STRUCTURE GEOTECHNICAL REPORT

Dixie Highway Culvert at Ditch

Approx. 0.17 Miles North of Governors Highway

Proposed SN: 016--2292

F.A.U. Route 2843, Contract 62A28

Cook County, Illinois

STRUCTURAL ENGINEER:

EFK Moen, LLC
303 Fountains Parkway
Suite 240
Fairview Heights, Illinois 62208

Prepared by:

Geo Services, Inc.
805 Amherst Court
Suite 204
Naperville, Illinois 60565
(630) 305-9186

JOB NO. 15042

05/19/15

Geo Services, Inc.
Geotechnical, Environmental and Civil Engineering

May 19, 2015

EFK Moen, LLC
125 South Wacker Drive
Suite 2090
Chicago, IL 60606

Attn: Mr. Joe Havel, PE

Job No. 15042

Re: Structural Geotechnical Report
Dixie Highway Culvert at Ditch
Dixie Highway, 0.17 Miles North of Governors Highway
Contract No. 62A28, Section 2014-083B
Proposed SN 016-2292
Hazel Crest, Cook County, IL

Dear Mr. Havel:

The following report presents the geotechnical analysis and recommendations for the reconstruction of Dixie Highway over a Ditch Culvert in Hazel Crest, Cook County, IL. A total of two (2) soil borings (SB-1 and SB-2) were completed at the site by Geo Services, Inc. (GSI). Copies of these boring logs, laboratory test results and a location diagram are included in this report.

If there are any questions with regard to the information submitted in this report, or if we can be of further assistance to you in any way, please do not hesitate to contact us.

Very truly yours,

GEO SERVICES, Inc.

Kiran Adhikary, P.E.
Senior Project Engineer

Andrew J. Ptak, P.E.
Office Manager

enc.

TABLE OF CONTENTS

SECTION 01: INTRODUCTION

The following report presents the geotechnical analysis and recommendations for the reconstruction of Dixie Highway (FAU 2843) over a Ditch Culvert Project, Contract No. 62A28, Section 2014-083B, in Hazel Crest, Cook County, IL. A total of two (2) soil borings (SB-1 and SB-2) were completed at the site by Geo Services, Inc. (GSI). Copies of the borings and a location diagram are included in this report.

The culvert is situated at a ditch location crossing Dixie Highway at approximately 0.17 miles north of Governors Highway in Hazel Crest, IL. An existing single reinforced concrete box culvert (8' x 3') at this location has deteriorated. The existing Structure Number of this culvert is 016-2211. The existing culvert at the project location will be completely removed and replaced with a new culvert. The invert of the new culvert will be set at approximately 5 to 6.5 feet below the existing roadway level. A Structure Number (SN) 016-2292 has been assigned to the new culvert.

The proposed design loadings were not provided by the designer; however, for the analyses purposes, we estimate an approximate foundation pressure of 1,000 psf will be applied to the foundation bearing soils at approximate depth of 5 to 6.5 feet below existing roadway level.

SECTION 02: SUBSURFACE INVESTIGATION PROCEDURES

Boring locations were selected by Geo Services, Inc. and approved by EFK Moen. Boring locations were located in the field by Geo Services, Inc. personnel after review of accessibility and utility locations. Boring locations are illustrated on the boring location diagram in Appendix C.

The borings were performed during the month of April, 2015 with a truck-mounted drilling rig and were advanced by means of hollow stem augers or rotary drilling techniques to completion to a depth of 40 feet. Representative samples from the drill rig were obtained employing split spoon sampling procedures in accordance with AASHTO T-206. Samples obtained in the field were returned to our laboratory for further examination and testing.

Split spoon sampling involves driving a 2.0-inch outside diameter split-barrel sampler into the soil with a 140-pound weight falling freely through a distance of 30 inches. Blow counts are recorded at 6" intervals and the blow counts are shown on the boring logs. The number of blows required to advance the sampler the last 12 inches is termed the Standard Penetration Resistance (N). The N value is an indication of the relative density of the soil.

SECTION 03: LAB TESTING PROGRAM

The test procedures were performed in accordance with test procedures discussed in the IDOT Geotechnical Manual. All split-spoon samples obtained from the drilling operation were visually classified in the field. Cohesive samples were tested for unconfined compressive strength using an IDOT modified RIMAC test device and/or calibrated penetrometer in the field.

The soil testing program included performing water content, density and either unconfined compression and/or calibrated penetrometer tests on the cohesive samples recovered. These tests were performed upon representative portions of the samples obtained in the field. The results of the above testing, along with a visual classification of the material based upon both the Illinois textural classification and the AASHTO Soil Classification System, are indicated on the boring logs.

SECTION 04: SOIL AND WATER TABLE CONDITIONS

Soil borings were completed near the proposed location of the culvert at the Dixie Highway roadway level. The pavement consisted of approximately 6 inches of asphalt overlying 8 inches of concrete. Below the pavement, embankment fill material consisting of silty clay was encountered to a depth of 3 feet. Below the fill soils, clay/clay loam/silty clay loam/silty loam/sand/silt/sand and gravel soils were generally encountered to the termination of borings at a depth of 40 feet below existing grade. The cohesive clayey soils (fill and natural) were soft to hard and had moisture contents within the range of 14% to 35%. The granular soils encountered between at the borings had moisture contents within the range of 11% to 21%.

Groundwater was encountered at boring SB-2 at a depth of 5.5 feet during drilling and sampling operations. No groundwater was encountered within 10 feet depth at the boring SB-01 during the drilling and sampling operations. Due to the nature of rotary-wash drilling, it is not possible to attain water levels below 10 feet of depth or after drilling. Due to coloration change of soils from brown and gray to gray, we estimate the long-term water table to be at a depth of 8 feet below existing grade. Fluctuations in the amount of water accumulated and in the hydrostatic water table can be anticipated depending upon variations in precipitation, surface runoff and nearby ditch level.

SECTION 05: SETTLEMENT ANALYSIS

Embankment

Proposed grade will be similar to existing grade or slightly higher than existing grade. Embankment settlement are not considered to affect the design of the proposed culvert.

Culvert Foundation

For the culvert settlement calculations, an assumed applied pressure of 1,000 psf from has been considered at the anticipated bottom of the foundation level located at a depth of 5 to 6.5 feet below existing roadway level. A total settlement due to the anticipated loading is calculated to be in the range of approximately 0.4 inches or less. This assumes that unsuitable soft soils are first overexcavated and replaced with granular soils as recommended in Section 7, Table 1 – Remedial Treatment Recommendations. Settlement and downdrag are not considered to affect the design of the proposed culvert.

SECTION 06: SLOPE STABILITY ANALYSIS

Side slopes of 2:1 (H:V) or flatter are planned for the new embankment. Proposed grade will be similar to the existing grade. Based on our review of these conditions, there are no external slope stability concerns with the proposed culvert.

SECTION 07: FOUNDATION RECOMMENDATIONS

Culvert Foundation Recommendations

Based on the results of the borings, a precast or cast in place reinforced concrete culvert can be used for design. The type of culvert selected should be based on economic, construction (staging) and functional considerations.

The proposed design loadings were not provided by the designer; however, for the analyses purposes, we estimate an approximate foundation pressure of 1,000 psf will be applied to the foundation bearing soils at approximate depth of 5 to 6.5 feet below existing grade.

Some of the soils encountered below the invert elevations were soft to medium silty clay soils, and remedial treatment at is recommended prior to the placement of new culvert. Provided the remedial treatments are completed *(see Table 1- Remedial Treatment Recommendations)*; no settlement or bearing capacity concerns are identified with the new culvert.

Based on the results of the borings, the estimated areas that merit soil remediation are summarized in the following Table 1.

Table 1- Remedial Treatment Recommendations

Boring No.	Estimated Invert Depth (ft.)	Subgrade Condition	Remedial Treatment Approx. Depth Below Invert Elevation (ft)	Recommended Remedial Treatment
SB-02	5 to 6.5	Soft to Medium Stiff Clay (wc=28% to 35%)	1.5 to 3	Undercut to a nominal depth of 8 feet below existing grade and replace with material meeting the Aggregate Subgrade Improvement*

*IDOT District One Special Provision (most recent version)

The actual need for removal and replacement with Aggregate Subgrade Improvement should be determined in the field at the time of construction by the Geotechnical Engineer or soils inspector.

Assuming unsuitable soft soils are first overexcavated and replaced with granular soils as recommended in Table 1 – Remedial Treatment Recommendations, the proposed culvert foundation can be designed using a factored bearing resistance pressure of 4,000 pounds per square foot (psf). For foundations situated on the granular base fill, a friction factor of 0.55 is recommended for evaluating resistance to sliding. If rockfill is used as a subbase for the structure, a friction factor of 0.70 may be used instead.

The subgrade should still be observed by the geotechnical engineer at the time of excavation/construction. If any unsuitable soils are present, the soils should be undercut to the depth encountered. From the IDOT Standard Specifications for Roadway and Bridge Construction, any removal and backfill for structures should be in compliance with Section 502. After removal of the unsuitable soil, a non-woven geo fabric should be placed to stabilize the subgrade soil before placement of the structural fill.

Any undercutting should be performed in such a manner as to minimize disturbance to the undercut subgrade. Heavy equipment traffic directly on the subgrade should be minimized. The actual extent of any undercut should be determined in the field at the time of construction by the geotechnical engineer.

Wing Wall Foundation Recommendations

The proposed culverts will have associated wingwalls on both ends of the structure. The foundation recommendations presented for the culverts earlier in this report are also valid for the wingwalls.

Based on the anticipated Dixie Highway roadway fill heights above the proposed culvert, proposed culvert heights, and the length of the proposed culverts, the horizontal, L-type and T-type wings may be feasible for the wingwall structure design. For the lateral design of yielding wingwalls, it is recommended that a lateral active earth pressure of 40 psf per foot of depth be used above the water table assuming a free-draining granular backfill is utilized. For cohesive soils, a lateral active earth pressure of 55 psf per foot should be used. For non-yielding abutment walls with granular backfill, a lateral at-rest pressure of 50 psf per foot should be used, assuming proper drainage. For cohesive soils, a lateral at-rest pressure of 65 psf per foot should be used. Allowances should be made for any surcharge loads adjacent to the retaining structure. According to the NAVFAQ Design Manual 7.02, a value of 0.34 may be used for the coefficient of friction between the concrete base and drained cohesive soils (this assumes a concrete base on the stiff cohesive soils). For a concrete base on approved granular structural fill, a friction angle of 28 degrees may be used, leading to a coefficient value of 0.53. Drainage should be provided behind any walls.

SECTION 08: LATERAL SOIL PROPERTIES

Permanent steel sheet piling will be installed near the end of the culvert. Where excavations for culvert require a temporary earth retention system steel sheet piling is recommended. The following table is a tabulation of lateral soil parameters to be used for sheet piling for the proposed culvert.

Table 2 – Soil Parameters[1] for Lateral Resistance (Boring SB-1)

Material (depth, feet)	Unit Weight (pcf)	Drained Friction Angle (°)	Undrained Cohesion (psf)	Lateral Modulus of Subgrade Reaction (pci)	Strain
Soft to Stiff Clay Loam/Clay (Top to 5)	120	26	800	200	0.009
Very Stiff to Hard Clay/Clay Loam (8 to 16)	125	28	3,000	1,000	0.005
Medium Dense to Dense Sand/Silt/Sand and Gravel (16 to 38)	125	30	--	60	--
Stiff Clay Loam (38 to 40)	125	26	2,000	660	0.006

Note: 1. Values recommended for use in design from L-pile Software Manual

Table 3 – Soil Parameters[1] for Lateral Resistance (Boring SB-2)

Material (depth, feet)	Unit Weight (pcf)	Drained Friction Angle (°)	Undrained Cohesion (psf)	Lateral Modulus of Subgrade Reaction (pci)	Strain
Soft to Stiff Clay Loam/Clay (Top to 8)	115	18	250	20	0.020
Very Stiff to Hard Clay/Clay Loam (8 to 16)	125	28	3,000	1,000	0.005
Medium Dense to Dense Sand/Silt/Sand and Gravel (16 to 38)	125	30	--	60	--
Stiff Clay Loam (38 to 40)	125	26	2,000	660	0.006

Note: 1. Values recommended for use in design from L-pile Software Manual

For the design of yielding walls, it is recommended that a lateral active earth pressure of 40 psf per foot of depth be used above the water table assuming a free-draining granular backfill is utilized. For cohesive soils, a lateral active earth pressure of 55 psf per foot should be used. The passive resistance should be based on the shear strength of the soil, which can be taken as ½ the unconfined strengths shown on the boring logs. For the design of culvert, the lateral pressure on the sidewalls should be based on an equivalent fluid pressure of 50 psf per foot of depth for the height of the barrel and 40 psf per foot of depth for the height of the fill. The above pressures do not consider hydrostatic effects on the wall.

Allowances should be made for any surcharge loads adjacent to the retaining structures. During excavation for the proposed improvements, movement of adjacent soils into the excavation should be prevented.

SECTION 09: GENERAL CONSTRUCTION CONSIDERATIONS

If the ditch water is diverted during construction, it is expected that groundwater can be controlled using sump pump and pit procedures. However, if the ditch is not diverted, the contractor should provide a plan to keep the site in the dry.

The installation of Temporary Soil Retention System may be required during the construction. Based on the results of borings, IDOT Temporary Sheet Piling Design Charts can be used for the design of a Temporary Soil Retention System.

From the IDOT Standard Specifications for Roadway and Bridge Construction, any excavation for structures should be in compliance with Section 502. During excavation for the proposed improvements, movement of adjacent soils into the excavation should

be prevented. Stockpiles of materials and equipment should not be placed near the top of the excavation slopes. All excavations should be performed in accordance with the latest Occupational Safety and Health Administration (OSHA) requirements. Allowances should be made for any surcharge loads adjacent to the retaining structures.

SECTION 10: GENERAL QUALIFICATIONS

The analysis and recommendations presented in this report are based upon the data obtained from our soil borings performed at the indicated locations. This report does not reflect any variations that may occur between borings or across the site. In addition, the soil samples cannot be relied on to accurately reflect the strata variations that usually exist between sampling locations. The nature and extent of such variations may not become evident until construction. If variations appear evident, it will be necessary to reevaluate the recommendations of the report. In addition, it is recommended that Geo Services Inc. be retained to perform construction observation and thereby provide a complete professional geotechnical engineering service through the observational method.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No other warranties, either expressed or implied, are intended or made. In the event that any changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions of this report modified or verified in writing by the geotechnical engineer. Also note that Geo Services Inc. is not responsible for any claims, damages, or liability associated with any other party's interpretation of this report's subsurface data or reuse of the report's subsurface data or engineering analyses without the express written authorization of Geo Services Inc.

APPENDIX A

GENERAL NOTES

GENERAL NOTES

CLASSIFICATION

American Association of State Highway & Transportation Officials (AASHTO) System used for soil classification.

Cohesionless Soils

Relative Density	No. of Blows per foot N
Very Loose	0 to 4
Loose	4 to 10
Medium Dense	10 to 30
Dense	30 to 50
Very Dense	Over 50

Cohesive Soils

Consistency	Unconfined Compressive Strength - qu (tsf)
Very Soft	Less than 0.25
Soft	0.25 - 0.5
Medium Stiff	0.5 - 1.0
Stiff	1.0 - 2.0
Very Stiff	2.0 - 4.0
Hard	Over 4.0

TERMINOLOGY

Streaks are considered to be paper thick. **Lenses** are considered to be less than 2 inches thick. **Layers** are considered to be less than 6 inches thick. **Stratum** are considered to be greater than 6 inches thick.

DRILLING AND SAMPLING SYMBOLS

SS:	Split Spoon 1-3/8" I.D., 2" O.D.	HS:	Housel Sampler
ST:	Shelby Tube 2" O.D., except where noted	WS:	Wash Sample
AS:	Auger Sample	FT:	Fish Tail
DB:	Diamond Bit - NX: BX: AX	RB:	Rock Bit
CB:	Carboloy Bit - NX: BX: AX	WO:	Wash Out
OS:	Osterberg Sampler		

Standard "N" Penetration: Blows per foot of a 140 lb. hammer falling 30" on a 2" O.D. Split Spoon

WATER LEVEL MEASUREMENT SYMBOLS

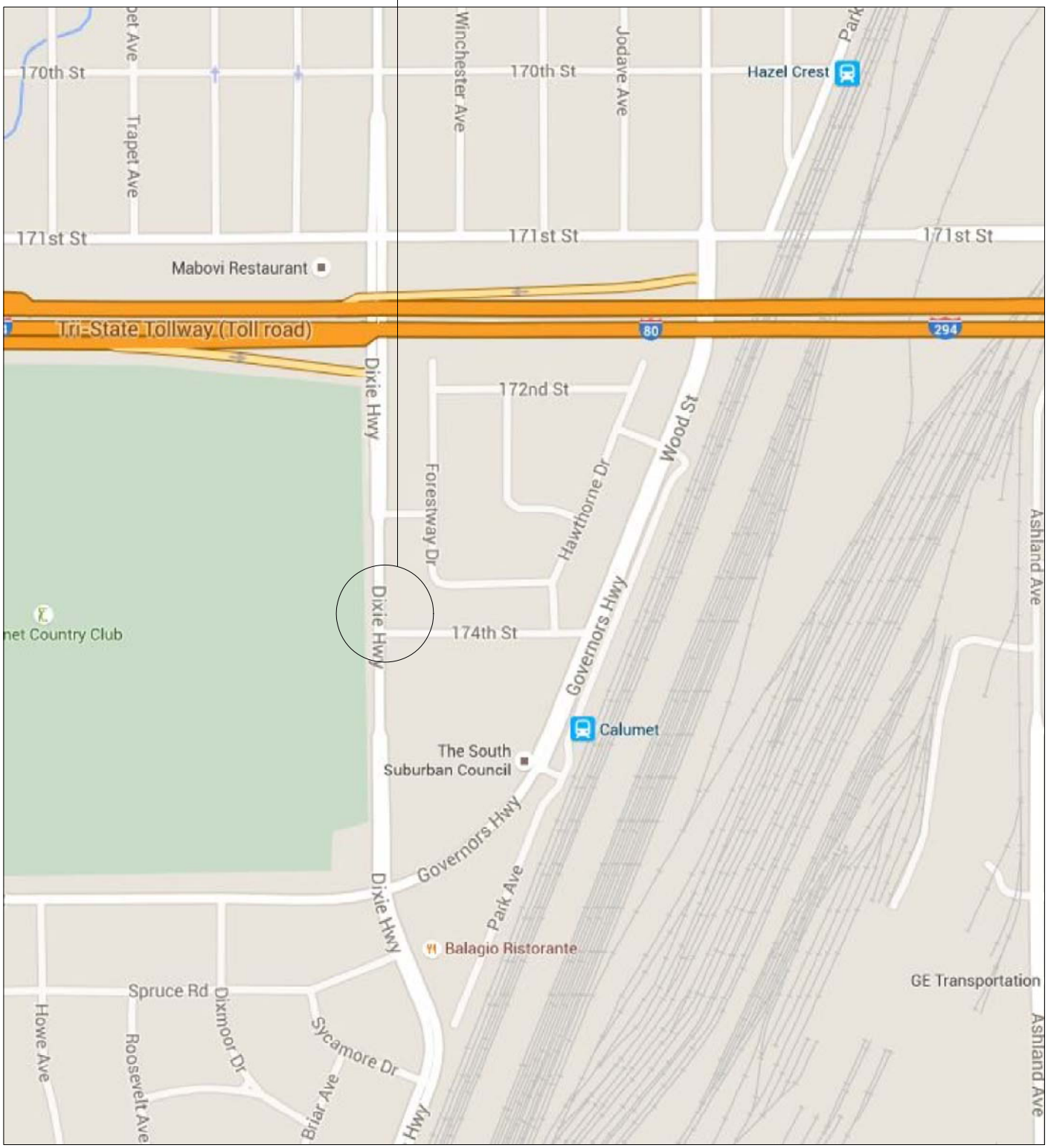
WL:	Water	WD:	While Drilling
WCI:	Wet Cave In	BCR:	Before Casing Removal
DCI:	Dry Cave In	ACR:	After Casing Removal
WS:	While sampling	AB:	After Boring

Water levels indicated on the boring logs are the levels measured in the boring at the times indicated. In pervious soils, the indicated elevations are considered reliable ground water levels. In impervious soils, the accurate determination of ground water elevations is not possible in even several days observation, and additional evidence on ground water elevations must be sought.

APPENDIX B

SITE LOCATION MAP

PROJECT SITE LOCATION



NORTH

SITE LOCATION MAP			
Geotechnical Investigation Dixie Highway Culvert at Ditch Dixie Highway, 0.17 Miles North of Governors Highway Contract No. 62A28, Section 2014-083B Proposed SN 016-2292 Hazel Crest, Cook County, IL	**Geo Services, Inc.** Geotechnical, Environmental & Civil Engineering 805 Amherst Court, Suite 204 Naperville, Illinois 60565 (630) 355-2838	DRAWN BY	BT
		APPROVED BY	AJP
		DATE	May 13, 2015
		GSI JOB No.	15042
		SCALE	NTS

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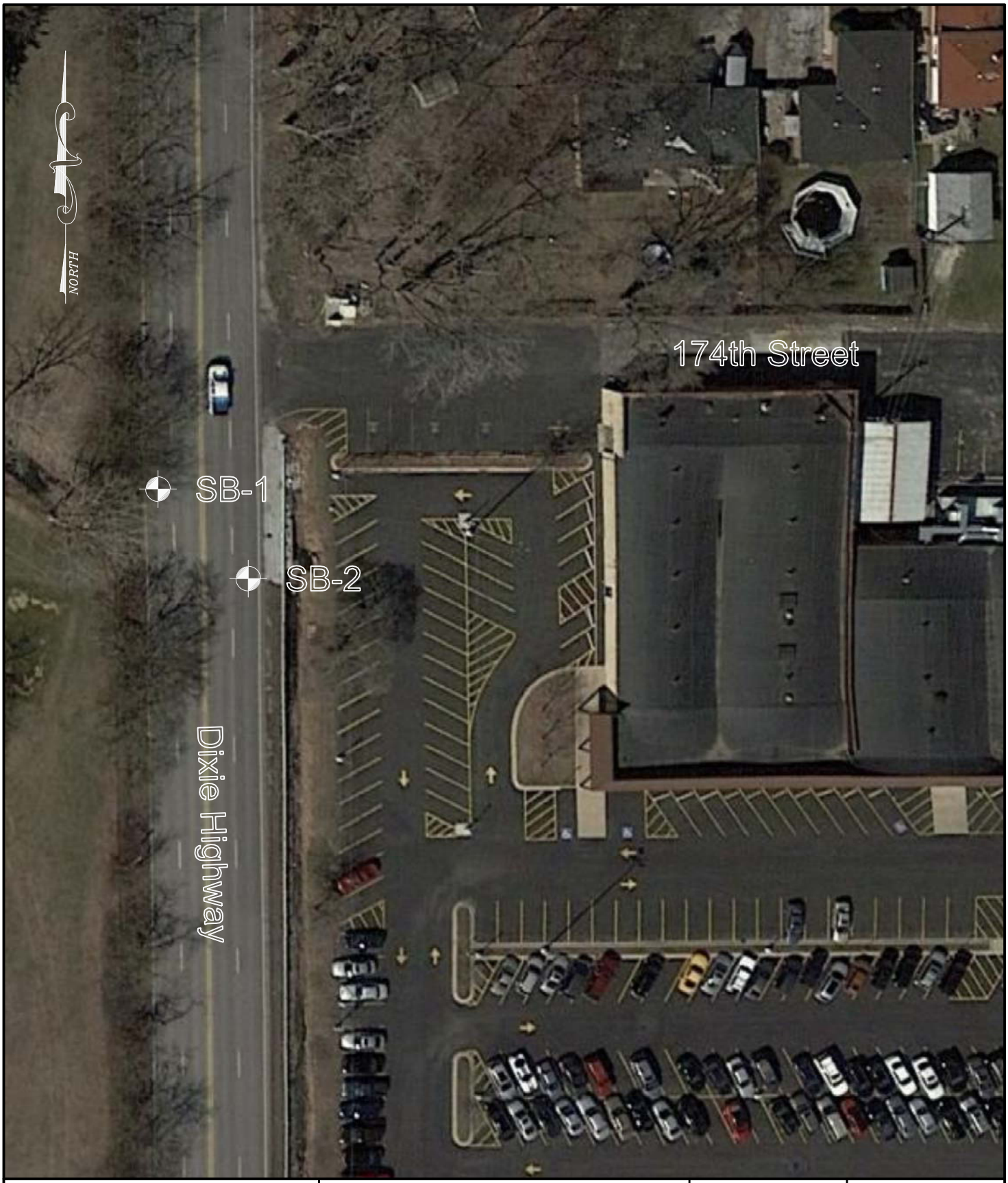
APPENDIX C

SOIL BORING PLAN



BORING LOCATION DIAGRAM			
Geotechnical Investigation Dixie Highway Culvert South Of 174th Street IDOT District One, Hazel Crest, Bremen Township Cook County, Illinois	Geo Services, Inc. Geotechnical, Environmental & Civil Engineering 805 Amherst Court, Suite 204 Naperville, Illinois 60565 (630) 355-2838	DRAWN BY	RWC
		APPROVED BY	AJP
		DATE	May 6, 2015
		GSI JOB No.	15042
		SCALE	1"=50'

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APPENDIX D

BORING LOGS

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

GSI Job No. 15042

Page 1 **of** 1

Date 4/8/15

ROUTE FAU 2843 **DESCRIPTION** Dixie Highway Culvert, Hazel Crest, Il. **LOGGED BY** MD

SECTION 2014-083B **LOCATION** SW 1/4, **SEC.** 30, **TWP.** T36N, **RNG.** R14E, 3rd **PM**

COUNTY Cook **DRILLING METHOD** Hollow Stem Auger/Rotary **HAMMER TYPE** CME Automatic

STRUCT. NO. 016-2292
Station

BORING NO. SB-1
Station
Offset
Ground Surface Elev. ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter Dry To -10.0' ft
Upon Completion n/a ft
After ____ **Hrs.** ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				6.0" ASPHALT 8.0" CONCRETE
	1			SILTY CLAY-black-medium stiff
	1	0.3	28	(Fill)
	2	P		
				CLAY-dark brown & gray-stiff
	2			
	3	1.3	26	
-5	3	B		
	3			CLAY LOAM-brown & gray-hard
	5	5.8	17	
	8	B		
	4			CLAY-gray-hard
	8	5.1	18	
-10	10	B		
	5			SILTY CLAY LOAM-gray-hard
	8	4.4	14	
	9	B		
	3			CLAY LOAM-gray-very stiff
	5	2.1	14	
-15	6	B		
	10			SAND-gray-medium dense to dense
	13		20	
	15			
	15			
	26		24	
-20	24			
	19			SAND-gray-medium dense to dense *(continued)*
	33		18	
	40			
	10			SAND & GRAVEL-gray-medium dense
	12		11	
-25	14			
	14			SILTY CLAY LOAM-gray-medium dense
	8		12	
	7			
	6			SILTY LOAM-gray-medium dense
	8		13	
-30	12			
	10			SILTY SAND-gray-medium dense
	11		16	
	13			
	13			SILT-gray-medium dense
	12		21	
-35	11			
	8			
	6		22	
	5			
	7			SILTY CLAY-gray-very stiff
	7	2.3	20	End Of Boring @ -40.0'. Boring backfilled with cuttings.
-40	8	B		

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, from 137 (Rev. 8-99)

Z:\PROJECTS\2015\15042 EFK MOEN, DIXIE HIGHWAY CULVERT\15042 BORING LOGS\15042_LOG.GPJ 5/13/15

Geo Services, Inc.
Geotechnical, Environmental & Civil Engineering
805 Amherst Court, Suite 204
Naperville, Illinois 60565
(630) 355-2838

SOIL BORING LOG

GSI Job No. 15042

Date 4/8/15

ROUTE FAU 2843 **DESCRIPTION** Dixie Highway Culvert, Hazel Crest, Il. **LOGGED BY** MD

SECTION 2014-083B **LOCATION** SW 1/4, **SEC.** 30, **TWP.** T36N, **RNG.** R14E, 3rd **PM**

COUNTY Cook **DRILLING METHOD** Hollow Stem Auger/Rotary **HAMMER TYPE** CME Automatic

STRUCT. NO. 016-2292
Station

BORING NO. SB-2
Station
Offset
Ground Surface Elev. ft

Surface Water Elev. n/a ft
Stream Bed Elev. n/a ft

Groundwater Elev.:
First Encounter ft ▼
Upon Completion n/a ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				6.0" ASPHALT 8.0" CONCRETE
	3			SILTY CLAY-black-medium stiff
	3	0.5	20	(Fill)
	2	P		
				CLAY-dark brown & gray-soft to
	1			medium stiff
	2	0.8	28	
-5	2	B		
▼				
	0			
	1	0.1	35	
	2	B		
				CLAY LOAM-gray-very stiff to hard
	3			
	7	5.5	19	
-10	11	B		
	4			
	5	2.4	15	
	8	B		
	4			
	6	2.2	15	
-15	7	B		
				SAND-gray-dense
	11			
	23		20	
	38			
	13			
	18		21	
-20	17			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				SAND-gray-dense *(continued)*
				SAND & GRAVEL-gray-medium
	7			dense
	9		14	
	12			
				SILT-gray-medium dense
	15			
	10		15	
-25	5			
	7			
	5		18	
	5			
				SILTY SAND-gray-medium dense
	10			
	8		18	
-30	10			
				SILT-gray-medium dense
	7			
	8		20	
	7			
	4			
	5		22	
-35	7			
				SILTY LOAM-gray-medium dense
	7			
	7		21	
	8			
				CLAY LOAM -gray-very stiff
	4			
	7	2.2	21	End Of Boring @ -40.0'. Boring
-40	7	B		backfilled with cuttings.

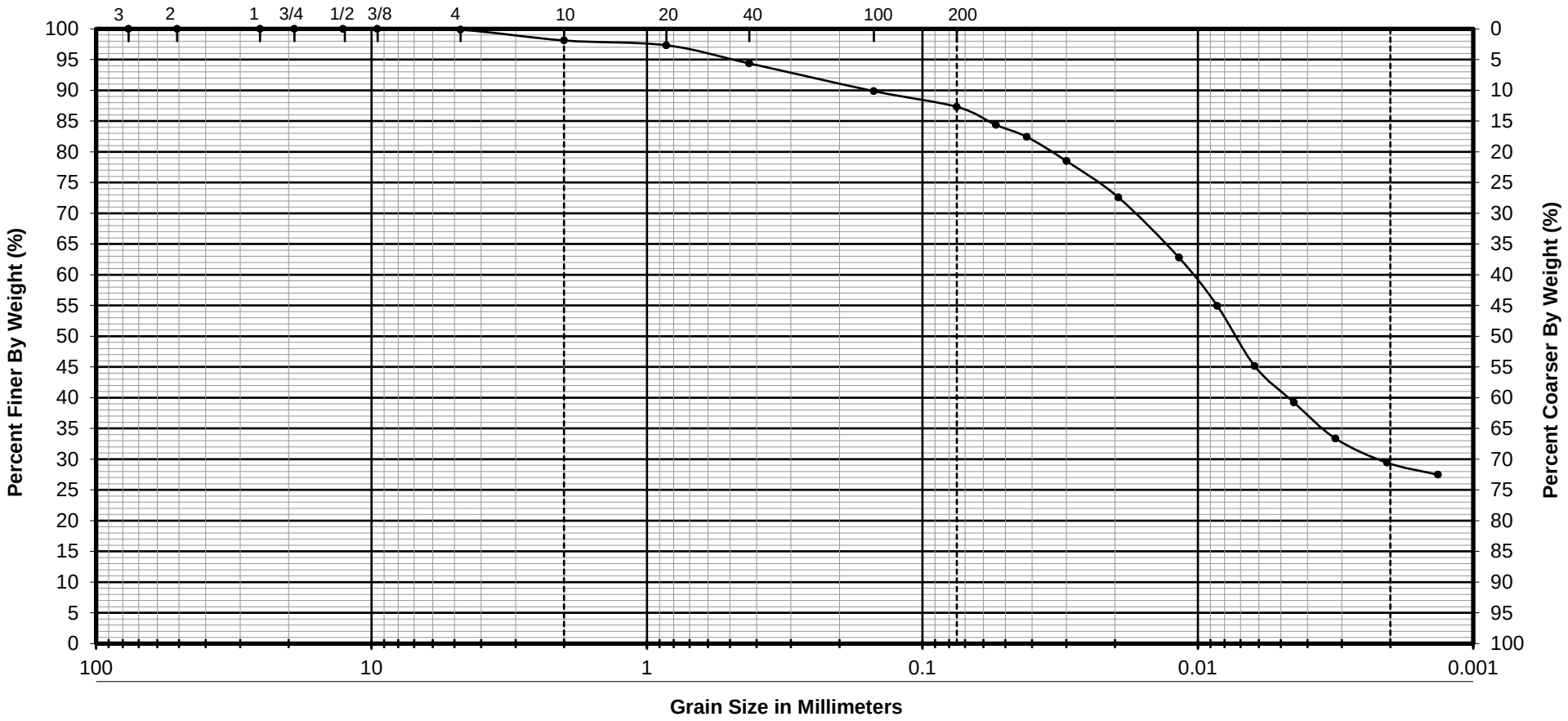
The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

BBS, from 137 (Rev. 8-99)

Z:\PROJECTS\2015\15042 EFK MOEN, DIXIE HIGHWAY CULVERT\15042 BORING LOGS\15042_LOG.GPJ 5/13/15

APPENDIX E

LABORATORY TEST RESULRS



GRAVEL	SAND		SILT	CLAY
	COARSE	FINE		

Boring No.	SB-1	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	4			
Depth	6.0'-7.5'	SILTY CLAY LOAM		Dixie Highway Culvert
Liquid Limit	34	A-6		Hazel Crest
Plastic Limit	17	brown & gray		Illinois
Plasticity Index	17	Group Index	14	
Test By	NOB/JE	% Gravel	1.9	
Date	5/14/15	% Sand	10.8	
Reviewed By	VH	% Silt	57.9	
Job No	15042	% Clay	29.4	

Geo Services, Inc.
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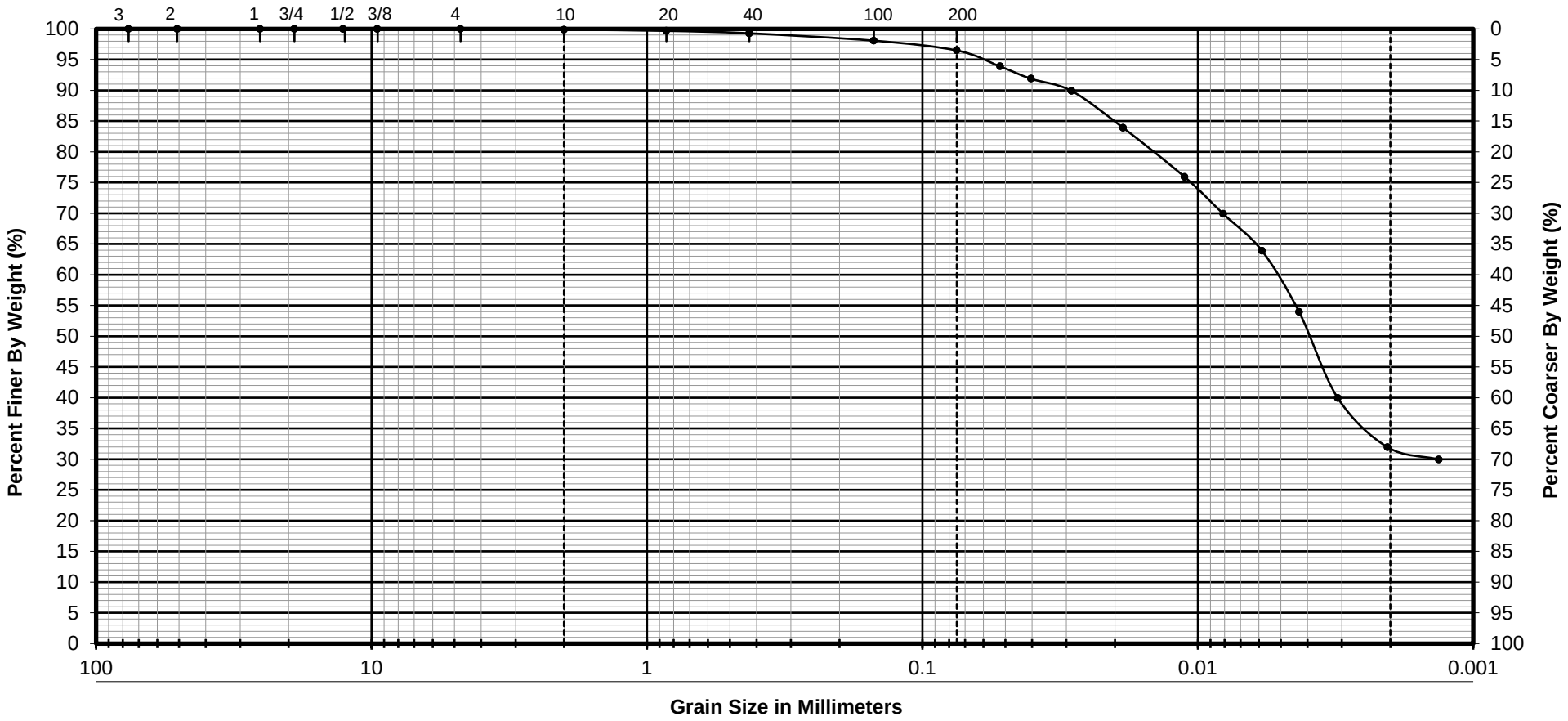
An MBE - DBE Firm
1235 E. Davis St., Arlington Heights, IL 60005
Phone 847-253-3845 ● Fax 847-253-0482



GRAVEL	SAND		SILT	CLAY
	COARSE	FINE		

Boring No.	SB-2	CLASSIFICATION		PARTICLE SIZE ANALYSIS-AASHTO T88
Sample No.	4			
Depth	6.0'-7.5'	SILTY CLAY		Dixie Highway Culvert
Liquid Limit	43	A-7		Hazel Crest
Plastic Limit	23	dark brown & gray		Illinois
Plasticity Index	20	Group Index	21	
Test By	NOB/JE	% Gravel	0.1	
Date	5/14/15	% Sand	3.4	
Reviewed By	VH	% Silt	64.5	
Job No	15042	% Clay	32.0	

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Arlington Heights, IL 60005
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Liquid Limit, Plastic Limit, and Plasticity Index of Soils

AASHTO T89/T90

Project Name Dixie Highway Culvert Job No 15042

Location Downers Grove, Illinois Date 5/13/15

Client EFK Moen

Boring No.	SB-1	SB-2						
Sample No.	6.0'-7.5'	6.0'-7.5'						
Depth	-	-						
LIQUID LIMIT (LL)	34	43						
PLASTIC LIMIT (PL)	17	23						
PLASTICITY INDEX (PI)	17	20						

Tested by JE