STRUCTURE GEOTECHNICAL REPORT
BOX CULVERT UNDER ILLINOIS ROUTE 83
SN 022-8300
OAKBROOK TERRACE
DUPAGE COUNTY, ILLINOIS

Prepared on: 1/28/2021

INTERRA, INC.
600 Territorial Drive, Suite G, Bolingbrook, IL 60440
Phone: (630) 754-8700, Fax: (630) 754-8705
By: Sanjeev Bandi
Email: sbandi@interraservices.com
www.interraservices.com

Prepared for:

Bowman Consulting
1001 Warrenville Road, Suite 110
Lisle, IL 60532

Table of Contents

STRUCTURE GEOTECHNICAL REPORT
BOX CULVERT UNDER ILLINOIS ROUTE 83
SN 022-8300
OAKBROOK TERRACE
DUPAGE COUNTY, ILLINOIS

1.0 INTRODUCTION

Interra, Inc. (INTERRA) was tasked by Bowman Consulting Group Ltd., based in Lisle, Illinois to conduct subsurface soil investigation and prepare the Structural Geotechnical Report (SGR) for the replacement culvert structure located under IL 83 (Kingery Highway), approximately 1000 feet north of the intersection of IL 83 & IL 38 (Roosevelt Road) in Oakbrook Terrace, Illinois.

The proposed improvements consist of in-place abandonment of the existing 10'x4' single cell concrete box culvert that was constructed in 1970 (SN 022-2022). The existing box culvert will be maintained during construction and then bulk-headed and filled with CLSM once construction of new box culvert is completed. A new triple cell box culvert, SN 022-8300 will be comprised of a 10'x5' center culvert flanked by two 8'x5' box culverts. The proposed culverts will be installed immediately south of the existing box culvert.

2.0 PROJECT SCOPE

INTERRA's scope of work included drilling four (4) geotechnical borings to a depth of 35.0 feet each from existing pavement surface of the ramp; performing associated laboratory tests on collected soil samples; preparation of Structure Geotechnical Report in accordance with IDOT Geotechnical Manual 2015.

3.0 SITE DESCRIPTION AND GEOLOGY

The project section is located within incorporated Oakbrook Terrace, DuPage Township,

Dupage County and defined as Section 14, 15, 22 and 23 T39N, R11E Third Meridian, Hinsdale Quadrangle. The subject area is located north of the intersection of IL 83 (Kingery Highway) and IL 38 (Roosevelt Road). The pavement surface elevation of the borehole locations varies between 664.00 and 666.00 feet. The proposed bottom of the Box Culvert structure is at 655.59 feet.

Illinois State Geological Survey water well logs show that Silurian age bedrock occurs beneath the site between 70 and 90 feet below ground surface. The Silurian bedrock consists of thinly bedded and laminated dolomite rock. Overlying the Silurian Dolomite bedrock is approximately 70 to 80 feet of glacially derived sediments deposited during the Wisconsin Episode. These glacial drift sediments are in the Lake Michigan Lobe, and are part of the Valparaiso Morainic and Tinley Morainic Systems. These Wisconsin Episode sediments consist mainly of Wedron Group, Wadsworth Formation, subglacial diamicton, lean clay, with variable percentages of silt, sand and gravel material randomly dispersed throughout the lean clay matrix. Some lenses of silt and sand also occur in the Wadsworth Formation. Glacial outwash sands and gravel deposits, and layers of laminated lacustrine silt and clay beds occur as interbedded sequences with the Wadsworth Formation that mark boundaries of glacier retreat and advance across the area. The lacustrine deposits and the outwash deposits are part of the Mason Group. The lake bottom laminated lacustrine silt and clay sediments are of the Equality Formation. The coarse-grained glacial outwash sediments are of the Henry Formation. The Henry Formation also commonly occurs on top of bedrock, below the bottom of the Wadsworth Formation. There are some near surface sand and gravel deposits overlying the lean clay diamicton deposits of the Wadsworth Formation. These near surface sand and gravels could be part of Henry Formation outwash sediments but could also be from river and stream deposits of the Hudson Episode, Cahokia Formation, which occurred post glaciation after the Wisconsin Episode. Based on boring log data, there is a couple to several feet of structural fill material on top of native sand and gravel and lean clay glacial sediments at the site.

3.1 Mining Activity

From the Illinois Stage Geological Survey (ISGS, 2000), DuPage County is not identified as coal producing area. Therefore, no past coal mining activities may have taken place at the project site. Sand and gravel mining from scattered locations across DuPage County is the only reported mining which occurred in the county.

3.2 Seismic Activity

Based on AASHTO LRFD 3.10.2.1-1 the Horizontal Peak Ground Acceleration (PGA) of 5% of gravity, with a 7% probability of exceedance in 75 years. The project area has no active, major faults (Kolata, 2005).

4.0 FIELD INVESTIGATION

Two soil boring (BC-01 and BC-02) were located on the northbound shoulders of IL 83. Boring BC-03 was located on the outside shoulder of southbound IL 83 and BC-04 was located on the outside shoulder of the ramp from southbound IL 83 to westbound IL 38. All the borings were located in the footprint of the proposed triple box culvert which is south of the existing box culvert carrying Salt Creek under IL 83. The borings were spaced in general accordance with the IDOT Geotechnical manual guidelines and adjusted as needed based on accessibility.

Prior to drilling, the drilling sub-contractor Geocon Professional Services (GEOCON) contacted the local one-call utility clearance service (JULIE) to clear underground utilities. Traffic control and protection was provided by traffic control sub-contractor ROADSAFE.

The borings were drilled with a track mounted drill rig Deidrich D-50 turbo. INTERRA's geologist was present during the drilling to collect and log the soil samples. The borings were drilled, and samples were collected in general accordance with the guidelines in the IDOT Geotechnical Manual. Soil sampling was performed per AASHTO T-206, "Penetration Test and Split Barrel Sampling of Soils". Soil sampling was performed at 2.5-foot intervals up to the exploration

depth. Borings BC-01, BC-02 and BC-04 were drilled to a depth of 35.0 feet and BC-03 was drilled to a depth of 36.0 feet. The soil samples were taken in conjunction with the Standard Penetration Test where a driving resistance to a standard 2" split-spoon samples indicates relative density of granular materials and consistency of cohesive soils. Soil specimens from the borings were visually identified in accordance with the AASHTO and IDOT textural classification systems. Also, unconfined compressive strength tests were performed on cohesive samples using an Illinois modified RIMAC tester. In addition to the split spoon samples, one (1) Shelby tube sample was collected from each borehole. The Shelby tube at BC-02 was damaged during sampling. Water level readings were taken during drilling and immediately after the completion of drilling.

5.0 LABORATORY TESTING

All laboratory testing was performed in accordance with IDOT and/or AASHTO standard methods for testing. Moisture content tests were performed for all soil samples and Unconfined Compressive Strength tests, Grainsize analysis and Atterberg Limits were performed on the 3 Shelby tube samples.

Soil boring logs indicating the blow counts, moisture content and soil description have been prepared and included in Appendix A of this report. The boring logs include the results of the laboratory testing. Results of laboratory testing are presented in Appendix B.

6.0 SUMMARY OF CLIMATIC CONDITIONS

The borings were drilled on 8/17/20 and 8/19/2020. Observations made of precipitation during this time and five months preceding are provided in the Table 1 below. These observations were made by Chicago O'Hare International Airport Weather Station, as reported by Weather Underground.

Table 1-Precipitation Data

Month	Monthly Total, inches	Monthly Average, inches
August, 2020	3.25	0.23
July, 2020	1.55	0.10
June 2020	5.16	0.17
May, 2020	2.72	0.09
April, 2020	0.55	0.02
March, 2020	2.56	0.08

7.0 SUBSURFACE CONDITIONS

Boring BC-01 was drilled near the east end of the proposed culvert, on the shoulder of NB IL 83. Ground surface at this location is approximately 666.00 feet. The boring encountered 12 inches of asphalt grindings and clay loam fill at the surface. This is underlain by hard black, brown and gray clayey fill material to a depth of 3.0 feet. Between 3.0 feet and 8.0 feet, medium dense to loose black sand fill mix was noted. This is followed by very dense light gray sand up to a depth of 10.5 feet. Hard yellowish brown and gray clay loam was noted between the depths of 10.5 feet and 13.0 feet. Between the depths of 13.0 feet and 25.0 feet, medium dense to loose light gray sand with cobbles and boulders was encountered. Beyond 25 feet to the final exploratory depth of 35 feet below grade, stiff to very stiff clay or clay loam was encountered.

Boring BC-02 was drilled east of the IL 83 median, on the northbound side. Ground surface at this location is approximately 666.00 feet. The boring encountered 2 inches of asphalt followed by 10 inches of concrete at the surface. This is underlain by 0.4 feet of a crushed aggregate sub-base and 2.3 feet of a hard black and olive green clay loam fill. Medium dense to loose brown sand and aggregate rock fill mix extends to a depth of 8.0 feet. This is followed by

medium dense to dense light gray sand with cobbles and boulders up to 25.5 feet. Beyond this and up to the exploration depth of 35 feet, stiff clayey soils were encountered.

Boring BC-03 was drilled on the outside shoulder of southbound IL 83. Ground surface at this location is approximately 666.00 feet. The boring encountered 10 inches of asphalt followed by 6 inches of crushed aggregate sub-base. This is underlain by 7.5 feet of dense, very dense and medium dense white crushed aggregate fill to a depth of 10.5 feet. Dense to medium dense light gray sand with cobbles and boulders extend from 10.5 to 30.5 feet. Beyond this and up to the exploration depth of 35 feet, very stiff clayey soils were encountered.

Boring BC-04 was drilled west of BC-03 on the westbound IL 38 ramp. Ground surface at this location is approximately 664.00 feet. The boring encountered 12 inches of a sand and clay fill followed by 7 feet of a very stiff black, brown clay loam fill to a depth of 8.0 feet. This is underlain by loose to median dense light gray sand with cobbles and boulders to 20.5 feet. Beyond this and up to the exploration depth of 35 feet, very stiff clayey soils were encountered.

Groundwater Information

Groundwater elevations were recorded during drilling, and immediately after completion of drilling at all boring locations. In all the boreholes, groundwater was encountered between the depths of at 8.5 feet and 9.0 feet during and after the completion of drilling. The boreholes were backfilled with auger cuttings and bentonite chips immediately after completion of drilling. Since the boreholes were backfilled immediately after drilling, the water levels reported may not represent the long-term groundwater levels. Changes in water levels should be expected due to seasonal variations and precipitation.

8.0 ANALYSIS AND RECOMMENDATIONS

The following recommendations are developed based on the field investigation and laboratory testing, project information provided to INTERRA, IDOT standard specifications and the AASHTO LRFD Bridge Design Specifications, 9th Edition, 2020.

Three new culverts (two 8'x5' and one 10'x5') are proposed immediately south of the existing culvert underneath I-83. Four borings were performed for the culvert. The foundation for the culverts is anticipated at 11 feet below the existing I-83 roadway surface. Foundations soils below this elevation, in general, consist of medium dense to dense granular soils with cobbles and boulders and stiff to hard clayey soils. Groundwater was encountered at an approximate depth of 10 feet.

The soils at and below the foundation level are suitable for a precast box culvert. Additionally, the roadway grade is not changing and there will be overburden relief on the foundation soils as a result of the culvert construction. Settlement is not anticipated to affect the performance of the precast box culvert.

Bearing Capacity and Settlement

Design loads for the proposed construction were not provided. However, for analyses purposes, it is estimated that the approximate bearing pressure applied to the foundation soils will be 1000 psf at an approximate depth of 11 feet below proposed roadway grade. Foundation soils at this elevation can be designed for a factored bearing resistance of 3000 psf, which includes an LRFD Resistance Factor of 0.45. Since there is no change in grade because of the proposed reconstruction, settlements are not expected to be greater than one inch.

Soils below the bottom slab of the proposed culvert are medium dense to dense granular soils. However, if during construction unsuitable soils are encountered, the engineer should be contacted to determine the lateral and vertical extent of undercuts needed. The unsuitable soil may need to be removed and replaced with suitable material. We recommend undercutting any unsuitable soils and replacing with Rockfill. A woven geotextile fabric should be used below the aggregate improvement for ground stabilization (IDOT Section 1080.02). The aggregate shall be capped with six inches of CA7 and satisfy the Standard Specifications unless otherwise indicated in the Special Provisions. If the foundation soils become unstable due to

construction equipment loadings during excavation or construction, a working platform may be needed. The need for such platform is dependent on the type, thickness and strength of the soils encountered, the method of water diversion selected by the Contractor, precipitation, construction sequence, and the time of the year the box culvert is constructed. The Engineer should make the determination that a working platform is required during excavation based on the field conditions.

Channel protection at culvert outlets can be achieved by providing a riprapped transition or apron from the culvert outlet to the natural channel. The riprap should have bedding and/or filter fabric under it and should be of sufficient size and depth for the anticipated flow. A length of protection of three times the anticipated velocity in feet per second is commonly used as a rule of thumb.

Scour

As per All Bridge Designers Memo 14.2, design scour elevations for box culverts are no longer needed.

Wingwalls

Phase I report for the project recommends sheet pile wing walls. Due to the presence of cobbles and boulders, the sheet pile option is feasible with pre-drilling and sheet pile protectors. We also recommend the use of compact and robust sections such the PZ sheetpiles. Alternatively, T-Type vertical cantilever wingwalls for the I-83 box culvert can be supported on spread footings placed a minimum depth of four feet below adjacent ground level for frost protection. The Wing walls at the box culvert should be designed for the lateral earth pressures and lateral pressures from live loads. Lateral earth pressures should be determined using an active earth pressure coefficient, Ka. Lateral earth pressure parameters are provided in Table 2. Live load surcharge from traffic and other surcharges can be estimated using a surcharge equivalent to 2 feet of soil for wingwalls. Wingwalls should have a minimum four

feet of free draining material behind the wall. Water should be facilitated to drain away from the wall by using geocomposite drains and perforated drainpipes.

Table 2- Lateral Earth Pressure Parameters

Soil	Unit Weight (pcf)	Angle of Internal Friction (deg)	Active coefficient of earth pressure	coefficient of earth pressure at-rest
Granular Backfill	120	30	0.33	0.50
Clay Fill	130	28	0.36	0.53

Any unsuitable soils should be undercut and replaced with suitable backfill in accordance with Section 8.0 above. A factored bearing resistance of 2500 psf which includes an LRFD resistance Factor of 0.45 is recommended. Resistance to sliding may be calculated using a nominal sliding resistance of half of normal stress on the interface between the footing and the soil. The LRFD resistance factor for sliding should be taken as 0.80. Resistance offered by the passive pressures should be neglected. Settlement of the footing is anticipated to be less than one inch.

Stability Analyses

Global slope stability analyses were conducted for the critical cross-section assuming wall height of 15 feet and a 3H:1V backfill. The LRFD resistance factor considered is 0.65, which is equivalent to slope stability factor of safety of 1.54. Slope stability analyses were conducted using SLIDE V7.0. Analyses indicated that the global slope stability factor of safety exceeded the minimum required value of 1.54 for both short and long-term loading conditions. Appendix C contains the results of the slope stability analyses.

9.0 CONSTRUCTION CONSIDERATIONS

No cofferdams appear to be required for this construction. Stream flow will continue through

the existing box culvert until the new culverts are completed. The contractor can consider temporary ditches, sumps, granular drainage blankets and other methods to control surface water infiltration and ground water and provide a dry condition for construction.

It is likely that a staged-construction will be utilized to maintain traffic during construction. A temporary soil retention system will be needed for a near vertical excavation along the centerline of the pavement. The exposed height will be on the order of 10 to 12 feet. Due to very dense granular soils having cobbles and boulders and very high blow counts at varying depths between 5 and 12 feet, a temporary sheet piling may only be feasible with pre-drilling and sheet protectors. Also, we recommend We also recommend the use of compact and robust sections such the PZ sheetpiles. Alternatively, a contractor-designed temporary soil retention system considered to accommodate stage construction. All Temporary Soil Retention Systems (TSRS) should consider surcharge loads from construction equipment, excavated material and trucks. The soil retention system should be designed by an Illinois Licensed Structural Engineer in accordance with IDOT standard specifications 522.07. Table 3 lists suggested lateral earth pressure and soil resistance parameters.

Table 3 - Recommended Soil Parameters for Temporary Soil Retention Systems

Elevation	Soil Type	Saturated Unit Weight (pcf)	Shear Strength (psf)		Friction Angle (deg)		Active Earth Pr. Coeff, Ka	At-Rest Earth Pr. Coeff, K_0	Passive Earth Pr. Coeff., Kp	Soil Modulus, k (pci)	Epsilon 50 Strain
			Undrained	Drained	Undrained	Drained					
666-656	Stiff Cohesive Soil	130	1500	75	0	28	0.36	0.53	2.7	400	0.005
656-653	Dense to V. Dense granular soils	125	-	0	-	34	0.28	0.44	3.0	90	-

653-640	Loose to M. Dense granular soils	120	-	0	-	30	0.33	0.50	3.0	50	-
640-630	Stiff Cohesive Soil	130	1500	75	0	28	0.36	0.53	2.7	400	0.005

All excavations must be performed in accordance with local and federal regulations.

10.0 CLOSURE

The analysis and recommendations submitted in this report are based upon the data obtained from four (4) soil boreholes performed at the locations indicated on the Borehole Location Plan, project information provided to INTERRA and from any other information discussed in this report. This report does not reflect any variations that may occur between these boreholes. In performing subsurface explorations, specific information is obtained at specific locations at specific times. It is a well-known fact that variations in soil and rock conditions exist on most sites between borehole locations. Also, groundwater levels vary from time to time. The nature and extent of variations may not become evident until the course of construction. If project characteristics change or if variations in the subsurface conditions appear evident, it will be necessary for a re-evaluation of the recommendations of this report.

We appreciate the opportunity to be of service to you. Should you need additional information or clarifications, please call us at (630) 754-8700.

Yours truly,

INTERRA, INC.

Ashok Guntaka, EI

Project Engineer

Sanjeev Bandi, Ph.D., PE

Principal Engineer

REFERENCES

AASHTO 2020, LRFD Bridge Design Specifications, 9th Edition 2020, American Association of State Highway and Transportation Officials, Washington, DC.

IDOT 2015, Geotechnical Manual, Illinois Department of Transportation.

IDOT 2016, Culvert Manual, Illinois Department of Transportation.

IDOT 2016, Standard Specifications for Road and Bridge Construction. Illinois Department of Transportation.

IDOT 2012, Bridge Manual, Bureau of Bridges and Structures, Illinois Department of Transportation.

Kolata, D. R., 2005, Bedrock Geology of Illinois, Illinois Map 14, Illinois State Geological Survey.

U.S.G.S. 2014, National Seismic Hazard Maps. http://earthquake.usgs.gov/research/hazmaps/

Coduto, Donald P., 1994, Foundation Design, Prentice Hall, Inc.

Hansel and Johnson, 1996, Illinois State Geological Survey, Bulletin 104

Illinois State Geological Survey, Illinois Water Well (ILWATER) Interactive Map, Isgs.illinois.edu/ilwater

Appendix A

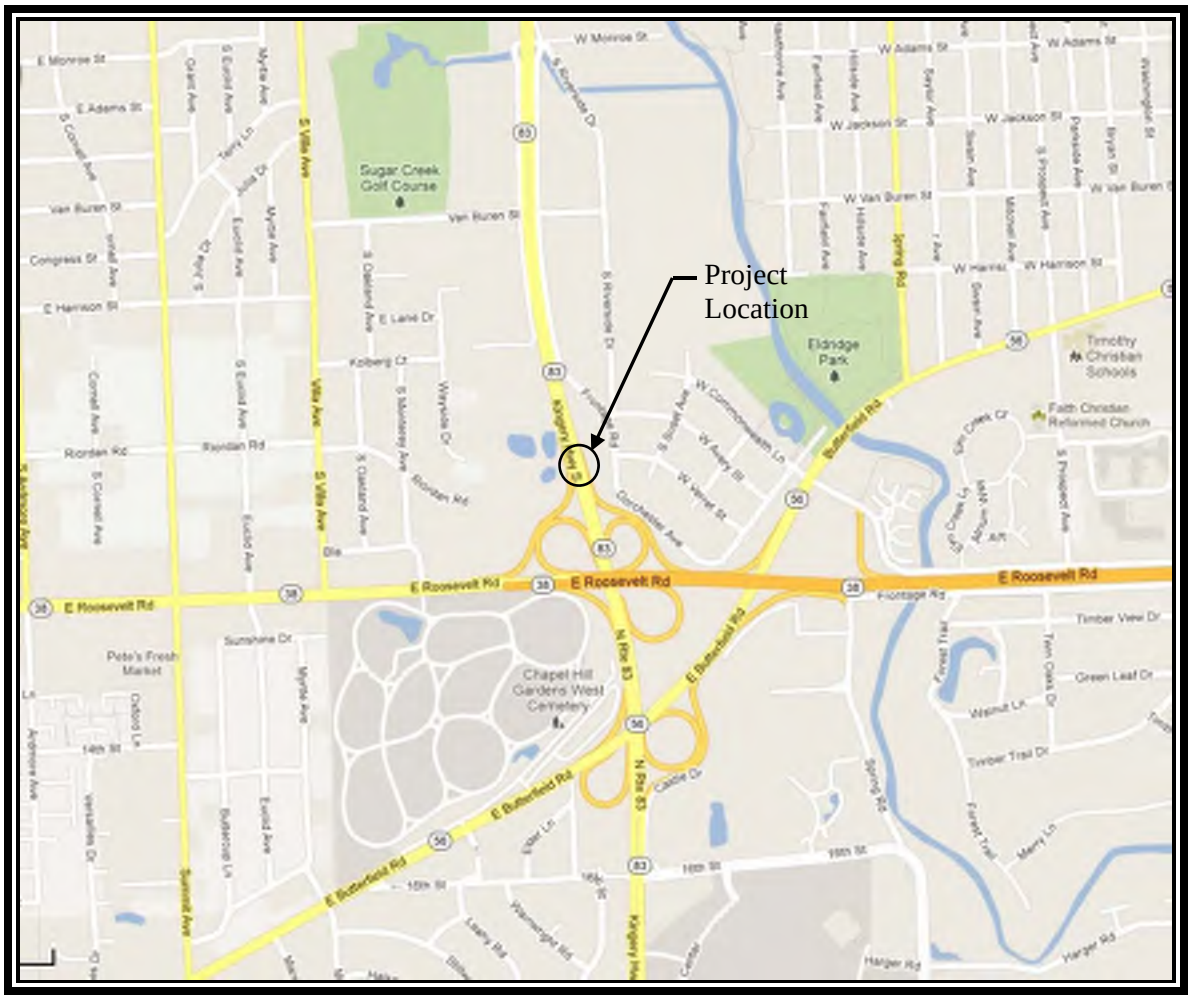
Site Location Map

Geologic Maps

Borehole Location Plan

Soil Boring Logs

LOCATION MAP



BOX CULVERT UNDER ILLINOIS ROUTE 83
SN: 022-8300
Section 2020-000-BR
Project 62M69
Job No. D-91-376-20
OAKBROOK TERRACE
DUPAGE COUNTY, ILLINOIS

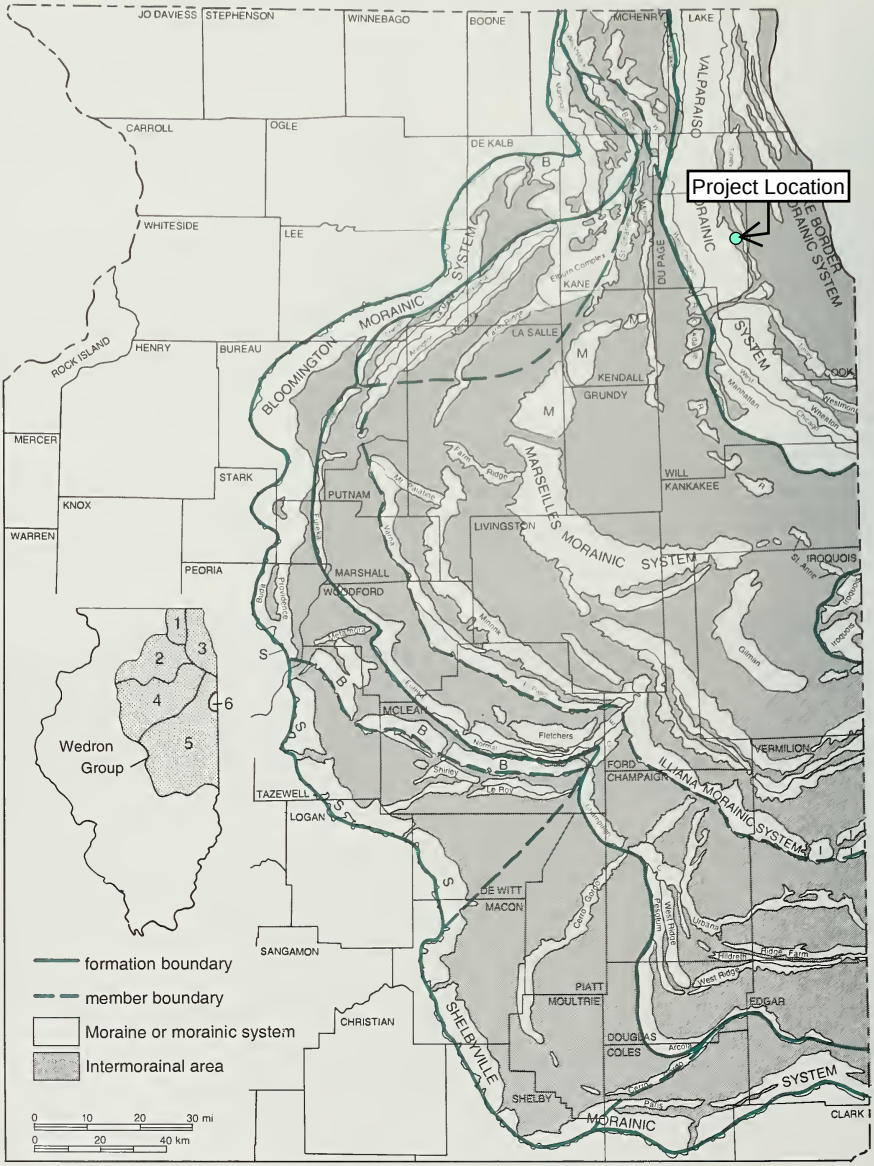


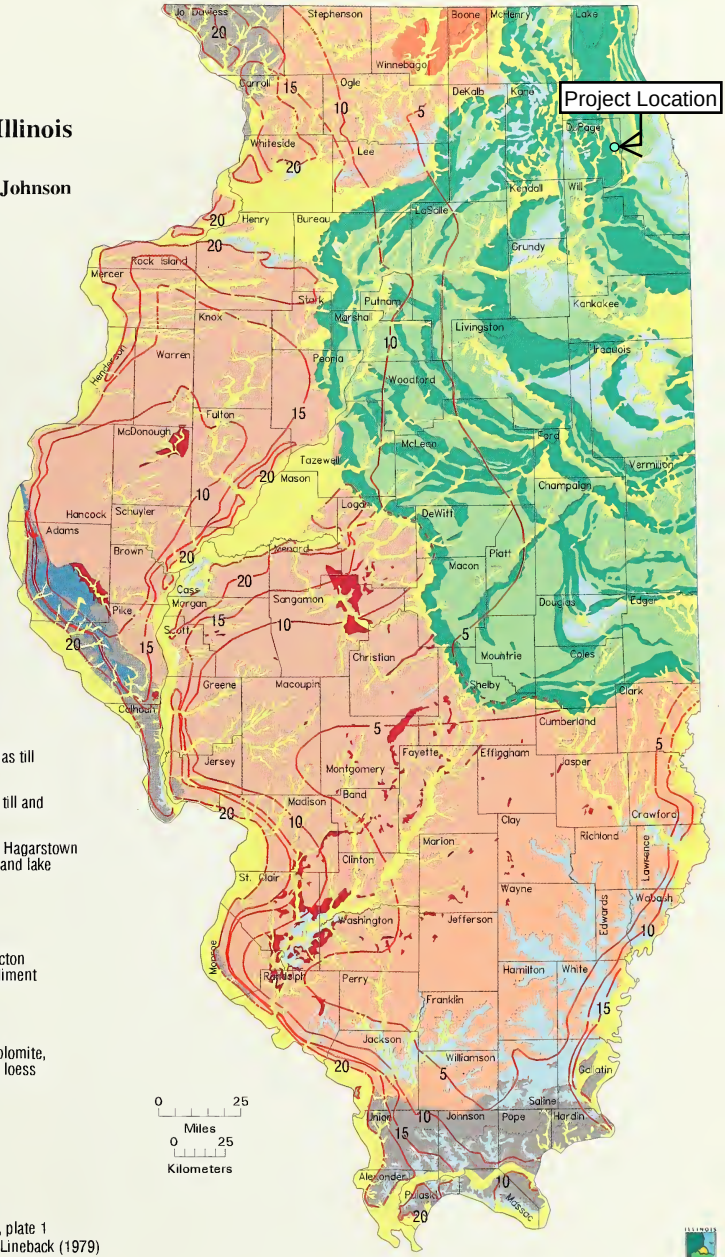
Figure 13a Areal distribution of moraines and boundaries of formations and predominant members of the Wedron Group and the Trafalgar Formation in Illinois. (Names of formations and members are labeled on 13b.) Sublobe areas of the Lake Michigan Lobe and the Huron-Erie Lobe are shown on inset map: (1) Harvard; (2) Princeton; (3) Joliet; (4) Peoria; (5) Decatur; and (6) Huron-Erie (sublobe areas and moraines are modified from Willman and Frye 1970).

Quaternary Deposits of Illinois

revised by

Ardith K. Hansel and W. Hilton Johnson

1996



Hudson and Wisconsin Episodes

Mason Group and Cahokia Fm

Cahokia and Henry Fms; sorted sediment including waterlain river sediment and windblown and beach sand

Equality Fm; fine grained sediment deposited in lakes

5 Thickness of Peoria and Roxana Silts; silt deposited as loess (5-foot contour interval)

Wedron Group (Tiskilwa, Lemont, and Wadsworth Fms) and Trafalgar Fm; diamicton deposited as till and ice-marginal sediment

End moraine

Ground moraine

Illinois Episode

Winnebago Fm; diamicton deposited as till and ice-marginal sediment

Glasford Fm; diamicton deposited as till and ice-marginal sediment

Teneriffe Silt and Pearl Fm, including Hagarstown Mbr; sorted sediment including river and lake deposits and wind-blown sand

Pre-Illinois Episodes

Wolf Creek Fm; predominantly diamicton deposited as till and ice-marginal sediment

Paleozoic, Mesozoic, and Cenozoic

Mostly Paleozoic shale, limestone, dolomite, or sandstone; exposed or covered by loess and/or residuum

Illinois State Geological Survey Bulletin 104, plate 1
Revised from Willman and Frye (1970) and Lineback (1979)
Digital compilation by B.J. Stiff

Printed by the authority of the State of Illinois/1996/3000

LEGEND

- ROADWAY CENTERLINE (685+00)
- EXISTING RIGHT-OF-WAY
- OUTLET DRAINAGE AREA
- FLOODPLAIN BOUNDARY
- FLOODWAY BOUNDARY
- EX CULVERT
- PR CULVERT
- EX CREEK CENTERLINE
- PR CREEK CENTERLINE
- EX STORM SEWER
- PR STORM SEWER
- EX UNDERGROUND FIBER OPTIC (FO)
- EX AERIAL LINES (A)
- EX UNDERGROUND CABLE TV (CTV)
- EX UNDERGROUND ELECTRIC (E)
- EX UNDERGROUND GAS LINE PER ATLAS (G)
- EX UNDERGROUND GAS LINE PER SUBSURFACE INVESTIGATION (G)
- EX DITCH
- EX SWALE
- SUMMIT
- EX SHEET FLOW
- EX OVERFLOW
- EX OUTLET
- CREEK FLOW DIRECTION
- EX SUBSURFACE INVESTIGATION TEST HOLE
- EX MANHOLE
- EX CATCH BASIN
- EX INLET
- EX END SECTION
- PR INLET BOX STRUCTURE
- EX HEADWALL
- PR HEADWALL
- Box Culvert Boring

KINGERY HIGHWAY/ IL RT 83

ROOSEVELT ROAD / IL RT 38

WB IL RT 38

NB IL RT 83

DORCHESTER PLACE

HDWL
IE 660.48
BURIED

HDWL
IE 662.46

24" CMP

EX ROW

LOW EDGE OF
PAVEMENT ELEV. = 663.66

BC-04

BC-03

BC-02

BC-01

#1044
STORM INLET
RIM 672.66
E INV. 12" 669.16
N INV. 12" 669.06

STORM MANHOLE
RIM 669.93
N INV. 666.13

BP HIGH PRESSURE
PETROLEUM PIPELINE
PER SUE (TYP.)

PROPOSED
RETAINING WALL
APPROXIMATE LIMITS
NB IL RT 83 RAMP
STATION 32+80 TO 36+50

SALT CREEK REACH NO. 5

PROPOSED TRIPLE BOX CULVERT
10' X 5' RC BOX WITH 1' SUMP (CTR)
2 - 8' X 5' RC BOXES W/ 1' SUMP &
1' HIGH WEIR
STATION 104+78, L = 209 FT
US INVERT = 655.72
DS INVERT = 655.59

HEC-RAS CROSS-SECTION: 2177.3

HEC-RAS CROSS-SECTION: 3141.9

HEC-RAS
CROSS-SECTION
2810.4

RELOCATED STREAM
CENTERLINE (TYP.)

APPROXIMATE LIMIT BP
HIGH PRESSURE PETROLEUM
PIPELINE PER ATLAS

DUPAGE COUNTY
PRELIMINARY
FLOODPLAIN LIMITS (TYP.)

HEC-RAS CROSS-SECTION: 2547.5

1"=50' SCALE 50 0 50 100 FEET

MODEL: Default
FILE NAME: E:\20\14\14189\14189.07\Drawings\Mstn\CADD Exhibits\LDTM\Sheet Files\EXH PDP02_14189.07.dgn

INTERRA Engineering • Inspection • Testing

DRAWN - GAK	REVISED -	REVISED -	IL 83 OVER SALT CREEK REACH NO. 5
CHECKED - SB	REVISED -	REVISED -	OAKBROOK TERRACE ILLINOIS
DATE - 9/17/2020	REVISED -	REVISED -	SCALE: 1" = 50'

BOX CULVERT UNDER IL ROUTE 83
SN: 022-8300

COUNTY
DUPAGE

Interra, Inc.
600 Territorial Drive, Suite G
Bolingbrook, IL 60440
www.interraservices.com

SOIL BORING LOG

Date 8/18/29

ROUTE FAP 344/Illinois 83 **DESCRIPTION** Culvert Boring **LOGGED BY** Eric D. Slusser

SECTION 2020-000-BR **LOCATION** Outside shoulder of NB IL 83

COUNTY DuPage County **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. SN 022-8300
Station

BORING NO. BC-01
Station 105+00 IL 83
Offset 72.00ft RT
Ground Surface Elev. 666.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 657.0 ft
Upon Completion 657.0 ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				ASPHALT
				665.17
	7			Brown SAND FILL (Sub-base), medium to fine, Moist
				665.00
	6		13.3	Hard, Brown, Black and Gray CLAY LOAM FILL, treace-little
	7	7.8 B		mediumto fine gravel, Moist
				663.00
	3			Medium Dense to Loose, Black Sand FILL or SAND AND CLAY FILL, trace gravel, cobbles and boulders
	8		10.2	
-5	9			
	9			
	7		2.9	
	2			
				658.00
	27			Very Dense, Gray COBBLES, Boulders and SAND, sand medium to fine, Saturated at 9.5 feet
	50		11.7	
-10	50			
				655.50
	5			Hard, Yellowish Brown and Gray CLAY LOAM, trace to little medum to fine gravel, Moist
	5		14.1	
	4	4.5 P		
				653.00
	12			Medium Dense to Loose, Light Gray SAND, COBBLES AND BOULDERS, sand coarse to fine, Saturated
	7		8.9	
-15	8			
				Black CLAYClay at tip MC=50.9%
	4			
	3		11.7	
	3			
	3			
	5		14.2	
-20	10			

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Medium Dense to Loose, Light Gray SAND, COBBLES AND BOULDERS, sand coarse to fine, Saturated
	11			
	7		30.8	Black CLAYClay at tip MC=50.9%
	6			*(continued)*
	5			
	6		12.4	
-25	3			
				641.00
				Stiiff to very stiff, Brown to Gray CLAY, trace sand, Moist
			20.8	
		1.7 B		Shelby Tube 26.0-28.0'
	4			
	4		20.1	
	6	2.4		
-30	5	B		
	5		27.2	
	6	2.5		
	3	P		
	3		15.6	
	5	2.9		
		B		
				633.00
	4			Very Stiff, Gray CLAY LOAM, trace medium to fine gravel, Moist
	6		17.1	
-35	8	2.9		
		B		
				END OF BORING 35.0 feet
				Backfill with soil cutting, cap with asphalt
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)

Interra, Inc.
600 Territorial Drive, Suite G
Bolingbrook, IL 60440
www.interraservices.com

SOIL BORING LOG

Date 8/17/20

ROUTE FAP 344/Illinois 83 **DESCRIPTION** Culvert Boring **LOGGED BY** Eric D. Slusser

SECTION 2020-000-BR **LOCATION** Inside shoulder of NB IL 83

COUNTY DuPage County **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. SN 022-8300
Station

BORING NO. BC-02
Station 105+00 IL 83
Offset 8.00ft RT
Ground Surface Elev. 666.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 657.5 ft
Upon Completion 657.5 ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
ASPHALT 665.83				
CONCRETE 665.00				
Medium Dense ROCK AGGREGATE (sub-base) 664.60		6		
		4		14.6
Hard, Black and Olive Green CLAY LOAM FILL, trace to little medium to fine gravel, Moist 663.00		6		
Loose to Very Dense, White CRUSHED ROCK AGGREGATE FILL, trace sand, Moist		19		
		15		5.8
	-5	13		
		2		
		1		3.1
		2		
658.00				
Very Dense to Loose, Gray COBBLES, BOULDERS and SAND, sand medium to fine, Saturated at 8.5 feet		8		
		36		7.5
	-10	50		
		12		
		6		12.6
653.70		5		
653.50 Hard, Yellowish Brown and Gray CLAY, Moist				
Dense to Loose, Brown SAND, COBBLES and BOULDERS, sand medium to fine, Saturated				20.4
	-15	17		
Color change to Light Gray at 21.0 feet		15		7.1
		6		
		7		
		9		16.4
		3		
		26		
		21		12.6
	-20	14		

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Dense to Loose, Brown SAND, COBBLES and BOULDERS, sand medium to fine, Saturated		10		
		6		12.1
Color change to Light Gray at 21.0 feet *(continued)*		7		
		21		
		25		23.2
	-25	15		
640.50				
Stiff, Black (26-28'), color change to Grayish Brown at 28 feet, CLAY, Moist		7		
		2		45.1
		3	1.2 B	
		1		
		4		19.0
	-30	4	1.8 B	
		4		
		4		17.9
		5	1.6 B	
		3		
		4		18.7
631.00	-35	6	194.0 B	
END OF BORING 35.0 feet				
Backfill with soil cuttings and cap with asphalt				
	-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)

Interra, Inc.
600 Territorial Drive, Suite G
Bolingbrook, IL 60440
www.interraservices.com

SOIL BORING LOG

Date 8/19/20

ROUTE FAP 344/Illinois 83 **DESCRIPTION** Culvert Boring **LOGGED BY** Eric D. Slusser

SECTION 2020-000-BR **LOCATION** Outside shoulder of SB IL 83

COUNTY DuPage County **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. SN 022-8300
Station

BORING NO. BC-03
Station 104+90 IL 83
Offset 53.00ft LT
Ground Surface Elev. 666.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 657.0 ft
Upon Completion 657.0 ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				ASPHALT
				665.17
				CRUSHED ROCK AGGREGATE(sub-base) 665.00
	11			
	5		14.4	Hard, Black and Gray CLAY LOAMFILL, trace to little medium to fine gravel, Moist
	11	4.5 P		
				663.00
				Dense to Very Dense, White CRUSHED ROCK AGGREGATE FILL, Saturated at 9.0 feet
	16			
	17		3.1	
-5	15			
	50			
	50		3.4	
	50			
	11			
	13		12.6	
-10	15			
				655.50
				Dense to Medium Dense, Lifgt Gray COBBLES, BOULDERS and SAND, more sand at lower depths, sand coarse to fine, Saturated,
	1			
	22		15.4	
	13			
	21			
	7		21.0	
-15	7			
	4			
	4		17.4	
	5			
	5			
	6		15.8	
-20	11			
				Dense to Medium Dense, Lifgt Gray COBBLES, BOULDERS and SAND, more sand at lower depths, sand coarse to fine, Saturated, *(continued)*
	5			
	6		25.8	
	14			
	14			
	11		12.5	
-25	4			
	7			
	12		25.2	
	13			
	3			
	5		16.2	
-30	6			
				635.50
				Very Stiff, Brown (32,5), Gray (32,5-36) CLAY, trace fine gravel, Moist
	3			
	3		17.8	
	5	2.7 B		Shelby Tube 32.5-34.5'
			16.4	
		2.8 B		
-35	5			
	7		16.5	
	9	2.7 B		
				630.00
				END OF BORING 36.0 feet Backfill with soil cutting and cap with asphalt
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)

Interra, Inc.
600 Territorial Drive, Suite G
Bolingbrook, IL 60440
www.interraservices.com

SOIL BORING LOG

Date 8/17/20

ROUTE FAP 344/Illinois 83 **DESCRIPTION** Culvert Boring **LOGGED BY** Eric D. Slusser

SECTION 2020-000-BR **LOCATION** Outside shoulder of Ramp from SB IL 83 to WB IL 38

COUNTY DuPage County **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. SN 022-8300
Station

BORING NO. BC-04
Station 104+90 IL 83
Offset 90.00ft LT
Ground Surface Elev. 664.00 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 655.0 ft
Upon Completion 655.0 ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				SAND AND CLAY FILL mix
				663.00
	4			Very Stiff, Black and Brown CLAY LOAM FILL, trace to little medium to fine gravel, Moist
	3		14.3	
	7	2.4 B		
				Color change Black, Brown and gray at 3.0 feet
	5			
	3		16.6	
-5	3	2.9 B		
	9			
	7		12.3	
	12	3.0 P		
				656.00
	12			Dense to Medium dense, Light Gray COBBLES, BOULDERS and SAND, sand coarse to fine, more sand in lower unit, Saturated at 9.0 feet
	18		14.6	
-10	13			
	10			
	8		13.3	
	8			
	3			
	3		10.3	
-15	4			
	5			
	6		13.7	
	7			
	9			
	10		11.9	
-20	9			
	7			Dense to Medium dense, Light Gray COBBLES, BOULDERS and SAND, sand coarse to fine, more sand in lower unit, Saturated at 9.0 feet *(continued)*
	9		18.9	
	6			
	8			
	9		13.3	
-25	11			
				638.50
	4			Stiff, Black to 27.5', Brown at 27,5' CLAY, Moist
	2		45.6	Shelby tube 27,5-29.5'
	3	1.6 B		
			18.2	
		1.0 B		
				634.50
-30	4			Very Stiff, Brown CLAY LOAM, trace to little medium to fine gravel, Moist
	5		17.6	
	7	2.4 B		
	2			
	5		17.5	
	8	2.7 B		
	6			
	8		16.8	
-35	11	2.4 B		
				629.00
				END OF BORING 35.0 feet Backfill with soil cuttings
-40				

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)

Appendix B

Laboratory Test Reports

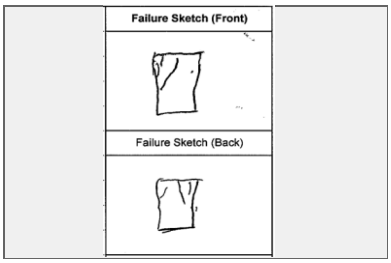
INTERRA
Engineering • Inspection • Testing

UNCONFINED COMPRESSIVE STRENGTH (ASTM D 2166)

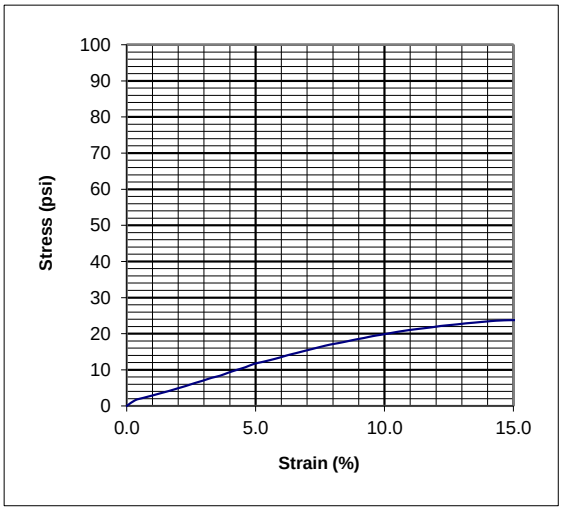
Project	IL 83 at IL 38 Geotechnical for Box Culvert and Retaining Wall, Oakbrook Terrace, IL						
Client	Bowman Consulting, 1001 Warrenville Road, Ste. 110, Lisle, IL 60532						
File No.	8681	**Sample No.**	BC01-ST11	**Date Tested**	8/22/20	**Tested By**	BKP
						QC By	RC

Date Sample Received	8/19/20
Description of Soil	Brown clay with gravel
Location	26-28'

Type of Sample	SS	
Average Height =	15.45	cm
Average Diameter =	7.22	cm
Height/Diameter Ratio =	2.14	
Wet Sample Weight=	1324.80	g
Wet Density =	2.09	g/cc
Moisture Content =	19.4	%
Dry Density =	1.76	g/cc
Strain Rate =	0.06	%/min



Failure Image



Unconfined Compressive Strength =	23.84	psi
	1.72	**tsf**
Shear Strength =	11.92	psi
	0.86	tsf
Strain at Failure =	15.4	%

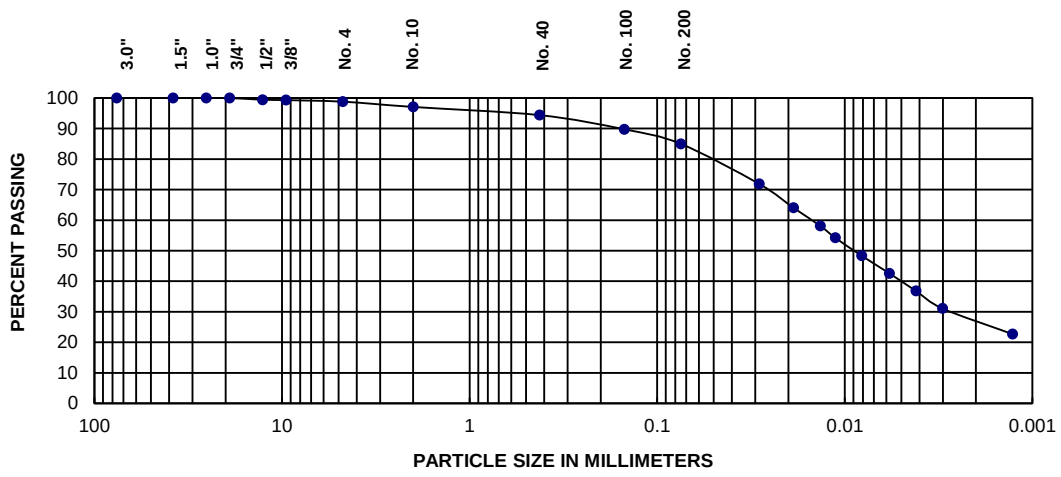
Remarks:

INTERRA
Engineering • Inspection • Testing

GRAIN SIZE ANALYSIS
AASHTO T 88

Project	IL 83 at IL 38 Geotechnical for Box Culvert and Retaining Wall, Oakbrook Terrace, IL						
Client	Bowman Consulting, 1001 Warrenville Road, Ste. 110, Lisle, IL 60532						
File No.	8681	**Sample #**	BC01-ST11	**Date Tested**	8/26/2020	**Tested by**	BKP
						Qc by	RC

Date Sample Received:	8/19/2020
Sample Location	26-28'
Sample Description	Brown silty clay with sand, trace gravel



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	2.9	12.1	56.9	28.1

For coarse-grained soils with <12% Fines	D60(mm)	D30(mm)	D10(mm)	Cu	Cc

Sieve Size	**Percent Passing**
3.0"	100.0
1.5"	100.0
1.0"	100.0
3/4"	100.0
1/2"	99.4
3/8"	99.3
No. 4	98.8
No. 10	97.1
No. 40	94.4
No. 100	89.8
No. 200	85.0

Liquid Limit, L_L	**Plastic Limit, PL**	**Plasticity Index, PI**
27	17	10

AASHTO Classification:	A-4(7)
IDH Classification:	Silty Clay Loam

Remarks:	

INTERRA
Engineering • Inspection • Testing

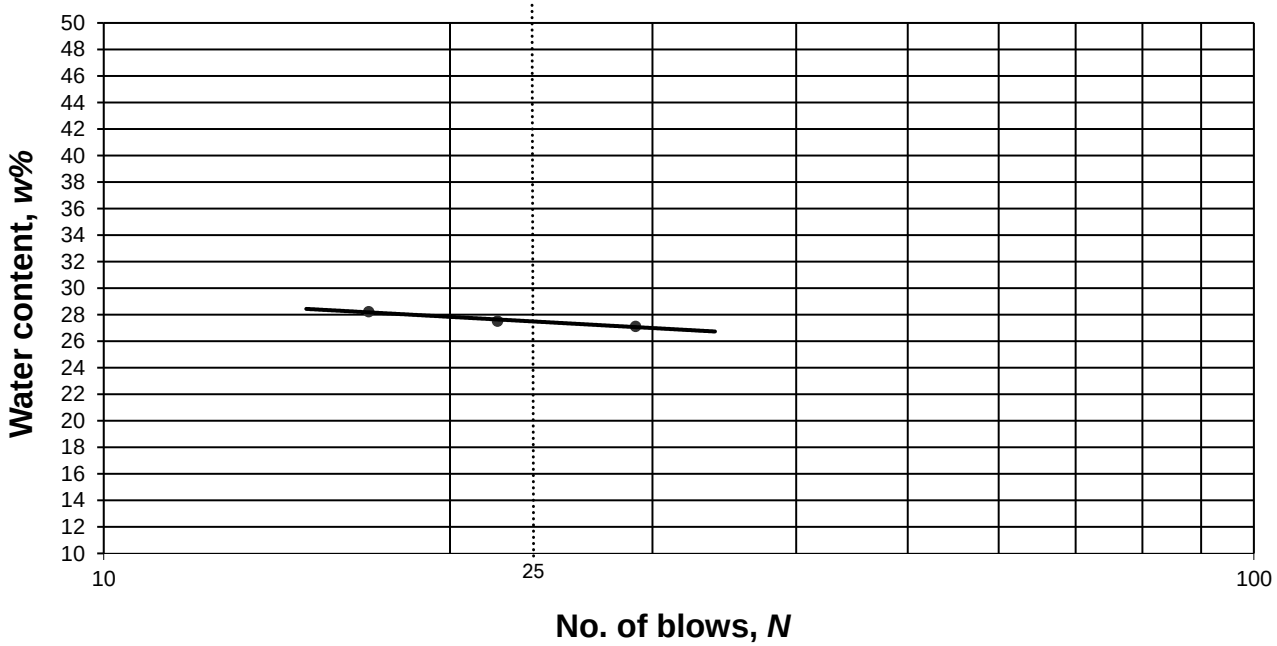
Atterberg Limits

AAASHTO T 89,90

Project	IL 83 at IL 38 Geotechnical for Box Culvert and Retaining Wall, Oakbrook Terrace, IL						
Client	Bowman Consulting, 1001 Warrenville Road, Ste. 110, Lisle, IL 60532						
File No.	8681	**Sample #**	BC01-ST11	**Date Tested**	8/26/2020	**Tested By**	BKP
						Qc By	RC

Date Sample Recd.	8/19/2020
Sample Location	26-28'
Sample Description	Brown silty clay with sand, trace gravel

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	**27**	**Plastic Limit, PL**	**17**	**Plasticity Index, PI**	**10**

Remarks

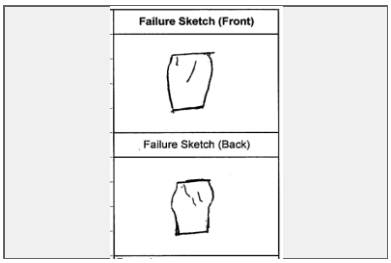
INTERRA
Engineering • Inspection • Testing

UNCONFINED COMPRESSIVE STRENGTH (ASTM D 2166)

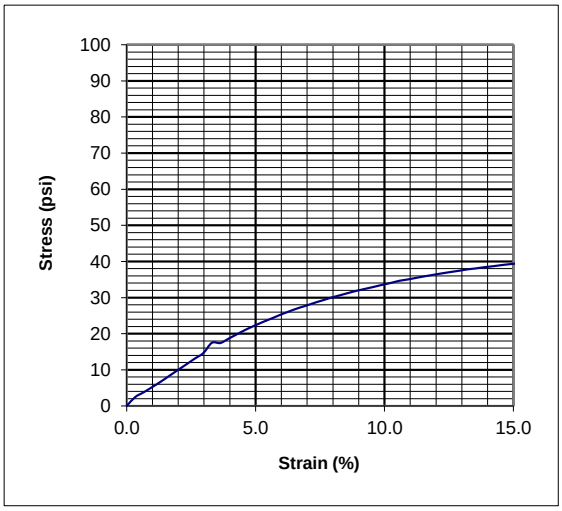
Project	IL 83 at IL 38 Geotechnical for Box Culvert and Retaining Wall, Oakbrook Terrace, IL						
Client	Bowman Consulting, 1001 Warrenville Road, Ste. 110, Lisle, IL 60532						
File No.	8681	**Sample No.**	BC03-ST14	**Date Tested**	8/22/20	**Tested By**	BKP
						QC By	RC

Date Sample Received	8/19/20
Description of Soil	Gray silty clay with gravel
Location	32.5-34.5'

Type of Sample	ST	
Average Height =	15.37	cm
Average Diameter =	7.25	cm
Height/Diameter Ratio =	2.12	
Wet Sample Weight=	1385.02	g
Wet Density =	2.18	g/cc
Moisture Content =	16.3	%
Dry Density =	1.88	g/cc
Strain Rate =	0.06	%/min



Failure Image



Unconfined Compressive Strength =	39.49	psi
	2.84	**tsf**
Shear Strength =	19.75	psi
	1.42	tsf
Strain at Failure =	15.2	%

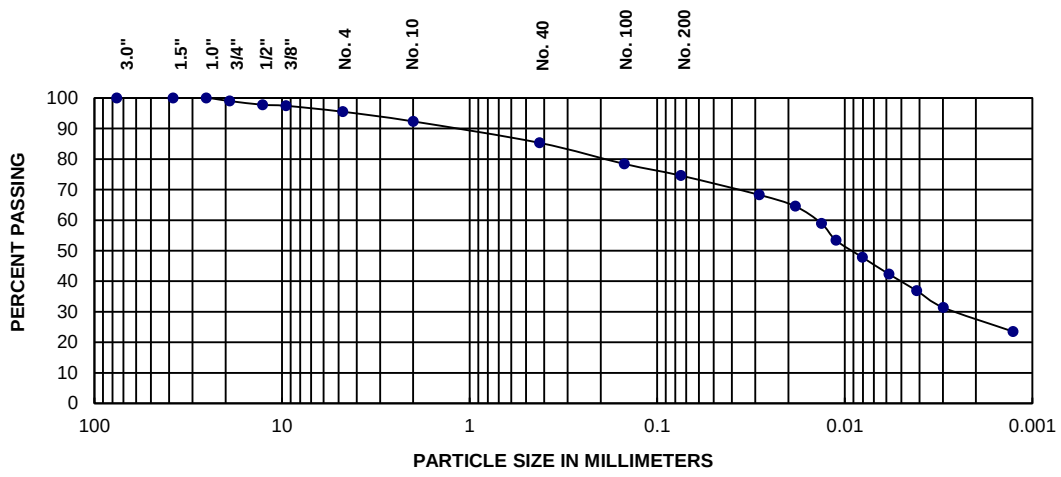
Remarks:

INTERRA Engineering • Inspection • Testing

GRAIN SIZE ANALYSIS
AASHTO T 88

Project	IL 83 at IL 38 Geotechnical for Box Culvert and Retaining Wall, Oakbrook Terrace, IL						
Client	Bowman Consulting, 1001 Warrenville Road, Ste. 110, Lisle, IL 60532						
File No.	8681	**Sample #**	BC03-ST14	**Date Tested**	8/26/2020	**Tested by**	BKP
						Qc by	RC

Date Sample Received:	8/19/2020
Sample Location	32.5-34.5'
Sample Description	Gray silty clay with sand and gravel



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	7.7	17.7	46.0	28.6

For coarse-grained soils with <12% Fines	D60(mm)	D30(mm)	D10(mm)	Cu	Cc

Sieve Size	**Percent Passing**
3.0"	100.0
1.5"	100.0
1.0"	100.0
3/4"	99.0
1/2"	97.8
3/8"	97.5
No. 4	95.5
No. 10	92.3
No. 40	85.3
No. 100	78.4
No. 200	74.6

Liquid Limit, L_L	**Plastic Limit, PL**	**Plasticity Index, PI**
28	16	12

AASHTO Classification:	A-6(7)
IDH Classification:	Clay Loam

Remarks:	

Test ID	63608

INTERRA
Engineering • Inspection • Testing

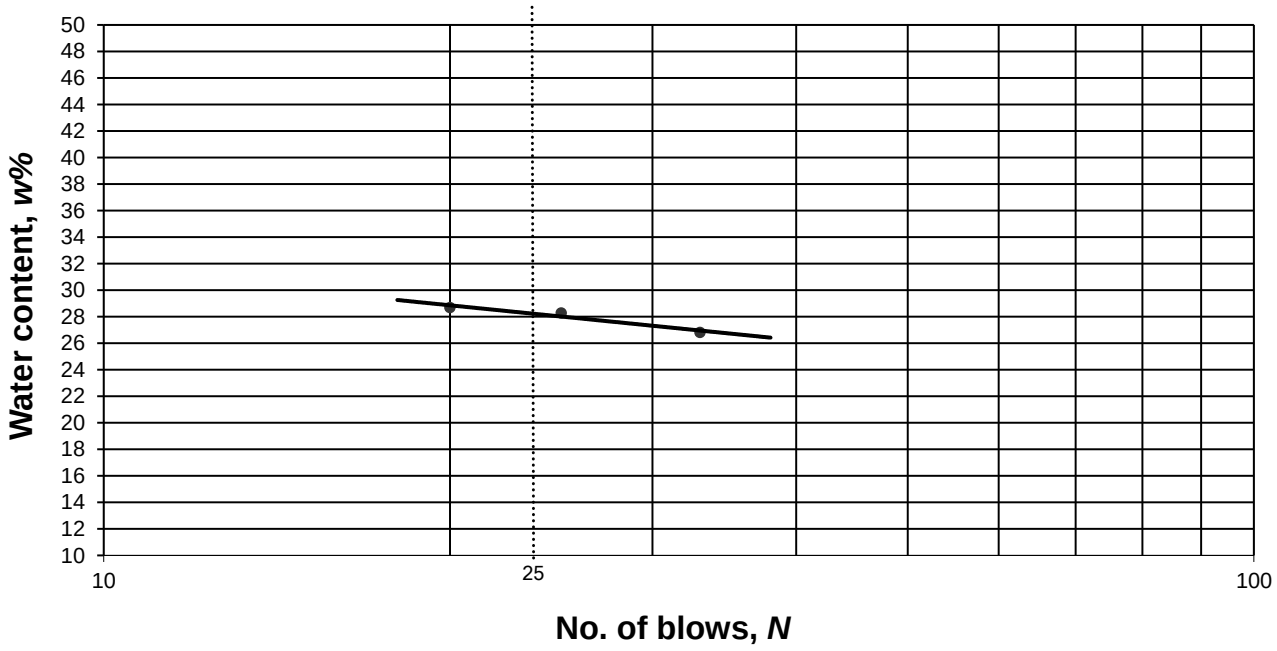
Atterberg Limits

AAASHTO T 89,90

Project	IL 83 at IL 38 Geotechnical for Box Culvert and Retaining Wall, Oakbrook Terrace, IL						
Client	Bowman Consulting, 1001 Warrenville Road, Ste. 110, Lisle, IL 60532						
File No.	8681	**Sample #**	BC03-ST14	**Date Tested**	8/26/2020	**Tested By**	BKP
						Qc By	RC

Date Sample Recd.	8/19/2020
Sample Location	32.5-34.5'
Sample Description	Gray silty clay with sand and gravel

LIQUID LIMIT DETERMINATION



Results					
Liquid Limit, LL	**28**	**Plastic Limit, PL**	**16**	**Plasticity Index, PI**	**12**

Remarks

www.interraservices.com

Test ID	63606

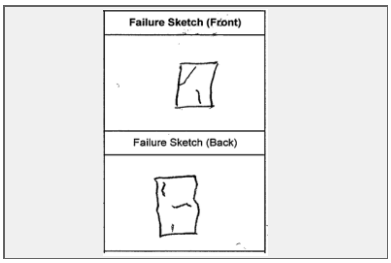
INTERRA
Engineering • Inspection • Testing

UNCONFINED COMPRESSIVE STRENGTH (ASTM D 2166)

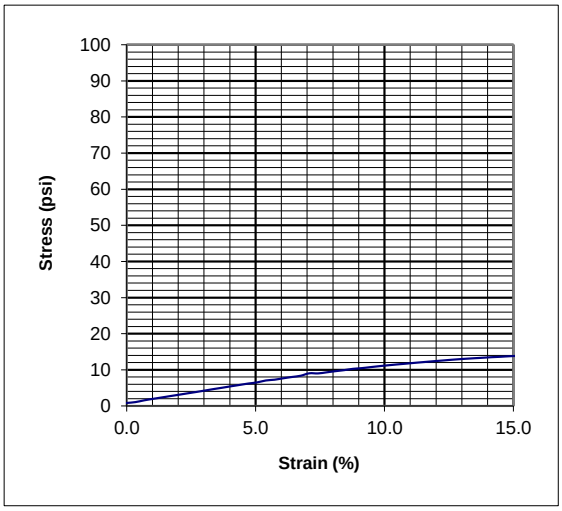
Project	IL 83 at IL 38 Geotechnical for Box Culvert and Retaining Wall, Oakbrook Terrace, IL						
Client	Bowman Consulting, 1001 Warrenville Road, Ste. 110, Lisle, IL 60532						
File No.	8681	**Sample No.**	BC04-ST12	**Date Tested**	8/22/20	**Tested By**	BKP
						QC By	RC

Date Sample Received	8/19/20
Description of Soil	Gray lean clay with silt and gravel
Location	27.5-29.5'

Type of Sample	ST	
Average Height =	15.06	cm
Average Diameter =	7.19	cm
Height/Diameter Ratio =	2.09	
Wet Sample Weight=	1325.00	g
Wet Density =	2.17	g/cc
Moisture Content =	18.3	%
Dry Density =	1.83	g/cc
Strain Rate =	0.06	%/min



Failure Image



Unconfined Compressive Strength =	13.87	psi
	1.00	**tsf**
Shear Strength =	6.93	psi
	0.50	tsf
Strain at Failure =	15.2	%

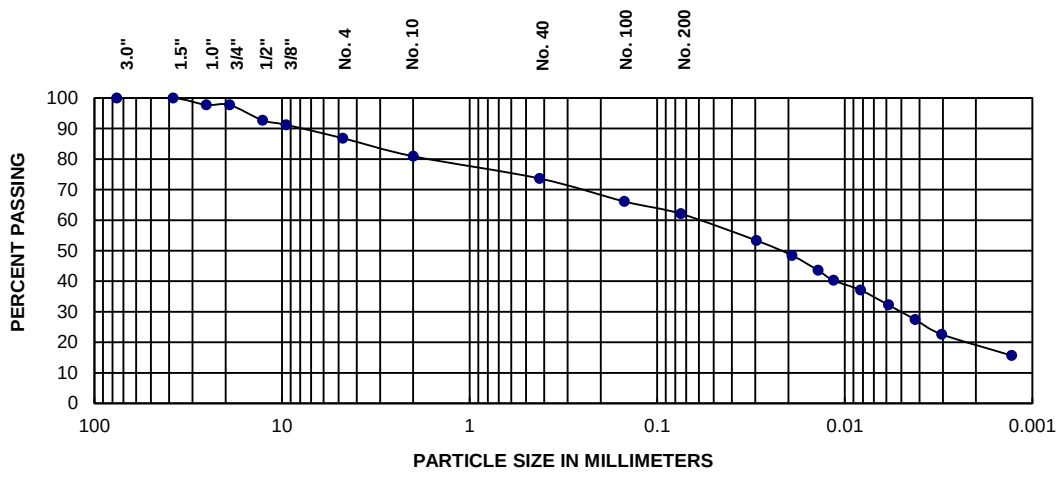
Remarks:

INTERRA
Engineering • Inspection • Testing

GRAIN SIZE ANALYSIS
AASHTO T 88

Project	IL 83 at IL 38 Geotechnical for Box Culvert and Retaining Wall, Oakbrook Terrace, IL						
Client	Bowman Consulting, 1001 Warrenville Road, Ste. 110, Lisle, IL 60532						
File No.	8681	**Sample #**	BC04-ST12	**Date Tested**	8/28/2020	**Tested by**	BKP
						Qc by	RC

Date Sample Received:	8/19/2020
Sample Location	27.5-29.5'
Sample Description	Gray silty clay with sand and gravel



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	19.1	18.8	41.7	20.4

For coarse-grained soils with <12% Fines	D60(mm)	D30(mm)	D10(mm)	Cu	Cc

Sieve Size	**Percent Passing**
3.0"	100.0
1.5"	100.0
1.0"	97.7
3/4"	97.7
1/2"	92.7
3/8"	91.2
No. 4	86.9
No. 10	80.9
No. 40	73.7
No. 100	66.1
No. 200	62.1

Liquid Limit, L_L	**Plastic Limit, PL**	**Plasticity Index, PI**
26	17	9

AASHTO Classification:	A-4(4)
IDH Classification:	Clay Loam

Remarks:	

www.interraservices.com

Test ID	63586

INTERRA
Engineering • Inspection • Testing

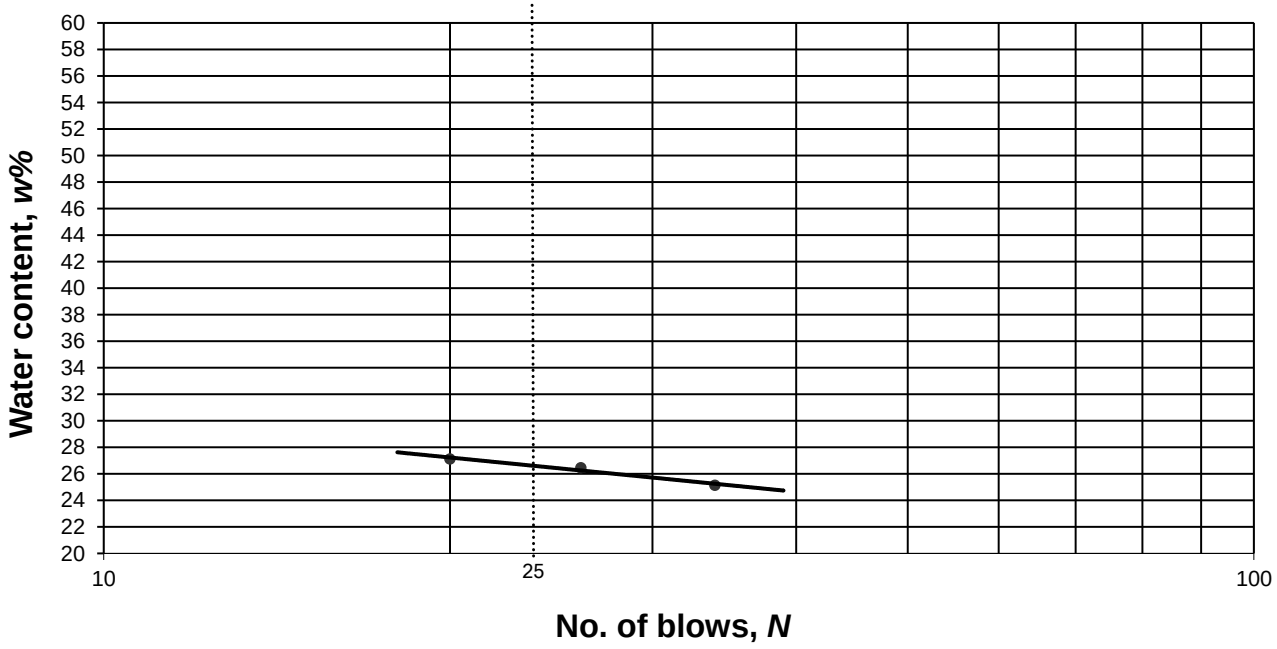
Atterberg Limits

AAASHTO T 89,90

Project	IL 83 at IL 38 Geotechnical for Box Culvert and Retaining Wall, Oakbrook Terrace, IL						
Client	Bowman Consulting, 1001 Warrenville Road, Ste. 110, Lisle, IL 60532						
File No.	8681	**Sample #**	BC04-ST12	**Date Tested**	8/26/2020	**Tested By**	BKP
						Qc By	RC

Date Sample Recd.	8/19/2020
Sample Location	27.5-29.5'
Sample Description	Gray silty clay with sand and gravel

LIQUID LIMIT DETERMINATION



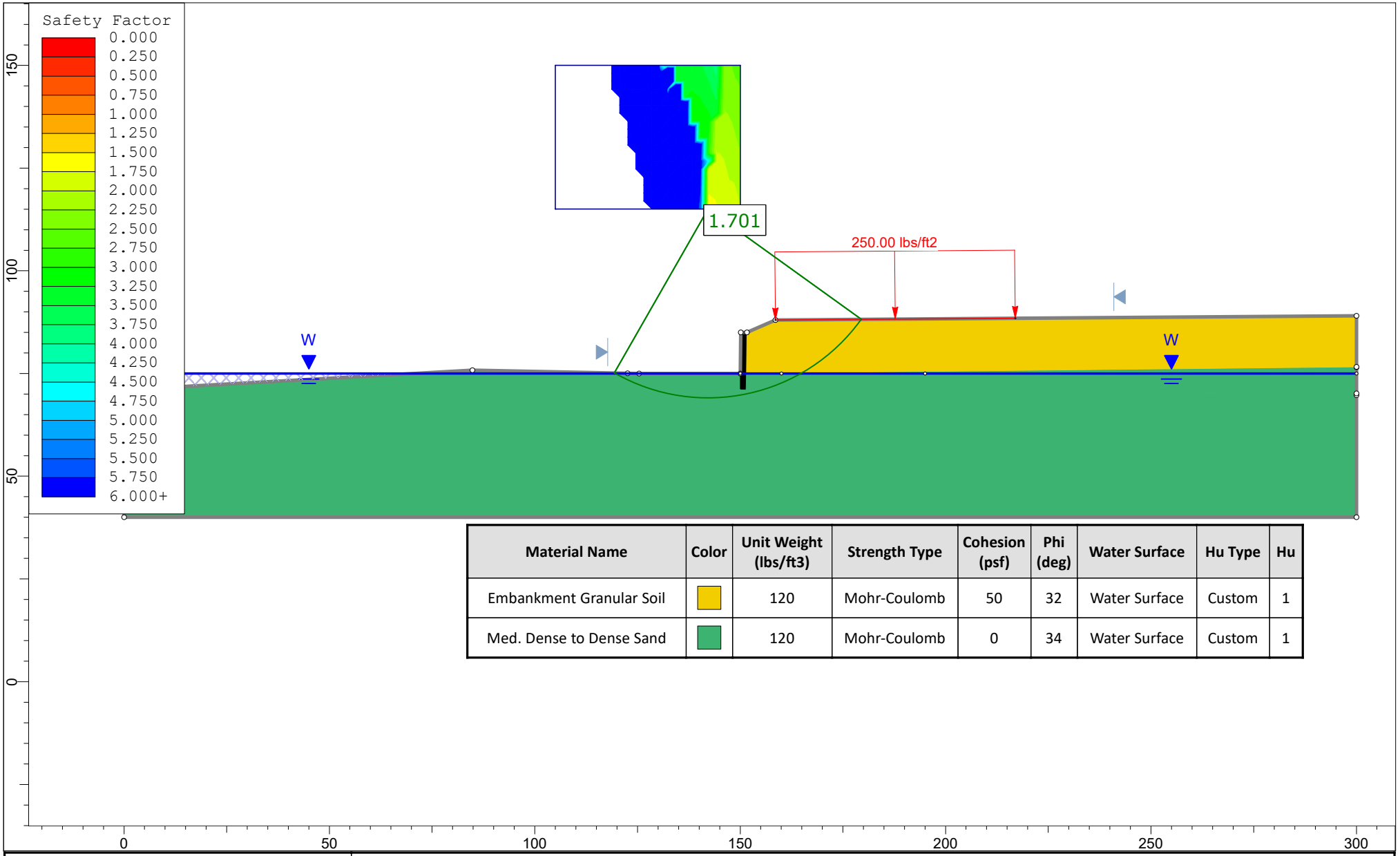
Results

Liquid Limit, LL	**26**	**Plastic Limit, PL**	**17**	**Plasticity Index, PI**	**9**

Remarks

Appendix C

Slope Stability Analysis



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu
Embankment Granular Soil		120	Mohr-Coulomb	50	32	Water Surface	Custom	1
Med. Dense to Dense Sand		120	Mohr-Coulomb	0	34	Water Surface	Custom	1

INTERRA
Engineering ▪ Inspection ▪ Testing

SLIDEINTERPRET 7.028

Project	IL-83 Culvert Wing Wall
	Long-Term Drained Analysis
Drawn By: SB	Company: INTERRA, INC.
Date: 09/23/20	File Name: Wing Wall Stability-Long Term