May 22, 2025

ODOT District 4
2088 S. Arlington Road
Akron, OH 44306

Attention: Mr. Thomas Powell, P.E.

Reference: **Structure Foundation Exploration**
SUM-303-3.216 Culvert Replacement (PID 112177)
Richfield, Summit County, Ohio
S&ME Project No. 23170065F, Task Order No. 04-05

Mr. Powell:

S&ME has completed the Subsurface Foundation Exploration for the SUM-303-3.216 Culvert Replacement project in Richfield, Summit County, Ohio. The work was performed in accordance with our proposal dated January 21, 2025, which was authorized by ODOT District 4 on February 3, 2025, under Encumbrance No. 741667. We have attached an Appendix including a Vicinity Map, Plan of Borings and a log of the completed boring including results of the laboratory testing.

Preparation of a draft set of Geotechnical Profile sheets in accordance with ODOT *SGE* requirements is in process and will be submitted at a later date when completed. We appreciate the opportunity to be of service on this project, and please don't hesitate to contact us if you have any questions.

Sincerely,

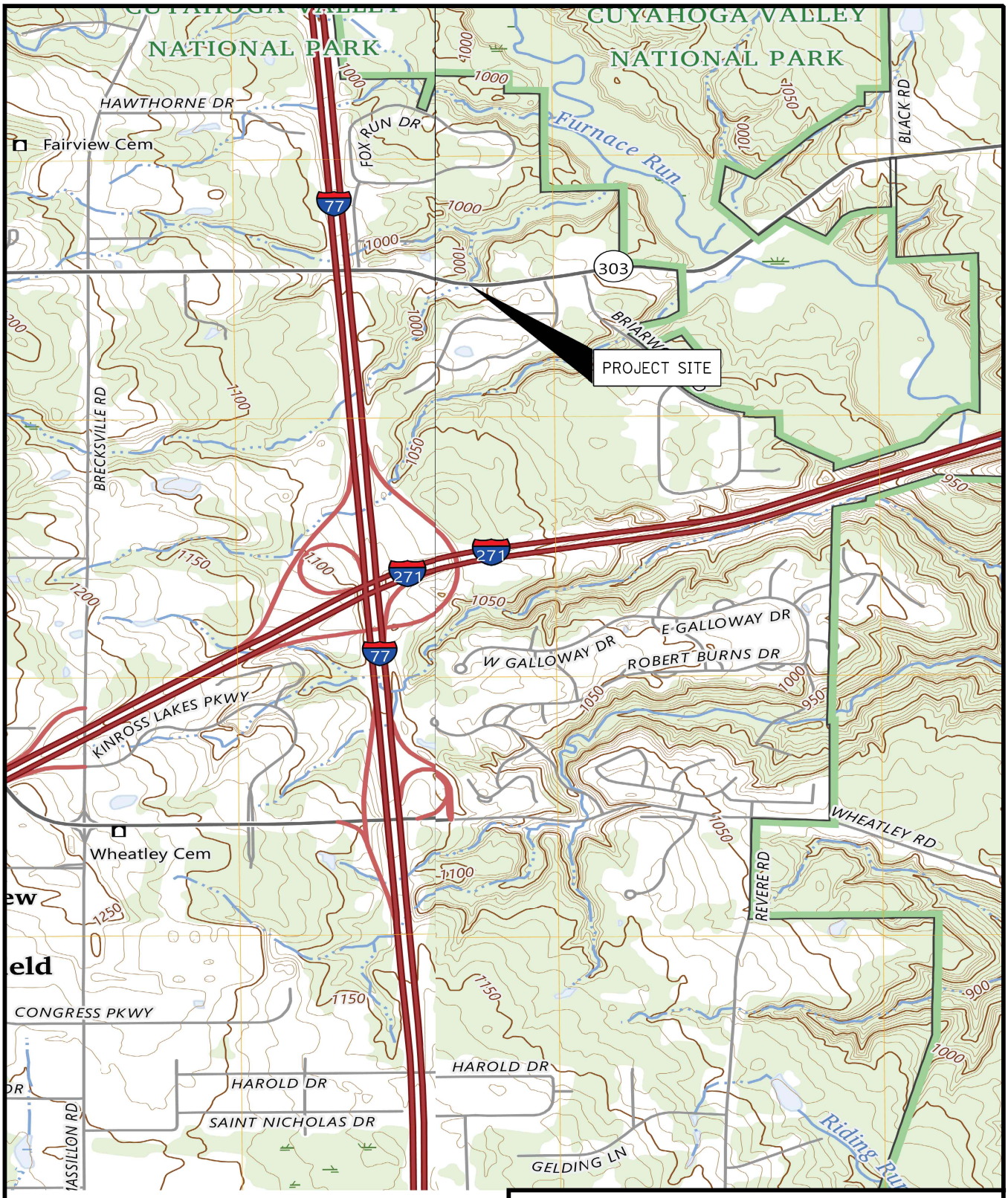
S&ME, Inc.

Kevin A. Harper
Engineer | Deputy Project Manager

Brian K. Sears, P.E.
Senior Engineer | Project Manager

Senior Review: Richard S. Weigand, P.E.

Attachments: Vicinity Map (1 page)
Plan of Borings (1 page)
ODOT Soil Legend (1 page)
Boring Log (2 pages)
Report Limitations (1 page)



Vicinity Map

SUM-303-3.216 Culvert Replacement
Summit County, Ohio

Project: 23-17-0065F	
Drawing Date: 5-21-2025	
Revision Date: 5-22-2025	
Drawn By: KAH	
Approved By: BKS	
Scale: GRAPHIC	ENGINEERING LICENSE NO: COA.03530

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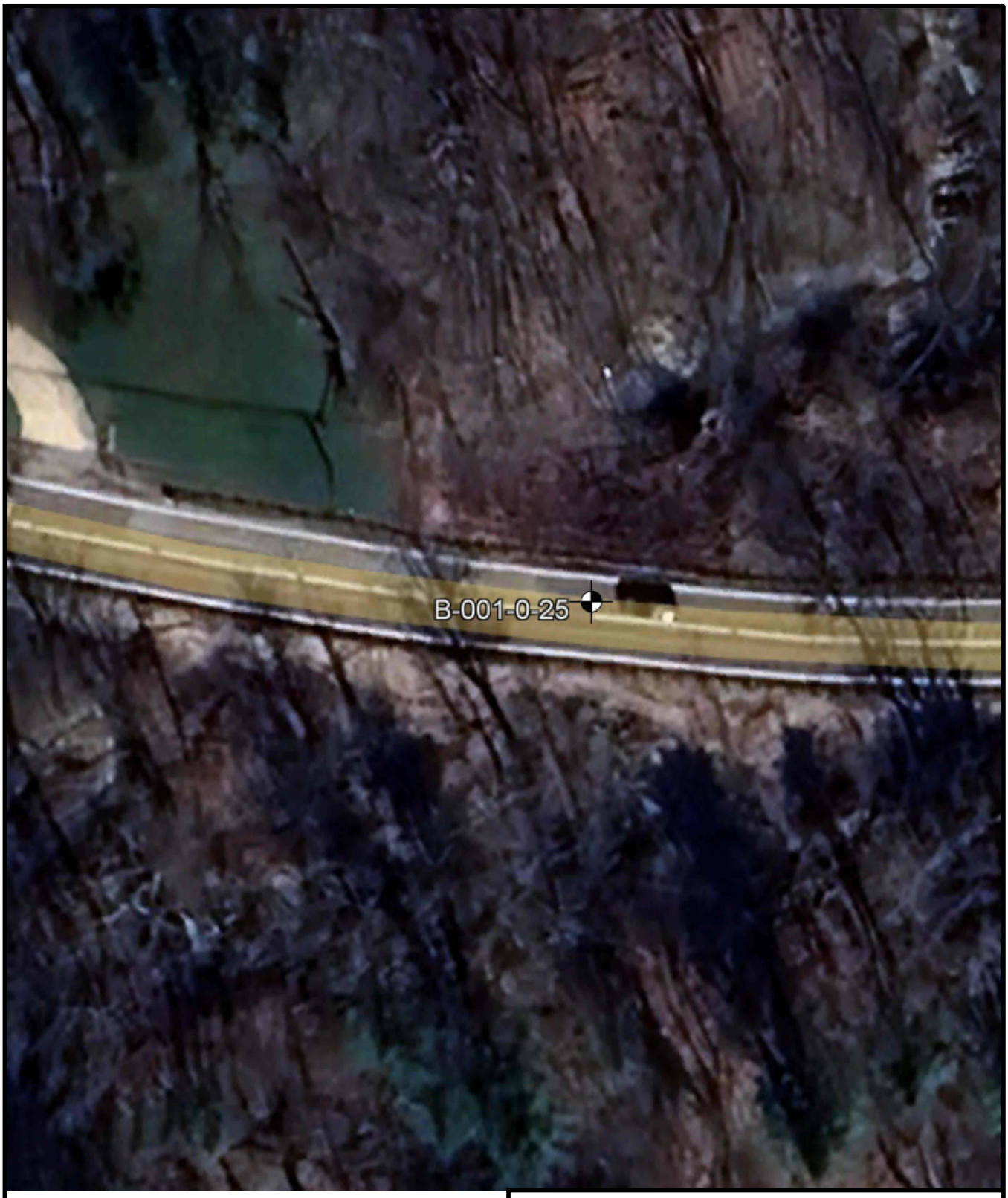
PLATE 1



N

LEGEND

B-1

BORING NUMBER
AND LOCATION

0 35 70

SCALE IN FEET

Plan of Borings

SUM-303-3.216 Culvert Replacement
Summit County, Ohio

Project: 23-17-0065F	
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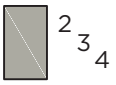
PLATE 2

ODOT SOIL LOG LEGEND

The STANDARD PENETRATION TEST (SPT) as defined by AASHTO T206 (or ASTM D1586) is a method to obtain a disturbed soil sample for examination and testing and to obtain relative density and consistency information. A standard 1.4-inch I.D./2-inch O.D. split-barrel sampler is driven three 6-inch increments (see graphic at right) with a 140 lb. hammer freely falling 30 inches. The hammer can either be of a trip, free-fall design, or actuated by a rope and cathead. The SPT N Value is determined by adding the number of blows from the 2nd and 3rd 6-inch increments.



SPT BLOWCOUNT CORRECTION FOR HAMMER EFFICIENCY (N_{60}) is determined by the following equation: $N_{60} = N * [$ Drill Rod Energy Ratio (%) / 60], and where the drill rod energy ratio is determined in accordance with ASTM D4633. If the drill rod energy ratio exceeds 90%, it is limited to 90% to determine the N_{60} value and is shown on the log as 90*.

SHELBY TUBE (ST) samples are obtained by hydraulically pushing a thin-walled tube (typically 3-inches in diameter) to obtain a relatively undisturbed sample for testing of fine-grained soils to determine engineering properties such as strength, compressibility, permeability, and density. Shelby tubes are sampled in general accordance with ASTM D1587 (AASHTO T207).

DESCRIPTIVE ORDER OF SOIL STRATA: Consistency/Density, color, ODOT soil classification description, minor soil constituents with percentage modifiers, organic content, miscellaneous constituents or descriptions, relative moisture condition.

ODOT SOIL CLASSIFICATION DESCRIPTION AND SYMBOL

- **GRAVEL** (A-1-a)
- **GRAVEL WITH SAND** (A-1-B)
- **FINE SAND** (A-3)
- **COARSE AND FINE SAND** (A-3a)
- **GRAVEL WITH SAND AND SILT** (A-2-4 OR A-2-5)
- **GRAVEL WITH SAND, SILT AND CLAY** (A-2-6 OR A-2-7)
- **SANDY SILT** (A-4a)
- **SILT** (A-4b)
- **ELASTIC SILT AND CLAY** (A-5)
- **SILT AND CLAY** (A-6a)
- **SILTY CLAY** (A-6b)
- **ELASTIC CLAY** (A-7-5)
- **CLAY** (A-7-6)
- **ORGANIC SILT** (A-8a)
- **ORGANIC CLAY** (A-8b)
- **PEAT**
- **UNCONTROLLED FILL**
- **BOULDERY ZONE**
- **SOD/ROOTMAT/ TOPSOIL**
- **PAVEMENT OR BASE**
- **CONCRETE**

SOIL LOG SYMBOLS

SS - Split-Spoon Sample

ST - Shelby Tube Sample

TR - Top of Rock

REC - Sample Recovery, %

HP - Hand Penetrometer Value, tsf

LOI - Loss on Ignition Test, %

Qu - Unconfined Compressive Strength

γd - Dry Unit Weight, pcf

γm - Moist Unit Weight, pcf

GR - Gravel Content, %

CS - Coarse Sand Content, %

FS - Fine Sand Content, %

SI - Silt Content, %

CL - Clay Content, %

LL - Liquid Limit

PL - Plastic Limit

PI - Plasticity Index

WC - Natural Water Content, %

NOTE: Particle size contents are expressed % by weight.

PARTICLE SIZE

Particle	Size	US Sieve Size
Boulder	>300 mm (12 in.)	12 in.
Cobble	75 - 300 mm (3 - 12 in.)	3 - 12 in.
Coarse gravel	19 - 75 mm (3/4 - 3 in.)	3/4 - 3 in.
Fine gravel	2 - 19 mm (0.08 - 3/4 in.)	#10 - 3/4 in.
Coarse sand	0.42 - 2.0 mm	#40 - #10
Fine sand	0.074 - 0.42 mm	#200 - #40
Silt	0.005 - 0.074 mm	NA
Clay	< 0.005 mm	NA

FINE-GRAINED SOIL
(Relative Consistency)

	N_{60}	HP
Very soft	< 2 bpf	< 0.25 tsf
Soft	2 - 4 bpf	> 0.25 - 0.5 tsf
Medium stiff	5 - 8 bpf	> 0.5 - 1.0 tsf
Stiff	9 - 15 bpf	> 1.0 - 2.0 tsf
Very stiff	16 - 30 bpf	> 2.0 - 4.0 tsf
Hard	> 30 bpf	> 4.0 tsf

COARSE-GRAINED SOIL
(Relative Density)

	N_{60}
Very loose	< 5 bpf
Loose	5 - 10 bpf
Medium dense	11 - 30 bpf
Dense	31 - 50 bpf
Very dense	> 50 bpf

MINOR CONSTITUENTS
(% By Weight)

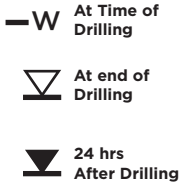
	Percentage
Trace	0% - 10%
Little	>10% - 20%
Some	>20% - 35%
"And"	≥ 35%

ORGANIC CONTENT OF SOIL
(Determined by ASTM D2974 or AASHTO T267)

Classification	Percentage
Slightly organic	2% - 4%
Moderately organic	>4% - 10%
Highly organic	> 10%

RELATIVE MOISTURE CONDITION

Dry	Cohesive - Powdery, WC well below PL Granular - No moisture present
Damp	Cohesive - Leaves very little moisture when pressed, WC < PL Granular - Internal moisture, little to no surface moisture
Moist	Cohesive - Leaves moisture when pressed, PL < WC < LL - 3 Granular - Free water on surface, shiny appearance
Wet	Cohesive - Mushy, WC near or above LL Granular - Voids filled with free water



Free water (seepage or groundwater) observation made anytime during the drilling process. Depending on time of reading and drilling methodologies, this value may be influenced by the drilling process.

Free water measurement soon after the drilling processes are complete, and the borehole is at final depth. Drilling fluids, if introduced during drilling, may influence this measurement.

Free water measurements made in a borehole hours to days after drilling is complete including the time elapsed (i.e., "24 hrs" as shown at left). Depending on subsurface conditions, elapsed time, drilling process, etc. this observation may reflect a stabilized level.

REFERENCES:

Ohio Department of Transportation (ODOT), Specifications for Geotechnical Explorations (SGE)

S&ME JOB: 23170065F

PROJECT: SUM-303-3.216	DRILLING FIRM / OPERATOR: OTB / D. HEPNER	DRILL RIG: OTB ATV B-57	STATION / OFFSET: 85+83, 9' LT
TYPE: CULVERT REPLACEMENT	SAMPLING FIRM / LOGGER: S&ME / K. HARPER	HAMMER: CME AUTOMATIC	ALIGNMENT: SR 303 CL
PID: 112177 BR ID: 1847716	DRILLING METHOD: 3-1/4" HSA	CALIBRATION DATE: 12/30/24	ELEVATION: 988.7 (MSL) EOB: 40.0 ft.
START: 4/18/25 END: 4/18/25	SAMPLING METHOD: SPT	ENERGY RATIO (%): 90*	LAT / LONG: 41.239287 N, 81.623522 W

EXPLORATION ID **B-001-0-25**

PAGE 1 OF 2

MATERIAL DESCRIPTION AND NOTES	ELEV. 988.7	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
ASPHALT - 16 INCHES	987.4																	
GRANULAR BASE - 8 INCHES	986.7																	
FILL: Very stiff brown **SANDY SILT**, some clay, trace fine gravel, damp.			2 3 3	9	100	SS-1	2.5-3.0	-	-	-	-	-	-	-	-	15	A-4a (V)	
			1 1 2	5	67	SS-2	2.0	-	-	-	-	-	-	-	-	17	A-4a (V)	
			1 2 3	8	100	SS-3	2.0	8	9	22	38	23	24	16	8	16	A-4a (5)	
			2 2 2	6	100	SS-4	2.5	-	-	-	-	-	-	-	-	18	A-4a (V)	
	977.2	W 977.2	1 2 5	11	100	SS-5A	2.5	-	-	-	-	-	-	-	-	22	A-4a (V)	
						SS-5B	-	-	-	-	-	-	-	-	-	21	A-3a (V)	
POSSIBLE FILL: Medium dense brown **COARSE AND FINE SAND**, little to some silt, trace fine gravel, trace clay, decayed plant matter and wood fragments from 11.5' to 11.7', wet.	975.7																	
Medium dense brown **GRAVEL**, some fine to coarse sand, trace silt, trace clay, wet.	974.2	W 974.7	3 5 2	11	100	SS-6A	-	61	13	12	7	7	NP	NP	NP	15	A-1-a (0)	
						SS-6B	1.5	-	-	-	-	-	-	-	-	29	A-4a (V)	
Stiff gray **SANDY SILT**, some to "and" clay, trace fine gravel, wet.	973.2																	
Medium dense gray **GRAVEL WITH SAND**, little silt, trace clay, wet.	970.7		4 6 6	18	100	SS-7	-	35	22	19	14	10	18	14	4	11	A-1-b (0)	
Hard gray **SANDY SILT**, some clay, little fine to coarse gravel, damp.			2 5 6	17	100	SS-8	4.5+	-	-	-	-	-	-	-	-	13	A-4a (V)	
			2 4 6	15	100	SS-9	4.5+	11	9	13	36	31	20	15	5	14	A-4a (6)	
			2 5 7	18	100	SS-10	4.5+	-	-	-	-	-	-	-	-	17	A-4a (V)	
			2 4 6	15	100	SS-11	4.5+	-	-	-	-	-	-	-	-	16	A-4a (V)	
			3 5 6	17	100	SS-12	4.5+	-	-	-	-	-	-	-	-	13	A-4a (V)	

S&ME ODOT LOG (8.5X11) - SGE 01/2019 - OH DOT.GDT - 5/22/25 14:06 - R:\SERVICE LINES\CS-2557\COLUMBUS\GINT\WPROJECTS\23170065F SUM-303.GPJ

PLATE 4

S&ME JOB: 23170065F

PID: 112177	BR ID: 1847716	PROJECT: SUM-303-3.216	STATION / OFFSET: 85+83, 9' LT	START: 4/18/25	END: 4/18/25	PG 2 OF 2	**B-001-0-25**

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) GR	CS	FS	SI	CL	ATTERBERG LL	PL	PI	WC	ODOT CLASS (GI)	BACK FILL
Hard gray **SANDY SILT**, some clay, little fine to coarse gravel, damp. *(continued)*	958.7	31																
		32	3 6 8	21	100	SS-13	4.5+	-	-	-	-	-	-	-	-	14	A-4a (V)	
		33																
		34	3 5 7	18	100	SS-14	4.5+	18	16	17	27	22	20	15	5	12	A-4a (3)	
		35																
		36	2 5 7	18	100	SS-15	4.5+	-	-	-	-	-	-	-	-	14	A-4a (V)	
		37																
		38	4 7 9	24	100	SS-16	4.5+	-	-	-	-	-	-	-	-	14	A-4a (V)	
	948.7	EOB 40																

NOTES:
- Seepage encountered during drilling at 11.5'.
- Water encountered during drilling at 14.0'.
- Borehole caved at a depth of 25' after augers were removed, and water was measured at 12.0'.

NOTES: SEE ABOVE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: ASPHALT PATCH; PLASTIC HOLE PLUG DEVICE; SOIL CUTTINGS MIXED WITH BENTONITE

S&ME ODOT LOG (8.5X11) - SGE 01/2019 - OH DOT.GDT - 5/22/25 14:06 - R:\SERVICE LINES\CS-2557\COLUMBUS\GINTW\PROJECTS\23170065F SUM-303.GPJ

PLATE 5

Important Information About Your
Geotechnical Engineering Report

Variations in subsurface conditions can be a principal cause of construction delays, cost overruns and claims. The following information is provided to assist you in understanding and managing the risk of these variations.

Geotechnical Findings Are Professional Opinions

Geotechnical engineers cannot specify material properties as other design engineers do. Geotechnical material properties have a far broader range on a given site than any manufactured construction material, and some geotechnical material properties may change over time because of exposure to air and water, or human activity.

Site exploration identifies subsurface conditions at the time of exploration and only at the points where subsurface tests are performed or samples obtained. Geotechnical engineers review field and laboratory data and then apply their judgment to render professional opinions about site subsurface conditions. Their recommendations rely upon these professional opinions. Variations in the vertical and lateral extent of subsurface materials may be encountered during construction that significantly impact construction schedules, methods and material volumes. While higher levels of subsurface exploration can mitigate the risk of encountering unanticipated subsurface conditions, no level of subsurface exploration can eliminate this risk.

Scope of Geotechnical Services

Professional geotechnical engineering judgment is required to develop a geotechnical exploration scope to obtain information necessary to support design and construction. A number of unique project factors are considered in developing the scope of geotechnical services, such as the exploration objective; the location, type, size and weight of the proposed structure; proposed site grades and improvements; the construction schedule and sequence; and the site geology.

Geotechnical engineers apply their experience with construction methods, subsurface conditions and exploration methods to develop the exploration scope. The scope of each exploration is unique based on available project and site information. Incomplete project information or constraints on the scope of exploration increases the risk of variations in subsurface conditions not being identified and addressed in the geotechnical report.

Services Are Performed for Specific Projects

Because the scope of each geotechnical exploration is unique, each geotechnical report is unique. Subsurface conditions are explored and recommendations are made for a specific project.

Subsurface information and recommendations may not be adequate for other uses. Changes in a proposed structure location, foundation loads, grades, schedule, etc. may require additional geotechnical exploration, analyses, and consultation. The geotechnical engineer should be consulted to determine if additional services are required in response to changes in proposed construction, location, loads, grades, schedule, etc.

Geo-Environmental Issues

The equipment, techniques, and personnel used to perform a geo-environmental study differ significantly from those used for a geotechnical exploration. Indications of environmental contamination may be encountered incidental to performance of a geotechnical exploration but go unrecognized. Determination of the presence, type or extent of environmental contamination is beyond the scope of a geotechnical exploration.

Geotechnical Recommendations Are Not Final

Recommendations are developed based on the geotechnical engineer's understanding of the proposed construction and professional opinion of site subsurface conditions. Observations and tests must be performed during construction to confirm subsurface conditions exposed by construction excavations are consistent with those assumed in development of recommendations. It is advisable to retain the geotechnical engineer that performed the exploration and developed the geotechnical recommendations to conduct tests and observations during construction. This may reduce the risk that variations in subsurface conditions will not be addressed as recommended in the geotechnical report.