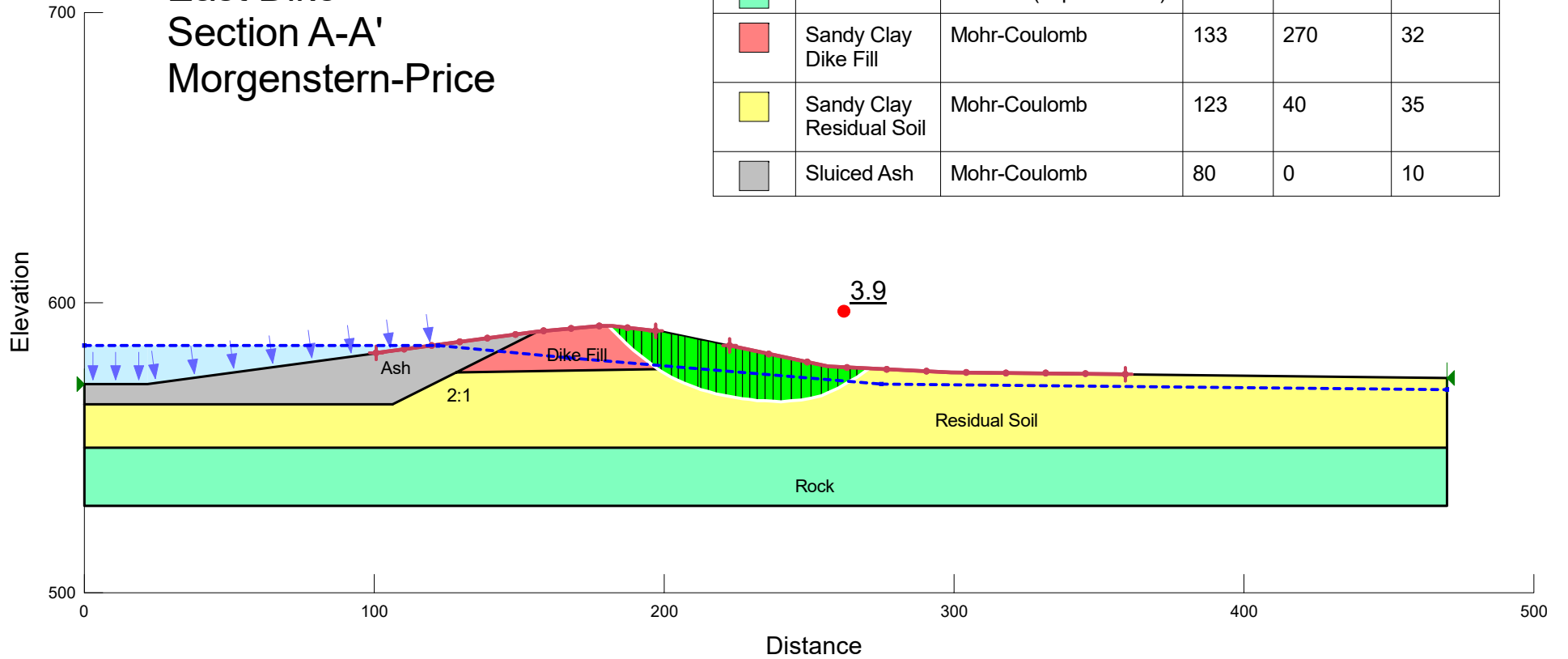
Plant Hammond
 Ash Pond 1
 Downstream - Max Storage
 East Dike
 Section A-A'
 Morgenstern-Price

Color	Name	Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Rock	Bedrock (Impenetrable)			
	Sandy Clay Dike Fill	Mohr-Coulomb	133	270	32
	Sandy Clay Residual Soil	Mohr-Coulomb	123	40	35
	Sluiced Ash	Mohr-Coulomb	80	0	10



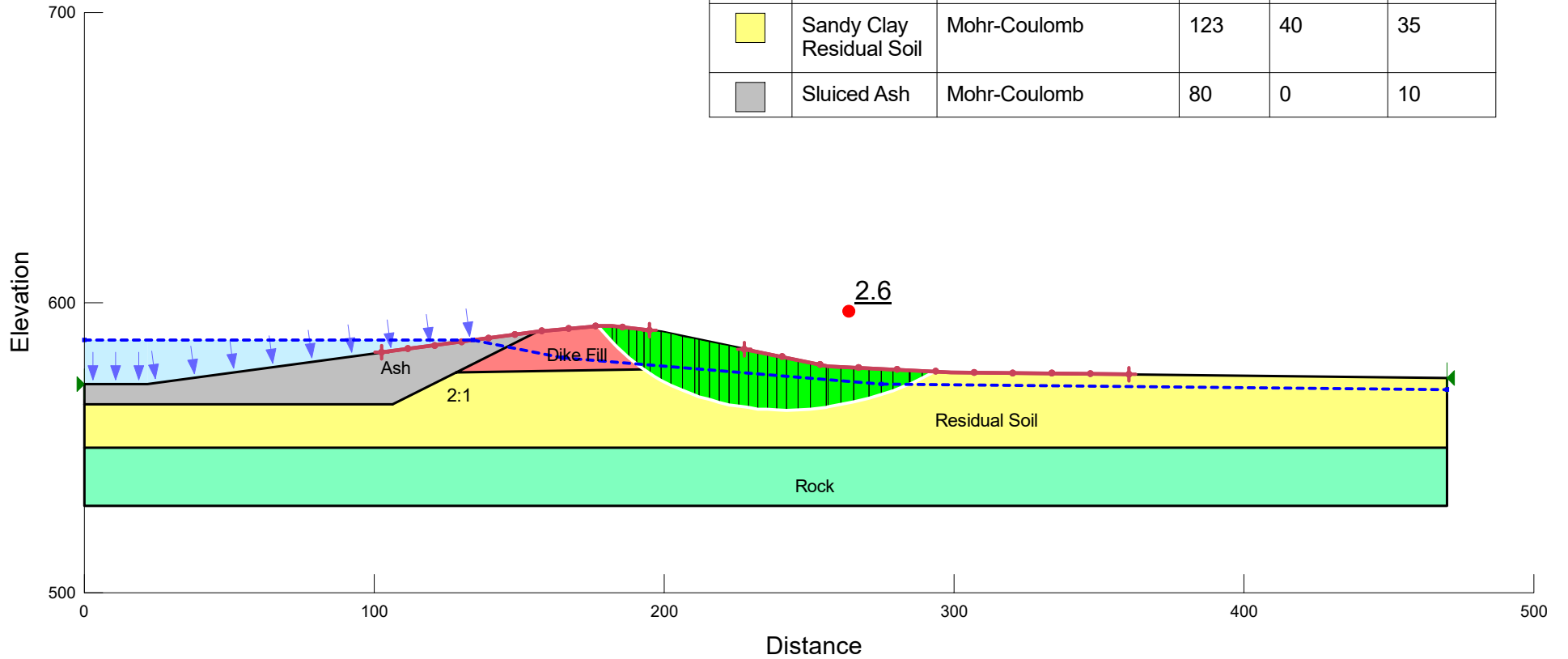
Plant Hammond Ash Pond 1
 Downstream - Max Surcharge
 East Dike
 Section A-A'
 Morgenstern-Price

Color	Name	Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
Light Green	Rock	Bedrock (Impenetrable)			
Red	Sandy Clay Dike Fill	Mohr-Coulomb	133	270	32
Yellow	Sandy Clay Residual Soil	Mohr-Coulomb	123	40	35
Grey	Sluiced Ash	Mohr-Coulomb	80	0	10



Plant Hammond Ash Pond 1
 Downstream - Seismic
 East Dike
 Section A-A'
 Morgenstern-Price

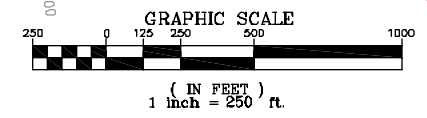
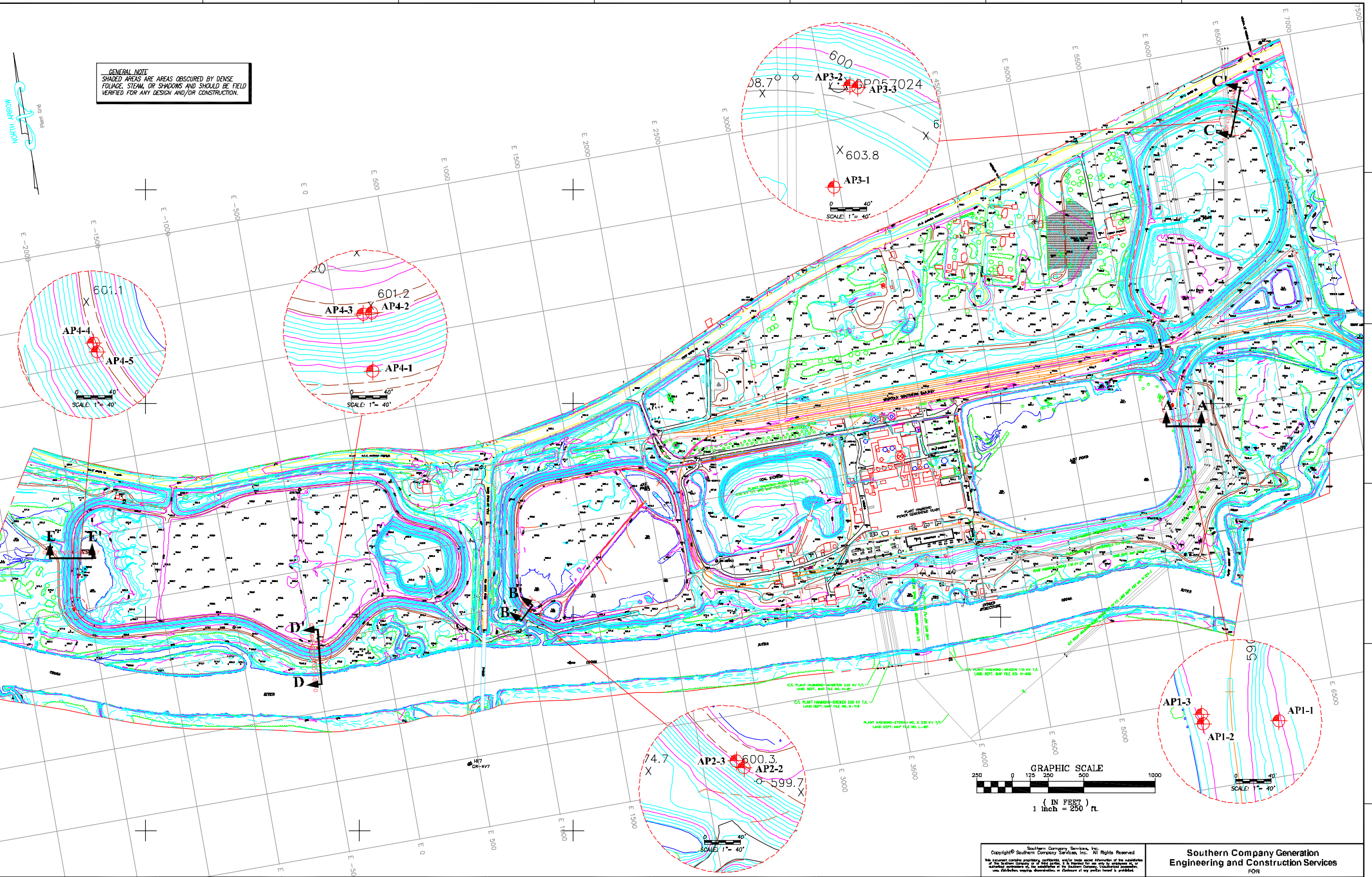
Color	Name	Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
Green	Rock	Bedrock (Impenetrable)			
Red	Sandy Clay Dike Fill	Mohr-Coulomb	133	270	32
Yellow	Sandy Clay Residual Soil	Mohr-Coulomb	123	40	35
Grey	Sluiced Ash	Mohr-Coulomb	80	0	10



Attachment A

Figures – Boring Location Plan

GENERAL NOTE
 SHADED AREAS ARE AREAS OBSCURED BY DENSE FOLIAGE, STEAM, OR SHADOWS AND SHOULD BE FIELD VERIFIED FOR ANY DESIGN AND/OR CONSTRUCTION.



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**Southern Company Generation
 Engineering and Construction Services**
 FOR
Georgia Power Company
PLANT HAMMOND
 FIGURE 1
 ATTACHMENT A
 BORING LOCATIONS AND CROSS SECTIONS
 CALC # TV-HM-ECS3201-001

SCALE	BORING NUMBER	SHEET	TOTAL SHEETS	REV
AS SHOWN	ES1844S1	1	FINAL	0

REVISION	DATE	REVISION	DATE	REVISION	DATE	REVISION	DATE	REVISION	DATE	REVISION	DATE	REVISION	DATE
BY	CHK'D	CIVL APPR	ELECT APPR	U/C APPR	MECH APPR	DISC MGR	BY	CHK'D	CIVL APPR	ELECT APPR	U/C APPR	MECH APPR	DISC MGR
BY	CHK'D	CIVL APPR	ELECT APPR	U/C APPR	MECH APPR	DISC MGR	BY	CHK'D	CIVL APPR	ELECT APPR	U/C APPR	MECH APPR	DISC MGR
BY	CHK'D	CIVL APPR	ELECT APPR	U/C APPR	MECH APPR	DISC MGR	BY	CHK'D	CIVL APPR	ELECT APPR	U/C APPR	MECH APPR	DISC MGR


Attachment B

Boring Logs

 SOUTHERN COMPANY <i>Energy to Serve Your World™</i>		DRILLING LOG			Hole No. AP1-1	
		GEOLOGICAL SERVICES			Sheet 1 of 1	
SITE Plant Hammond		HOLE DEPTH 20 ft	SURF ELEV. 579.00			
LOCATION Rome, GA		COORDINATES N _____ E _____				
ANGLE Vertical	BEARING _____	CONTRACTOR Ranger Consulting, Inc		DRILL NO. CME 550X		
DRILLING METHOD Hollow stem auger		NO. SAMPLES 4	NO. U.D. SAMPLES 0			
CASING SIZE _____	LENGTH _____	CORE SIZE _____		TOTAL % REC. _____		
WATER TABLE DEPTH _____		ELEV. _____	TIME AFTER COMP. _____		DATE TAKEN _____	
TYPE GROUT Bentonite		QUANTITY _____	MIX _____	DRILLING START DATE 3/16/2010		
DRILLER Justin	RECORDER J Pugh	APPROVED _____		DRILLING COMP. DATE 3/16/2010		

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	579.00	Drilled from toe of dike							
1	578.00								
2	577.00								
3	576.00								
4	575.00								
4	575.00	Brown sandy clay; moist	1	3.5-5	2-2-3	5	Water table at 4 ft at 24-hr		
5	574.00								
6	573.00								
7	572.00								
8	571.00								
9	570.00	Orange and gray very silty fine to medium grained sand; wet	2	8.5-10	6-8-11	19	Water table at 8 ft at T.O.B.		
10	569.00								
11	568.00								
12	567.00								
13	566.00								
14	565.00	Orange and gray very silty fine to medium grained sand with rock fragments; wet	3	13.5-15	8-6-8	14			
15	564.00								
16	563.00								
17	562.00								
18	561.00								
19	560.00	Orange and gray very silty fine to medium grained sand with rock fragments; wet	4	18.5-20	WH-2-2	4			
20	559.00	Bottom of hole at 20 ft							

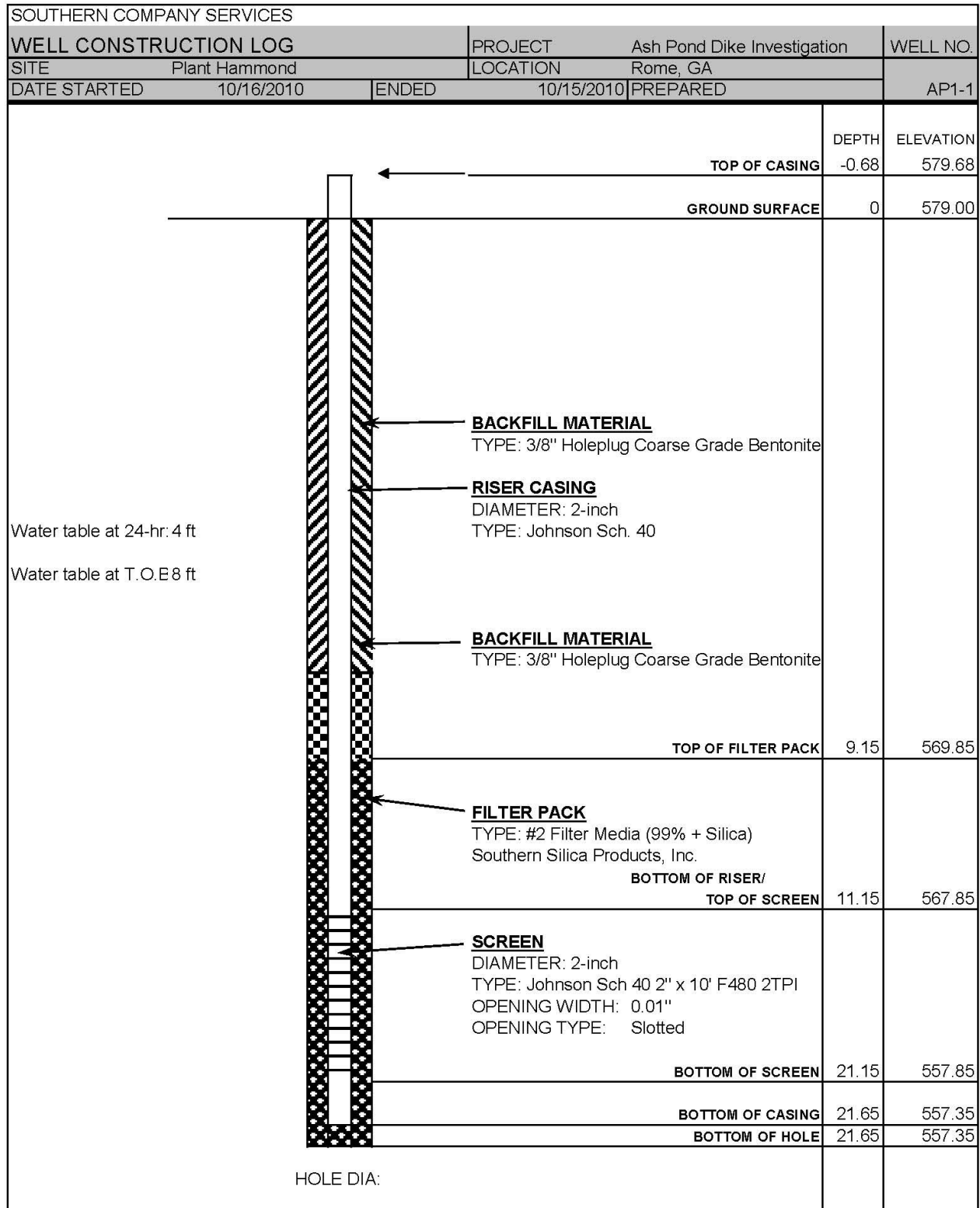
Form GS9901 7-26-2004

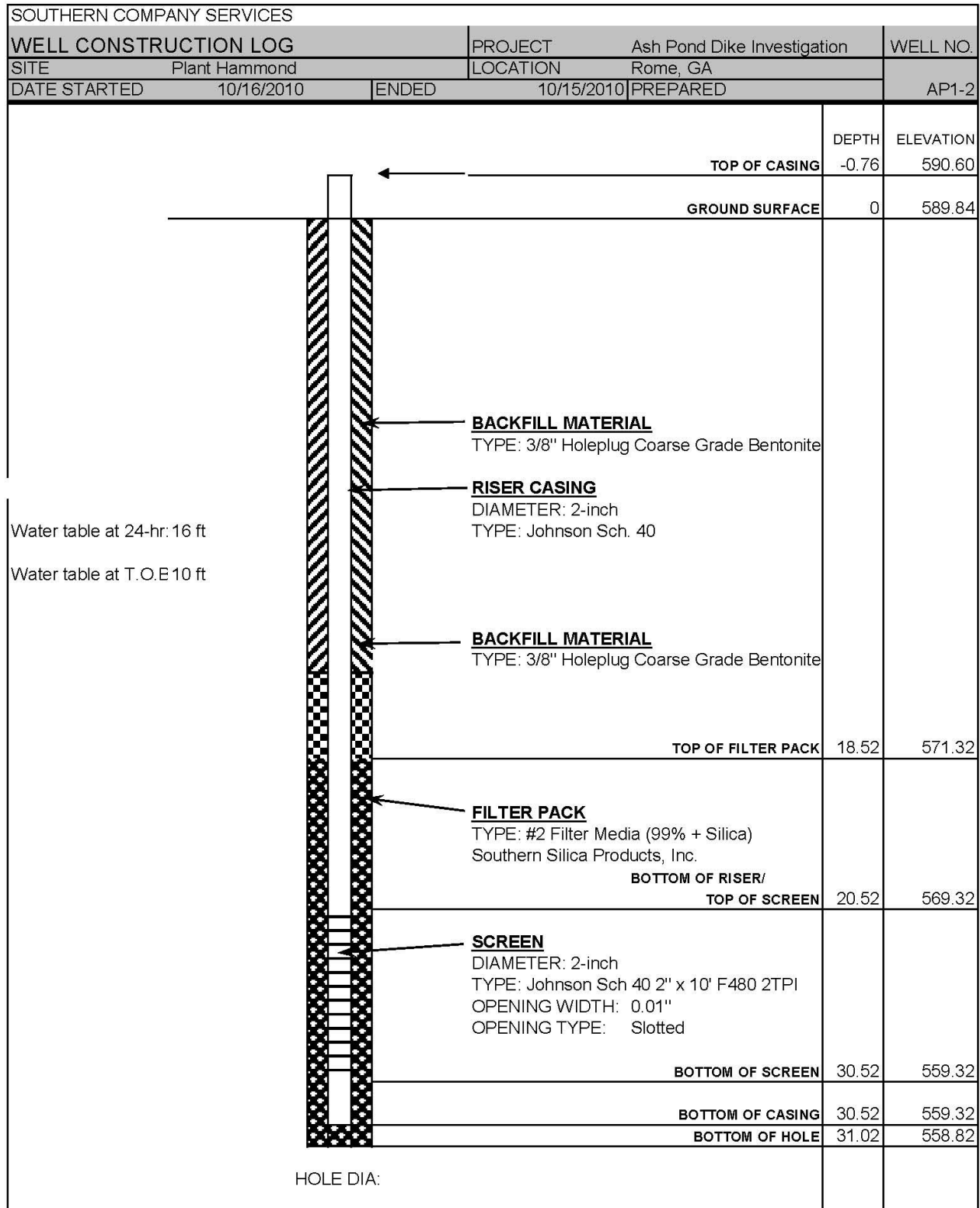
 DRILLING LOG GEOLOGICAL SERVICES		Hole No. AP1-2							
		Sheet 1 of 2							
SITE Plant Hammond		HOLE DEPTH 30 ft	SURF ELEV. 589.84						
LOCATION Rome, GA		COORDINATES N _____ E _____							
ANGLE Vertical	BEARING _____	CONTRACTOR Ranger Consulting, Inc	DRILL NO. CME 550X						
DRILLING METHOD Hollow stem auger		NO. SAMPLES 6	NO. U.D. SAMPLES 1						
CASING SIZE _____	LENGTH _____	CORE SIZE _____	TOTAL % REC. _____						
WATER TABLE DEPTH _____		ELEV. _____	TIME AFTER COMP. _____ DATE TAKEN _____						
TYPE GROUT Bentonite		QUANTITY _____ MIX _____	DRILLING START DATE 3/16/2010						
DRILLER Justin	RECORDER J Pugh	APPROVED _____	DRILLING COMP. DATE 3/16/2010						
Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test			Comments	% Rec	RQD
				From To	Blows	N			
0	589.84	Begin drilling at dike crest							
1	588.84	Light brown and orange clayey sand with gravel; moist	1	3.5-5	3-3-4	7	Post hole to 3 ft		
2	587.84								
3	586.84								
4	585.84								
5	584.84	Mottled brown, red and tan sandy clay with gravel; moist	2	8.5-10	5-6-8	14	Water table at 10 ft at 24-hr		
6	583.84								
7	582.84								
8	581.84								
9	580.84	Brown and gray clay with minor fine sand; moist	3	13.5-15	4-4-4	8	Water table at 16 ft at T.O.B.		
10	579.84								
11	578.84								
12	577.84								
13	576.84	Mottled light brown, red and tan clayey sand with gravel; wet	4	18.5-20	9-9-11	20			
14	575.84								
15	574.84								
16	573.84								
17	572.84	Light brown and gray very silty sand with gravel	5	23.5-25	3-4-7	11			
18	571.84								
19	570.84								
20	569.84								
21	568.84								
22	567.84								
23	566.84								
24	565.84								

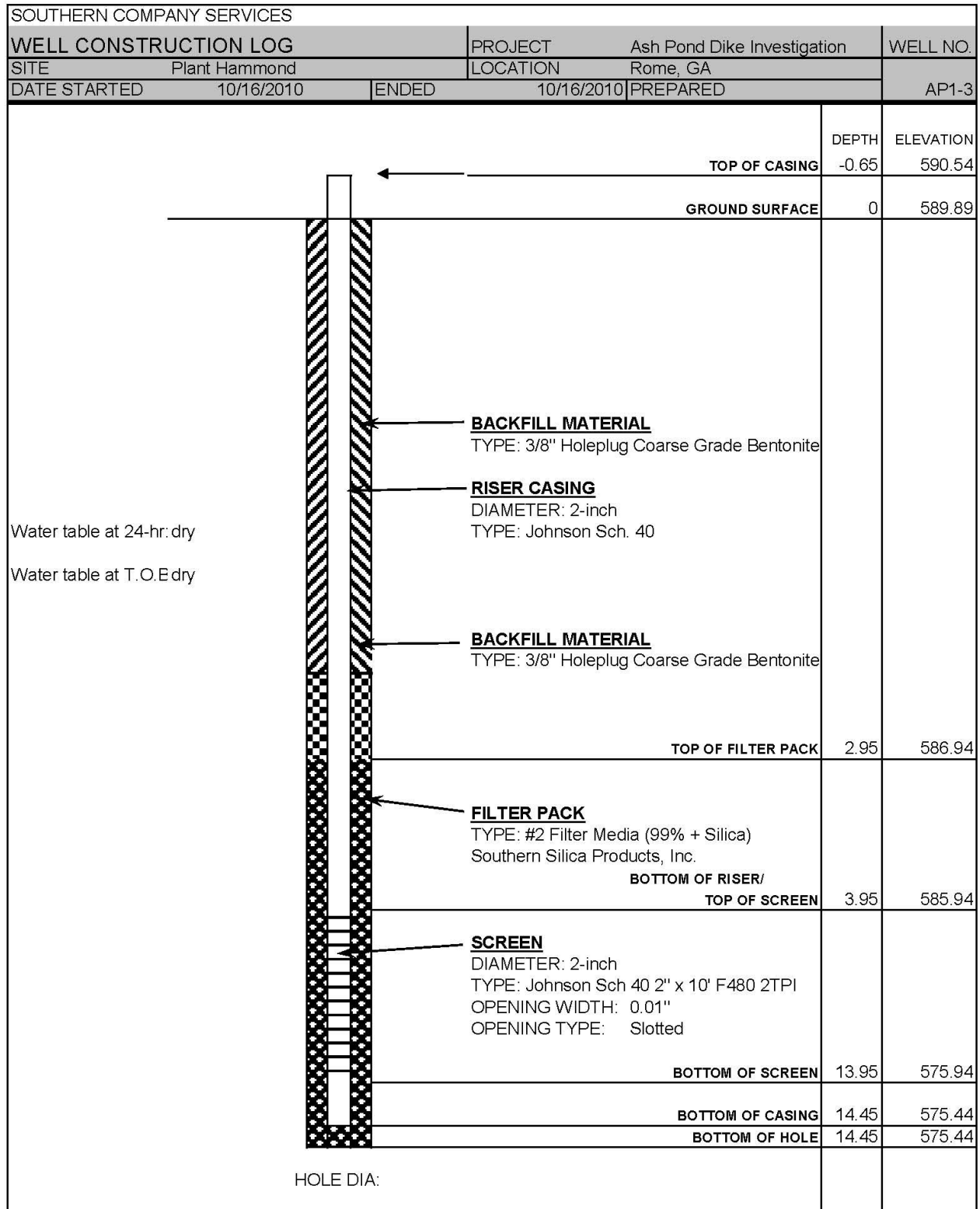
Form GS9901 7-26-2004

Attachment C

Piezometer Logs







Attachment D

Soil Laboratory Analysis

April 21, 2010

Southern Company Services
241 Ralph McGill Boulevard
16th Floor, Bin 10185
Atlanta, Georgia 30308

Attention: Mr. Gary H. McWhorter

Subject: Plant Hammond Ash Pond Dikes
S&ME Job No. 28900

Gentlemen:

S&ME, Inc. has completed the laboratory testing on the soil samples sent by your office. The following tests were performed:

- ◆ Atterberg Limits
- ◆ Sieve Analysis
- ◆ Triaxial Shear

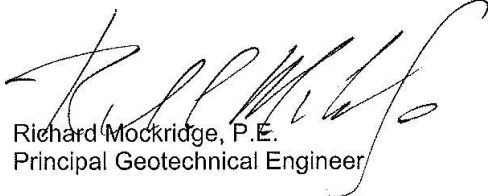
S&ME, Inc. performs soil tests in general accordance with the applicable American Society for Testing and Materials (ASTM) or AASHTO procedures. These procedures are generally recognized as the basis for uniformity and consistency of test results in the geotechnical engineering profession. All the work is supervised by a qualified engineer. Attached are test results for your review. While S&ME is not responsible for the use or interpretation of these data we note that the test results do not appear to be consistent with our expectations for materials with these unified soil classifications.

S&ME, Inc. appreciates the opportunity to provide these laboratory services. Please contact us if you have any questions concerning this report or if we may be of further service.

Respectfully submitted,

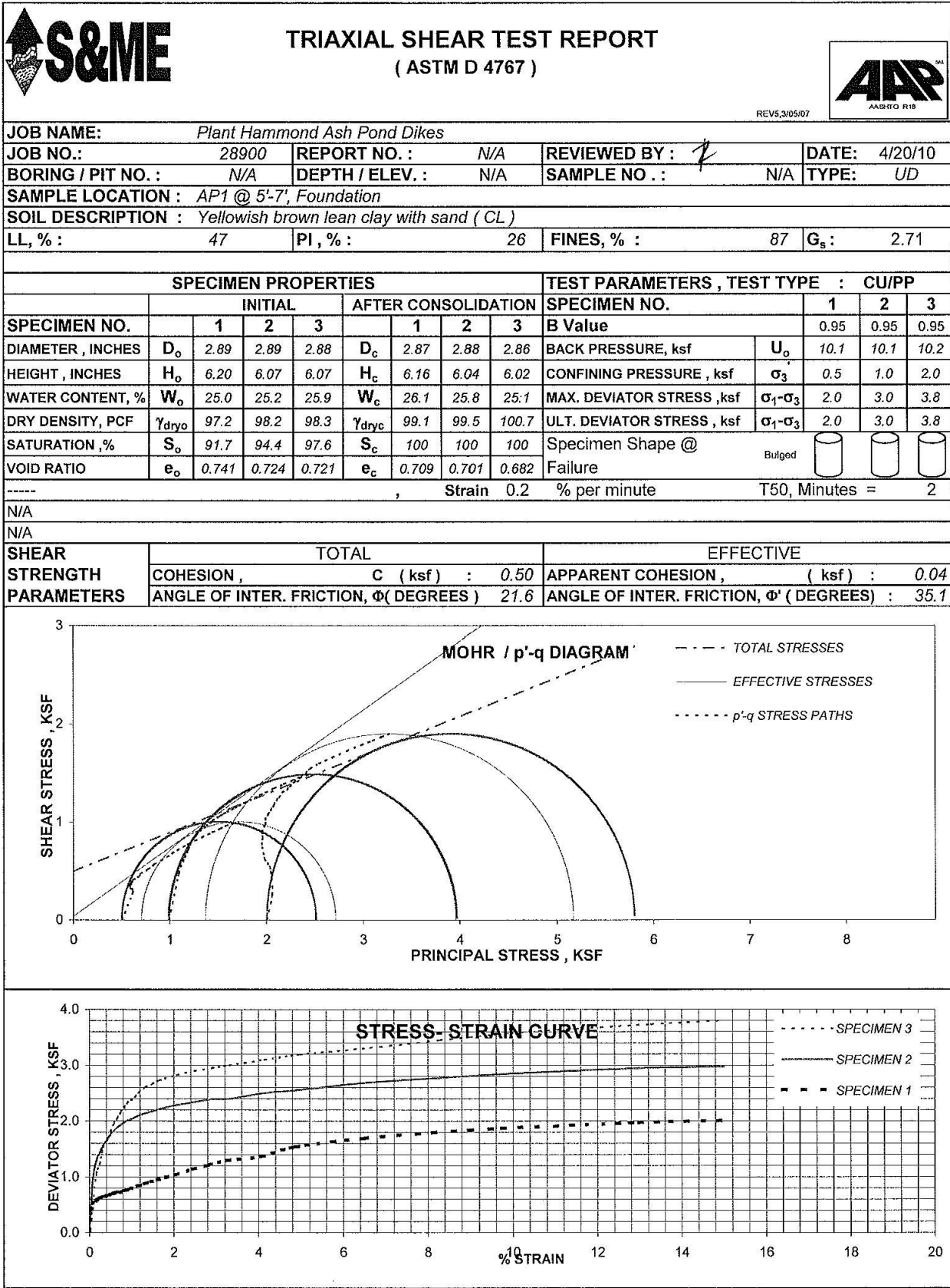
S&ME, Inc.



Ashok K. Mangla
Geotechnical Laboratory Manager


Richard Mockridge, P.E.
Principal Geotechnical Engineer

AKM/RM/pg


Attachment





PARTICLE-SIZE DISTRIBUTION TEST REPORT

SIEVE AND HYDROMETER
ASTM D422 0

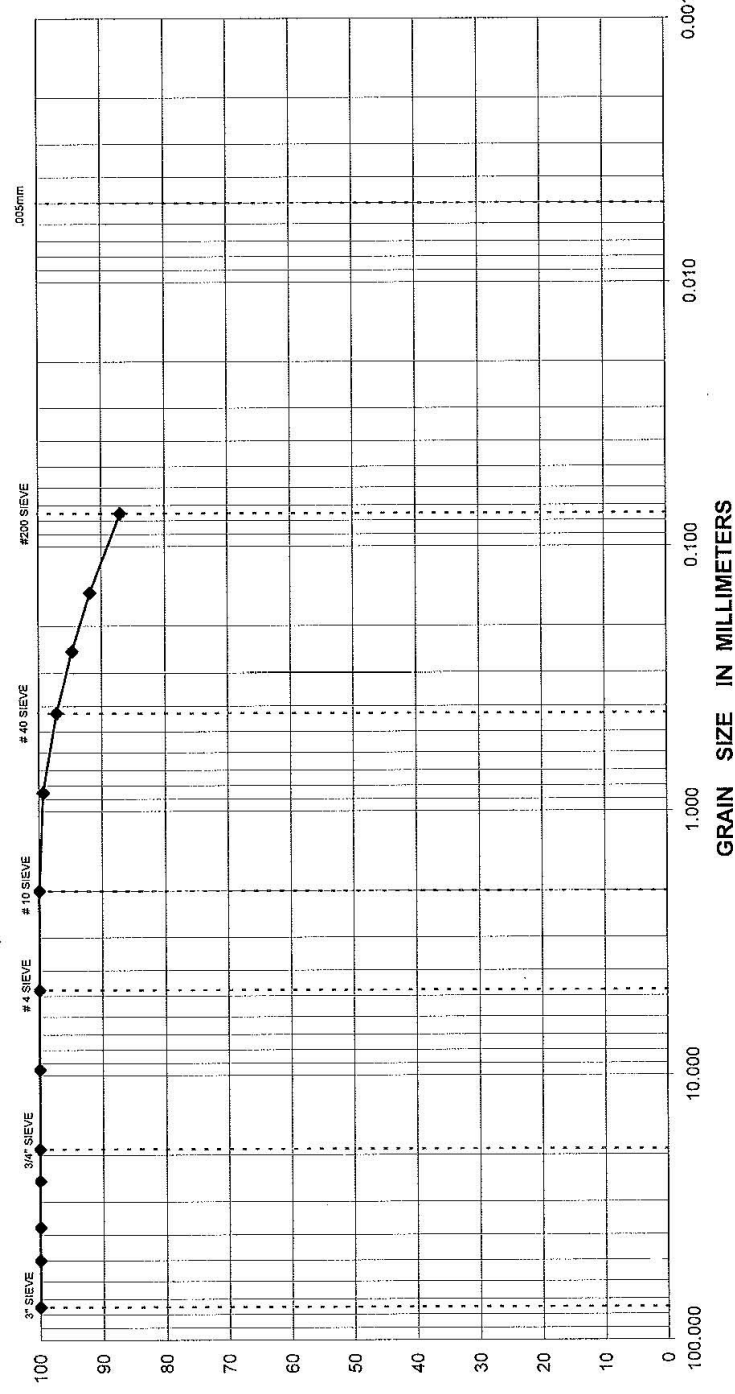


REV2.080705
AASHTO FR-8

JOB NAME :	Plant Hammond Ash Pond Dikes		
JOB NO. :	28900	REPORT NO. :	N/A
BORING / PIT NO. :	N/A	DEPTH / ELEV. :	N/A
SAMPLE LOCATION :	AP1 @ 5'-7" foundation		
SOIL DESCRIPTION :	Yellowish brown, lean clay with sand.		
LIQUID LIMIT, % :	47	PLASTICITY INDEX, % :	26
D10, MM :	N/A	D30, MM :	N/A
CLASSIFICATION	UNIFIED :	AASHTO :	CL

REVIEWED BY :	DATE :	SAMPLE NO. :	SAMPLE TYPE :
	4/20/10	N/A	UD
SP. GRAVITY, G _s :	N/A		
FINES, % :	87		
COEFF. OF CURVATURE, C _c :	N/A		
COEFF. OF UNIFORMITY, C _u :	N/A		

GRAVEL	COARSE	FINE	SAND	FINE	SILT	CLAY



Sieve Size (mm)	% Finer
3" Sieve	100
3/4" Sieve	100
#4 Sieve	100
#10 Sieve	100
#20 Sieve	100
#40 Sieve	100
#60 Sieve	100
#100 Sieve	100
#200 Sieve	100
#425 Sieve	100
0.075 mm	87



ATTERBERG LIMITS
(ASTM D 4318)

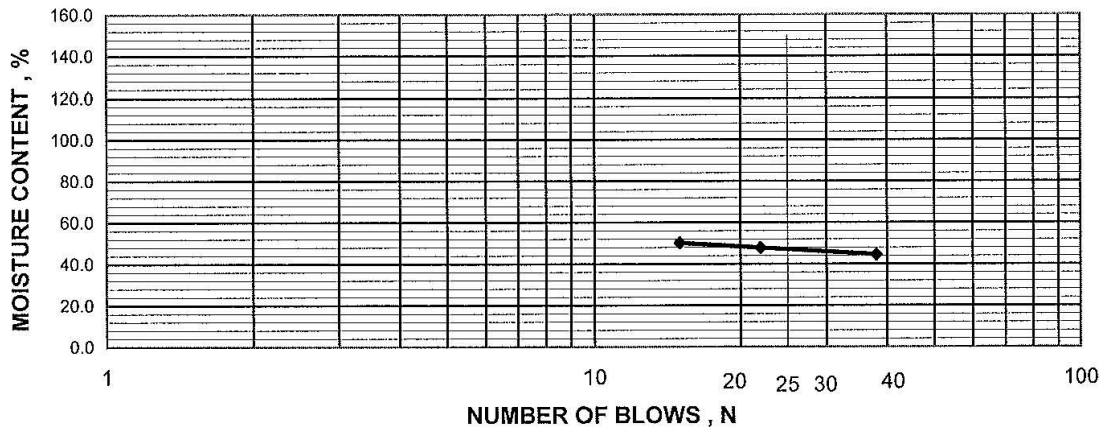


REV., 5/10/06

JOB NAME :		Plant Hammond Ash Pond Dikes					
JOB NO. :	28900	REPORT NO. :	-	DATE :	04/20/10	REVIEWED BY :	<input checked="" type="checkbox"/>
BORING / PIT NO. :	N/A	DEPTH / ELEV. :	N/A	SAMPLE NO. :	N/A	SAMPLE TYPE :	UD
SAMPLE LOCATION : AP1 @ 5'-7' foundation							
SOIL DESCRIPTION : Yellowish brown lean clay with sand.							
LIQUID LIMIT , % :	47	PLASTIC LIMIT , % :	21	PLASTICITY INDEX , % :	26	MOISTURE , % :	25
CLASSIFICATION :		UNIFIED :	CL	AASHTO :	-	FINES , % :	87

LIQUID LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN LIQUID & PLASTIC STATES --
% MOISTURE AT WHICH SOIL FLOWS FOR A DISTANCE OF 13 MM (1/2 ") AT THE BASE OF GROOVE WHEN SUBJECTED TO 25 BLOWS

TEST NO. :	1	2	3	4	5
CONTAINER NO.	1	2	3		
NUMBER OF BLOWS	38	22	15		
WT. WET SOIL + CAN (GRAMS)	32.20	31.59	32.70		
WT. DRY SOIL + CAN (GRAMS)	26.92	26.31	26.88		
WT. OF WATER (GRAMS)	5.28	5.28	5.82		
WT. OF CONTAINER (GRAMS)	15.06	15.27	15.27		
WT. OF DRY SOIL (GRAMS)	11.86	11.04	11.61		
WATER CONTENT, (%)	44.52	47.83	50.13		



PLASTIC LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN PLASTIC & BRITTLE STATES --
% MOISTURE AT WHICH SOIL CAN NO LONGER BE DEFORMED BY ROLLING INTO 3.2 MM (1/8 ") IN DIAMETER THREADS WITHOUT CRUMBLING

TEST NO. :	1	2	3	4	5
CONTAINER NO.	4	5			
WT. WET SOIL + CAN (GRAMS)	21.81	21.61			
WT. DRY SOIL + CAN (GRAMS)	20.63	20.54			
WT. OF WATER (GRAMS)	1.18	1.07			
WT. OF CONTAINER (GRAMS)	15.06	15.55			
WT. OF DRY SOIL (GRAMS)	5.57	4.99			
WATER CONTENT, (%)	21.18	21.44			

PLASTICITY INDEX - THE RANGE OF % MOISTURE CONTENT OVER WHICH SOIL BEHAVES PLASTICALLY -
THE DIFFERENCE BETWEEN LIQUID LIMIT & PLASTIC LIMIT **PI = LL - PL**



TRIAXIAL SHEAR TEST REPORT
(ASTM D 4767)



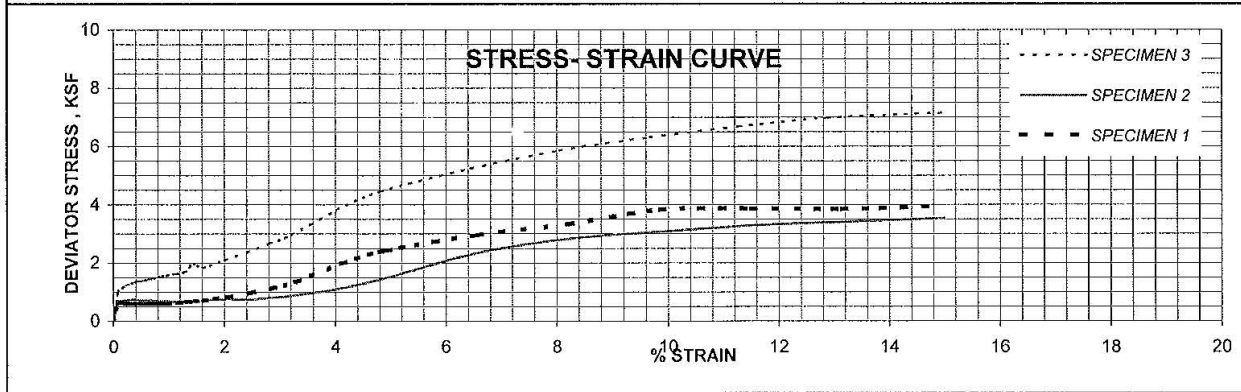
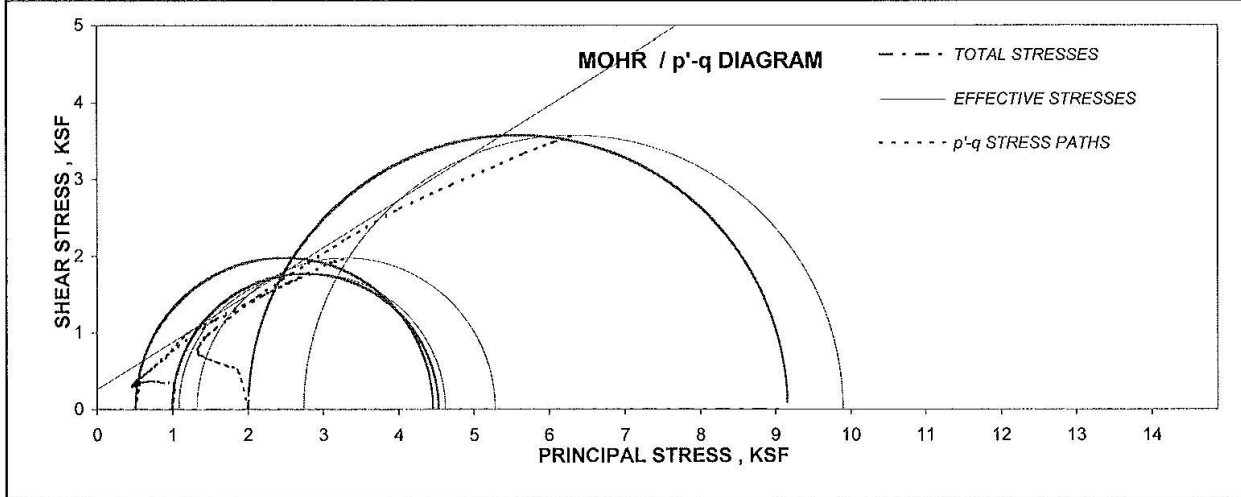
REV5,3/05/07

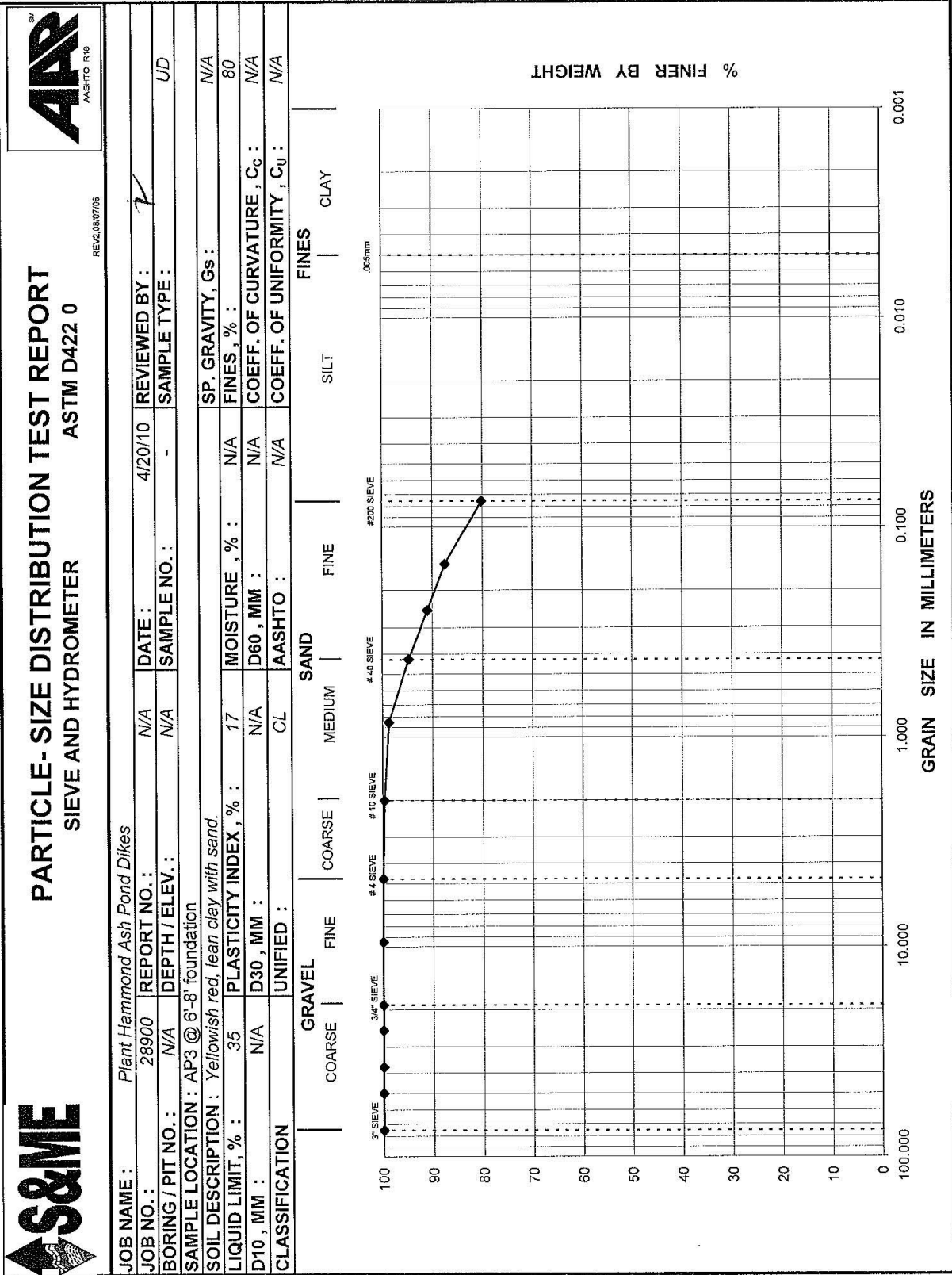
JOB NAME: Plant Hammond Ash Pond Dikes	
JOB NO.: 28900	REPORT NO.: N/A
BORING / PIT NO.: N/A	DEPTH / ELEV.: N/A
SAMPLE LOCATION: AP3 @ 6'-8', foundation	REVIEWED BY: <i>[Signature]</i>
SOIL DESCRIPTION: Yellowish red lean clay with sand (CL)	DATE: 4/20/10
LL, %: 35	PI, %: 17
FINES, %: 80	G_s: 2.71
TYPE: UD	SAMPLE NO.: N/A

SPECIMEN PROPERTIES									TEST PARAMETERS, TEST TYPE : CU/PP				
SPECIMEN NO.	INITIAL			AFTER CONSOLIDATION			SPECIMEN NO.	1	2	3			
	1	2	3	1	2	3							
							B Value	0.95	0.95	0.95			
DIAMETER, INCHES	D_o	2.88	2.88	2.89	D_c	2.86	2.85	2.86	BACK PRESSURE, ksf	U_o	10.2	10.2	10.1
HEIGHT, INCHES	H_o	6.13	6.11	6.26	H_c	6.09	6.05	6.20	CONFINING PRESSURE, ksf	σ₃	0.5	1.0	2.0
WATER CONTENT, %	W_o	17.4	18.4	17.2	W_c	18.9	20.6	18.8	MAX. DEVIATOR STRESS, ksf	σ₁-σ₃	4.0	3.5	7.2
DRY DENSITY, PCF	γ_{dryo}	109.5	105.4	108.7	γ_{dryc}	111.7	108.4	111.9	ULT. DEVIATOR STRESS, ksf	σ₁-σ₃	4.0	3.5	7.2
SATURATION, %	S_o	87.0	82.5	84.0	S_c	100	100	100	Specimen Shape @	Bulged			
VOID RATIO	e_o	0.542	0.603	0.554	e_c	0.513	0.558	0.510	Failure				
									Strain	0.2	% per minute		T50, Minutes = 0.7

N/A

SHEAR STRENGTH PARAMETERS	TOTAL		EFFECTIVE	
	COHESION, C (ksf)	ANGLE OF INTER. FRICTION, Φ (DEGREES)	APPARENT COHESION, (ksf)	ANGLE OF INTER. FRICTION, Φ' (DEGREES)
		N/A	N/A	0.26







ATTERBERG LIMITS
(ASTM D 4318)

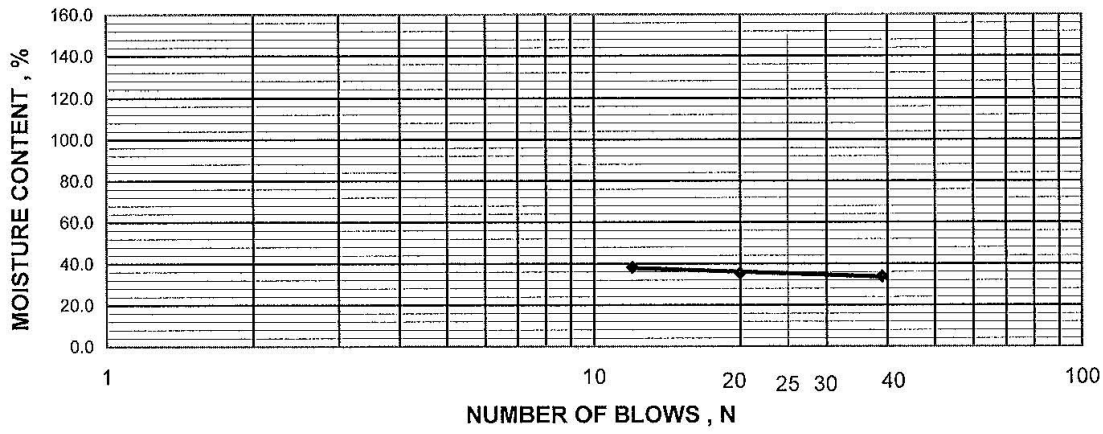


REV. 5/10/06

JOB NAME : Plant Hammond Ash Pond Dikes	
JOB NO. : 28900	REPORT NO. : -
DATE : 04/20/10	REVIEWED BY : ✓
BORING / PIT NO. : N/A	DEPTH / ELEV. : N/A
SAMPLE NO. : N/A	SAMPLE TYPE : UD
SAMPLE LOCATION : AP3 @ 6'-8' foundation	
SOIL DESCRIPTION : Yellowish red lean clay with sand.	
LIQUID LIMIT , % : 35	PLASTIC LIMIT , % : 18
PLASTICITY INDEX , % : 17	MOISTURE , % : 17
CLASSIFICATION :	UNIFIED : CL
AASHTO : -	FINES , % : 80

LIQUID LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN LIQUID & PLASTIC STATES --
 % MOISTURE AT WHICH SOIL FLOWS FOR A DISTANCE OF 13 MM (1/2 ") AT THE BASE OF GROOVE WHEN SUBJECTED TO 25 BLOWS

TEST NO. :	1	2	3	4	5	
CONTAINER NO.	18	19	20	BRAND	MODEL	SERIAL
NUMBER OF BLOWS	39	20	12	BALANCE	PRECISA	2200 C
WT. WET SOIL + CAN (GRAMS)	33.32	34.64	35.29	LL MACHINE	HUMBOLT	1
WT. DRY SOIL + CAN (GRAMS)	28.77	29.52	29.81	BALANCE	OHAUS-3100 G	ARC120
WT. OF WATER (GRAMS)	4.55	5.12	5.48	OVEN	DESPATCH-3436	1650032533
WT. OF CONTAINER (GRAMS)	15.31	15.07	15.48			
WT. OF DRY SOIL (GRAMS)	13.46	14.45	14.33			
WATER CONTENT, (%)	33.80	35.43	38.24			



PLASTIC LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN PLASTIC & BRITTLE STATES --
 % MOISTURE AT WHICH SOIL CAN NO LONGER BE DEFORMED BY ROLLING INTO 3.2 MM (1/8") IN DIAMETER THREADS WITHOUT CRUMBLING

TEST NO. :	1	2	3	4	5
CONTAINER NO.	42	43			
WT. WET SOIL + CAN (GRAMS)	21.59	22.58			
WT. DRY SOIL + CAN (GRAMS)	20.58	21.40			
WT. OF WATER (GRAMS)	1.01	1.18			
WT. OF CONTAINER (GRAMS)	15.05	14.98			
WT. OF DRY SOIL (GRAMS)	5.53	6.42			
WATER CONTENT, (%)	18.26	18.38			

PLASTICITY INDEX - THE RANGE OF % MOISTURE CONTENT OVER WHICH SOIL BEHAVES PLASTICALLY -
 THE DIFFERENCE BETWEEN LIQUID LIMIT & PLASTIC LIMIT **PI = LL - PL**



TRIAXIAL SHEAR TEST REPORT
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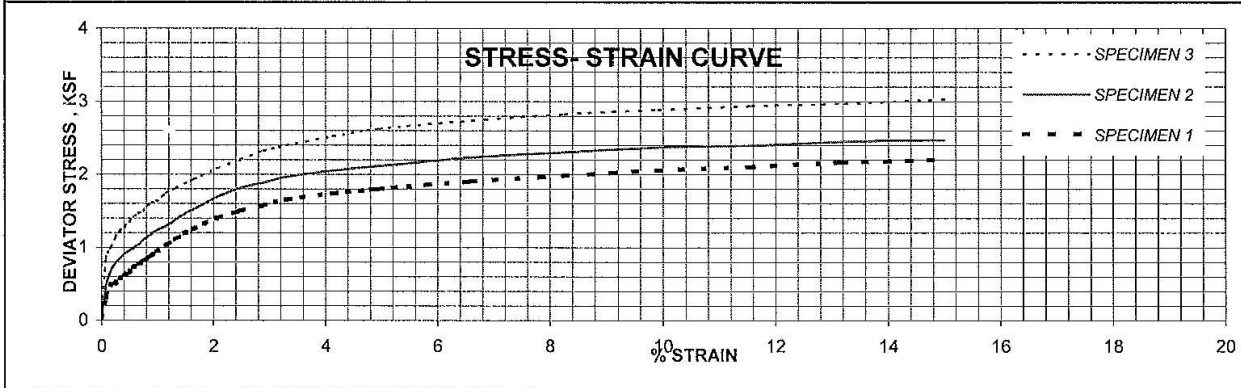
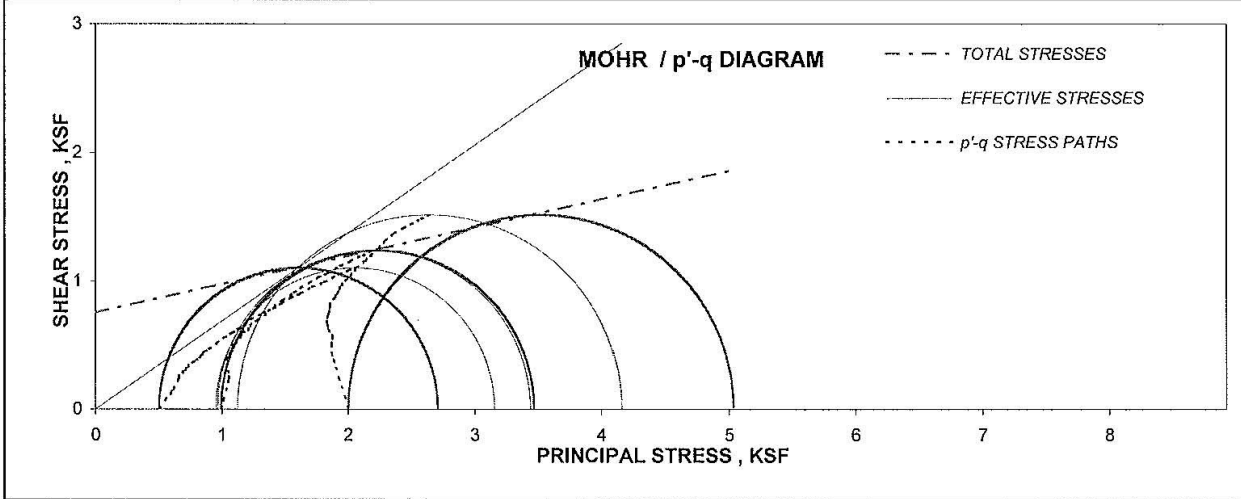


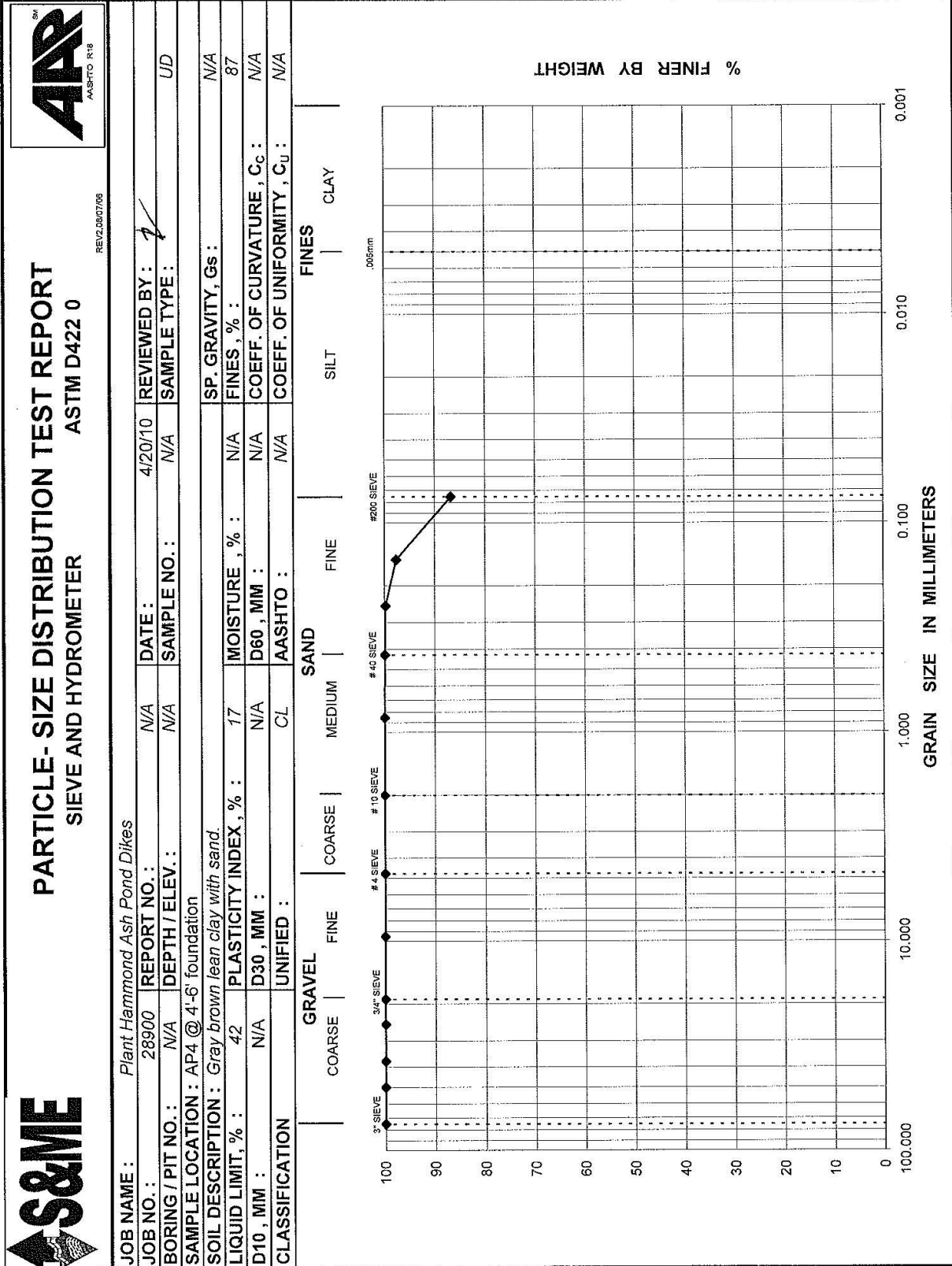
REV5,3/05/07

JOB NAME: Plant Hammond Ash Pond Dikes			
JOB NO.: 28900	REPORT NO.: N/A	REVIEWED BY: ✓	DATE: 4/20/10
BORING / PIT NO.: N/A	DEPTH / ELEV.: N/A	SAMPLE NO.: N/A	TYPE: UD
SAMPLE LOCATION: AP 4 @ 4'-6', Foundation			
SOIL DESCRIPTION: Gray brown lean clay with sand (CL)			
LL, %: 42	PI, %: 17	FINES, %: 87	G_s: 2.69

SPECIMEN PROPERTIES								TEST PARAMETERS, TEST TYPE : CU/PP					
SPECIMEN NO.	INITIAL			AFTER CONSOLIDATION			SPECIMEN NO.	1	2	3			
	1	2	3	1	2	3							
							B Value	0.95	0.95	0.95			
DIAMETER, INCHES	D_o	2.89	2.88	2.88	D_c	2.88	2.86	2.84	BACK PRESSURE, ksf	U_o	10.2	10.1	10.1
HEIGHT, INCHES	H_o	6.09	6.02	6.13	H_c	6.07	5.98	6.05	CONFINING PRESSURE, ksf	σ₃	0.5	1.0	2.0
WATER CONTENT, %	W_o	29.0	28.9	33.2	W_c	31.1	30.0	32.8	MAX. DEVIATOR STRESS, ksf	σ₁-σ₃	2.2	2.5	3.0
DRY DENSITY, PCF	γ_{dryo}	90.5	91.1	85.7	γ_{dryc}	91.5	93.0	89.2	ULT. DEVIATOR STRESS, ksf	σ₁-σ₃	2.2	2.5	3.0
SATURATION, %	S_o	91.1	92.2	93.1	S_c	100	100	100	Specimen Shape @	Bulged			
VOID RATIO	e_o	0.856	0.844	0.961	e_c	0.837	0.808	0.884	Failure				
								Strain	0.2	% per minute	T50, Minutes =	0.7	

SHEAR STRENGTH PARAMETERS		TOTAL		EFFECTIVE	
		COHESION, C (ksf) : 0.75		APPARENT COHESION, (ksf) : 0.00	
		ANGLE OF INTER. FRICTION, Φ (DEGREES) : 12.5		ANGLE OF INTER. FRICTION, Φ' (DEGREES) : 34.5	







ATTERBERG LIMITS
(ASTM D 4318)



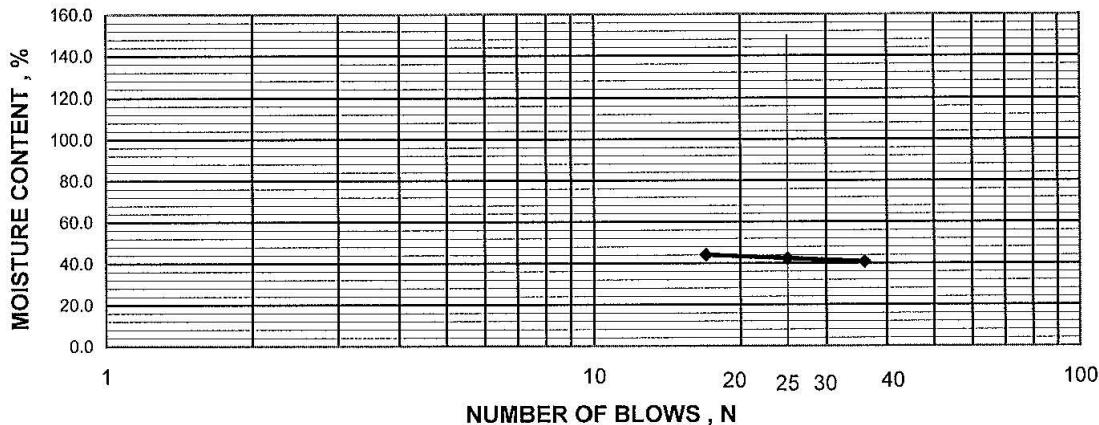
REV. 5/10/06

JOB NAME : Plant Hammond Ash Pond Dikes							
JOB NO. :	28900	REPORT NO. :	-	DATE :	04/20/10	REVIEWED BY :	<i>[Signature]</i>
BORING / PIT NO. :	N/A	DEPTH / ELEV. :	N/A	SAMPLE NO. :	N/A	SAMPLE TYPE :	UD
SAMPLE LOCATION : AP4 @ 4'-6' foundation							
SOIL DESCRIPTION : Gray brown lean clay with sand.							
LIQUID LIMIT , % :	42	PLASTIC LIMIT , % :	25	PLASTICITY INDEX , % :	17	MOISTURE , % :	30
CLASSIFICATION :		UNIFIED :	CL	AASHTO :	-	FINES , % :	87

LIQUID LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN LIQUID & PLASTIC STATES --

% MOISTURE AT WHICH SOIL FLOWS FOR A DISTANCE OF 13 MM (1/2 ") AT THE BASE OF GROOVE WHEN SUBJECTED TO 25 BLOWS

TEST NO. :	1	2	3	4	5	
CONTAINER NO.	91	92	93			
NUMBER OF BLOWS	36	25	17			
WT. WET SOIL + CAN (GRAMS)	31.84	35.25	34.15			
WT. DRY SOIL + CAN (GRAMS)	27.02	29.27	28.32			
WT. OF WATER (GRAMS)	4.82	5.98	5.83			
WT. OF CONTAINER (GRAMS)	15.18	15.13	15.09			
WT. OF DRY SOIL (GRAMS)	11.84	14.14	13.23			
WATER CONTENT, (%)	40.71	42.29	44.07			
				BRAND	MODEL	SERIAL
				BALANCE	PRECISA	2200 C
				LL MACHINE	HUMBOLT	1
				BALANCE	OHAUS-3100 G	ARC120
				OVEN	DESPATCH-3436	1650032533



PLASTIC LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN PLASTIC & BRITTLE STATES --

% MOISTURE AT WHICH SOIL CAN NO LONGER BE DEFORMED BY ROLLING INTO 3.2 MM (1/8") IN DIAMETER THREADS WITHOUT CRUMBLING

TEST NO. :	1	2	3	4	5
CONTAINER NO.	44	54			
WT. WET SOIL + CAN (GRAMS)	21.58	23.22			
WT. DRY SOIL + CAN (GRAMS)	20.31	21.62			
WT. OF WATER (GRAMS)	1.27	1.60			
WT. OF CONTAINER (GRAMS)	15.12	15.43			
WT. OF DRY SOIL (GRAMS)	5.19	6.19			
WATER CONTENT, (%)	24.47	25.85			

PLASTICITY INDEX - THE RANGE OF % MOISTURE CONTENT OVER WHICH SOIL BEHAVES PLASTICALLY -
THE DIFFERENCE BETWEEN LIQUID LIMIT & PLASTIC LIMIT $PI = LL - PL$



TRIAxIAL SHEAR TEST REPORT
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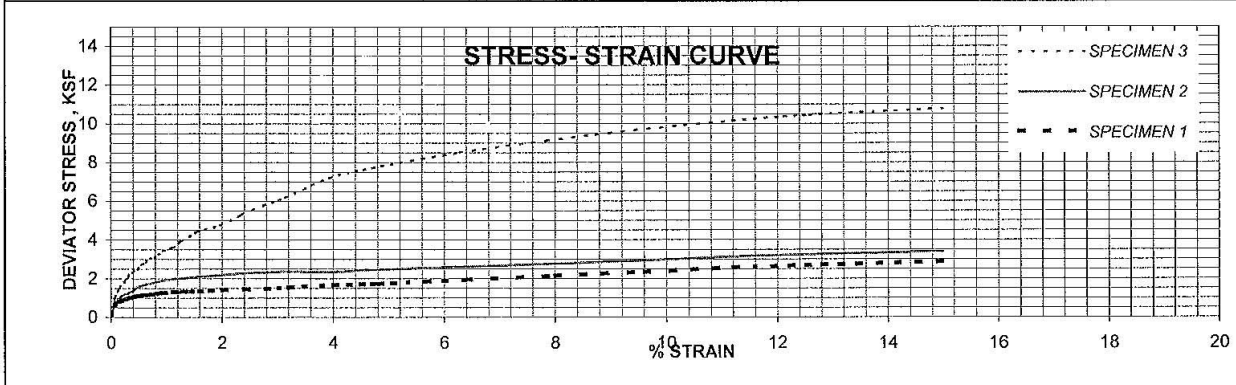
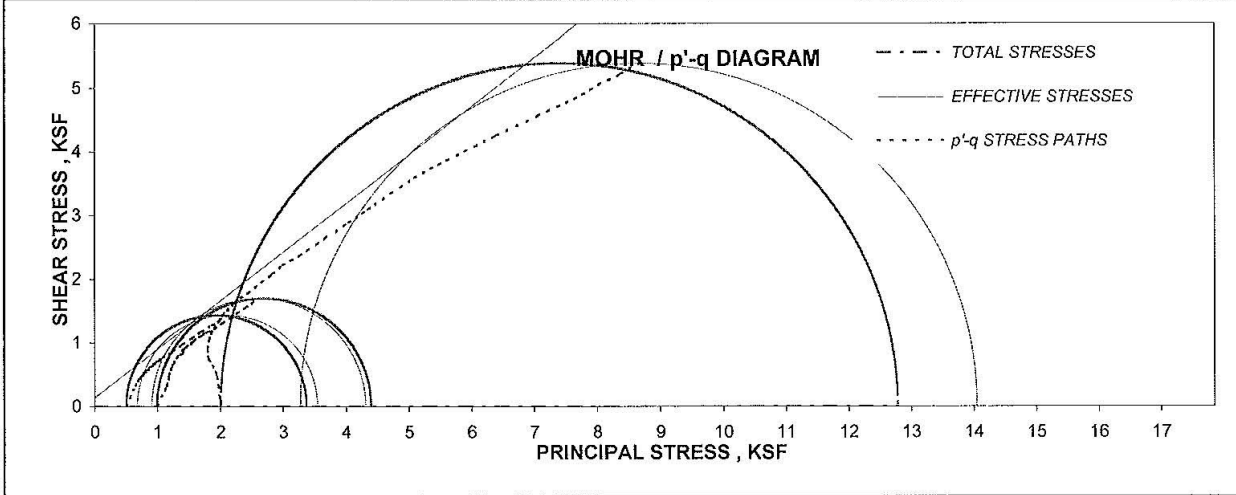
JOB NAME: <i>Plant Hammond Ash Pond Dikes</i>				
JOB NO.:	28900	REPORT NO.:	N/A	REVIEWED BY: <i>[Signature]</i>
BORING / PIT NO.:	N/A	DEPTH / ELEV.:	N/A	DATE: 4/20/10
SAMPLE LOCATION: <i>AP2 @ 4'-6' & 6'-8' fill</i>		SAMPLE NO.:	N/A	TYPE: <i>UD</i>
SOIL DESCRIPTION: <i>Yellowish red clayey sand with gravel (SC)</i>				
LL, %:	52	PI, %:	26	FINES, %: 34 G_s : 2.72

SPECIMEN PROPERTIES								TEST PARAMETERS, TEST TYPE : CU/PP					
SPECIMEN NO.	INITIAL			AFTER CONSOLIDATION			SPECIMEN NO.	1	2	3			
		1	2	3	1	2					3	B Value	0.95
DIAMETER, INCHES	D_o	2.88	2.90	2.90	D_c	2.87	2.89	2.88	BACK PRESSURE, ksf	U_o	10.2	10.2	10.1
HEIGHT, INCHES	H_o	6.25	6.32	6.39	H_c	6.24	6.29	6.36	CONFINING PRESSURE, ksf	σ_3	0.5	1.0	2.0
WATER CONTENT, %	W_o	12.7	15.0	15.7	W_c	18.1	19.7	16.8	MAX. DEVIATOR STRESS, ksf	$\sigma_1 - \sigma_3$	2.9	3.4	10.8
DRY DENSITY, PCF	γ_{dryo}	113.1	109.4	114.8	γ_{dryc}	113.7	110.6	116.5	ULT. DEVIATOR STRESS, ksf	$\sigma_1 - \sigma_3$	2.9	3.4	10.8
SATURATION, %	S_o	69.0	74.0	89.4	S_c	100	100	100	Specimen Shape @				
VOID RATIO	e_o	0.501	0.551	0.479	e_c	0.493	0.535	0.458	Failure				
								Strain	0.2	% per minute	T50, Minutes =	0.6	

N/A

N/A

SHEAR STRENGTH PARAMETERS	TOTAL		EFFECTIVE	
	COHESION, C (ksf) :	N/A	APPARENT COHESION, (ksf) :	0.14
	ANGLE OF INTER. FRICTION, Φ (DEGREES) :	N/A	ANGLE OF INTER. FRICTION, Φ' (DEGREES) :	37.3





ATTERBERG LIMITS
(ASTM D 4318)



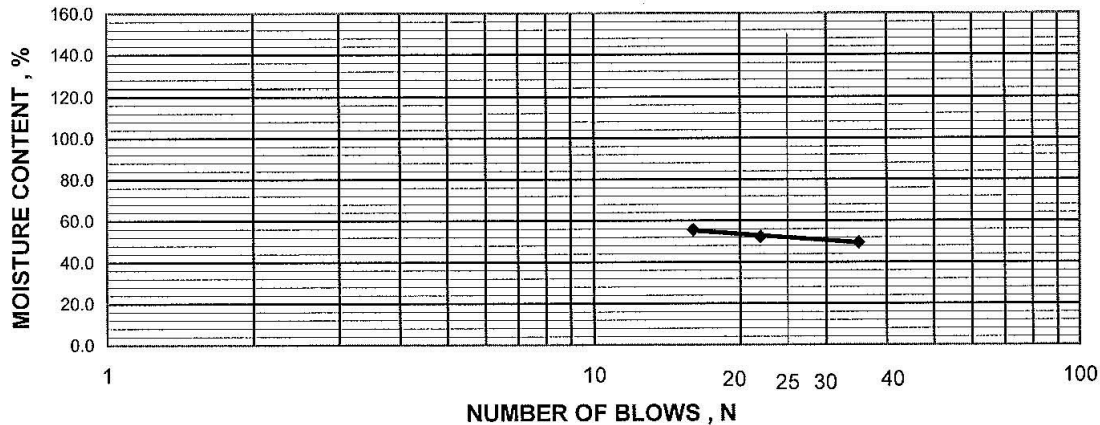
REV. 5/10/06

JOB NAME : Plant Hammond Ash Pond Dikes				
JOB NO. : 28900	REPORT NO. : -	DATE : 04/20/10	REVIEWED BY : P	
BORING / PIT NO. : N/A	DEPTH / ELEV. : N/A	SAMPLE NO. : N/A	SAMPLE TYPE : UD	
SAMPLE LOCATION : AP2 Fill @ 4'-6' & 6'-8'				
SOIL DESCRIPTION : Yellowish red clayey sand with gravel .				
LIQUID LIMIT , % : 52	PLASTIC LIMIT , % : 26	PLASTICITY INDEX , % : 26	MOISTURE , % : 15	
CLASSIFICATION :	UNIFIED : SC	AASHTO : -	FINES , % : 34	

LIQUID LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN LIQUID & PLASTIC STATES --

% MOISTURE AT WHICH SOIL FLOWS FOR A DISTANCE OF 13 MM (1/2 ") AT THE BASE OF GROOVE WHEN SUBJECTED TO 25 BLOWS

TEST NO. :	1	2	3	4	5
CONTAINER NO.	18	19	20	BRAND	MODEL SERIAL
NUMBER OF BLOWS	35	22	16	BALANCE	PRECISA 2200 C
WT. WET SOIL + CAN (GRAMS)	31.51	30.35	30.84	LL MACHINE	HUMBOLT 1
WT. DRY SOIL + CAN (GRAMS)	26.13	25.12	25.35	BALANCE	OHAUS-3100 G ARC120
WT. OF WATER (GRAMS)	5.38	5.23	5.49	OVEN	DESPATCH-3436 1650032533
WT. OF CONTAINER (GRAMS)	15.27	15.11	15.47		
WT. OF DRY SOIL (GRAMS)	10.86	10.01	9.88		
WATER CONTENT, (%)	49.54	52.25	55.57		



PLASTIC LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN PLASTIC & BRITTLE STATES --

% MOISTURE AT WHICH SOIL CAN NO LONGER BE DEFORMED BY ROLLING INTO 3.2 MM (1/8") IN DIAMETER THREADS WITHOUT CRUMBLING

TEST NO. :	1	2	3	4	5
CONTAINER NO.	42	43			
WT. WET SOIL + CAN (GRAMS)	23.42	23.5			
WT. DRY SOIL + CAN (GRAMS)	21.66	21.74			
WT. OF WATER (GRAMS)	1.76	1.76			
WT. OF CONTAINER (GRAMS)	15.03	14.96			
WT. OF DRY SOIL (GRAMS)	6.63	6.78			
WATER CONTENT, (%)	26.55	25.96			

PLASTICITY INDEX - THE RANGE OF % MOISTURE CONTENT OVER WHICH SOIL BEHAVES PLASTICALLY -
THE DIFFERENCE BETWEEN LIQUID LIMIT & PLASTIC LIMIT **PI = LL - PL**



TRIAxIAL SHEAR TEST REPORT
(ASTM D 4767)



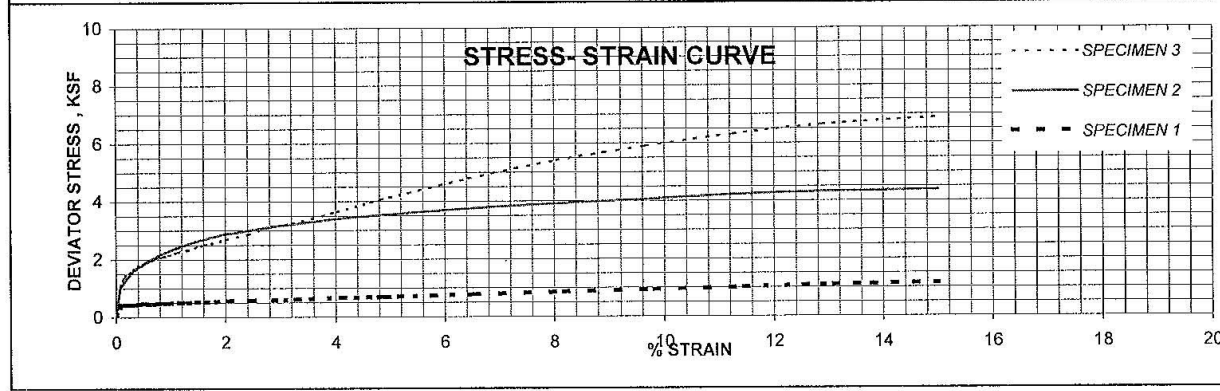
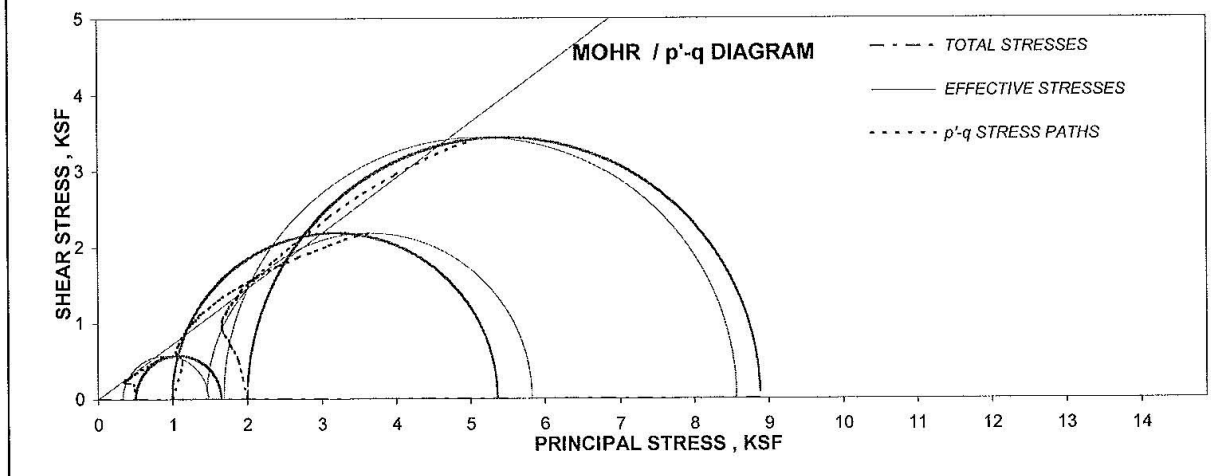
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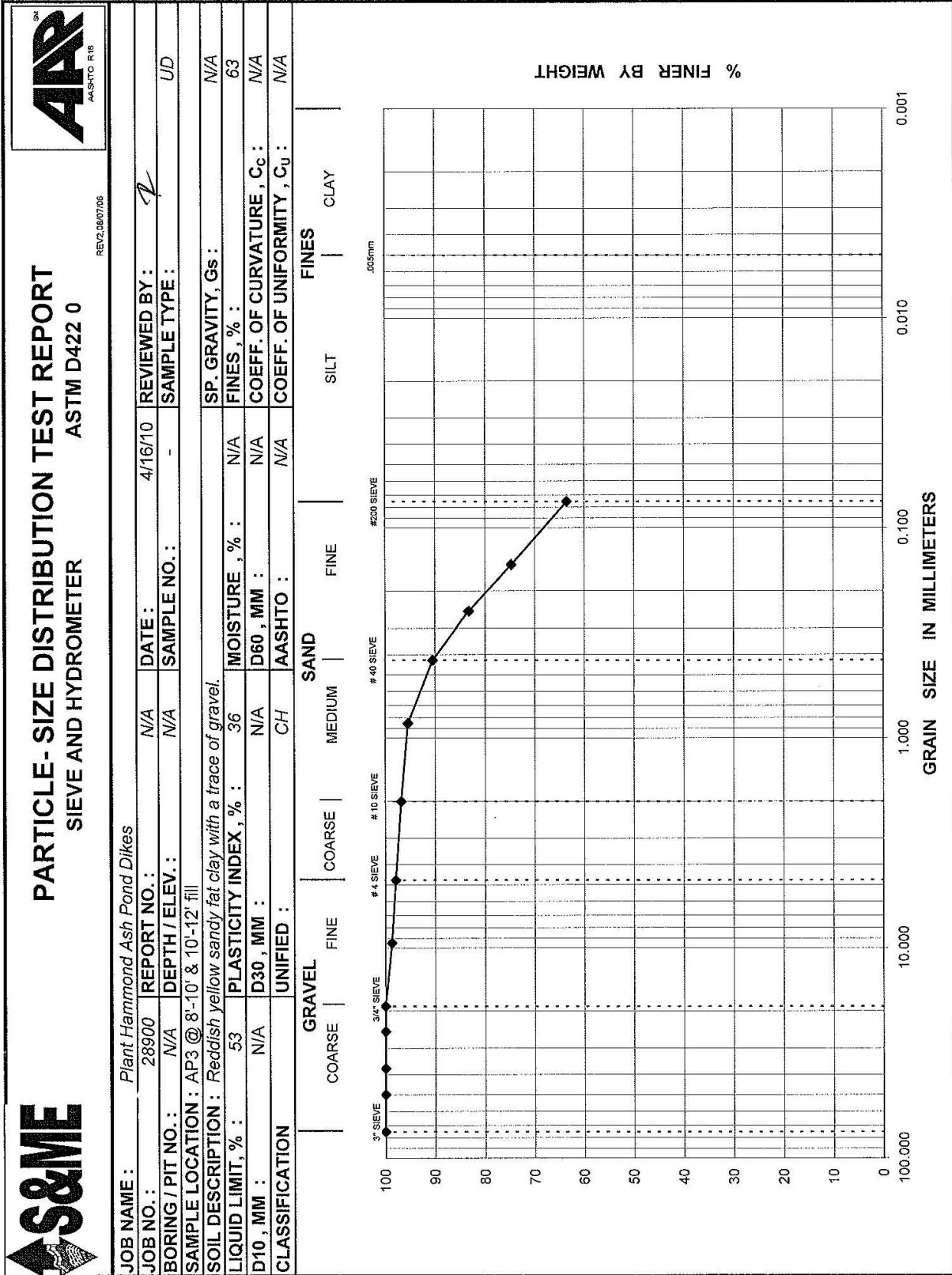
JOB NAME: Plant Hammond Ash Pond Dikes			
JOB NO.: 28900	REPORT NO.: N/A	REVIEWED BY: <i>[Signature]</i>	DATE: 3/12/10
BORING / PIT NO.: N/A	DEPTH / ELEV.: N/A	SAMPLE NO.: N/A	TYPE: UD
SAMPLE LOCATION: AP3 @ 8'-10' & 10'-12' fill			
SOIL DESCRIPTION: Reddish yellow sandy fat clay with gravel (CH)			
LL, %: 53	PI, %: 36	FINES, %: 63	G_s: 2.70

SPECIMEN PROPERTIES				TEST PARAMETERS, TEST TYPE : CU/PP									
SPECIMEN NO.	INITIAL			AFTER CONSOLIDATION			SPECIMEN NO.	1	2	3			
	1	2	3	1	2	3							
DIAMETER, INCHES	D _o	2.87	2.90	2.88	D _c	2.85	2.90	2.86	B Value	0.95	0.95	0.95	
HEIGHT, INCHES	H _o	6.13	6.35	6.23	H _c	6.11	6.34	6.21	BACK PRESSURE, ksf	U _o	10.1	10.2	10.1
WATER CONTENT, %	W _o	15.1	15.3	17.3	W _c	19.2	17.7	18.0	CONFINING PRESSURE, ksf	σ ₃	0.5	1.0	2.0
DRY DENSITY, PCF	γ _{dryo}	109.8	113.4	112.1	γ _{dryc}	111.0	113.9	113.3	MAX. DEVIATOR STRESS, ksf	σ ₁ -σ ₃	1.1	4.4	6.9
VOID RATIO	e _o	0.534	0.485	0.502	e _c	0.517	0.479	0.487	ULT. DEVIATOR STRESS, ksf	σ ₁ -σ ₃	1.1	4.4	6.9
SATURATION, %	S _o	76.3	85.3	92.8	S _c	100	100	100	Specimen Shape @	Bulged			
										Failure			
										Strain 0.02 % per minute	T50, Minutes = 20		

N/A
N/A

SHEAR STRENGTH PARAMETERS	TOTAL		EFFECTIVE	
	COHESION, C (ksf)	N/A	APPARENT COHESION, (ksf)	0.00
	ANGLE OF INTER. FRICTION, Φ (DEGREES)	N/A	ANGLE OF INTER. FRICTION, Φ' (DEGREES)	36.0







ATTERBERG LIMITS
(ASTM D 4318)

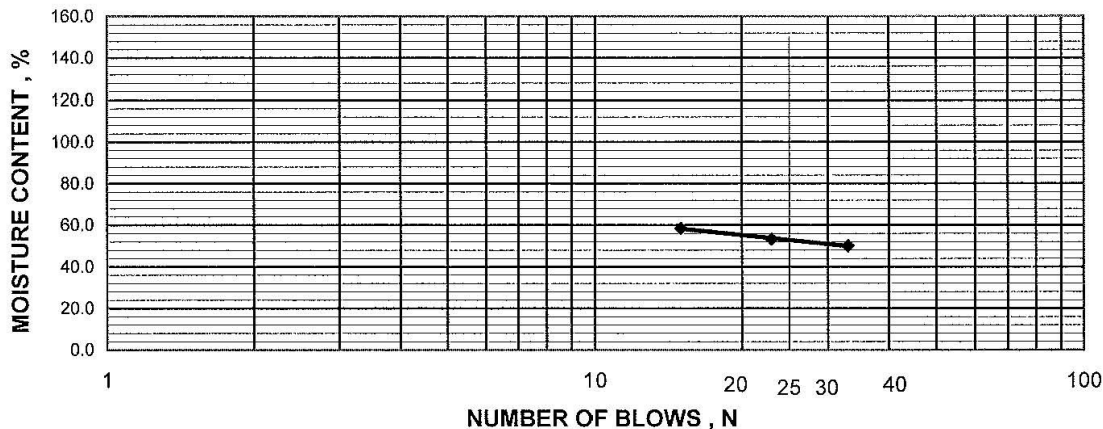


REV. 6/10/06

JOB NAME : Plant Hammond Ash Pond Dikes									
JOB NO. :	28900	REPORT NO. :	-	DATE :	04/13/10	REVIEWED BY :	✓		
BORING / PIT NO. :	N/A	DEPTH / ELEV. :	N/A	SAMPLE NO. :	N/A	SAMPLE TYPE :	UD		
SAMPLE LOCATION : AP3 @ 8'-10' & 10'-12' fill									
SOIL DESCRIPTION : Reddish yellow sandy fat clay with gravel.									
LIQUID LIMIT , % :	53	PLASTIC LIMIT , % :	17	PLASTICITY INDEX , % :	36	MOISTURE , % :	15		
CLASSIFICATION :		UNIFIED :	CH	AASHTO :	-	FINES , % :	63		

LIQUID LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN LIQUID & PLASTIC STATES --
% MOISTURE AT WHICH SOIL FLOWS FOR A DISTANCE OF 13 MM (1/2 ") AT THE BASE OF GROOVE WHEN SUBJECTED TO 25 BLOWS

TEST NO. :	1	2	3	4	5
CONTAINER NO.	1	2	3		
NUMBER OF BLOWS	33	23	15		
WT. WET SOIL + CAN (GRAMS)	29.96	29.97	29.01		
WT. DRY SOIL + CAN (GRAMS)	24.98	24.85	23.93		
WT. OF WATER (GRAMS)	4.98	5.12	5.08		
WT. OF CONTAINER (GRAMS)	15.04	15.24	15.24		
WT. OF DRY SOIL (GRAMS)	9.94	9.61	8.69		
WATER CONTENT, (%)	50.10	53.28	58.46		



PLASTIC LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN PLASTIC & BRITTLE STATES --
% MOISTURE AT WHICH SOIL CAN NO LONGER BE DEFORMED BY ROLLING INTO 3.2 MM (1/8") IN DIAMETER THREADS WITHOUT CRUMBLING

TEST NO. :	1	2	3	4	5
CONTAINER NO.	4	5			
WT. WET SOIL + CAN (GRAMS)	24.45	24.1			
WT. DRY SOIL + CAN (GRAMS)	23.13	22.80			
WT. OF WATER (GRAMS)	1.32	1.30			
WT. OF CONTAINER (GRAMS)	15.01	15.42			
WT. OF DRY SOIL (GRAMS)	8.12	7.38			
WATER CONTENT, (%)	16.26	17.62			

PLASTICITY INDEX - THE RANGE OF % MOISTURE CONTENT OVER WHICH SOIL BEHAVES PLASTICALLY -
THE DIFFERENCE BETWEEN LIQUID LIMIT & PLASTIC LIMIT **PI = LL - PL**



TRIAXIAL SHEAR TEST REPORT
(ASTM D 4767)



REV5.3/05/07

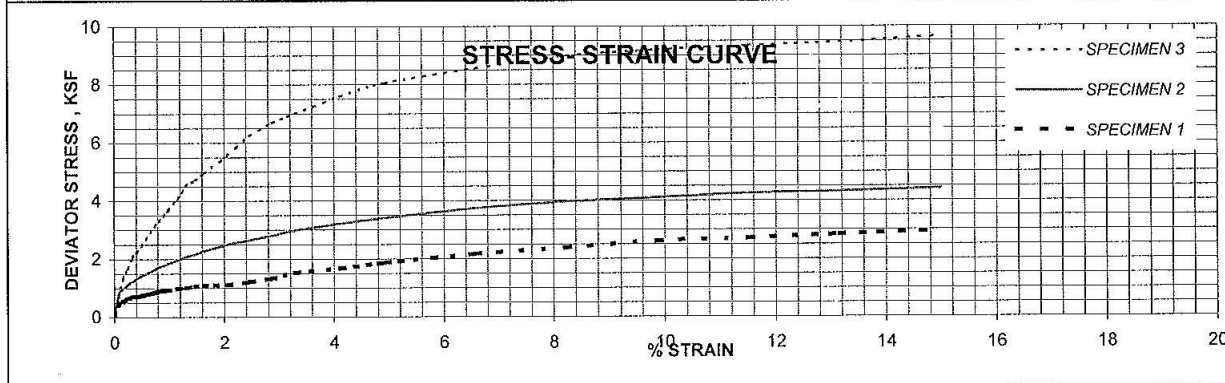
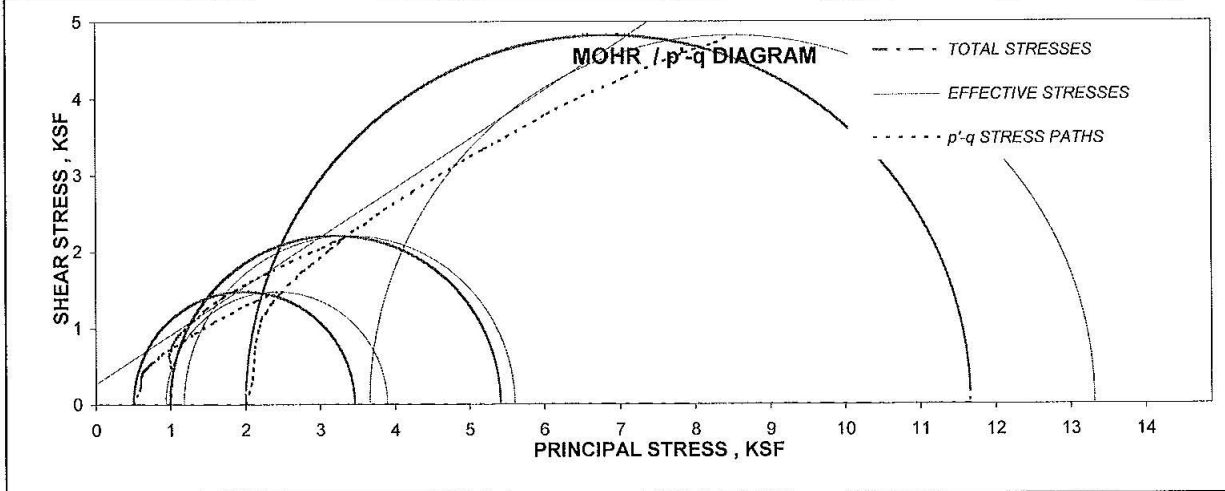
JOB NAME: Plant Hammond Ash Pond Dikes			
JOB NO.: 28900	REPORT NO.: N/A	REVIEWED BY: P	DATE: 3/24/10
BORING / PIT NO.: N/A	DEPTH / ELEV.: N/A	SAMPLE NO.: N/A	TYPE: UD
SAMPLE LOCATION: AP1-2 @ 10'-12.5'			
SOIL DESCRIPTION: Yellowish brown lean clay with sand (CL)			
LL, %: 25	PI, %: 12	FINES, %: 82	G_s: 2.65

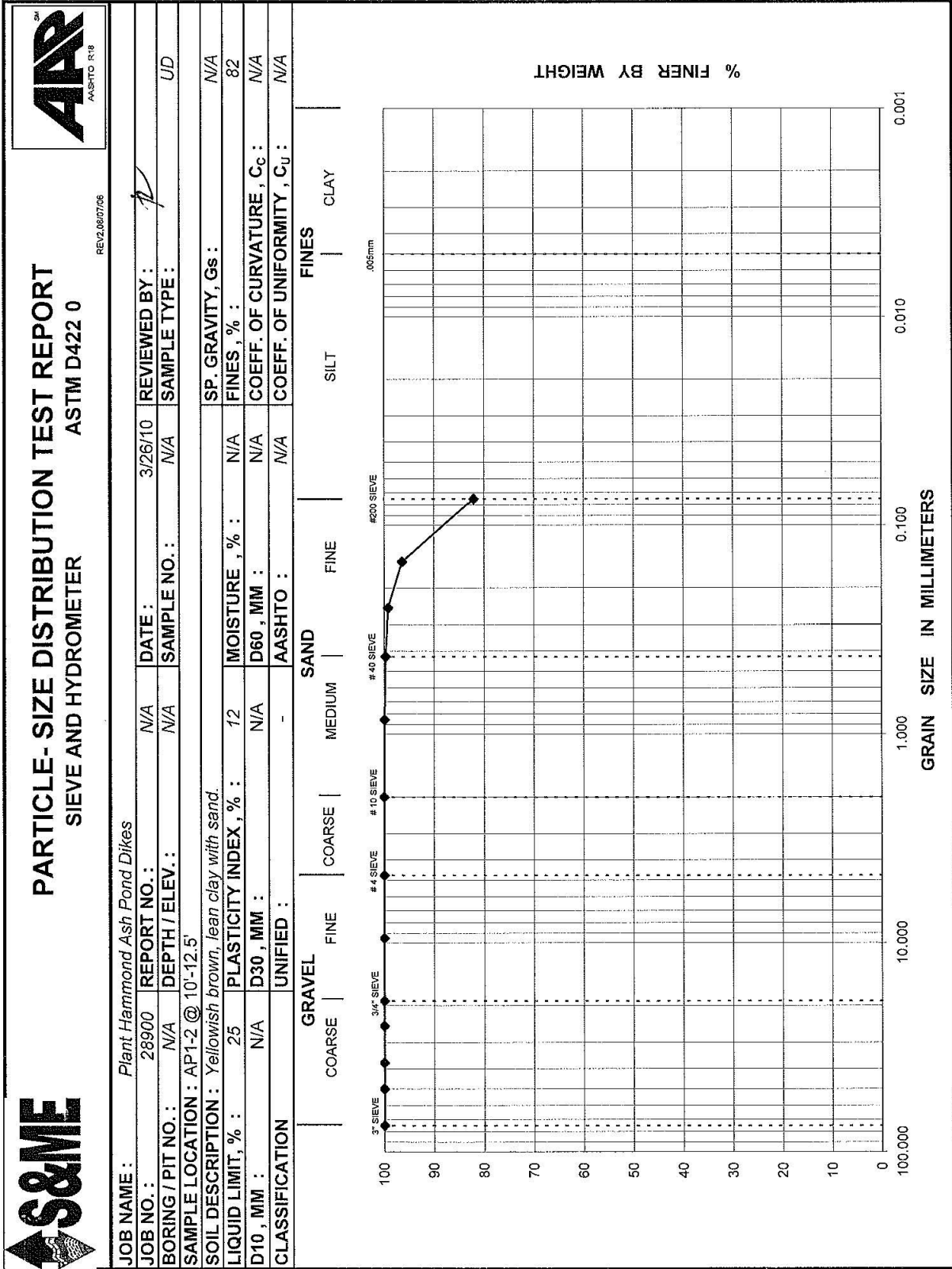
SPECIMEN PROPERTIES								TEST PARAMETERS, TEST TYPE : CU/PP					
SPECIMEN NO.	INITIAL			AFTER CONSOLIDATION			SPECIMEN NO.	1	2	3			
	D _o	1	2	3	D _c	1					2	3	
							B Value	0.95	0.95	0.95			
DIAMETER, INCHES	D _o	2.87	2.88	2.88	D _c	2.86	2.87	2.87	BACK PRESSURE, ksf	U _o	10.1	10.2	10.1
HEIGHT, INCHES	H _o	6.10	6.09	6.11	H _c	6.08	6.07	6.08	CONFINING PRESSURE, ksf	σ ₃	0.5	1.0	2.0
WATER CONTENT, %	W _o	14.8	14.5	12.4	W _c	16.9	14.3	13.3	MAX. DEVIATOR STRESS, ksf	σ ₁ -σ ₃	3.0	4.4	9.7
DRY DENSITY, PCF	γ _{dryo}	113.3	118.9	120.5	γ _{dryc}	114.3	119.9	122.2	ULT. DEVIATOR STRESS, ksf	σ ₁ -σ ₃	3.0	4.4	9.7
SATURATION, %	S _o	85.1	98.4	88.4	S _c	100	100	100	Specimen Shape @	Sheared			
VOID RATIO	e _o	0.460	0.391	0.372	e _c	0.447	0.380	0.353	Failure				
								Strain	0.2	% per minute	T50, Minutes =	2	

N/A

N/A

SHEAR STRENGTH PARAMETERS	TOTAL		EFFECTIVE	
	COHESION, C (ksf)	N/A	APPARENT COHESION, (ksf)	0.27
	ANGLE OF INTER. FRICTION, Φ (DEGREES)	N/A	ANGLE OF INTER. FRICTION, Φ' (DEGREES)	32.6







ATTERBERG LIMITS
(ASTM D 4318)

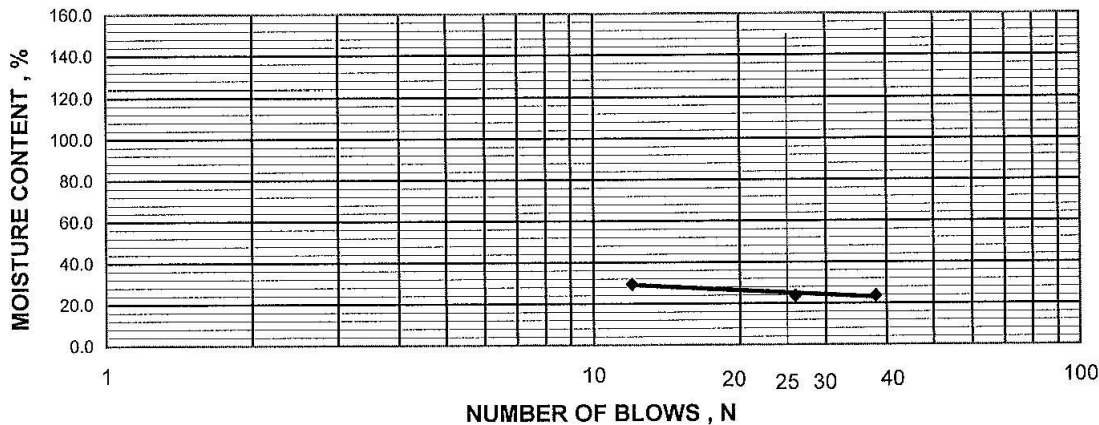


REV. 5/10/06

JOB NAME : Plant Hammond Ash Pond Dikes				
JOB NO. : 28900	REPORT NO. : -	DATE : 03/24/10	REVIEWED BY : <i>[Signature]</i>	
BORING / PIT NO. : N/A	DEPTH / ELEV. : N/A	SAMPLE NO. : N/A	SAMPLE TYPE : UD	
SAMPLE LOCATION : AP1-2 @ 10'-12.5'				
SOIL DESCRIPTION : Yellowish brown lean clay with sand.				
LIQUID LIMIT, % : 25	PLASTIC LIMIT, % : 13	PLASTICITY INDEX, % : 12	MOISTURE, % : 14	
CLASSIFICATION :	UNIFIED : CL	AASHTO : -	FINES, % : 82	

LIQUID LIMIT, % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN LIQUID & PLASTIC STATES --
% MOISTURE AT WHICH SOIL FLOWS FOR A DISTANCE OF 13 MM (1/2 ") AT THE BASE OF GROOVE WHEN SUBJECTED TO 25 BLOWS

TEST NO. :	1	2	3	4	5	
CONTAINER NO.	42	43	44	BRAND	MODEL	SERIAL
NUMBER OF BLOWS	38	26	12	BALANCE	PRECISA	2200 C
WT. WET SOIL + CAN (GRAMS)	32.55	28.73	30.87	LL MACHINE	HUMBOLT	1
WT. DRY SOIL + CAN (GRAMS)	29.19	26.09	27.28	BALANCE	OHAUS-3100 G	ARC120
WT. OF WATER (GRAMS)	3.36	2.64	3.59	OVEN	DESPATCH-3436	1650032533
WT. OF CONTAINER (GRAMS)	15.03	14.96	15.10			
WT. OF DRY SOIL (GRAMS)	14.16	11.13	12.18			
WATER CONTENT, (%)	23.73	23.72	29.47			



PLASTIC LIMIT, % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN PLASTIC & BRITTLE STATES --
% MOISTURE AT WHICH SOIL CAN NO LONGER BE DEFORMED BY ROLLING INTO 3.2 MM (1/8") IN DIAMETER THREADS WITHOUT CRUMBLING

TEST NO. :	1	2	3	4	5
CONTAINER NO.	53	54			
WT. WET SOIL + CAN (GRAMS)	23.27	23.88			
WT. DRY SOIL + CAN (GRAMS)	22.40	22.90			
WT. OF WATER (GRAMS)	0.87	0.98			
WT. OF CONTAINER (GRAMS)	15.50	15.14			
WT. OF DRY SOIL (GRAMS)	6.90	7.76			
WATER CONTENT, (%)	12.61	12.63			

PLASTICITY INDEX - THE RANGE OF % MOISTURE CONTENT OVER WHICH SOIL BEHAVES PLASTICALLY -
THE DIFFERENCE BETWEEN LIQUID LIMIT & PLASTIC LIMIT $PI = LL - PL$



TRIAXIAL SHEAR TEST REPORT (ASTM D 4767)



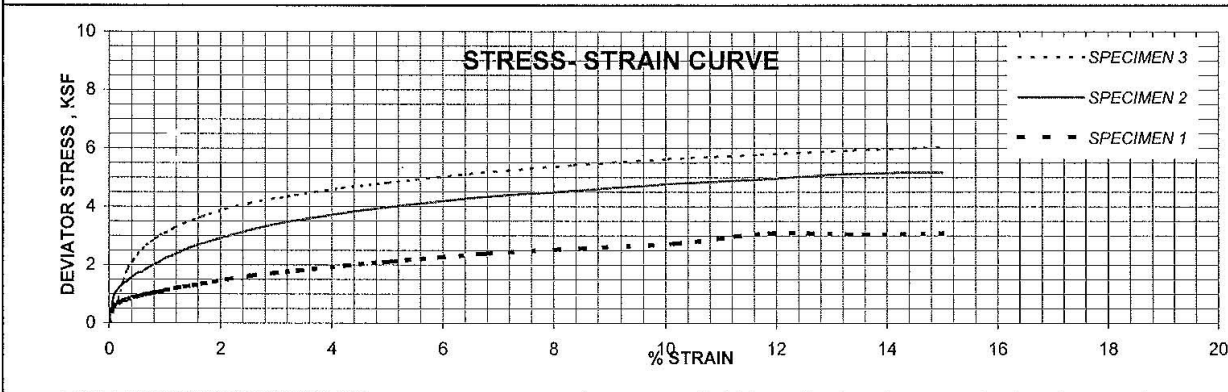
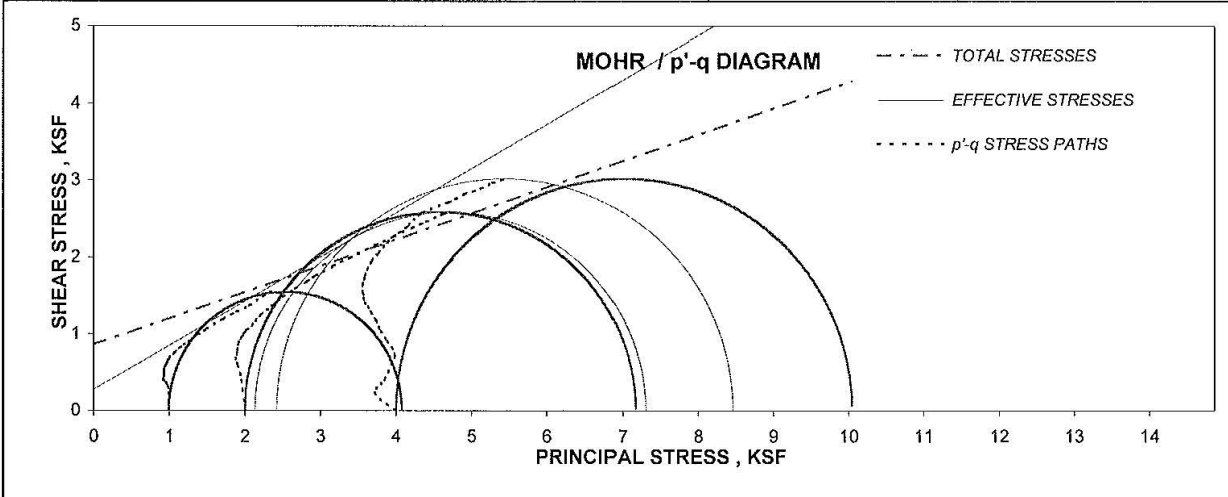
REV5,3/05/07

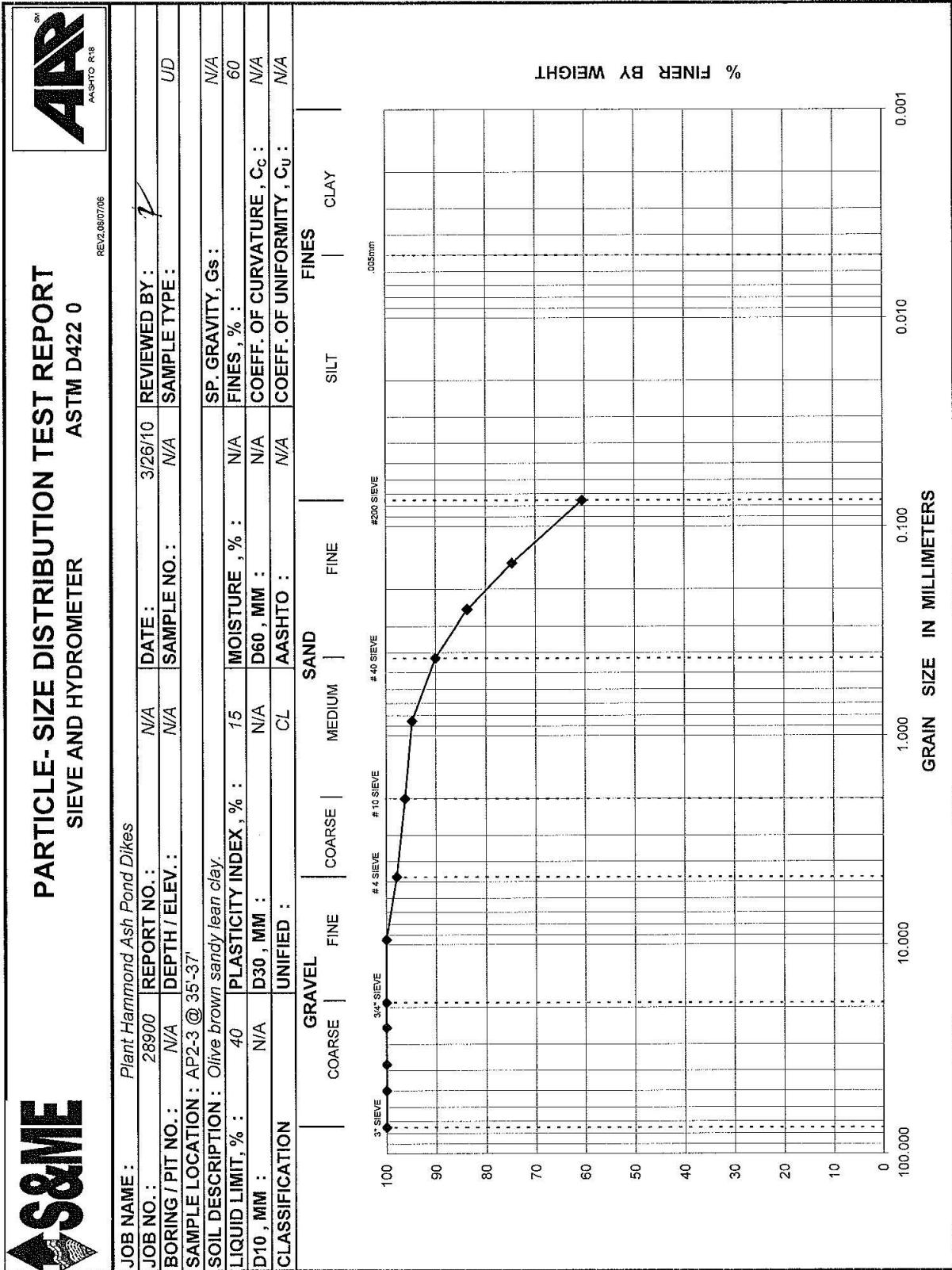
JOB NAME: <i>Plant Hammond Ash Pond Dikes</i>				
JOB NO.: 28900	REPORT NO.: N/A	REVIEWED BY: <i>[Signature]</i>	DATE: 3/24/10	
BORING / PIT NO.: N/A	DEPTH / ELEV.: N/A	SAMPLE NO.: N/A	TYPE: UD	
SAMPLE LOCATION: AP2-3 @ 35'-37'				
SOIL DESCRIPTION: Olive brown sandy lean clay (CL)				
LL, %: 40	PI, %: 15	FINES, %: 60	G_s: 2.66	

SPECIMEN PROPERTIES									TEST PARAMETERS, TEST TYPE : CU/PP				
SPECIMEN NO.	INITIAL			AFTER CONSOLIDATION			SPECIMEN NO.	1	2	3			
		1	2	3	1	2					3	B Value	0.95
DIAMETER, INCHES	D _o	2.88	2.88	2.88	D _c	2.86	2.86	2.86	BACK PRESSURE, ksf	U _o	10.2	10.2	10.1
HEIGHT, INCHES	H _o	5.93	6.03	6.02	H _c	5.89	5.99	5.97	CONFINING PRESSURE, ksf	σ ₃	1.0	2.0	4.0
WATER CONTENT, %	W _o	25.0	25.4	26.5	W _c	24.0	24.1	24.9	MAX. DEVIATOR STRESS, ksf	σ ₁ -σ ₃	3.1	5.2	6.0
DRY DENSITY, PCF	γ _{dryo}	99.6	99.4	97.5	γ _{dryc}	101.4	101.2	99.9	ULT. DEVIATOR STRESS, ksf	σ ₁ -σ ₃	3.1	5.2	6.0
SATURATION, %	S _o	99.6	100.7	100.1	S _c	100	100	100	Specimen Shape @	Sheared			
VOID RATIO	e _o	0.667	0.671	0.704	e _c	0.638	0.641	0.663	Failure	T50, Minutes = 2			
									Strain	0.2 % per minute			

N/A

SHEAR STRENGTH PARAMETERS	TOTAL		EFFECTIVE	
	COHESION, C (ksf) :	0.85	APPARENT COHESION, (ksf) :	0.28
	ANGLE OF INTER. FRICTION, Φ (DEGREES) :	18.9	ANGLE OF INTER. FRICTION, Φ' (DEGREES) :	29.9







ATTERBERG LIMITS
(ASTM D 4318)

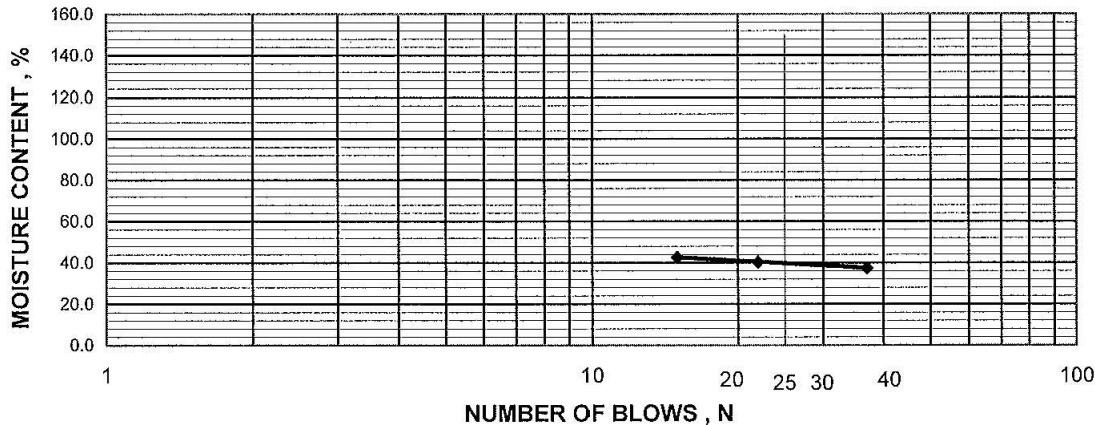


REV. 5/10/06

JOB NAME : Plant Hammond Ash Pond Dikes									
JOB NO. :	28900	REPORT NO. :	-	DATE :	03/24/10	REVIEWED BY :	✓		
BORING / PIT NO. :	N/A	DEPTH / ELEV. :	N/A	SAMPLE NO. :	N/A	SAMPLE TYPE :	UD		
SAMPLE LOCATION : AP2-3 @ 35'-37'									
SOIL DESCRIPTION : Olive brown sandy lean clay.									
LIQUID LIMIT , % :	40	PLASTIC LIMIT , % :	25	PLASTICITY INDEX , % :	15	MOISTURE , % :	25		
CLASSIFICATION :		UNIFIED :	CL	AASHTO :	-	FINES , % :	60		

LIQUID LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN LIQUID & PLASTIC STATES --
% MOISTURE AT WHICH SOIL FLOWS FOR A DISTANCE OF 13 MM (1/2 ") AT THE BASE OF GROOVE WHEN SUBJECTED TO 25 BLOWS

TEST NO. :	1	2	3	4	5
CONTAINER NO.	91	92	93		
NUMBER OF BLOWS	37	22	15		
WT. WET SOIL + CAN (GRAMS)	28.49	29.57	32.23		
WT. DRY SOIL + CAN (GRAMS)	24.84	25.42	27.09		
WT. OF WATER (GRAMS)	3.65	4.15	5.14		
WT. OF CONTAINER (GRAMS)	15.10	15.12	15.05		
WT. OF DRY SOIL (GRAMS)	9.74	10.30	12.04		
WATER CONTENT, (%)	37.47	40.29	42.69		



PLASTIC LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN PLASTIC & BRITTLE STATES --
% MOISTURE AT WHICH SOIL CAN NO LONGER BE DEFORMED BY ROLLING INTO 3.2 MM (1/8 ") IN DIAMETER THREADS WITHOUT CRUMBLING

TEST NO. :	1	2	3	4	5
CONTAINER NO.	94	95			
WT. WET SOIL + CAN (GRAMS)	23.52	22.94			
WT. DRY SOIL + CAN (GRAMS)	21.84	21.39			
WT. OF WATER (GRAMS)	1.68	1.55			
WT. OF CONTAINER (GRAMS)	15.05	15.06			
WT. OF DRY SOIL (GRAMS)	6.79	6.33			
WATER CONTENT, (%)	24.74	24.49			

PLASTICITY INDEX - THE RANGE OF % MOISTURE CONTENT OVER WHICH SOIL BEHAVES PLASTICALLY -
THE DIFFERENCE BETWEEN LIQUID LIMIT & PLASTIC LIMIT $PI = LL - PL$



TRIAXIAL SHEAR TEST REPORT
(ASTM D 4767)



REV5.3/05/07

JOB NAME: <i>Plant Hammond Ash Pond Dikes</i>			
JOB NO.:	28900	REPORT NO.:	N/A
BORING / PIT NO.:	N/A	DEPTH / ELEV.:	N/A
REVIEWED BY: <i>[Signature]</i>		DATE: 3/24/10	
SAMPLE NO.:		N/A	
TYPE:		UD	

SAMPLE LOCATION : *AP3-1 @ 8'-10'*

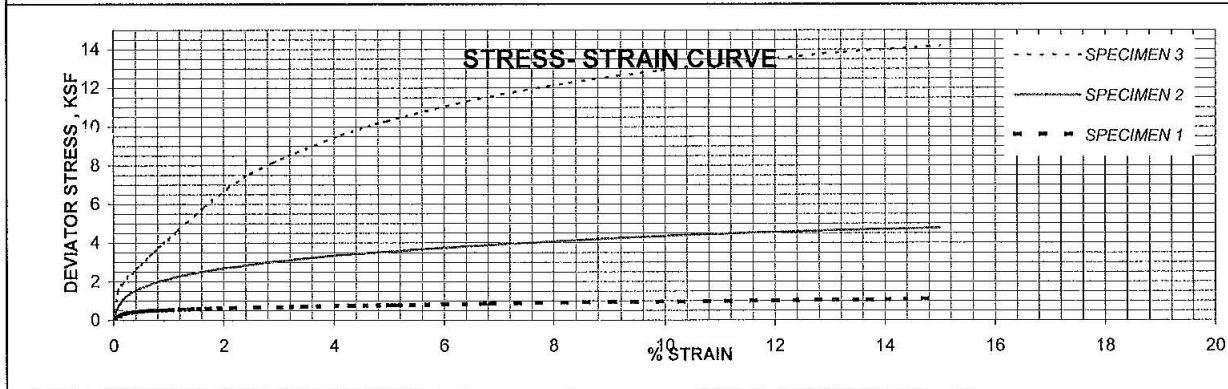
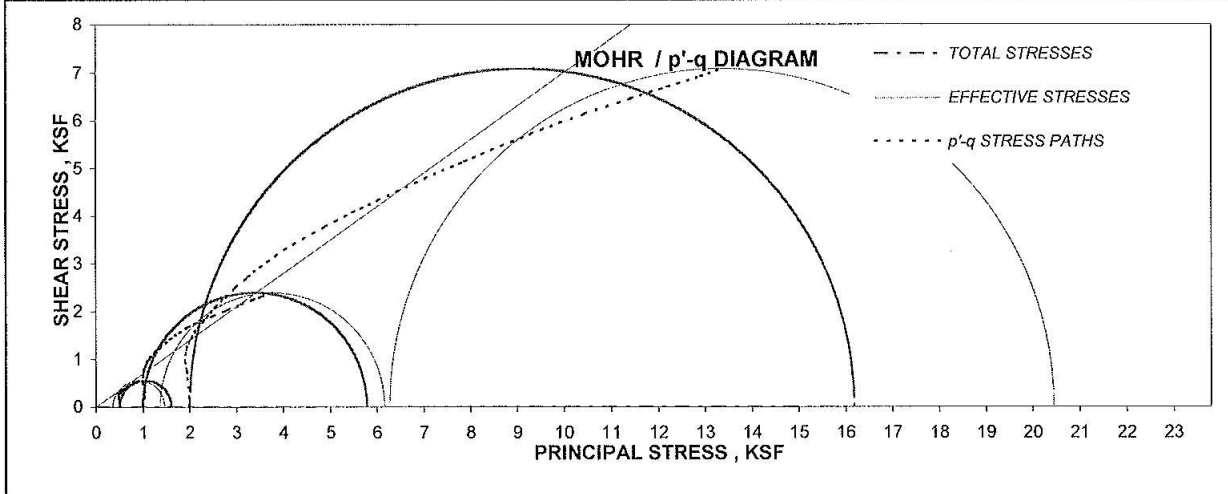
SOIL DESCRIPTION : *Specimen 1 & 2 : yellow & brown sandy lean clay with gravel, specimen 3 : yellow sandy clay.*

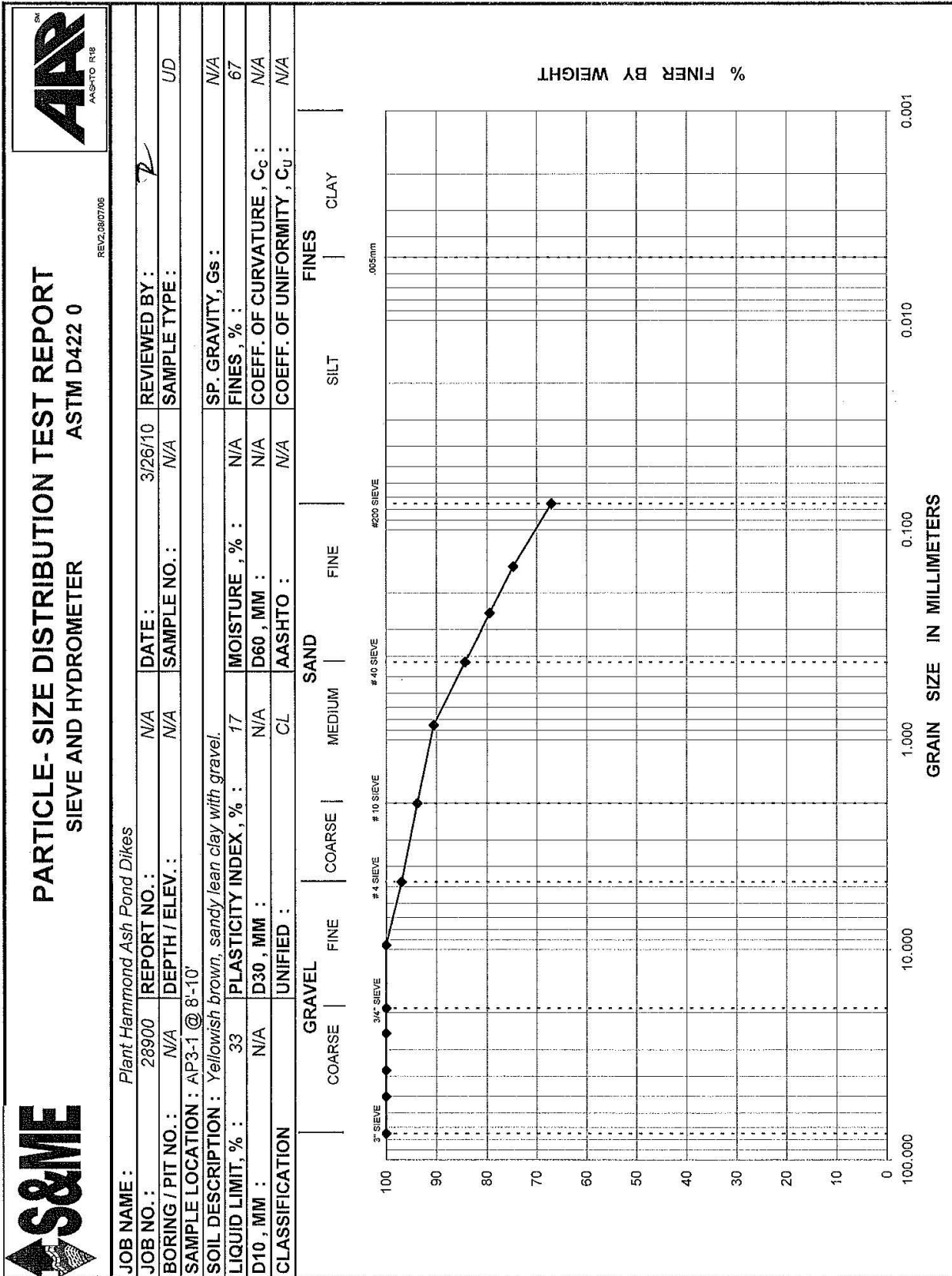
LL, % :	33	PI, % :	17	FINES, % :	67	G _s :	2.66
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SPECIMEN PROPERTIES				TEST PARAMETERS, TEST TYPE : CU/PP									
SPECIMEN NO.	INITIAL			AFTER CONSOLIDATION			SPECIMEN NO.						
	1	2	3	1	2	3							
DIAMETER, INCHES	D _o	2.89	2.89	2.88	D _c	2.86	2.88	2.87	B Value	0.95	0.95	0.95	
HEIGHT, INCHES	H _o	5.89	6.29	6.06	H _c	5.85	6.28	6.03	BACK PRESSURE, ksf	U _o	11.6	11.5	11.6
WATER CONTENT, %	W _o	21.8	14.5	18.4	W _c	22.2	15.4	17.4	CONFINING PRESSURE, ksf	σ ₃	0.5	1.0	2.0
DRY DENSITY, PCF	γ _{dryo}	102.0	117.1	111.9	γ _{dryc}	104.4	117.7	113.5	MAX. DEVIATOR STRESS, ksf	σ ₁ -σ ₃	1.1	4.8	14.2
SATURATION, %	S _o	92.5	92.4	101.4	S _c	100	100	100	ULT. DEVIATOR STRESS, ksf	σ ₁ -σ ₃	1.1	4.8	14.2
VOID RATIO	e _o	0.627	0.417	0.483	e _c	0.590	0.409	0.462	Specimen Shape @	Sheared			
				Strain 0.04 % per minute				T50, Minutes = 10					

N/A
N/A

SHEAR STRENGTH PARAMETERS	TOTAL		EFFECTIVE	
	COHESION, C (ksf) :	N/A	APPARENT COHESION, (ksf) :	0.00
ANGLE OF INTER. FRICTION, φ (DEGREES) :	N/A	ANGLE OF INTER. FRICTION, φ' (DEGREES) :	35.0	







ATTERBERG LIMITS
(ASTM D 4318)



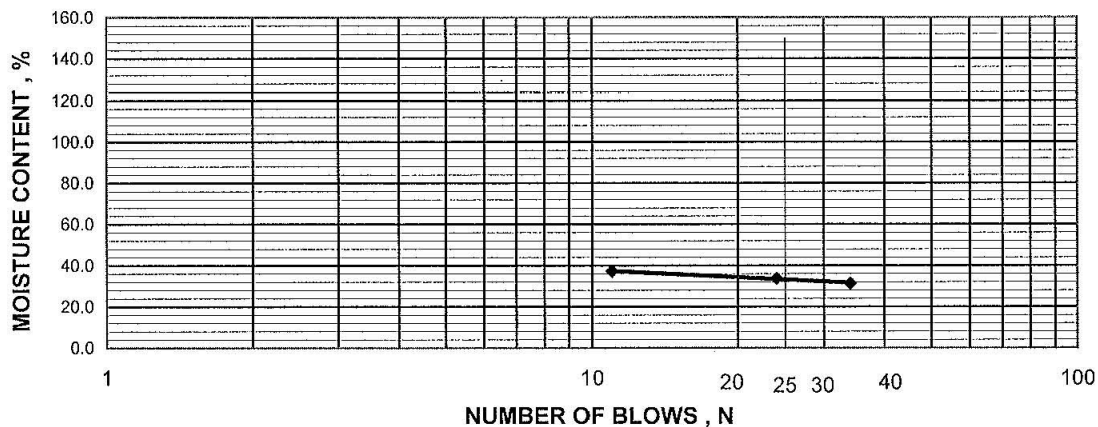
REV. 5/10/06

JOB NAME : Plant Hammond Ash Pond Dikes	
JOB NO. : 28900	REPORT NO. : -
DATE : 03/31/10	REVIEWED BY : <i>[Signature]</i>
BORING / PIT NO. : AP3-1	DEPTH / ELEV. : 8'-10'
SAMPLE NO. : N/A	SAMPLE TYPE : UD
SOIL DESCRIPTION : -	
LIQUID LIMIT , % : 33	PLASTIC LIMIT , % : 16
PLASTICITY INDEX , % : 17	MOISTURE , % : 18
CLASSIFICATION :	UNIFIED : CL
AASHTO : -	FINES , % : 67

LIQUID LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN LIQUID & PLASTIC STATES --

% MOISTURE AT WHICH SOIL FLOWS FOR A DISTANCE OF 13 MM (1/2 ") AT THE BASE OF GROOVE WHEN SUBJECTED TO 25 BLOWS

TEST NO. :	1	2	3	4	5	
CONTAINER NO.	42	43	44	BRAND	MODEL	SERIAL
NUMBER OF BLOWS	34	24	11	BALANCE	PRECISA	2200 C
WT. WET SOIL + CAN (GRAMS)	29.83	29.12	30.57	LL MACHINE	HUMBOLT	1
WT. DRY SOIL + CAN (GRAMS)	26.29	25.54	26.37	BALANCE	OHAUS-3100 G	ARC120
WT. OF WATER (GRAMS)	3.54	3.58	4.20	OVEN	DESPATCH-3436	1650032533
WT. OF CONTAINER (GRAMS)	15.00	14.93	15.07			
WT. OF DRY SOIL (GRAMS)	11.29	10.61	11.30			
WATER CONTENT, (%)	31.36	33.74	37.17			



PLASTIC LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN PLASTIC & BRITTLE STATES --

% MOISTURE AT WHICH SOIL CAN NO LONGER BE DEFORMED BY ROLLING INTO 3.2 MM (1/8") IN DIAMETER THREADS WITHOUT CRUMBLING

TEST NO. :	1	2	3	4	5
CONTAINER NO.	54	56			
WT. WET SOIL + CAN (GRAMS)	22.5	21.75			
WT. DRY SOIL + CAN (GRAMS)	21.46	20.83			
WT. OF WATER (GRAMS)	1.04	0.92			
WT. OF CONTAINER (GRAMS)	15.11	15.19			
WT. OF DRY SOIL (GRAMS)	6.35	5.64			
WATER CONTENT, (%)	16.38	16.31			

PLASTICITY INDEX - THE RANGE OF % MOISTURE CONTENT OVER WHICH SOIL BEHAVES PLASTICALLY -

THE DIFFERENCE BETWEEN LIQUID LIMIT & PLASTIC LIMIT **PI = LL - PL**



ATTERBERG LIMITS
(ASTM D 4318)

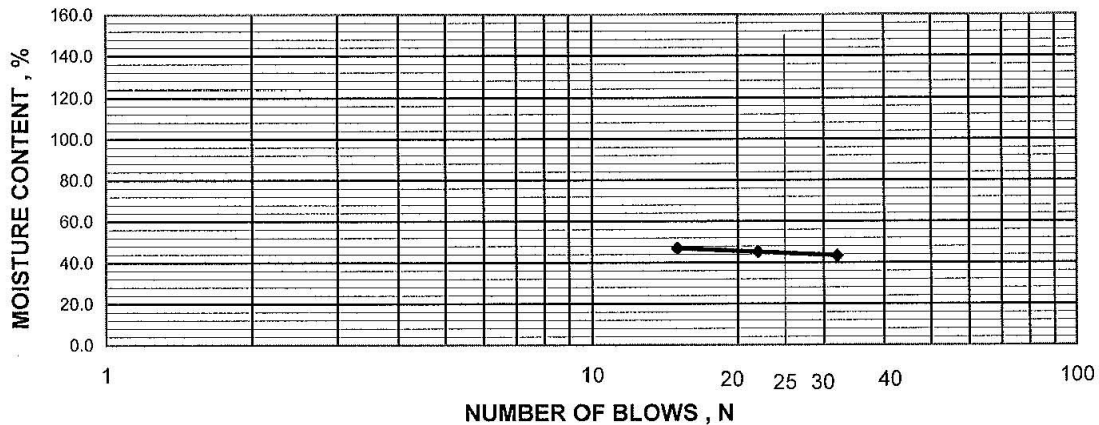


REV. 5/10/06

JOB NAME : Plant Hammond Ash Pond Dikes		REPORT NO. : N/A		DATE : 03/26/10	REVIEWED BY : <i>[Signature]</i>
JOB NO. : 28900	DEPTH / ELEV. : N/A	SAMPLE NO. : N/A	SAMPLE TYPE : UD		
BORING / PIT NO. : N/A					
SAMPLE LOCATION : AP4-1 @ 10'-12.5'					
SOIL DESCRIPTION : -					
LIQUID LIMIT , % : 45	PLASTIC LIMIT , % : 25	PLASTICITY INDEX , % : 20	MOISTURE , % : 30		
CLASSIFICATION :	UNIFIED : CL	AASHTO : -	FINES , % : 87		

LIQUID LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN LIQUID & PLASTIC STATES --
% MOISTURE AT WHICH SOIL FLOWS FOR A DISTANCE OF 13 MM (1/2 ") AT THE BASE OF GROOVE WHEN SUBJECTED TO 25 BLOWS

TEST NO. :	1	2	3	4	5
CONTAINER NO.	6	7	9		
NUMBER OF BLOWS	32	22	15		
WT. WET SOIL + CAN (GRAMS)	29.18	29.88	30.36	BRAND	MODEL
WT. DRY SOIL + CAN (GRAMS)	25.04	25.56	25.64	BALANCE	PRECISA
WT. OF WATER (GRAMS)	4.14	4.32	4.72	LL MACHINE	HUMBOLT
WT. OF CONTAINER (GRAMS)	15.49	16.00	15.58	BALANCE	OHAUS-3100 G
WT. OF DRY SOIL (GRAMS)	9.55	9.56	10.06	OVEN	DESPATCH-3436
WATER CONTENT, (%)	43.35	45.19	46.92		1650032533



PLASTIC LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN PLASTIC & BRITTLE STATES --
% MOISTURE AT WHICH SOIL CAN NO LONGER BE DEFORMED BY ROLLING INTO 3.2 MM (1/8 ") IN DIAMETER THREADS WITHOUT CRUMBLING

TEST NO. :	1	2	3	4	5
CONTAINER NO.	28	53			
WT. WET SOIL + CAN (GRAMS)	28.13	26.55			
WT. DRY SOIL + CAN (GRAMS)	25.72	24.29			
WT. OF WATER (GRAMS)	2.41	2.26			
WT. OF CONTAINER (GRAMS)	16.08	15.49			
WT. OF DRY SOIL (GRAMS)	9.64	8.80			
WATER CONTENT, (%)	25.00	25.68			

PLASTICITY INDEX - THE RANGE OF % MOISTURE CONTENT OVER WHICH SOIL BEHAVES PLASTICALLY -
THE DIFFERENCE BETWEEN LIQUID LIMIT & PLASTIC LIMIT $PI = LL - PL$



TRIAXIAL SHEAR TEST REPORT
(ASTM D 4767)

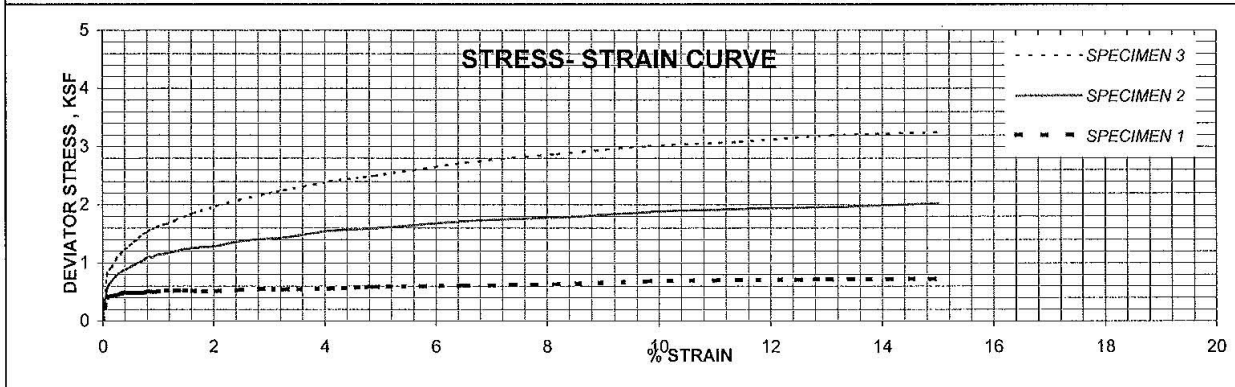
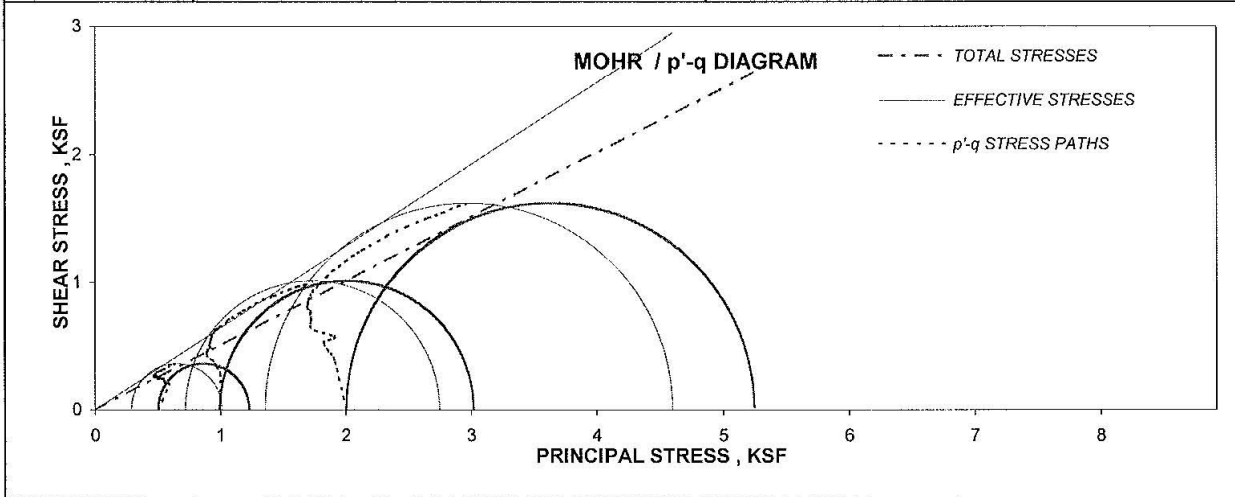


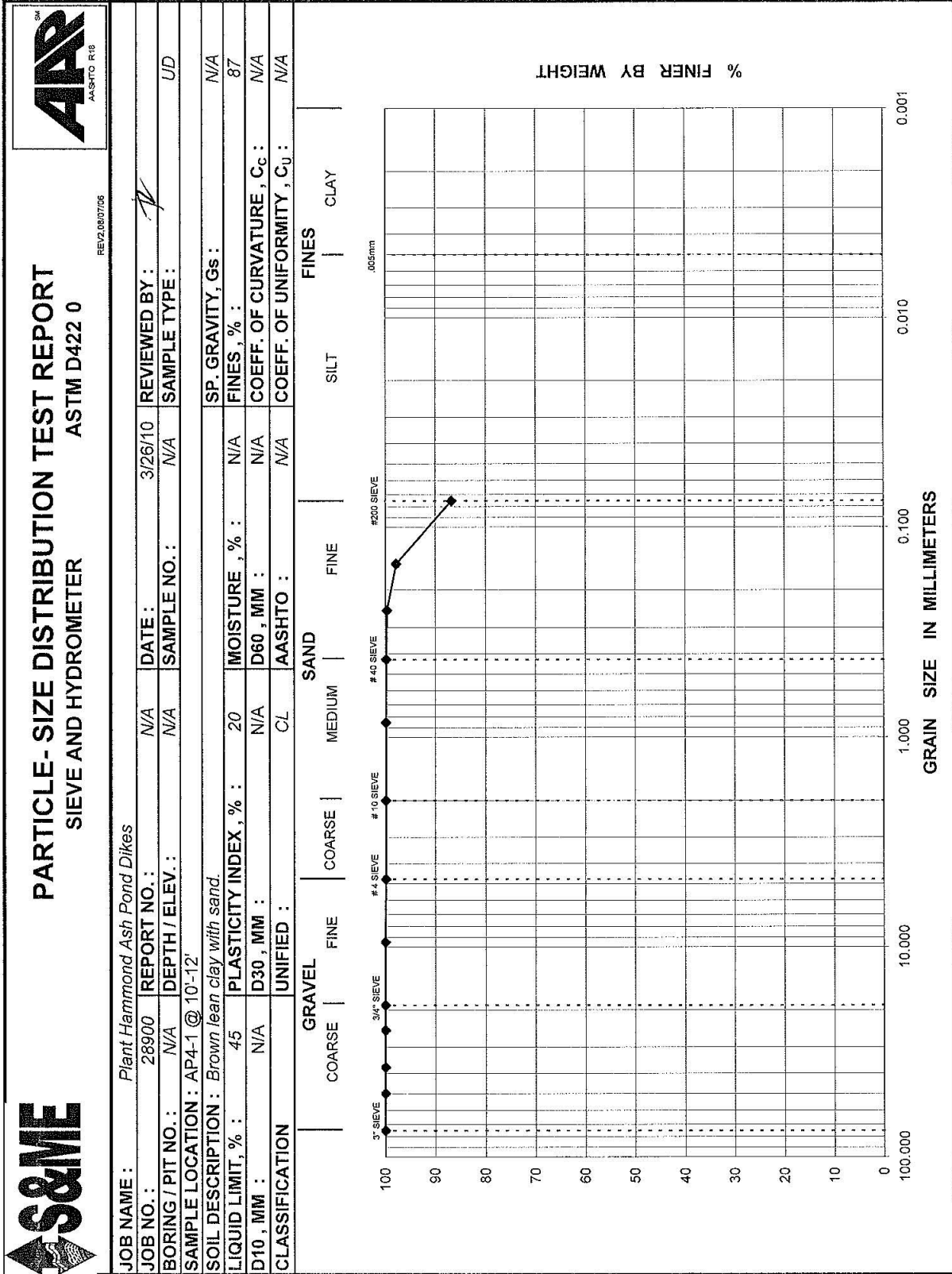
REV5,3/05/07

JOB NAME: <i>Plant Hammond Ash Pond Dikes</i>	
JOB NO.: 28900	REPORT NO.: N/A
BORING / PIT NO.: N/A	DEPTH / ELEV.: N/A
SAMPLE LOCATION: AP4-1 @ 10'-12.5'	TYPE: UD
SOIL DESCRIPTION: <i>Specimen 1: yellow & brown clay with gravel, specimen 2: brown lean clay with sand, specimen 3: brown lean clay with sand.</i>	
LL, %: 45	PI, %: 20
FINES, %: 87	G _s : 2.68

SPECIMEN PROPERTIES									TEST PARAMETERS, TEST TYPE : CU/PP				
SPECIMEN NO.	INITIAL			AFTER CONSOLIDATION			SPECIMEN NO.						
	1	2	3	1	2	3	1	2	3				
DIAMETER, INCHES	D _o	2.87	2.89	2.88	D _c	2.86	2.87	2.85	B Value	0.95	0.95	0.95	
HEIGHT, INCHES	H _o	6.16	6.07	6.16	H _c	6.15	6.04	6.11	BACK PRESSURE, ksf	U _o	11.7	11.6	11.6
WATER CONTENT, %	W _o	21.8	30.3	30.7	W _c	27.5	30.2	29.7	CONFINING PRESSURE, ksf	σ ₃	0.5	1.0	2.0
DRY DENSITY, PCF	γ _{dryo}	95.4	91.2	90.8	γ _{dryc}	96.3	92.5	93.1	MAX. DEVIATOR STRESS, ksf	σ ₁ -σ ₃	0.7	2.0	3.2
SATURATION, %	S _o	77.4	97.4	97.6	S _c	100	100	100	ULT. DEVIATOR STRESS, ksf	σ ₁ -σ ₃	0.7	2.0	3.2
VOID RATIO	e _o	0.753	0.835	0.842	e _c	0.737	0.809	0.798	Specimen Shape @	Sheared			
									Failure	T50, Minutes = 10			
									Strain	0.04 % per minute			

SHEAR STRENGTH PARAMETERS		TOTAL		EFFECTIVE	
COHESION, C (ksf) :		0.00		APPARENT COHESION, (ksf) :	
ANGLE OF INTER. FRICTION, Φ (DEGREES) :		26.8		ANGLE OF INTER. FRICTION, Φ' (DEGREES) :	
				32.7	







TRIAXIAL SHEAR TEST REPORT
(ASTM D 4767)

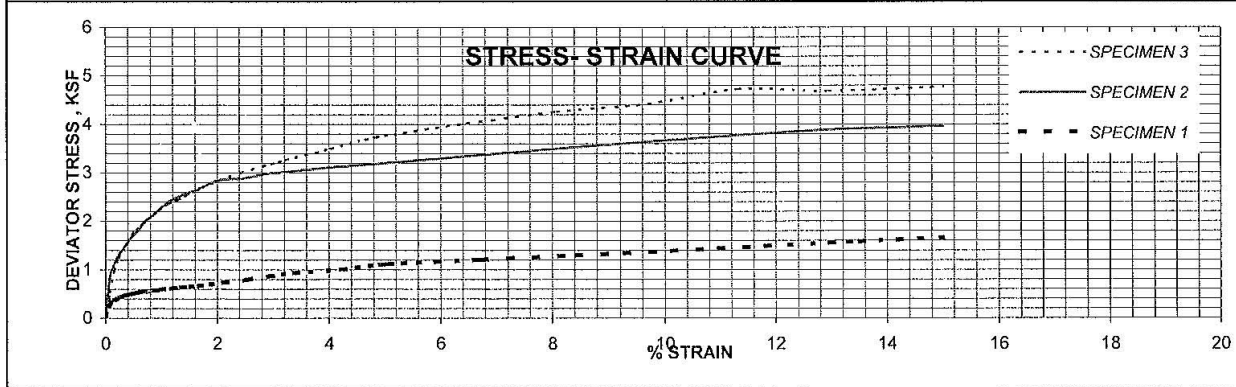
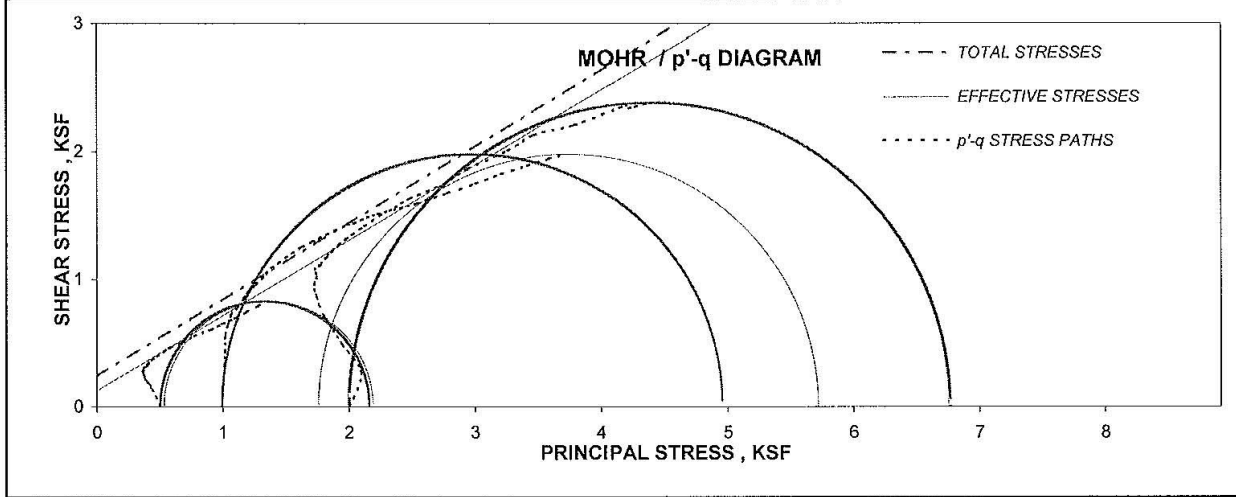


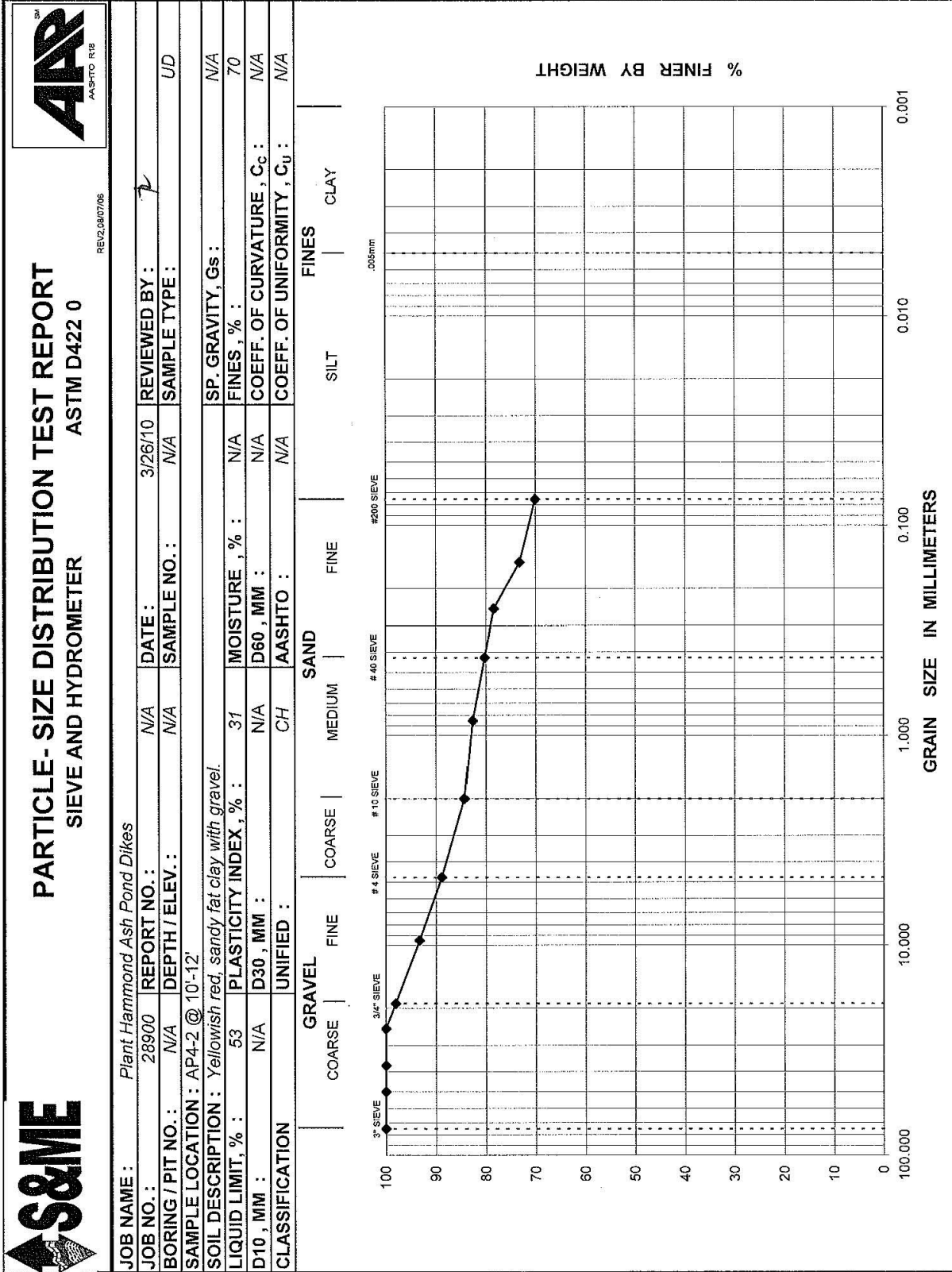
REV5,3/05/07

JOB NAME: Plant Hammond Ash Pond Dikes	
JOB NO.: 28900	REPORT NO.: N/A
BORING / PIT NO.: N/A	DEPTH / ELEV.: N/A
SAMPLE LOCATION: AP4-2/5 @ 10'-12.5'	REVIEWED BY: <i>[Signature]</i>
SOIL DESCRIPTION: Yellowish red fat clay with gravel (CH)	DATE: 3/24/10
LL, %: 53	PI, %: 31
FINES, %: 70	G_s: 2.74
TYPE: UD	

SPECIMEN PROPERTIES									TEST PARAMETERS, TEST TYPE : CU/PP				
SPECIMEN NO.	INITIAL			AFTER CONSOLIDATION			SPECIMEN NO.	1	2	3			
	1	2	3	1	2	3							
	D_o	2.87	2.89	2.88	D_c	2.86	2.89	2.87	B Value	0.95	0.95	0.95	
	H_o	5.95	6.12	6.20	H_c	5.93	6.12	6.18	BACK PRESSURE, ksf	U_o	10.1	10.1	10.1
	W_o	18.0	20.8	18.6	W_c	22.9	22.7	19.3	CONFINING PRESSURE, ksf	σ₃	0.5	1.0	2.0
	γ_{dryo}	103.5	105.1	110.4	γ_{dryc}	104.9	105.3	111.7	MAX. DEVIATOR STRESS, ksf	σ₁-σ₃	1.7	4.0	4.8
	S_o	75.7	91.4	93.2	S_c	100	100	100	ULT. DEVIATOR STRESS, ksf	σ₁-σ₃	1.7	4.0	4.8
	e_o	0.648	0.624	0.546	e_c	0.627	0.621	0.528	Specimen Shape @	Sheared			
									Failure				
									Strain	0.04	% per minute	T50, Minutes =	10

N/A		
N/A		
SHEAR STRENGTH PARAMETERS	TOTAL	EFFECTIVE
	COHESION, C (ksf) : 0.24	APPARENT COHESION, (ksf) : 0.13
	ANGLE OF INTER. FRICTION, Φ (DEGREES) : 31.0	ANGLE OF INTER. FRICTION, Φ' (DEGREES) : 30.5







ATTERBERG LIMITS
(ASTM D 4318)



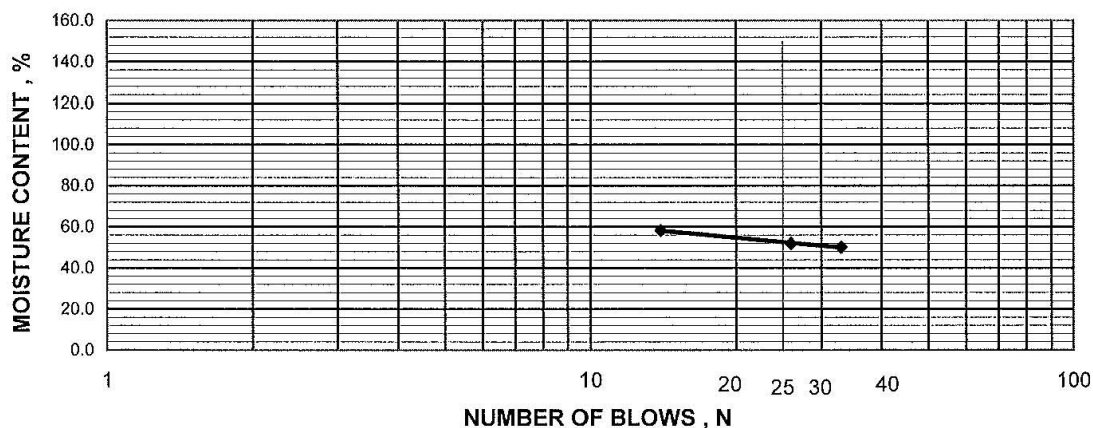
REV. 5/10/06

JOB NAME : Plant Hammond Ash Pond Dikes		REPORT NO. : -		DATE : 03/25/10	REVIEWED BY : <i>[Signature]</i>
JOB NO. : 28900	DEPTH / ELEV. : N/A	SAMPLE NO. : N/A	SAMPLE TYPE : UD		
BORING / PIT NO. : N/A					
SAMPLE LOCATION : AP4-2 @ 10'-12.5'					
SOIL DESCRIPTION : -					
LIQUID LIMIT , % : 53	PLASTIC LIMIT , % : 22	PLASTICITY INDEX , % : 31	MOISTURE , % : 18		
CLASSIFICATION :	UNIFIED : CH	AASHTO : -	FINES , % : 70		

LIQUID LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN LIQUID & PLASTIC STATES --

% MOISTURE AT WHICH SOIL FLOWS FOR A DISTANCE OF 13 MM (1/2 ") AT THE BASE OF GROOVE WHEN SUBJECTED TO 25 BLOWS

TEST NO. :	1	2	3	4	5	
CONTAINER NO.	25	26	27	BRAND	MODEL	SERIAL
NUMBER OF BLOWS	33	26	14	BALANCE	PRECISA	2200 C
WT. WET SOIL + CAN (GRAMS)	28.47	29.15	29.20	LL MACHINE	HUMBOLT	1
WT. DRY SOIL + CAN (GRAMS)	24.04	24.66	24.33	BALANCE	OHAUS-3100 G	ARC120
WT. OF WATER (GRAMS)	4.43	4.49	4.87	OVEN	DESPATCH-3436	1650032533
WT. OF CONTAINER (GRAMS)	15.20	16.00	15.96			
WT. OF DRY SOIL (GRAMS)	8.84	8.66	8.37			
WATER CONTENT, (%)	50.11	51.85	58.18			



PLASTIC LIMIT , % MOISTURE AT THE ARBITRARY DEFINED BOUNDARY BETWEEN PLASTIC & BRITTLE STATES --

% MOISTURE AT WHICH SOIL CAN NO LONGER BE DEFORMED BY ROLLING INTO 3.2 MM (1/8") IN DIAMETER THREADS WITHOUT CRUMBLING

TEST NO. :	1	2	3	4	5
CONTAINER NO.	18	19			
WT. WET SOIL + CAN (GRAMS)	22.72	23.04			
WT. DRY SOIL + CAN (GRAMS)	21.37	21.64			
WT. OF WATER (GRAMS)	1.35	1.40			
WT. OF CONTAINER (GRAMS)	15.24	15.06			
WT. OF DRY SOIL (GRAMS)	6.13	6.58			
WATER CONTENT, (%)	22.02	21.28			

PLASTICITY INDEX - THE RANGE OF % MOISTURE CONTENT OVER WHICH SOIL BEHAVES PLASTICALLY -

THE DIFFERENCE BETWEEN LIQUID LIMIT & PLASTIC LIMIT **PI = LL - PL**

Attachment E

Groundwater Levels

