PERIODIC SAFETY FACTOR ASSESSMENT
391-3-4-.10(4) and 40 C.F.R. PART 257.73
PLANT HAMMOND ASH POND 2 (AP-2)
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 2 (AP-2) 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 northwest side of the perimeter embankment. Under current conditions, the northwest 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 embankment.

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

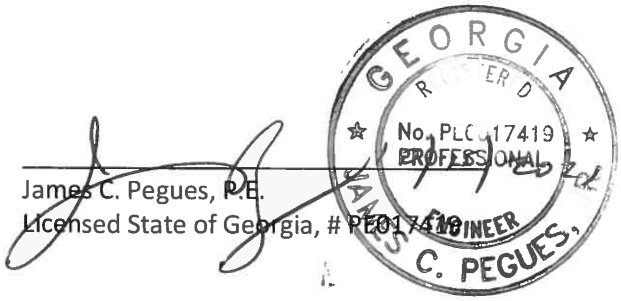
Loading Condition	Minimum Calculated Safety Factor	Minimum Required Safety Factor
Long-term Maximum Storage Pool (Static)	1.9	1.5
Maximum Surcharge Pool (Static)	1.9	1.4
Seismic	1.6	1.0

The embankment is constructed of sandy 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

Southern Company

Technical and Project Solutions Calculation

Calculation Number: TV-HM- GPC1139448-001

Project/Plant: Plant Hammond AP-2	**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

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

Ash Pond 2 was originally constructed in the late 1960s and a divider dike was installed in approximately 1998 to 2000. Currently, material stored in Ash Pond 2 is being excavated and transported to the Huffaker Road permitted solid waste disposal facility. The pond has been dewatered, and only receives rain that falls within its watershed. 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 2.

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 require minimum.

Load Conditions	Computed Factor of Safety	Required Minimum Factor of Safety
Long-term Maximum Storage (Static)	1.9	1.5
Maximum Surcharge Pool (Static)	1.9	1.4
Seismic	1.6	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 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 0.070g 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.

<u>Ash Pond 2</u>

- The cross-section of Ash Pond 2 was obtained using the following sources:
  1) March 2010 survey for the top of the dike and downstream surface of the dike, the width of the ash “platform” on the upstream side of the dike, and the elevations of water within the pond and in the discharge canal at the toe of the pond.
  2) Original design Drawing No. H-401 for the upstream surface of the dike.
  3) Drawing No. E8544, Excavation Plan, for the elevation of the ash on the interior of the pond.
- Groundwater elevations through the dike were determined from piezometers installed in March 2010.

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	112.4	129	140	37.3	300	21
Sandy Clay Fdn Soil	98.8	124	280	29.9	850	18.9
Sluiced Ash		80	0	10	0	10

Hydrologic Considerations

Ash Pond 2 was used as a dewatering pond when the plant was producing ash. Under those conditions, the maximum surcharge condition was analyzed using a water elevation of 597.2 in the pond. As the amount and distribution of the remaining ash varies from day to day, we will continue to utilize that value for the maximum surcharge condition and with the ash layer equal to the crest of the dike elevation for the purposes of this calculation.

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

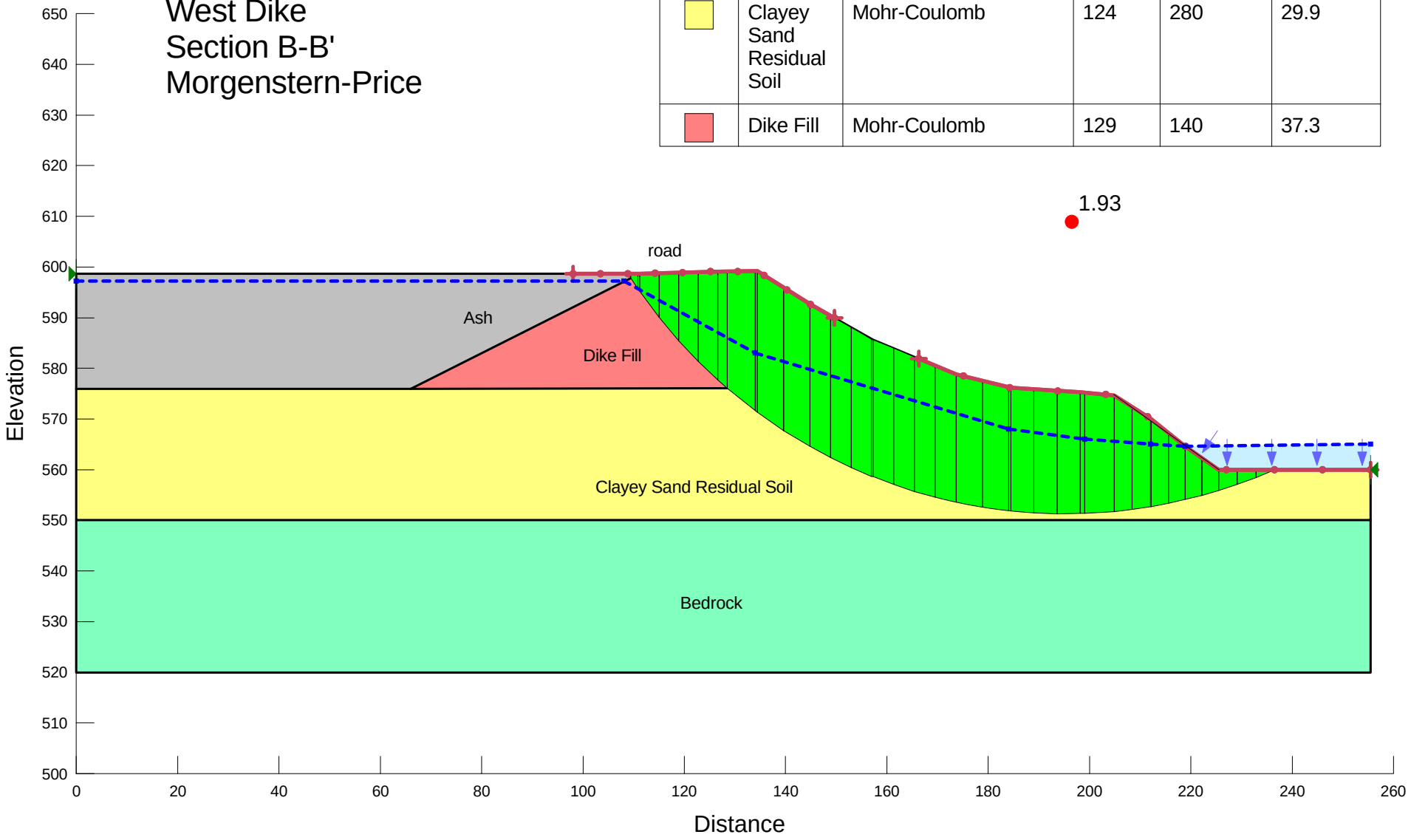
E&CS Calculation TV-HM-GPC607582-002
USGS Earthquake Hazards website, http://earthquake.usgs.gov/hazards/hazmaps/.
NOAA website, http://www.srh.noaa.gov/ffc/html/rva.php.
GPC Drawing H-35, Plant Hammond Units 1 & 2 Ash Basin Area – Excavation and Drainage
GPC Drawing H-30, Plant Hammond Plot Plan of Drill Holes
Metro Topographic Map, Georgia Power Company, Plant Hammond, February 29, 2000
GPC Drawing H-401, Plant Hammond Unit 4 Cross Sections and Volume Calculations for New Ash Pond West of Powerhouse
SCS Drawing E8544, Plant Hammond Ash Pond #2 Excavation Plan for Northern Cell
GPC Drawing H-436, Plant Hammond 1973 Ash Pond Plan and Sections
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.

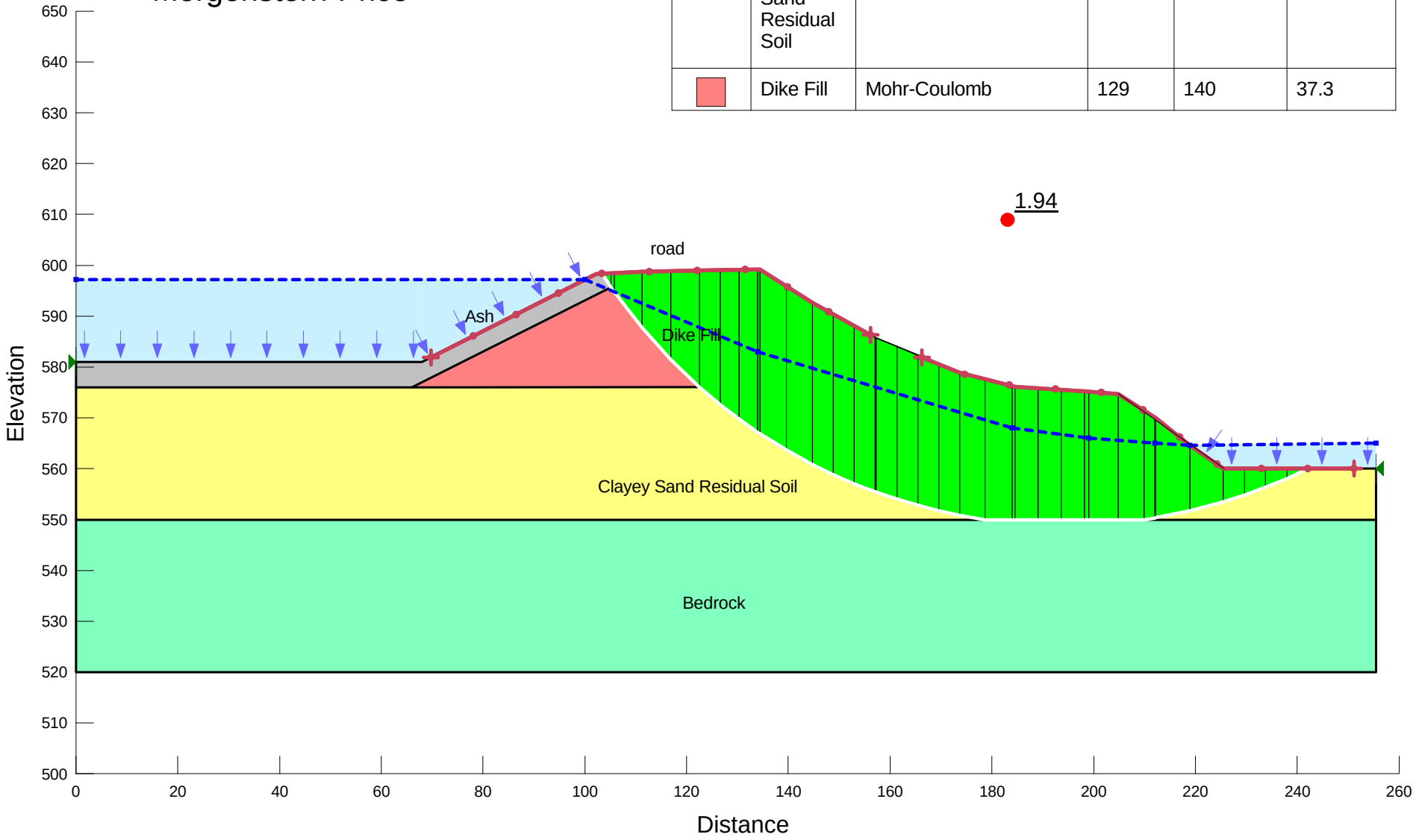
Plant Hammond
Ash Pond 2
Downstream - Max Storage
West Dike
Section B-B'
Morgenstern-Price

Color	Name	Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Ash	Mohr-Coulomb	80	0	10
	Bedrock	Bedrock (Impenetrable)			
	Clayey Sand Residual Soil	Mohr-Coulomb	124	280	29.9
	Dike Fill	Mohr-Coulomb	129	140	37.3



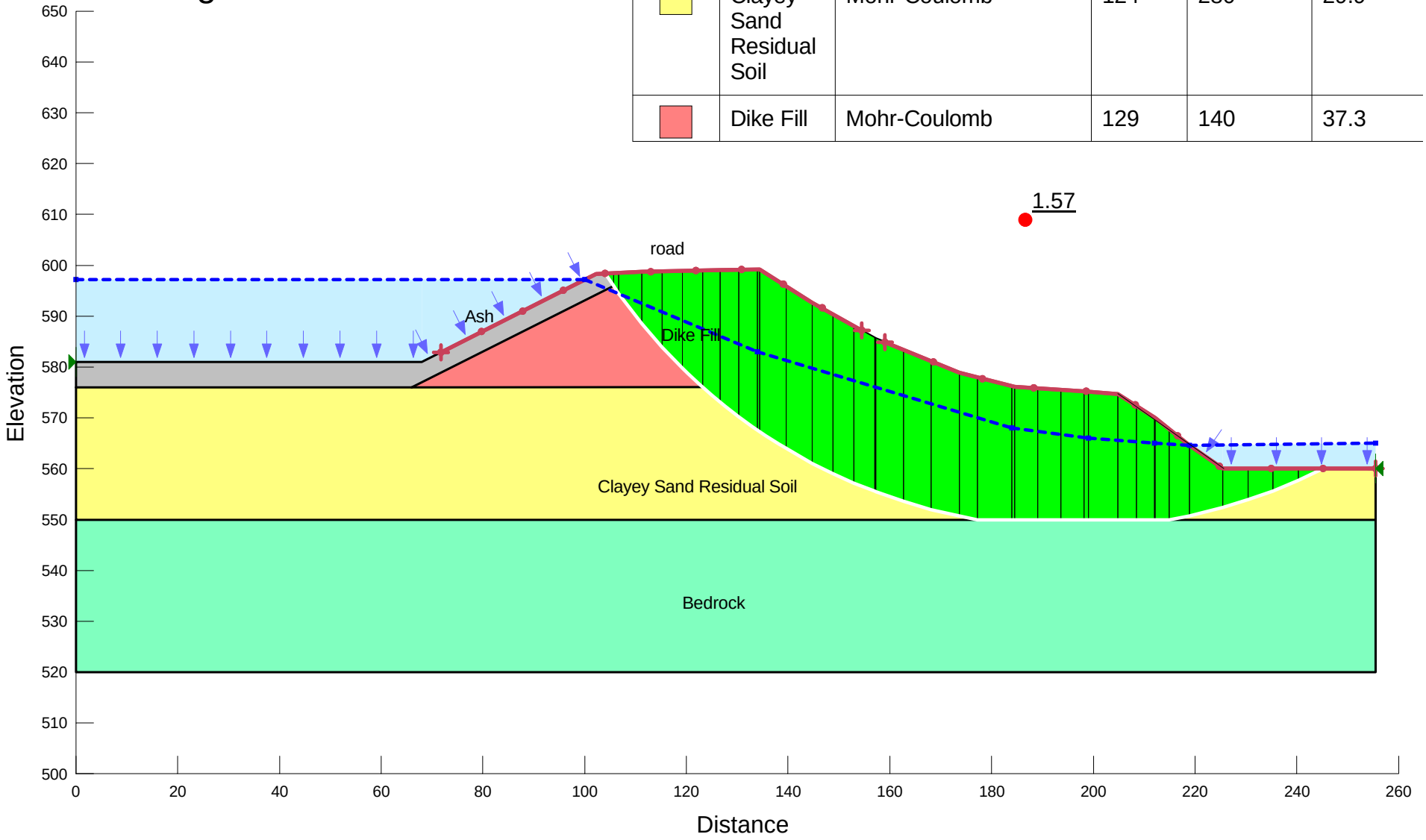
Plant Hammond
Ash Pond 2
Downstream - Max Surcharge
Section B-B'
Morgenstern-Price

Color	Name	Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Ash	Mohr-Coulomb	80	0	10
	Bedrock	Bedrock (Impenetrable)			
	Clayey Sand Residual Soil	Mohr-Coulomb	124	280	29.9
	Dike Fill	Mohr-Coulomb	129	140	37.3



Plant Hammond
Ash Pond 2
Downstream - Seismic
Section B-B'
Morgenstern-Price

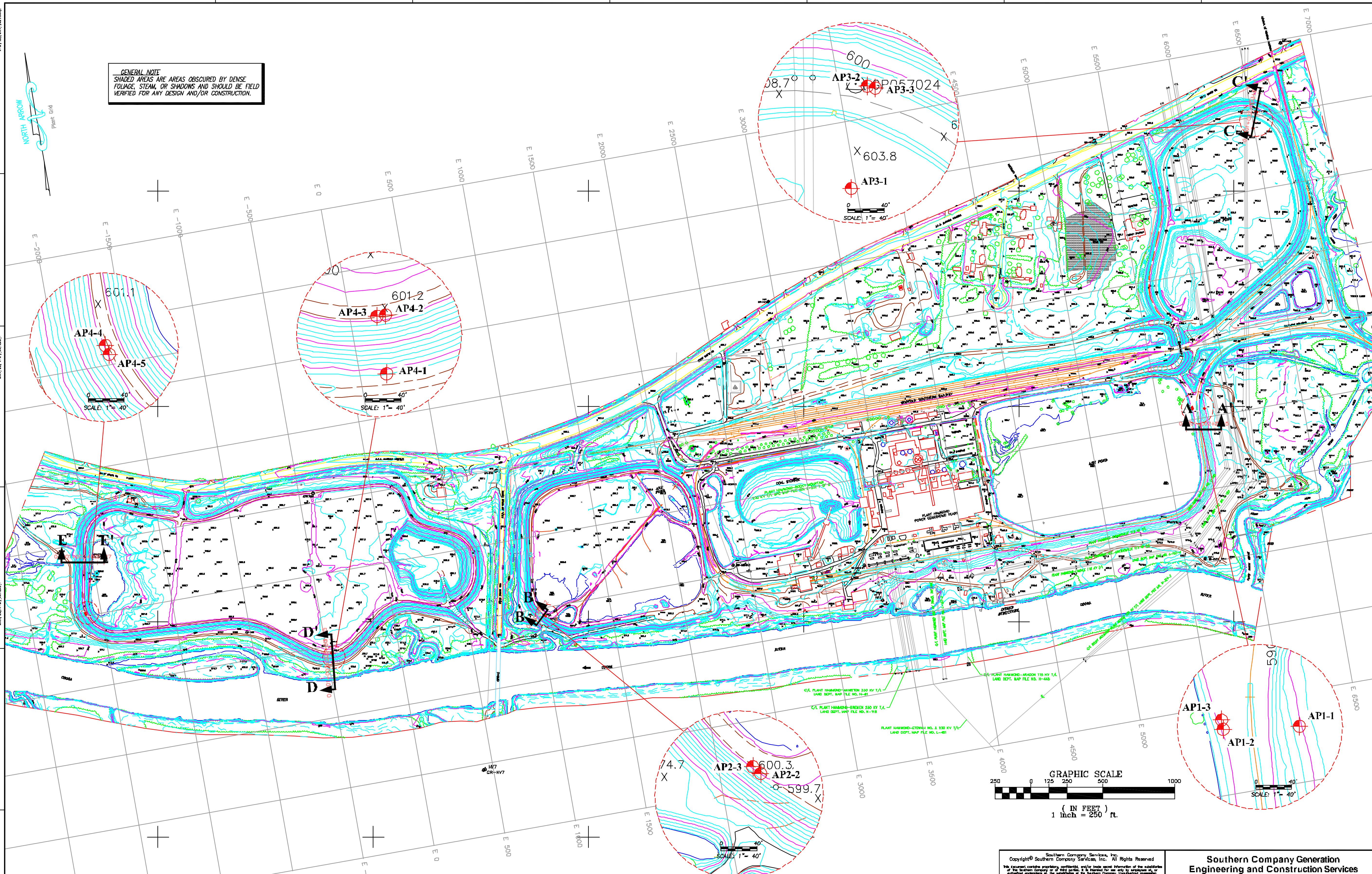
Color	Name	Material Model	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)
	Ash	Mohr-Coulomb	80	0	10
	Bedrock	Bedrock (Impenetrable)			
	Clayey Sand Residual Soil	Mohr-Coulomb	124	280	29.9
	Dike Fill	Mohr-Coulomb	129	140	37.3



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.



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	DRAWING NUMBER	SHEET	CONT'D	REV
AS SHOWN	ES1844S1	1	FINAL	0

REVISION	DATE	REVISION	DATE	REVISION	DATE	REVISION	DATE	REVISION	DATE	REVISION	DATE	REVISION	DATE

ANSI F: 40x28 Acad2009

Attachment B

Boring Logs

SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. AP2-2
Sheet 1 of 2

SITE: Plant Hammond | HOLE DEPTH: 25 ft | SURF ELEV: 599.50
LOCATION: Rome, GA | COORDINATES N: | E:
ANGLE: Vertical | BEARING: | CONTRACTOR: Ranger Consulting, Inc | DRILL NO: CME 550X
DRILLING METHOD: Hollow stem auger | NO. SAMPLES: 0 | NO. U.D. SAMPLES: 0
CASING SIZE: | LENGTH: | CORE SIZE: | TOTAL % REC:
WATER TABLE DEPTH: Dry | 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 From To	Blows	N	Comments	% Rec.	RQD
0	599.50	~10 feet from AP2-3 on dike crest					Logged from AP2-3 No samples		
1	598.50						Post hole to 3 ft		
2	597.50								
3	596.50								
4	595.50	Red, orange and tan very silty fine sand with clay and small rock fragments							
5	594.50								
6	593.50								
7	592.50								
8	591.50								
9	590.50	Light brown and orange very silty fine sand with minor clay and abundant small rock fragments							
10	589.50								
11	588.50								
12	587.50								
13	586.50								
14	585.50	Orange and gray silty fine to medium grained sand with rock fragments							
15	584.50								
16	583.50								
17	582.50								
18	581.50								
19	580.50	Brown very silty fine sand with rock fragments							
20	579.50								
21	578.50								
22	577.50								
23	576.50						Dry at T.O.B.		
24	575.50	Brown and tan very silty fine sand with rock fragments					Dry at 24-hr		

Form GS0001 7-26-2004

SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. AP2-2
Sheet 2 of 2

SITE: Plant Hammond TOTAL DEPTH: 25 ft SURF ELEV: 599.5

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From To	Blows	N	Comments	% Rec	RQD
25	574.50	Brown and tan very silty fine sand with rock fragments							
		Bottom of hole at 25 ft							

Form GS0901 7-25-2004

SOUTHERN COMPANY
Energy to Serve Your World

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. AP2-3
Sheet 1 of 2

SITE: Plant Hammond | HOLE DEPTH: 40 ft | SURF ELEV: 599.87
LOCATION: Rome, GA | COORDINATES N: | E:
ANGLE: Vertical | BEARING: | CONTRACTOR: Ranger Consulting, Inc | DRILL NO: CME 550X
DRILLING METHOD: Hollow stem auger | NO. SAMPLES: 8 | NO. U.D. SAMPLES: 3
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
DRILLED BY: Justin | RECORDER: J Pugh | APPROVED: | DRILLING COMP. DATE: 3/16/2010

Depth	Elev.	Material Description, Classification and Remarks	Sample No.	Standard Penetration Test From-To	Blows	N	Comments	% Rec.	ROD
0	599.87	Drilled from dike crest							
1	598.87						Post hole to 3 ft		
2	597.87								
3	596.87								
4	595.87	Red, orange and tan very silty fine sand with clay and small rock fragments	1	3.5-5	5-8-9	17			
5	594.87								
6	593.87								
7	592.87								
8	591.87								
9	590.87	Light brown and orange very silty fine sand with minor clay and abundant small rock fragments	2	8.5-10	4-5-7	12			
10	589.87								
11	588.87						UD #1 (10" rec.)		
12	587.87								
13	586.87								
14	585.87	Orange and gray silty fine to medium grained sand with rock fragments	3	13.5-15	5-5-8	13			
15	584.87								
16	583.87						UD #2 (16" rec.)		
17	582.87								
18	581.87								
19	580.87	Brown very silty fine sand with rock fragments	4	18.5-20	6-11-15	26			
20	579.87								
21	578.87								
22	577.87								
23	576.87								
24	575.87	Brown and tan very silty fine sand with rock fragments	5	23.5-25	3-7-7	14			

Form GSS901 7-26-2004

SOUTHERN COMPANY
Energy to Serve Your World℠

DRILLING LOG
GEOLOGICAL SERVICES

Hole No. AP2-3
Sheet 2 of 2

SITE: Plant Hammond — TOTAL DEPTH: 40 ft — SURF ELEV: 599.87

Depth	Elev	Material Description, Classification and Remarks	Sample No	Standard Penetration Test From/To	Blows	N	Comments	% Rec	RQD
25	574.87								
26	573.87								
27	572.87								
28	571.87								
29	570.87	Brown and gray clayey sand with rock fragments; slightly moist	6	28.5-30	4-5-8	13			
30	569.87								
31	568.87								
32	567.87						Water table at 32.6 ft at 24-hr		
33	566.87								
34	565.87	Light brown silt with minor very fine sand; slightly moist	7	33.5-35	3-3-7	10	Water table at 36 ft at T.O.B.		
35	564.87								
36	563.87						UD #3 (30" rec.)		
37	562.87								
38	561.87								
39	560.87	Light brown silt with minor very fine sand; wet	8	38.5-40	WH-3-5	8			
40	559.87								
		Bottom of hole at 40 ft							

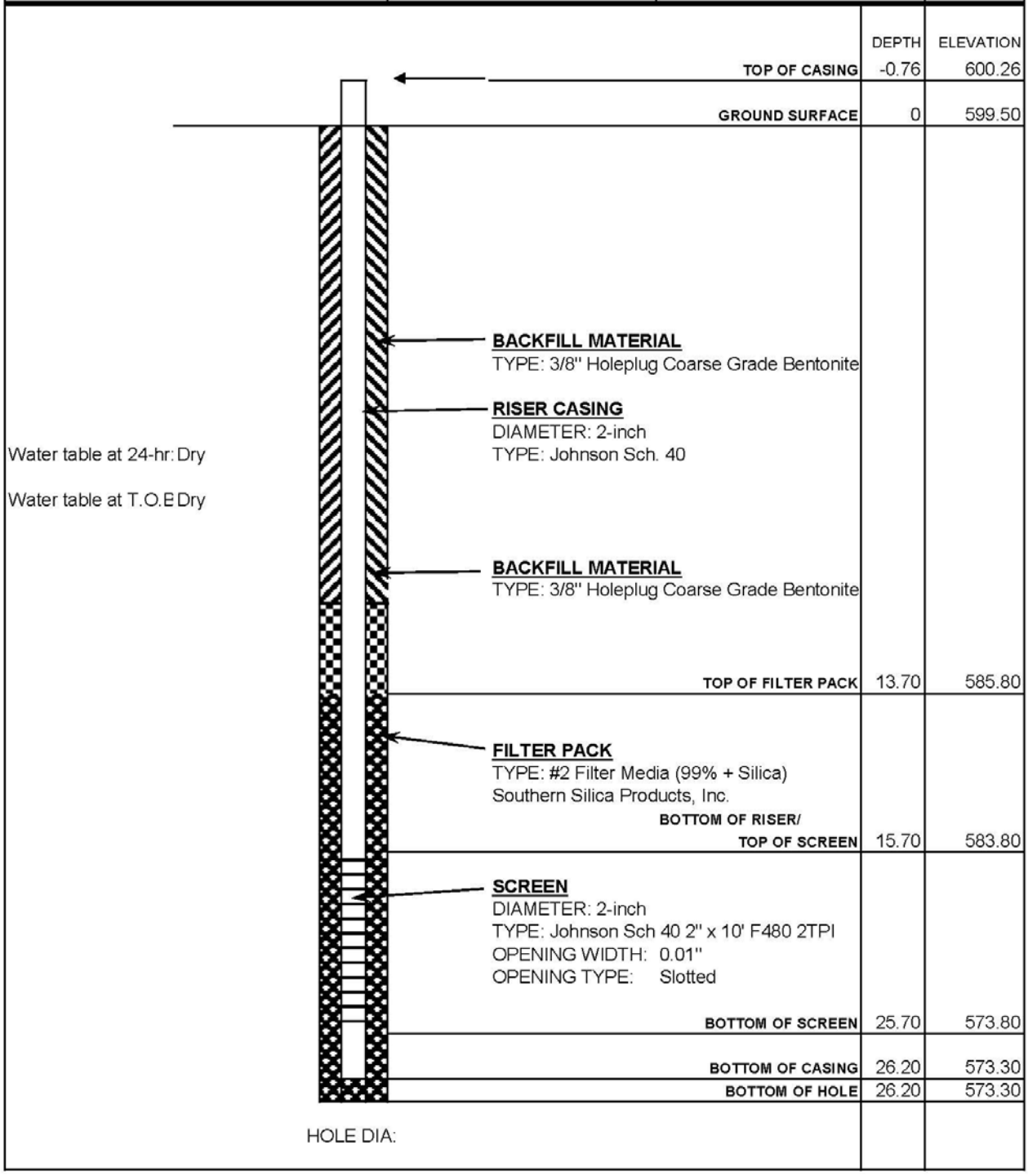
Form GS9901 7-26-2004

Attachment C

Piezometer Logs

SOUTHERN COMPANY SERVICES

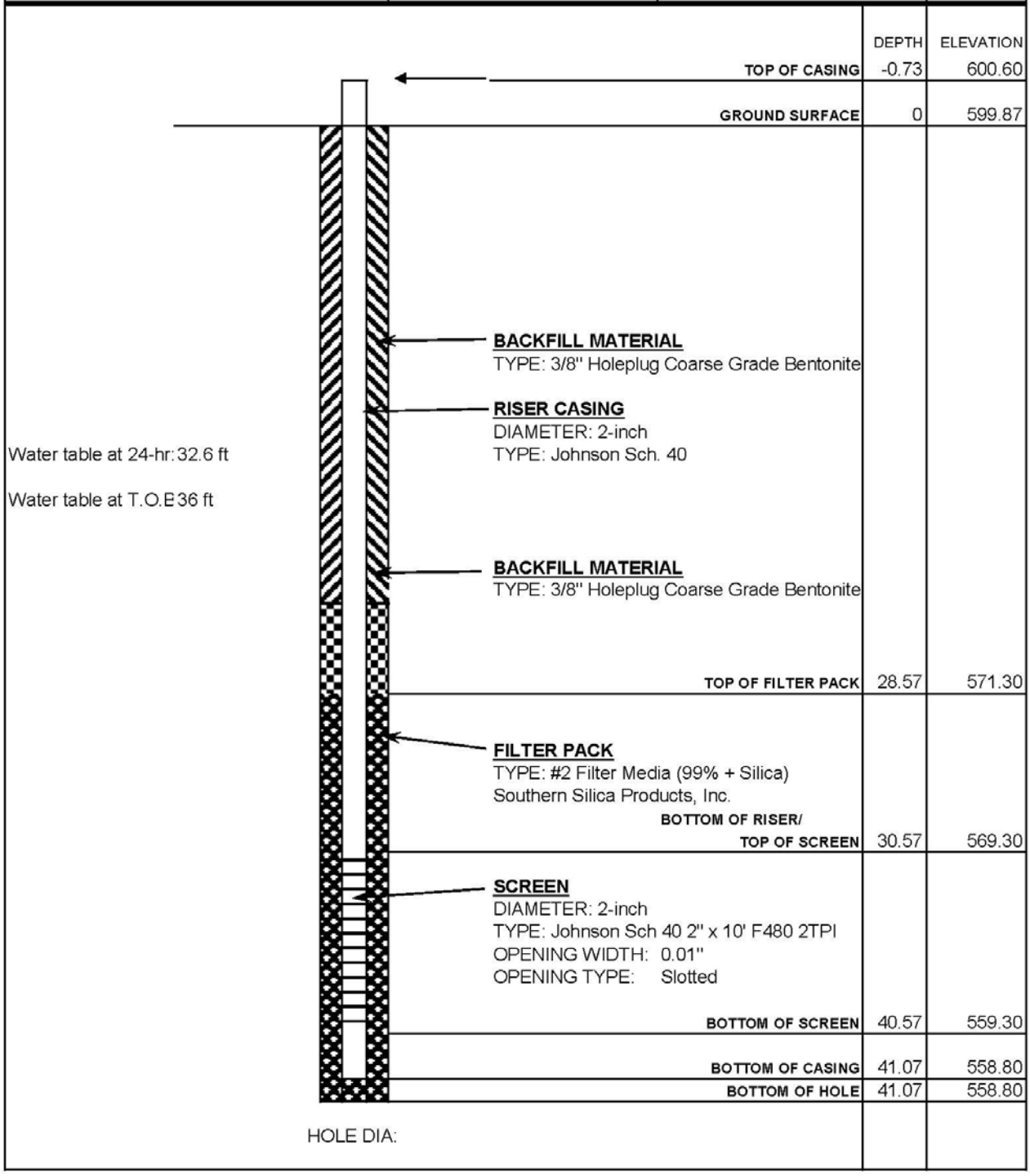
WELL CONSTRUCTION LOG		PROJECT	Ash Pond Dike Investigation	WELL NO.
SITE	Plant Hammond	LOCATION	Rome, GA	
DATE STARTED	10/16/2010	ENDED 10/16/2010	PREPARED	AP2-2



	DEPTH	ELEVATION
TOP OF CASING	-0.76	600.26
GROUND SURFACE	0	599.50
TOP OF FILTER PACK	13.70	585.80
BOTTOM OF RISER/ TOP OF SCREEN	15.70	583.80
BOTTOM OF SCREEN	25.70	573.80
BOTTOM OF CASING	26.20	573.30
BOTTOM OF HOLE	26.20	573.30

SOUTHERN COMPANY SERVICES

WELL CONSTRUCTION LOG		PROJECT	Ash Pond Dike Investigation	WELL NO.
SITE	Plant Hammond	LOCATION	Rome, GA	
DATE STARTED	10/16/2010	ENDED 10/16/2010	PREPARED	AP2-3



	DEPTH	ELEVATION
TOP OF CASING	-0.73	600.60
GROUND SURFACE	0	599.87
BACKFILL MATERIAL TYPE: 3/8" Holeplug Coarse Grade Bentonite		
RISER CASING DIAMETER: 2-inch TYPE: Johnson Sch. 40		
BACKFILL MATERIAL TYPE: 3/8" Holeplug Coarse Grade Bentonite		
TOP OF FILTER PACK	28.57	571.30
FILTER PACK TYPE: #2 Filter Media (99% + Silica) Southern Silica Products, Inc.		
BOTTOM OF RISER/ TOP OF SCREEN	30.57	569.30
SCREEN DIAMETER: 2-inch TYPE: Johnson Sch 40 2" x 10' F480 2TPI OPENING WIDTH: 0.01" OPENING TYPE: Slotted		
BOTTOM OF SCREEN	40.57	559.30
BOTTOM OF CASING	41.07	558.80
BOTTOM OF HOLE	41.07	558.80

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

TRIAXIAL SHEAR TEST REPORT
(ASTM D 4767)

REVS,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 :	AP1 @ 5'-7', Foundation						
SOIL DESCRIPTION :	Yellowish brown lean clay with sand (CL)						
LL, % :	47	PI , % :	26	FINES, % :	87	G_s :	2.71

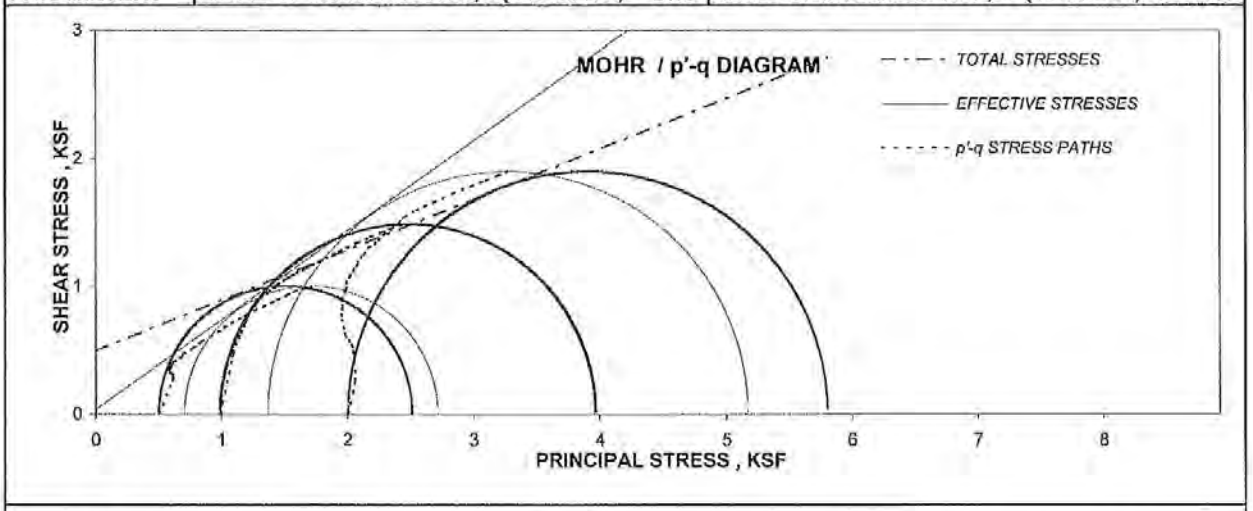
SPECIMEN PROPERTIES									TEST PARAMETERS , TEST TYPE : CU/PP				
		INITIAL			AFTER CONSOLIDATION				SPECIMEN NO.		1	2	3
SPECIMEN NO.		1	2	3		1	2	3	B Value		0.95	0.95	0.95
DIAMETER , INCHES	D_o	2.89	2.89	2.88	D_c	2.87	2.88	2.86	BACK PRESSURE, ksf	U_o	10.1	10.1	10.2
HEIGHT , INCHES	H_o	6.20	6.07	6.07	H_c	6.16	6.04	6.02	CONFINING PRESSURE , ksf	σ_3	0.5	1.0	2.0
WATER CONTENT, %	W_o	25.0	25.2	25.9	W_c	26.1	25.8	25.1	MAX. DEVIATOR STRESS ,ksf	σ_1-σ_3	2.0	3.0	3.8
DRY DENSITY, PCF	γ_{dryo}	97.2	98.2	98.3	γ_{dryc}	99.1	99.5	100.7	ULT. DEVIATOR STRESS , ksf	σ_1-σ_3	2.0	3.0	3.8
SATURATION ,%	S_o	91.7	94.4	97.6	S_c	100	100	100	Specimen Shape @ Failure	Bulged			
VOID RATIO	e_o	0.741	0.724	0.721	e_c	0.709	0.701	0.682					

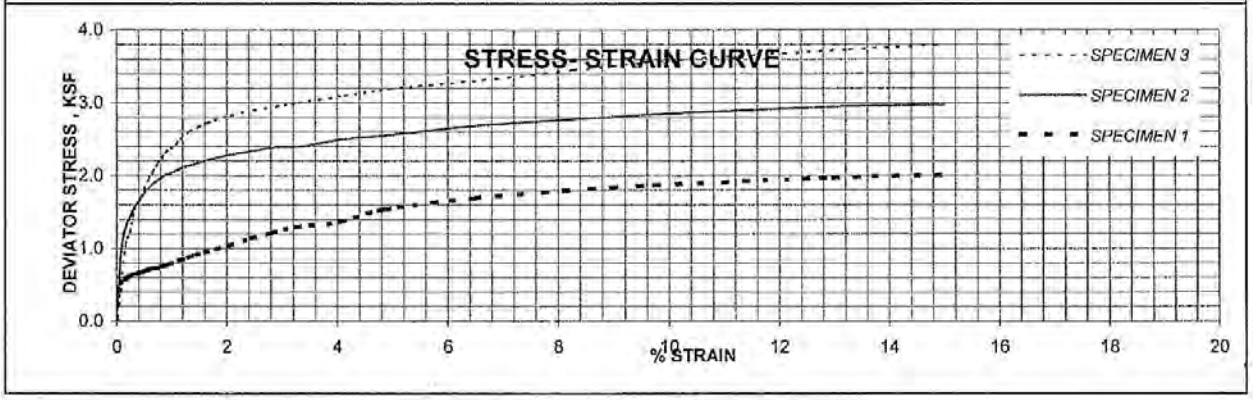
----- , Strain 0.2 % per minute T50, Minutes = 2

N/A

N/A

SHEAR STRENGTH PARAMETERS	TOTAL		EFFECTIVE	
	COHESION , C (ksf) :	0.50	APPARENT COHESION , (ksf) :	0.04
	ANGLE OF INTER. FRICTION, Φ(DEGREES)	21.6	ANGLE OF INTER. FRICTION, Φ' (DEGREES) :	35.1





S&ME

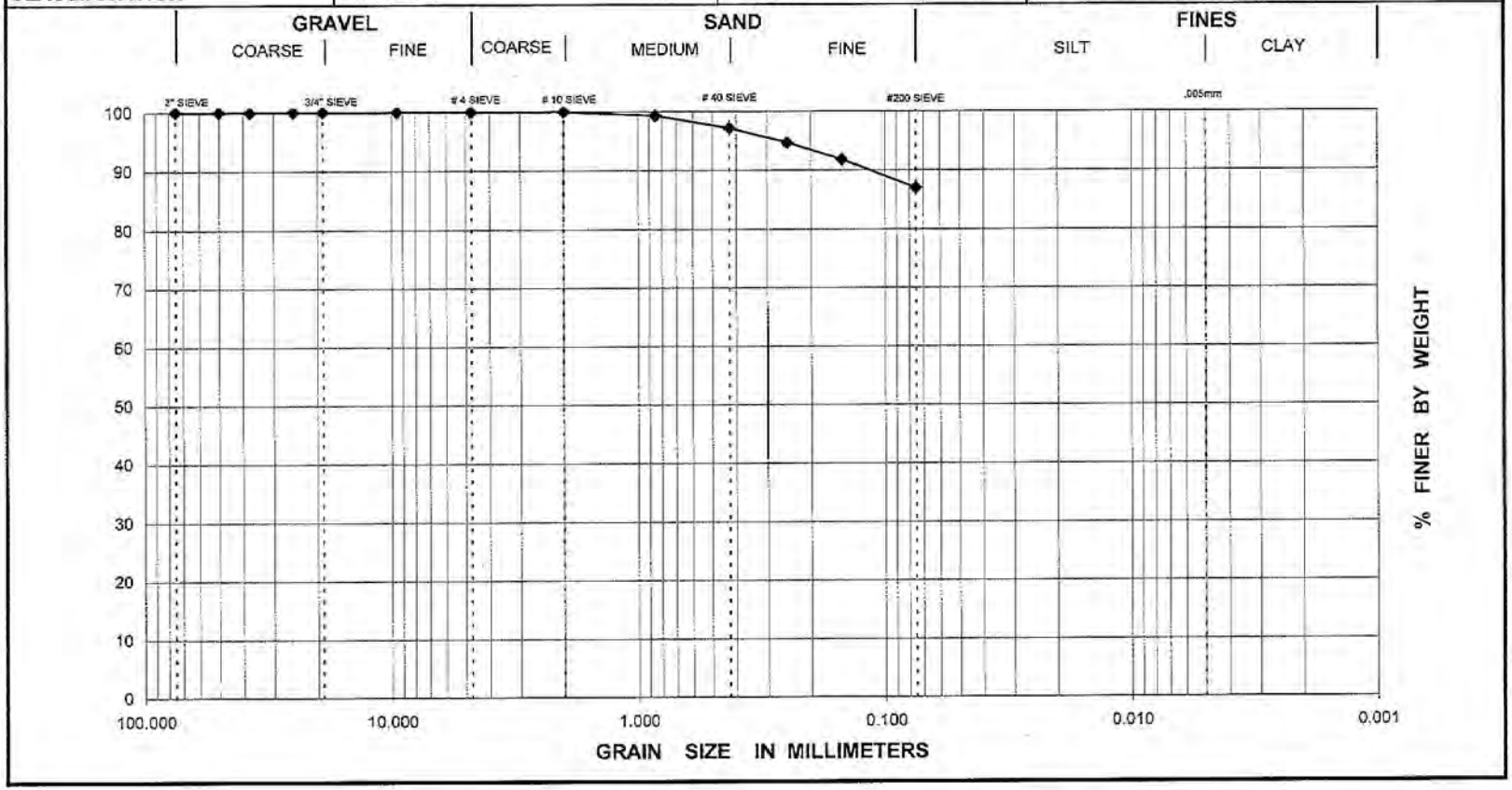
PARTICLE- SIZE DISTRIBUTION TEST REPORT

SIEVE AND HYDROMETER ASTM D422 0

REV2,08/07/06

AAR AASHTO R18

JOB NAME :	*Plant Hammond Ash Pond Dikes*						
JOB NO. :	*28900*	REPORT NO. :	*N/A*	DATE :	4/20/10	REVIEWED BY :	
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.*					SP. GRAVITY, Gs :	*N/A*
LIQUID LIMIT, % :	*47*	PLASTICITY INDEX , % :	*26*	MOISTURE , % :	N/A	FINES , % :	*87*
D10 , MM :	N/A	D30 , MM :	N/A	D60 , MM :	N/A	COEFF. OF CURVATURE , C_C :	*N/A*
CLASSIFICATION		UNIFIED :	*CL*	AASHTO :	*N/A*	COEFF. OF UNIFORMITY , C_U :	*N/A*



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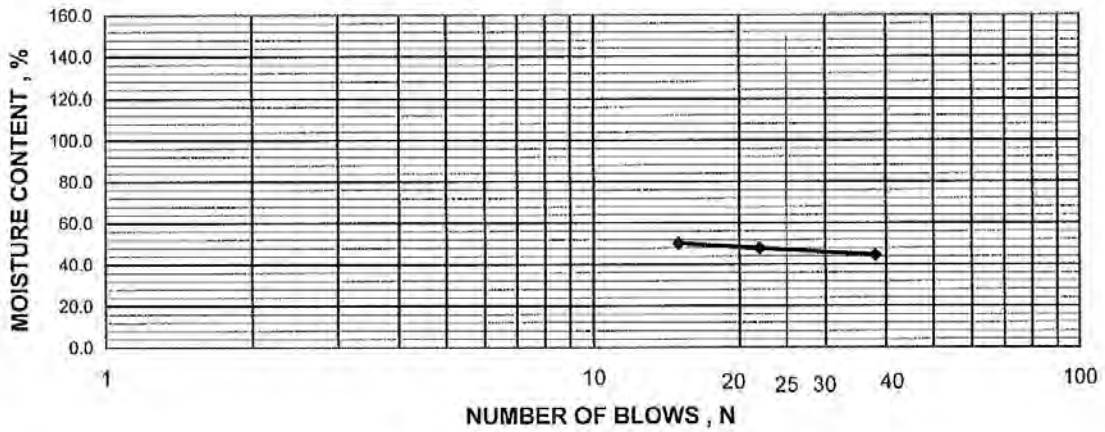
ATTERBERG LIMITS
(ASTM D 4318)

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 :	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	BRAND	MODEL	SERIAL	
NUMBER OF BLOWS	38		22		15	BALANCE	PRECISA	2200 C	
WT. WET SOIL + CAN (GRAMS)	32.20		31.59		32.70	LL MACHINE	HUMBOLT	1	
WT. DRY SOIL + CAN (GRAMS)	26.92		26.31		26.88	BALANCE	OHAUS-3100 G	ARC120	
WT. OF WATER (GRAMS)	5.28		5.28		5.82	OVEN	DESPATCH-3436	1650032533	
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	REVIEWED BY :		DATE:	4/20/10
BORING / PIT NO. :	N/A	DEPTH / ELEV. :	N/A	SAMPLE NO . :	N/A	TYPE:	UD
SAMPLE LOCATION :	AP3 @ 6'-8', foundation						
SOIL DESCRIPTION :	Yellowish red lean clay with sand (CL)						
LL, % :	35	PI , % :	17	FINES, % :	80	G_s :	2.71

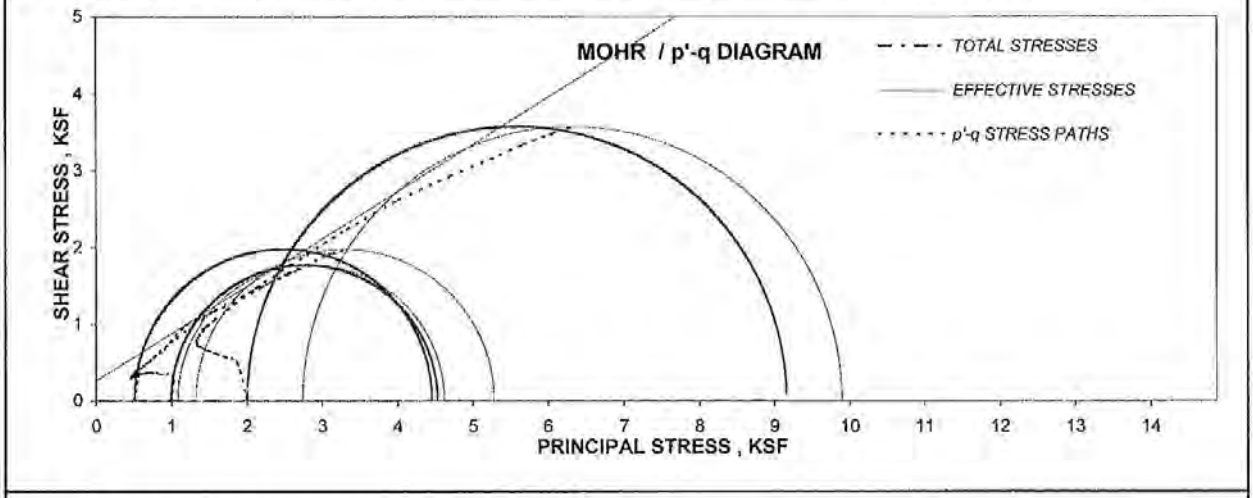
SPECIMEN PROPERTIES									TEST PARAMETERS , TEST TYPE : CU/PP				
		INITIAL			AFTER CONSOLIDATION				SPECIMEN NO.		1	2	3
SPECIMEN NO.		1	2	3		1	2	3	B Value		0.95	0.95	0.95
DIAMETER , INCHES	D_o	2.88	2.88	2.89	D_c	2.86	2.85	2.86	BACK PRESSURE, ksf	U_o	10.2	10.2	10.1
HEIGHT , INCHES	H_o	6.13	6.11	6.26	H_c	6.09	6.05	6.20	CONFINING PRESSURE , ksf	σ_3	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	σ_1-σ_3	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	σ_1-σ_3	4.0	3.5	7.2
SATURATION ,%	S_o	87.0	82.5	84.0	S_c	100	100	100	Specimen Shape @ Failure	Bulged			
VOID RATIO	e_o	0.542	0.603	0.554	e_c	0.513	0.558	0.510					

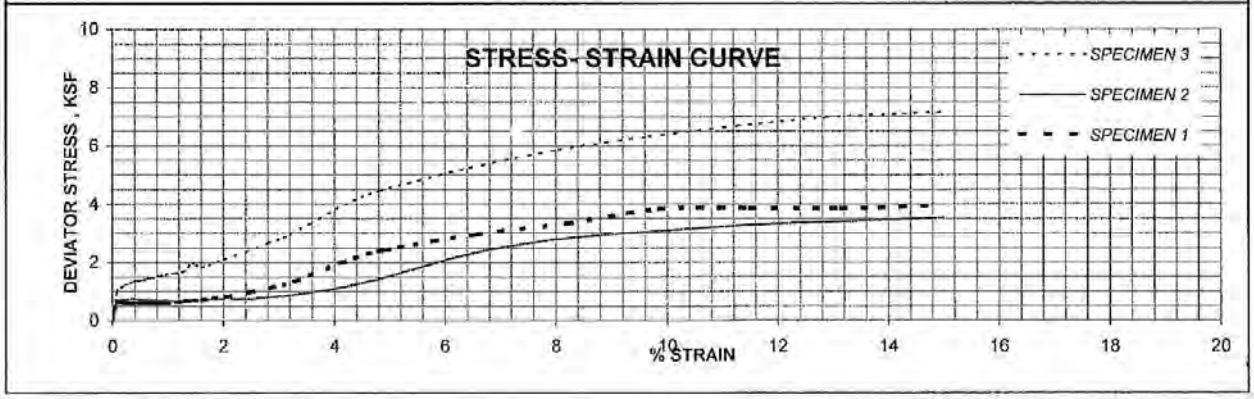
----- , Strain 0.2 % per minute T50, Minutes = 0.7

N/A

N/A

SHEAR STRENGTH PARAMETERS	TOTAL		EFFECTIVE	
	COHESION , C (ksf) :	N/A	APPARENT COHESION , (ksf) :	0.26
	ANGLE OF INTER. FRICTION, Φ(DEGREES)	N/A	ANGLE OF INTER. FRICTION, Φ' (DEGREES) :	31.7





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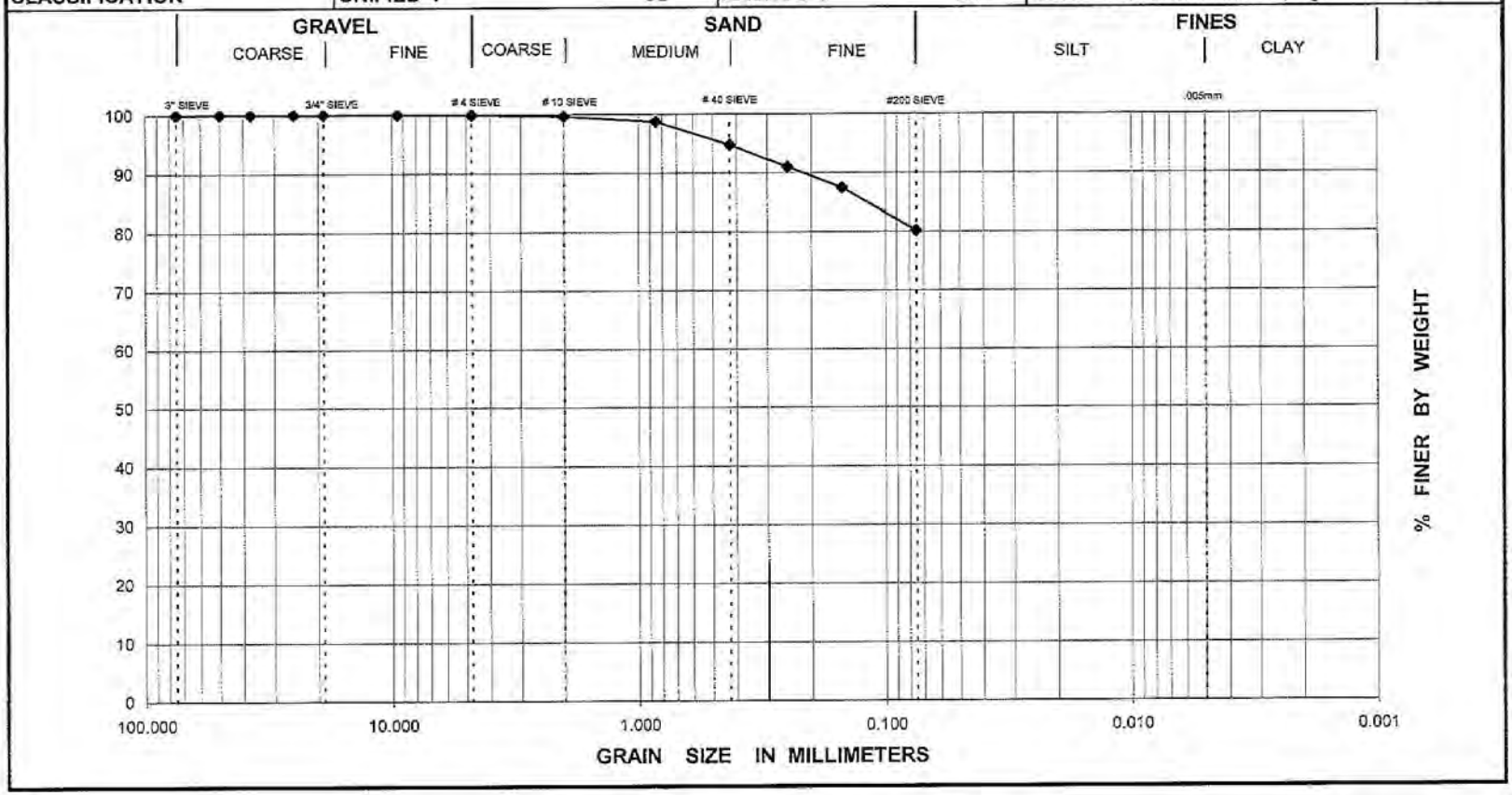
PARTICLE- SIZE DISTRIBUTION TEST REPORT

SIEVE AND HYDROMETER ASTM D422 0

REV2,08/07/06

AAR AASHTO R18

JOB NAME :	Plant Hammond Ash Pond Dikes						
JOB NO. :	28900	REPORT NO. :	N/A	DATE :	4/20/10	REVIEWED BY :	
BORING / PIT NO. :	N/A	DEPTH / ELEV. :	N/A	SAMPLE NO. :	-	SAMPLE TYPE :	UD
SAMPLE LOCATION :	AP3 @ 6'-8' foundation						
SOIL DESCRIPTION :	Yellowish red, lean clay with sand.					SP. GRAVITY, Gs :	N/A
LIQUID LIMIT, % :	35	PLASTICITY INDEX , % :	17	MOISTURE , % :	N/A	FINES , % :	80
D10 , MM :	N/A	D30 , MM :	N/A	D60 , MM :	N/A	COEFF. OF CURVATURE , C_C :	N/A
CLASSIFICATION		UNIFIED :	CL	AASHTO :	N/A	COEFF. OF UNIFORMITY , C_U :	N/A



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ATTERBERG LIMITS
(ASTM D 4318)

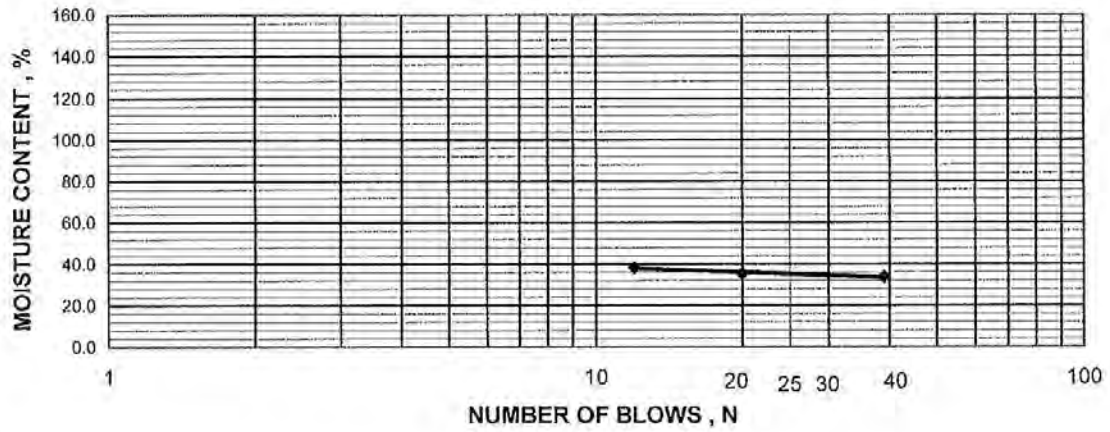
REV. 5/18/06

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

(ASTM D 4767)

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

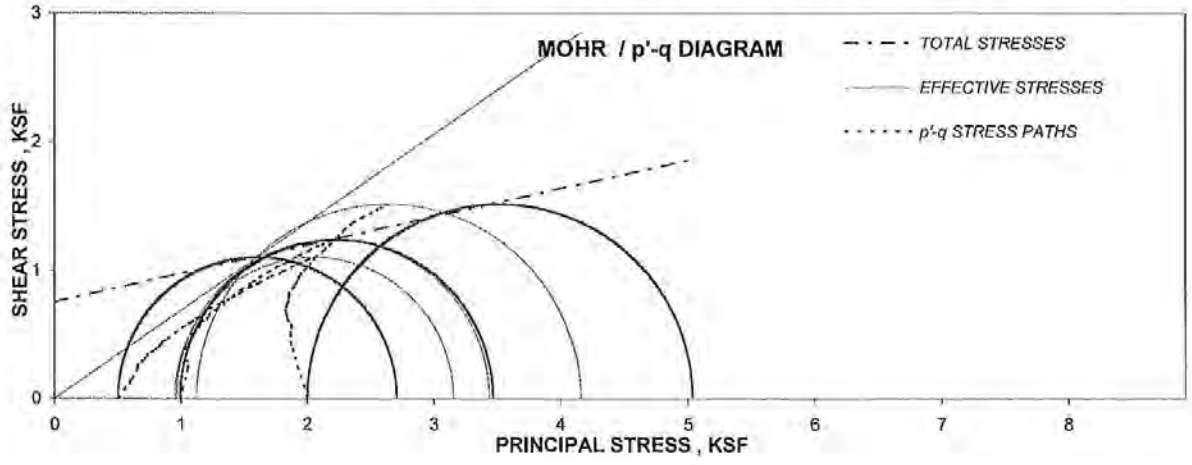
SPECIMEN PROPERTIES									TEST PARAMETERS , TEST TYPE : CU/PP				
		INITIAL			AFTER CONSOLIDATION				SPECIMEN NO.		1	2	3
SPECIMEN NO.		1	2	3		1	2	3	B Value		0.95	0.95	0.95
DIAMETER , INCHES	D_o	2.89	2.88	2.88	D_c	2.88	2.86	2.84	BACK PRESSURE, ksf	U_o	10.2	10.1	10.1
HEIGHT , INCHES	H_o	6.09	6.02	6.13	H_c	6.07	5.98	6.05	CONFINING PRESSURE , ksf	σ_3	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	σ_1-σ_3	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	σ_1-σ_3	2.2	2.5	3.0
SATURATION ,%	S_o	91.1	92.2	93.1	S_c	100	100	100	Specimen Shape @ Failure	Bulged			
VOID RATIO	e_o	0.856	0.844	0.951	e_c	0.837	0.808	0.884					

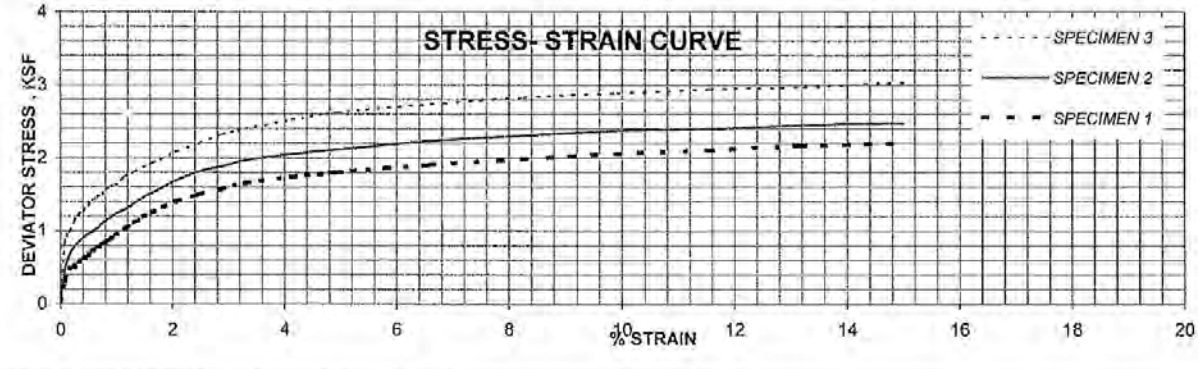
----- , Strain 0.2 % per minute T50, Minutes = 0.7

N/A

N/A

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





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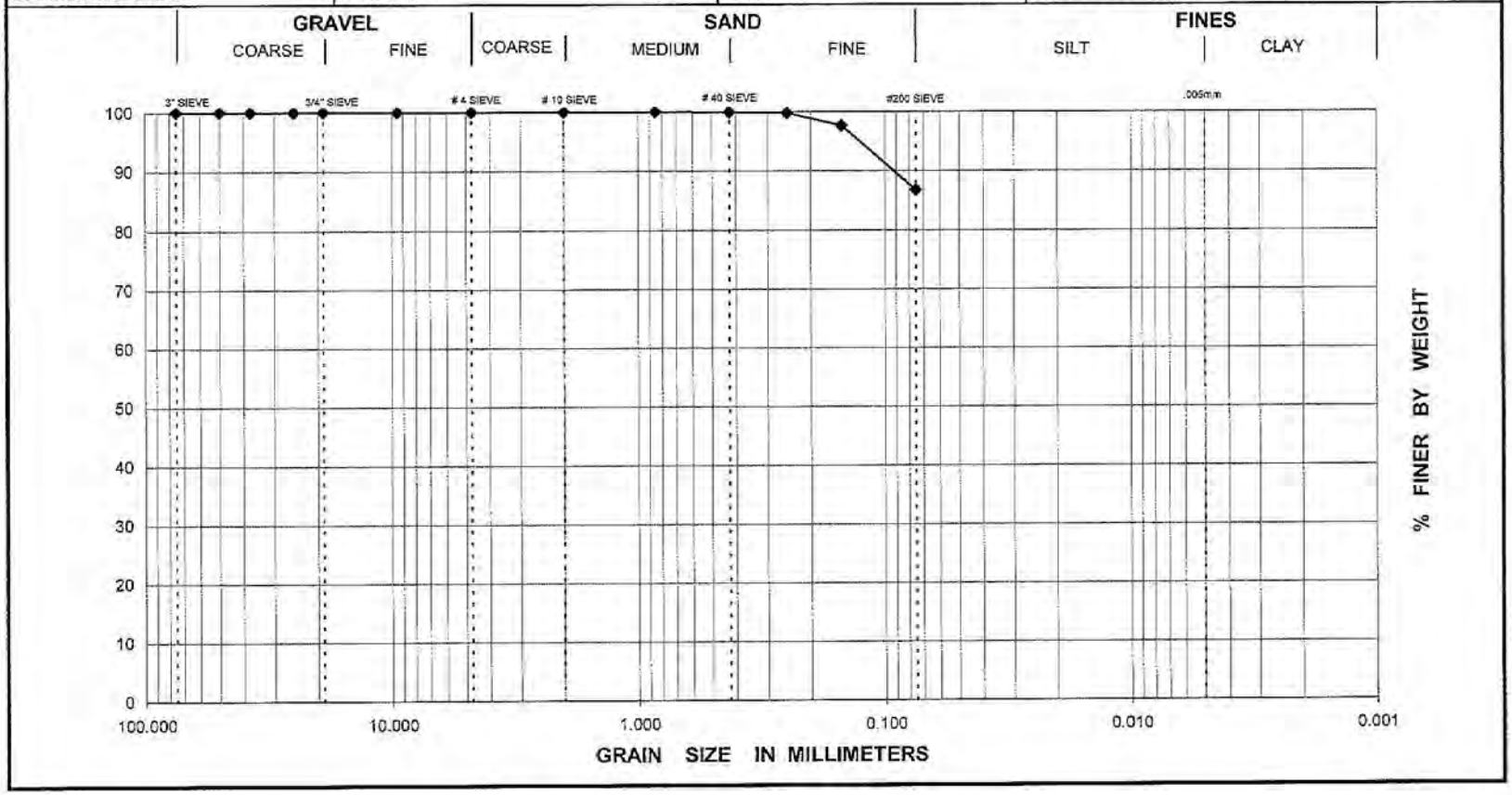
PARTICLE- SIZE DISTRIBUTION TEST REPORT

SIEVE AND HYDROMETER ASTM D422 0

REV2.08/07/06

AASHTO R16

JOB NAME :	*Plant Hammond Ash Pond Dikes*						
JOB NO. :	*28900*	REPORT NO. :	*N/A*	DATE :	4/20/10	REVIEWED BY :	
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.*					SP. GRAVITY, Gs :	*N/A*
LIQUID LIMIT, % :	*42*	PLASTICITY INDEX , % :	*17*	MOISTURE , % :	N/A	FINES , % :	*87*
D10 , MM :	N/A	D30 , MM :	N/A	D60 , MM :	N/A	COEFF. OF CURVATURE , C_C :	*N/A*
CLASSIFICATION		UNIFIED :	*CL*	AASHTO :	*N/A*	COEFF. OF UNIFORMITY , C_U :	*N/A*



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ATTERBERG LIMITS
(ASTM D 4318)

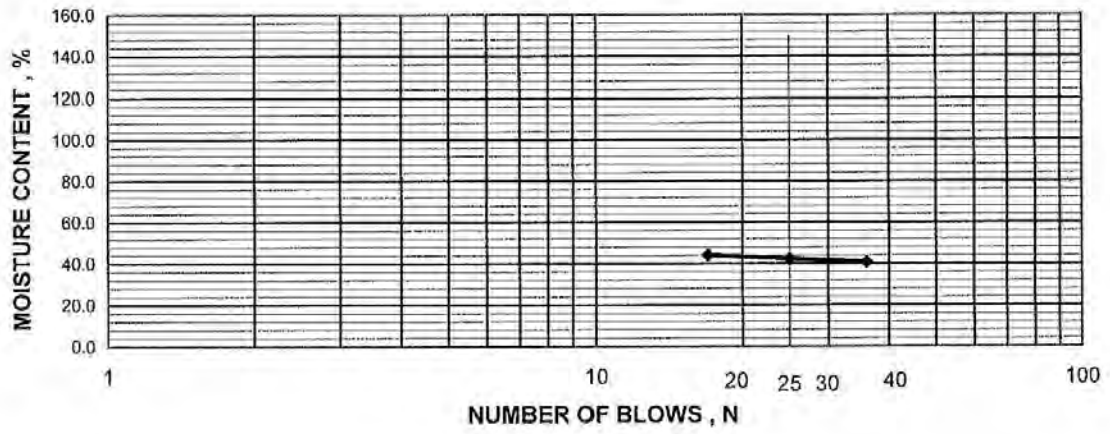
REV1,5/10/06

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 :	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	BRAND	MODEL	SERIAL	
NUMBER OF BLOWS	36		25		17	BALANCE	PRECISA	2200 C	
WT. WET SOIL + CAN (GRAMS)	31.84		35.25		34.15	LL MACHINE	HUMBOLT	1	
WT. DRY SOIL + CAN (GRAMS)	27.02		29.27		28.32	BALANCE	OHAUS-3100 G	ARC120	
WT. OF WATER (GRAMS)	4.82		5.98		5.83	OVEN	DESPATCH-3436	1650032533	
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				



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

(ASTM D 4767)

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 :	AP2 @ 4'-6' & 6'-8' fill						
SOIL DESCRIPTION :	Yellowish red clayey sand with gravel (SC)						
LL, % :	52	PI , % :	26	FINES, % :	34	G_s :	2.72

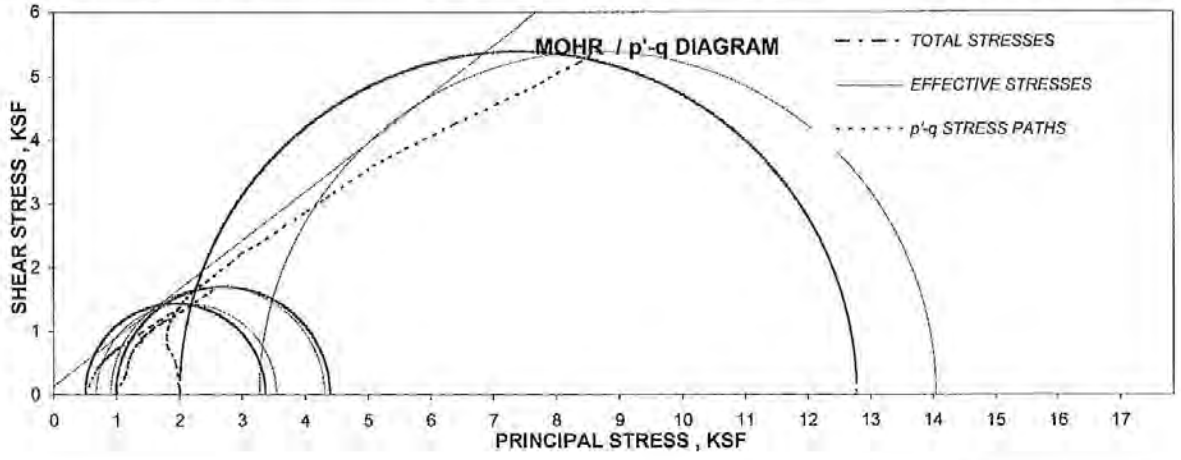
SPECIMEN PROPERTIES									TEST PARAMETERS , TEST TYPE : CU/PP				
	INITIAL				AFTER CONSOLIDATION				SPECIMEN NO.		1	2	3
SPECIMEN NO.		1	2	3		1	2	3	B Value		0.95	0.95	0.95
DIAMETER , INCHES	D_o	2.88	2.90	2.90	D_c	2.87	2.89	2.88	BACK PRESSURE, ksf	U_o	10.2	10.2	10.1
HEIGHT , INCHES	H_o	6.25	6.32	6.39	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	σ_1-σ_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	σ_1-σ_3	2.9	3.4	10.8
SATURATION ,%	S_o	69.0	74.0	89.4	S_c	100	100	100	Specimen Shape @ Failure	Bulged			
VOID RATIO	e_o	0.501	0.551	0.479	e_c	0.493	0.535	0.458					

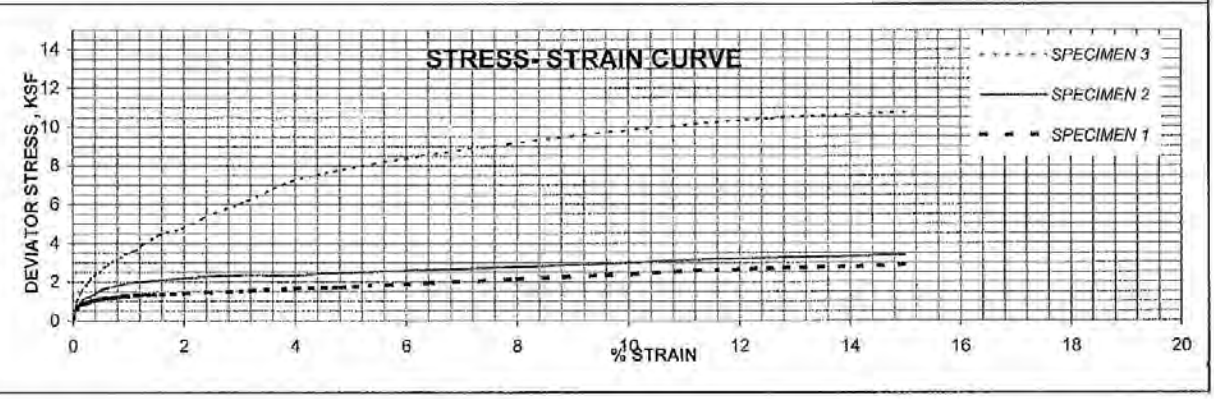
----- , Strain 0.2 % per minute T50, Minutes = 0.6

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





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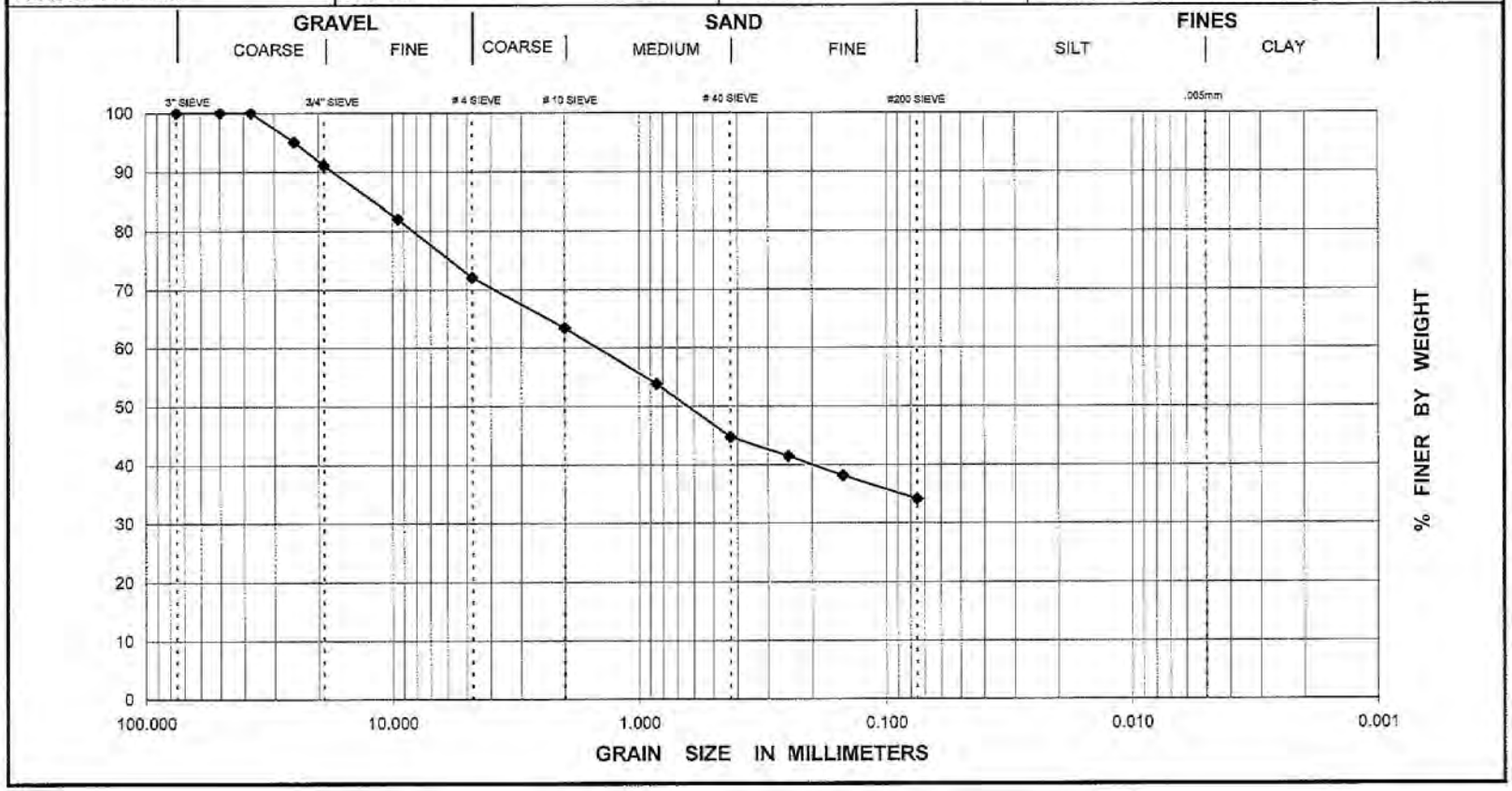
PARTICLE- SIZE DISTRIBUTION TEST REPORT

SIEVE AND HYDROMETER ASTM D422 0

REV2,09/07/06

AASHTO R1b

JOB NAME :	*Plant Hammond Ash Pond Dikes*						
JOB NO. :	*28900*	REPORT NO. :	*N/A*	DATE :	4/20/10	REVIEWED BY :	
BORING / PIT NO. :	*N/A*	DEPTH / ELEV. :	*N/A*	SAMPLE NO. :	-	SAMPLE TYPE :	*UD*
SAMPLE LOCATION :	AP2 @ 4'-6' fill						
SOIL DESCRIPTION :	*Yellowish red clayey sand with gravel.*					SP. GRAVITY, Gs :	*N/A*
LIQUID LIMIT, % :	*52*	PLASTICITY INDEX , % :	*26*	MOISTURE , % :	N/A	FINES , % :	*34*
D10 , MM :	N/A	D30 , MM :	N/A	D60 , MM :	N/A	COEFF. OF CURVATURE , C_C :	*N/A*
CLASSIFICATION		UNIFIED :	*SC*	AASHTO :	*N/A*	COEFF. OF UNIFORMITY , C_U :	*N/A*



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ATTERBERG LIMITS
(ASTM D 4318)

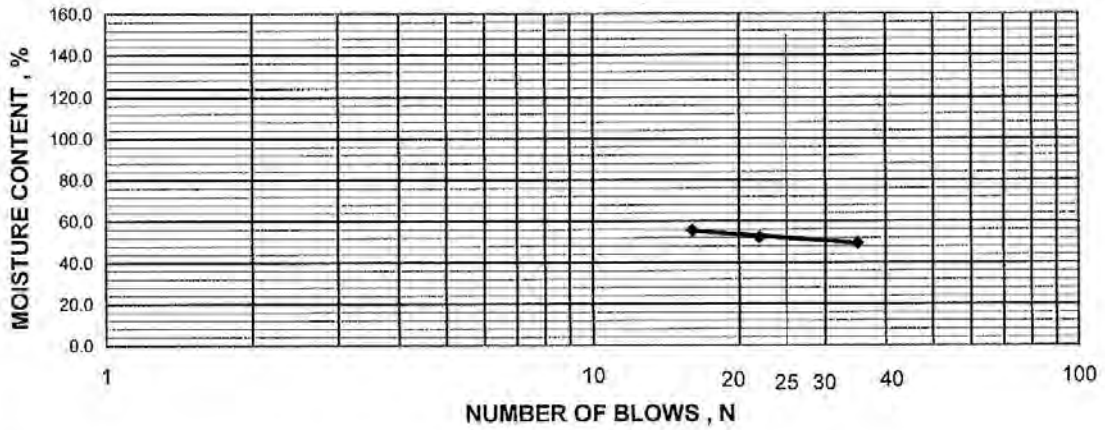
REV. 5/10/06

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 :	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 3435	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)

REV5,3/05/07

JOB NAME:	Plant Hammond Ash Pond Dikes				
JOB NO.:	28900	REPORT NO. :	N/A	REVIEWED BY :	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		INITIAL			AFTER CONSOLIDATION			
SPECIMEN NO.		1	2	3		1	2	3
DIAMETER , INCHES	D_o	2.87	2.90	2.88	D_c	2.85	2.90	2.86
HEIGHT , INCHES	H_o	6.13	6.35	6.23	H_c	6.11	6.34	6.21
WATER CONTENT, %	W_o	15.1	15.3	17.3	W_c	19.2	17.7	18.0
DRY DENSITY, PCF	γ_{dryo}	109.8	113.4	112.1	γ_{dryc}	111.0	113.9	113.3
SATURATION ,%	S_o	76.3	85.3	92.8	S_c	100	100	100
VOID RATIO	e_o	0.534	0.485	0.502	e_c	0.517	0.479	0.487

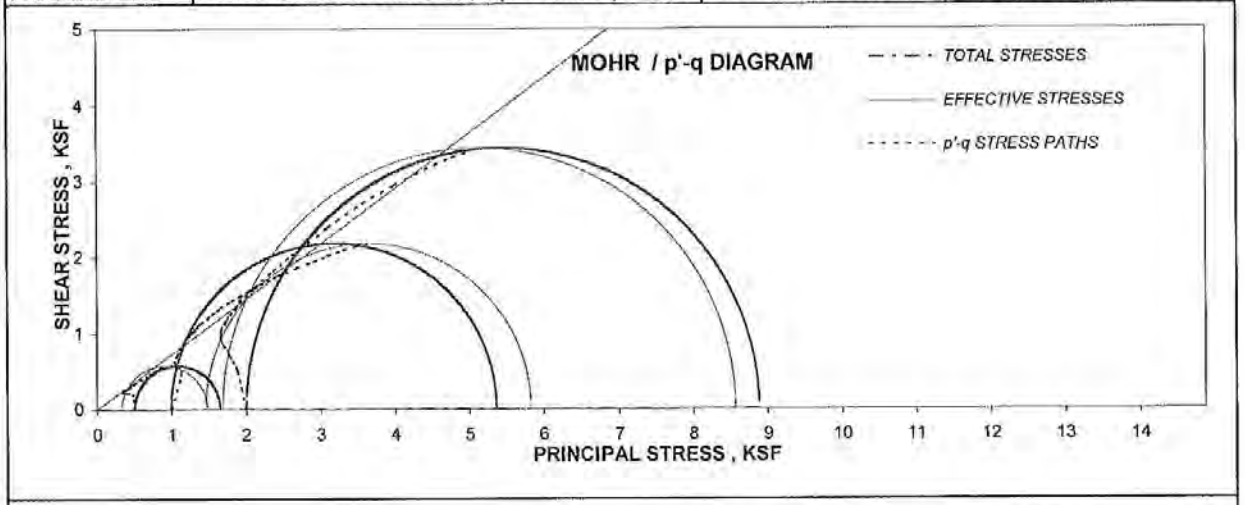
TEST PARAMETERS , TEST TYPE : CU/PP				
SPECIMEN NO.		1	2	3
B Value		0.95	0.95	0.95
BACK PRESSURE, ksf	U_o	10.1	10.2	10.1
CONFINING PRESSURE , ksf	σ_3	0.5	1.0	2.0
MAX. DEVIATOR STRESS ,ksf	$\sigma_1-\sigma_3$	1.1	4.4	6.9
ULT. DEVIATOR STRESS , ksf	$\sigma_1-\sigma_3$	1.1	4.4	6.9
Specimen Shape @ Failure		Bulged		

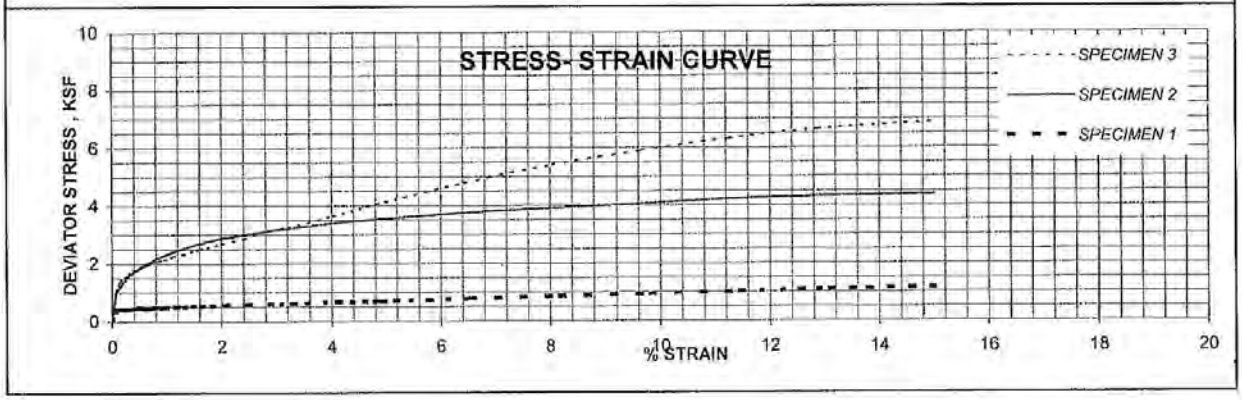
----- , Strain 0.02 % per minute T50, Minutes = 20

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





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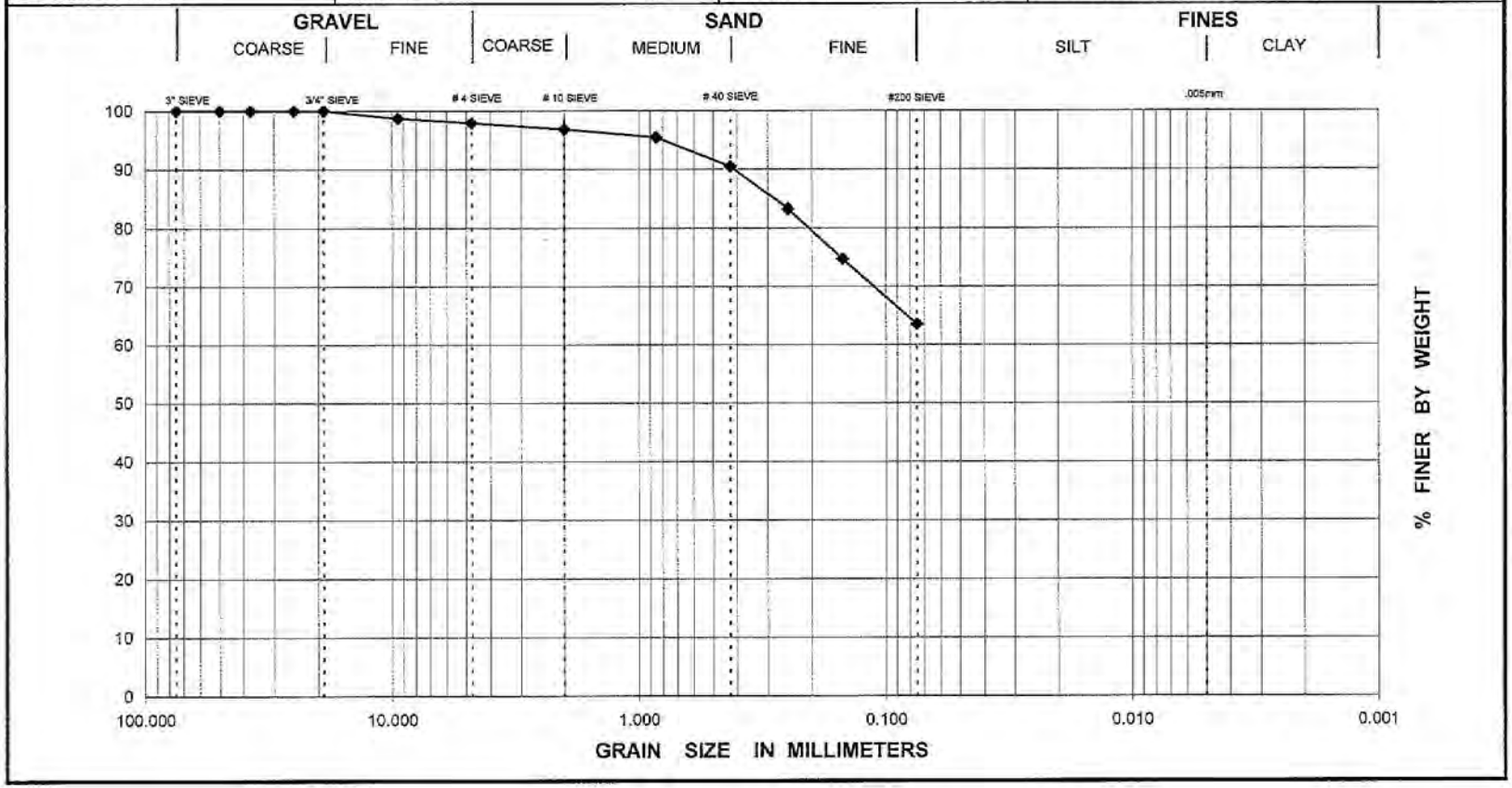
PARTICLE- SIZE DISTRIBUTION TEST REPORT

SIEVE AND HYDROMETER ASTM D422 0

REV2,08/07/06

AAR AASHTO R18

JOB NAME :	Plant Hammond Ash Pond Dikes						
JOB NO. :	28900	REPORT NO. :	N/A	DATE :	4/16/10	REVIEWED BY :	
BORING / PIT NO. :	N/A	DEPTH / ELEV. :	N/A	SAMPLE NO. :	-	SAMPLE TYPE :	UD
SAMPLE LOCATION :	AP3 @ 8'-10' & 10'-12' fill						
SOIL DESCRIPTION :	Reddish yellow sandy fat clay with a trace of gravel.					SP. GRAVITY, Gs :	N/A
LIQUID LIMIT, % :	53	PLASTICITY INDEX , % :	36	MOISTURE , % :	N/A	FINES , % :	63
D10 , MM :	N/A	D30 , MM :	N/A	D60 , MM :	N/A	COEFF. OF CURVATURE , C_C :	N/A
CLASSIFICATION		UNIFIED :	CH	AASHTO :	N/A	COEFF. OF UNIFORMITY , C_U :	N/A



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ATTERBERG LIMITS
(ASTM D 4318)

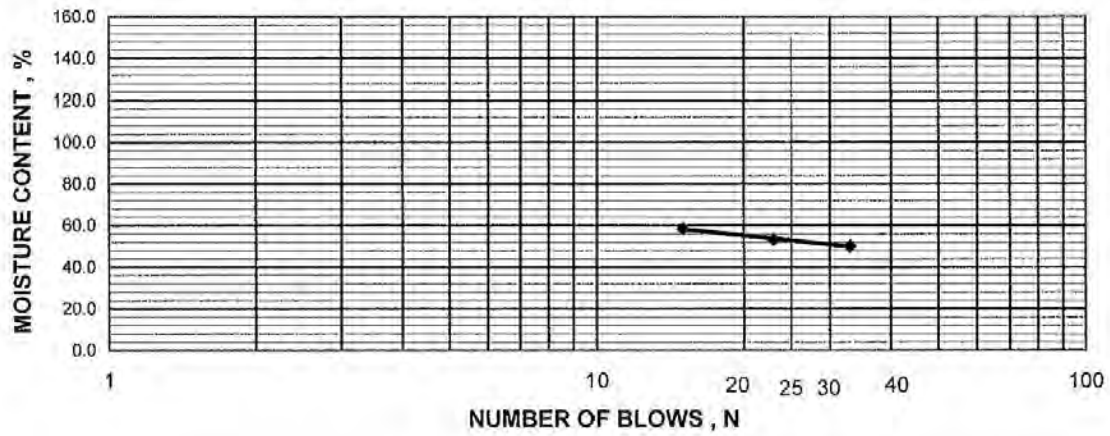
REV,.5/10/06

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	BRAND	MODEL	SERIAL			
NUMBER OF BLOWS	33	23	15	BALANCE	PRECISA	2200 C			
WT. WET SOIL + CAN (GRAMS)	29.96	29.97	29.01	LL MACHINE	HUMBOLT	1			
WT. DRY SOIL + CAN (GRAMS)	24.98	24.85	23.93	BALANCE	OHAUS-3100 G	ARC120			
WT. OF WATER (GRAMS)	4.98	5.12	5.08	OVEN	DESPATCH-3436	1650032533			
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 :		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

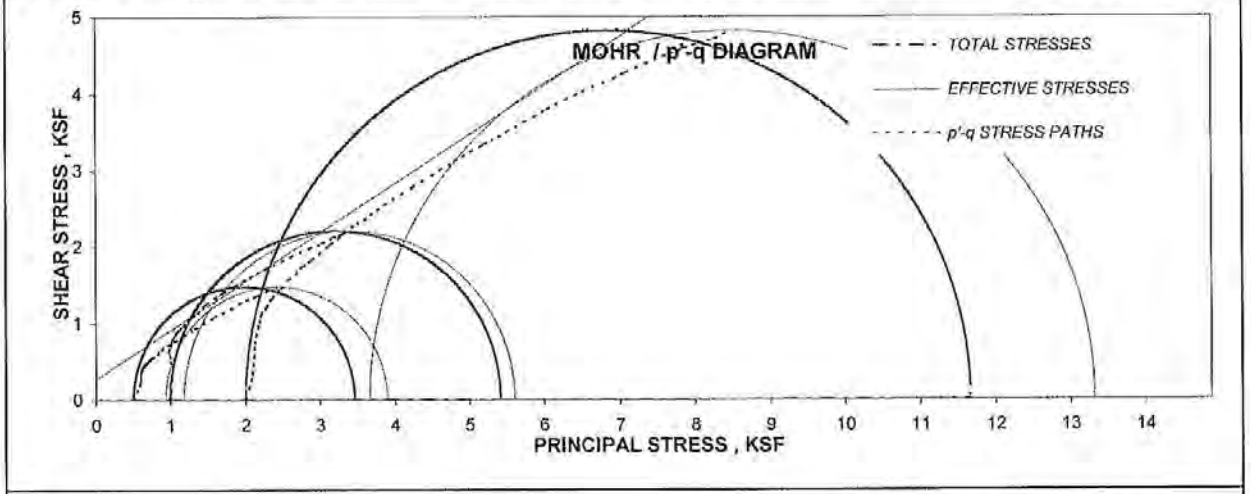
SPECIMEN PROPERTIES									TEST PARAMETERS , TEST TYPE : CU/PP				
		INITIAL			AFTER CONSOLIDATION				SPECIMEN NO.		1	2	3
SPECIMEN NO.		1	2	3		1	2	3	B Value		0.95	0.95	0.95
DIAMETER , INCHES	D_o	2.87	2.88	2.88	D_c	2.86	2.87	2.87	BACK PRESSURE, ksf	U_o	10.1	10.2	10.1
HEIGHT , INCHES	H_o	6.10	6.09	6.11	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	$\sigma_1-\sigma_3$	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	$\sigma_1-\sigma_3$	3.0	4.4	9.7
SATURATION ,%	S_o	85.1	98.4	88.4	S_c	100	100	100	Specimen Shape @ Failure	Sheared			
VOID RATIO	e_o	0.460	0.391	0.372	e_c	0.447	0.380	0.353					

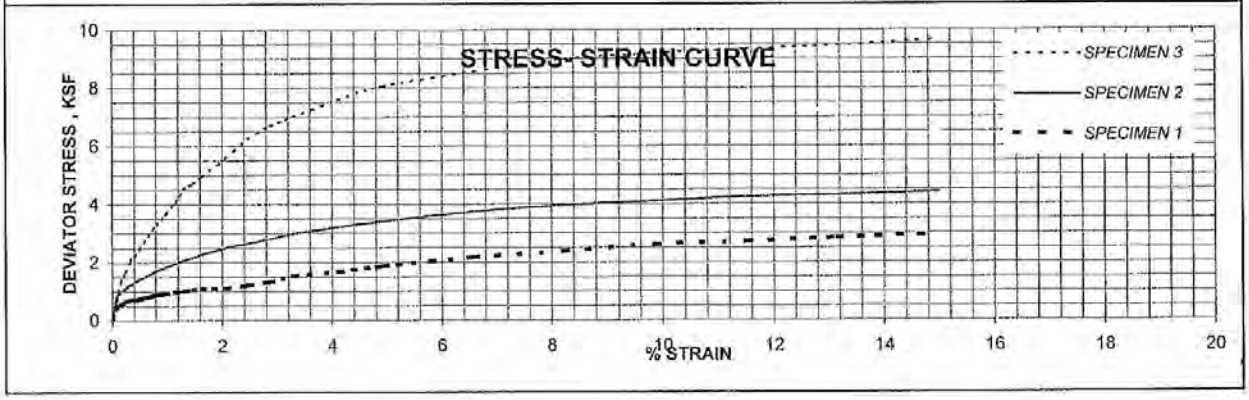
----- , Strain 0.2 % per minute T50, Minutes = 2

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





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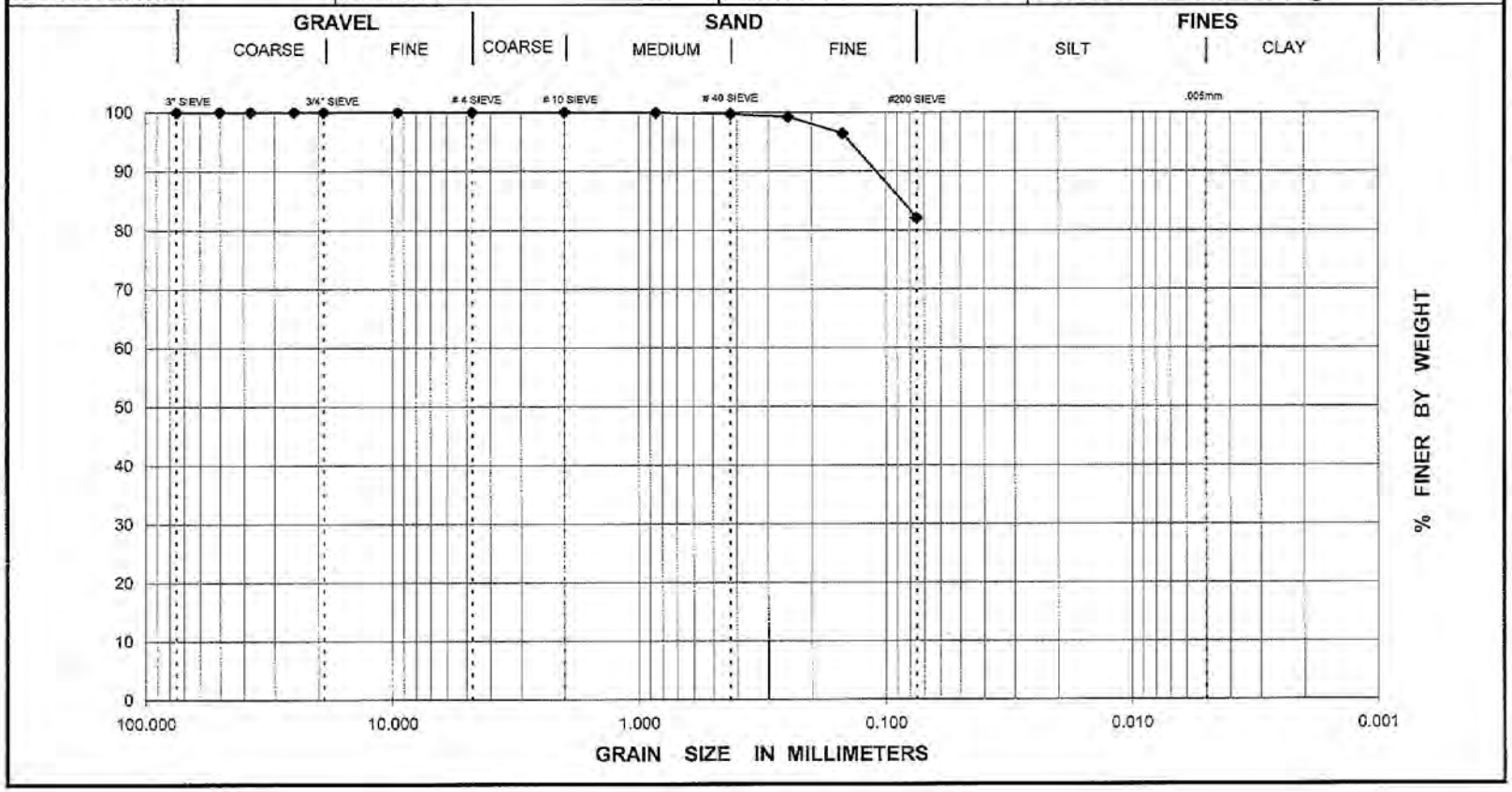
PARTICLE- SIZE DISTRIBUTION TEST REPORT

SIEVE AND HYDROMETER ASTM D422 0

REV2.06/07/06

AASHTO R18

JOB NAME :	*Plant Hammond Ash Pond Dikes*						
JOB NO. :	*28900*	REPORT NO. :	*N/A*	DATE :	3/26/10	REVIEWED BY :	
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.*					SP. GRAVITY, Gs :	*N/A*
LIQUID LIMIT, % :	*25*	PLASTICITY INDEX , % :	*12*	MOISTURE , % :	N/A	FINES , % :	*82*
D10 , MM :	N/A	D30 , MM :	N/A	D60 , MM :	N/A	COEFF. OF CURVATURE , C_C :	*N/A*
CLASSIFICATION		UNIFIED :	-	AASHTO :	*N/A*	COEFF. OF UNIFORMITY , C_U :	*N/A*



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ATTERBERG LIMITS
(ASTM D 4318)

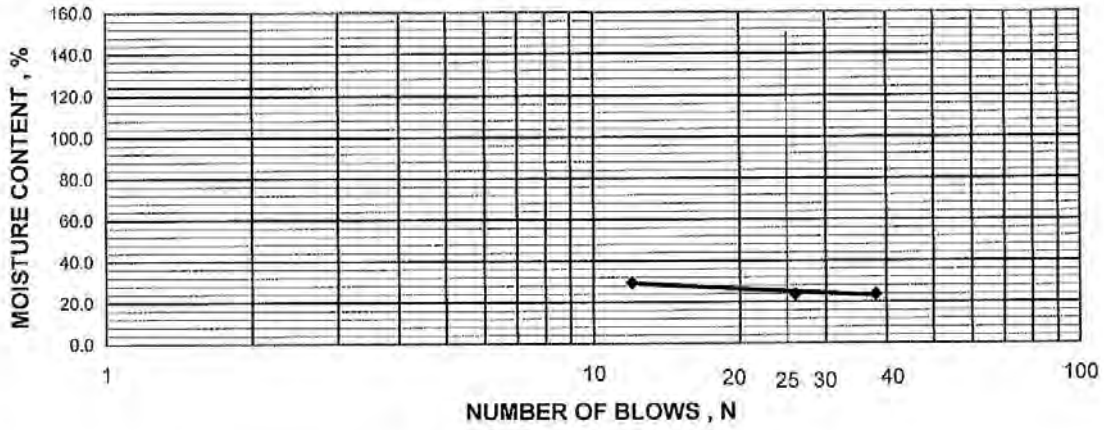
REV., 5/10/06

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 :	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)

REV6,3/05/07

JOB NAME:	Plant Hammond Ash Pond Dikes						
JOB NO.:	28900	REPORT NO. :	N/A	REVIEWED BY :		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

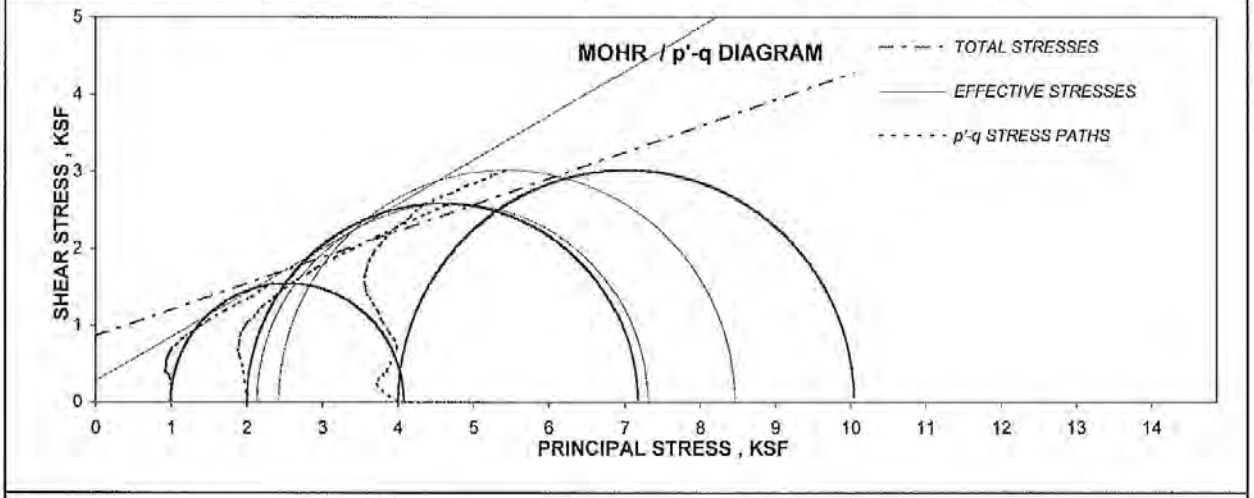
SPECIMEN PROPERTIES									TEST PARAMETERS , TEST TYPE : CU/PP				
		INITIAL			AFTER CONSOLIDATION				SPECIMEN NO.		1	2	3
SPECIMEN NO.		1	2	3		1	2	3	B Value		0.95	0.95	0.95
DIAMETER , INCHES	D_o	2.88	2.88	2.88	D_c	2.86	2.86	2.86	BACK PRESSURE, ksf	U_o	10.2	10.2	10.1
HEIGHT , INCHES	H_o	5.93	6.03	6.02	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 @ Failure	Sheared			
VOID RATIO	e_o	0.667	0.671	0.704	e_c	0.638	0.641	0.663					

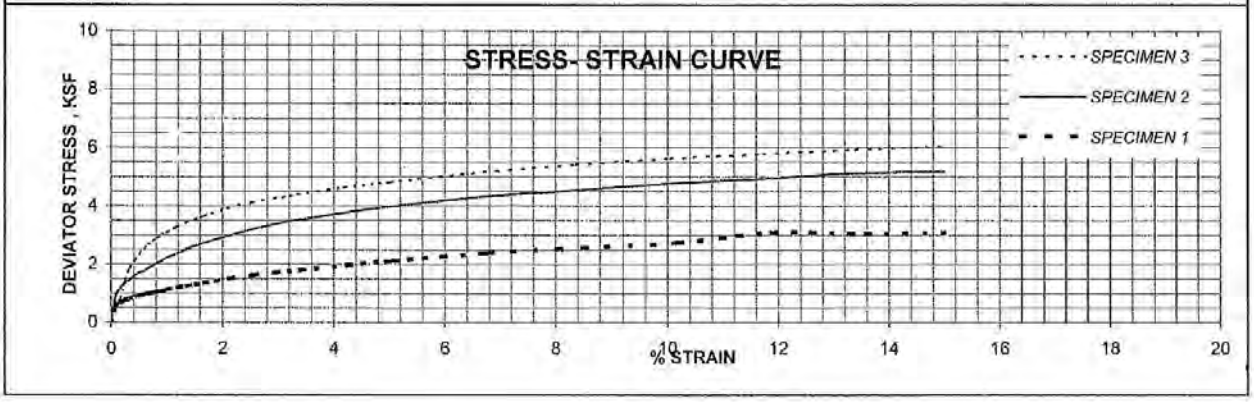
----- , Strain 0.2 % per minute T50, Minutes = 2

N/A

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





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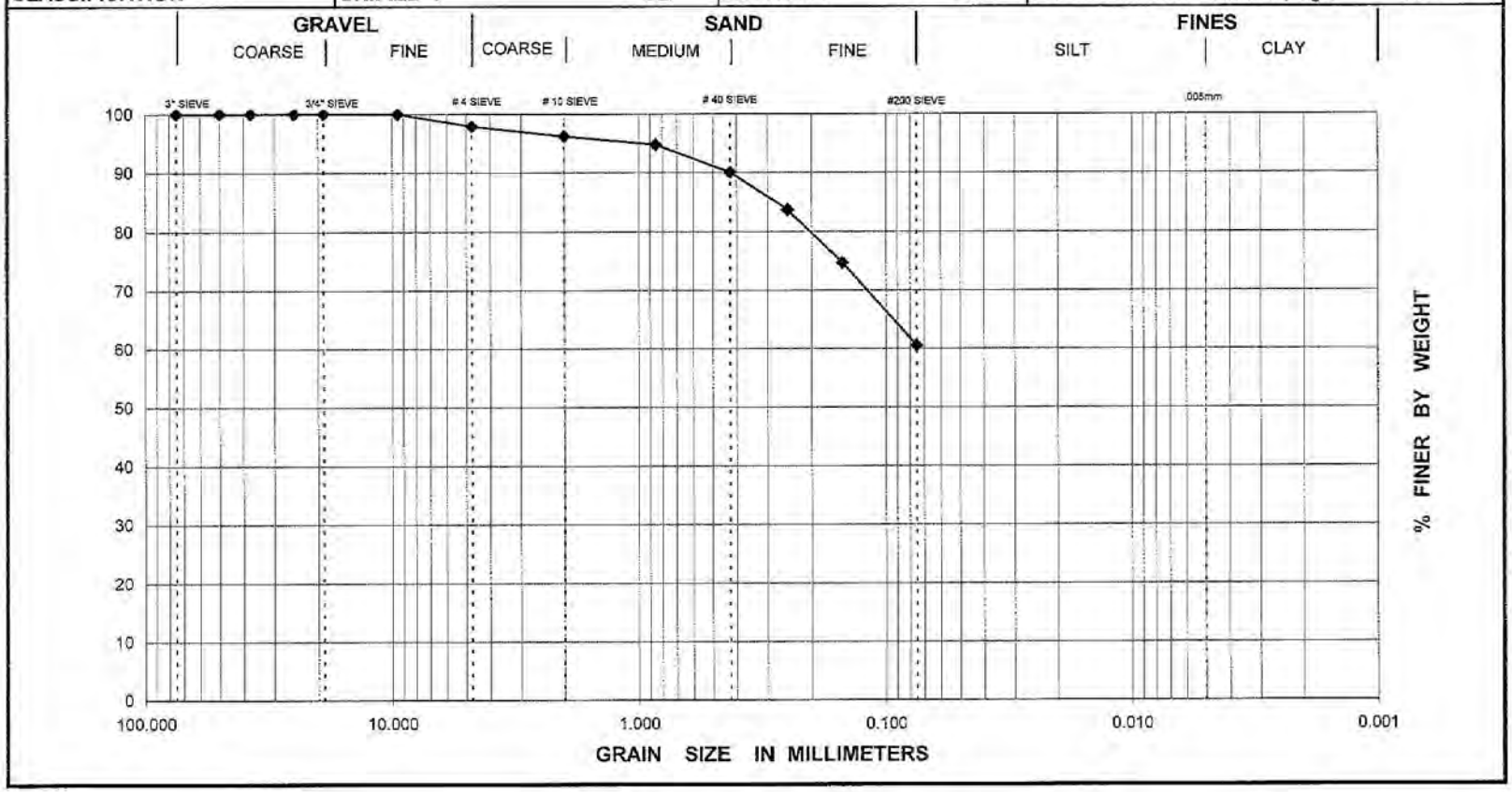
PARTICLE- SIZE DISTRIBUTION TEST REPORT

SIEVE AND HYDROMETER ASTM D422 0

REV2,06/07/06

AAR AASHTO R18

JOB NAME :	*Plant Hammond Ash Pond Dikes*						
JOB NO. :	*28900*	REPORT NO. :	*N/A*	DATE :	3/26/10	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.*					SP. GRAVITY, Gs :	*N/A*
LIQUID LIMIT, % :	*40*	PLASTICITY INDEX , % :	*15*	MOISTURE , % :	N/A	FINES , % :	*60*
D10 , MM :	N/A	D30 , MM :	N/A	D60 , MM :	N/A	COEFF. OF CURVATURE , C_C :	*N/A*
CLASSIFICATION		UNIFIED :	*CL*	AASHTO :	*N/A*	COEFF. OF UNIFORMITY , C_U :	*N/A*



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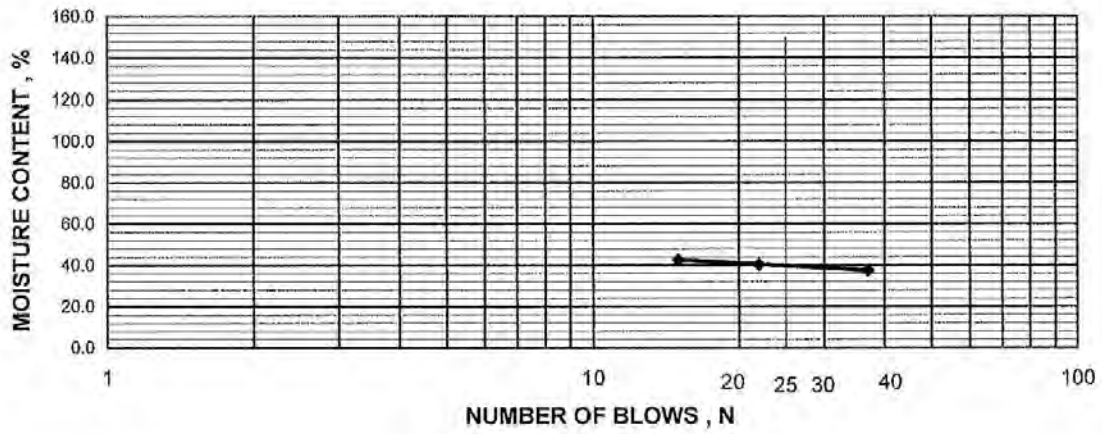
ATTERBERG LIMITS
(ASTM D 4318)

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	BRAND	MODEL	SERIAL	
NUMBER OF BLOWS	37	22	15	BALANCE	PRECISA	2200 C	
WT. WET SOIL + CAN (GRAMS)	28.49	29.57	32.23	LL MACHINE	HUMBOLT	1	
WT. DRY SOIL + CAN (GRAMS)	24.84	25.42	27.09	BALANCE	OHAUS-3100 G	ARC120	
WT. OF WATER (GRAMS)	3.65	4.15	5.14	OVEN	DESPATCH-3436	1650032533	
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:	Plant Hammond Ash Pond Dikes						
JOB NO.:	28900	REPORT NO. :	N/A	REVIEWED BY :		DATE:	3/24/10
BORING / PIT NO. :	N/A	DEPTH / ELEV. :	N/A	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

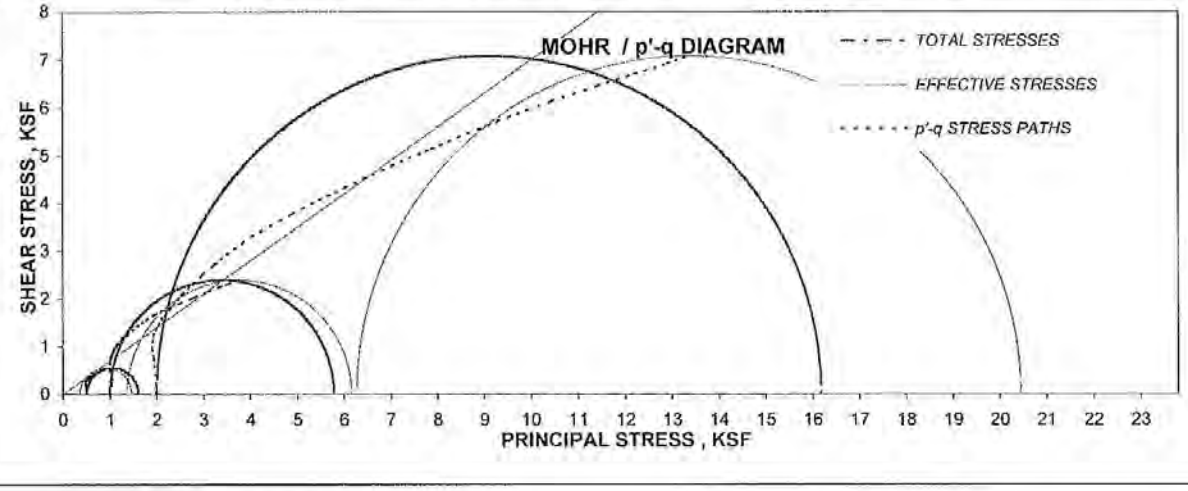
SPECIMEN PROPERTIES									TEST PARAMETERS , TEST TYPE : CU/PP				
		INITIAL			AFTER CONSOLIDATION				SPECIMEN NO.		1	2	3
SPECIMEN NO.		1	2	3		1	2	3	B Value		0.95	0.95	0.95
DIAMETER , INCHES	D_o	2.89	2.89	2.88	D_c	2.86	2.88	2.87	BACK PRESSURE, ksf	U_o	11.6	11.5	11.6
HEIGHT , INCHES	H_o	5.89	6.29	6.06	H_c	5.85	6.28	6.03	CONFINING PRESSURE , ksf	σ_3	0.5	1.0	2.0
WATER CONTENT, %	W_o	21.8	14.5	18.4	W_c	22.2	15.4	17.4	MAX. DEVIATOR STRESS ,ksf	σ_1-σ_3	1.1	4.8	14.2
DRY DENSITY, PCF	γ_{dryo}	102.0	117.1	111.9	γ_{dryc}	104.4	117.7	113.5	ULT. 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	Specimen Shape @ Failure	Sheared			
VOID RATIO	e_o	0.627	0.417	0.483	e_c	0.590	0.409	0.462					

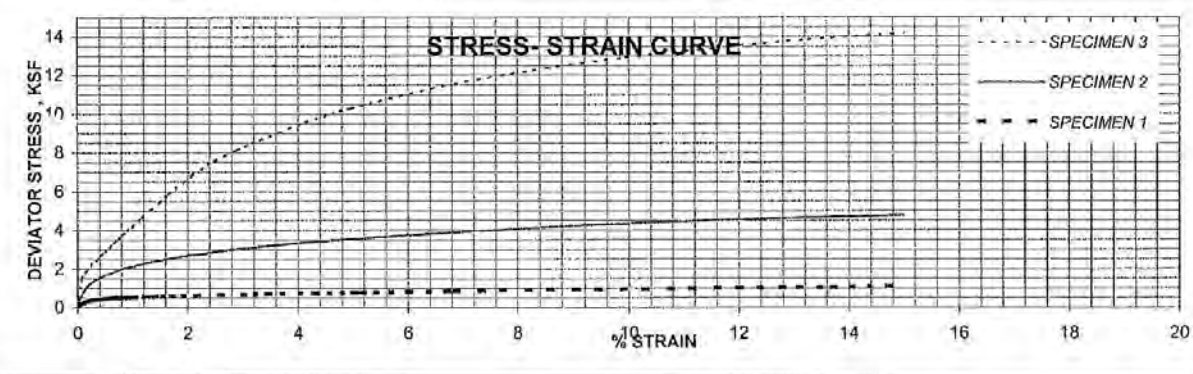
----- , Strain 0.04 % per minute T50, Minutes = 10

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





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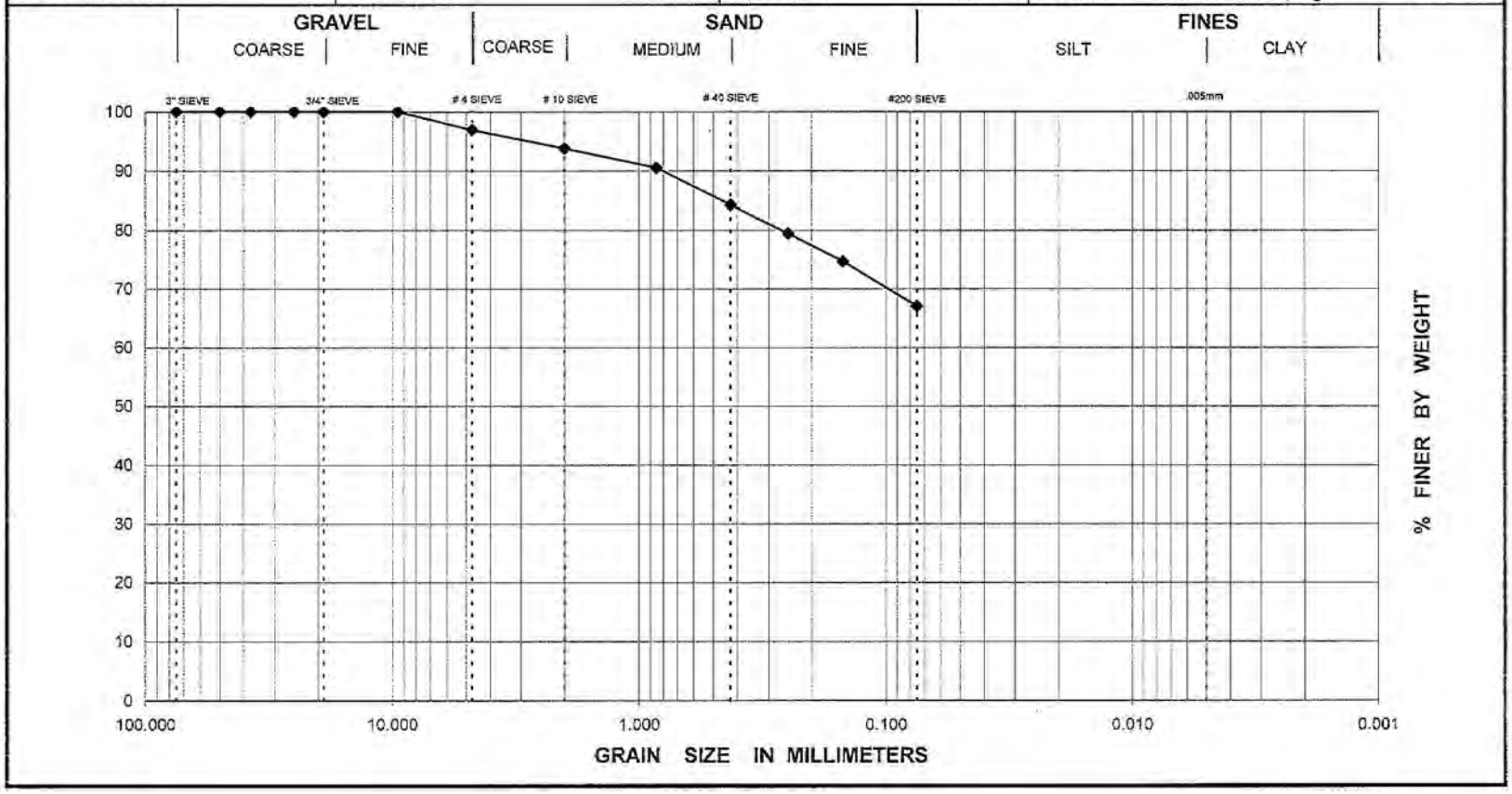
PARTICLE- SIZE DISTRIBUTION TEST REPORT

SIEVE AND HYDROMETER ASTM D422 0

REV2,08/07/06

AASHTO R18

JOB NAME :	*Plant Hammond Ash Pond Dikes*						
JOB NO. :	*28900*	REPORT NO. :	*N/A*	DATE :	3/26/10	REVIEWED BY :	
BORING / PIT NO. :	*N/A*	DEPTH / ELEV. :	*N/A*	SAMPLE NO. :	*N/A*	SAMPLE TYPE :	*UD*
SAMPLE LOCATION :	AP3-1 @ 8'-10'						
SOIL DESCRIPTION :	*Yellowish brown, sandy lean clay with gravel.*					SP. GRAVITY, Gs :	*N/A*
LIQUID LIMIT, % :	*33*	PLASTICITY INDEX , % :	*17*	MOISTURE , % :	N/A	FINES , % :	*67*
D10 , MM :	N/A	D30 , MM :	N/A	D60 , MM :	N/A	COEFF. OF CURVATURE , C_C :	*N/A*
CLASSIFICATION		UNIFIED :	*CL*	AASHTO :	*N/A*	COEFF. OF UNIFORMITY , C_U :	*N/A*



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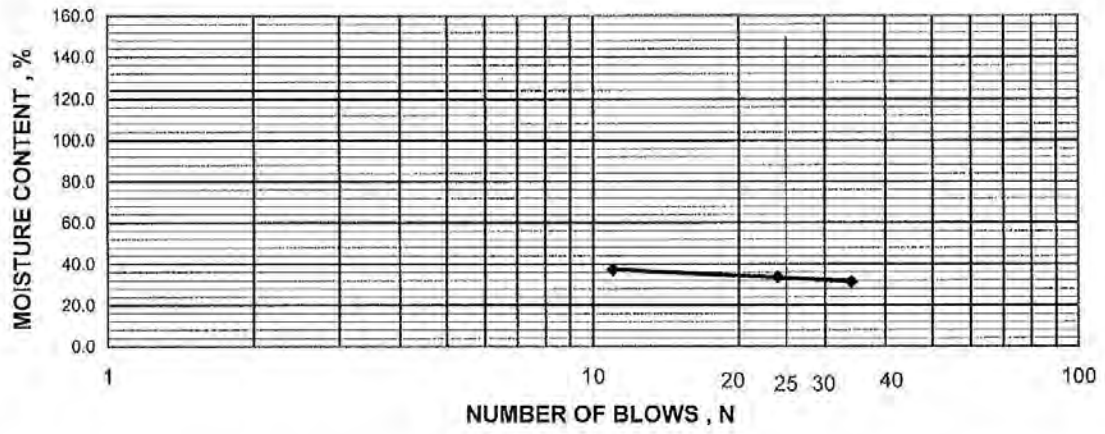
ATTERBERG LIMITS
(ASTM D 4318)

REV. 5/10/06

JOB NAME :	Plant Hammond Ash Pond Dikes						
JOB NO. :	28900	REPORT NO. :	-	DATE :	03/31/10	REVIEWED BY :	
BORING / PIT NO. :	AP3-1	DEPTH / ELEV. :	8'-10'	SAMPLE NO. :	N/A	SAMPLE TYPE :	UD
SAMPLE LOCATION : -							
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

S&ME

ATTERBERG LIMITS
(ASTM D 4318)

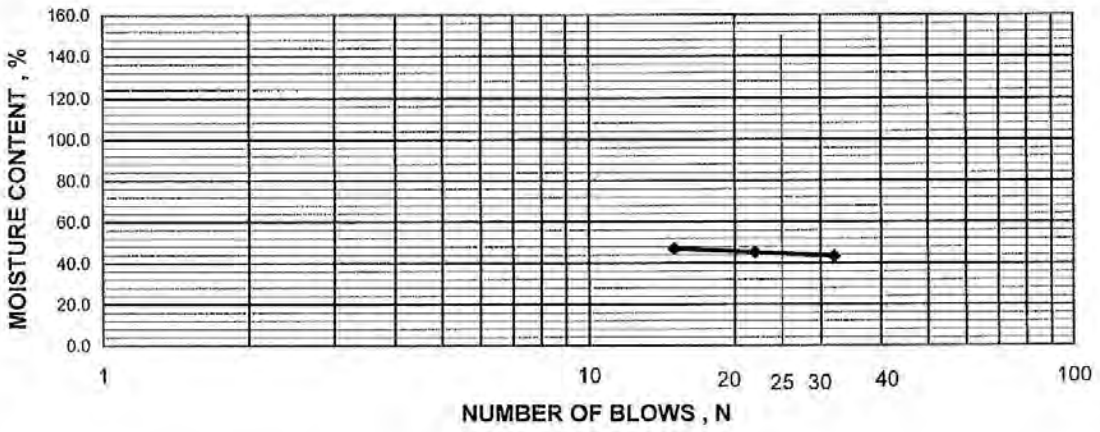
REV 5/10/06

JOB NAME :	Plant Hammond Ash Pond Dikes						
JOB NO. :	28900	REPORT NO. :	N/A	DATE :	03/26/10	REVIEWED BY :	
BORING / PIT NO. :	N/A	DEPTH / ELEV. :	N/A	SAMPLE NO. :	N/A	SAMPLE TYPE :	UD
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	BRAND	MODEL	SERIAL	
NUMBER OF BLOWS	32	22	15	BALANCE	PRECISA	2200 C	
WT. WET SOIL + CAN (GRAMS)	29.18	29.88	30.36	LL MACHINE	HUMBOLT	1	
WT. DRY SOIL + CAN (GRAMS)	25.04	25.56	25.64	BALANCE	OHAUS-3100 G	ARC120	
WT. OF WATER (GRAMS)	4.14	4.32	4.72	OVEN	DESPATCH-3436	1650032533	
WT. OF CONTAINER (GRAMS)	15.49	16.00	15.58				
WT. OF DRY SOIL (GRAMS)	9.55	9.56	10.06				
WATER CONTENT, (%)	43.35	45.19	46.92				



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)

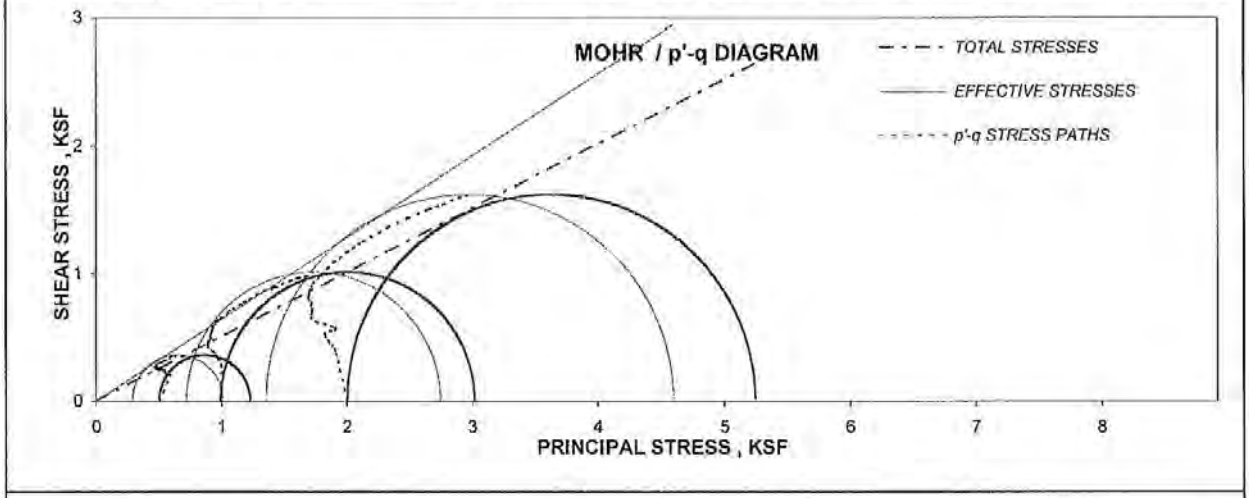
S&ME

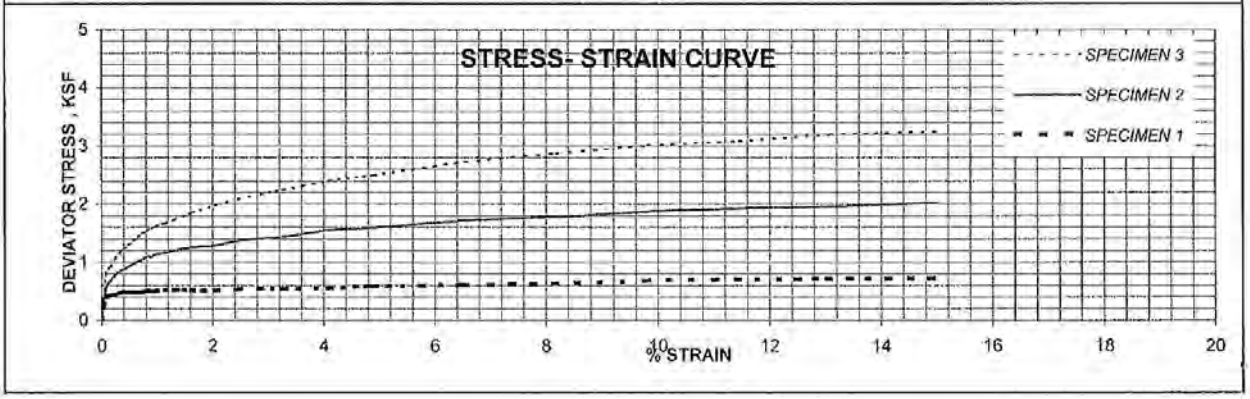
REV5,3/05/07

JOB NAME:	Plant Hammond Ash Pond Dikes				
JOB NO.:	28900	REPORT NO. :	N/A	REVIEWED BY :	DATE: 3/24/10
BORING / PIT NO. :	N/A	DEPTH / ELEV. :	N/A	SAMPLE NO . : N/A	TYPE: UD
SAMPLE LOCATION :	AP4-1 @ 10'-12.5'				
SOIL DESCRIPTION :	Specimen 1: yellow & brown clay with gravel, specimen 2 : brown lean clay with sand., specimen 3 : brown lean clay with sand.				
LL, % :	45	PI , % :	20	FINES, % : 87	G_s : 2.68

SPECIMEN PROPERTIES									TEST PARAMETERS , TEST TYPE : CU/PP				
		INITIAL			AFTER CONSOLIDATION				SPECIMEN NO.		1	2	3
SPECIMEN NO.		1	2	3		1	2	3	B Value		0.95	0.95	0.95
DIAMETER , INCHES	D_o	2.87	2.89	2.88	D_c	2.86	2.87	2.85	BACK PRESSURE, ksf	U_o	11.7	11.6	11.6
HEIGHT , INCHES	H_o	6.16	6.07	6.16	H_c	6.15	6.04	6.11	CONFINING PRESSURE , ksf	σ_3	0.5	1.0	2.0
WATER CONTENT, %	W_o	21.8	30.3	30.7	W_c	27.5	30.2	29.7	MAX. DEVIATOR STRESS ,ksf	σ_1-σ_3	0.7	2.0	3.2
DRY DENSITY, PCF	γ_{dryo}	95.4	91.2	90.8	γ_{dryc}	96.3	92.5	93.1	ULT. 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	Specimen Shape @ Failure	Sheared			
VOID RATIO	e_o	0.753	0.835	0.842	e_c	0.737	0.809	0.798					
-----					,	Strain	0.04		% per minute		T50, Minutes =		10
N/A													
N/A													

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





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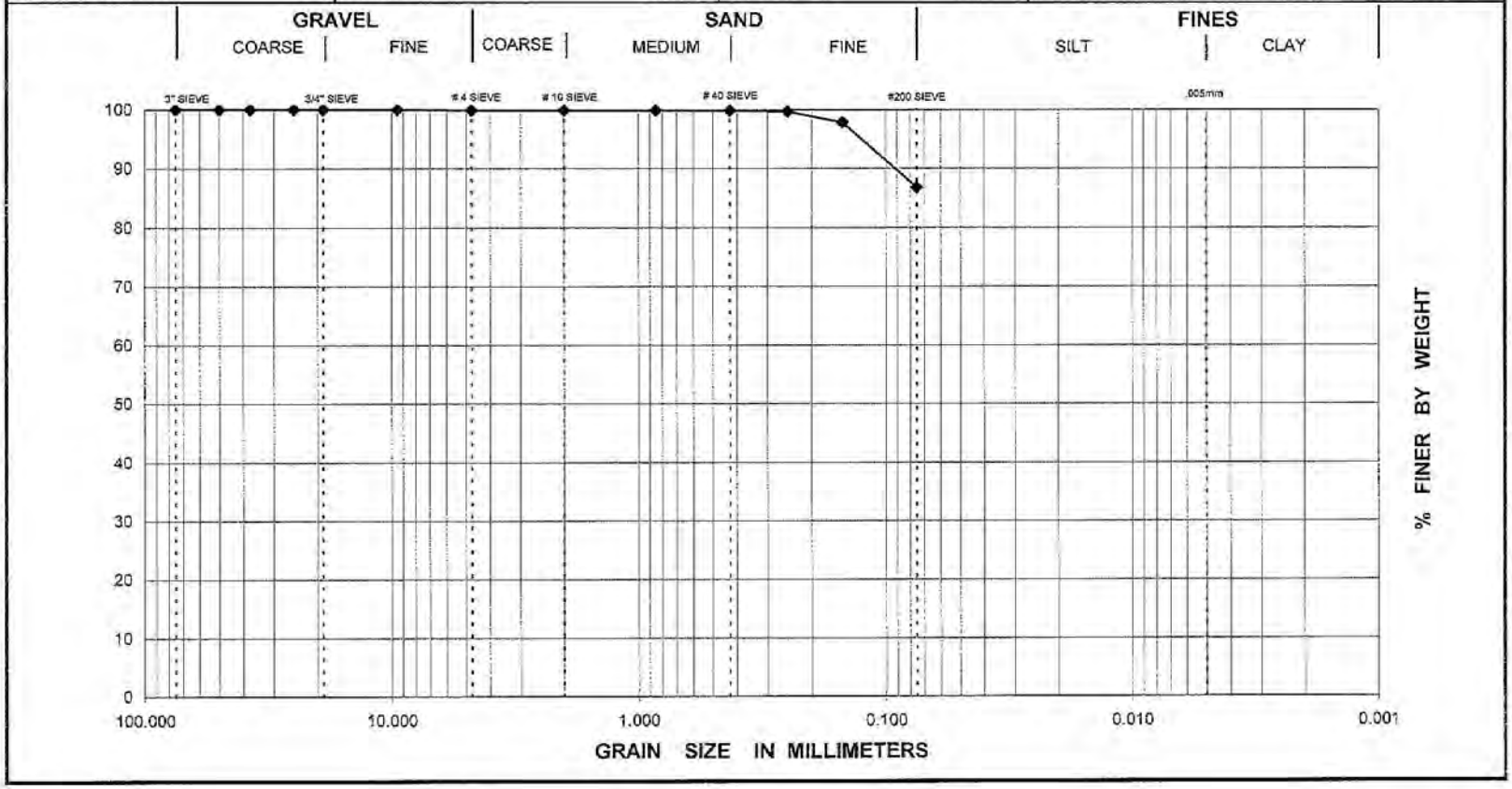
PARTICLE- SIZE DISTRIBUTION TEST REPORT

SIEVE AND HYDROMETER ASTM D422 0

REV2,08/07/06

AAR SM AASHTO R18

JOB NAME :	*Plant Hammond Ash Pond Dikes*						
JOB NO. :	*28900*	REPORT NO. :	*N/A*	DATE :	3/26/10	REVIEWED BY :	
BORING / PIT NO. :	*N/A*	DEPTH / ELEV. :	*N/A*	SAMPLE NO. :	*N/A*	SAMPLE TYPE :	*UD*
SAMPLE LOCATION :	AP4-1 @ 10'-12'						
SOIL DESCRIPTION :	*Brown lean clay with sand.*					SP. GRAVITY, Gs :	*N/A*
LIQUID LIMIT, % :	*45*	PLASTICITY INDEX , % :	*20*	MOISTURE , % :	N/A	FINES , % :	*87*
D10 , MM :	N/A	D30 , MM :	N/A	D60 , MM :	N/A	COEFF. OF CURVATURE , C_C :	*N/A*
CLASSIFICATION		UNIFIED :	*CL*	AASHTO :	*N/A*	COEFF. OF UNIFORMITY , C_U :	*N/A*



TRIAXIAL SHEAR TEST REPORT

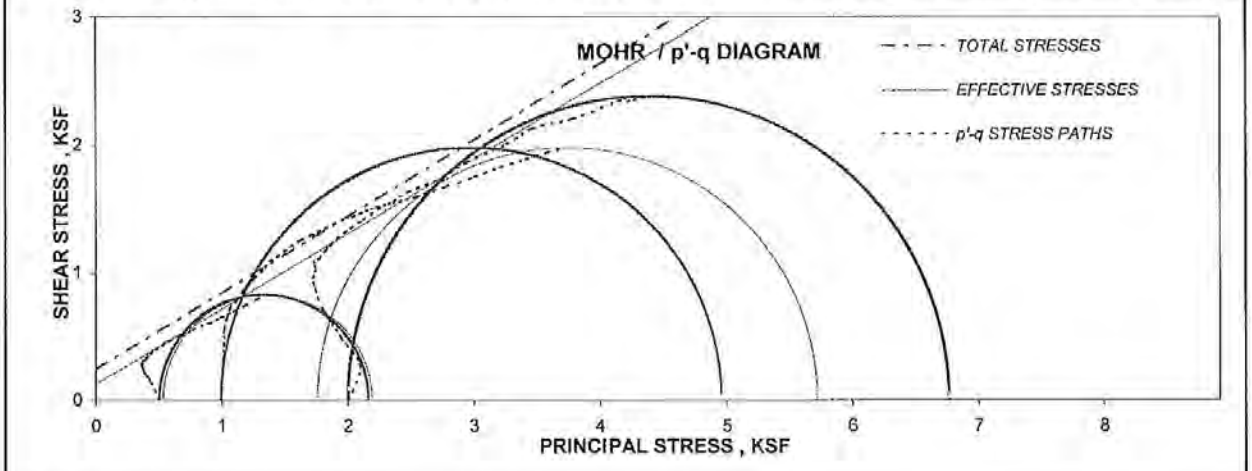
(ASTM D 4767)

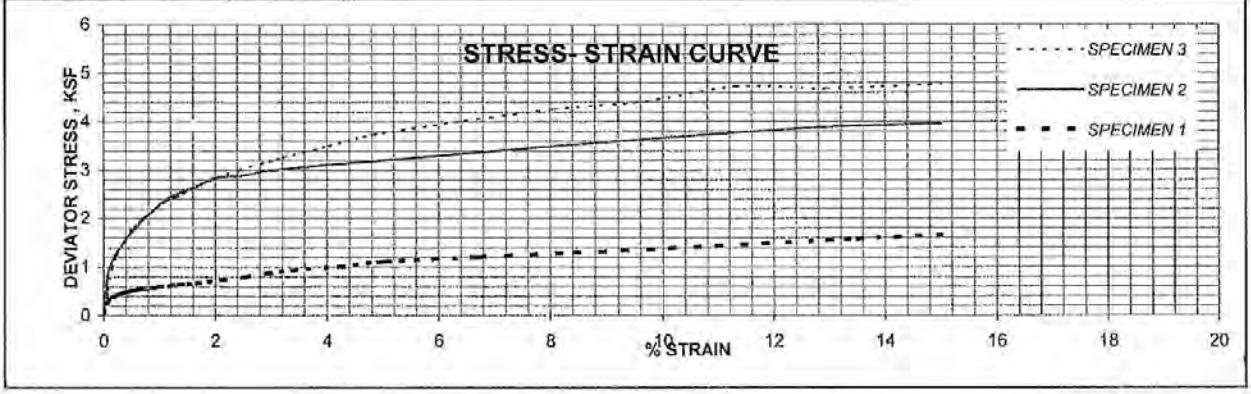
REV5,3/05/07

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

SPECIMEN PROPERTIES									TEST PARAMETERS , TEST TYPE : CU/PP				
		INITIAL			AFTER CONSOLIDATION				SPECIMEN NO.		1	2	3
SPECIMEN NO.		1	2	3		1	2	3	B Value		0.95	0.95	0.95
DIAMETER , INCHES	D_o	2.87	2.89	2.88	D_c	2.86	2.89	2.87	BACK PRESSURE, ksf	U_o	10.1	10.1	10.1
HEIGHT , INCHES	H_o	5.95	6.12	6.20	H_c	5.93	6.12	6.18	CONFINING PRESSURE , ksf	σ_3	0.5	1.0	2.0
WATER CONTENT, %	W_o	18.0	20.8	18.6	W_c	22.9	22.7	19.3	MAX. DEVIATOR STRESS ,ksf	σ_1-σ_3	1.7	4.0	4.8
DRY DENSITY, PCF	γ_{dryo}	103.5	105.1	110.4	γ_{dryc}	104.9	105.3	111.7	ULT. DEVIATOR STRESS , ksf	σ_1-σ_3	1.7	4.0	4.8
SATURATION ,%	S_o	75.7	91.4	93.2	S_c	100	100	100	Specimen Shape @ Failure	Sheared			
VOID RATIO	e_o	0.648	0.624	0.546	e_c	0.627	0.621	0.528					
-----					,		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





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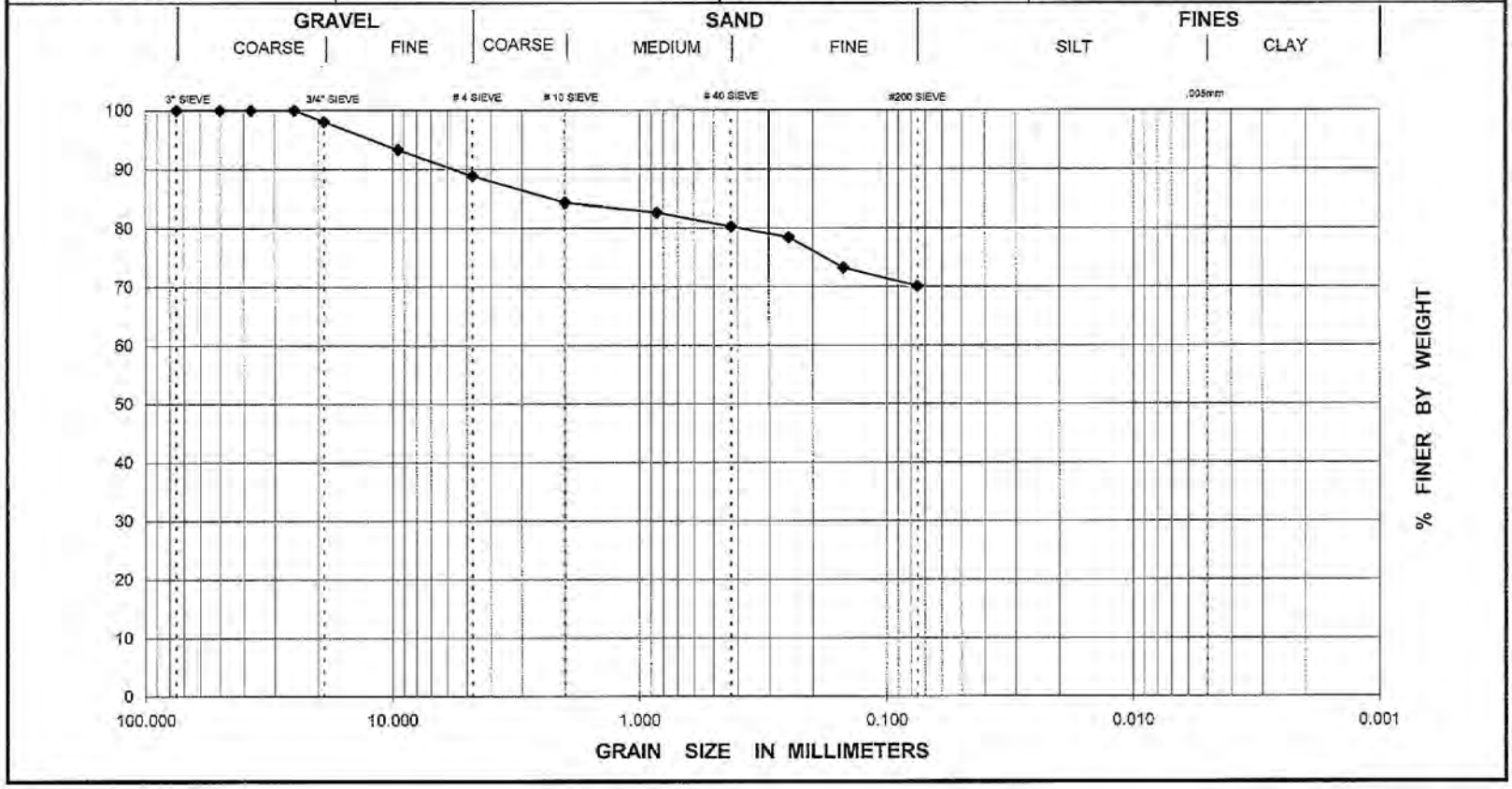
PARTICLE- SIZE DISTRIBUTION TEST REPORT

SIEVE AND HYDROMETER ASTM D422 0

REV2,08/07/06

AASHTO R18

JOB NAME :	*Plant Hammond Ash Pond Dikes*						
JOB NO. :	*28900*	REPORT NO. :	*N/A*	DATE :	3/26/10	REVIEWED BY :	
BORING / PIT NO. :	*N/A*	DEPTH / ELEV. :	*N/A*	SAMPLE NO. :	*N/A*	SAMPLE TYPE :	*UD*
SAMPLE LOCATION :	AP4-2 @ 10'-12'						
SOIL DESCRIPTION :	*Yellowish red, sandy fat clay with gravel.*					SP. GRAVITY, Gs :	*N/A*
LIQUID LIMIT, % :	*53*	PLASTICITY INDEX , % :	*31*	MOISTURE , % :	N/A	FINES , % :	*70*
D10 , MM :	N/A	D30 , MM :	N/A	D60 , MM :	N/A	COEFF. OF CURVATURE , C_C :	*N/A*
CLASSIFICATION		UNIFIED :	*CH*	AASHTO :	*N/A*	COEFF. OF UNIFORMITY , C_U :	*N/A*



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ATTERBERG LIMITS
(ASTM D 4318)

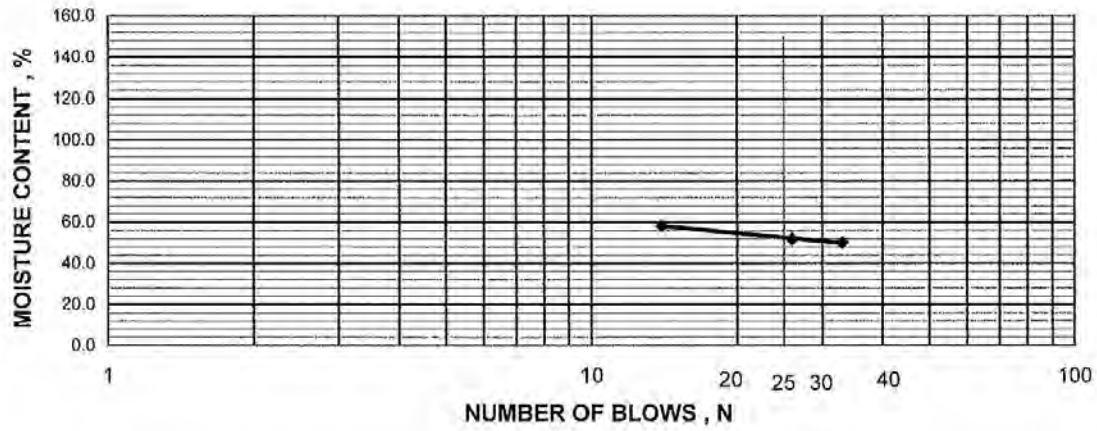
REV1,5/10/06

JOB NAME :	Plant Hammond Ash Pond Dikes						
JOB NO. :	28900	REPORT NO. :	-	DATE :	03/25/10	REVIEWED BY :	
BORING / PIT NO. :	N/A	DEPTH / ELEV. :	N/A	SAMPLE NO. :	N/A	SAMPLE TYPE :	UD
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

Piezometer measurements are taken from the
Top of Casing (reference)

Plant Hammond - Ash Ponds 1, 2, 3 and 4
2020
Monthly Piezometer/Weir Measurement Log

Date	Initials	Weather	Temp (F)	Rain in Past 30 days (in)	Pond Elev. (ft.)	Piezometer Levels (ft.)												
						Ash Pond 1			Ash Pond 2		Ash Pond 3			Ash Pond 4				
						AP1-1	AP1-2	AP1-3	AP2-2	AP2-3	AP3-1	AP3-2	AP3-3	AP4-1	AP4-2	AP4-3	AP4-4	AP4-5
Depth to bottom of Piezometer from Reference (ft.)						*22.3'*	*31.28'*	*15.10'*	*26.96'*	*41.80'*	*32.51'*	*48.03'*	*33.30'*	*22.74'*	*42.79'*	*26.87'*	*26.25'*	*38.70'*
1/13/2021	LBC	SUNNY	25	3.25	N/A	7.39	14.94	13.25	19.52	39.2	N/A	N/A	N/A	17.96	40.29	24.42	25.44	38.40
2/12/2021	LBC	CLOUDY	44	3.775	N/A	7.36	15.51	13.5	20.16	38.98	N/A	N/A	N/A	17.47	39.99	24.74	25.33	38.25
3/12/2021	LBC	CLOUDY	64	4.8	N/A	7.41	16.02	13.4	20.60	38.35	N/A	N/A	N/A	16.15	38.54	24.53	24.37	37.21
4/14/2021	LBC	SUNNY	72	11.9	N/A	7.75	15.62	12.64	19.4	36.2	N/A	N/A	N/A	12.98	35.24	23.36	22.42	32.96
											N/A	N/A	N/A					
											N/A	N/A	N/A					
											N/A	N/A	N/A					
											N/A	N/A	N/A					
											N/A	N/A	N/A					
											N/A	N/A	N/A					
											N/A	N/A	N/A					
											N/A	N/A	N/A					
											N/A	N/A	N/A					