



May 19, 2017

Carpenter Marty Transportation, Inc.
6612 Singletree Drive
Columbus, OH 43229

Attention: Mr. Kevin P. Carpenter, P.E., P.S.

Reference: **Preliminary Summary - Subgrade Exploration**
Morse Road/Kitzmilller Road Intersection Improvements
Franklin County, Ohio
S&ME Project No. 1117-17-007

Mr. Carpenter:

In accordance with your request, S&ME is herewith presenting a preliminary summary of the findings of the Subgrade Exploration performed for the Morse Road and Kitzmilller Road Intersection Improvement project in Franklin County, Ohio.

Scope of Project

S&ME understands that intersection improvements are proposed for the Morse Road and Kitzmilller Road intersection in Franklin County. The bridge carrying Morse Road over Blacklick Creek is also to be replaced as part of this project.

Field Exploration and Laboratory Testing

S&ME performed 5 roadway borings and 1 structure boring on March 23 and 24, 2017. The roadway borings were performed at approximate 400 foot intervals along the length of the project, were advanced to depths of 6 to 7.5 feet below the existing roadway subgrade, and were continuously sampled in accordance with ODOT specifications. The structure boring was terminated after coring 10 feet into the bedrock.

The recovered soil and rock samples were returned to our laboratory, and in accordance with ODOT specifications, moisture content, Atterberg limit, and grain size analyses tests being performed on at least 2 samples recovered from just below the subgrade level in each boring. Sulfate content testing was also performed on a subgrade level soil sample from four of the roadway borings.

Preliminary Geotechnical Information

Preliminary copies of the boring logs, a plan of borings, and a subgrade analysis spreadsheet are included in the Appendix at the rear of this submission. Additionally, copies of the logs of historic borings drilled for the current bridge and provided by the Franklin County Engineer's office the available in the project area are included in the Appendix. A copy of a boring log from a 2002 subsurface investigation for a



water line located just south of Morse Road is also included. The approximate locations of these historic explorations are included on the Plan of Borings at the rear of this submission..

Closing

S&ME is proceeding with preparation of our Subgrade and structure Exploration report and will complete the report after receiving all required information.

If you have any questions regarding this preliminary submission, please do not hesitate to contact our office.

Respectfully,

S&ME, Inc.

Nathan D. Abele, P.E.
Project Manager

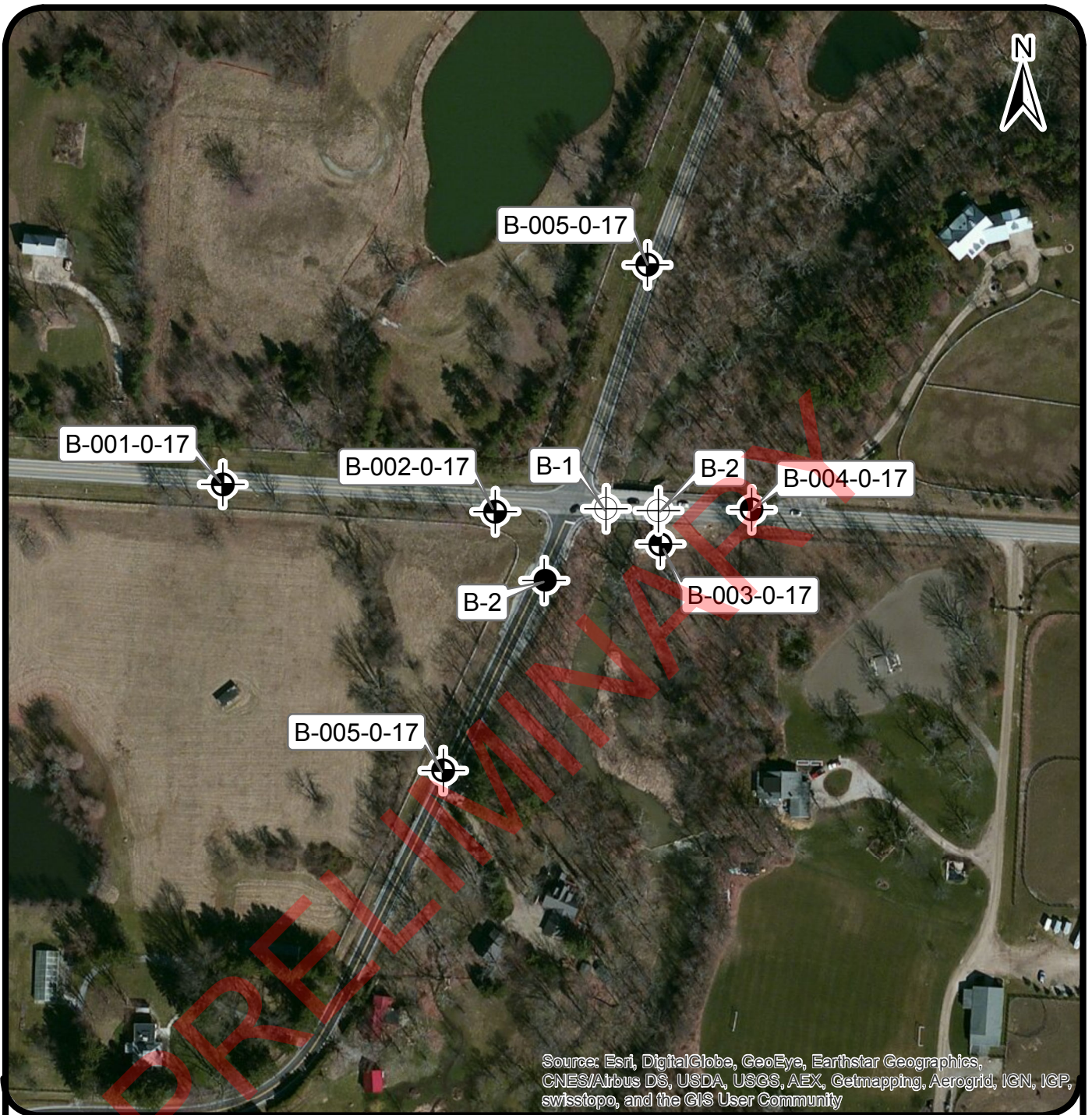
Richard S. Weigand, P.E.
Senior Engineer/Senior Reviewer

Attachments: Appendix (11 sheets)

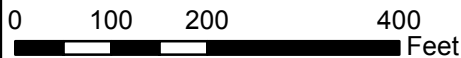
Submitted: Email (kcarpenter@cmtran.com, kmessaros@cmtran.com, and gjohnson@cmtran.com)

Appendix

Document Path: C:\Users\cwest\Desktop\GIS Projects\1117-17-007\FRA-cr17-10.43_POB.mxd






Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



NOTES:
THE ABOVE BORING LOCATION DATA IS ESTIMATED AND NOT BASED ON SURVEY DATA.

Legend

-  RESOURCE INTERNATIONAL, INC. 1982 APPROXIMATE BORING LOCATIONS
-  BBC&M 2002 APPROXIMATE BORING LOCATION
-  APPROXIMATE BORING LOCATIONS

SCALE:	1 inch = 200 feet
DATE:	4/30/2017
DRAWN BY:	CRW
PROJECT NO:	1117-17-007



PLAN OF BORINGS

MORSE RD & KITZMILLER RD
FRA-CR71-10.43
FRANKLIN COUNTY, OHIO

PLATE NO.

2

PROJECT: <u>FRA-CR17-10.43</u>	DRILLING FIRM / OPERATORS <u>S&ME / C. BRUMMAGE</u>	DRILL RIG: <u>S&ME ATV D50</u>	STATION / OFFSET: <u>401+91, 6.2' RT</u>	EXPLORATION ID
TYPE: <u>ROADWAY</u>	SAMPLING FIRM / LOGGER: <u>S&ME / D. GODWIN</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>CR 17 CL</u>	B-001-0-17
PID: _____ BR ID: _____	DRILLING METHOD: <u>3.25" HSA</u>	CALIBRATION DATE: <u>9/28/15</u>	ELEVATION: <u>1023.5 (MSL) EOB: 7.5 ft.</u>	PAGE
START: <u>3/24/17</u> END: <u>3/24/17</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>84.7</u>	LAT / LONG: <u>40.052743 N, 82.804719 W</u>	1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI	WC		
ASPHALT - 7-1/2 INCHES	1023.5																	
GRANULAR BASE - 6 -1/2 INCHES	1022.9	1																
Fill: Very-stiff brown and gray CLAY , some silt, some fine to coarse sand, trace fine gravel, moist.	1022.3	2	3															
Stiff to very-stiff brown CLAY , some silt, "and" fine to coarse sand, trace fine gravel, moist.	1020.5	3	5	16	56	SS-1	2.0-2.5	9	15	17	23	36	42	20	22	21	A-7-6 (10)	
Stiff to very-stiff brown mottled with gray SILT AND CLAY , some fine to coarse sand, little fine to coarse gravel, damp.	1019.0	4	5	14	100	SS-2	2.0-3.0	6	17	19	22	36	46	21	25	22	A-7-6 (11)	
SHALE , brown and gray, highly to severely weathered, very-weak to weak, fractured, nearly horizontally bedded.	1017.5	5	5	7	23	72	SS-3	1.5-3.0	-	-	-	-	-	-	-	-	16	A-6a (V)
	1016.0	6	8	9														
		7	22	48	99	89	SS-4	-	-	-	-	-	-	-	-	-	11	Rock (V)

EOB

- No seepage noted.
- Dry at completion.
- Sample SS-1: Sulfate content = 200 ppm.

S&ME STANDARD ODOT LOG (8.5X11) - 2015 - OH.DOT.GDT - 5/19/17 15:04 - T:\RESOURCES\CS\GINT\WP\PROJECTS\111717007.GPJ

PLATE 4

PRELIMINARY

NOTES: SEE NOTES.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; SOIL CUTTINGS MIXED WITH BENTONITE

PROJECT: <u>FRA-CR17-10.43</u>	DRILLING FIRM / OPERATORS <u>S&ME / C. BRUMMAGE</u>	DRILL RIG: <u>S&ME ATV D50</u>	STATION / OFFSET: <u>405+56, 23.0' RT</u>	EXPLORATION ID: <u>B-002-0-17</u>
TYPE: <u>ROADWAY</u>	SAMPLING FIRM / LOGGER: <u>S&ME / D. GODWIN</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>CR 17 CL</u>	PAGE 1 OF 1
PID: _____ BR ID: _____	DRILLING METHOD: <u>3.25" HSA</u>	CALIBRATION DATE: <u>9/28/15</u>	ELEVATION: <u>1025.6 (MSL)</u> EOB: <u>7.0 ft.</u>	
START: <u>3/23/17</u> END: <u>3/23/17</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>84.7</u>	LAT / LONG: <u>40.052646 N, 82.803420 W</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI	WC		
TOPSOIL / ROOTMAT - 7 INCHES	1025.0																	
Probable Fill: Very-stiff brown with gray SANDY SILT , some clay, trace to little fine to coarse gravel, damp.		1	3															<><><>
		2	3	10	56	SS-1	3.5-4.0	18	12	18	27	25	29	19	10	17	A-4a (3)	<><><>
	1022.4	3	1	7	67	SS-2A	1.7-2.7	7	14	15	34	30	29	20	9	20	A-4a (6)	<><><>
POSSIBLE FILL: Loose brown GRAVEL WITH SAND, SILT, AND CLAY , roots, damp.	1021.6	4	2			SS-2B	-	-	-	-	-	-	-	-	-	16	A-2-6 (V)	<><><>
Very-stiff brown mottled with gray SILT AND CLAY , some clay, little fine to coarse gravel, damp.		5	1	13	33	SS-3	2.5	-	-	-	-	-	-	-	-	19	A-6a (V)	<><><>
	1020.1	6	3															<><><>
Hard brown SILT AND CLAY , some fine to coarse sand, some fine to coarse gravel, moist.	1018.6	7	4	16	61	SS-4	4.2-4.5	-	-	-	-	-	-	-	-	15	A-6a (V)	<><><>
		EOB																<><><>

- No seepage noted.
- Dry at completion.

S&ME STANDARD ODOT LOG (8.5X11) - 2015 - OH.DOT.GDT - 5/19/17 15:04 - T:\RESOURCES\CS\GINT\PROJECTS\111717007.GPJ

PLATE 5

PRELIMINARY

NOTES: SEE NOTES.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS MIXED WITH BENTONITE

PROJECT: <u>FRA-CR17-10.43</u>	DRILLING FIRM / OPERATORS <u>S&ME / C. BRUMMAGE</u>	DRILL RIG: <u>S&ME ATV D50</u>	STATION / OFFSET: <u>407+80, 49.8' RT</u>	EXPLORATION ID: <u>B-003-0-17</u>
TYPE: <u>ROADWAY</u>	SAMPLING FIRM / LOGGER: <u>S&ME / D. GODWIN</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>CR 17 CL</u>	
PID: <u>BR ID: FRA-CR17-1053</u>	DRILLING METHOD: <u>3.25" HSA / NQ2</u>	CALIBRATION DATE: <u>9/28/15</u>	ELEVATION: <u>1014.7 (MSL) EOB: 16.7 ft.</u>	PAGE: <u>1 OF 1</u>
START: <u>3/23/17</u> END: <u>3/23/17</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>84.7</u>	LAT / LONG: <u>40.052528 N, 82.802630 W</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	HOLE SEALED
								GR	CS	FS	SI	CL	LL	PL	PI	WC		
TOPSOIL/ROOTMAT - 6 INCHES	1014.7																	
Possible Fill: Very-stiff brown SILTY CLAY , "and" fine to coarse sand, little fine gravel, moist.	1014.2	1	2															
		2	3	10	56	SS-1	2.0-2.5	-	-	-	-	-	-	-	-	-	21	A-6b (V)
		3	4															
Very-loose brown and gray SANDY SILT , some clay, trace fine gravel, moist.	1010.7	4																
		5	1	4	56	SS-2	-	2	8	42	27	21	23	16	7	21	A-4a (3)	
		6	2															
SANDSTONE , brown highly to severely weathered, very-weak to weak, few gray shale fragments.	1008.7	7	3	-	56	SS-3	-	-	-	-	-	-	-	-	-	-	11	Rock (V)
		8	50-3"															
Interbedded SANDSTONE (55%) AND SHALE (45%) , REC = 95%, RQD=18%; Sandstone, gray, moderately weathered, slightly strong to strong, fine-grained, thin to medium bedding, few highly weathered zones, fractured to moderately fractured, few vertical fractures;	1006.8	8	0		83	NQ2-4	-											CORE
		9																
Shale, gray, highly to severely weathered, very-weak to weak, laminated to very-thin bedded, friable, highly fractured, few diagonal to near vertical fractures.		10																
		11																
- From 10.3'-15.7' Unconfined Compressive Strength = 9,424 psi		12	20		100	NQ2-5	-											CORE
		13																
		14																
		15																
		16	42		100	NQ2-6	-											CORE
	998.0	EOB																

- No seepage noted prior to coring.

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PLATE 9

NOTES: SEE NOTES.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: 1/3 BAG BENTONITE; 1 BAG CEMENT; 50 GAL. WATER

PROJECT: <u>FRA-CR17-10.43</u>	DRILLING FIRM / OPERATORS <u>S&ME / C. BRUMMAGE</u>	DRILL RIG: <u>S&ME ATV D50</u>	STATION / OFFSET: <u>408+98, 5.0' LT</u>	EXPLORATION ID
TYPE: <u>ROADWAY</u>	SAMPLING FIRM / LOGGER: <u>S&ME / D. GODWIN</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>CR 17 CL</u>	B-004-0-17
PID: _____ BR ID: _____	DRILLING METHOD: <u>3.25" HSA</u>	CALIBRATION DATE: <u>9/28/15</u>	ELEVATION: <u>1020.7 (MSL) EOB: 7.5 ft.</u>	PAGE
START: <u>3/24/17</u> END: <u>3/24/17</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>84.7</u>	LAT / LONG: <u>40.052656 N, 82.802195 W</u>	1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	BACK FILL
								GR	CS	FS	SI	CL	LL	PL	PI	WC		
ASPHALT - 7 INCHES	1020.7																	
GRANULAR BASE - 8 INCHES	1019.4	1																
Fill: Very-stiff to hard brown SANDY SILT , some clay, little fine to coarse gravel, contains brick fragments, moist.	1017.7	2	3	4	11	56	SS-1	2.2-4.2	14	16	11	30	29	30	20	10	15	A-4a (5)
Possible Fill: Very-stiff to hard brown and gray SANDY SILT , little clay, little fine to coarse gravel, moist.		3	1	5	20	39	SS-2	4.0-4.5+	14	13	14	40	19	25	19	6	14	A-4a (5)
		4		9														
		5	7	5	14	61	SS-3	2.7-4.0	-	-	-	-	-	-	-	-	13	A-4a (V)
	1014.3	6		5														
Very-stiff to hard brown mottled with gray SILT AND CLAY , some fine to coarse sand, little fine gravel, moist.	1013.2	7	4	6	18	78	SS-4A	2.7-4.5+	-	-	-	-	-	-	-	-	17	A-4a (V)
		EOB		7			SS-4B	3.5-4.5+	-	-	-	-	-	-	-	-	15	A-6a (V)

- No seepage noted.
- Dry at completion.
- Sample SS-1: Sulfate Content = 174 ppm.

PRELIMINARY

NOTES: SEE NOTES.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; SOIL CUTTINGS MIXED WITH BENTONITE

S&ME STANDARD ODOT LOG (8.5X11) - 2015 - OH DOT.GDT - 5/19/17 15:04 - T:\RESOURCES\CS\GINT\PROJECTS\111717007.GPJ

PLATE 7

PROJECT: <u>FRA-CR17-10.43</u>	DRILLING FIRM / OPERATORS <u>S&ME / C. BRUMMAGE</u>	DRILL RIG: <u>S&ME ATV D50</u>	STATION / OFFSET: <u>53+53, 5.9' LT</u>	EXPLORATION ID
TYPE: <u>ROADWAY</u>	SAMPLING FIRM / LOGGER: <u>S&ME / D. GODWIN</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>CR 110 CL</u>	B-005-0-17
PID: _____ BR ID: _____	DRILLING METHOD: <u>3.25" HSA</u>	CALIBRATION DATE: <u>9/28/15</u>	ELEVATION: <u>1021.4 (MSL) EOB: 7.5 ft.</u>	PAGE
START: <u>3/24/17</u> END: <u>3/24/17</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>84.7</u>	LAT / LONG: <u>40.051694 N, 82.803662 W</u>	1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI	WC			
ASPHALT - 6-1/2 INCHES	1021.4																		
GRANULAR BASE - 7 INCHES	1020.9	1																	
Fill: Very-stiff brown and gray SILT AND CLAY , some fine to coarse sand, some fine to coarse gravel, damp.	1020.3	2	5																
Stiff brown mottled with dark-brown SILT AND CLAY , some fine to coarse sand, little fine gravel, slight organic, damp.	1018.4	3	4	13	39	SS-1	2.5-4.0	23	14	13	24	26	33	18	15	16	A-6a (5)	<><><>	
Very-stiff to hard brown mottled with gray SILT AND CLAY , some to "and" fine to coarse sand, trace fine to coarse gravel, contains iron oxide stains, damp.	1016.9	4	3	5	18	78	SS-2	1.0-2.0	13	11	12	36	28	32	19	13	18	A-6a (7)	<><><>
		5	4	14	61	SS-3	3.5-4.2	-	-	-	-	-	-	-	-	-	18	A-6a (V)	<><><>
		6	1	6															<><><>
	1013.9	7	5	17	67	SS-4	3.75-4.5+	-	-	-	-	-	-	-	-	-	17	A-6a (V)	<><><>

EOB

- No seepage noted.
- Dry at completion.
- Sample SS-1: Sulfate Content = 93 ppm.

PRELIMINARY

NOTES: SEE NOTES.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; SOIL CUTTINGS MIXED WITH BENTONITE

S&ME STANDARD ODOT LOG (8.5X11) - 2015 - OH.DOT.GDT - 5/19/17 15:04 - T:\RESOURCES\CS\GINT\WP\PROJECTS\111717007.GPJ

PROJECT: <u>FRA-CR17-10.43</u>	DRILLING FIRM / OPERATORS <u>S&ME / C. BRUMMAGE</u>	DRILL RIG: <u>S&ME ATV D50</u>	STATION / OFFSET: <u>60+84, 4.7' LT</u>	EXPLORATION ID: <u>B-006-0-17</u>
TYPE: <u>ROADWAY</u>	SAMPLING FIRM / LOGGER: <u>S&ME / D. GODWIN</u>	HAMMER: <u>CME AUTOMATIC</u>	ALIGNMENT: <u>CR 110 CL</u>	PAGE 1 OF 1
PID: <u>BR ID:</u>	DRILLING METHOD: <u>3.25" HSA</u>	CALIBRATION DATE: <u>9/28/15</u>	ELEVATION: <u>1029.1 (MSL) EOB: 7.5 ft.</u>	
START: <u>3/24/17</u> END: <u>3/24/17</u>	SAMPLING METHOD: <u>SPT</u>	ENERGY RATIO (%): <u>84.7</u>	LAT / LONG: <u>40.053553 N, 82.802696 W</u>	

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTH	SPT/ RQD	N ₆₀	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%)					ATTERBERG				ODOT CLASS (GI)	BACK FILL	
								GR	CS	FS	SI	CL	LL	PL	PI	WC			
ASPHALT - 5 1/2 INCHES	1028.7																		
GRANULAR BASE - 3 1/2 INCHES	1028.4	1																	
Fill: Very-stiff brown SANDY SILT , some clay, little fine gravel, damp.	1026.1	2	4	11	30	39	SS-1	2.0-3.0	16	14	16	30	24	27	18	9	14	A-4a (4)	
Fill: Hard brown SILTY CLAY , some fine to coarse sand, some fine to coarse gravel, damp.	1024.6	3	6	5	13	39	SS-2	4.0-4.5+	27	11	13	25	24	33	17	16	14	A-6b (5)	
Very-stiff to hard brown mottled with gray CLAY , some silt, little to some fine to coarse sand, trace fine to coarse gravel, contains iron oxide stains, damp.	1023.1	4	2	5	16	72	SS-3	3.0-4.25	-	-	-	-	-	-	-	-	24	A-7-6 (V)	
Medium-dense brown and gray GRAVEL WITH SAND, SILT AND CLAY , contains coarse gravel sized sandstone fragments, few iron oxide stains, damp.	1021.6	5	14	7	17	44	SS-4	2.0-2.5	-	-	-	-	-	-	-	-	18	A-2-6 (V)	
		6																	
		7																	

EOB

- No seepage noted.
- Dry at completion.
- Sample SS-1: Sulfate Content = 249 ppm.

S&ME STANDARD ODOT LOG (8.5X11) - 2015 - OH.DOT.GDT - 5/19/17 15:04 - T:\RESOURCES\CS\GINT\WP\PROJECTS\111717007.GPJ

PLATE 9

PRELIMINARY

NOTES: SEE NOTES.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; SOIL CUTTINGS MIXED WITH BENTONITE

ODOT Geotechnical Bulletin GB-1 Subgrade Analysis Spreadsheet
Morse-Kitzmilller Roundabout, Franklin County, Ohio

Subgrade Analysis				Global Options		Classification Counts by Sample														Surface Class		% Borings		% Surface		Rig	ER				
V. 13.00		01/15/16		320	No	R	1a	1b	3	3a	2-4	2-5	2-6	2-7	4a	4b	5	6a	6b	7-5	7-6	8a	8b	2-5	0	N _{60L} ≤ 5	0%	40%		A	85
Design		7		206	Option	1	0	0	0	0	0	0	0	7	0	0	8	1	0	3	0	0	4b	0	≤ 10	20%	0%	40%	B		
CBR				206	No	5%								9%			32%	5%		14%			5	0	>= 20	0%	M+	100%	C		
					12	5%								9%			36%	5%		14%			7-5	0	R	20%	M+	100%	D		
						5%								9%			86%						7-6	1	R	20%	R	20%	E		
						5%								9%			86%						8a	0					F		
						5%								9%			86%						8b	0					G		
						5%								9%			86%						R	0					H		

Total Borings		5		Average		N ₆₀		N _{60L}		PI		Clay		M		M _{OPT}		GI	
PID		105623		Maximum		20.0		11.6		13.5		27.7		16.8		14.0		6.71	
Location		FRA-CR17-10.43		Minimum		99		14		6		40		24		18		14	
						7		7		25		19		11		10		2	

#	B #	Boring Location	Depth	To	Cut Fill *	Subgrade		Standard Penetration				Physical Characteristics						Moisture		Class		Sulfate	Problem		Undercut		Analysis / Comments							
						Depth	To	n ₂	n ₃	N	Rig	N ₆₀	N _{60L}	LL	PL	PI	% Silt	% Clay	P	M	M _{OPT}		Ohio DOT	GI	w/ Class	w/ MN		UC Class	UC MN					
1	B 001-0 17	401+91, 6.2' RT	1.5	3.0	-1.2	0.3	1.8	5	6	11	A	16		42	20	22	23	36	59	21	18	7-6	10	200										
			3.0	4.5		1.8	3.3	5	5	10		14		46	21	25	22	36	58	22	18	7-6	11		BR	MN		12						
			4.5	6.0		3.3	4.8	7	9	16		23								16	14	6a	8											
			6.0	7.5		4.8	6.3	22	48	70		99	14							11		R												
2	B 002-0 17	405+56, 23' RT	1.0	2.5	-2.3	-1.3	0.2	3	4	7	A	10		29	19	10	27	25	52	17	14	4a	3											
			2.5	3.2		0.2	0.9							29	20	9	34	30	64	20	15	4a	6											
			3.2	4.0		0.9	1.7	2	3	5		7								16	10	2-6	2											
			4.0	5.5		1.7	3.2	3	6	9		13								19	14	6a	8											
			5.5	7.0		3.2	4.7	4	7	11		16	7							15	14	6a	8											
3	B 004-0 17	408+98, 5.0' LT	1.5	3.0	2.2	3.7	5.2	4	4	8	A	11		30	20	10	30	29	59	15	15	4a	5	174										
			3.0	4.5		5.2	6.7	5	9	14		20		25	19	6	40	19	59	14	14	4a												
			4.5	6.0		6.7	8.2	5	5	10		14								13	10	4a												
			6.0	6.4		8.2	8.6													17	10	4a												
			6.4	7.5		8.6	9.7	6	7	13		18	11						15	14	6a													
4	B 005-0 17	53+53, 5.9 LT	1.5	3.0	-1.7	-0.2	1.3	4	5	9	A	13		33	18	15	24	26	50	16	14	6a	5	93										
			3.0	4.5		1.3	2.8	5	8	13		18		32	19	13	36	28	64	18	14	6a	7											
			4.5	6.0		2.8	4.3	4	6	10		14								18	14	6a	8											
			6.0	7.5		4.3	5.8	5	7	12		17	13							17	14	6a	8											
5	B 006-0 17	60+84, 4.7 LT	1.5	3.0	-1.1	0.4	1.9	11	10	21	A	30		27	18	9	30	24	54	14	13	4a	4	249										
			3.0	4.5		1.9	3.4	5	4	9		13		33	17	16	25	24	49	14	16	6b	5											
			4.5	6.0		3.4	4.9	5	6	11		16								24	18	7-6	14											
			6.0	7.5		4.9	6.4	7	5	12		17	13							18	10	2-6	2											
6					0.0						A																							
7					0.0						A																							
8					0.0						A																							
9					0.0						A																							
10					0.0						A																							
11					0.0						A																							

* Cut/Fill Depth anticipates a 1.2-foot-thick proposed pavement section.



RESOURCE INTERNATIONAL INC.
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 Selma, Kuwait
 Silver Spring, Maryland
 Canton, Ohio
 Cincinnati, Ohio
 Ft. Lauderdale, Florida

REPORT OF SOIL EXPLORATION Sta. 10+42.7 ft. Rt.

Client Sticklen-Belsheim & Associates
 Project Morse Rd. over Blacklick Creek
Subsurface Investigation
 Job Number RII 82-700

Boring Number B1
 Sheet 1 of 1
 Completion Depth 25 ft.
 surface EL. 1023.5

DRILLING AND SAMPLING INFORMATION

Date Started 8-19-82 Boring Method CFA
 Date Finished 8-19-82 Hammer Weight 140 lbs.
 Drilled By Mason, Sandefur & deVerteuil, Inc. Hammer Drop 30 in.

Sample No.	Blows Per 6"	Sample Type	Depth Ft.	Soil Description	Moisture Content	Atterberg	
						LL	PL
1	AUGER SAMPLE		2.5	SILTY SAND + GRAVEL W/ A.C. SURFACE			
2	5/7/6	ALL 2S	5	DAMP SANDY SILT W/ SANDSTONE FRAGMENTS	13.0		
3	8/7/14		9.7	MOIST SILT W/LITTLE SAND			
4	4/5/9		13.0	NET SILTY SAND + GRAVEL	23.0	31	21
5	1/3/3	CORE REC.	13.8	GRAY	21.0		
SC-1			15	SOUND CONCRETE			
SC-2			17.7	BADLY BROKEN SANDY SHALE			
		96" 89"	18.7	BROKEN SANDSTONE			
			20.5	BROKEN SHALE W/ THIN SANDSTONE SEAMS			
		36" 36"	25.0				
				** LIGHTLY WEATHERED TO 18.2' DEPTH			

SAMPLER TYPE

- 2S—2"OD Spill Spoon
- 3S—3"OD Spill Spoon
- ST—Shelby Tube
- RC—Rock Core

GROUND WATER READING

At Completion 11.1 Ft.
 After 24 Hrs. _____ Ft.

BORING METHOD

- HSA—Hollow Stem Augers
- CFA—Continuous Flight Augers
- MD—Mud Drilling
- WD—Wash Drilling

* DRILLING WATER



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REPORT OF SOIL EXPLORATION Sta. 11+12, 7' Rt.

Client Sticklen-Belsheim & Associates
 Project Morse Rd. over Blacklick Creek
Subsurface Investigation
 Job Number RII 82-700

Boring Number B2
 Sheet 1 of 1
 Completion Depth 28 ft.
 surface El. 1022.7

DRILLING AND SAMPLING INFORMATION

Date Started 8-19-82 Boring Method CFA
 Date Finished 8-19-82 Hammer Weight 140 lbs.
 Drilled By Mason, Sandefur & deVerteuil, Inc. Hammer Drop 30 in.

Sample No.	Blows Per 6"	Sample Type	Depth FT.	Soil Description	Moisture Content	Atterberg		
						LL	PL	
1	Auger SAMPLE		0	2.5 SILTY SAND + GRAVEL W/A.C. SURFACE BLACK				
2	3/4/7	ALL 2S	5	MOIST GRAY + BROWN	16.0			
3					23.0			
4	4/5/6					SILT W/LITTLE SAND TRACE ROOT FIBERS AND SHALE FRAGS.		
5	2/6/5			9.2				
6	5/4/5		10	MOIST GRAY + BROWN	23.0			
7	5/4/3		14.3	SILT AND CLAY SOME GRAVEL	17.0	31	19	
8	5/1/3		15	MOIST SILTY CLAYEY GRAVEL W/ LITTLE SAND BROWN	16.0	26	22	
		CORE REC. 36" 34" 84" 79"	18.0	WET SILTY CLAYEY GRAVEL W/ LITTLE SAND BROWN	25.0			
			19.8	BROKEN SANDSTONE GRAY + BROWN **				
			22.0	BADLY BROKEN SHALE GRAY				
			22.8	BROKEN SANDY SHALES GRAY				
			23.8	MASSIVE SANDSTONE GRAY				
			25	BEDDED SHALE GRAY WITHIN SANDSTONE SEAMS				
			27.0					
			28.0	MASSIVE SANDSTONE GRAY				
			30	** LIGHTLY WEATHERED TO 19.0' DEPTH				

SAMPLER TYPE
 2S—2"OD Split Spoon
 3S—3"OD Split Spoon
 ST—Shebly Tube
 RC—Rock Core

GROUND WATER READING *
 At Completion 12.6 Ft.
 After 24 Hrs. _____ Ft.

BORING METHOD
 HSA—Hollow Stem Augers
 CFA—Continuous Flight Augers
 MD—Mud Drilling
 WD—Wash Drilling

* DRILLING WATER



**LOG OF BORING NO. B-2
MORSE ROAD AREA WATER LINE
COLUMBUS, OHIO**

LOCATION: See Plate 2 (~ Water Line Sta. 19+50, 74' Rt.) ELEVATION: 1024.0 DATE: 1/18/02
 DRILLING METHOD: 4-1/2" O.D. Continuous-flight Auger COMPLETION DEPTH: 30.0'
 SAMPLER(S): 2" O.D. Split-barrel Sampler

DEPTH, FEET	SAMPLE NUMBER	SAMPLE	SAMPLE EFFORT	DESCRIPTION	NATURAL CONSISTENCY INDEX				TEST RESULTS
					NATURAL MOISTURE CONTENT		PLASTIC LIMIT	LIQUID LIMIT	
0					10	20	30	40	
1	4	1/5/6		FILL: Fine to coarse gravel. POSSIBLE FILL: Very-stiff to hard brown silty clay, "and" fine to coarse sand, trace fine to coarse gravel.					H=4.0-4.5+
5	2	3/3/3							H=3.0-4.5+
3		50-6"R		Very-dense brown fine to coarse gravel, little fine to coarse sand, little clayey silt.					
10				Medium-hard brown fine-grained sandstone and siltstone.					
4		50-1"R							
15				Soft to medium-hard gray shale, nearly horizontally bedded.					
5		50-4"R							
20									
6		50-3"R							
25									
7		50-4"R							
30									
- No seepage or groundwater noted.									
- Encountered sampler refusal at 28.5', augered to 30.0'.									

BORLJ 17169000.GP M.GDT 1/31/02

WATER LEVEL: "Dry"
 WATER NOTE: _____
 DATE: 1/18/02

SYMBOLS USED TO INDICATE TEST RESULTS

G - GRADATION	SEE SEPARATE CURVES	H - PENETROMETER (tsf)
Q - UNCONFINED COMPR		W - UNIT DRY WEIGHT (pcf)
T - TRIAXIAL COMPR		D - RELATIVE DENSITY (%)
C - CONSOLIDATION		