ENVIRONMENTAL • GEOTECHNICAL
BUILDING SCIENCES • MATERIALS TESTING

REPORT OF GEOTECHNICAL EXPLORATION
PROPOSED MEGASITE ROADWAY
SR 435 AND SR 729, WASHINGTON COURT HOUSE, FAYETTE COUNTY, OHIO
ATC FILE NUMBER: 241GC00276

Prepared for: Fayette County Engineer
1600 Robinson Road SE
Washington Court House, Ohio 43160
Attn: Mr. Steven Luebbe, P.E., P.S.

Prepared By: ATC Group Services LLC
11121 Canal Road
Cincinnati, Ohio 45241-1861

April 30, 2019

ENVIRONMENTAL • GEOTECHNICAL
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April 30, 2019

Fayette County Engineer
1600 Robinson Road SE
Washington Court House, Ohio 43160
Attn: Mr. Steven Luebbe, P.E., P.S.

Re: Report of Geotechnical Exploration
Proposed Megasite Roadway
SR 435 and SR 729
Washington Court House, Fayette County, Ohio
ATC File Number: 241GC00276

Gentlemen:

In compliance with your request, ATC has completed a subsurface exploration and evaluation for the above referenced project. It is our pleasure to transmit herewith this report of the result of this exploration.

This work was performed in general accordance with our written proposal number 241-2019-0154, dated March 12, 2019, and was authorized by written notice-to-proceed from Mr. Steven Luebbe, received on March 12, 2019. If you should have any questions regarding our report, please contact this office.

Sincerely,

ATC Group Services, LLC

Alexander S. Ham, P.E.
Project Geotechnical Engineer

John A. Kerr, P.E.
Principal Geotechnical Engineer

TABLE OF CONTENTS

REPORT OF GEOTECHNICAL EXPLORATION

PROPOSED MEGASITE ROADWAY
SR 435 AND SR 729, WASHINGTON COURT HOUSE, FAYETTE COUNTY, OHIO
ATC FILE NUMBER: 241GC00276

1.0 INTRODUCTION

This report presents the results of a geotechnical exploration and subsurface condition evaluation for the proposed new Megasite roadway to be constructed as a northward extension of the alignment of State Route 729 across State Route 435 in Washington Court House, Fayette County, Ohio. This work was performed in general accordance with our written proposal number 241-2019-0154 dated March 12, 2019, and was authorized by written notice-to-proceed from Mr. Steven Luebbe, received on March 12, 2019.

The purpose of this exploration was to identify the general subsurface profile at the site, evaluate these materials, and develop recommendations specifically relative to the design and construction of the proposed roadway. General comments regarding earthwork and site preparation have been included for reference.

The scope of the exploration included a review of available geologic and subsurface data for the project area, the completion of ten (10) test borings, field and laboratory testing of recovered samples, and an engineering analysis and evaluation of the subsurface conditions encountered at the site. ATC also completed a preliminary geotechnical exploration report for Megasite development (ATC Project No. 241GC00062, dated January 12, 2016), of which this proposed roadway site is a part.

2.0 PROJECT AND SITE CHARACTERISTICS

We understand that the project is to consist of the construction of approximately 2,600 liner feet (l.f.) of presumably 2-lane roadway. The new road is to have the same approximately south-north alignment as SR 729, and will extend northward from the intersection of SR 729 and SR 435. The proposed roadway alignment traverses mainly existing agricultural land, and USGS

topographic mapping indicates that the proposed roadway area is nearly level and at an approximate elevation of 1050 feet. We understand that some modest filling (on the order of approximately 1 to 2 feet above the existing ground surface) may be done to establish the new roadbed. From about 500 feet west and to about 100 feet east of the new intersection, SR 435 will be widened on the north side by one lane.

If any of the information provided above, or if ATC's assumptions are misrepresented and/or incorrect, please contact ATC so that we may review our recommendations.

3.0 GENERAL SUBSURFACE CONDITIONS

Ten (10) soil test borings were completed at the site on April 5, 2019. Subsurface material samples were recovered and returned to ATC's Cincinnati, Ohio laboratory for analysis, testing and evaluation. Samples were classified by ATC's engineering staff by visual/manual methods, and boring logs were prepared.

It should be noted that stratification lines shown on the soil boring logs represent approximate transitions between material types. In-situ strata changes could occur gradually or at slightly different levels. Also it should be noted that the borings depict conditions at the particular locations and times indicated on the logs. Some conditions, particularly groundwater levels, could change with time. Also variations may be present between boring positions. The generalized subsurface and groundwater conditions for each boring are described in detail on the test boring logs presented in the Appendix of this report.

3.1 Geology

Review of the draft *Surficial Geology map of the Springfield Quadrangle*, dated June 2005, indicates the site to be underlain with two major glacial till deposits, with intervening layers outwash sand and silt. The soils mapped in this area a generally of Wisconsinan age.

Based on *Bedrock Topography Map of the Jeffersonville, Ohio Quadrangle*, dated 1994, the bedrock at the site is mapped as likely being approximately 100 feet below the existing ground surface. The *Bedrock Geology Map of the Jeffersonville, Ohio Quadrangle*, dated 1994, indicates the bedrock at the site consists of Cedarville-Springfield-Euphemia Undivided Dolomite formations of the Silurian Geologic System.

3.2 Subsurface Profile

In general, the borings completed for this investigation encountered approximately 4 to 8 inches of topsoil at the ground surface. As noted above, the majority of the project site is agricultural in nature, and it is not unusual for organic matter to have been dispersed throughout the "plow zone" (up to approximately 18 or more inches) and greater thicknesses of organic soil may be present.

Megasite Roadway (B-001-0-19 to B-007-0-19): Beneath the surficial material, these borings encountered a mix of cohesive soils generally consisting of brown, dark brown, gray-brown, and black and brown clay (ODOT Classification A-7-6), silt and clay (A-6A), silty clay (A-6b), and sandy silt (A-4a) with varying amounts of gravel, sand, and root hairs to a depth of approximately 3 feet below the existing ground surface. Standard Penetration Test (SPT) N_{60}-values in this material ranged from 7 to 12 blows per foot (bpf), indicating a medium stiff to stiff consistency for cohesive soils. Boring B-007-0-19 then encountered a layer of medium dense gravel and/or stone fragments with sand and silt (A-2-4) and little clay to a depth of approximately 6 feet below the existing ground surface.

Beneath the upper cohesive layer, and the granular layer in Boring B-007-0-19, these borings then encountered brown-gray to gray sandy silt (A-4a) and silt (A-4b) with varying amounts of gravel, rock fragments, and clay to the boring termination depth of 10 feet below the existing ground surface. This material is generally believed to represent a glacially-deposited till. SPT N_{60}-values in this material ranged from 8 to 33 bpf, indicating a medium stiff to hard consistency for cohesive soils.

SR 435 (B-008-0-19 to B-010-0-19): Beneath the surficial material, these borings encountered gray-brown and brown and gray clay (ODOT Classification A-7-6) with varying amounts of gravel, sand, silt, and root hairs to depths ranging from approximately 1.5 to 4.5 feet below the existing ground surface. SPT N_{60}-values in this material ranged from 5 to 11 blows per foot (bpf), indicating a medium stiff to stiff consistency for cohesive soils.

Beneath the upper cohesive layer, these borings then encountered brown-gray to gray sandy silt (A-4a) with varying amounts of gravel and clay to the boring termination depth of 10 feet below the existing ground surface. This material is generally believed to represent a glacially-deposited till. SPT N_{60}-values in this material ranged from 4 to 21 bpf, indicating a soft to very stiff consistency for cohesive soils.

The generalized subsurface and groundwater conditions for each boring are described in detail on the test boring logs presented in the Appendix of this report.

3.3 Groundwater Conditions

Groundwater level observations were made both during and on completion of drilling operations. Groundwater was observed upon completion of drilling in Borings B-001-0-19 and B-008-0-19 at depths of approximately 7 and 6 feet below the existing ground surface, respectively. Boring cave-in depths were observed to vary from approximately 7 to 7.5 feet upon withdrawal of the augers. It is noted that the observed groundwater levels may fluctuate in response to short-term and seasonal variations in precipitation, surface runoff, and that local pockets of groundwater may be present at shallower depths in the profile during wetter periods.

4.0 GEOTECHNICAL CONCLUSIONS AND RECOMMENDATIONS

Based upon our analysis of the soil conditions, the following conclusions have been reached, and the following recommendations developed. If the project characteristics are different from those assumed herein, or if differing subsurface conditions are encountered, ATC should be notified, so

that our recommendations can be reviewed and any necessary modifications developed. **The following conclusions assume that all applicable ODOT specifications, including Item 203 *Roadway Excavation And Embankment*, Item 204 *Subgrade Compaction And Proof Rolling*, and Geotechnical Bulletin GB1, are followed.**

4.1 Roadway Subgrade

We understand that the majority of the proposed roadway is planned to have approximately 1 to 2 feet of fill placed to establish final grades; however, no specific grading plan was made available to us at the time of this report. As stated above, it is assumed that all applicable ODOT specifications, including Item 203 *Roadway Excavation And Embankment*, Item 204 *Subgrade Compaction And Proof Rolling*, and Geotechnical Bulletin GB1, are followed in the construction of the new roadway and roadway widening. Using the ODOT GB1 Subgrade Analysis worksheet, a design California Bearing Ratio (CBR) of 7 was returned for the roadway to be aligned with SR 729 (Borings B-001-0-19 through B-007-0-19), and 6 for the widening of SR 435 (Borings B-008-0-19 through B-010-0-19).

Please note that due to the lack of specific site grading information, we conservatively assumed no cut or fill along the proposed roadway and roadway widening when performing our subgrade analysis, and that any imported fills for embankment construction will be similar or superior to the soils encountered at the project site. Based on this assumption, the GB1 Subgrade Analysis worksheet indicated the following stabilization options:

- Chemical Stabilization
    - 14 inches Cement Stabilization (Megasite Roadway & widening of SR 435)
    - 14 inches Lime Stabilization (widening of SR 435 only)
- Excavate and Replace Stabilization (Megasite Roadway & widening of SR 435)
    - 18 to 24 inches Global Geotextile
    - 12 to 18 inches Global Geogrid

The need for stabilization was mainly driven by low soil strength and consistency, complicated with high soil moisture. The stabilization requirement may change once

specific grading details have been determined. The ODOT GB1 Subgrade Analysis worksheets are included in the Appendix.

4.2 Embankments

The roadway embankment should be built per ODOT Item 203 *Roadway Excavation and Embankment*. Particular attention should be paid to the definition of suitable materials (ODOT 203.02R) and certain restrictions regarding materials per ODOT Item 203.03. Special attention should be given to the final required in-place density of the soil as discussed in ODOT Item 203.07 *Compaction and Moisture Requirements.*

5.0 PLAN REVIEW AND CONSTRUCTION MONITORING

It is recommended that ATC be retained to review final project plans and specifications, and to perform continuous monitoring of the foundation construction phase of the project. If ATC is not retained for these purposes, we can assume no responsibility for compliance of the work with the design concepts, specifications, or for modifications or recommendations made during construction.

6.0 FIELD AND LABORATORY INVESTIGATIONS

6.1 Field Exploration

Field exploration included the performance of ten (10) soil test borings located approximately as shown on the enclosed Test Boring Location Plan. Test borings were performed with a track-mounted ATV drilling rig equipped with a rotary head. Conventional hollow-stem augers were used to advance the holes. Samples of the in-situ soils were obtained employing split-barrel sampling procedures in general accordance with ASTM Standard Method D-1586. Observations regarding groundwater levels, and other pertinent conditions were made at each boring location.

The encountered materials have been visually classified by the ATC's engineering staff, and are described in detail on the boring logs. The results of the field penetration tests,

strength tests, water level observations and laboratory moisture content determinations are presented on the boring logs in numerical form. Samples of the soils encountered in the field were placed in sealed sample jars and are stored in the laboratory for further analysis, if desired. Unless notified to the contrary, all samples will be disposed of in thirty (30) days from the date of this report.

6.2 Laboratory Testing Program

In conjunction with the field exploration, a laboratory testing program was conducted to determine pertinent engineering characteristics of the subsurface materials as necessary for development of engineering recommendations. The laboratory-testing program included visual classification of all samples. Natural moisture content, grain-size analysis, and Atterberg Limits tests were conducted on selected soil samples. All phases of the laboratory-testing program were conducted in general accordance with applicable ASTM specifications and procedures.

7.0 LIMITATIONS OF STUDY

7.1 Differing Conditions

Recommendations for this project were developed utilizing soil information obtained from the test borings that were completed at the proposed site. These borings indicate subsurface soil and groundwater conditions at the specific locations and time at which the borings were conducted. Conditions at other locations on the site may differ from those occurring at the boring positions. If deviations from the noted subsurface conditions are encountered during construction, they should be brought to the immediate attention of the geotechnical engineer so that recommendations can be reviewed and revised as required.

7.2 Changes in Plans

The conclusions and recommendations herein have been based upon the available soil information and the preliminary design details furnished by a representative of the owner of the proposed project and/or as assumed herein. Any revision in the plans for the proposed construction from those anticipated in this report should be brought to the

attention of the geotechnical engineer to determine whether any changes in the foundation or earthwork recommendations are necessary.

7.3 Recommendations vs. Final Design

This report and the recommendations included within are not intended as a final design, but rather as a basis for the final design to be completed by others. It is the client's responsibility to ensure that the recommendations of the geotechnical engineer are properly integrated into the design, and that the geotechnical engineer is provided the opportunity for design input and comment after the submittal of this report, as needed. It is strongly recommended that ATC be retained to review the final construction documents to confirm that the proposed project design sufficiently incorporates the geotechnical recommendations. ATC should be represented at pre-bid and/or pre-construction meetings regarding this project to offer any needed clarifications of the geotechnical information to all involved.

7.4 Construction Issues

Although general constructability issues have been considered in this report, the means, methods, techniques, sequences and operations of construction, safety precautions, and all items incidental thereto and consequences of, are the responsibility of the parties to the project other than ATC. This office should be contacted if additional guidance is needed in these matters.

7.5 Report Interpretation

ATC is not responsible for conclusions, opinions, or recommendations developed by others on the basis of the data included herein. It is the client's responsibility to seek any guidance and clarifications from the geotechnical engineer needed for proper interpretation of this report.

7.6 Environmental Considerations

The scope of services does not include any environmental assessment investigation for the presence or absence of hazardous or toxic materials in the soil, groundwater, or surface water within or beyond the site studies. Any statements in this report or on the test boring logs regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of our client. Unless complete environmental information regarding the site is already available, an environmental assessment is recommended prior to the development of this site.

7.7 Standard of Care

The professional services and engineering recommendations presented in this report have been developed in accordance with generally accepted geotechnical engineering principles and practices in the geographical area of the project at the time of the report. No other warranties, either expressed or implied are offered.

APPENDIX

Test Boring Location Plan

Logs of Borings (10)

Grain Size Distribution (10)

Atterberg Limits Results (2)

GB1 Subgrade Analysis Worksheets (8)

ODOT Quick Reference for Visual Description of Soils

ODOT Classification of Soils

Important Information About Your Report

Project Zeus

Drawing:	TEST BORING LOCATION PLAN
Project:	NEW MEGASITE ROADWAY + SR435 WIDENING
Location:	FAYETTE COUNTY, OHIO
Client:	FAYETTE COUNTY ENGINEER
Project No.:	241GC00276

ENVIRONMENTAL • GEOTECHNICAL
BUILDING SCIENCES • MATERIALS TESTING

PROJECT: FAY-MEGASITE ROADWAY-
TYPE: ROADWAY
PID: BR ID:
START: 4/5/19 END: 4/5/19

DRILLING FIRM / OPERATOR: CSTAR / AR
SAMPLING FIRM / LOGGER: ATC / ASH
DRILLING METHOD: 3.75" HSA
SAMPLING METHOD: SPT

DRILL RIG: D-50 ATV
HAMMER: DIEDRICH AUTOMATIC
CALIBRATION DATE: 11/9/17
ENERGY RATIO (%): 82.4

STATION / OFFSET:
ALIGNMENT: MEGASITE ROADWAY
ELEVATION: 100.0 (MSL) EOB: 10.0 ft.
LAT / LONG: Not Recorded

EXPLORATION ID B-001-0-19

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
TOPSOIL (8")	100.0																	
	99.3																	
STIFF, DARK BROWN, **CLAY**, AND SILT, TRACE SAND AND ROOT HAIRS, MOIST		1	3 4 3	10	89	SS-1	2.25	0	2	6	46	46	47	19	28	25	A-7-6 (17)	
	97.0	2																
STIFF, BROWN-GRAY, **SANDY SILT**, SOME CLAY, TRACE GRAVEL AND ROCK FRAGMENTS, MOIST [GLACIAL TILL]		3																
		4	3 3 4	10	100	SS-2	2.25	8	12	17	37	26	26	17	9	17	A-4a (6)	
		5																
		6																
		7	3 3 4	10	100	SS-3	4.25	-	-	-	-	-	-	-	-	14		
	92.0	8																
VERY STIFF, BROWN, **SANDY SILT**, SOME GRAVEL AND ROCK FRAGMENTS, LITTLE CLAY, MOIST [GLACIAL TILL]		9	8 10 10	27	100	SS-4	4.25	23	8	18	32	19	21	15	6	16	A-4a (3)	
	90.0	EOB 10																

NOTES: CAVE-IN DEPTH: 7.5'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

STANDARD ODOT SOIL BORING LOG (8.5 X 11) - OH DOT.GDT - 4/30/19 12:23 - S:\GEOTECHNICAL ENGINEERING\GEOTECH\REPORTS\ENGRPTS1901-1903\241GC00276 FAYETTE COUNTY_ME

PROJECT: FAY-MEGASITE ROADWAY-	DRILLING FIRM / OPERATOR: CSTAR / AR	DRILL RIG: D-50 ATV	STATION / OFFSET:	EXPLORATION ID B-002-0-19
TYPE: ROADWAY	SAMPLING FIRM / LOGGER: ATC / ASH	HAMMER: DIEDRICH AUTOMATIC	ALIGNMENT: MEGASITE ROADWAY	
PID: BR ID:	DRILLING METHOD: 3.75" HSA	CALIBRATION DATE: 11/9/17	ELEVATION: 100.0 (MSL) EOB: 10.0 ft.	PAGE 1 OF 1
START: 4/5/19 END: 4/5/19	SAMPLING METHOD: SPT	ENERGY RATIO (%): 82.4	LAT / LONG: Not Recorded	

MATERIAL DESCRIPTION AND NOTES	ELEV. 100.0	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
TOPSOIL (6")	99.5																	
STIFF, BROWN, **SILT AND CLAY**, SOME SAND AND GRAVEL, MOIST		1	3 4 4	11	100	SS-1	2.25	24	9	13	29	25	30	16	14	20	A-6a (5)	
	97.0	2																
STIFF TO VERY STIFF, BROWN-GRAY, **SANDY SILT**, SOME CLAY, LITTLE GRAVEL, MOIST [GLACIAL TILL]		3																
		4	5 7 6	18	100	SS-2	3.50	14	12	17	36	21	23	15	8	14	A-4a (4)	
		5																
		6	4 4 4	11	100	SS-3	3.25	-	-	-	-	-	-	-	-	15		
	92.0	7																
STIFF, GRAY, **SANDY SILT**, SOME CLAY, LITTLE GRAVEL, MOIST [GLACIAL TILL]		8																
		9	5 5 6	15	100	SS-4	3.25	13	12	17	36	22	21	14	7	11	A-4a (5)	
	90.0 EOB	10																

NOTES: CAVE-IN DEPTH: 7.5'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: FAY-MEGASITE ROADWAY-
TYPE: ROADWAY
PID: BR ID:
START: 4/5/19 END: 4/5/19

DRILLING FIRM / OPERATOR: CSTAR / AR
SAMPLING FIRM / LOGGER: ATC / ASH
DRILLING METHOD: 3.75" HSA
SAMPLING METHOD: SPT

DRILL RIG: D-50 ATV
HAMMER: DIEDRICH AUTOMATIC
CALIBRATION DATE: 11/9/17
ENERGY RATIO (%): 82.4

STATION / OFFSET:
ALIGNMENT: MEGASITE ROADWAY
ELEVATION: 100.0 (MSL) EOB: 10.0 ft.
LAT / LONG: Not Recorded

EXPLORATION ID B-003-0-19

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
	100.0																	
TOPSOIL (6")	99.5																	
STIFF, BROWN, **SANDY SILT**, SOME GRAVEL AND CLAY, MOIST		1	2 3 4	10	100	SS-1	2.75	21	11	16	30	22	26	16	10	18	A-4a (3)	
	97.0	2																
STIFF, BROWN-GRAY, **SANDY SILT**, LITTLE CLAY, TRACE GRAVEL, MOIST TO WET [GLACIAL TILL]		3	3 3 4	10	100	SS-2	2.25	7	7	31	40	15	18	16	2	23	A-4a (4)	
		4																
		5	3 4 5	12	100	SS-3	2.50	-	-	-	-	-	-	-	-	14		
	92.0	6																
VERY STIFF, GRAY, **SANDY SILT**, SOME GRAVEL AND ROCK FRAGMENTS, LITTLE CLAY, MOIST [GLACIAL TILL]		7																
		8	5 7 8	21	100	SS-4	4.50	32	10	15	27	16	20	14	6	10	A-4a (2)	
	90.0 EOB	9																
		10																

NOTES: CAVE-IN DEPTH: 7.0'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: FAY-MEGASITE ROADWAY-
TYPE: ROADWAY
PID: BR ID:
START: 4/5/19 END: 4/5/19

DRILLING FIRM / OPERATOR: CSTAR / AR
SAMPLING FIRM / LOGGER: ATC / ASH
DRILLING METHOD: 3.75" HSA
SAMPLING METHOD: SPT

DRILL RIG: D-50 ATV
HAMMER: DIEDRICH AUTOMATIC
CALIBRATION DATE: 11/9/17
ENERGY RATIO (%): 82.4

STATION / OFFSET:
ALIGNMENT: MEGASITE ROADWAY
ELEVATION: 100.0 (MSL) EOB: 10.0 ft.
LAT / LONG: Not Recorded

EXPLORATION ID B-004-0-19

MATERIAL DESCRIPTION AND NOTES	ELEV. 100.0	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
TOPSOIL (6")	99.5																	
MEDIUM STIFF, DARK BROWN, **CLAY**, AND SILT, LITTLE SAND, TRACE GRAVEL AND ROOT HAIRS, MOIST		1	2	7	100	SS-1	1.75	5	6	9	44	36	41	22	19	27	A-7-6 (12)	
	97.0	2	2 3															
STIFF TO VERY STIFF, BROWN-GRAY, **SANDY SILT**, SOME CLAY, TRACE GRAVEL, MOIST [GLACIAL TILL]		3	3	11	100	SS-2	3.75	10	13	18	35	24	23	15	8	13	A-4a (5)	
		4	3 5															
		5																
		6	4	26	100	SS-3	4.5+	-	-	-	-	-	-	-	-	12		
		7	8 11															
	92.0	8																
HARD, GRAY, **SANDY SILT**, SOME GRAVEL, ROCK FRAGMENTS, AND CLAY, MOIST [GLACIAL TILL]		9	8	41	100	SS-4	4.5+	27	10	15	28	20	22	15	7	11	A-4a (3)	
	90.0	EOB 10	16 14															

NOTES: CAVE-IN DEPTH: 7.0'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: FAY-MEGASITE ROADWAY-
TYPE: ROADWAY
PID: BR ID:
START: 4/5/19 END: 4/5/19

DRILLING FIRM / OPERATOR: CSTAR / AR
SAMPLING FIRM / LOGGER: ATC / ASH
DRILLING METHOD: 3.75" HSA
SAMPLING METHOD: SPT

DRILL RIG: D-50 ATV
HAMMER: DIEDRICH AUTOMATIC
CALIBRATION DATE: 11/9/17
ENERGY RATIO (%): 82.4

STATION / OFFSET:
ALIGNMENT: MEGASITE ROADWAY
ELEVATION: 100.0 (MSL) EOB: 10.0 ft.
LAT / LONG: Not Recorded

EXPLORATION ID B-005-0-19

MATERIAL DESCRIPTION AND NOTES	ELEV. 100.0	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
TOPSOIL (6")	99.5																	
STIFF, GRAY-BROWN, **SILT AND CLAY**, SOME SAND, TRACE GRAVEL, MOIST		1	3 3 6	12	100	SS-1	4.5+	10	11	14	35	30	28	17	11	14	A-6a (6)	
	97.0	2																
STIFF TO VERY STIFF, GRAY-BROWN, **SANDY SILT**, SOME CLAY, LITTLE GRAVEL, MOIST [GLACIAL TILL]		3	5 7 7	19	100	SS-2	2.25	11	9	15	36	29	25	16	9	17	A-4a (6)	
		4																
		5																
		6	5 5 6	15	100	SS-3	3.25	-	-	-	-	-	-	-	-	14		
	92.0	7																
VERY STIFF, GRAY, **SILT**, SOME CLAY, LITTLE GRAVEL AND ROCK FRAGMENTS, TRACE SAND, MOIST [GLACIAL TILL]		8																
	90.0	9	6 11 11	30	100	SS-4	4.5+	14	3	7	55	21	22	14	8	11	A-4b (8)	
EOB		10																

NOTES: CAVE-IN DEPTH: 7.0'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: FAY-MEGASITE ROADWAY-
TYPE: ROADWAY
PID: BR ID:
START: 4/5/19 END: 4/5/19

DRILLING FIRM / OPERATOR: CSTAR / AR
SAMPLING FIRM / LOGGER: ATC / ASH
DRILLING METHOD: 3.75" HSA
SAMPLING METHOD: SPT

DRILL RIG: D-50 ATV
HAMMER: DIEDRICH AUTOMATIC
CALIBRATION DATE: 11/9/17
ENERGY RATIO (%): 82.4

STATION / OFFSET:
ALIGNMENT: MEGASITE ROADWAY
ELEVATION: 100.0 (MSL) EOB: 10.0 ft.
LAT / LONG: Not Recorded

EXPLORATION ID B-006-0-19

MATERIAL DESCRIPTION AND NOTES	ELEV. 100.0	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
TOPSOIL (8")	99.3																	
STIFF, BLACK AND BROWN, **CLAY**, AND SILT AND SAND, TRACE GRAVEL AND ROOT HAIRS, MOIST	97.0	1	3 4 5	12	100	SS-1	2.50	2	15	20	37	26	52	21	31	25	A-7-6 (15)	
MEDIUM STIFF TO STIFF, BROWN-GRAY, **SANDY SILT**, LITTLE CLAY AND GRAVEL, MOIST [GLACIAL TILL]		2 3 4 5	4 2 4	8	100	SS-2	2.00	20	10	15	36	19	25	16	9	15	A-4a (4)	
	92.0	6 7 8	4 5 6	15	100	SS-3	4.25	17	11	17	37	18	22	15	7	13	A-4a (4)	
VERY STIFF, GRAY, **SANDY SILT**, SOME CLAY, LITTLE GRAVEL, MOIST [GLACIAL TILL]	90.0	EOB 10	9 9 9	25	100	SS-4	4.5+	12	10	16	39	23	23	15	8	12	A-4a (5)	

NOTES: CAVE-IN DEPTH: 7.5'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: FAY-MEGASITE ROADWAY-
TYPE: ROADWAY
PID: BR ID:
START: 4/5/19 END: 4/5/19

DRILLING FIRM / OPERATOR: CSTAR / AR
SAMPLING FIRM / LOGGER: ATC / ASH
DRILLING METHOD: 3.75" HSA
SAMPLING METHOD: SPT

DRILL RIG: D-50 ATV
HAMMER: DIEDRICH AUTOMATIC
CALIBRATION DATE: 11/9/17
ENERGY RATIO (%): 82.4

STATION / OFFSET:
ALIGNMENT: MEGASITE ROADWAY
ELEVATION: 100.0 (MSL) EOB: 10.0 ft.
LAT / LONG: Not Recorded

EXPLORATION ID B-007-0-19

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
TOPSOIL (8")	100.0																	
	99.3																	
STIFF, BROWN, **SILTY CLAY**, LITTLE SAND, TRACE GRAVEL, MOIST		1	3	10	100	SS-1	1.75	2	4	12	45	37	40	17	23	24	A-6b (13)	
	97.0	2	2 5															
		3																
MEDIUM DENSE, BROWN, **GRAVEL AND/OR STONE FRAGMENTS WITH SAND AND SILT**, LITTLE CLAY, MOIST		4	4	16	100	SS-2	2.25	49	10	11	19	11	25	16	9	12	A-2-4 (0)	
	94.0	5	6 6															
		6																
HARD, BROWN-GRAY, **SANDY SILT**, LITTLE GRAVEL AND CLAY, MOIST [GLACIAL TILL]		7	8 11 13	33	100	SS-3	4.5+	16	12	17	35	20	23	15	8	12	A-4a (4)	
	92.0	8																
VERY STIFF, GRAY, **SANDY SILT**, LITTLE GRAVEL, ROCK FRAGMENTS, AND CLAY, MOIST [GLACIAL TILL]		9	5 5 7	16	100	SS-4	4.5+	19	12	17	34	18	21	14	7	11	A-4a (3)	
	90.0	EOB 10																

NOTES: CAVE-IN DEPTH: 7.0'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: FAY-MEGASITE ROADWAY-
TYPE: ROADWAY
PID: BR ID:
START: 4/5/19 END: 4/5/19

DRILLING FIRM / OPERATOR: CSTAR / AR
SAMPLING FIRM / LOGGER: ATC / ASH
DRILLING METHOD: 3.75" HSA
SAMPLING METHOD: SPT

DRILL RIG: D-50 ATV
HAMMER: DIEDRICH AUTOMATIC
CALIBRATION DATE: 11/9/17
ENERGY RATIO (%): 82.4

STATION / OFFSET:
ALIGNMENT: SR 435 WIDENING
ELEVATION: 100.0 (MSL) EOB: 10.0 ft.
LAT / LONG: Not Recorded

EXPLORATION ID B-008-0-19
PAGE 1 OF 1

MATERIAL DESCRIPTION AND NOTES	ELEV. 100.0	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
TOPSOIL (4")	99.7		2 2 3	7	100	SS-1	2.25	-	-	-	-	-	-	-	-	22		
SOFT TO STIFF, BROWN AND GRAY, **CLAY**, AND SILT, LITTLE SAND, TRACE GRAVEL, MOIST		1																
		2	3 3 4	10	100	SS-2	1.75	1	3	13	38	45	45	17	28	24	A-7-6 (16)	
		3																
	95.5	4	2 3 2	7	100	SS-3	1.25	-	-	-	-	-	-	-	-	29		
SOFT TO VERY STIFF, BROWN-GRAY, **SANDY SILT**, LITTLE TO SOME CLAY, TRACE TO LITTLE GRAVEL, MOIST [GLACIAL TILL]		5	2 1 2	4	100	SS-4	0.25	8	8	15	45	24	25	17	8	18	A-4a (7)	
		6																
		7	4 4 8	16	100	SS-5	2.25	16	12	18	35	19	23	16	7	16	A-4a (4)	
	92.0	8																
VERY STIFF, GRAY, **SANDY SILT**, SOME GRAVEL AND ROCK FRAGMENTS, LITTLE CLAY, MOIST [GLACIAL TILL]		9	5 7 7	19	100	SS-6	4.5+	25	10	16	31	18	21	15	6	9	A-4a (3)	
	90.0	EOB 10																

NOTES: CAVE-IN DEPTH: 7.5'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: FAY-MEGASITE ROADWAY-
TYPE: ROADWAY
PID: BR ID:
START: 4/5/19 END: 4/5/19

DRILLING FIRM / OPERATOR: CSTAR / AR
SAMPLING FIRM / LOGGER: ATC / ASH
DRILLING METHOD: 3.75" HSA
SAMPLING METHOD: SPT

DRILL RIG: D-50 ATV
HAMMER: DIEDRICH AUTOMATIC
CALIBRATION DATE: 11/9/17
ENERGY RATIO (%): 82.4

STATION / OFFSET:
ALIGNMENT: SR 435 WIDENING
ELEVATION: 100.0 (MSL) EOB: 10.0 ft.
LAT / LONG: Not Recorded

EXPLORATION ID B-009-0-19

MATERIAL DESCRIPTION AND NOTES	ELEV. 100.0	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
TOPSOIL (4")	99.7																	
MEDIUM STIFF, GRAY-BROWN, **CLAY**, AND SILT, SOME SAND, LITTLE GRAVEL, TRACE ROOT HAIRS, MOIST	98.5		1 2 2	5	67	SS-1	1.50	14	10	11	35	30	43	18	25	22	A-7-6 (12)	
MEDIUM STIFF TO VERY STIFF, BROWN-GRAY, **SANDY SILT**, SOME CLAY, TRACE GRAVEL, MOIST [GLACIAL TILL]		1	2 2 3	7	100	SS-2	2.75	-	-	-	-	-	-	-	-	18		
		2	3 4 5	12	100	SS-3	3.25	9	5	13	47	26	25	17	8	17	A-4a (8)	
		3	3 3 4	10	100	SS-4	1.75	-	-	-	-	-	-	-	-	15		
		4	6 7 8	21	100	SS-5	2.75	-	-	-	-	-	-	-	-	13		
		5																
		6	6 6 7	18	100	SS-6	3.75	-	-	-	-	-	-	-	-	15		
	90.0	EOB 7																
		8																
		9																
		10																

NOTES: CAVE-IN DEPTH: 7.0'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

PROJECT: FAY-MEGASITE ROADWAY-
TYPE: ROADWAY
PID: BR ID:
START: 4/5/19 END: 4/5/19

DRILLING FIRM / OPERATOR: CSTAR / AR
SAMPLING FIRM / LOGGER: ATC / ASH
DRILLING METHOD: 3.75" HSA
SAMPLING METHOD: SPT

DRILL RIG: D-50 ATV
HAMMER: DIEDRICH AUTOMATIC
CALIBRATION DATE: 11/9/17
ENERGY RATIO (%): 82.4

STATION / OFFSET:
ALIGNMENT: SR 435 WIDENING
ELEVATION: 100.0 (MSL) EOB: 10.0 ft.
LAT / LONG: Not Recorded

EXPLORATION ID B-010-0-19

MATERIAL DESCRIPTION AND NOTES	ELEV. 100.0	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
TOPSOIL (5")	99.6		2 2 4	8	100	SS-1	2.00	-	-	-	-	-	-	-	-	31		
MEDIUM STIFF TO STIFF, GRAY-BROWN, **CLAY**, AND SILT, LITTLE SAND, TRACE GRAVEL AND ROOT HAIRS, MOIST		1																
		2	3 3 4	10	100	SS-2	1.50	1	3	9	38	49	52	20	32	29	A-7-6 (18)	
		3	2 4 4	11	100	SS-3	1.75	-	-	-	-	-	-	-	-	27		
	95.5	4																
STIFF, BROWN-GRAY, **SANDY SILT**, SOME CLAY, LITTLE GRAVEL, MOIST [GLACIAL TILL]		5	3 3 4	10	100	SS-4	1.50	15	12	17	34	22	23	16	7	16	A-4a (4)	
		6	3 3 4	10	100	SS-5	2.25	-	-	-	-	-	-	-	-	13		
	92.0	7																
VERY STIFF, GRAY, **SANDY SILT**, SOME CLAY, LITTLE GRAVEL, MOIST [GLACIAL TILL]		8																
	90.0	9	5 6 9	21	100	SS-6	4.5+	11	11	17	34	27	25	15	10	12	A-4a (5)	
EOB		10																

NOTES: CAVE-IN DEPTH: 7.0'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BACKFILLED WITH AUGER CUTTINGS

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11121 Canal Road
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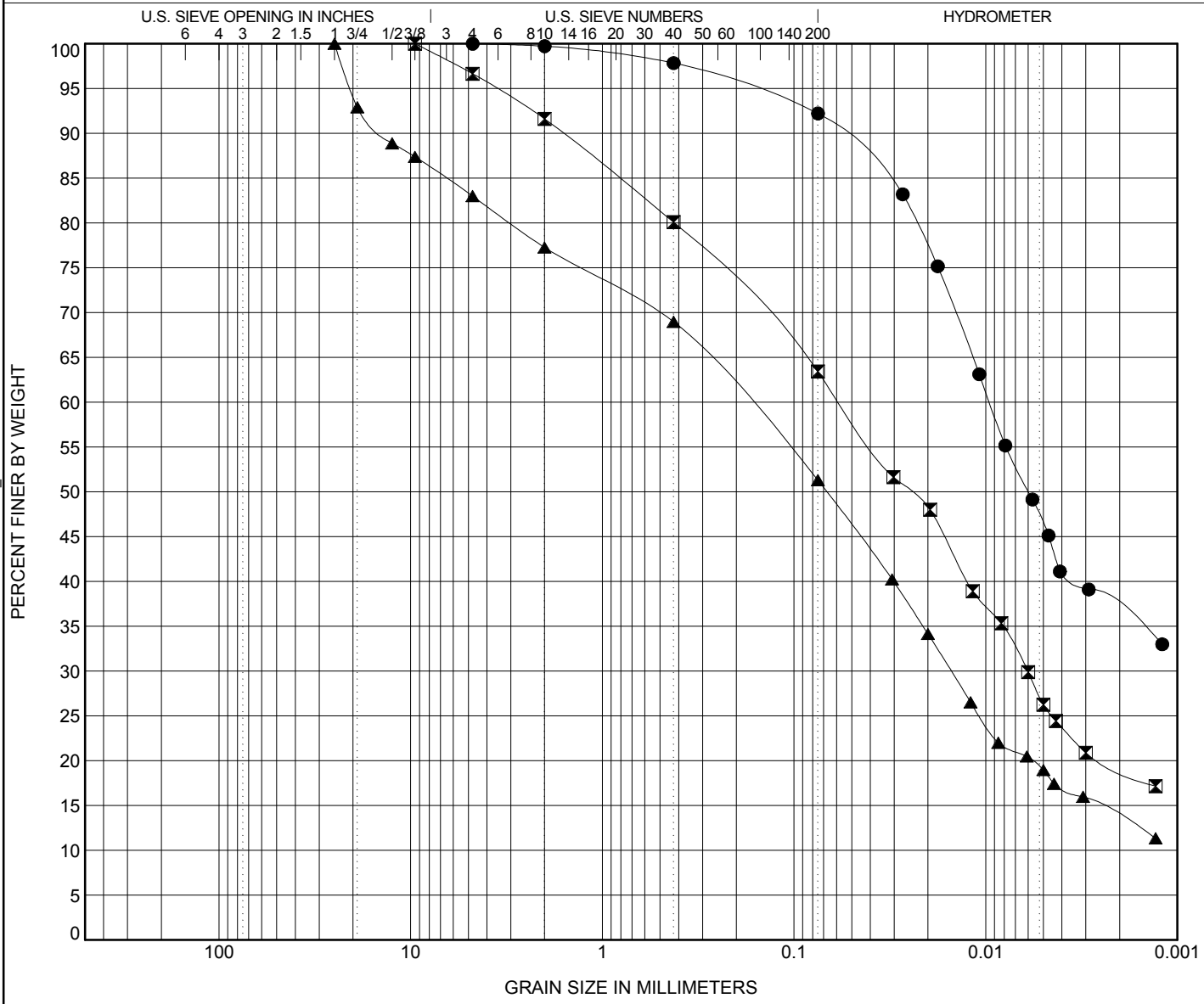
Telephone: (513) 771-2112
Fax: (513) 782-6908

GRAIN SIZE DISTRIBUTION

PROJECT FAY-MEGASITE ROADWAY- **PID**

OGE NUMBER 241GC00276 **PROJECT TYPE** Roadway



COBBLES	GRAVEL		SAND		SILT	CLAY
	coarse	fine	coarse	fine		

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-001-0-19	1.0	A-7-6	47	19	28		
⊠	B-001-0-19	3.5	A-4a	26	17	9		
▲	B-001-0-19	8.5	A-4a	21	15	6		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-001-0-19	1.0	4.75	0.01			0	8	46	46
⊠	B-001-0-19	3.5	9.5	0.058	0.006		8	29	37	26
▲	B-001-0-19	8.5	25	0.176	0.015		23	26	32	19

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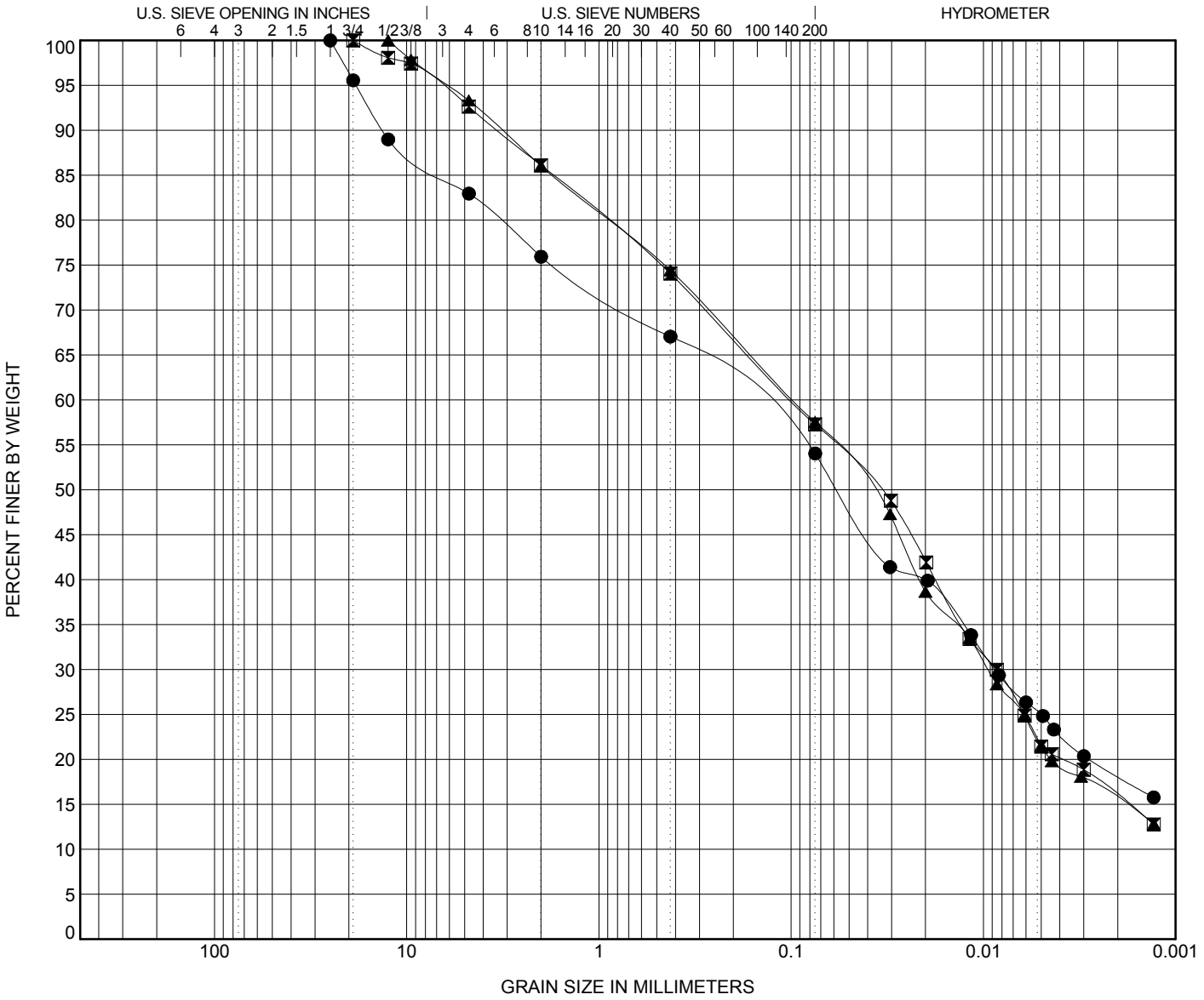
GRAIN SIZE DISTRIBUTION

PROJECT FAY-MEGASITE ROADWAY- **PID**

OGE NUMBER 241GC00276 **PROJECT TYPE** Roadway



COBBLES	GRAVEL		SAND		SILT	CLAY
	coarse	fine	coarse	fine		

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-002-0-19**	**1.0**	**A-6a**	**30**	**16**	**14**		
⊠	**B-002-0-19**	**3.5**	**A-4a**	**23**	**15**	**8**		
▲	**B-002-0-19**	**8.5**	**A-4a**	**21**	**14**	**7**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-002-0-19**	**1.0**	**25**	**0.166**	**0.009**		**24**	**22**	**29**	**25**
⊠	**B-002-0-19**	**3.5**	**19**	**0.099**	**0.009**		**14**	**29**	**36**	**21**
▲	**B-002-0-19**	**8.5**	**12.5**	**0.097**	**0.009**		**13**	**29**	**36**	**22**

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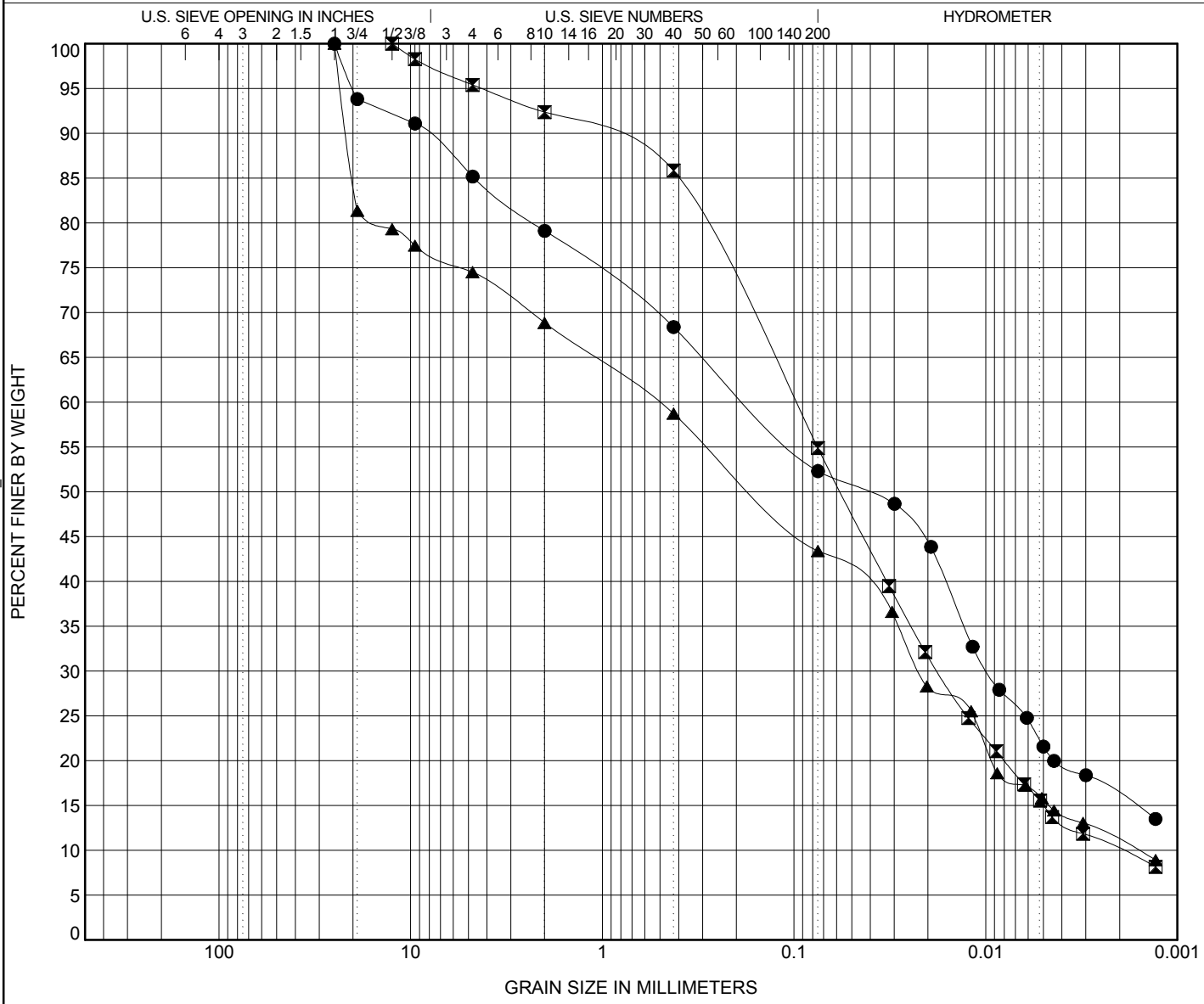
GRAIN SIZE DISTRIBUTION

PROJECT FAY-MEGASITE ROADWAY- **PID**

OGE NUMBER 241GC00276 **PROJECT TYPE** Roadway



COBBLES	GRAVEL		SAND		SILT	CLAY
	coarse	fine	coarse	fine		

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-003-0-19	1.0	A-4a	26	16	10		
⊠	B-003-0-19	3.5	A-4a	18	16	2	1.59	49.81
▲	B-003-0-19	8.5	A-4a	20	14	6	0.58	316.02

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-003-0-19	1.0	25	0.172	0.01		21	27	30	22
⊠	B-003-0-19	3.5	12.5	0.1	0.018	0.002	7	38	40	15
▲	B-003-0-19	8.5	25	0.517	0.022	0.002	32	25	27	16

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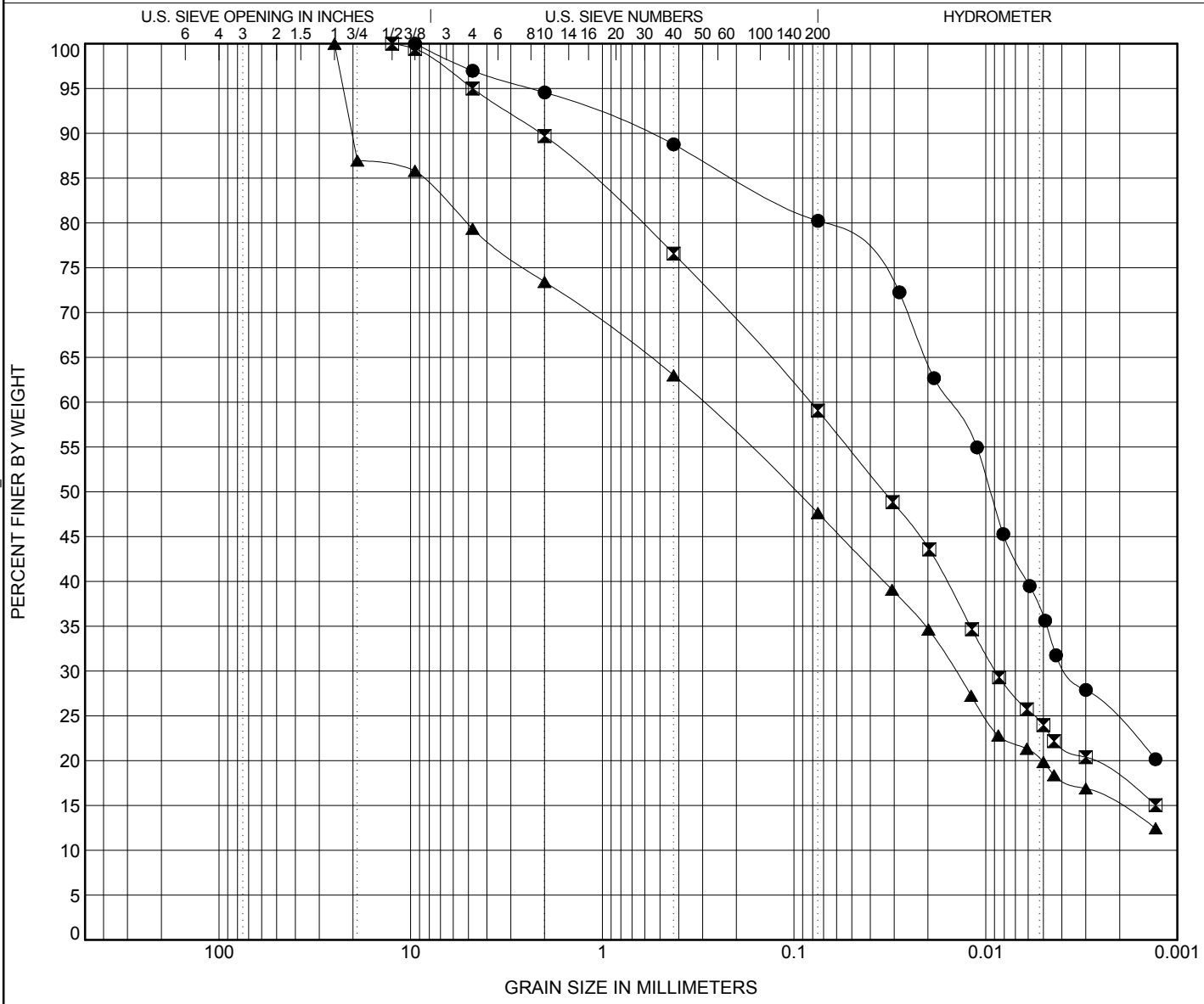
PROJECT FAY-MEGASITE ROADWAY- **PID**

OGE NUMBER 241GC00276 **PROJECT TYPE** Roadway



COBBLES	GRAVEL		SAND		SILT	CLAY
	coarse	fine	coarse	fine		

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● B-004-0-19	1.0	A-7-6	41	22	19		
⊠ B-004-0-19	3.5	A-4a	23	15	8		
▲ B-004-0-19	8.5	A-4a	22	15	7		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-004-0-19	1.0	9.5	0.016	0.004		5	15	44	36
⊠ B-004-0-19	3.5	12.5	0.082	0.009		10	31	35	24
▲ B-004-0-19	8.5	25	0.303	0.014		27	25	28	20

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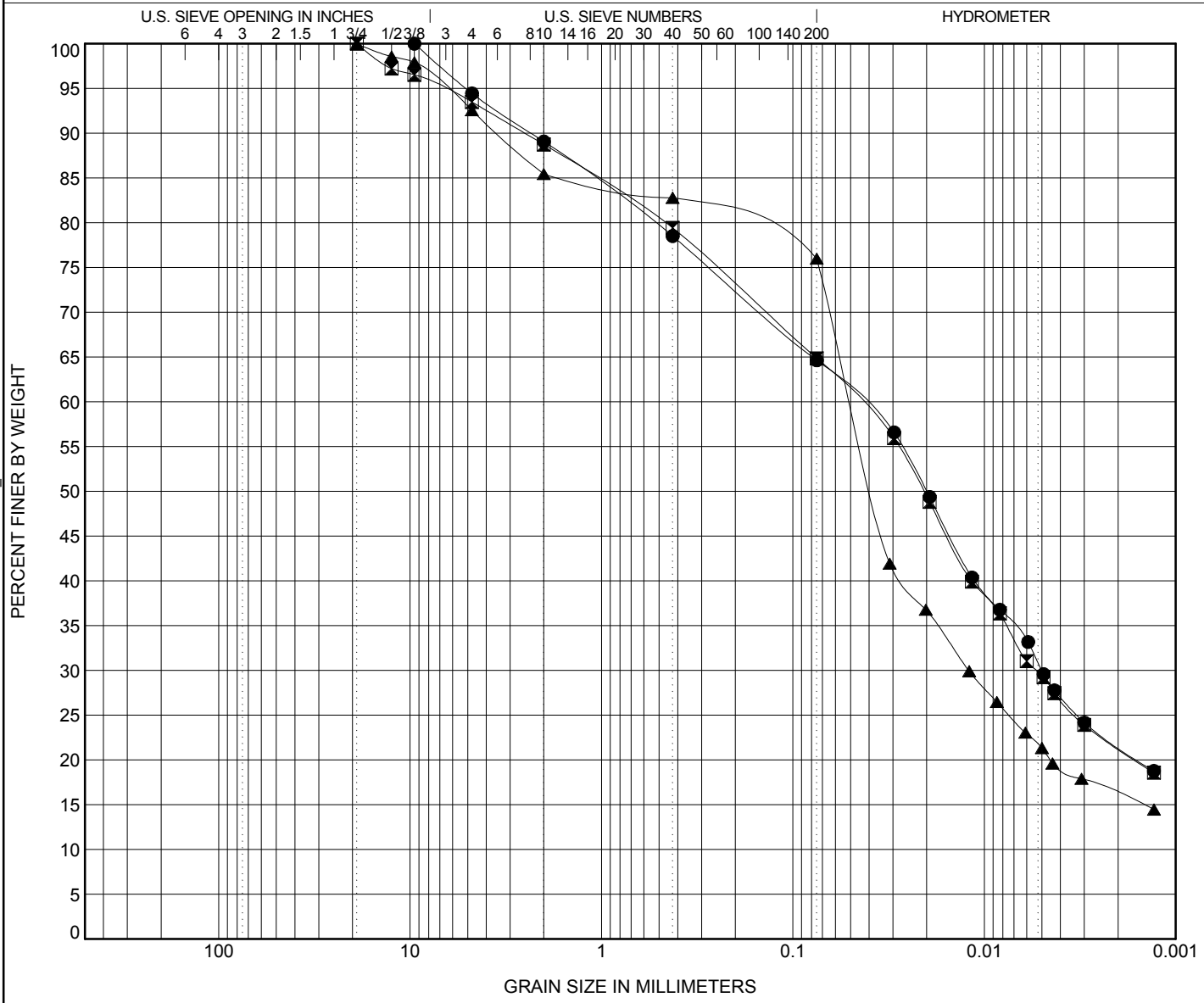
GRAIN SIZE DISTRIBUTION

PROJECT FAY-MEGASITE ROADWAY- **PID**

OGE NUMBER 241GC00276 **PROJECT TYPE** Roadway



COBBLES	GRAVEL		SAND		SILT	CLAY
	coarse	fine	coarse	fine		

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-005-0-19 1.0	A-6a	28	17	11		
⊠	B-005-0-19 3.5	A-4a	25	16	9		
▲	B-005-0-19 8.5	A-4b	22	14	8		

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-005-0-19 1.0	9.5	0.044	0.005		10	25	35	30
⊠	B-005-0-19 3.5	19	0.045	0.005		11	24	36	29
▲	B-005-0-19 8.5	19	0.05	0.012		14	10	55	21

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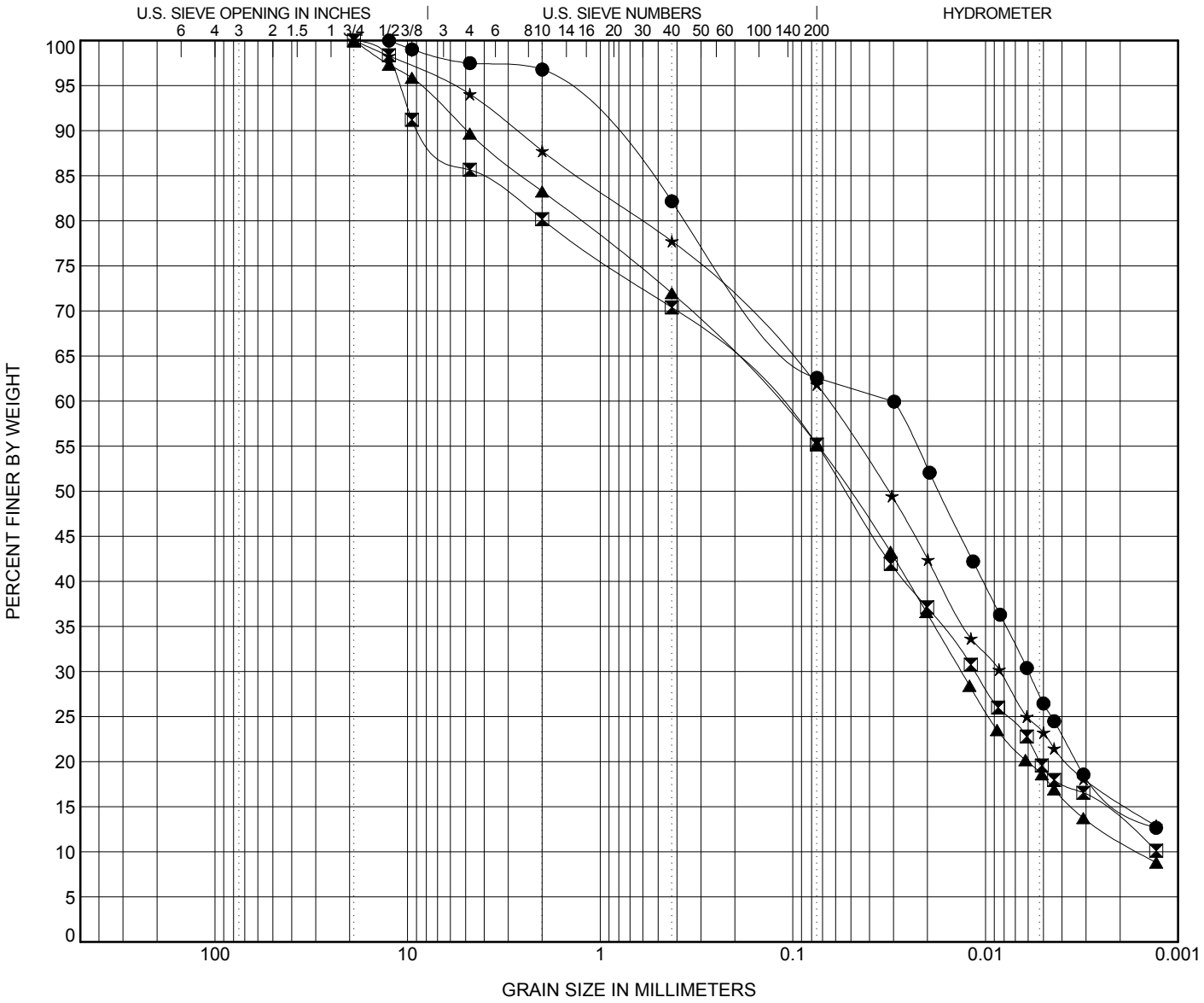
GRAIN SIZE DISTRIBUTION

PROJECT FAY-MEGASITE ROADWAY- **PID**

OGE NUMBER 241GC00276 **PROJECT TYPE** Roadway



COBBLES	GRAVEL		SAND		SILT	CLAY
	coarse	fine	coarse	fine		

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-006-0-19	1.0	A-7-6	52	21	31		
⊠	B-006-0-19	3.5	A-4a	25	16	9		
▲	B-006-0-19	6.0	A-4a	22	15	7	0.91	76.85
★	B-006-0-19	8.5	A-4a	23	15	8		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-006-0-19	1.0	12.5	0.03	0.006		2	35	37	26
⊠	B-006-0-19	3.5	19	0.13	0.011		20	25	36	19
▲	B-006-0-19	6.0	19	0.123	0.013	0.002	17	28	37	18
★	B-006-0-19	8.5	19	0.066	0.008		12	26	39	23

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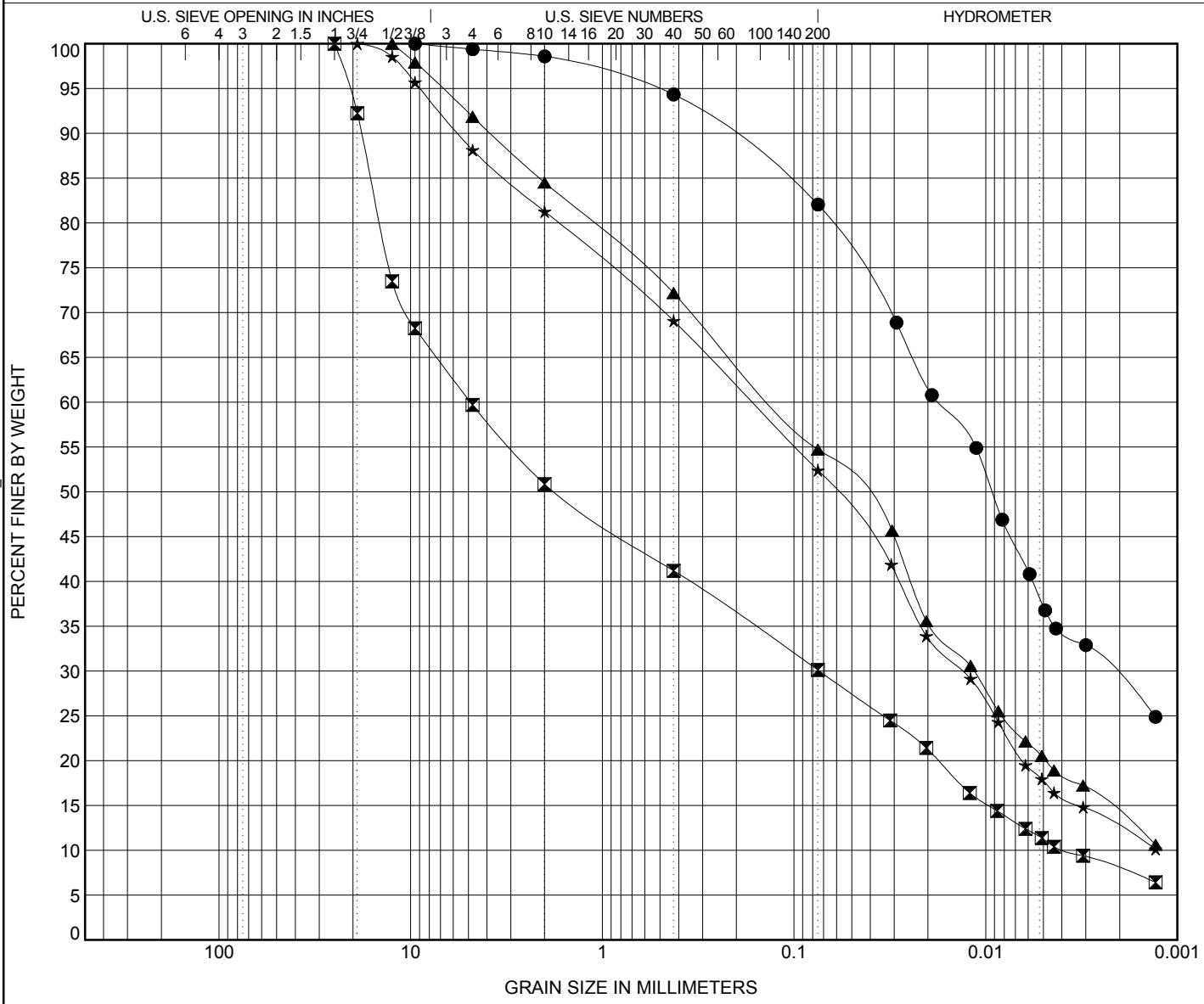
GRAIN SIZE DISTRIBUTION

PROJECT FAY-MEGASITE ROADWAY- **PID**

OGE NUMBER 241GC00276 **PROJECT TYPE** Roadway



COBBLES	GRAVEL		SAND		SILT	CLAY
	coarse	fine	coarse	fine		

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-007-0-19	1.0	A-6b	40	17	23		
⊠	B-007-0-19	3.5	A-2-4	25	16	9	0.29	1271.25
▲	B-007-0-19	6.0	A-4a	23	15	8		
★	B-007-0-19	8.5	A-4a	21	14	7		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-007-0-19	1.0	9.5	0.018	0.002		2	16	45	37
⊠	B-007-0-19	3.5	25	4.869	0.074	0.004	49	21	19	11
▲	B-007-0-19	6.0	12.5	0.127	0.012		16	29	35	20
★	B-007-0-19	8.5	19	0.165	0.013		19	29	34	18

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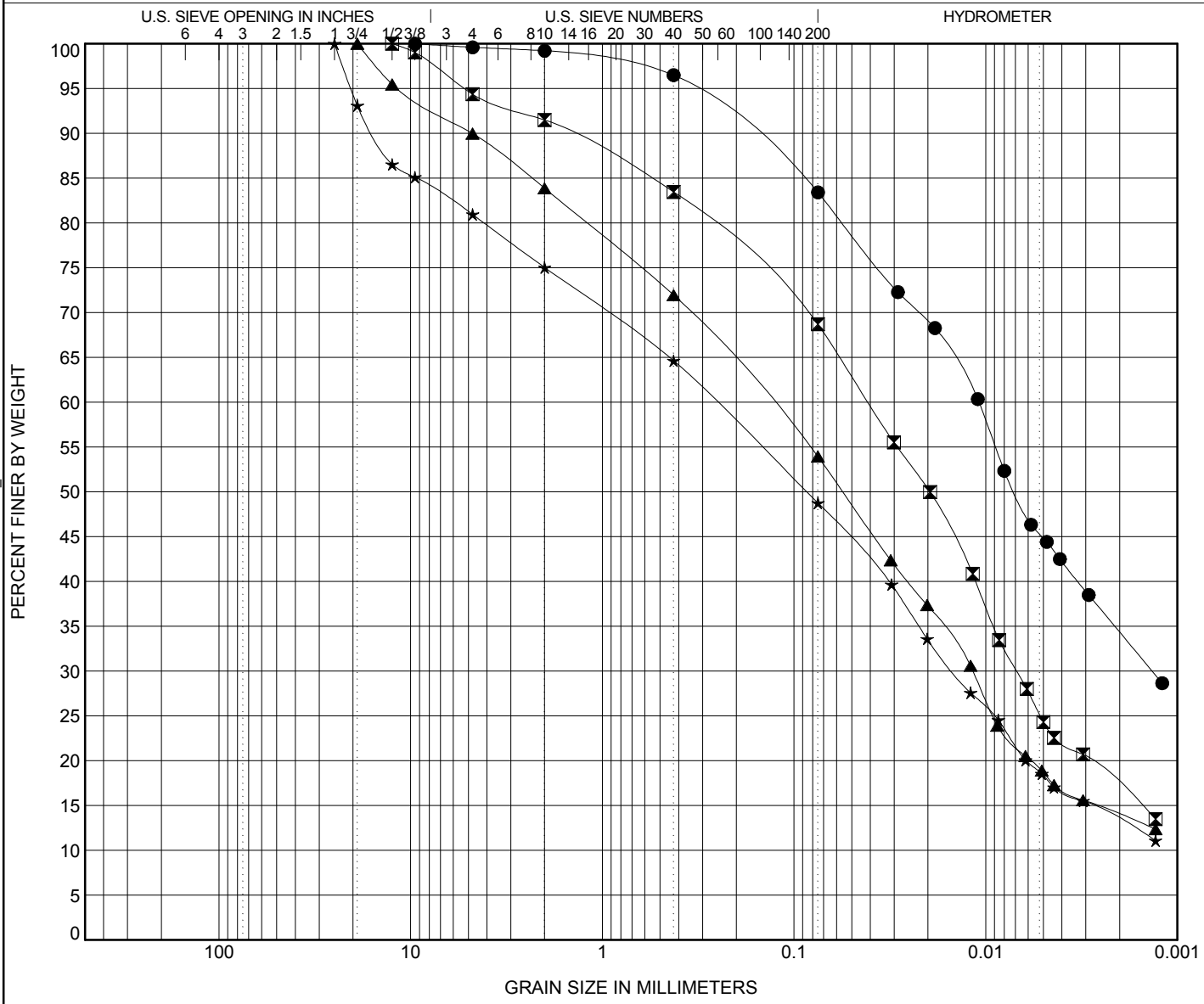
GRAIN SIZE DISTRIBUTION

PROJECT FAY-MEGASITE ROADWAY- **PID**

OGE NUMBER 241GC00276 **PROJECT TYPE** Roadway



COBBLES	GRAVEL		SAND		SILT	CLAY
	coarse	fine	coarse	fine		

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	B-008-0-19	1.5	A-7-6	45	17	28		
⊠	B-008-0-19	4.5	A-4a	25	17	8		
▲	B-008-0-19	6.0	A-4a	23	16	7		
★	B-008-0-19	8.5	A-4a	21	15	6		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	B-008-0-19	1.5	9.5	0.011	0.001		1	16	38	45
⊠	B-008-0-19	4.5	12.5	0.041	0.007		8	23	45	24
▲	B-008-0-19	6.0	19	0.134	0.012		16	30	35	19
★	B-008-0-19	8.5	25	0.256	0.015		25	26	31	18

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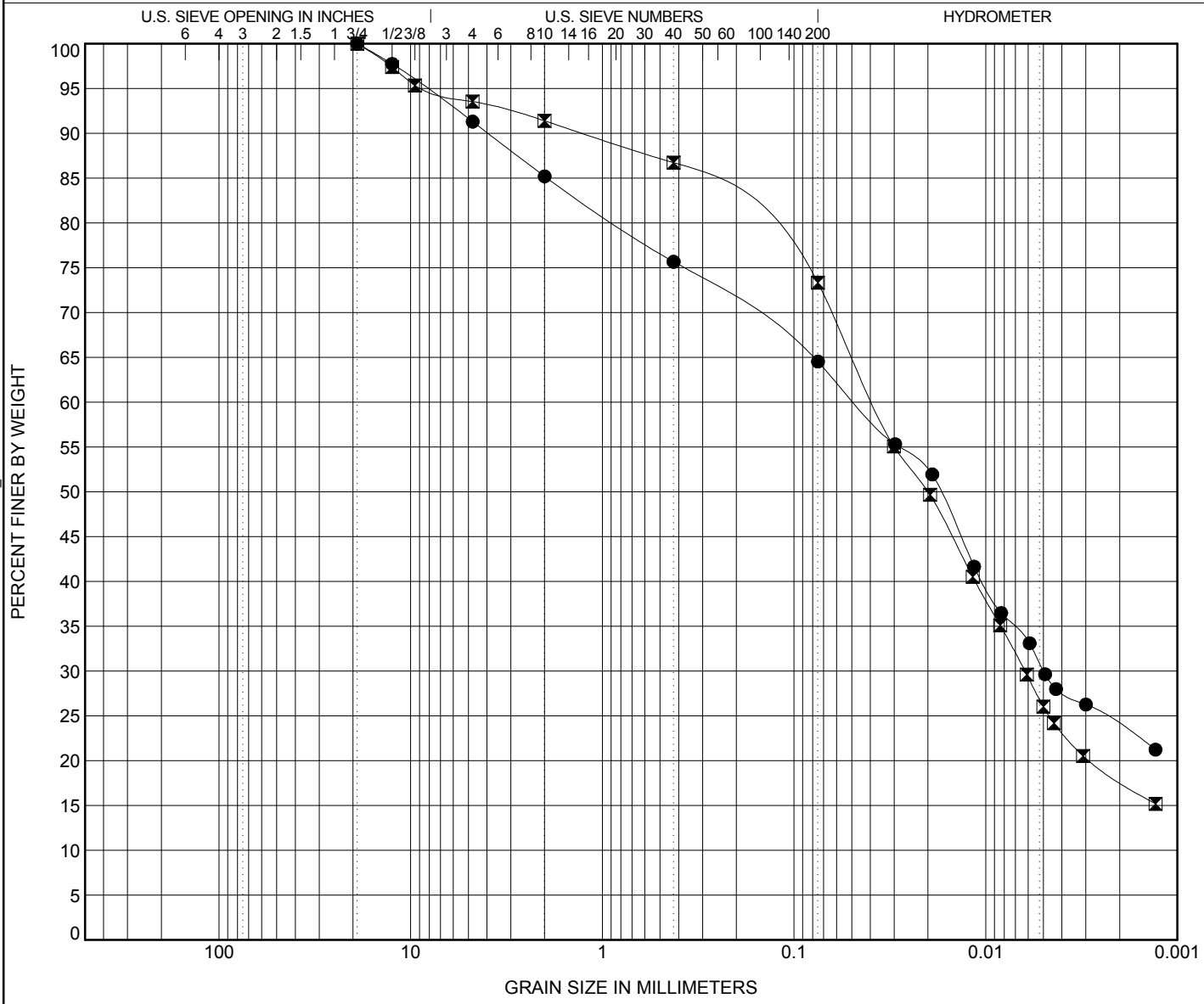
GRAIN SIZE DISTRIBUTION

PROJECT FAY-MEGASITE ROADWAY- **PID**

OGE NUMBER 241GC00276 **PROJECT TYPE** Roadway



COBBLES	GRAVEL		SAND		SILT	CLAY
	coarse	fine	coarse	fine		

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-009-0-19**	**0.0**	**A-7-6**	**43**	**18**	**25**		
⊠	**B-009-0-19**	**3.0**	**A-4a**	**25**	**17**	**8**		

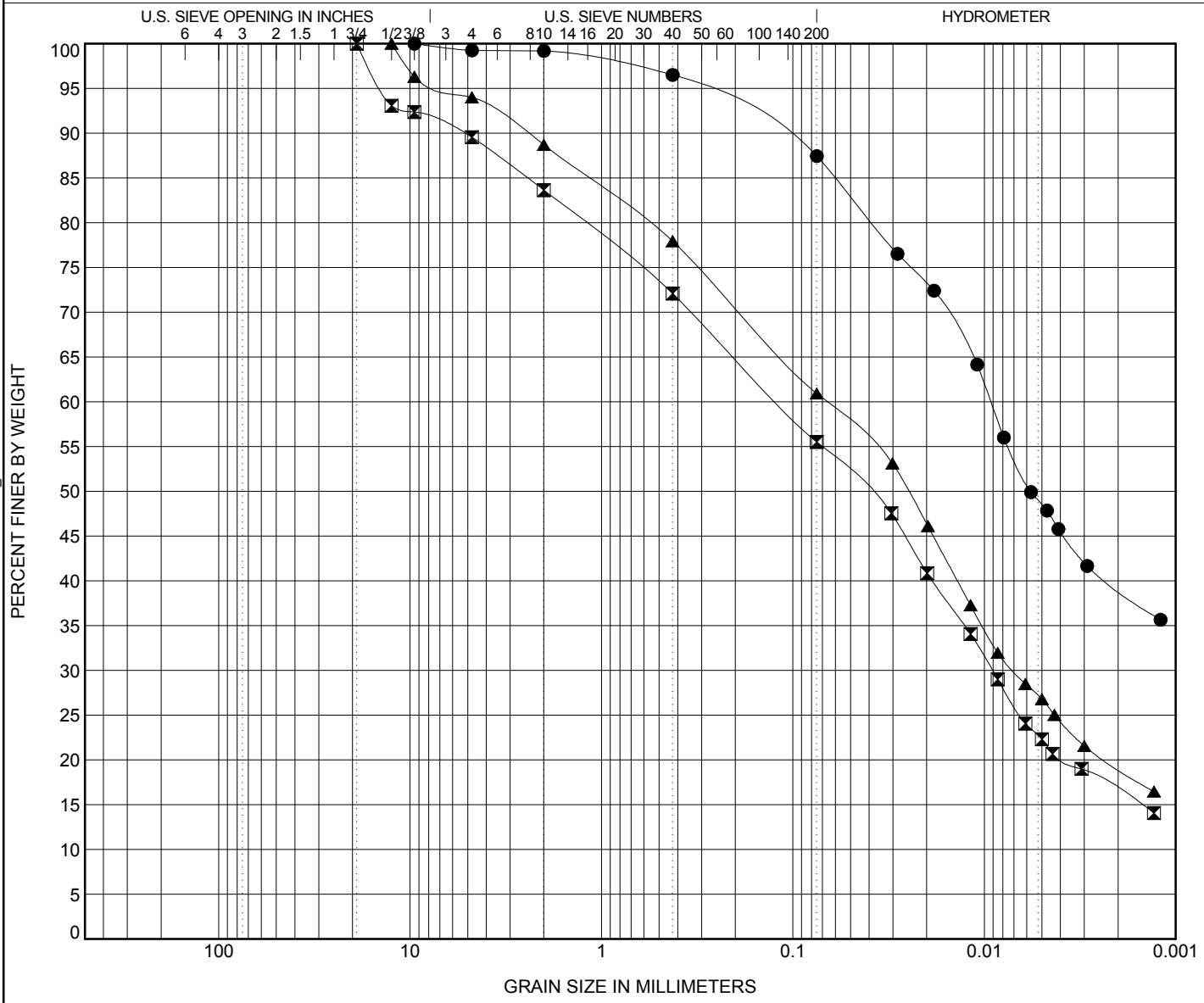
	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-009-0-19**	**0.0**	**19**	**0.048**	**0.005**		**14**	**21**	**35**	**30**
⊠	**B-009-0-19**	**3.0**	**19**	**0.039**	**0.006**		**9**	**18**	**47**	**26**

ATC Associates, Inc.
11121 Canal Road
Cincinnati, Ohio 45251
Telephone: (513) 771-2112
Fax: (513) 782-6908

GRAIN SIZE DISTRIBUTION

PROJECT FAY-MEGASITE ROADWAY- **PID**

OGE NUMBER 241GC00276 **PROJECT TYPE** Roadway



COBBLES	GRAVEL		SAND		SILT	CLAY
	coarse	fine	coarse	fine		

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**B-010-0-19**	**1.5**	**A-7-6**	**52**	**20**	**32**		
⊠	**B-010-0-19**	**4.5**	**A-4a**	**23**	**16**	**7**		
▲	**B-010-0-19**	**8.5**	**A-4a**	**25**	**15**	**10**		

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-010-0-19**	**1.5**	**9.5**	**0.009**			**1**	**12**	**38**	**49**
⊠	**B-010-0-19**	**4.5**	**19**	**0.12**	**0.009**		**15**	**29**	**34**	**22**
▲	**B-010-0-19**	**8.5**	**12.5**	**0.067**	**0.007**		**11**	**28**	**34**	**27**

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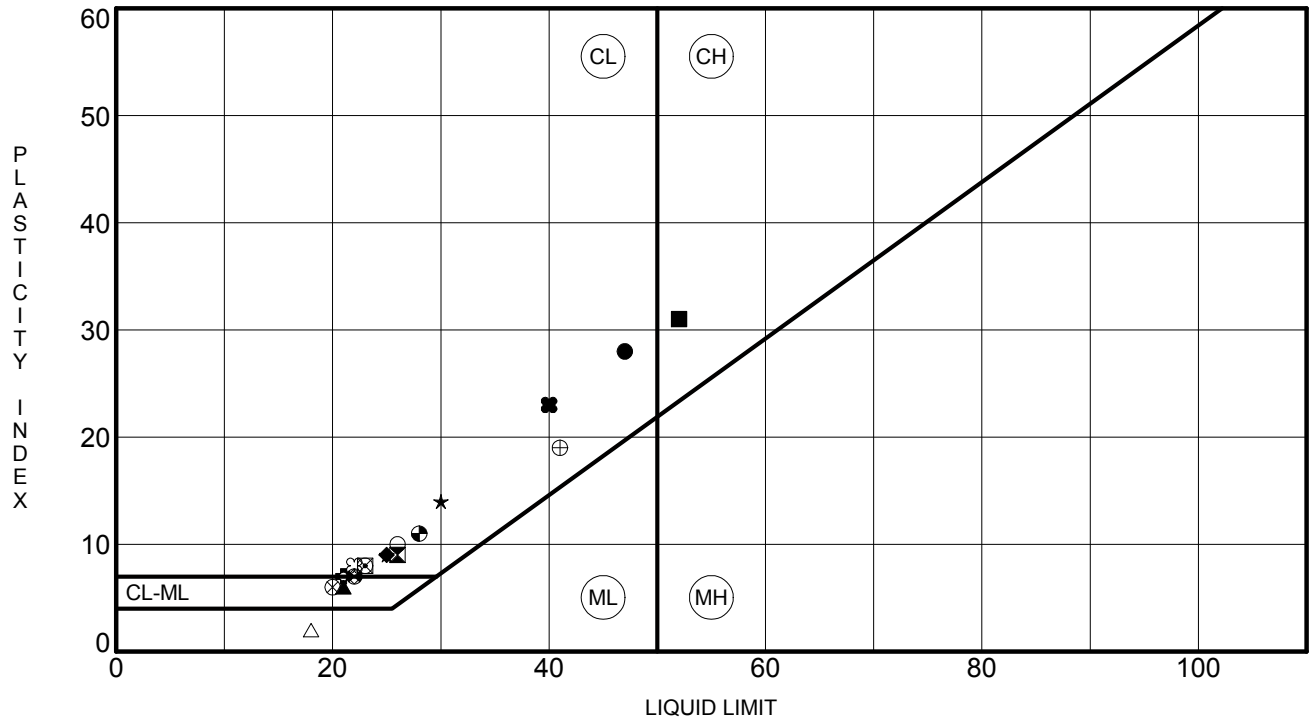
ATTERBERG LIMITS' RESULTS

PROJECT FAY-MEGASITE ROADWAY- **PID**

OGE NUMBER 241GC00276 **PROJECT TYPE** Roadway



	Specimen Identification		LL	PL	PI	Fines	Classification
●	B-001-0-19	1.0	47	19	28	92	A-7-6
⊠	B-001-0-19	3.5	26	17	9	63	A-4a
▲	B-001-0-19	8.5	21	15	6	51	A-4a
★	B-002-0-19	1.0	30	16	14	54	A-6a
⊙	B-002-0-19	3.5	23	15	8	57	A-4a
✿	B-002-0-19	8.5	21	14	7	58	A-4a
○	B-003-0-19	1.0	26	16	10	52	A-4a
△	B-003-0-19	3.5	18	16	2	55	A-4a
⊗	B-003-0-19	8.5	20	14	6	43	A-4a
⊕	B-004-0-19	1.0	41	22	19	80	A-7-6
□	B-004-0-19	3.5	23	15	8	59	A-4a
⊛	B-004-0-19	8.5	22	15	7	48	A-4a
◔	B-005-0-19	1.0	28	17	11	65	A-6a
☆	B-005-0-19	3.5	25	16	9	65	A-4a
⊠	B-005-0-19	8.5	22	14	8	76	A-4b
■	B-006-0-19	1.0	52	21	31	63	A-7-6
◆	B-006-0-19	3.5	25	16	9	55	A-4a
◇	B-006-0-19	6.0	22	15	7	55	A-4a
×	B-006-0-19	8.5	23	15	8	62	A-4a
✖	B-007-0-19	1.0	40	17	23	82	A-6b

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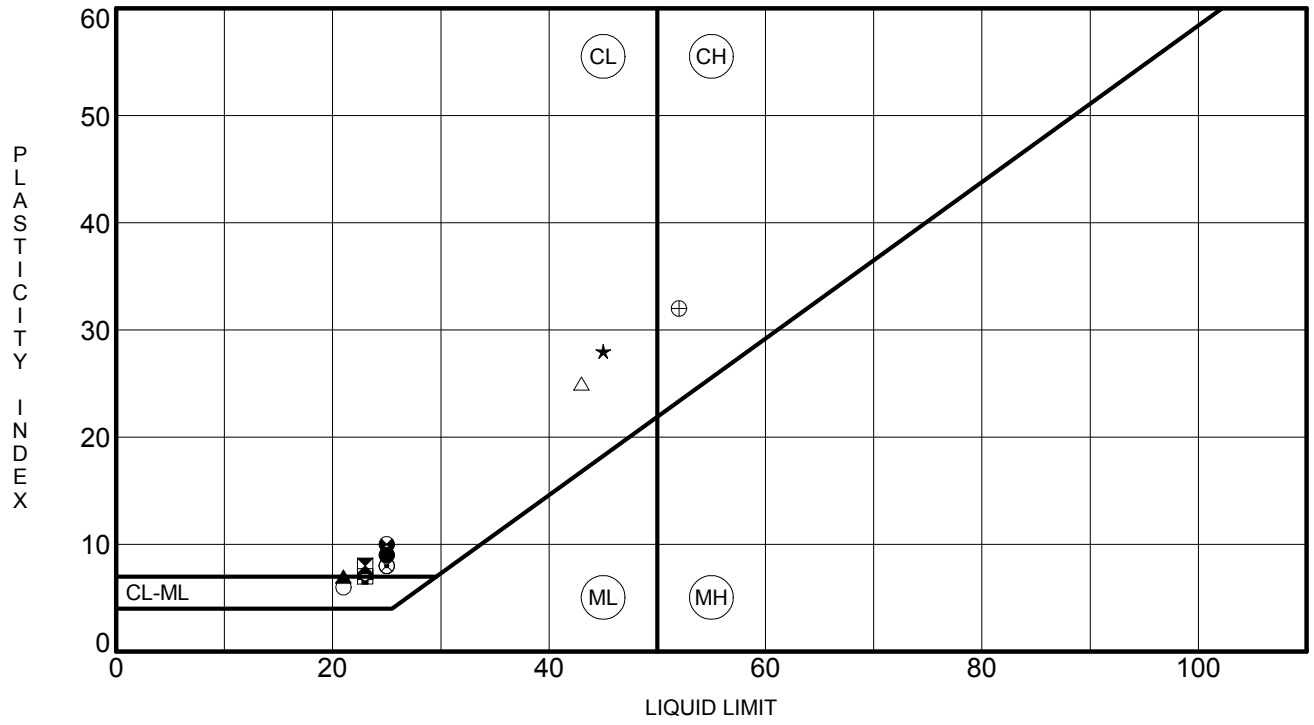
ATTERBERG LIMITS' RESULTS

PROJECT FAY-MEGASITE ROADWAY- **PID**

OGE NUMBER 241GC00276 **PROJECT TYPE** Roadway



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**B-007-0-19**	**3.5**	**25**	**16**	**9**	**30**	**A-2-4**
⧓	**B-007-0-19**	**6.0**	**23**	**15**	**8**	**55**	**A-4a**
▲	**B-007-0-19**	**8.5**	**21**	**14**	**7**	**52**	**A-4a**
★	**B-008-0-19**	**1.5**	**45**	**17**	**28**	**83**	**A-7-6**
⊙	**B-008-0-19**	**4.5**	**25**	**17**	**8**	**69**	**A-4a**
✿	**B-008-0-19**	**6.0**	**23**	**16**	**7**	**54**	**A-4a**
○	**B-008-0-19**	**8.5**	**21**	**15**	**6**	**49**	**A-4a**
△	**B-009-0-19**	**0.0**	**43**	**18**	**25**	**65**	**A-7-6**
⊗	**B-009-0-19**	**3.0**	**25**	**17**	**8**	**73**	**A-4a**
⊕	**B-010-0-19**	**1.5**	**52**	**20**	**32**	**87**	**A-7-6**
□	**B-010-0-19**	**4.5**	**23**	**16**	**7**	**56**	**A-4a**
⊠	**B-010-0-19**	**8.5**	**25**	**15**	**10**	**61**	**A-4a**

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

Megasite Roadway

SR 729, Washington Count House, Fayette County

ATC Group Services, LLC

Prepared By: Alexander Ham
Date prepared: Monday, April 29, 2019

Alexander Ham
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NO. OF BORINGS: 7

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	1	1.0	2.5	1.0	2.5	10		2.25	47	19	28	46	46	92	25	18	A-7-6	17	24		N_{60} & Mc		**12"**	
	001-0	2	3.5	5.0	3.5	5.0	10		2.25	26	17	9	37	26	63	17	12	A-4a	6						
	19	3	6.0	7.5	6.0	7.5	10		4.25							14									
		4	8.5	10.0	8.5	10.0	27	10	4.25	21	15	6	32	19	51	16	10	A-4a							
2	B	1	1.0	2.5	1.0	2.5	11		2.25	30	16	14	29	25	54	20	14	A-6a	5	3		N_{60} & Mc		**12"**	
	002-0	2	3.5	5.0	3.5	5.0	18		3.5	23	15	8	36	21	57	14	10	A-4a	4						
	19	3	6.0	7.5	6.0	7.5	11		3.25							15									
		4	8.5	10.0	8.5	10.0	15	11	3.25	21	14	7	36	22	58	11	10	A-4a							
3	B	1	1.0	2.5	1.0	2.5	10		2.75	26	16	10	30	22	52	18	11	A-4a	3	3		N_{60} & Mc		**12"**	
	003-0	2	3.5	5.0	3.5	5.0	10		2.25	18	16	2	40	15	55	23	11	A-4a	4						
	19	3	6.0	7.5	6.0	7.5	12		2.5							14									
		4	8.5	10.0	8.5	10.0	21	10	4.5	20	14	6	27	14	41	10	10	A-4a							
4	B	1	1.0	2.5	1.0	2.5	7		1.75	41	22	19	44	36	80	27	19	A-7-6	12	5		HP & Mc		**15"**	
	004-0	2	3.5	5.0	3.5	5.0	11		3.75	23	15	8	35	24	59	13	10	A-4a	5						
	19	3	6.0	7.5	6.0	7.5	26		4.5							12									
		4	8.5	10.0	8.5	10.0	41	7	4.5	22	15	7	28	20	48	11	10	A-4a							
5	B	1	1.0	2.5	1.0	2.5	12		4.5	28	17	11	35	30	65	14	14	A-6a	6	4					
	005-0	2	3.5	5.0	3.5	5.0	19		2.25	25	16	9	36	29	65	17	11	A-4a	6						
	19	3	6.0	7.5	6.0	7.5	15		3.25							14									
		4	8.5	10.0	8.5	10.0	30	12	4.5	22	14	8	55	21	76	11	10	A-4b							
6	B	1	1.0	2.5	1.0	2.5	12		2.5	52	21	31	37	26	63	25	18	A-7-6	15	19		N_{60} & Mc		**12"**	
	006-0	2	3.5	5.0	3.5	5.0	8		2	25	16	9	15	16	31	15	11	A-4a	0						
	19	3	6.0	7.5	6.0	7.5	15		4.25	22	15	7	22	15	37	13	10	A-4a							
		4	8.5	10.0	8.5	10.0	25	8	4.5	23	15	8	23	15	38	12	10	A-4a							
7	B	1	1.0	2.5	1.0	2.5	10		1.75	40	17	23	45	37	82	24	16	A-6b	13	5		HP & Mc		**12"**	
	007-0	2	3.5	5.0	3.5	5.0	16		2.25	25	16	9	19	11	30	12	10	A-2-4	0						
	19	3	6.0	7.5	6.0	7.5	33		4.5	23	15	8	35	20	55	12	10	A-4a							
		4	8.5	10.0	8.5	10.0	16	10	4.5	21	14	7	34	18	52	11	10	A-4a							

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

PID:

County-Route-Section: Megasite Roadway
No. of Borings: 7

Geotechnical Consultant: ATC Group Services, LLC
Prepared By: Alexander Ham
Date prepared: 4/29/2019

Chemical Stabilization Options		
320	Rubblize & Roll	No
206	Cement Stabilization	Option
	Lime Stabilization	No
206	Depth	14''

Excavate and Replace Stabilization Options	
Global Geotextile Override(N60L):	18''
Override(HP):	24''
Global Geogrid Override(N60L):	12''
Override(HP):	18''

Design CBR	7

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	0%	HP ≤ 0.5	0%
$N_{60} < 12$	52%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	14%	1 < HP ≤ 2	14%
$N_{60} \geq 20$	10%	HP > 2	86%
M+	29%		
Rock	0%		
Unsuitable	4%		

Excavate and Replace at Surface	
Average	0''
Maximum	0''
Minimum	0''

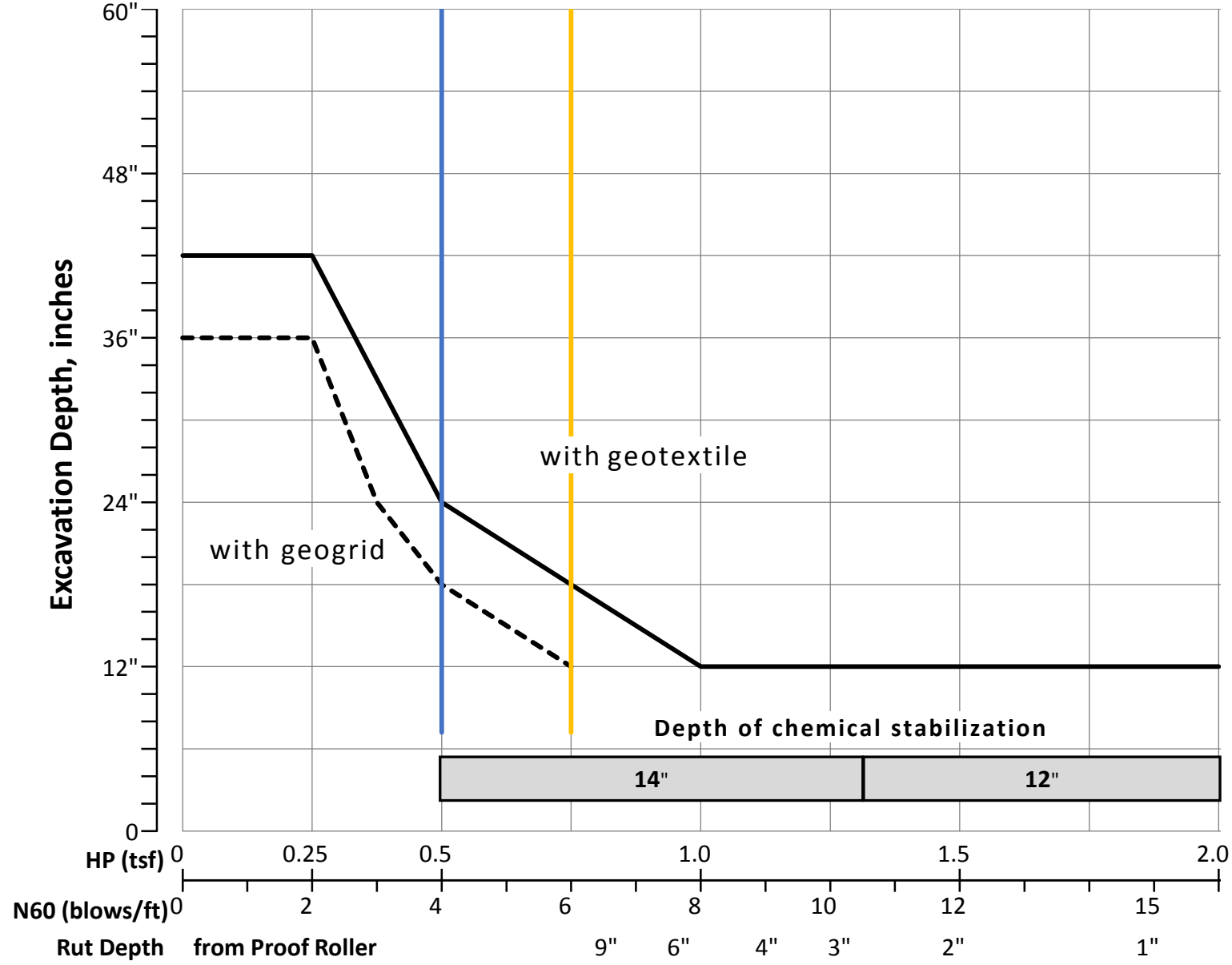
% Proposed Subgrade Surface	
Unstable & Unsuitable	86%
Unstable	86%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	16	10	3.30	27	16	11	34	23	57	16	12	7
Maximum	41	12	4.50	52	22	31	55	46	92	27	19	17
Minimum	7	7	1.75	18	14	2	15	11	30	10	10	0

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	0	1	0	0	0	0	0	15	1	0	2	1	0	3	0	0	23
Percent	0%	0%	0%	4%	0%	0%	0%	0%	0%	65%	4%	0%	9%	4%	0%	13%	0%	0%	100%
% Rock|Granular|Cohesive	0%	70%									30%								100%
Surface Class Count	0	0	0	0	0	0	0	0	0	1	0	0	2	1	0	3	0	0	7
Surface Class Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	14%	0%	0%	29%	14%	0%	43%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
3.30	0.50	☑ HP
9.71	6.00	☑ N60L

Average HP
Average N_{60L}

OHIO DEPARTMENT OF TRANSPORTATION

OFFICE OF GEOTECHNICAL ENGINEERING

PLAN SUBGRADES
Geotechnical Bulletin GB1

Megasite Roadway

SR 435, Washington Count House, Fayette County

ATC Group Services, LLC

Prepared By: Alexander Ham
Date prepared: Monday, April 29, 2019

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ATC Group Services LLC
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Cincinnati, Ohio 45241
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alexander.ham@atcgs.com

NO. OF BORINGS: 3

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

#	Boring	Sample	Sample Depth		Subgrade Depth		Standard Penetration		HP (tsf)	Physical Characteristics						Moisture		Ohio DOT		Sulfate Content (ppm)	Problem		Excavate and Replace (Item 204)		Recommendation (Enter depth in inches)
			From	To	From	To	N_{60}	N_{60L}		LL	PL	PI	% Silt	% Clay	P200	M_C	M_{OPT}	Class	GI		Unsuitable	Unstable	Unsuitable	Unstable	
1	B	1	0.0	1.5	0.0	1.5	7		2.25							22				14		N_{60}		15"	
	008-0	2	1.5	3.0	1.5	3.0	10		1.75	45	17	28	38	45	83	24	18	A-7-6	16			HP & Mc			
	19	3	3.0	4.5	3.0	4.5	7		1.25							29									
		4	4.5	6.0	4.5	6.0	4	4	0.25	25	17	8	45	24	69	18	12	A-4a	7						
2	B	1	0.0	1.5	0.0	1.5	5		1.5	43	18	25	35	30	65	22	18	A-7-6	12			HP & Mc		21"	
	009-0	2	1.5	3.0	1.5	3.0	7		2.75							18				16		N_{60}			
	19	3	3.0	4.5	3.0	4.5	12		3.25	25	17	8	47	26	73	17	12	A-4a	8						
		4	4.5	6.0	4.5	6.0	10	5	1.75							15									
3	B	1	0.0	1.5	0.0	1.5	8		2							31				5		N_{60}		12"	
	010-0	2	1.5	3.0	1.5	3.0	10		1.5	52	20	32	38	49	87	29	18	A-7-6	18			HP & Mc			
	19	3	3.0	4.5	3.0	4.5	11		1.75							27									
		4	4.5	6.0	4.5	6.0	10	8	1.5	23	16	7	34	22	56	16	11	A-4a	4						

OHIO DEPARTMENT OF TRANSPORTATION

Subgrade Analysis

V. 14.5 1/18/2019

PID:

County-Route-Section: Megasite Roadway
No. of Borings: 3

Geotechnical Consultant: ATC Group Services, LLC
Prepared By: Alexander Ham
Date prepared: 4/29/2019

Chemical Stabilization Options		
320	Rubblize & Roll	No
206	Cement Stabilization	Option
	Lime Stabilization	Option
206	Depth	14''

Excavate and Replace Stabilization Options	
Global Geotextile Override(N60L):	18''
Override(HP):	24''
Global Geogrid Override(N60L):	12''
Override(HP):	18''

Design CBR	6

% Samples within 6 feet of subgrade			
$N_{60} \leq 5$	17%	HP ≤ 0.5	8%
$N_{60} < 12$	92%	0.5 < HP ≤ 1	0%
$12 \leq N_{60} < 15$	8%	1 < HP ≤ 2	67%
$N_{60} \geq 20$	0%	HP > 2	25%
M+	25%		
Rock	0%		
Unsuitable	0%		

Excavate and Replace at Surface	
Average	0''
Maximum	0''
Minimum	0''

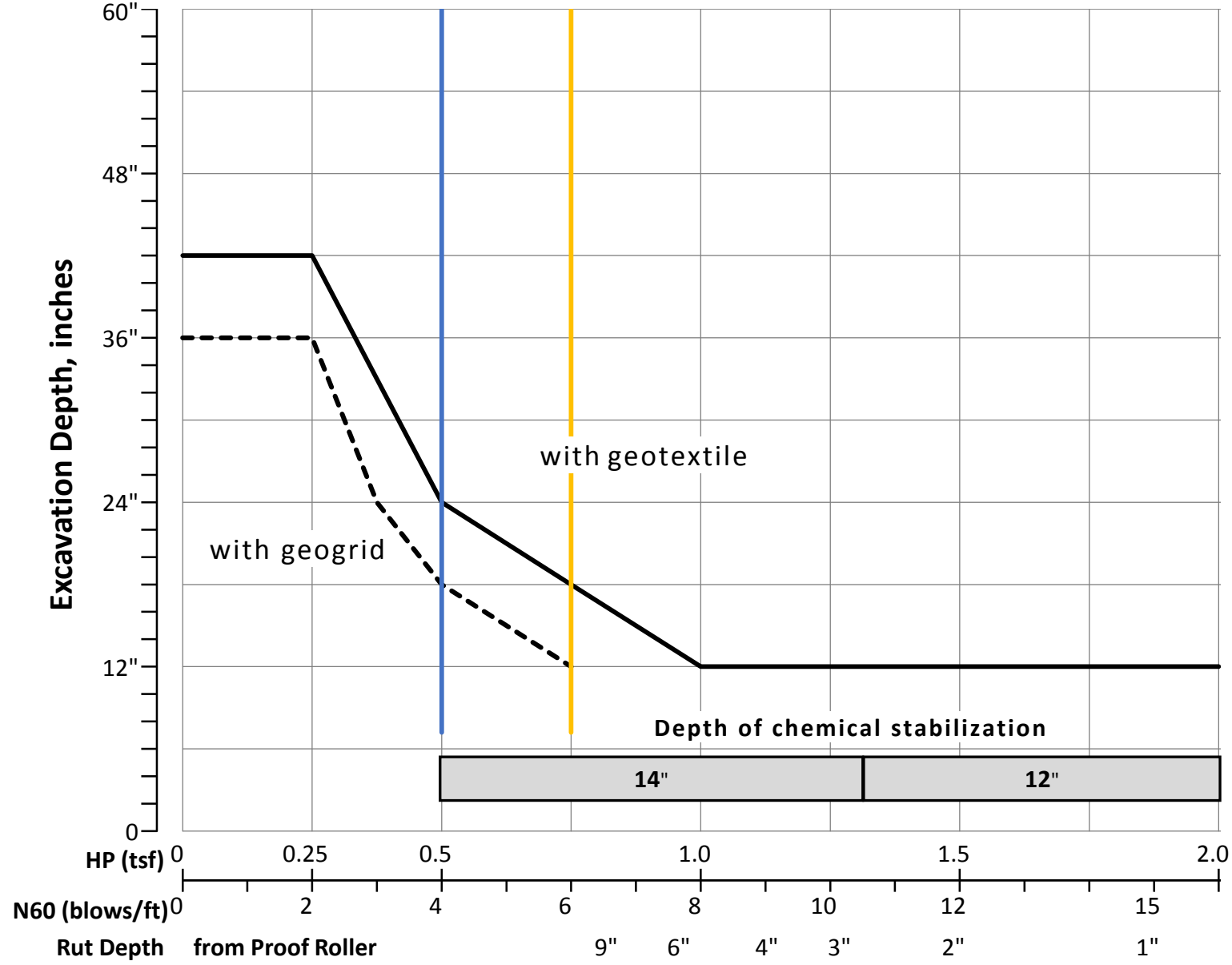
% Proposed Subgrade Surface	
Unstable & Unsuitable	200%
Unstable	200%
Unsuitable	0%

	N_{60}	N_{60L}	HP	LL	PL	PI	Silt	Clay	P 200	M_C	M_{OPT}	GI
Average	8	6	1.79	36	18	18	40	33	72	22	15	11
Maximum	12	8	3.25	52	20	32	47	49	87	31	18	18
Minimum	4	4	0.25	23	16	7	34	22	56	15	11	4

Classification Counts by Sample

ODOT Class	Rock	A-1-a	A-1-b	A-2-4	A-2-5	A-2-6	A-2-7	A-3	A-3a	A-4a	A-4b	A-5	A-6a	A-6b	A-7-5	A-7-6	A-8a	A-8b	Totals
Count	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3	0	0	6
Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	0%	0%	0%	0%	0%	50%	0%	0%	100%
% Rock|Granular|Cohesive	0%	50%									50%								100%
Surface Class Count	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
Surface Class Percent	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	100%

GB1 Figure B – Subgrade Stabilization



OVERRIDE TABLE

Calculated Average	New Values	Check to Override
1.79	0.50	☑ HP
5.67	6.00	☑ N60L

Average HP

Average N_{60L}

APPENDIX A.1 - ODOT Quick Reference for Visual Description of Soils

1) STRENGTH OF SOIL:

Non-Cohesive (granular) Soils - Compactness	
Description	**Blows Per Ft.**
Very Loose	≤ 4
Loose	5 – 10
Medium Dense	11 – 30
Dense	31 – 50
Very Dense	> 50

2) COLOR :

If a color is a uniform color throughout, the term is single, modified by an adjective such as light or dark. If the predominate color is shaded by a secondary color, the secondary color procedes the primary color. If two major and distinct colors are swirled throughout the soil, the colors are modified by the term "mottled"

3) PRIMARY COMPONENT

Use **DESCRIPTION** from ODOT Soil Classification Chart on Back

Cohesive (fine grained) Soils - Consistency

Description	Qu (TSF)	Blows Per Ft.	Hand Manipulation
Very Soft	<0.25	<2	Easily penetrates 2" by fist
Soft	0.25-0.5	2 - 4	Easily penetrates 2" by thumb
Medium Stiff	0.5-1.0	5 - 8	Penetrates by thumb with moderate effort
Stiff	1.0-2.0	9 - 15	Readily indents by thumb, but not penetrate
Very Stiff	2.0-4.0	16 - 30	Readily indents by thumbnail
Hard	>4.0	>30	Indent with difficulty by thumbnail

4) COMPONENT MODIFIERS:

Description	Percentage By Weight
Trace	0% - 10%
Little	10% - 20%
Some	20% - 35%
"And"	35% -50%

5) Soil Organic Content

Description	% by Weight
Slightly Organic	2% - 4%
Moderately Organic	4% - 10%
Highly Organic	> 10%

6) Relative Visual Moisture

Description	Criteria	
	Cohesive Soil	**Non-cohesive Soils**
Dry	Powdery; Cannot be rolled; Water content well below the plastic limit	No moisture present
Damp	Leaves very little moisture when pressed between fingers; Crumbles at or before rolled to $^1/_8$"; Water content below plastic limit	Internal moisture, but no to little surface moisture
Moist	Leaves small amounts of moisture when pressed between fingers; Rolled to $^1/_8$" or smaller before crumbling; Water content above plastic limit to -3% of the liquid limit	Free water on surface, moist (shiny) appearance
Wet	Very mushy; Rolled multiple times to $^1/_8$" or smaller before crumbles; Near or above the liquid limit	Voids filled with free water, can be poured from split spoon.

CLASSIFICATION OF SOILS

Ohio Department of Transportation

(The classification of a soil is found by proceeding from top to bottom of the chart.
The first classification that the test data fits is the correct classification.)

SYMBOL	DESCRIPTION	Classifcation		LL_O/LL x 100*	% Pass #40	% Pass #200	Liquid Limit (LL)	Plastic Index (PI)	Group Index Max.	REMARKS
		AASHTO	OHIO							
	Gravel and/or Stone Fragments	A-1-a			30 Max.	15 Max.		6 Max.	0	Min. of 50% combined gravel, cobble and boulder sizes
	Gravel and/or Stone Fragments with Sand	A-1-b			50 Max.	25 Max.		6 Max.	0	
	Fine Sand	A-3			51 Min.	10 Max.	NON-PLASTIC		0	
	Coarse and Fine Sand	--	A-3a			35 Max.		6 Max.	0	Min. of 50% combined coarse and fine sand sizes
	Gravel and/or Stone Fragments with Sand and Silt	A-2-4 A-2-5				35 Max.	40 Max. 41 Min.	10 Max.	0	
	Gravel and/or Stone Fragments with Sand, Silt and Clay	A-2-6 A-2-7				35 Max.	40 Max. 41 Min.	11 Min.	4	
	Sandy Silt	A-4	A-4a	75 Min.		36 Min.	40 Max.	10 Max.	8	Less than 50% silt sizes
	Silt	A-4	A-4b	75 Min.		50 Min.	40 Max.	10 Max.	8	50% or more silt sizes
	Elastic Silt and Clay	A-5		75 Min.		36 Min.	41 Min.	10 Max.	12	
	Silt and Clay	A-6	A-6a	75 Min.		36 Min.	40 Max.	11 - 15	10	
	Silty Clay	A-6	A-6b	75 Min.		36 Min.	40 Max.	16 Min.	16	
	Elastic Clay	A-7-5		75 Min.		36 Min.	41 Min.	$\leq$LL-30	20	
	Clay	A-7-6		75 Min.		36 Min.	41 Min.	>LL-30	20	
	Organic Silt	A-8	A-8a	74 Max.		36 Min.				W/o organics would classify as A-4a or A-4b
	Organic Clay	A-8	A-8b	74 Max.		36 Min.				W/o organics would classify as A-5, A-6a, A-6b, A-7-5 or A-7-6

MATERIAL CLASSIFIED BY VISUAL INSPECTION

 Sod and Topsoil

 Pavement or Base

 Uncontrolled Fill (Describe)

 Bouldery Zone

 Peat

* Only perform the oven-dried liquid limit test and this calculation if organic material is present in the sample.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly

problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
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