STRUCTURE GEOTECHNICAL REPORT
STRUCTURE NO. 056-0318, 056-0319, 056-0320
056-0345 & 056-0346
JOB D-91-476-16
SECTION 2016-092B&R
McHENRY COUNTY, ILLINOIS

03/21/2018

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Prepared for:

Baxter & Woodman Consulting Engineers
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Crystal Lake, IL 60012

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STRUCTURE GEOTECHNICAL REPORT
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SECTION 2016-092B&R
MCHENRY COUNTY, ILLINOIS

1.0 INTRODUCTION

Baxter & Woodman Consulting Engineers (B & W) was tasked by Illinois Department of transportation (IDOT) to provide a Phase II Engineering services for various improvements to US20 (FAP 525, S. Grant Highway) in McHenry County which include three intersection improvements of US20 at West Union Road, Coral Road and Marengo/Beck/S Union Road; and the removal and replacement of an existing box culvert with multiple drainage culverts, widening the roadway for shoulder improvements and placing two feet of additional fill within this section to raise the roadway grade. The box culvert section is located between Coral Road and Marengo Road. In addition, the project involves the installation of a 200-foot long retaining wall on the west side of US 20 and a 160-foot long retaining wall on the east side to retain the additional fill materials for the shoulder improvements. Interra, Inc. was retained as the Geotechnical Engineering sub-consultant to perform subsurface soil exploration and prepare the Structural Geotechnical Report (SGR). The existing 8'X4' box culvert allows flow of an unnamed creek under US 20. The proposed improvements consist of replacement of the existing box culvert with a 10'X5' box culvert (SN 056-0318), and addition of two new 6'X5' box culverts, one on the north side (SN 056-0319) and the other on the south side (SN 056-0320) of the existing box culvert.

2.0 PROJECT SCOPE

The scope of work included drilling a total of nine (9) structural soil borings to a depth of 30 feet each from the existing ground/pavement surface in accordance with approved Interra's Proposal number 3502 and dated, 12/14/16. The borings were located in areas of the proposed retaining walls and box culverts.

3.0 SITE DESCRIPTION AND GEOLOGY

The project section is located in McHenry County, between Coral Road (north) and Marengo Road (south). The site is located within unincorporated Coral Township defined as Section 17, T43N, R6E Third Meridian, Marengo South Quadrangle.

The site is presently developed as a two lane road (US 20) with a small bridge which incorporates a box culvert that allows flow of an unnamed creek under US 20 with ponds on either side of US 20. The approximate elevation of the roadway surface on the bridge is 877 feet. Depth to water surface from road surface is noted to be approximately 8 feet, at the time of drilling on 5/9/2017.

The project area is located on the eastern flank of the southward plunging Wisconsin Arch. The area belongs to Valparaiso Morainic System. Majority of the area contains the quaternary deposits belonging to Henry and Glasford Formations, from the Wisconsin and Illinois Episodes. Thickness of the formations varies between 150 feet and 200 feet consisting of proglacial sands and gravels with interbedded diamictons underlain by loams, silty and sandy loams with interbedded sands and gravel. Bedrock surface is Ordovician dolomite with the upper surface fractured with crevices and solution cavities.

3.1 Mining Activity

From the Illinois Stage Geological Survey (ISGS, 2000), McHenry 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 McHenry County is the only reported mining which occurred in the county.

3.2 Seismic Activity

USGS National Seismic Hazard Maps (USGS, 2014) indicate a Peak Ground Acceleration (PGA) of 3% 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

A total of eight (8) out of the 9 proposed borings were performed during this investigation by Interra. Boring B-19 was attempted but could not be drilled beyond about 1 foot from surface due to auger refusal in an unknown old reinforced concrete structure. Borings B-14, B-16, B-18, B-20 and B-22 were drilled on the west side of US 20 and borings B-15, B-17 and B-21 were drilled on the east side of US 20. All of the eight borings were drilled to a depth of 30 feet from the existing pavement/ground surface. The boring locations were established in the field as shown in the boring location plan presented in Appendix A.

The borings were drilled and samples were tested in accordance with the guidelines in the IDOT Geotechnical Manual. Soil sampling was performed at 2.5 foot intervals to a depth of 30.0 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. Also, pocket penetrometer tests were performed on the recovered samples. Shelby tube samples were obtained from selected depths of different boring locations. Water level readings were taken during drilling. Twenty-four hour water levels were not recorded as the boreholes were backfilled immediately due to safety concerns.

Soil specimens from the borings were visually identified in accordance with the AASHTO and IDOT textural classification systems. Pocket penetrometer estimates of unconfined compressive strength were obtained for all cohesive specimens from all the borings.

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. Grainsize Analysis, Atterberg Limits and Unconfined Compressive Strength tests were performed on selected samples at depths where the proposed retaining walls and improvement of the culvert box are proposed.

Soil boring logs have been prepared for all the structure borings. The boring logs include the results of the laboratory testing. The boring logs are included in Appendix B of this report. Results of laboratory testing are presented in Appendix C.

6.0 SUBSURFACE CONDITIONS

West Side US 20

Borings on the west side of US 20 (B-14, B-16, B-18, B-20 and B-22) noted 6 to 8 inches of asphalt pavement and 6 to 12 inches of crushed rock aggregate (subbase). This is underlain by very loose to loose sandy or medium stiff to stiff clayey fill material to a depth of 3 feet below grade except at B-16 where black clay was encountered directly below the subbase. The fill material is underlain by a stiff to very soft clay loam/sandy clay or clay to a depth of 8 feet below grade. Buried topsoil or organic soils were observed in all borings from 1.5 feet at B-16 to a maximum depth of 8 feet below grade at B-20. The black soils were sometimes combined with greenish gray to gray or pale brown soils (B-16, B-18, B-22). Medium dense loam (B-14, B-20,) or silty loam (B-22) ranges in depth from 8.0 to a maximum depth of 10.5 feet. At boring B-18, a layer of medium dense sand with gravel extends from 8 to 10.5 feet, underlain by a loose loam to a depth of 13 feet. Medium dense to dense sands, sandy loams, and silty loams extend to depths ranging from 20.5 feet (B-18) and 30 feet (B-22). Hard to stiff clay or clay loam was observed in borings B-14, B-16, B-18 & B-20 underlying the sandy soils when present, to a final depth between 28 to 30 feet below grade.

East side US 20

Borings on the east side of US 20 (B-15, B-17, B-21) noted 8 to 10 inches of asphalt pavement and 6-8 inches of crushed rock aggregate (sub-base). This is underlain by loose to medium dense sand or sandy loam fill to a depth of 2.5 to 3.0 feet below grade.

In boring B-15, medium stiff clay loam was observed to 5.5 feet below grade, underlain by very soft clay to 8.0 feet below grade. This is underlain by stiff to medium stiff sandy clay to 12.5 feet below grade. This is followed by loam to 14.4 feet and then by a medium dense sand layer

to 16.0 feet below grade. Medium dense to very dense silty loams extended to 23 feet below grade are followed by hard brown clay loam 25.5 feet. Medium dense silty loam ranges from 25.5 to the exploration depth of 30.0 feet.

In boring B-17, a stiff to very soft clay loam extents to 8.0 feet which is underlain by medium stiff sandy clay to 10.5 feet. Underlying the sandy clay is a medium dense loam to 13.0 feet, followed by a hard clay loam to a depth of 18.0 feet. Dense silt was noted between 18 and 20.5 feet, followed by dense silty loam to 23.0 feet below grade. Hard clay loam was noted from 23 feet to 25.5 feet and the boring is terminated in hard to very stiff clay at a depth of 30 feet.

In boring B-21, medium stiff black clay loam was noted from 3.0 to 5.5 feet and is underlain by a layer of very soft black clay to 8.0 feet below grade. Alternating sandy clays, loams, sandy loam, medium dense sands and silty loam complete the profile of this boring.

Please see the attached borehole logs in Appendix B for detailed soil stratification.

Groundwater Information

Groundwater was encountered during drilling between the elevations of 865.5 (B-14) and 871.1 feet (B-21). This depth roughly corresponds with the first very permeable soils (sands/sandy loams) or below the water surface elevation of the unnamed creek.

Water levels were not measured after 24 hours upon completion of drilling. The boreholes were backfilled with auger cuttings after completion due to safety reasons and an asphalt patch was placed on top. Hence, the findings may not represent the long-term groundwater levels.

Seismic Considerations

The following seismic data is recommended in accordance with IDOT Geotechnical Manual, AGMU 09.1 and the LRFD Bridge Design Specifications.

Soil Site Class: D

Seismic Performance Zone (SPZ): 1

Design Spectral Acceleration at a period of (T) of 1.0 sec, S_{D1} : 0.080g

Design Spectral Acceleration at a period of (T) of 0.2 sec, S_{DS} : 0.140g

Liquefaction Potential

According to AGMU 10.1 "Liquefaction Analysis Procedure", the site does not require a liquefaction analysis as it is not located in Seismic Performance Zones 2, 3 or 4.

7.0 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, 8th Edition, 2017.

BOX Culverts (Structure No. 056-0318, 056-0319 & 056-0320)

The bottom of the culverts is proposed at EL 871.5. Immediately below this elevation, the foundation soils consist of very soft clay and clay loam with organics and very high moisture content to a depth of 2 to 4 feet followed by medium stiff to very stiff sandy clay and medium dense to dense silt loam, loam and sand. The very soft soils do not have the required bearing and are unsuitable to support the box culvert. We recommend undercutting the unsuitable soils and replacing with coarse aggregate CA 1 or CA 2. A woven geotechnical fabric should be used below the aggregate subgrade improvement for ground stabilization. The aggregate subgrade shall be capped with a minimum 3 inches of CA 6 or CA 10.

Bearing Capacity and Settlement

Foundation soils improved as recommended above can be designed for a bearing resistance of 3000 psf, which includes an LRFD Resistance Factor of 0.45. Settlement of the culverts is anticipated to be less than one inch.

East Retaining Wall (SN: 056-0346) and West Retaining Wall(SN: 056-0345)

Two retaining walls totaling a length of approximately 350 feet are proposed in the area of the culverts on the east and west side of US 20 to retain the additional fill material for shoulder improvements and raising the roadway grade. Several possible wall types such as concrete cantilever wall, Mechanically Stabilized Earth (MSE) retaining wall, steel sheet pile wall and soldier pile wall. Of these, the steel sheet pile wall and the soldier pile walls are normally used in cut condition and deflections caused by compaction could be significant. Selection of a wall type depends on several factors such as soil conditions, feasibility, cost and control of top of wall deflections. In our opinion, a cast-in-place concrete retaining wall or MSE wall will be more appropriate.

Concrete Retaining Wall

The bottom of the footing for the proposed retaining walls is anticipated approximately at EL 869. At this elevation, the foundation soils consist of very soft clay and clay loam with organics and very high moisture content to a depth of 2 to 4 feet followed by medium stiff to very stiff sandy clay and medium dense to dense silt loam, loam and sand. The very soft soils do not have the required bearing and are unsuitable to support the retaining wall. We recommend undercutting the unsuitable soils and replacing with coarse aggregate CA 1 or CA 2. A woven geotechnical fabric should be used below the aggregate subgrade improvement for ground stabilization. The aggregate subgrade shall be capped with a minimum 3 inches of CA 6 or CA 10.

Bearing Capacity

A factored bearing resistance of 3000 psf, which includes an LRFD Resistance Factor of 0.55 is recommended. The bottom of the footings should be placed at minimum of four feet below final grade for frost protection.

Settlement

Based on the soil profile and the expected wall loads, settlement is estimated to be less than

0.5 inch.

Lateral Earth Pressures

We recommend the retaining wall be designed for an active earth pressure of 43 psf per foot depth for a level backfill assuming drainable backfill material. 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 1.0. Resistance offered by the passive pressures should be neglected. Lateral loads from traffic should be considered at a minimum surcharge pressure of 250 psf.

Drainage Considerations

A geocomposite wall drain should be placed and connected to 6" diameter perforated drain pipe over the entire length of the back face of the retaining wall. Free draining porous granular embankment (special) material should be placed behind the retaining wall for a minimum width of 2.0 feet.

MSE Wall

Based on the cross-sections provided by the client, the maximum wall height is approximately nine feet from top of leveling pad. The MSE wall should be analyzed and designed for external stability, internal stability and settlement. Interra performed analysis the external stability for bearing capacity, settlement, global slope stability. Contractor will provide design for the wall soil system and its internal stability.

Bearing Capacity

The bottom of the reinforced soil system is anticipated at EL 869. Soft subgrade conditions exist at this elevation. Subgrade should be undercut and prepared as mentioned above for the concrete retaining wall. A factored bearing resistance of 3000 psf, which includes an LRFD Resistance Factor of 0.65, is recommended. The bottom of the concrete leveling pad should be placed at minimum of four feet below final grade for frost protection.

Settlement

Based on the soil profile and the expected wall loads, settlement is estimated to be less than 0.5 inch.

Lateral Earth Pressures

Resistance to sliding may be calculated using a nominal sliding resistance of half of normal stress on the interface between the reinforced mass and the soil. The LRFD resistance factor for sliding should be taken as 1.0. Resistance offered by the passive pressures should be neglected. Lateral loads from traffic should be considered at a minimum surcharge pressure of 250 psf. We recommend a base width of 0.75H or a minimum 8 feet, where H is the wall height measured from the leveling pad.

Stability Analyses

Global slope stability analyses were conducted for the critical cross-section. 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 factor is above the required minimum value for both short and long-term loading conditions. Appendix D contains the results of the slope stability analyses. Preliminary analyses indicated that the wall be stable with regards to vertical pressure and overturning. Overturning should be checked for final dimensions of the MSE wall system.

8.0 CONSTRUCTION CONSIDERATIONS

Construction of the box culverts and retaining walls will require sheeting, bracing and groundwater control due to the close proximity to the unnamed creek and ponds. Temporary sheet piling can be designed using IDOT's Temporary Sheet Piling Design Guide. Contractor should control seepage water accumulating in open excavations for the box culverts and the retaining walls. Seepage could be controlled using method such as drainage ditches, drainage blankets and sumps. If seepage cannot be controlled an open-graded backfill such as CA7 can be placed and compacted to come out of the standing water.

Stage Construction Considerations

As per the TSL plan construction of the culverts will occur in two stages: stage one will involve the removal and construction of the culverts under the northbound portion of the roadway; stage two will involve the removal and construction of the culverts on the southbound portion of the roadway. 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. Based on our evaluation, a temporary sheet piling may not be feasible at all locations. Therefore, we recommend a contractor-designed temporary soil retention system 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 the IDOT Culvert Manual for projects where the fill height is such that the Stage II traffic limitations cannot be met with a 1:1 slope, a geotextile retaining wall or a temporary soil retention system can be built to retain the soil on top of the box. Geotextile retaining walls require a minimum of 4 ft. 6 in. from the Stage I Construction line to the Stage II traffic line. The planner should consult with the District's construction staff to discuss the amount of room that will be necessary to properly build the pavement in Stage I.

The construction monitoring shall be according the IDOT Standard Specifications, Special Provisions and Contract Plans. Local, state and federal regulations and IDOT guidelines shall be followed for all excavations and construction.

9.0 CLOSURE

The analysis and recommendations submitted in this report are based upon the data obtained from eight (8) 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.

10.0 REFERENCES

AASHTO 2017, LRFD Bridge Design Specifications, 8th Edition 2017, American Association of State Highway and Transportation Officials, Washington, DC.

IDOT 2015, Geotechnical Manual, Illinois Department of Transporation.

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

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IDOT 2015, Geotechnical Manual Illinois Department of Transporation.

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

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

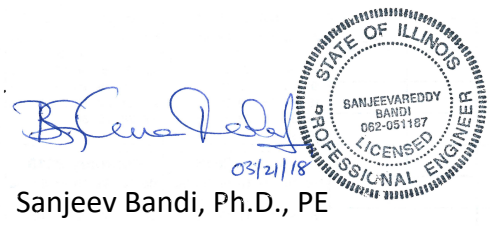
We appreciate the opportunity to be of service to you. Should you need additional information or clarifications, please call us at (630) 754-8700.

Yours truly,

Interra, Inc.

Ashok Guntaka, EI
Project Engineer

Eric Stusser, PG
Project Geologist



Sanjeev Bandi, Ph.D., PE
Principal Engineer

Appendix A

Borehole Location Plan

Benchmark: Set iron rod with cap, 1' north of east guardrail end, 41' east of power pole. Elev. 876.894

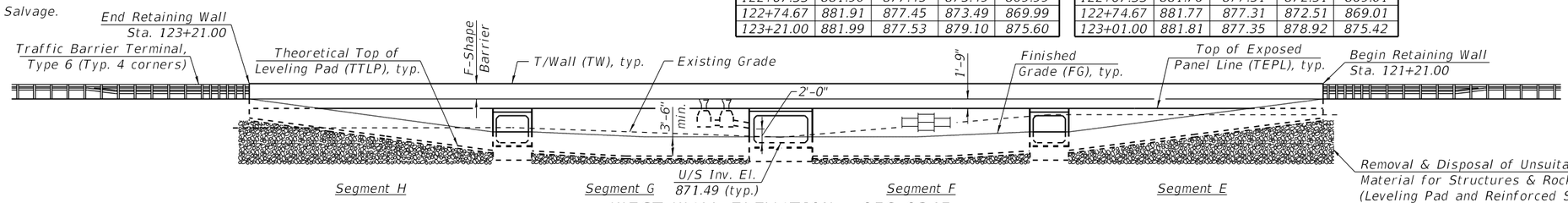
Existing Structure: S.N. 056-0087, 8' x 4' cast in place concrete box culvert, approx. 32' in length with concrete headwalls and attached guardrail. Two 36" CMP culverts lie within the box culvert, approximate length of CMP 45' each.

One lane of traffic to be maintained using staged construction.

No Salvage.

West Wall Elevations				
Station	TW El.	TEPL El.	FG El.	TTLP El.
121+21.00	882.08	877.62	879.18	875.68
121+67.33	881.96	877.50	873.49	869.99
121+74.67	881.95	877.49	873.49	869.99
121+96.00	881.92	877.46	872.49	868.99
122+46.00	881.89	877.44	872.49	868.99
122+67.33	881.90	877.45	873.49	869.99
122+74.67	881.91	877.45	873.49	869.99
123+21.00	881.99	877.53	879.10	875.60

East Wall Elevations				
Station	TW El.	TEPL El.	FG El.	TTLP El.
121+41.00	881.88	877.42	878.99	875.49
121+67.33	881.82	877.36	872.51	869.01
121+74.67	881.81	877.35	872.51	869.01
122+15.08	881.76	877.30	872.26	868.76
122+26.92	881.75	877.30	872.26	868.76
122+67.33	881.76	877.31	872.51	869.01
122+74.67	881.77	877.31	872.51	869.01
123+01.00	881.81	877.35	878.92	875.42

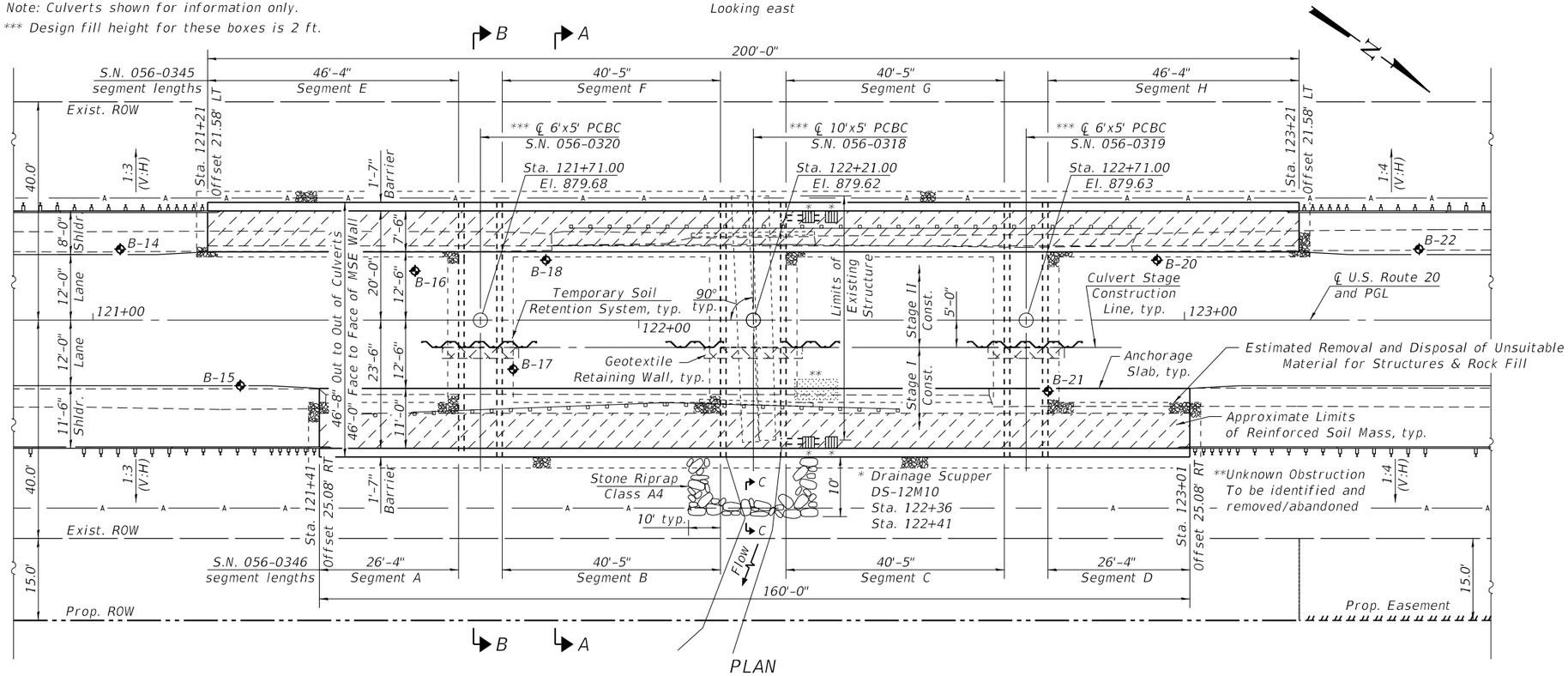


WEST WALL ELEVATION – 056-0345

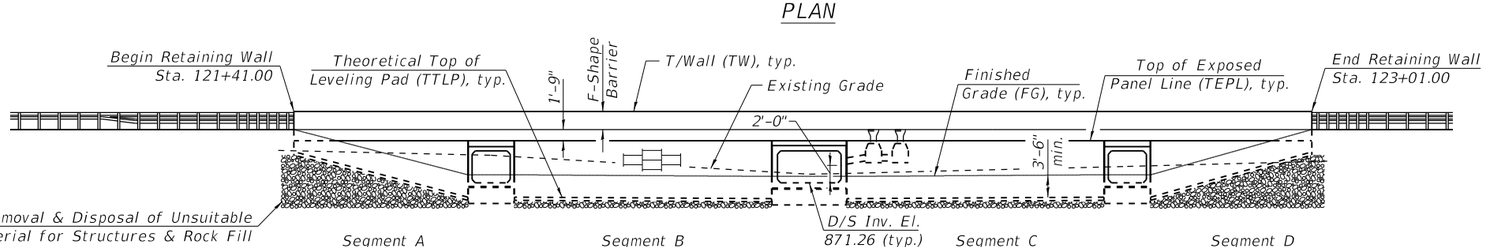
Looking east

Note: Culverts shown for information only.

*** Design fill height for these boxes is 2 ft.

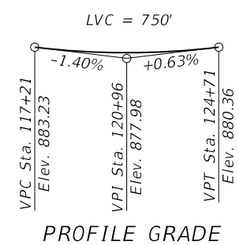


PLAN



EAST WALL ELEVATION – SN 056-0346

Looking west



PROFILE GRADE

Along ℄ U.S. Route 20

DESIGN SPECIFICATIONS

2017 AASHTO LRFD Bridge Design
Specifications Customary U.S. Units, 8th Edition

LOADING HL-93

Allow 50#/sq. ft. for future wearing surface.

HIGHWAY CLASSIFICATION

U.S. Rte. 20 – F.A.P. Rte. 525
Functional Class: Strategic Regional Arterial
ADT: 8,900 (2018)
ADTT: 1,424 (2018)
DHV: 890 (2018)
Design Speed: 55 m.p.h.
Posted Speed: 55 m.p.h.
2-Way Traffic
Directional Distribution: 50:50

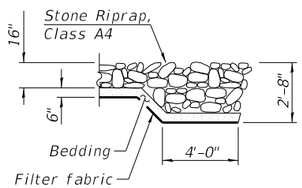
DESIGN STRESSES

FIELD UNITS

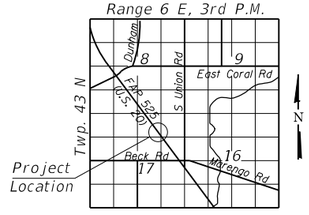
f'c = 3,500 psi
fy = 60,000 psi (Reinforcement)

PRECAST UNITS

f'c = 4,500 psi (Precast Panels)
f'c = 5,000 psi (Precast Box Culverts)
fy = 65,000 psi (Welded Wire Reinforcement)



SECTION C-C



LOCATION SKETCH

GENERAL PLAN & ELEVATION
U.S. ROUTE 20 RETAINING WALLS
STRUCTURE NO. 056-0345 & 056-0346
F.A.P. RTE. 525 – SEC 2016-092B&R
McHENRY COUNTY
STATION 121+21 TO 123+21

BAXTER & WOODMAN Consulting Engineers

USER NAME =	DESIGNED - BLB	REVISED -
	CHECKED - CDL	REVISED -
PLOT SCALE =	DRAWN - BLB	REVISED -
PLOT DATE =	CHECKED - CDL	REVISED -

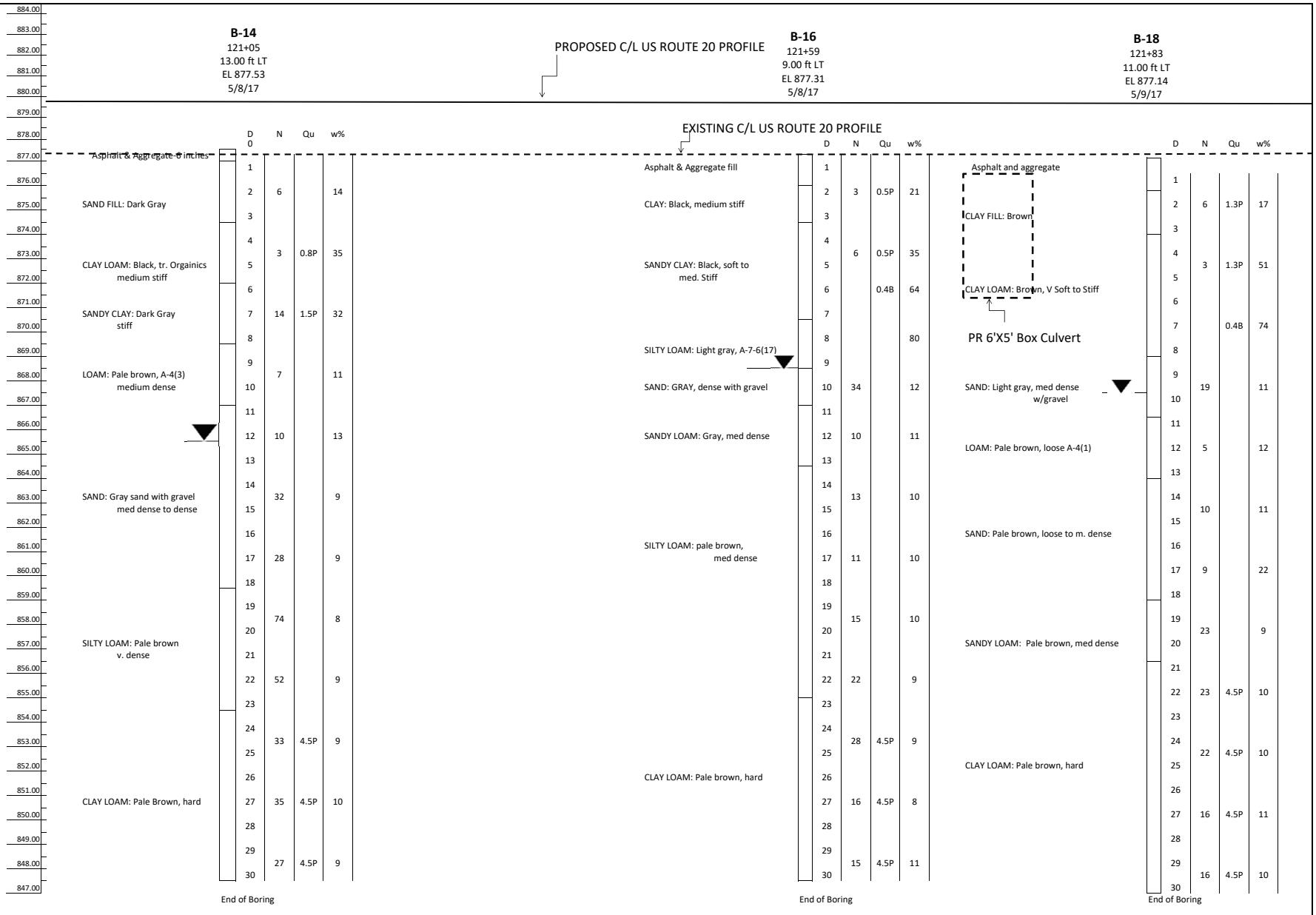
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

BOREHOLE LOCATION PLAN

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
525	2016-092B&R	McHENRY		
		CONTRACT NO. 62D36		
		ILLINOIS FED. AID PROJECT		

Appendix B

Subsurface Data Profiles & Soil Boring Logs



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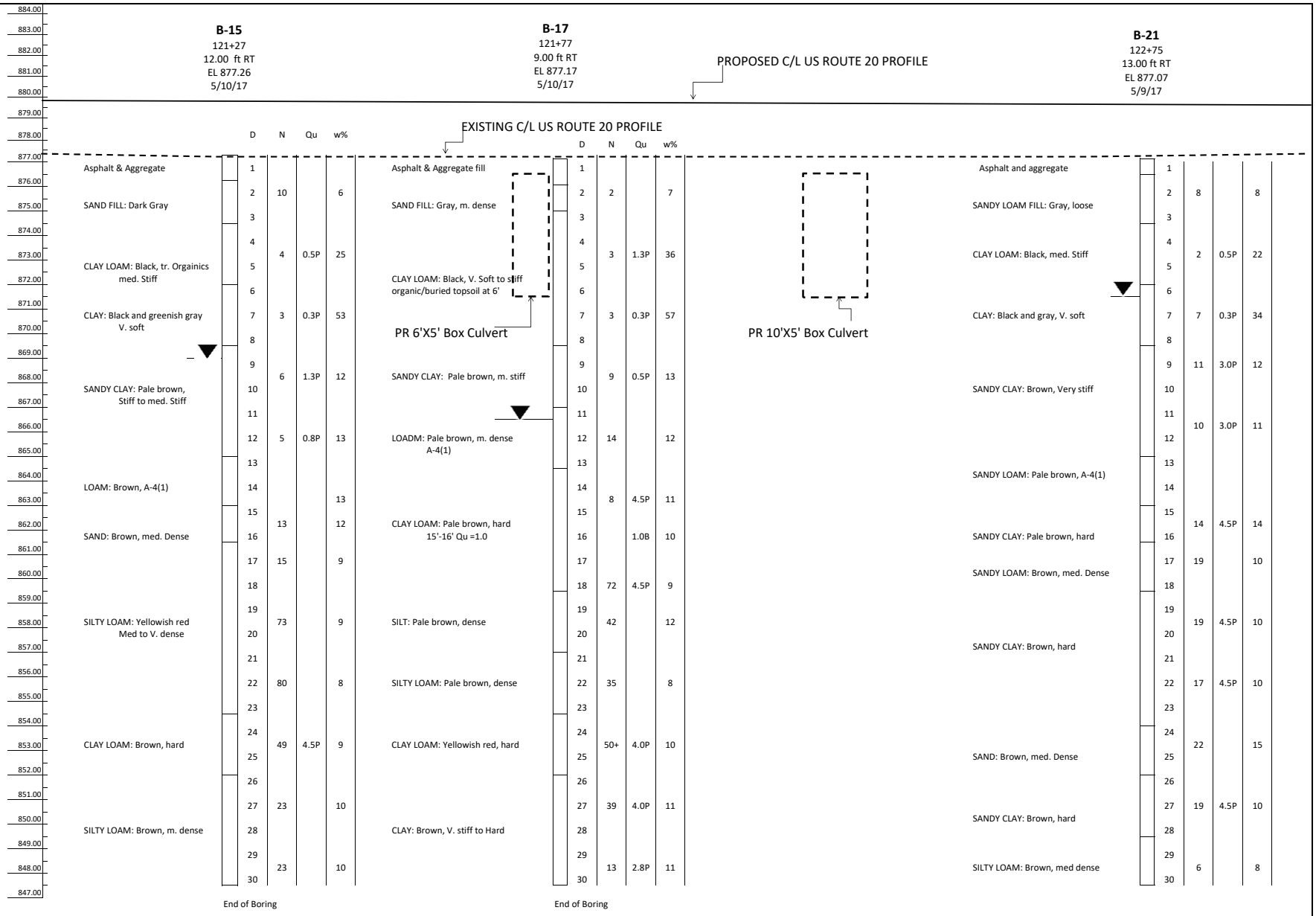
Drawn By SB Date 3/20/2018

Checked By GAK Date 3/20/2018

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SUBSURFACE DATA PROFILE
US ROUTE 20

FAP RTE	SECTION	COUNTY	TOTAL SHEETS	SHEET NO
525	2016-092B&R	MCHENRY	3	1
		CONTRACT NO. 62D36		
	ILLINOIS	FED. AID PROJECT LGMW (759)		



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STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

SUBSURFACE DATA PROFILE
US ROUTE 20

FAP RTE	SECTION	COUNTY	TOTAL SHEETS	SHEET NO
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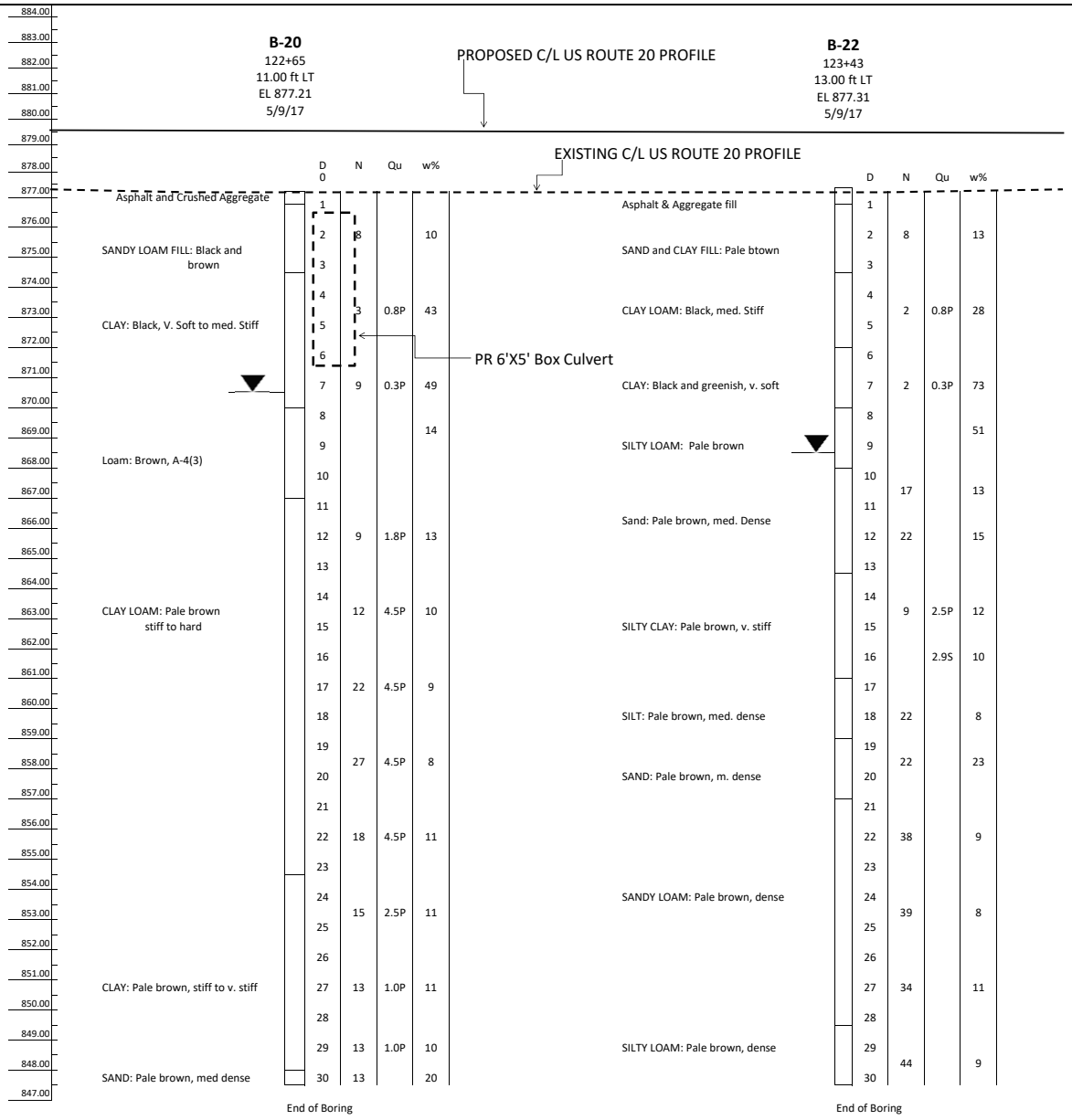
		CONTRACT NO. 62D36		
	ILLINOIS	FED. AID PROJECT LGMW (759)		



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STATE OF ILLINOIS
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SUBSURFACE DATA PROFILE
US ROUTE 20

FAP RTE	SECTION	COUNTY	TOTAL SHEETS	SHEET NO
525	2016-092B&R	MCHENRY	3	3
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	ILLINOIS	FED. AID PROJECT LGMW (759)		

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SOIL BORING LOG

Date 5/8/17

ROUTE FAP 525 (US Route 20) **DESCRIPTION** US 20 Culvert/proposed Retaining Wall **LOGGED BY** Eric Slusser

SECTION D-91-476-16 **LOCATION** West side US 20

COUNTY MCHENRY **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. 056-0318, 056-0319 & 056-0320
Station

BORING NO. B-14
Station 121+05
Offset 13.00ft LT
Ground Surface Elev. 877.53 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 865.5 ft
Upon Completion 865.5 ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
877.03				ASPHALT
876.53				CRUSHED AGGREAGATE FILL (sub-base)
	4			
	3		13.7	Loose, dark gray (10YR 4/1) SAND FILL, medium to fine grained, moist
	3			
874.53				
	2			Medium Stiff, black (10YR 2/1) CLAY LOAM (CL), trace organics, moist. Remnant topsoil or organic soil
	1		34.6	
-5	2	0.8 P		
872.03				
	2			Stiff, dark gray (10YR 4/1) SANDY CLAY (SaC), trace fine gravel, trace sand, moist
	4		31.9	
	10	1.5 P		
869.53				
	3			Medium Dense, pale brown (10YR 6/3) LOAM (L), little gravel, little sand, AASHTO Classification A-4(3), moist
	3		11.4	
-10	4			
867.03				
	3			Medium Dense to Dense, gray (10YR 5/1) SAND WITH GRAVEL (S), gravel large to fine, sand medium to fine, saturated at 12.0',
	4		12.7	
	6			
	9			
	22		8.6	
-15	10			
	21			
	17		9.4	
	21			
859.53				
	16			Very Dense, pale brown (10YR 6/3) SILTY LOAM (SiL), trace to little gravel, trace to little sand, moist
	31		8.1	
-20	43			
	19			Very Dense, pale brown (10YR 6/3) SILTY LOAM (SiL), trace to little gravel, trace to little sand, moist *(continued)*
	21		9.3	
	31			
854.53				
	9			Hard, pale brown (10YR 6/3) CLAY LOAM (CL), trace to little gravel, trace to little sand, moist
	14		8.5	
-25	19	4.5 P		
	9			
	14		9.7	
	21	4.5 P		
	8			
	13		9.4	
847.53 -30	14	4.5 P		
-35				
-40				

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

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SOIL BORING LOG

Date 5/10/17

ROUTE FAP 525 (US Route 20) **DESCRIPTION** US 20 Culvert/proposed Retaining Wall **LOGGED BY** Eric Slusser

SECTION D-91-476-16 **LOCATION** East side US 20

COUNTY MCHENRY **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. 056-0318, 056-0319 & 056-0320
Station

BORING NO. B-15
Station 121+27
Offset 12.00ft RT
Ground Surface Elev. 877.26 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 868.8 ft
Upon Completion 868.8 ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				ASPHALT 876.59
				Medium Dense, black (10YR 2/1) CRUSHED AGGREGATE FILL (sub-base), moist 875.93
	9			
	5		5.7	
	5			Medium Dense, brown (10YR 5/3) SAND FILL, medium to fine grained, pieces of concrete and rock, moist 874.26
	3			
	2		25.3	Medium Stiff, black (10YR 2/1) CLAY LOAM (CL), trace fine gravel, orgainic soil or remnant topsoil, moist
-5	2	0.5 P		871.76
	1			Very Soft, black (10YR 2/1) and greenish gray (GLEY 6/1) CLAY (C), pieces of wood, moist to wet,
	1		53.4	
	2	0.3 P		869.26
	3			Stiff to Medium Stiff, pale brown (10YR 6/3) SANDY CLAY (SaC), trace to little gravel, moist
	3		12.0	
-10	3	1.3 P		
	2			
	2		12.7	
	3	0.8 P		864.76
			12.5	brown (10YR 5/3) LOAM (L), trace fine gravel, some sand, moist AASHTO Classification A-4(1) 862.76
-15	6			Medium Dense, brown (10YR 5/3) SAND (S), medium to fine grained, saturated
	6		12.0	
	7			861.26
	5			Medium Dense to Very Dense, brown (10YR 5/3) to 21.0', yellowish red (5YR 4/6) SILTY LOAM (SiL), trace to little medium to fine gravel, trace fine sand, saturated
	8		8.9	
	7			
	10			
	39		8.6	
-20	43			
				Medium Dense to Very Dense, brown (10YR 5/3) to 21.0', yellowish red (5YR 4/6) SILTY LOAM (SiL), trace to little medium to fine gravel, trace fine sand, saturated *(continued)*
	19			
	31		8.2	
	49			854.26
				Hard, brown (10YR 5/3) CLAY LOAM (CL), trace to little medium to fine gravel, trace fine sand, moist
	13			
	18		9.1	
-25	31	4.5 P		851.76
	8			Medium Dense, brown (10YR 5/3) SILTY LOAM (SiL), trace to little medium to fine gravel, trace fine sand, moist
	10		10.1	
	13			
	5			
	10		10.1	
-30	13			847.26
-35				
-40				

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

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SOIL BORING LOG

Date 5/8/17

ROUTE FAP 525 (US Route 20) **DESCRIPTION** US 20 Culvert/proposed Retaining Wall **LOGGED BY** Eric Slusser

SECTION D-91-476-16 **LOCATION** West side US 20

COUNTY MCHENRY **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. 056-0318, 056-0319 & 056-0320
Station

BORING NO. B-16
Station 121+59
Offset 9.00ft LT
Ground Surface Elev. 877.31 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 868.3 ft
Upon Completion 868.3 ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				ASPHALT 876.81
	1			Very Loose, black (10YR 2/1) CRUSHED AGGREGATE FILL (sub-base) 875.81
	2		21.4	
	1	0.5 P		Medium Stiff, Black (10YR 2/1) CLAY (C), trace gravel, trace sand, moist 874.31
	1			Medium Stiff to Soft, black (10YR 2/1) and gray (10YR 6/1) SANDY CLAY (SaC), trace gravel, trace sand, shelby tubes ST-03 from 5'-7', UC=0.35 tsf, moist
	4		35.1	
-5	2	0.5 P		
			64.3	
		0.4 B		870.31
				light gray (10YR 7/1) SILTY LOAM (SiL), trace gravel, trace sand, little clay, AASHTO classification A-7-6(17), moist
			80.3	
				868.31 ▼
	7			Dense, gray (10YR 5/1) SAND WITH GRAVEL (S), gravel medium to fine grained, sand predominantly fine to very fine, saturated 866.81
-10	13		12.0	
	21			
	4			Medium Dense, gray (10YR 5/1) SANDY LOAM (SaL), little medium to fine gravel, sand medium to fine, saturated 864.31
	5		11.1	
	5			
	4			Medium Dense, pale brown (10YR 6/3) SILTY LOAM (SiL), trace to little fine gravel, saturated
	5		10.0	
-15	8			
	5			
	5		10.3	
	6			
	5			
	7		9.9	
-20	8			
	9			Medium Dense, pale brown (10YR 6/3) SILTY LOAM (SiL), trace to little fine gravel, saturated *(continued)*
	11		9.3	
	11			855.01
	12			Hard, pale brown (10YR 6/3) CLAY LOAM (CL), trace to little fine gravel, trace to little fine sand, moist
	13		9.1	
-25	15	4.5 P		
	5			
	8		8.1	
	8	4.5 P		
	5			
	6		10.9	
-30	9	4.5 P		847.31
-35				
-40				

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

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SOIL BORING LOG

Date 5/10/17

ROUTE FAP 525 (US Route 20) **DESCRIPTION** US 20 Culvert/proposed Retaining Wall **LOGGED BY** Eric Slusser

SECTION D-91-476-16 **LOCATION** East side US 20

COUNTY MCHENRY **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. 056-0318, 056-0319 & 056-0320
Station

BORING NO. B-17
Station 121+77
Offset 9.00ft RT
Ground Surface Elev. 877.17 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 866.2 ft
Upon Completion 866.2 ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				ASPHALT
				876.34
	8			Medium Dense, black (10YR 2/1) CRUSHED AGGREGATE FILL (sub-base)
	8		7.3	875.67
	4			Medium Dense, gray (10YR 5/1) SAND FILL, trace fine gravel, sand, medium to fine, moist
				874.67
	3			Stiff to Very Soft, black (10YR 2/1) CLAY LOAM (CL), trace to little fine gravel, trace to little fine sand, trace roots at 6.0', moist, organic soil or buried topsoil
	2		35.9	
-5	1	1.3 P		
	1			
	1		57.4	
	2	0.3 P		
				869.17
	2			Medium Stiff, pale brown (10YR 6/3) SANDY CLAY (SaC), trace to little fine gravel, moist
	4		12.6	
-10	5	0.5 P		
				866.67
	5			Medium Dense, pale brown (10YR 6/3) LOAM (L), trace fine gravel, some fine sand, little clay, AASHTO classification A-4(1), moist
	7		12.3	
	7			
				864.17
	2			Hard, pale brown (10YR 6/3) CLAY LOAM (CL), trace to little fine gravel, trace to little sand, moist, Shelby tube 15-16' Qu=1.0 tsf
	2		10.5	
-15	6	4.5 P		
			9.9	
	18	1.0		
	31	B	8.7	
	41			
		4.5 P		
				859.17
	15			Dense,pale brown (10YR 6/3) SILT (Si), moist to wet
	18		11.8	
-20	24			
				856.67
	13			Dense, pale brown (10YR 6/3) SILTY LOAM (SiL), trace medium to fine gravel, trace to little fine sand, moist
	17		8.4	
	18			
				854.17
	44			Hard, yellowish red (5YR 4/6) CLAY LOAM (CL), trace fine gravel, trace fine sand, moist
	50		10.0	
-25		4.0 P		
				851.67
	13			Hard to Very Stiff, brown (10YR 5/3) CLAY (C), trace fine gravel, trace fine sand, moist
	18		11.3	
	21	4.0 P		
	4			
	7		10.6	
-30	6	2.8 P		
				847.17
-35				
-40				

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

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SOIL BORING LOG

Date 5/9/17

ROUTE FAP 525 (US Route 20) **DESCRIPTION** US 20 Culvert/proposed Retaining Wall **LOGGED BY** Eric Slusser

SECTION D-91-476-16 **LOCATION** West side US 20

COUNTY MCHENRY **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. 056-0318, 056-0319 & 056-0320
Station

BORING NO. B-18
Station 121+83
Offset 11.00ft LT
Ground Surface Elev. 877.14 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 867.6 ft
Upon Completion 867.6 ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
876.47 ASPHALT			
875.81 Loose, black (10YR 2/1) CRUSHED ROCK AGGREGATE FILL (sub-base)	9		
	3		17.1
Stiff black (10YR 2/1) and brown (10YR 5/3) CLAY FILL, trace fine gravel, trace fine sand, moist	3	1.3 P	
874.14			
Stiff to Very Soft black (10YR 2/1) to 6.0', pale brown (10YR 6/3) to 8.0' CLAY LOAM (CL), trace organics to 5.0', shelby tube 5-7', moist	2		
	1		50.5
-5	2	1.3 P	
			73.5
		0.4 B	
869.14			
Medium Dense (light gray (10YR 7/1) SAND with GRAVEL (S), gravel large to fine, sand course to fine, saturated	5		
▼	8		10.5
-10	11		
866.64			
Loose, pale brown (10YR 6/3) LOAM (L), trace fine gravel, some sand, little clay, moist, AASHTO Classification A-4(1)	3		
	2		12.3
	3		
864.14			
Medium Dense to Loose, pale brown (10YR 6/3) SAND (S), some large to fine gravel from 15.5-15', sand medium to fine, saturated	3		
	4		11.1
-15	6		
	3		
	3		21.8
	6		
859.14			
Medium Dense, pale brown (10YR 6/3) SANDY LOAM (SaL), trace to little medium to fine gravel, sand medium to fine, saturated	5		
	10		8.6
-20	13		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
856.64			
Hard, pale brown (10YR 6/3) CLAY LOAM (CL), trace to little fine gravel, trace to little fine sand, moist	8		
	10		10.0
	13	4.5 P	
	7		
	9		10.2
-25	13	4.5 P	
	6		
	7		10.5
	9	4.5 P	
	5		
	7		9.9
847.14 -30	9	4.5 P	
-35			
-40			

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

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600 Territorial Drive, Suite G
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SOIL BORING LOG

Date 5/9/17

ROUTE FAP 525 (US Route 20) **DESCRIPTION** US 20 Culvert/proposed Retaining Wall **LOGGED BY** Eric Slusser

SECTION D-91-476-16 **LOCATION** West side US 20

COUNTY MCHENRY **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. 056-0318, 056-0319 & 056-0320
Station

BORING NO. B-20
Station 122+65
Offset 11.00ft LT
Ground Surface Elev. 877.21 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 870.2 ft
Upon Completion 870.2 ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				ASPHALT 876.63
				Loose, black (10YR 2/1) CRUSHED AGGREGATE FILL (sub-base) 876.13
	3			
	4		10.4	Loose, black (10YR 2/1) and brown (10YR 5/3) SANDY LOAM FILL, little fine gravel, moist 874.21
	4			
	1			Medium Stiff to Very Soft black (10YR 2/1) CLAY (C), trace fine gravel, trace fine sand, wet at 7.0'
	1		43.2	
-5	2	0.8 P		
	0			
	3		49.1	
	6	0.3 P		869.71
				pale brown (10YR 6/3) LOAM (L), trace fine gravel, some fine sand, AASHTO classification A-4(3), moist
			13.5	
-10				866.71
	3			Stiff to Hard, pale brown (10YR 6/3) CLAY LOAM (CL), trace to little fine gravel, trace to little fine sand, moist
	3		12.5	
	6	1.8 P		
	4			
	5		9.7	
-15	7	4.5 P		
	6			
	11		8.6	
	11	4.5 P		
	8			
	13		8.1	
-20	14	4.5		
		P		Stiff to Hard, pale brown (10YR 6/3) CLAY LOAM (CL), trace to little fine gravel, trace to little fine sand, moist *(continued)*
	6			
	8		11.3	
	10	4.5 P		
				854.21
	7			Very Stiff to Stiff pale brown (10YR 6/3) CLAY (C), trace fine gravel, trace fine sand, moist
	7		10.8	
-25	8	2.5 P		
	5			
	6		11.2	
	7	1.0 P		
	5			
	7		10.2	847.71
-30	6	1.0 P		Medium Dense pale brown (10YR 6/3) SAND (S), medium to very fine, saturated, MC=20.1% 847.21
-35				
-40				

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

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SOIL BORING LOG

Date 5/9/17

ROUTE FAP 525 (US Route 20) **DESCRIPTION** US 20 Culvert/proposed Retaining Wall **LOGGED BY** Eric Slusser

SECTION D-91-476-16 **LOCATION** East side US 20

COUNTY MCHENRY **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. 056-0318, 056-0319 & 056-0320
Station

BORING NO. B-21
Station 122+75
Offset 13.00ft RT
Ground Surface Elev. 877.07 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 871.1 ft
Upon Completion 871.1 ft
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				ASPHALT 876.40
				Loose, black (10YR 2/1) CRUSHED ROCK AGGREGATE FILL (sub-base) 875.97
	6			
	3		8.4	Loose, gray (10YR 5/1) SANDY LOAM FILL, trace large to fine gravel, sand medium to very fine, moist 874.07
	5			
	1			Medium Stiff black (10YR 2/1) CLAY LOAM (CL), trace fine gravel, trace fine sand, moist
	1		21.8	
-5	1	0.5 P		
				871.57
	1			Very Soft black (10YR 2/1) and gray (10YR 5/1) CLAY (C), trace fine gravel, trace fine sand, wet, organic soil
	1		34.2	
	6	0.3 P		
				869.07
	4			Very Stiff to Hard brown (10YR 5/3) SANDY CLAY (SaC), trace medium to fine gravel, moist,
	4		12.4	
-10	7	3.0 P		
	3			
	5		11.1	
	5	3.0 P		
				864.57
			11.8	Pale Brown (10YR 6/3) SANDY LOAM (SaL), trace gravel, little silt, little clay, AASHTO Classification A-4(1), saturated
				862.57
-15	6			Hard Pale Brown (10YR 6/3) SANDY CLAY (SaC), trace gravel, moist
	7		14.4	
	7	4.5 P		
				861.07
	6			Medium Dense brown (10YR 5/30 SANDY LOAM (SaL), clay lense 16.1'-16.4', saturated
	9		9.7	
	10			
				859.07
	5			Hard brown (10YR 5/3) SANDY CLAY (SaC), trace fine gravel, moist
	8		10.3	
-20	11	4.5		

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
		P		Hard brown (10YR 5/3) SANDY CLAY (SaC), trace fine gravel, moist *(continued)*
	6			
	8		10.0	
	9	4.5 P		
				853.57
	6			Medium Dense brown (10YR 5/3) SAND (S), medium to very fine, trace to little silt, saturated
	8		14.5	
-25	14			
				851.57
	7			Hard brown (10YR 5/3) SANDY CLAY (SaC), trace to little fine gravel, trace to little fine sand, moist
	8		9.9	
	11	4.5 P		
				849.07
	6			Medium Dense brown (10YR 5/3) SILTY LOAM (SiL), trace to little, medium to fine gravel, wet
	11		8.3	
-30	1			
	5			
				847.07
-35				
-40				

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

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SOIL BORING LOG

Date 5/9/17

ROUTE FAP 525 (US Route 20) **DESCRIPTION** US 20 Culvert/proposed Retaining Wall **LOGGED BY** Eric Slusser

SECTION D-91-476-16 **LOCATION** West side US 20

COUNTY MCHENRY **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** Automatic

STRUCT. NO. 056-0318, 056-0319 & 056-0320
Station

BORING NO. B-22
Station 123.43
Offset 13.00ft LT
Ground Surface Elev. 877.31 ft

Surface Water Elev. ft
Stream Bed Elev. ft

Groundwater Elev.:
First Encounter 868.3 ft
Upon Completion 868.3 ft
After Hrs. ft

	DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
ASPHALT 876.64				
Loose black (10YR 2/1) CRUSHED AGGREGATE FILL (sub-base) 876.23		3		
Loose pale brown (10YR 6/3) SAND AND CLAY FILL, trace fine gravel, brick fragments, moist 874.31		3 5		12.9
Medium Stiff black (10YR 2/1) CLAY LOAM (CL), trace to little gravel, moist remnant topsoil?		1		
	-5	1 1	0.8 P	28.1
Very Soft black (10YR 2/1) and greenish gray (GREY 4/6) CLAY (C), trace fine gravel, little sand, moist 871.81		1		
		1 1	0.3 P	73.3
brown (10YR 5/3) SILTY LOAM (SiL), trace gravel, some sand, little clay, moist to wet 869.81				51.4
Medium Dense pale brown (10YR 6/3) SAND (S), medium to very fine, saturated, scattered silt lenses (0.01') 11.0-12.5' 867.81	-10	5		
		9 8		12.6
		24		
		14 8		14.8
Very Stiff pale brown (10YR 6/3) SILTY CLAY (SiC), trace fine gravel, trace fine sand, ST-08 15'-17', MC=9.6%, moist 864.31		5		
	-15	4 5	2.5 P	11.7
				9.6
Medium Dense pale brown (10YR 6/3) SILT (Si), trace to little fine gravel, trace fine sand, moist to wet 860.81			2.9 S	
		6		
		8 14		8.4
Medium Dense pale brown (10YR 6/3) SAND (S), medium to very fine, saturated 858.81		9		
	-20	10 12		22.5
Dense pale brown (10 YR 6/3) SANDY LOAM (SaL), trace to little fine gravel, scattered silt lenses 0.01'-0.05', saturated 856.81				
		7		
		14 24		8.6
		14		
	-25	18 21		7.9
		12		
		15 19		11.3
Dense pale brown (10YR 6/3) SILTY LOAM (SiL), trace fine gravel, trace to little fine sand, moist to wet 849.31		12		
847.31	-30	19 25		8.7
	-35			
	-40			

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

Appendix C

Laboratory Test Reports

STRUCTURE GEOTECHNICAL REPORT
US 20 IMPROVEMENT, STRUCTURE NO. 056-0318, 056-0319 & 056-0320
McHENRY COUNTY, ILLINOIS
Interra Project # 7698
Table 1 - Laboratory Test Summary

BORING LOCATION:	**B-14 SS-04**	**B-15 ST-06**	**B-16 ST-03**	**B-16 ST-04**	**B-17 ST-07**	**B-18 ST-03**	**B-18 S5-05**	**B-20 ST-04**	**B-21 ST-06**	**B-22 ST-04**	**B-22 ST-08**
Station	121+05	121+27	121+59	121+59	121+77	121+83	121+83	122+65	122+75	123+43	123+43
Offset	13.00 ft LT	12.00 ft RT	9.00 ft LT	9.00 ft LT	9.00 ft RT	11.00 ft LT	11.00 ft LT	11.00 ft LT	13.00 ft RT	13.00 ft LT	13.00 ft LT
ELEVATION	877.53	887.26	877.31	877.31	877.17	877.14	877.14	877.21	877.07	877.31	877.31
SAMPLE DEPTH	8.5'-10.0'	12.5'-14.5'	5.0'-7.0'	7.0'-9.0'	15.0'-16.0'	6.0'-8.0'	11.0'-12.5'	7.5'-9.5'	12.5'-14.5'	7.5'-9.5'	15.0'-17.0'
IDH /AASHTO CLASSIFICATION	Loam A-4(3)	Loam A-4(1)	Sandy Clay	Silty Loam A-7-6(17)	Clay Loam	Clay Loam	Loam A-4(1)	Loam A-4(3)	Sandy Loam A-4(1)	Silty Loam A-6(6)	Silty Clay
GRADATION-PASSING 1" SIEVE %	100.0	100.0		100.0			100.0	100.0	100.0	100.0	
" 3/4" " %	93.6	100.0		100.0			100.0	100.0	100.0	98.3	
" 1/2" " %	93.6	98.3		100.0			96.7	98.2	98.1	97.1	
" 3/8" " %	89.5	97.5		100.0			96.7	97.7	97.7	96.7	
" NO. 4 " %	87.3	94.4		99.8			94.4	95.0	94.8	93.6	
" NO. 10 " %	85.0	91.7		99.6			91.1	92.0	91.6	90.6	
" NO. 40 " %	80.4	86.0		98.7			85.4	86.8	83.9	86.1	
" NO. 100 " %	68.7	71.6		97.3			70.5	73.2	65.8	74.6	
" NO. 200 " %	60.8	62.3		93.1			60.7	64.2	54.5	68.7	
GRAVEL % (IDH)	15.0	8.3		0.4			8.9	8.0	8.4	9.4	
SAND % (IDH)	28.5	32.0		6.5			33.4	30.2	37.1	24.2	
SILT % (IDH)	42.5	47.1		74.3			45.7	44.8	42.8	51.8	
CLAY % (IDH)	14.0	12.5		18.8			12.0	17.0	11.7	14.6	
D_{90}(mm)											
D_{50}(mm)											
LIQUID LIMIT											
PLASTICITY INDEX											
UNCONFINED COMPRESSIVE STRENGTH (PSF)			703		2054	710					5740
Moisture (%)	11.4	12.5	64.3	80.3	9.9	73.5	12.3	13.5	11.8	51.4	9.6
REMARKS:											

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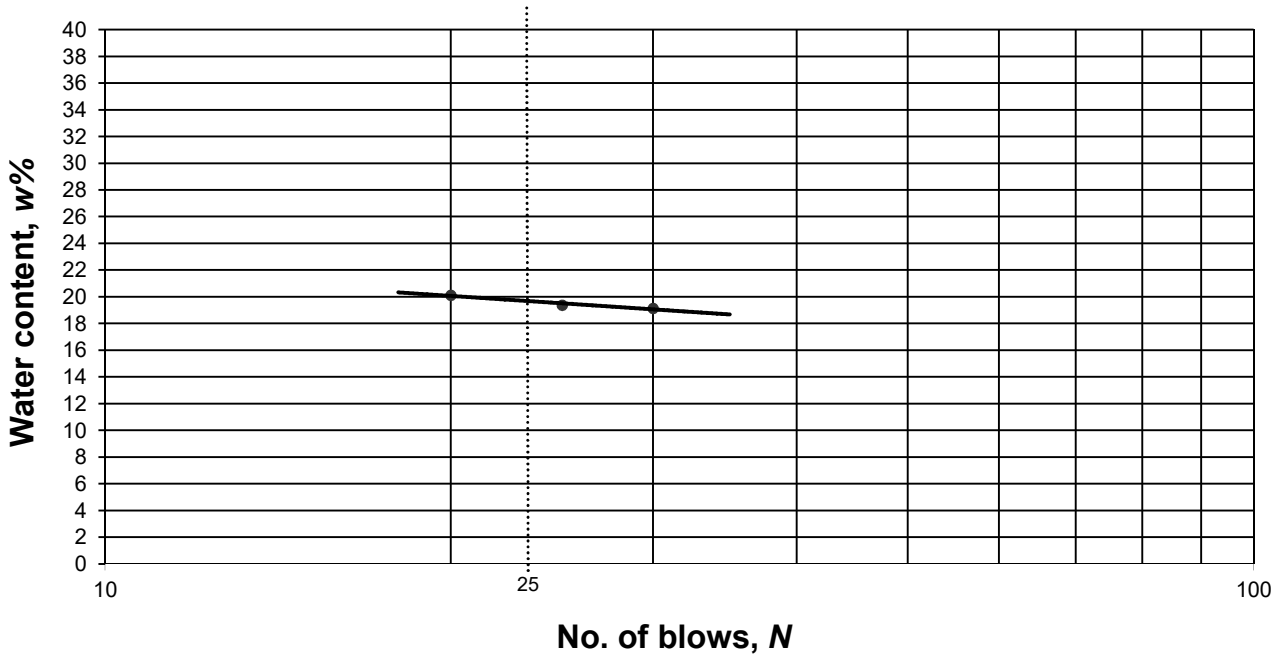
Atterberg Limits

AASHTO T89, 90

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-14 SS-04	**Date Tested**	6/21/2017	**Tested By**	PP
						Qc By	RC

Date Sample Recd.	5/8/2017
Sample Location	8.5-10'
Sample Description	Brown SANDY LEAN CLAY, little gravel

LIQUID LIMIT DETERMINATION



Results					
Liquid Limit, LL	**20**	**Plastic Limit, PL**	**11**	**Plasticity Index, PI**	**9**

Remarks

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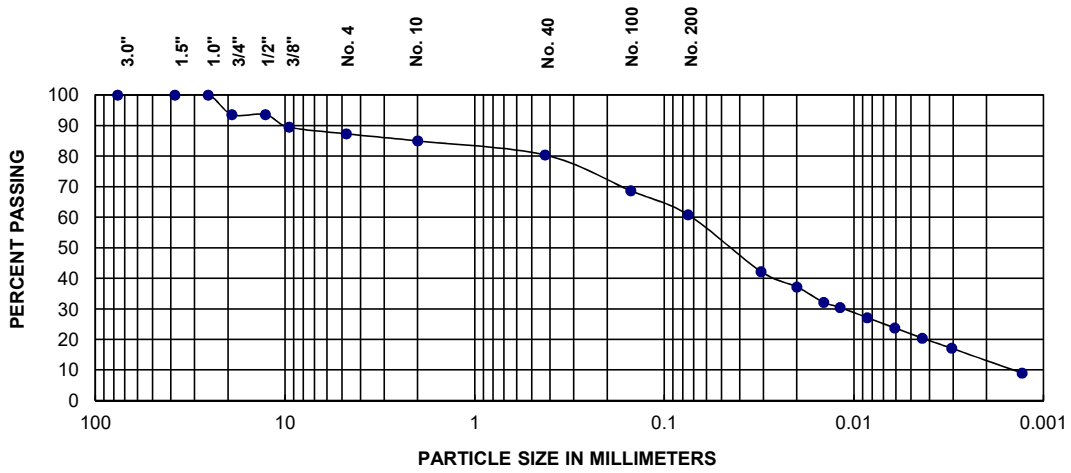
GRAIN SIZE ANALYSIS
AASHTO T88

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-14 SS-04	**Date Tested**	6/2/2017	**Tested by**	PP
						Qc by	RC

Date Sample Received:	5/8/2017
Sample Location	8.5-10'
Sample Description	Brown SANDY LEAN CLAY, little gravel



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	12.7	26.5	38.9	21.9

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"	93.6
1/2"	93.6
3/8"	89.5
No. 4	87.3
No. 10	85.0
No. 40	80.4
No. 100	68.7
No. 200	60.8

Liquid Limit, L_L	**Plastic Limit, PL**	**Plasticity Index, PI**
20	11	9

Soil Classification:	CL
Soil Description:	Sandy lean clay
System:	USCS

Remarks:	
IDH Classification: Loam; AASHTO Classification: A-4(3)	

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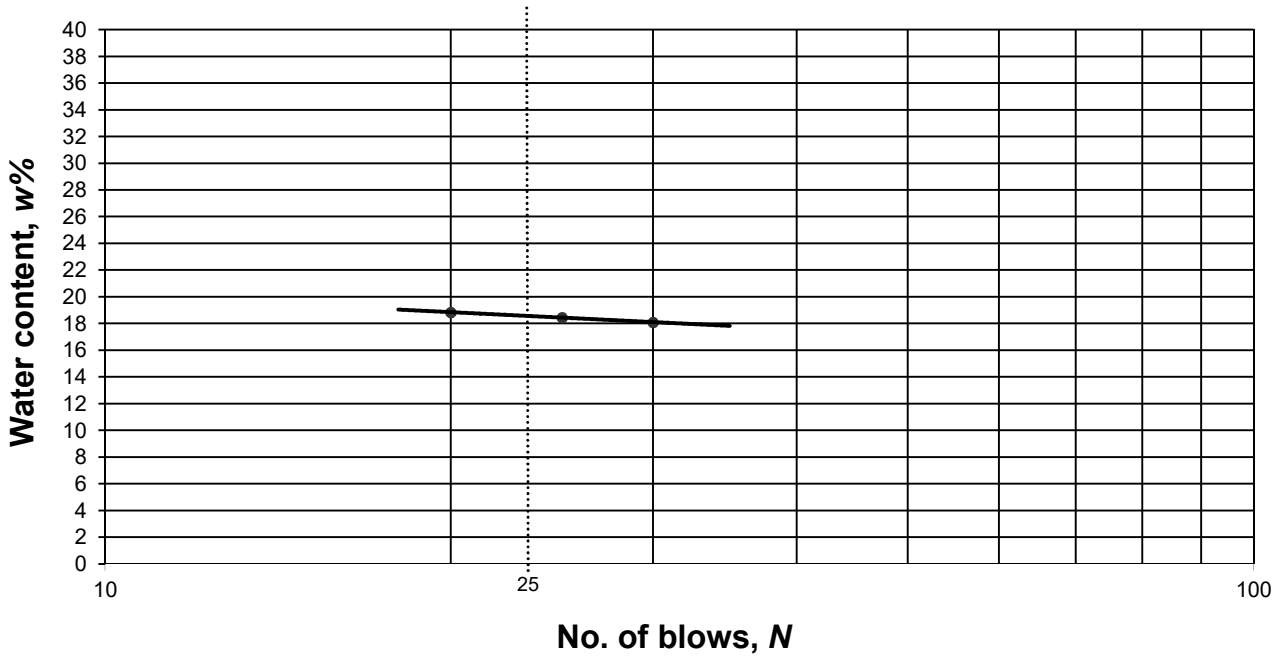
Atterberg Limits

AASHTO T89, 90

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-15 ST-06	**Date Tested**	6/1/2017	**Tested By**	PP
						Qc By	RC

Date Sample Recd.	5/10/2017
Sample Location	12.5-14.5
Sample Description	Pale brown (10YR 6/3)SANDY LEAN CLAY, trace gravel

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	**18**	**Plastic Limit, PL**	**12**	**Plasticity Index, PI**	**6**

Remarks

INTERRA
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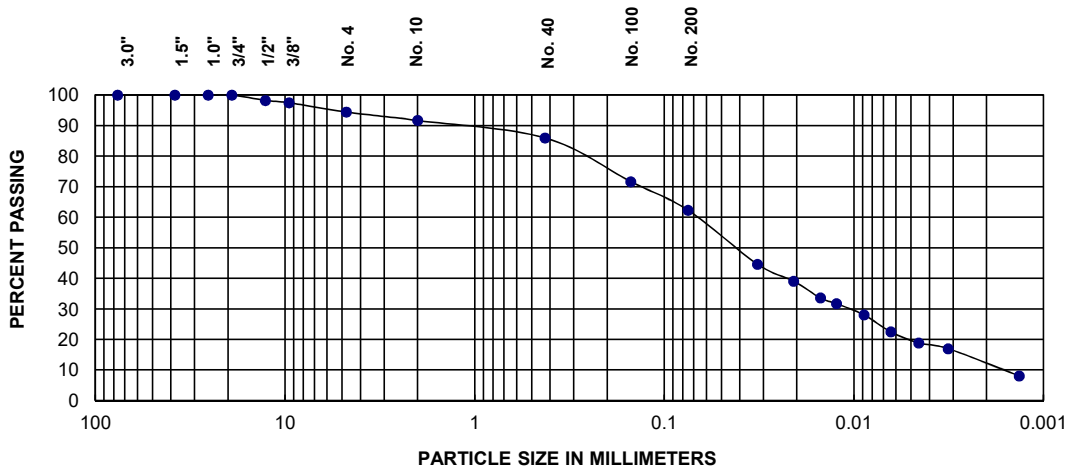
GRAIN SIZE ANALYSIS
AASHTO T88

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-15 ST-06	**Date Tested**	6/2/2017	**Tested by**	PP
						Qc by	RC

Date Sample Received:	5/10/2017
Sample Location	12.5-14.5
Sample Description	Pale brown (10YR 6/3) SANDY LEAN CLAY, trace gravel



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	5.6	32.1	42.1	20.2

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"	98.3
3/8"	97.5
No. 4	94.4
No. 10	91.7
No. 40	86.0
No. 100	71.6
No. 200	62.3

Liquid Limit, L_L	**Plastic Limit, PL**	**Plasticity Index, PI**
18	12	6

Soil Classification:	CL-ML
Soil Description:	Sandy silty clay
System:	USCS

Remarks:	
IDH Classification: Loam; AASHTO Classification: A-4(1)	

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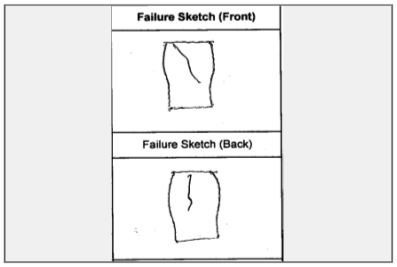
UNCONFINED COMPRESSIVE STRENGTH (ASTM D 2166)

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample No.**	B-15 ST-06	**Date Tested**	5/24/17	**Tested By**	PP
						QC By	RC

Date Sample Received	5/10/17
Description of Soil	pale brown (10YR 6/3) Sandy Clay , trace to little gravel
Location	12.5'-14.5'

Type of Sample	SS	
Average Height =	15.89	cm
Average Diameter =	7.23	cm
Height/Diameter Ratio =	2.20	
Wet Sample Weight=	1527.17	g
Wet Density =	2.34	g/cc
Moisture Content =	12.5	%
Dry Density =	2.08	g/cc
Strain Rate =	1.00	%/min



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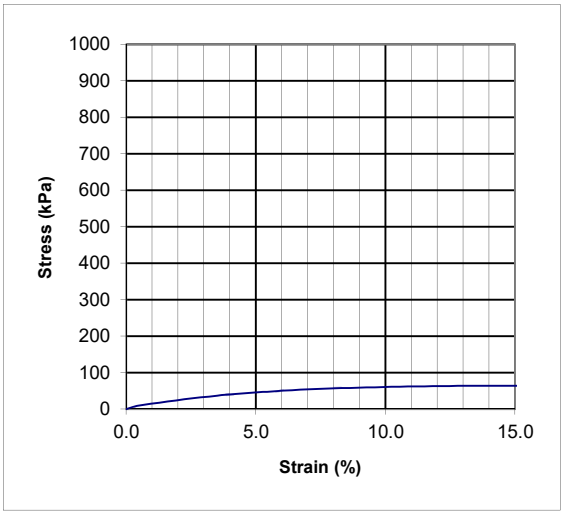

Unconfined Compressive Strength =	63.9 **1335**	kPa **psf**
Shear Strength =	32 668	kPa psf
Strain at Failure =	15.0	%

Remarks:

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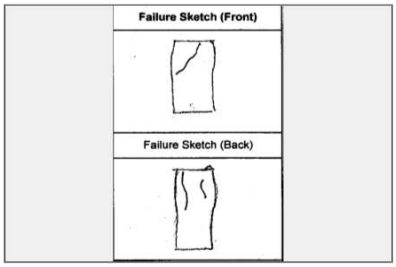
UNCONFINED COMPRESSIVE STRENGTH (ASTM D 2166)

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample No.**	B-16 ST-03	**Date Tested**	5/23/17	**Tested By**	PP
						QC By	RC

Date Sample Received	5/8/17
Description of Soil	
Location	5-7'

Type of Sample	SS	
Average Height =	15.10	cm
Average Diameter =	7.18	cm
Height/Diameter Ratio =	2.10	
Wet Sample Weight=	971.81	g
Wet Density =	1.59	g/cc
Moisture Content =	64.3	%
Dry Density =	0.97	g/cc
Strain Rate =	1.00	%/min



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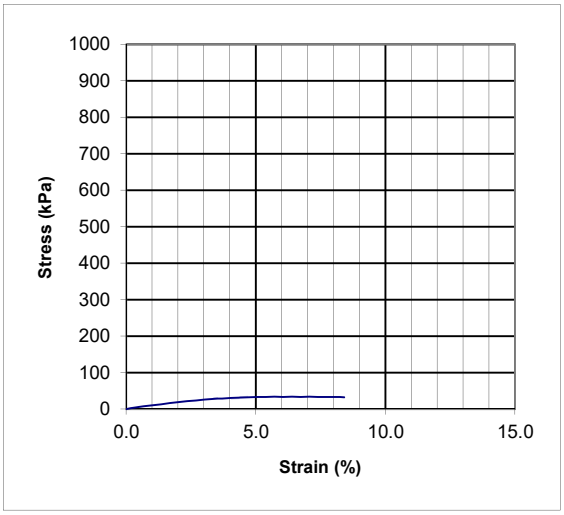

Unconfined Compressive Strength =	33.7 **703**	kPa **psf**
Shear Strength =	17 352	kPa psf
Strain at Failure =	7.1	%

Remarks:

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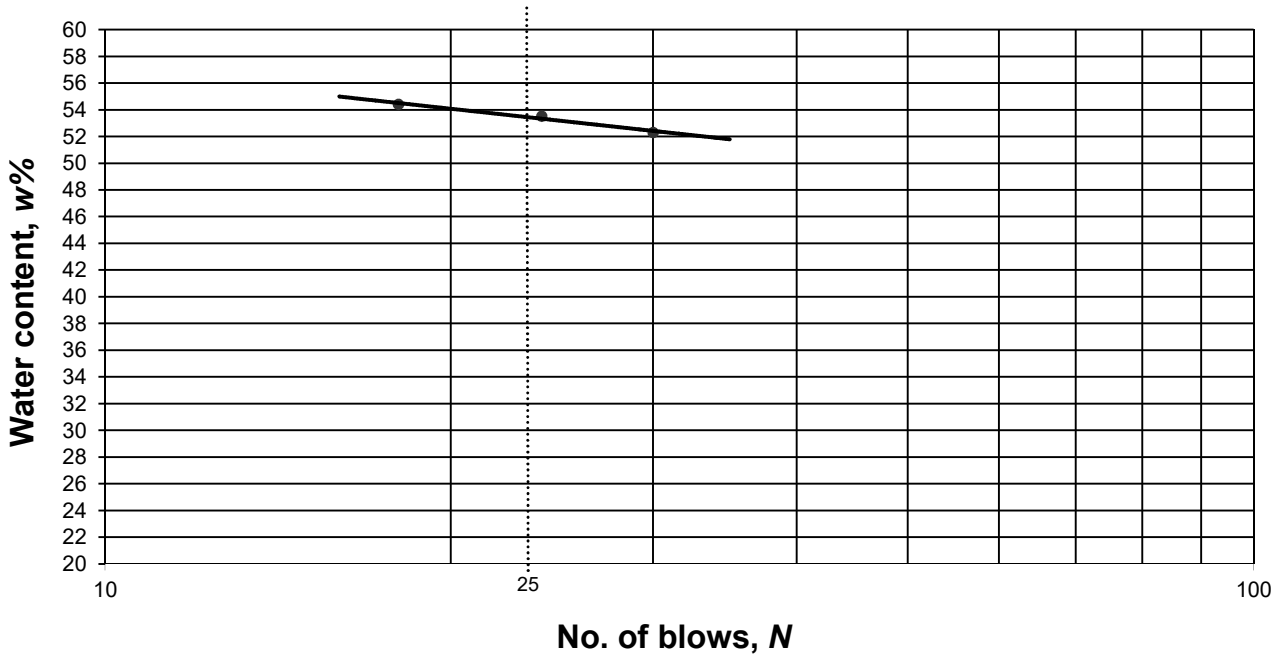
Atterberg Limits

AASHTO T89, 90

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-16 ST-04	**Date Tested**	7/10/2017	**Tested By**	PP
						Qc By	RC

Date Sample Recd.	5/8/2017
Sample Location	7-9'
Sample Description	light gray (10YR 7/1)

LIQUID LIMIT DETERMINATION



Results					
Liquid Limit, LL	**53**	**Plastic Limit, PL**	**41**	**Plasticity Index, PI**	**12**

Remarks

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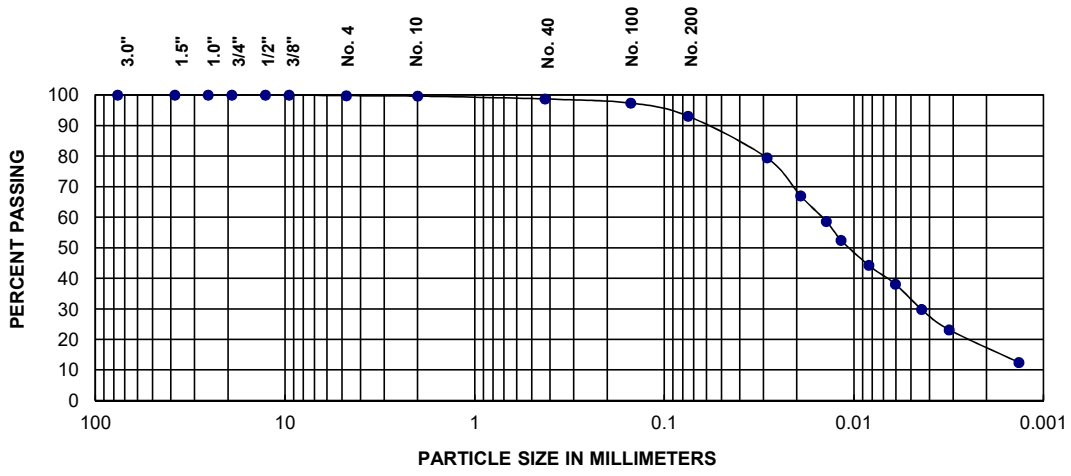
GRAIN SIZE ANALYSIS
AASHTO T88

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-16 ST-04	**Date Tested**	7/10/2017	**Tested by**	PP
						Qc by	RC

Date Sample Received:	5/8/2017
Sample Location	7-9'
Sample Description	light gray (10YR 7/1)



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	0.2	6.7	59.8	33.3

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"	100.0
3/8"	100.0
No. 4	99.8
No. 10	99.6
No. 40	98.7
No. 100	97.3
No. 200	93.1

Liquid Limit, L_L	**Plastic Limit, PL**	**Plasticity Index, PI**
53	41	12

Soil Classification:	MH
Soil Description:	Elastic silt
System:	USCS

Remarks:	
IDH Classification: Silty loam; AASHTO Classification: A-7-6(17)	

Test ID	58645

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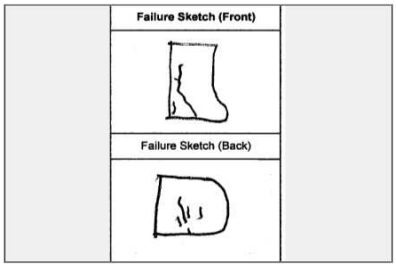
UNCONFINED COMPRESSIVE STRENGTH (ASTM D 2166)

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample No.**	B-16 ST-04	**Date Tested**	7/5/17	**Tested By**	PP
						QC By	RC

Date Sample Received	5/8/17
Description of Soil	light gray (10YR 7/1)
Location	7-9'

Type of Sample	SS	
Average Height =	15.47	cm
Average Diameter =	7.16	cm
Height/Diameter Ratio =	2.16	
Wet Sample Weight=	961.08	g
Wet Density =	1.54	g/cc
Moisture Content =	80.3	%
Dry Density =	0.86	g/cc
Strain Rate =	1.00	%/min



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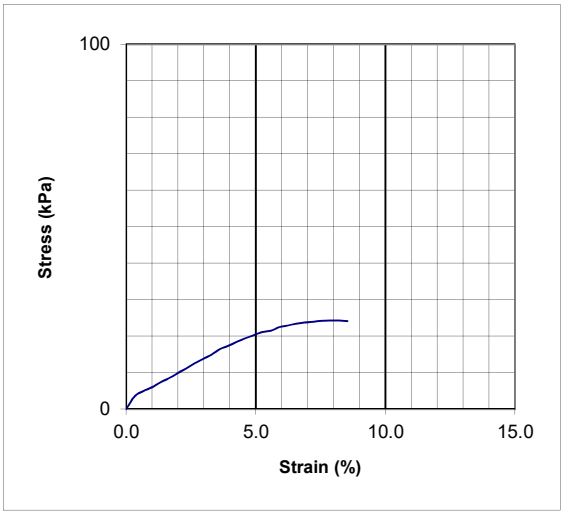

Unconfined Compressive Strength =	24.3 **507**	kPa **psf**
Shear Strength =	12 254	kPa psf
Strain at Failure =	7.9	%

Remarks:

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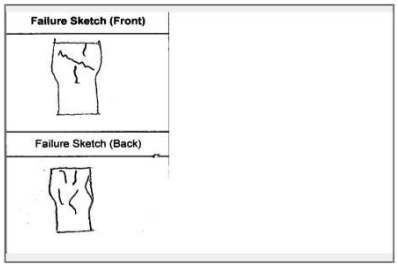
UNCONFINED COMPRESSIVE STRENGTH (ASTM D 2166)

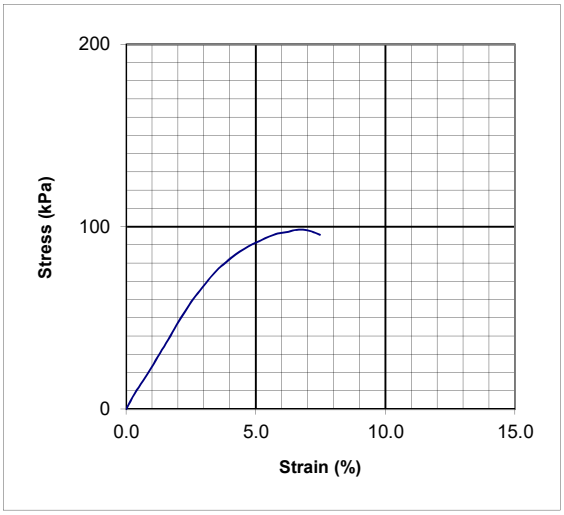
Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample No.**	B-17 ST-07	**Date Tested**	5/18/17	**Tested By**	PP
						QC By	RC

Date Sample Received	5/10/17
Description of Soil	Pale brown (10 YR 6/3) Clay loam, trace fine gravel
Location	15-17' (15-16')

Type of Sample	SS	
Average Height =	15.64	cm
Average Diameter =	7.25	cm
Height/Diameter Ratio =	2.16	
Wet Sample Weight=	1539.08	g
Wet Density =	2.38	g/cc
Moisture Content =	9.9	%
Dry Density =	2.17	g/cc
Strain Rate =	1.00	%/min



Failure Image



Unconfined Compressive Strength =	98.4 **2054**	kPa **psf**
Shear Strength =	49 1028	kPa psf
Strain at Failure =	6.8	%

Remarks:

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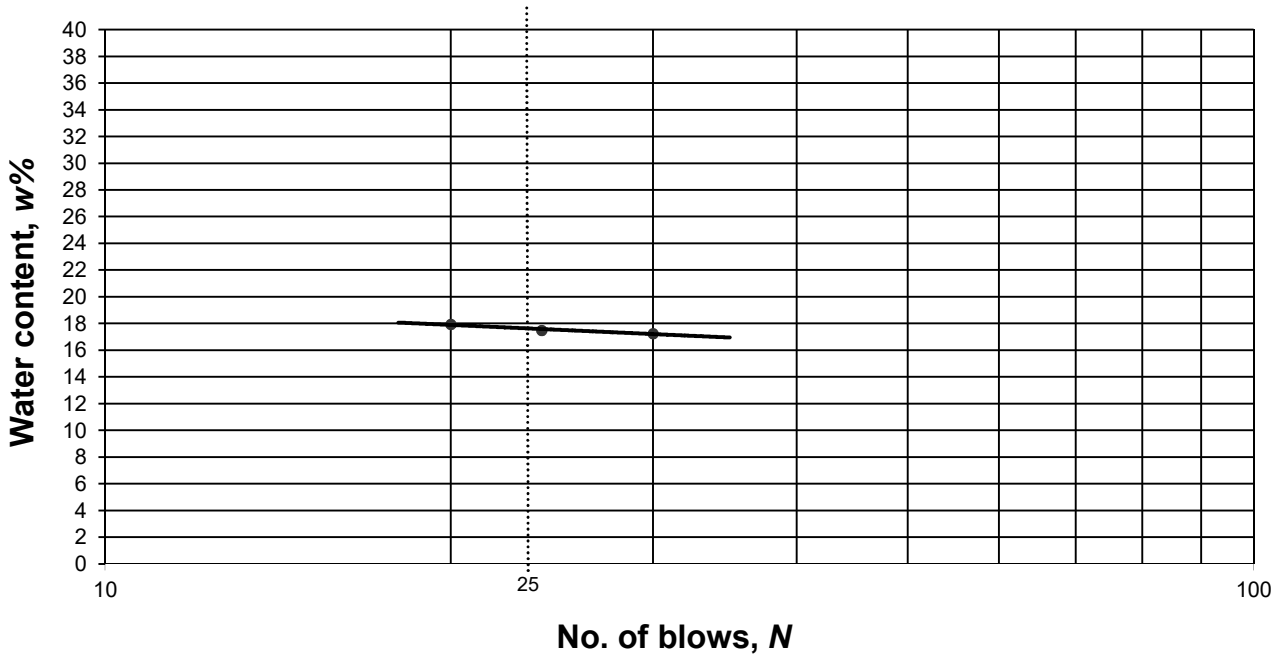
Atterberg Limits

AASHTO T89, 90

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-18 SS-05	**Date Tested**	6/1/2017	**Tested By**	PP
						Qc By	RC

Date Sample Recd.	5/9/2017
Sample Location	11-12.5'
Sample Description	Pale Brown (10YR 6/3) SANDY LEAN CLAY, trace gravel

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	**18**	**Plastic Limit, PL**	**12**	**Plasticity Index, PI**	**6**

Remarks

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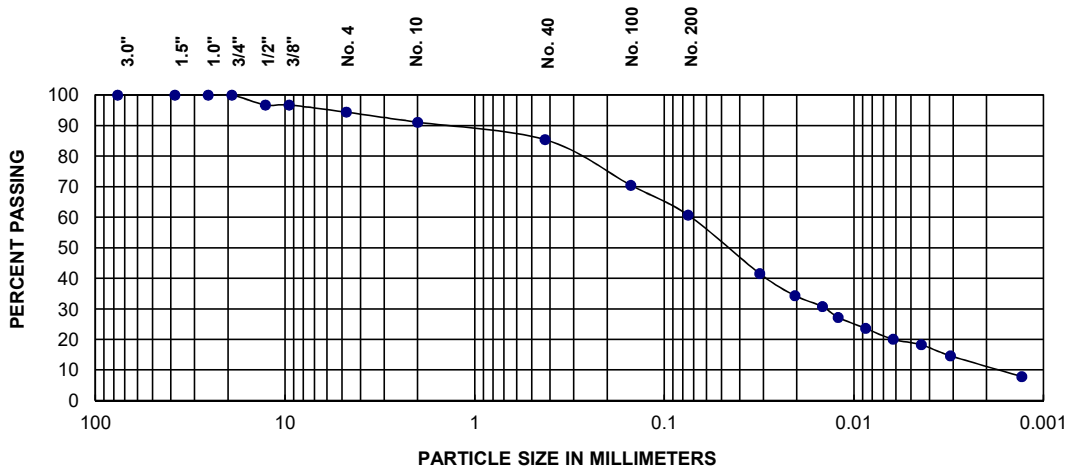
GRAIN SIZE ANALYSIS
AASHTO T88

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-18 SS-05	**Date Tested**	6/2/2017	**Tested by**	PP
						Qc by	RC

Date Sample Received:	5/9/2017
Sample Location	11-12.5'
Sample Description	Pale Brown (10YR 6/3) SANDY LEAN CLAY, trace gravel



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	5.6	33.7	41.8	18.9

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"	96.7
3/8"	96.7
No. 4	94.4
No. 10	91.1
No. 40	85.4
No. 100	70.5
No. 200	60.7

Liquid Limit, L_L	**Plastic Limit, PL**	**Plasticity Index, PI**
18	12	6

Soil Classification:	CL-ML
Soil Description:	Sandy silty clay
System:	USCS

Remarks:	
IDH Classification: Loam; AASHTO Classification: A-4(1)	

Test ID	58647

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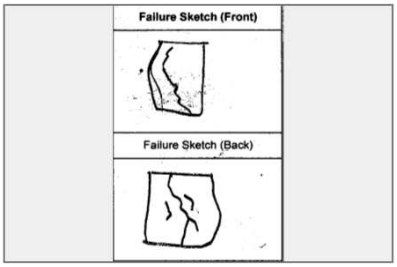
UNCONFINED COMPRESSIVE STRENGTH (ASTM D 2166)

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample No.**	B-18 ST-03	**Date Tested**	7/5/17	**Tested By**	ES
						QC By	RC

Date Sample Received	5/9/17
Description of Soil	Black (10YR 2/1)
Location	6-8'

Type of Sample	ST	
Average Height =	15.05	cm
Average Diameter =	7.20	cm
Height/Diameter Ratio =	2.09	
Wet Sample Weight=	881.25	g
Wet Density =	1.44	g/cc
Moisture Content =	73.5	%
Dry Density =	0.83	g/cc
Strain Rate =	1.00	%/min



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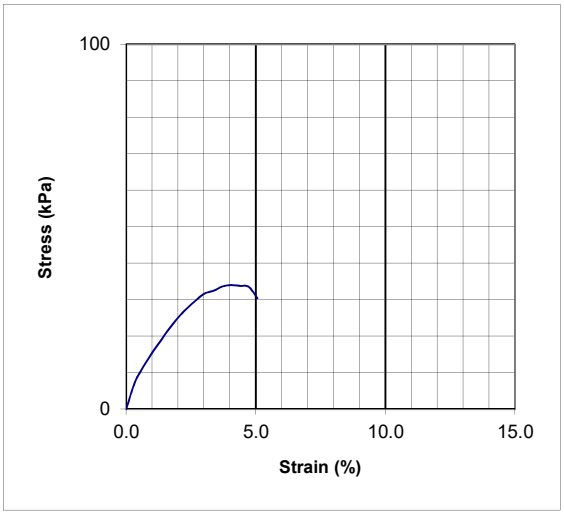

Unconfined Compressive Strength =	34.0 **710**	kPa **psf**
Shear Strength =	17 355	kPa psf
Strain at Failure =	4.4	%

Remarks:

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Test ID	58399

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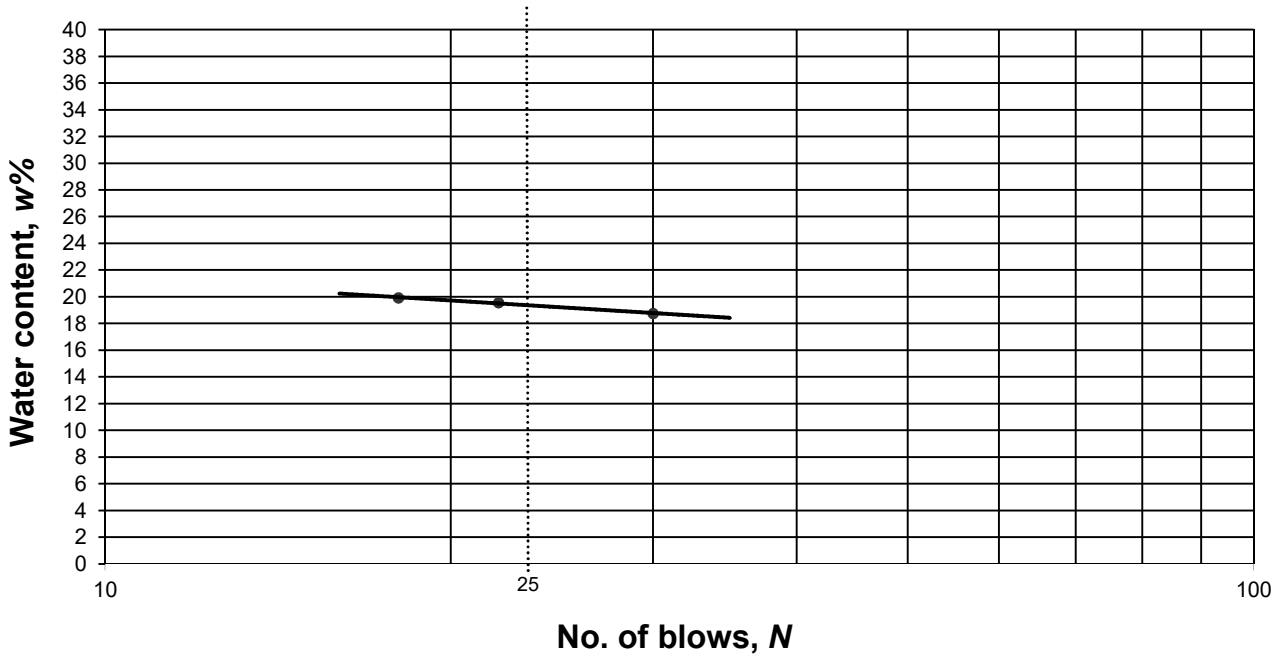
Atterberg Limits

AASHTO T89, 90

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-20 ST-04	**Date Tested**	7/10/2017	**Tested By**	PP
						Qc By	RC

Date Sample Recd.	5/9/2017
Sample Location	7.5-9.5'
Sample Description	Brown (10YR 5/3) SANDY LEAN CLAY, trace gravel

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	**19**	**Plastic Limit, PL**	**11**	**Plasticity Index, PI**	**8**

Remarks

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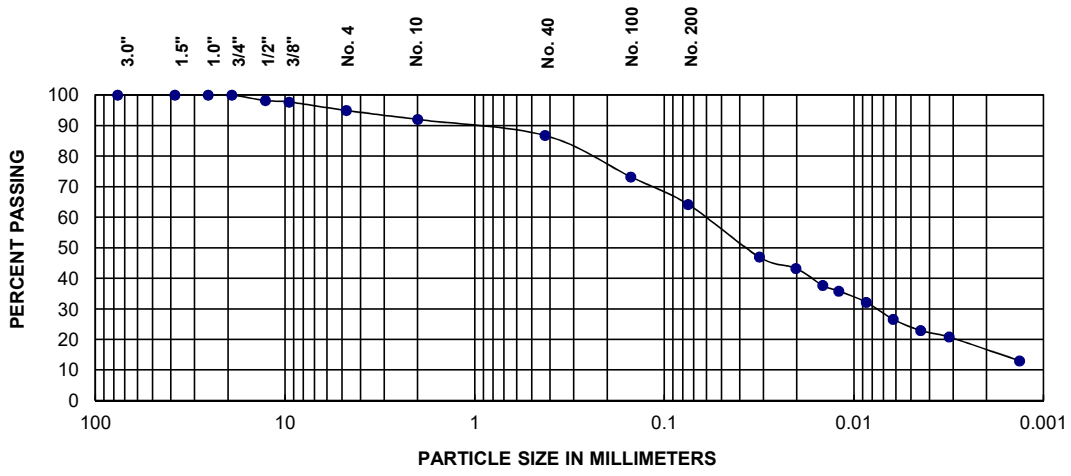
GRAIN SIZE ANALYSIS
AASHTO T88

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-20 ST-04	**Date Tested**	7/10/2017	**Tested by**	PP
						Qc by	RC

Date Sample Received:	5/9/2017
Sample Location	7.5-9.5'
Sample Description	Brown (10YR 5/3) SANDY LEAN CLAY, trace gravel



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	5.0	30.8	39.7	24.5

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"	98.2
3/8"	97.7
No. 4	95.0
No. 10	92.0
No. 40	86.8
No. 100	73.2
No. 200	64.2

Liquid Limit, L_L	**Plastic Limit, PL**	**Plasticity Index, PI**
19	11	8

Soil Classification:	CL
Soil Description:	Sandy lean clay
System:	USCS

Remarks:	
IDH Classification: Loam; AASHTO Classification: A-4(3)	

Test ID	58649

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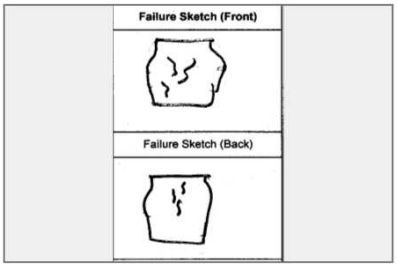
UNCONFINED COMPRESSIVE STRENGTH (ASTM D 2166)

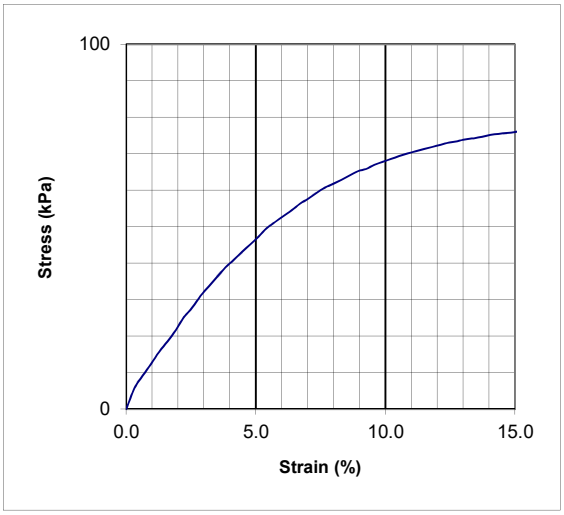
Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample No.**	B-20 ST-04	**Date Tested**	7/5/17	**Tested By**	ES
						QC By	RC

Date Sample Received	5/9/17
Description of Soil	Brown (10YR 5/3) SANDY LEAN CLAY, trace gravel
Location	7.5-9.5'

Type of Sample	ST	
Average Height =	15.91	cm
Average Diameter =	7.23	cm
Height/Diameter Ratio =	2.20	
Wet Sample Weight=	1494.34	g
Wet Density =	2.29	g/cc
Moisture Content =	13.5	%
Dry Density =	2.01	g/cc
Strain Rate =	1.00	%/min



Failure Image



Unconfined Compressive Strength =	75.9 **1585**	kPa **psf**
Shear Strength =	38 793	kPa psf
Strain at Failure =	15.0	%

Remarks:

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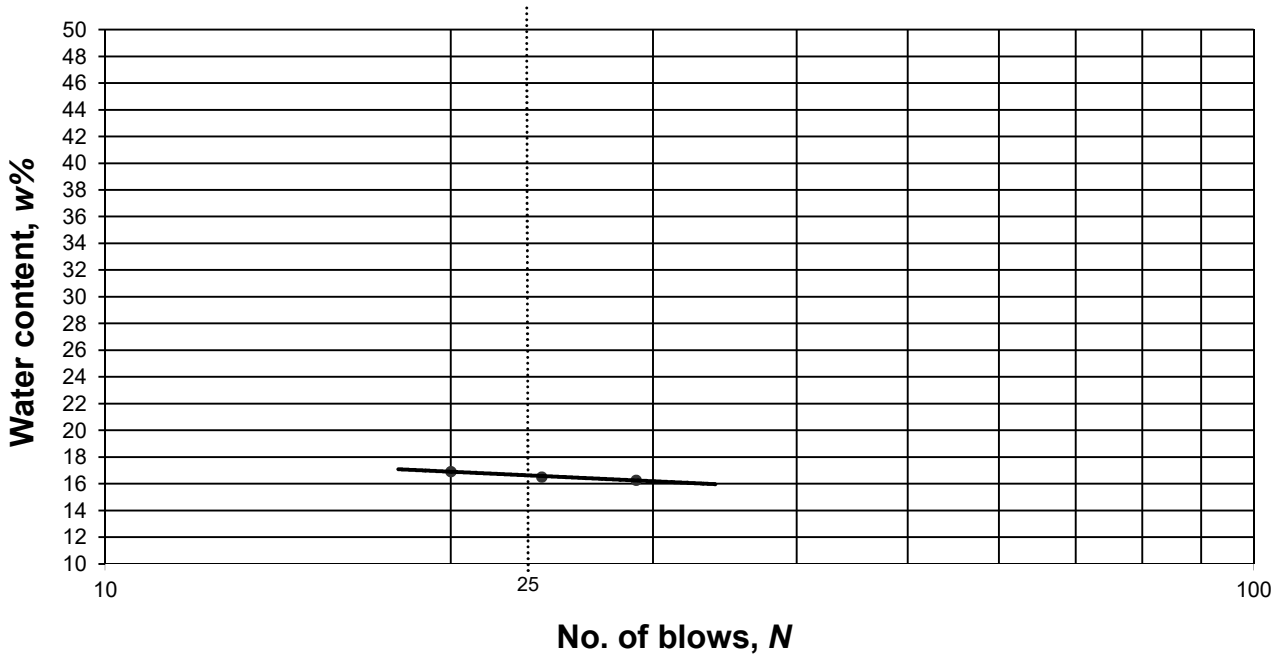
Atterberg Limits
AASHTO T89, 90

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-21 ST-06	**Date Tested**	6/1/2017	**Tested By**	PP
						Qc By	RC

Date Sample Recd.	5/9/2017
Sample Location	12.5-14.5'
Sample Description	Pale brown (10 YR 6/3) SANDY SILTY CLAY, trace gravel

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	**17**	**Plastic Limit, PL**	**11**	**Plasticity Index, PI**	**6**

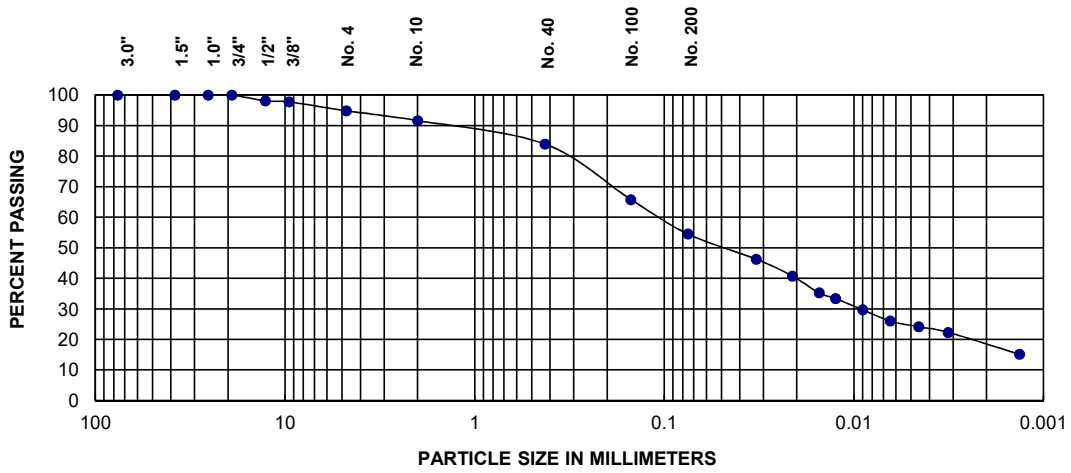
Remarks

INTERRA
Engineering • Inspection • Testing

GRAIN SIZE ANALYSIS
AASHTO T88

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-21 ST-06	**Date Tested**	6/2/2017	**Tested by**	PP
						Qc by	RC

Date Sample Received:	5/9/2017
Sample Location	12.5-14.5'
Sample Description	Pale brown (10 YR 6/3) SANDY SILTY CLAY, trace gravel



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	5.2	40.3	29.9	24.6

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"	100.0
1/2"	98.1
3/8"	97.7
No. 4	94.8
No. 10	91.6
No. 40	83.9
No. 100	65.8
No. 200	54.5

Liquid Limit, L_L	**Plastic Limit, PL**	**Plasticity Index, PI**
17	11	6

Soil Classification:	CL-ML
Soil Description:	Sandy silty clay
System:	USCS

Remarks:	
IDH Classification: Sandy loam; AASHTO Classification: A-4(1)	

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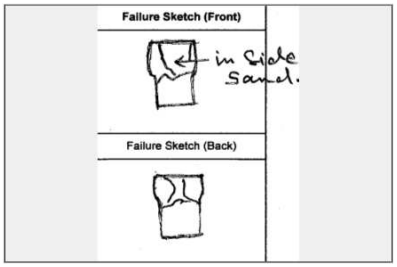
UNCONFINED COMPRESSIVE STRENGTH (ASTM D 2166)

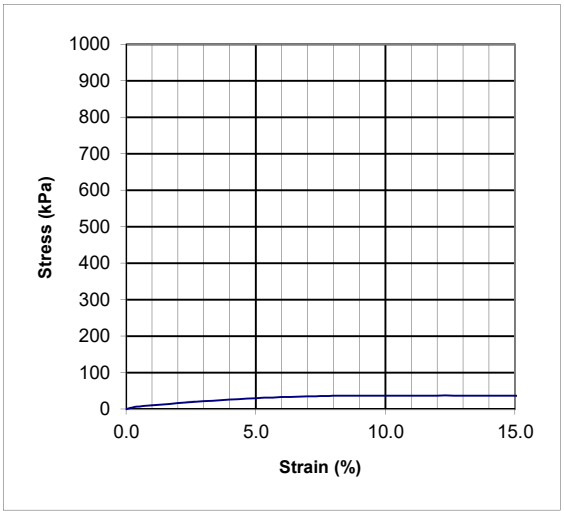
Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample No.**	B-21 ST-06	**Date Tested**	5/23/17	**Tested By**	PP
						QC By	RC

Date Sample Received	5/9/17
Description of Soil	Pale brown (10 YR 6/3) sandy clay
Location	12.5-14.5'

Type of Sample	ST	
Average Height =	15.27	cm
Average Diameter =	7.32	cm
Height/Diameter Ratio =	2.09	
Wet Sample Weight=	1481.81	g
Wet Density =	2.30	g/cc
Moisture Content =	11.8	%
Dry Density =	2.06	g/cc
Strain Rate =	1.00	%/min



Failure Image



Unconfined Compressive Strength =	37.2 **776**	kPa **psf**
Shear Strength =	19 388	kPa psf
Strain at Failure =	12.3	%

Remarks:

INTERRA
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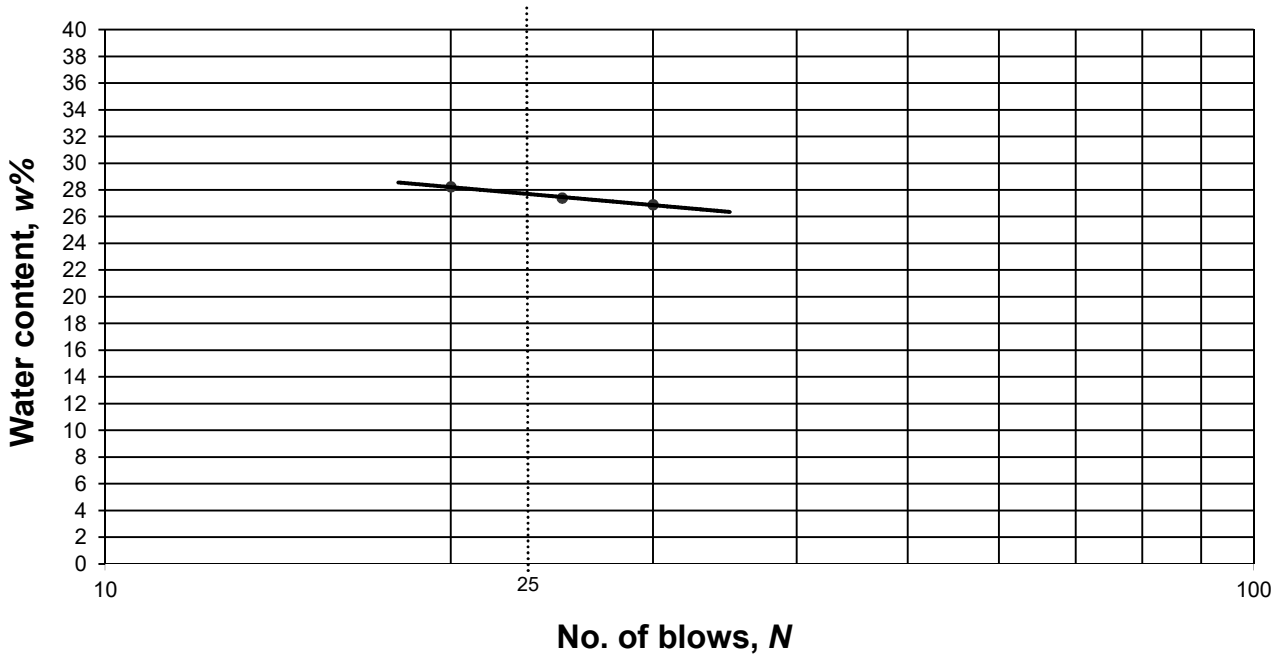
Atterberg Limits

AASHTO T89, 90

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-22 ST-04	**Date Tested**	6/1/2017	**Tested By**	PP
						Qc By	RC

Date Sample Recd.	5/9/2017
Sample Location	7.5-9.5'
Sample Description	Brown(10YR 5/3) SANDY LEAN CLAY, trace gravel

LIQUID LIMIT DETERMINATION



Results

Liquid Limit, LL	**27**	**Plastic Limit, PL**	**16**	**Plasticity Index, PI**	**11**

Remarks

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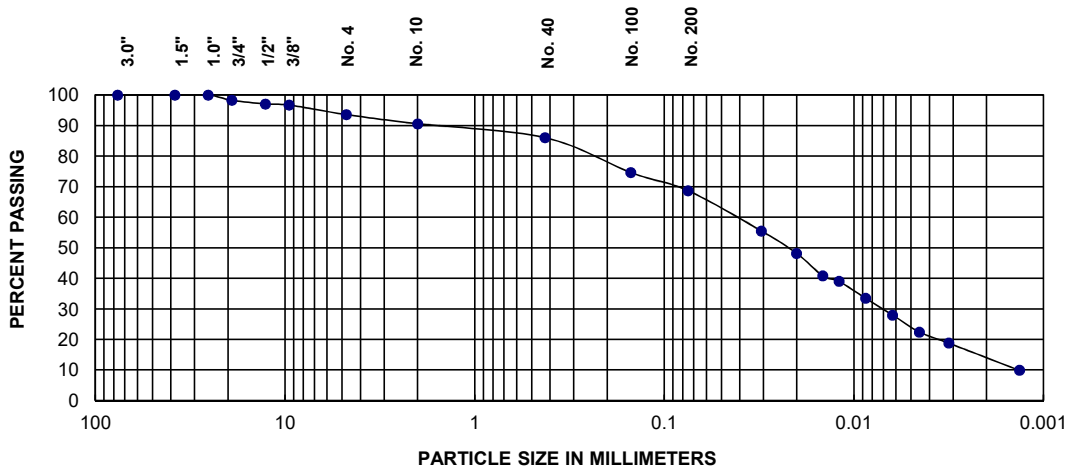
GRAIN SIZE ANALYSIS
AASHTO T88

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample #**	B-22 ST-04	**Date Tested**	6/2/2017	**Tested by**	PP
						Qc by	RC

Date Sample Received:	5/9/2017
Sample Location	7.5-9.5'
Sample Description	Brown(10YR 5/3) SANDY LEAN CLAY, trace gravel



			Fines	
% + 3"	**% Gravel**	**% Sand**	**% Silt**	**% Clay**
0.0	6.4	24.9	44.2	24.5

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"	98.3
1/2"	97.1
3/8"	96.7
No. 4	93.6
No. 10	90.6
No. 40	86.1
No. 100	74.6
No. 200	68.7

Liquid Limit, L_L	**Plastic Limit, PL**	**Plasticity Index, PI**
27	16	11

Soil Classification:	CL
Soil Description:	Sandy lean clay
System:	USCS

Remarks:	
IDH Classification: Silty loam; AASHTO Classification: A-6(6)	

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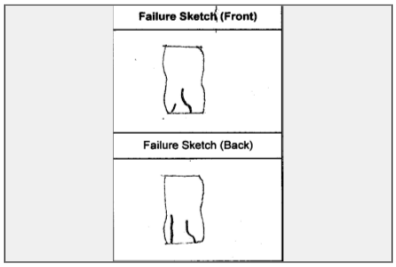
UNCONFINED COMPRESSIVE STRENGTH (ASTM D 2166)

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample No.**	B-22 ST-04	**Date Tested**	5/23/17	**Tested By**	PP
						QC By	RC

Date Sample Received	5/9/17
Description of Soil	
Location	7.5-9.5'

Type of Sample	ST	
Average Height =	14.44	cm
Average Diameter =	7.15	cm
Height/Diameter Ratio =	2.02	
Wet Sample Weight=	1042.89	g
Wet Density =	1.80	g/cc
Moisture Content =	51.4	%
Dry Density =	1.19	g/cc
Strain Rate =	1.00	%/min



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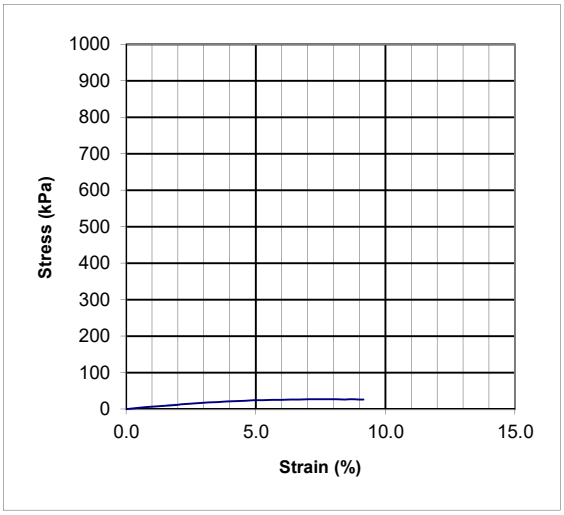

Unconfined Compressive Strength =	26.8 **560**	kPa **psf**
Shear Strength =	13 280	kPa psf
Strain at Failure =	7.7	%

Remarks:

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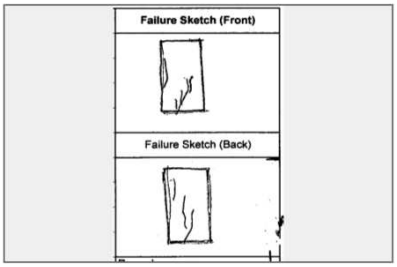
UNCONFINED COMPRESSIVE STRENGTH (ASTM D 2166)

Project	US 20 Cont. No. 62D36 Geotech - Baxter Woodman						
Client	Baxter & Woodman, 8678 Ridgefield Road, Crystal Lake, IL 60012						
File No.	7698	**Sample No.**	B-22 ST-08	**Date Tested**	5/17/17	**Tested By**	PP
						QC By	RC

Date Sample Received	5/9/17
Description of Soil	Pale brown (10 YR 6/3) Silty clay, trace fine gravel, trace-little sand
Location	15-17'

Type of Sample	SS	
Average Height =	15.78	cm
Average Diameter =	7.17	cm
Height/Diameter Ratio =	2.20	
Wet Sample Weight=	1508.71	g
Wet Density =	2.37	g/cc
Moisture Content =	9.6	%
Dry Density =	2.16	g/cc
Strain Rate =	1.00	%/min



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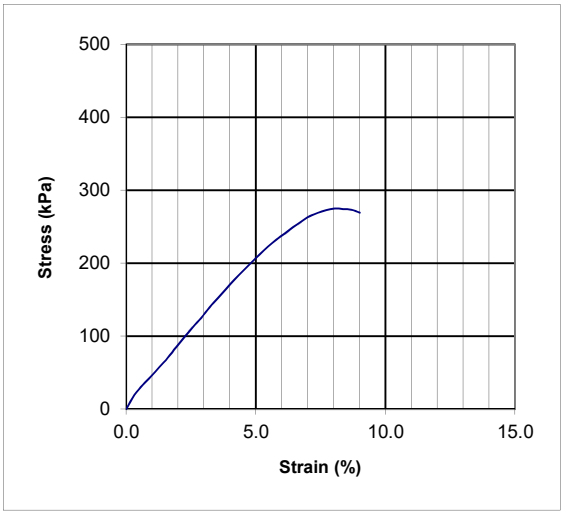


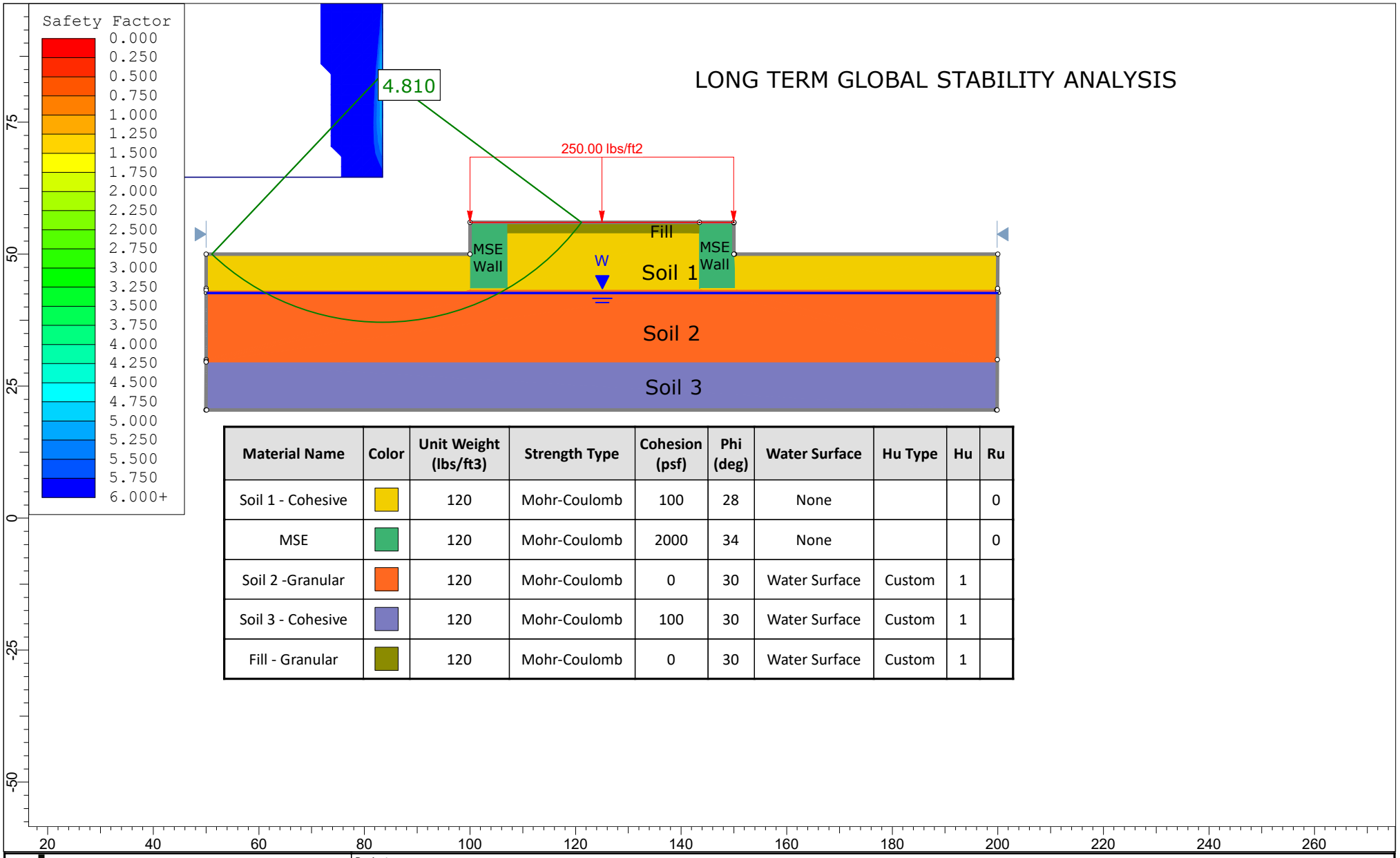
Unconfined Compressive Strength =	274.9 **5740**	kPa **psf**
Shear Strength =	137 2871	kPa psf
Strain at Failure =	8.4	%

Remarks:

Appendix D

Retaining Wall Global Slope Stability Analysis Results

LONG TERM GLOBAL STABILITY ANALYSIS



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Soil 1 - Cohesive		120	Mohr-Coulomb	100	28	None			0
MSE		120	Mohr-Coulomb	2000	34	None			0
Soil 2 -Granular		120	Mohr-Coulomb	0	30	Water Surface	Custom	1	
Soil 3 - Cohesive		120	Mohr-Coulomb	100	30	Water Surface	Custom	1	
Fill - Granular		120	Mohr-Coulomb	0	30	Water Surface	Custom	1	

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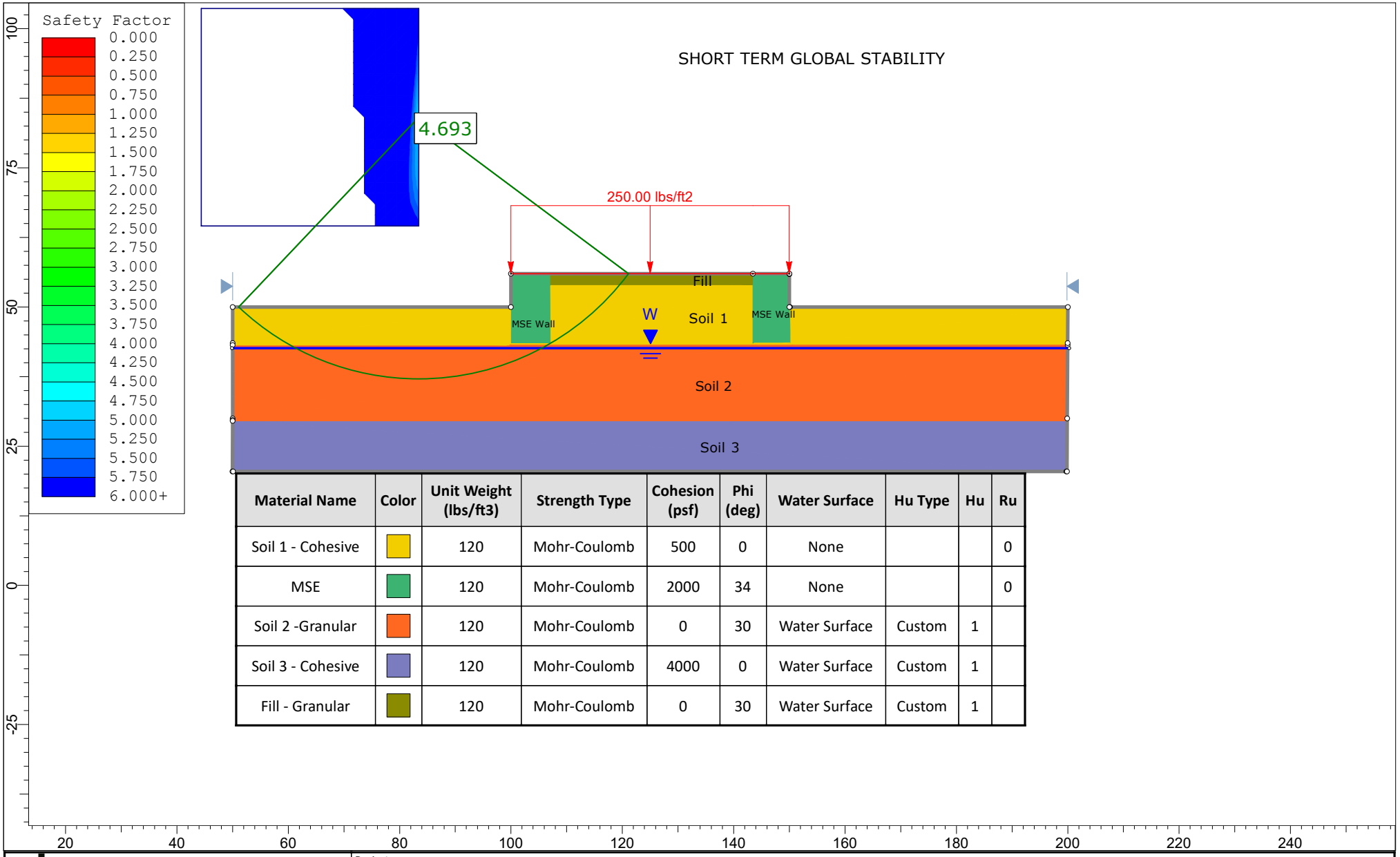
SLIDEINTERPRET 7.028

Project	US 20-MSE Retaining Walls, **JOB D-91-476-16**		
Analysis Description	GLOBAL STABILITY ANALYSIS		
Drawn By		*Scale* 1:301	*Company* INTERRA, Inc.
Date	10/13/17		*File Name* Retaining Wall-Long Term.slim



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)	Water Surface	Hu Type	Hu	Ru
Soil 1 - Cohesive		120	Mohr-Coulomb	500	0	None			0
MSE		120	Mohr-Coulomb	2000	34	None			0
Soil 2 -Granular		120	Mohr-Coulomb	0	30	Water Surface	Custom	1	
Soil 3 - Cohesive		120	Mohr-Coulomb	4000	0	Water Surface	Custom	1	
Fill - Granular		120	Mohr-Coulomb	0	30	Water Surface	Custom	1	

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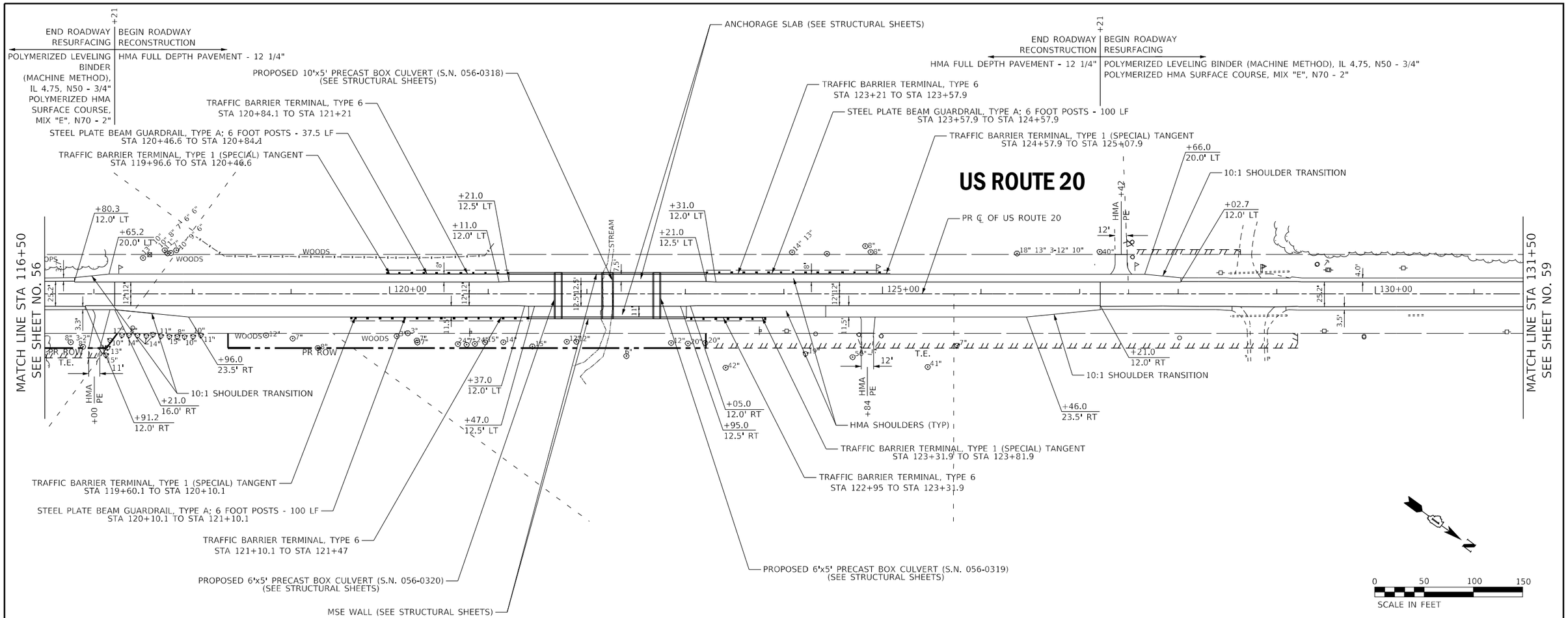
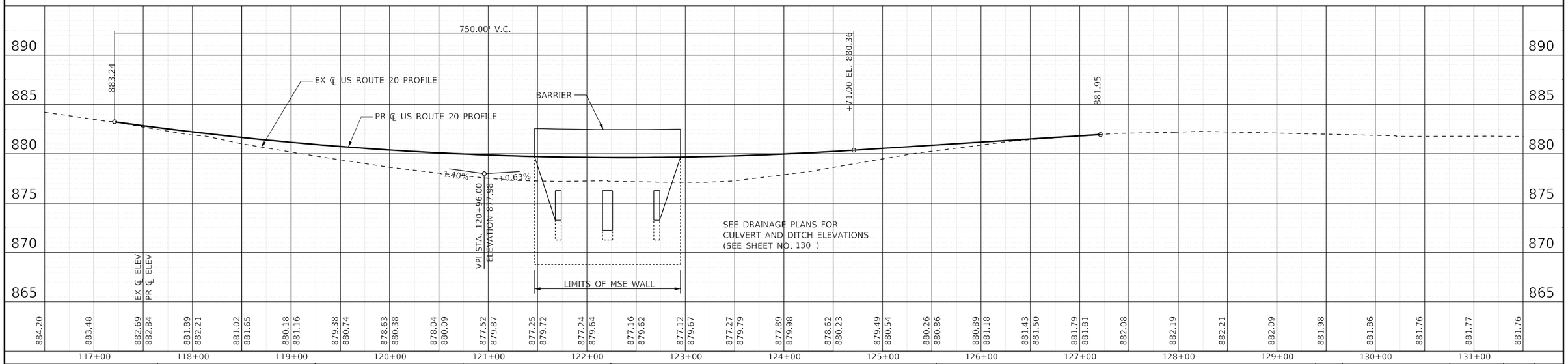
SLIDEINTERPRET 7.028

Project	US 20-MSE Retaining Walls, **JOB D-91-476-16**		
Analysis Description	GLOBAL STABILITY ANALYSIS		
Drawn By		Scale 1:286	Company INTERRA, Inc.
Date	10/13/17		File Name Retaining Wall.slim

Appendix E

Roadway Plan & Profile





BAXTER & WOODMAN Consulting Engineers	USER NAME = 560KAR	DESIGNED - REW	REVISED -	STATE OF ILLINOIS DEPARTMENT OF TRANSPORTATION	ROADWAY PLAN & PROFILE US ROUTE 20
		DRAWN - CJC	REVISED -		
	PLOT SCALE = 50.0000 ' / in.	CHECKED - JFM	REVISED -		SCALE: 1" = 50' SHEET 4 OF 14 SHEETS STA. 116+50 TO STA. 131+50
	PLOT DATE = 3/12/2018	DATE - 1-2-18	FILE - D162D36-sht-plnprf03_US20.dgn		

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
525	2016-092B&R	MCHENRY	264	58
		CONTRACT NO. 62D36		
	ILLINOIS FED. AID PROJECT LGMW(759)			