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APPENDICES

Appendix 1 (4.1) Boring Log Example

INDOT BORING LOG

BORING NO.: RB-2

DES NO : US 40 WAYNE COUNTY

SHEET 1 OF 1

LOCATION : 6.54 MILES EAST OF S.R. 1 IN WAYNE COUNTY.

DATE STARTED : 05-11-04

PROJECT NO. : STP-4089(018)

DATE COMPLETED : 05-11-04

BORING				
ELEVATION	1021.1	BORING METHOD	HSA	HAMMER : AUTO
STATION	214+00	RIG TYPE	TRUCK	DRILLER/INSP : DT/JL
OFFSET	20.0 ftL	CASING DIA.		TEMPERATURE : 82 °F
LINE	'B'	CORE SIZE		WEATHER : SUNNY
DEPTH	15.0 ft			

GROUNDWATER: Encountered at DRY At completion DRY N/After 24 hours Caved in at 3.9 ft

STRATUM ELEVATION	SAMPLE DEPTH	SOIL/MATERIAL DESCRIPTION	STRATUM DEPTH	SAMPLE NUMBER	SPT per 6"	BLOWS per 12" (N)	% RECOVERY	MOISTURE CONTENT	POCKET PEN., ksf	UNCONF. COMP., ksf	ATTERBERG LIMITS LL	PL	PI
		ASPHALT & CONCRETE(VISUAL)											
1019.8			1.3										
	2.5	BROWN,MOIST,LOOSE,SANDY LOAM A-1-b #201769		SS 1	3 3 4	7	60						
	5.0			SS 2	5 4 4	8	50						
	7.5			SS 3	2 3 4	7	60						
1012.1		BROWN,MOIST,MEDIUM STIFF TO STIFF,LOAM A-4 #201761	9.0										
	10.0			SS 4	3 6 5	11	65						
	12.5												
1006.1	15.0		15.0	SS 5	3 3 5	8	90						
		Bottom of Boring at 15.0 ft											

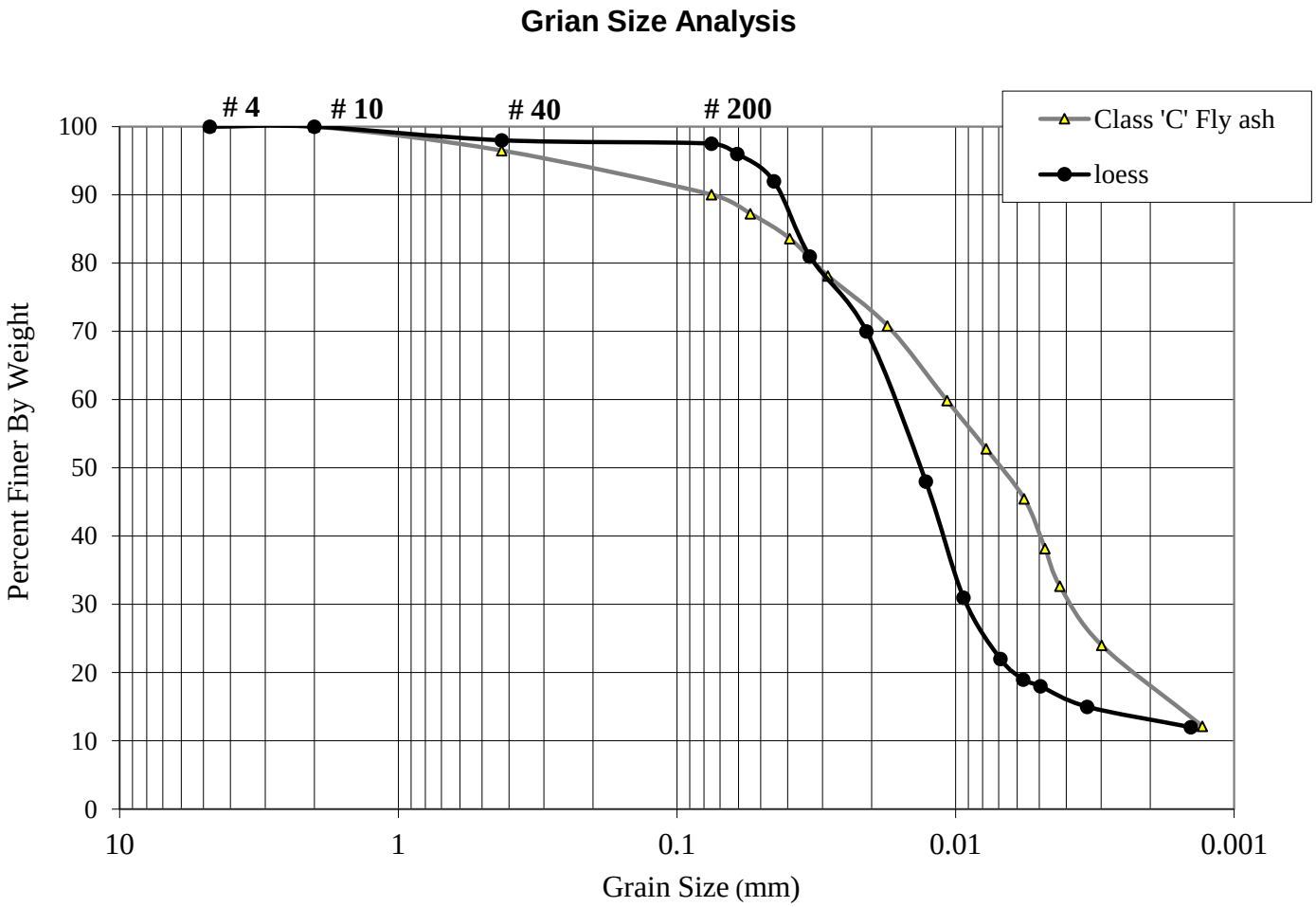
REMARKS

ABBREVIATIONS

LL - Liquid Limit
PL - Plastic Limit
PI - Plasticity Index
SPT - Standard Penetration Test

INDOT BORING LOG ORIGINAL 9901590.GPJ IN DOT.GDT 11/4/04

Appendix 2 Grain Size Example



Boulders	Gravel	Sand		Silt	Cla y
		Coarse	Fine		

Sample Identification.		Station / Offset / Line			Dept, meters			Elev. USCGS			
RB-5	SS-3	2+300	3.0m Lt.	"A"	1.2 - 1.7			258.8 + 258.1			
Lab #	Class	Spec. Gravity	pH	% Gravel	% Sand	% Silt	% Clay	MC %	LL	PL	PI
N/A	Loam A-4(1)										

Appendix 3 Consolidation Test

(Specimen Data)

Date:_____

Project: _____

Boring No: _____

Classification: _____

			Before Test			After Test	
			Specimen		Trimmings	Specimen	
Tare No.			Ring and Plates				
Weight in grams	Tare plus wet soil						
	Tare plus dry soil						
	Water	W_W	W_W			W_{WF}	
	Tare						
	Dry Soil	W_S					
Water Content		w	w_O	%	%	w_F	
Consolidometer No.					Area of specimen A, sq. in.		
Weight of ring, g					Height of specimen, H, in.		
Weight of plates, g					Specific gravity of solids, G_S		

$$H_S = \frac{W_S}{AG\ \gamma_w}$$

$$\text{Degree of saturation after test, } Sr = \frac{H_{WF}}{H_f - H_s} = \quad _____ \quad \%.$$

Net change of height of specimen at end of test, ΔH= _____in.

Height of specimen at end of test, Hr = H - ΔH= _____ in.

Remarks: _____

_____

$$\text{Void ratio after tests} = \frac{H_f - H_s}{H_s} = \quad _____ \quad =$$

$$\text{Degree of saturation before test, } So = \frac{H_w}{H - H_s} = \quad — = \quad — \ \%$$

$$\text{Dry Density} = \frac{Ws}{H_s \text{ x } A} = \quad _____ \text{ lb/cu ft.}$$

Technician:_____Computed by:_____Checked by:_____

Appendix 4 Consolidation Test
(Time-Consolidation Data)

Date: _____

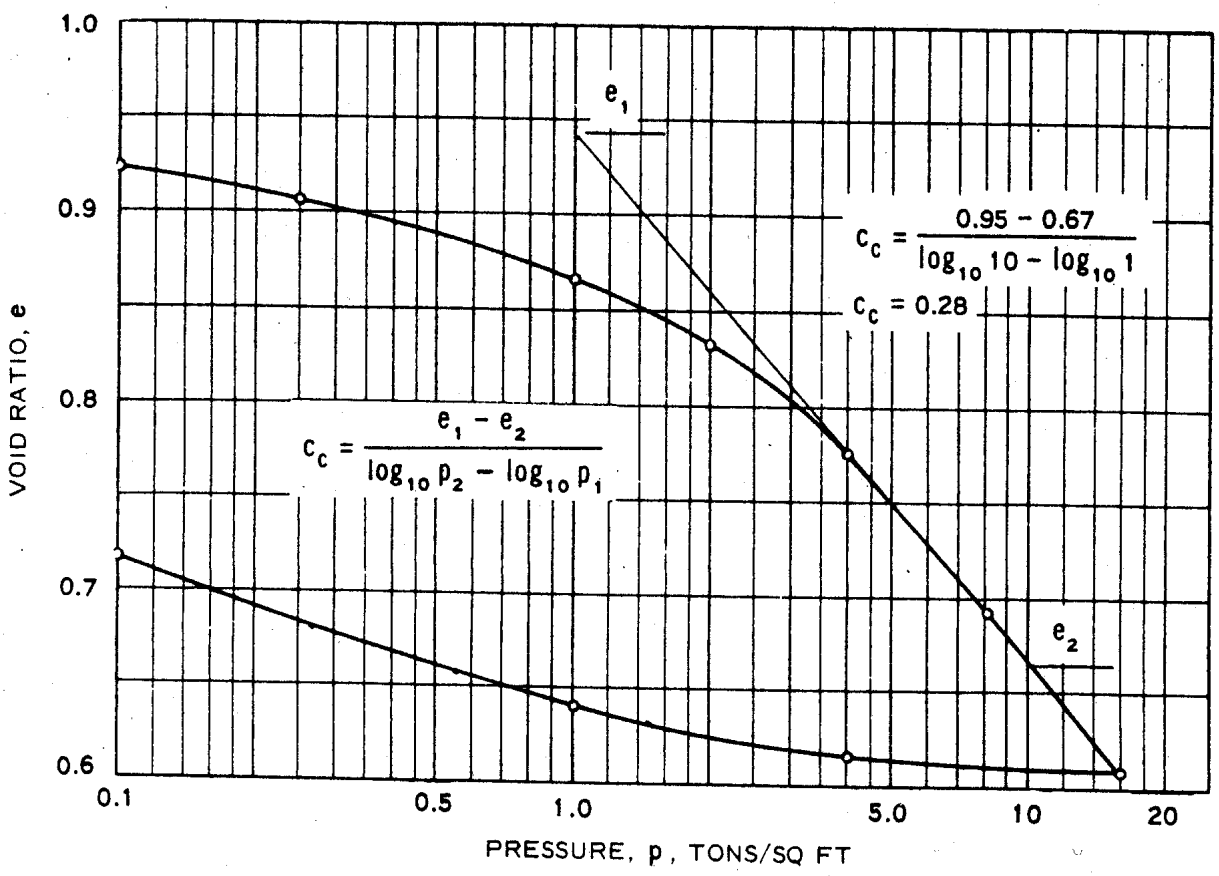
Subject: _____

Boring No: _____ Sample No: _____ Consolidation No: _____

Date & Pressure	Time	Elapsed time, min.	Dial Rdg. 10^{-4} in.	Temp. °C	Date & Pressure	Time	Elapsed time, min.	Dial Rdg. 10^{-4} in.	Temp. °C

Appendix 5 E-Log P Curve

Consolidation Test



Boring No: _____Sample No: _____Depth: _____

Soil Description: _____

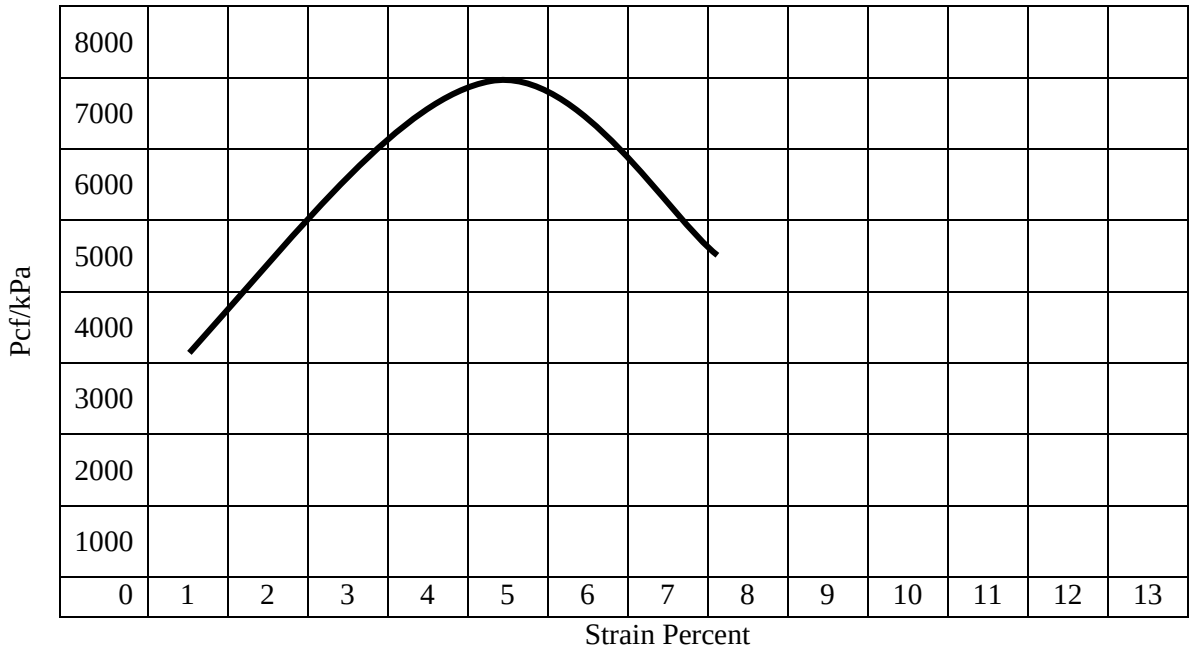
Liquid Limit: _____Plastic Limit: _____% Fines:_____

Wet Density, t: _____Water Content, W%: _____Initial Void Ratio, ℓo: _____

Cc: _____Cr: _____Pc: _____Cv: _____

Appendix 6 Strain Percentage Worksheet

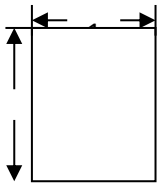
Unconfined Compressive Strength Test



Sample Location: _____

Depth: _____ Moisture Content _____

Strain Rate: _____ Dry Unit Weight _____



Soil Description: _____

Soil Description: _____

Soil Description: _____

Project #: _____ Des. #: _____

Road: _____ County: _____

Location: _____

Appendix 7 Triaxial Compression Test

(Specimen Data)

		Date:	
Project:			
Boring No:		Sample No:	
Type of Test:		Confining Pressure	tons/sq ft
Test No.		Classification:	

Before test

		Specimen	Trimmings	Specimen
Tare No:				
Weight,q	Tare plus wet soil			
	Tare plus dry soil			
	Water W_W		W_{WO}	W_{wf}
	Tare			
	Wet Soil W_S			
	Dry Soil W			

Water Content	w	%	w_O	%	w_f	%

Initial Condition of Specimen

Diameter, inch (cm)	D_o	Top	Center	Bottom	Average	
Height, cm	H_o		Volume of solids, in. ^{3}		V_s	
Area sq inch = 7.854 D^2	A_o		Void ratio = $(V_o - V_s) \div V_s$		e_o	
Volume = in.^{2}	V_o		Saturation, %		S	
Specific gravity of solids	G		Dry Density, lb/cu ft		$_d$	

Condition of Specimen After Consolidation (R and S Tests)

Change in height during consolidation, in.	δH_o		Volume, in. = A_cH_c	V_c	
Height, = H_o -δH_oin.	H_c		Void Ratio = $(V_c - V_s) \div V_s$	e_c	
Area, sq. in.	A_c		Saturation, %	S_c	

Condition of Specimen After Test (R and S Tests)

Diameter, cm	D_r	Top	Center	Bottom	Average	
Change in height during Shear Tests, in.	ΔH		Volume, in.^{3} = A_fH_f		V_f	
Height, in. = H_c - Δ H	H_r		Void Ratio = $(V_r - V_s) \div V_s$		e_r	
Area, sq inch	A_f		Saturation, %		S_r	

$$Ws = \frac{W}{w}, v_s = \frac{W_s}{Y_w G_s}, S_o = \frac{\frac{w_o}{100} x \frac{w_s}{yw}}{V_o - V_s} x100, s_c = \frac{\frac{w_c}{100} x \frac{w_s}{yw}}{V_c - V_s} x100,$$

$$S_r = \frac{\frac{wf}{100} x \frac{w_s}{\gamma w}}{Vf - Vs} x100, = \frac{w_s}{Vo} \ x \ 62.4, Ac = A_o \frac{H_o - \Delta H}{H_o}$$

$$w = water\ content$$

Remarks:

Technician:		Computed by:		Checked by:	

Appendix 8 Triaxial Compression (Q) and Test Axial Loading Data

Date: _____

Project:_____

Boring No: _____ Sample No: _____ Test No: _____

Type Test: _____ Confining Pressure: _____ lb/sq ft: _____

Time	Elapsed Time min.	Dial Reading 10^{-2}	Cumulative Change (Δ H) 10^{-} 2 in	P Axial Load lb	P Axial Strain * $\frac{\Delta H}{H}$	ε	^corr = $\frac{A^{**}}{1 - \varepsilon}$ sq in.	Deviator Stress = $\frac{P}{}$ x 0.465 Corr tons/sq ft

* Use H_o for Q tests and H_c for R tests H_o _____ inch (cm) _____ in A_o sq in

**Use H_o for Q tests and H_c for R tests H_o _____ inch (cm) _____ in A_o sq in

Test time to failure _____ min. Type Failure:

.

Technician:

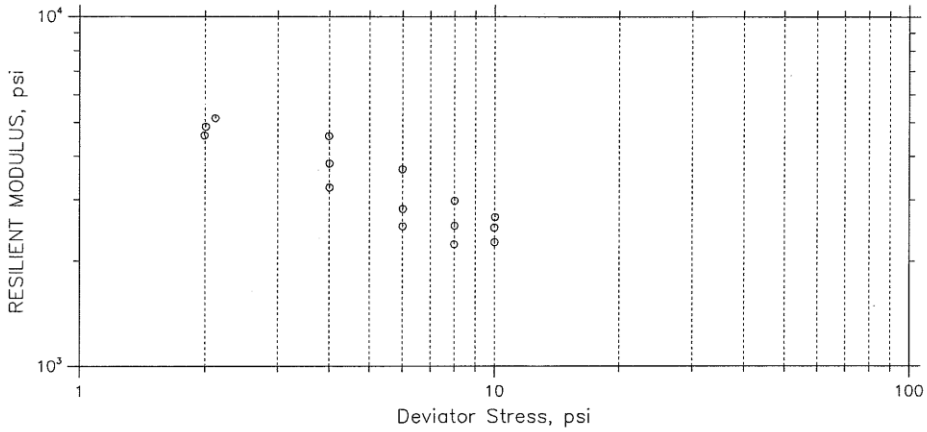
.

Appendix 9 Resilient Modulus Test Data Sheet OMC

RESILIENT MODULUS TEST DATA

SUMMARY REPORT

$Mr = 118.87 * Pa * (B/Pa)^{0.32} * (Sd/Pa)^{-0.551}$ $r = 0.96624$



Confining Stress S3 (psi)	Nom. Max. Deviator Stress (psi)	Mean Deviator Stress (psi)	Std. Dev. Deviator Stress (psi)	Mean Bulk Stress (psi)	Mean Resilient Strain (%)	Std. Dev. Resilient Strain (%)	Mean Resilient Modulus (psi)	Std. Dev. Resilient Modulus (psi)
5.944	2	2.009	0.0220	19.84	0.04	0.00	4860.1	41.039
5.957	4	3.991	0.0303	21.86	0.09	0.00	4568.2	9.5005
5.87	6	5.994	0.0070	23.6	0.16	0.00	3667.4	7.162
5.911	8	8.012	0.0232	25.74	0.25	0.00	2976	1.644
5.882	10	10.02	0.0083	27.67	0.35	0.00	2671.8	6.3841
3.888	2	2.118	0.3716	13.78	0.04	0.01	5141.3	143.77
3.925	4	4.003	0.0362	15.78	0.10	0.00	3810	7.4317
3.905	6	6.011	0.0211	17.72	0.20	0.00	2820.6	7.0813
3.965	8	8.007	0.0225	19.9	0.30	0.00	2523.2	1.1863
3.926	10	9.988	0.0524	21.77	0.37	0.00	2492.2	3.1053
1.987	2	1.994	0.0078	7.956	0.04	0.00	4586.8	26.805
1.956	4	4.005	0.0237	9.873	0.12	0.00	3253.1	8.3585
1.969	6	6.003	0.0194	11.91	0.22	0.00	2515	2.5653
1.974	8	7.992	0.0287	13.92	0.33	0.00	2232.9	1.6959
1.977	10	10	0.0026	15.93	0.41	0.00	2262.5	0.55944

Project: Covington	Location: Allen Co.	Project No.: DES 0710928
Boring No.: RB - 2A	Tested By: LS	Checked By:
Sample No.: 10-RM001~2	Test Date: 01/15/2010	Depth: 1' - 3'
Test No.: #2	Sample Type: remolded	Elevation: n/a
Description: CLAY A- 6 (9) .....Maximum Dry Density 110.7 pcf and 17.1% Optimum Moisture		
Remarks: Tested at 2% above Optimum Moisture Content. (Permanent Strain = 0.34328% after Conditioning Sequence)		
File: C:\Documents and Settings\MRSPITSY\Desktop\RM file\2010\RM001\10-RM001~2.dat		

Tue, 19-JAN-2010 09:42:00

Appendix 10 Subgrade Evaluation (example)

Boring No.	Sta	Offset	Line	Sample No	Depth (ft.)	Soil Type	AASHTO Class.	SPT (N)	In-situ Dry Density (pcf)	Max. Dry Density (pcf)	In-situ % Comp action	Nat. Moisture (%)	Opt iMoisture (%)	% Moi Diff
RB-06	276+00	20’ Lt	“A”	SS-1	2.0-3.5	Loam	A-6	5	110.9	110.0	100.8	14.5	17.8	-3.3
RB-09	290+00	20’ Rt	“A”	SS-2	3.5-5.0	Silty Clay Loam	A-6	13	111.5	110.0	101.4	17.6	17.8	-0.2
RB-11	303+00	30’ Rt	“A”	SS-1	1.5-3.0	Silty Clay Loam	A-6	7	109.1	110.0	99.2	17.8	17.8	0.0
RB-16	322+50	35’ Lt	“A”	SS-1	2.0-3.5	Silty Clay Loam	A-6	9	108.3	110.0	98.4	16.0	17.8	-1.8
RB-22	343+00	20’ Lt	“A”	SS-1	2.0-3.0	Loam	A-6	9	119.5			110.6		
RB-27	385+00	35’ Lt	“A”	SS-1	2.0-3.0	Silty Clay Loam	A-6	10	109.8	110.0	99.8	12.7	17.8	-5.1
RB-36	440+00	15’ Lt	“PR-A”	SS-2	1.5-3.5	Silty Clay Loam	A-6	12	108.2	110.0	98.3	18.7	17.8	0.9

Appendix 11: Peat Unit Weight (example)

Boring No.	Station	Offset	Line	Sample No.	Depth (feet)	Soil Type	AASHTO Class.	SPT (N)	Natural Moisture (%)	Max. Dry Density (pcf)
RB-17B	326+00	98’Rt	“A”	ST-2	16.0-18.0	Silty Clay w/Little Organic Matter	A-7-5	0	82.6	91.8
RB-17B	326+50	98’Rt	“A”	SWT-9	33.5-35.0	Silty Clay w/Little Organic Matter	A-7-5	0	103.6	90.2
RB-17B	326+50	98’Rt	“A”	ST-3	36.0-38.0	Silty Clay w/Little Organic Matter	A-7-5	0	71.5	81.0
RB-18	326+50	54’Lt	“A”	SS-1	0.5-2.0	Silty Clay w/Traces of Organic Matter	A-6	2	55.4	92.3
RB-18	326+50	54’Lt	“A”	SS-4	8.5-10.0	Silty Clay w/Little Organic Matter	A-7-5	0	65.0	93.2
RB-18	326+50	54’Lt	“A”	SS-9	21.0-22.5	Silty Clay w/Little Organic Matter	A-7-5	0	119.1	88.8
RB-18B	328+00	51’Lt	“A”	SS-2	3.0-4.5	Silty Clay w/Little Organic Matter	A-7-5	1	89.1	105.2*
RB-19	332+15	35’Rt	“A”	SS-1	1.0-2.0	Silty Clay w/Traces of Organic Matter	Visual	25	35.4	110.3*
Average of Peat Unit Weight										89.5*
RB-18D	326+50	30’Lt	“A”	SS-4	8.5-10.0	Loam	A-7-6	16.3	16.3	120.9*
RB-18E	326+45	54’Lt	“A”	ST-1	5.0-7.0	Clay w/Little Organic Matter	Visual	75.6	75.6	119.8

** Not included in average*

Appendix 12: MSE Wall Design Parameter and Geotechnical Check Table

MSE Wall Design Parameter and Geotechnical Check Table	
Design Parameter	**Value (area 1)***
Maximum Calculated Settlement	"x" inches
Maximum Differential Settlement	"y" inches
Time for settlement completion	"z" days
Maximum wall height	XX ft
Design Recommendations	
Minimum Reinforcement Length/Height Ratio	0.75H (example)
Undercut required	**yes**/no
Undercut depth	X feet
Undercut area	from Sta. XX to XX line "XX"
Undercut Backfill Material	XXXXXXX
Seismic recommendation	
Site Class	
Seismic Zone	
Peak Ground Acceleration As	
Geotechnical Analysis Checks	**CDR**
Sliding	>=1.0
Eccentricity	>=1.0
Global Stability	Factor of safety/ resistance factor
Factored Bearing Resistance	5400 psf (example value)
Foundation Soils Strength Parameters**	
Cohesion	
internal friction angle	

Notes:
*more sheets can be added to include recommendations for each area of concern.
**if varying soil conditions encountered underneath the MSE wall, the table can be expanded to include all soil profile information

Appendix 13: Example Pavement Core Report

PAVEMENT CORE REPORT

Des No.:

Location:

Road	Core No.	Date Cored	Core Dia.	Station	Offset	Line

Photo of Core next to measurement tape

Photo of Core Location looking down the roadway

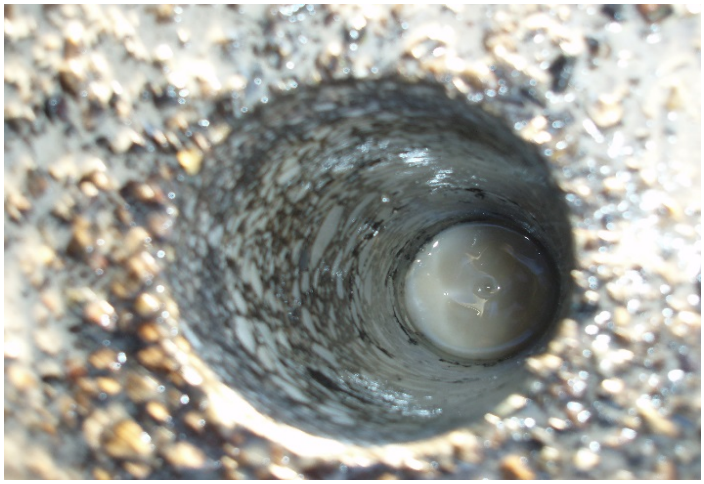
Photo inside the hole where core was extracted

Photo of the base stones at the base of the pavement core

Depth (inches)	Pavement Type	Notes

Recovered Core Length (inches)	In-hole Depth (inches)	Recovery (%)

Location	Core No.	Date Cored	Core Dia.	Station	Offset	Line
SR 29	PC-2	10/17/2018	4	34+75	6 ft Lt	CL



Depth (inches)	Pavement Type	Notes
13	Asphalt	

Recovered Core Length (inches)	In-hole Depth (inches)	Recovery (%)
13		100

Geotechnical Engineering

Report Completion

Schedule

Schedule

Did the consultant meet the delivery schedule?

Exceeds - An acceptable final product was delivered more than 30 calendar days ahead of schedule.

Above Average - An acceptable final product was delivered more than 14 but less than 30 calendar days ahead of schedule.

Satisfactory - An acceptable final work product was delivered within the scheduled time.

Improvement Required - An acceptable final work product was delivered up to two months behind schedule.

Unsatisfactory - An acceptable final work product was delivered more than two months behind schedule.

Not Applicable - Not Applicable

Budget

Budget

Did the consultant deliver the services cost effectively?

Exceeds - The consultant improved the operations budget more than 10%.

Above Average - The consultant improved the operations budget more than 5%.

Satisfactory - The consultant maintained the operations budget within 5%.

Improvement Required - The consultant had budget slippage of 5% to 10%.

Unsatisfactory - The consultant exceeded the budget by more than 10%.

Not Applicable - Not Applicable

Drilling Procedure

Quality

Were samples collected in accordance with INDOT standards?

Exceeds - All samples were collected in accordance with INDOT standards also additional samples were collected to accommodate any change in the scope of the project.

Above Average - All samples were collected in accordance with INDOT standards also additional samples were collected to accommodate only one change in the scope of the project.

Satisfactory - All samples were collected in accordance with INDOT standards.

Improvement Required - Some samples were not collected in compliance with INDOT standards.

Unsatisfactory - Most samples were not in compliance with INDOT standards. As a result the consultant was instructed to remobilize and collect the required samples.

Appropriate Equipmment

Quality

Was the appropriate equipment mobilized for the work assignment?

Exceeds - Equipment mobilized was adequate and very good operating condition.

Above Average - Equipment mobilized was adequate and in good operating condition.

Geotechnical Engineering

Satisfactory - Equipment was generally adequate but needed some adjustment during the field operation.

Improvement Required - Some equipment mobilized was not adequate and required an adjustment in the scope of work.

Unsatisfactory - Correct equipment was not mobilized causing delays, change in scope, and change in boring locations.

24 Hour Water Levels

Quality

Were 24 hour water levels recorded for boreholes at the appropriate time?

Above Average - 24hr water level readings were recorded in boreholes, some readings were taken after 72 hours or more.

Satisfactory - 24hr water level readings were recorded.

Improvement Required - 24hr water level readings were not recorded in boreholes.

Unsatisfactory - No 24hr water level readings were recorded.

Backfilling Boreholes

Quality

Were boreholes appropriately backfilled?

Exceeds - All boreholes were backfilled and re-backfilled after the settlement period.

Above Average - All boreholes were backfilled and some were re-backfilled after the settlement period.

Satisfactory - All boreholes were backfilled but not checked for settlement.

Improvement Required - Some boreholes backfilled correctly, consultant requested to go back and fill unfilled holes.

Unsatisfactory - None of the boreholes were backfilled. Consultant was required to go back and fill the holes.

Traffic Control

Quality

Were appropriate traffic control measures followed?

Exceeds - Met all requirements and exceeded expectations.

Above Average - Met all requirements and expectations.

Satisfactory - Met all requirements with no minor adjustments.

Improvement Required - Was incomplete and required major revisions.

Unsatisfactory - Consultant did not have traffic control when it was required.

Laboratory Procedures

Quality

Were laboratory tests performed in accordance with requirements?

Exceeds - Laboratory tests performed in accordance with requirements and provided additional graphs and plots of test data.

Above Average - All tests were performed in accordance with standards and requirements, some with additional graphs and plots of test data.

Geotechnical Engineering

Satisfactory - All tests were performed in accordance with standards and requirements.

Improvement Required - Some tests were not performed in accordance with standards and requirements.

Unsatisfactory - None of the tests were performed in accordance with the standards and requirements.

Engineering Recommendations

Quality

Were engineering recommendations technically correct and economically effective?

Exceeds - Engineering recommendations were both technically correct and presented the most economical engineering solutions. No revisions were required to the original submittal.

Above Average - Engineering recommendations were technically correct and presented the most economical engineering solutions. Minor revisions were required to the original submittal.

Satisfactory - Engineering recommendations were adequate. Revisions were required to the original submittal.

Improvement Required - Initial engineering recommendations were inadequate. Revisions were required to the original submittal.

Unsatisfactory - Initial engineering recommendations were inadequate and inappropriate. Multiple revisions were required and multiple submittals were required to achieve an acceptable report.

Operations Responsiveness

Responsiveness

Willingness to answer questions and make appropriate changes to plans/documents.

Exceeds - Willingness to answer questions and make requested changes exceeded expectations and was proactive in addressing project issues.

Above Average - The consultant revised plans/documents in accordance with comments and made additional improvements that had not been suggested but resulted in an improved product. Readily explained revisions and answered all questions.

Satisfactory - The consultant did revise the plans/documents in accordance with the comments and/or explained why revisions were not made and showed a willingness to answer questions.

Improvement Required - The Consultant did not revise some of the plans/documents in accordance with the comments and did not explain why some of the revisions were not made. Consultant showed some cooperation in answering questions but required several requests.

Unsatisfactory - The consultant did not comply with any of the above.