Chicago Testing Laboratory, Inc.
30W114 Butterfield Road, Warrenville, IL 60555 p 630.393.CTL1 f 630.393.CTL7
18000 South Williams Street, Thornton, IL 60476 p 708.877.1801 f 708.877.6926
3966 West Dayton Street, Unit A, McHenry, IL 60050 p 815.385.8351 f 815.385.8456
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Structure Geotechnical Report

TR 154 (Crego Road) over Branch of Somonauk Creek
Section (116) I
Dekalb County
Sta 10+40.96
SN 019-5309 (Existing)
SN 019-2024 (Proposed)
PTB 149/15
P-93-036-08

Prepared By: Christopher Chan, P.E
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Tahir Munawar
Geotechnical Engineer
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(630) 393-CTL1 (2851)

Date: Revised May 21, 2010
Original September 8, 2009

Prepared For: Greene & Bradford, Inc.
Mr. Michael Trello, P.E., S.E.
(217) 793-8844

Attachments: Preliminary TS&L
Subsurface Profile
Boring Logs

Contact the author if there are any questions regarding this report or if there are modifications to structure location, size, geometry, or vertical alignment.

Chicago Testing Laboratory, Inc.

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May 21, 2010

Mr. Michael Trello, P.E., S.E.
Greene & Bradford, Inc.
3501 Constitution Drive
Springfield, Illinois 62711

Re: Structure Geotechnical Report
TR 154 (Crego Road) over Branch of Somonauk Creek
Section (116)
Dekalb County
SN 019-5309 (Existing)
SN 019-2024 (Proposed)
PTB 149/15
P-93-036-08
CTL Project No. 09EG204

Dear Mr. Trello:

Chicago Testing Laboratory, Inc. (CTL) has prepared this Structure Geotechnical Report to discuss the Geotechnical related elements of design and possible construction considerations at the referenced project.

Thank you for the opportunity to be of service. Please do not hesitate to contact us with any questions regarding the information contained herein.

Sincerely,
CHICAGO TESTING LABORATORY, INC.

Tahir Munawar
Geotechnical Engineer

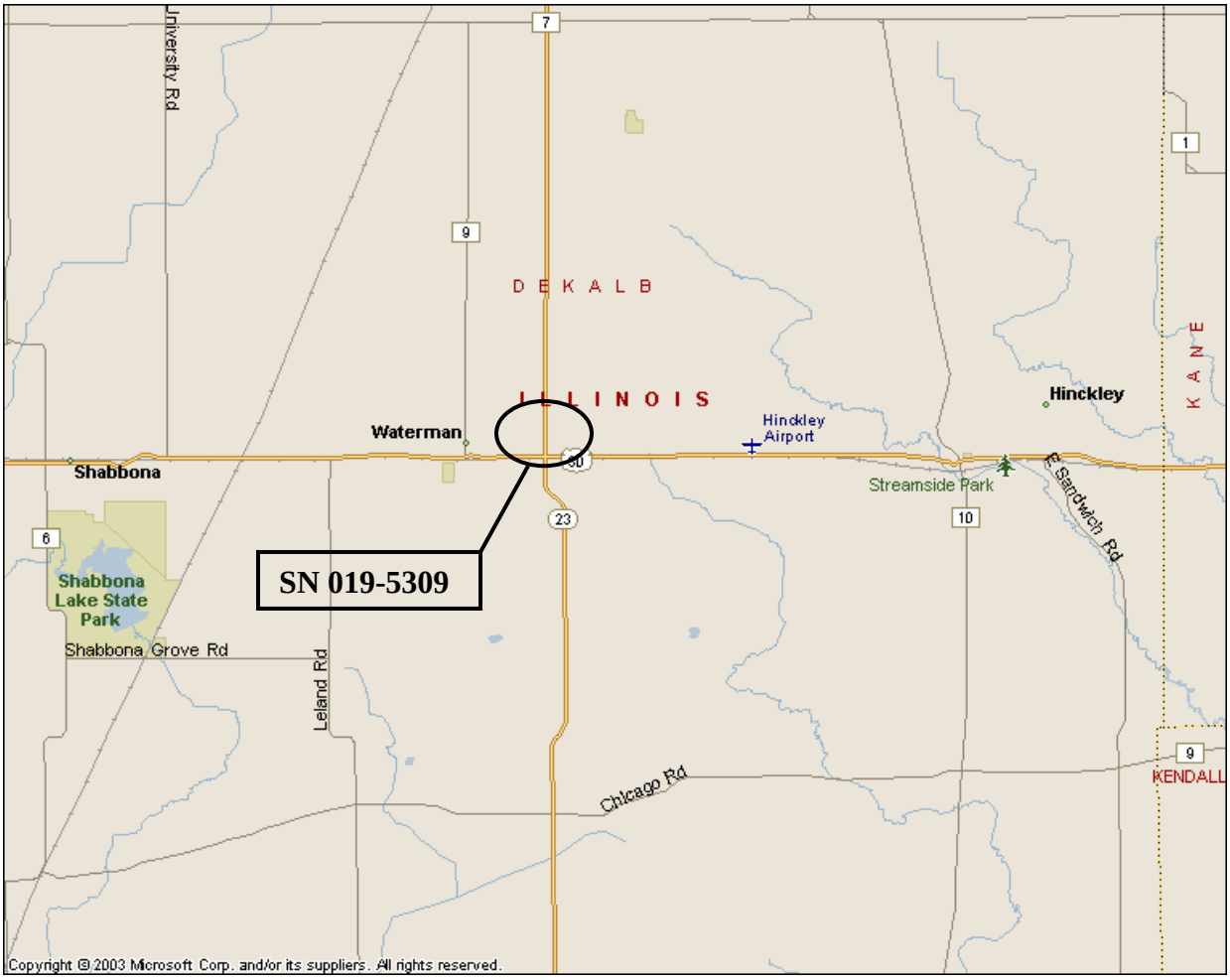
Christopher Chan, P.E.
Senior Geotechnical Engineer

TABLE OF CONTENTS

Introduction

The proposed structure consists of a double barrel box culvert carrying TR 154 (Crego Road) over a Branch of Somonauk Creek. The project site is located 40 feet north of the intersection of US 30 and Crego Road situated in southern Dekalb County, Illinois.

The project includes removing the existing double 10' x 5.5' concrete box culvert and constructing a new double 10' x 6' concrete box culvert. The preliminary TS&L also indicated that the proposed culvert will be longer than the existing culvert. Below is a location map for this structure.



Subsurface Condition

Soil Deposits

The mapped soil association that encompasses the project location is designated as Drummer Silty Clay Loam. This soil consists of very deep, poorly drained soils formed

in loess or other Silty material and in the underlying loamy stratified outwash on nearly level or depressional parts of outwash plain, stream terraces, and till plains. Slope ranges from 0 to 2 percent. Mean annual precipitation is about 37 inches and mean annual air temperature is about 52 degrees F. This soil is poorly drained, has a negligible to low potential for surface runoff, moderately high to high saturated hydraulic conductivity and moderate permeability.

Subsurface Profile

Two boring logs were provided by IDOT for this structure. Borings #1 and #2 were performed in March 2009. Hollow stem augers (HSA) were used to advance the boreholes. Soils were sampled at 2½-foot intervals to the maximum explored depth of the respective borehole. A 24" split spoon and an automatic hammer were used for sampling.

Boring #1 (NW Quad, Sta. 10+63 9'Lt) performed at a ground surface elevation of 762.86 feet encountered 2.5 feet of Sand/Gravel Shoulder Stone & Silty Clay Loam FILL over 2 feet of Very Stiff Silty Clay Loam Topsoil to an elevation of 758.36 feet. From a depth of 4.5 to 7 feet (elevation 758.36 to 755.86 feet) below the existing ground surface (bgs) was Stiff Silty Loam and Silty Clay Loam Loess over 5.5 feet of Stiff to Very Stiff Sandy Loam, Sandy Clay Loam, Sand/Gravel layers with Organics-old Alluvial deposits. From an elevation of 750.36 feet to 738.86 feet (12.5 to 24 feet), Medium Fine to Coarse Sand with minor Fine Gravel & free water was encountered which was followed by Very Stiff to Stiff reddish brown Sandy Clay Loam Till through the boring termination depth of 36.5 feet or an elevation of 726.36 feet.

Boring #2 (SE Quad, Sta. 10+15 9'Rt) performed at a ground surface elevation of 763.46 feet encountered 2.5 feet of Sand/Gravel Shoulder Stone & Silty Clay Loam FILL over 4.5 feet of Very Stiff Silty Clay Loam FILL. Underneath the Fill, Stiff Sandy Loam, Sandy Clay Loam, Sand/Gravel Layers – Alluvial deposits were found to a depth of 12.5 feet or an elevation of 750.96 feet. Below 12.5 feet, Medium gray fine to coarse Sand with fine Gravel was encountered to a depth of 24 feet or an elevation of 739.46 feet. Below 24 feet depth, Medium to Stiff reddish brown Sandy Clay Loam Till was encountered through the boring termination depth of 36.5 feet or an elevation of 726.96 feet.

The medium to very stiff consistency of Sandy Loam/Sandy Clay Loam Till was shown by Qu values ranging from 1.0 tsf to 3.8 tsf. The moisture content ranged from 7.8 percent to 33.3 percent. The medium condition of Fine to Coarse Sand was shown SPT N-values of 8 to 22 blows per foot (bpf). Reference the attached soil boring logs for a more detailed description of the subsurface profile.

Groundwater

Groundwater was encountered at an elevation of 753.9 feet in Boring #1 and at an elevation of 755.5 feet in Boring #2. Both water level reading were noted upon completion of the boreholes.

Scour Potential

The current structure is a double 10' X 5.5' box culvert with a length of 25'-8" out to out. Based on a review of the Hydraulic Report prepared by Hutchison Engineering, Inc. dated June 27, 2008, scour is not likely to be a problem at this location. Precautions, such as the placement of Class A4 riprap at the upstream and downstream ends of the culverts should be considered as part of the design.

Abandoned Coal Mines

Based on the information obtained from Illinois State Geological Survey (ISGS), there are no records that indicate any former mining activity at the specific project location.

Geotechnical Evaluation

Slope Stability

Slope stability is not expected to be a concern for the proposed box culvert structure since there is no new slope construction.

Soil Conditions and Settlement

The invert elevation of proposed (754.81 and 754.73 feet at the upper end and lower end, respectively) cast in place box culvert is approximately ½ foot lower than the existing box culvert; therefore approximately 6 inches of soil cut at the proposed culvert location is necessary to lower the grade to the proposed invert elevation. Soil conditions from the boring logs show that the proposed box culvert will rest on Stiff Sandy Loam to Sandy Clay Loam soils. It is understood that the east and west portions of the proposed box culvert are located on previously unloaded channel sediments while the middle portion is located on the existing box culvert subgrade.

Stiff Sandy Loam/Sandy Clay loam encountered at the bottom of the box culvert structure is considered suitable to support the culvert structure. As shown on the boring logs, organics or old alluvial deposits may be encountered at the bottom of proposed culvert elevation. Alluvial material is also expected under the existing culvert, which should be removed. Upon removing the organic alluvial materials or any other unsuitable or soft materials, the undercut areas should be backfilled with controlled engineered fill. Upon providing the above mentioned improvement the total and differential settlement of the culvert is considered to be negligible.

Proposed Culvert Section

In addition to the proposed double 10'x6' R.C box culvert, a precast three sided culvert or four sided box culvert may also be considered. Three sided culverts allow for brook and stream crossings maintaining the natural streambed. Typically the legs of the three sided culvert are supported on cast-in place or precast footings. A four sided box culvert has a base slab that allows for a smooth precast concrete invert in place of the natural streambed. Two or more lines of box culverts may be placed side by side to create a twin barrel installation.

Depending upon the requirements of the project, the precast culvert can be a single cell or multi-cell construction. When multi-cell boxes are used, a 3 inch space shall be provided between adjacent precast sections. The decision to substitute a precast culvert for cast-in-place type construction should be arrived at only after making a careful evaluation of the site to determine its suitability for this type of construction.

It should be noted that precast concrete culverts are not suitable in areas which are subject to flooding or in areas with highly scourable flow line soils such as silt and fine sand. Also, since precast concrete segments do not lend themselves to cambering (providing a collar around every joint is not practical), this type of construction cannot be considered in soils which are susceptible to excessive settlements.

If precast box culvert is used, upon removing any unsuitable materials from the channel and replacing it with a controlled engineered fill to the desired grade, a layer of compacted granular bedding material would be required under the precast structure.

Precast culverts have a quick installation time, reducing environment and traffic impact. Joint leakage and uneven settlement seems to be the most predominant problems associated with precast culverts. A filter fabric wrap is usually required on the top and sides of the joint to prevent soil infiltration in to the culvert. Scour of the culvert inlets and outlets can be prevented with the use of appropriately sized stone riprap. If differential settlement is deemed excessive, the installation of settlement collars may be warranted. Precast may not work well if "Stage Construction" option is considered.

It should be noted that Mr. Mike Trello (Structural Engineer) was consulted regarding the use of precast culvert. He advised that due to the trapezoid shape of the proposed culvert and need for head walls; cast in place section will be more economical. Therefore pre-cast option is not allowed on this project.

Foundation Recommendations

As per TSL, the wingwalls are going to be a horizontal cantilever off of the new box culvert and typically will be structurally continuous with the outside wall of the culvert. This type of wingwall does not need supporting foundation; therefore there are no foundation concerns at the location of the standard wingwalls.

Besides the horizontal wings, non standard wing alignments, such as a concrete capped permanent sheet piling could also be considered as an alternative to the southern longer wings to stabilize the adjacent roadway.

If culvert design is revised and any other type of wingwall (such as L-type, depending on the length of wingwall) is considered, footings established on stiff clay may be designed for an allowable soil bearing capacity of 1,800 pounds per square foot (psf)

The lateral active earth pressure acting on the sidewalls or wingwall supporting the adjacent roadway can be assumed as an equivalent fluid pressure of 40 pcf for the depth of the fill and 50 pcf for the height of the barrel (IDOT Culvert Manual, June 2000, Page 2-3).

Since the water flow elevation is not changing significantly, no drop structure is planned to be built at the end of the culvert.

Construction Consideration

At this time, it is assumed that the road will be closed during construction and this structure will not be built utilizing stage construction methods. Temporary sheet piling will not be required.

We do not anticipate the need for cofferdams. However, in order to maintain a dry construction area, temporary control of water in the stream would be required. Seal coats or mud slab will be required in order to provide a stable base. Contract documents should allow provisions for the contractor to include “Underwater Structure Excavation Protection”.

It is our understanding that the borings were performed at northwest and southeast quadrants along the roadway, outside of the Channel area. We believe that the borings do not represent the streambed correctly. Upon removing the existing culvert structure, the subgrade soils should be carefully evaluated with a hand auger probe to at least 2 to 3 feet below the bottom of the proposed culvert. Removal of soft and unsuitable bearing soils from the channel is anticipated. It may be prudent to incorporate quantities in the plans for over excavation and removing the soft soils present below the existing culvert in the channel.

The undercut areas should be backfilled with a controlled compacted engineered fill to the proposed bottom of culvert grade.

Controlled engineered fill may consist of Rockfill with IDOT’s CA-6 or CA-7 gradation depending on the presence of groundwater. CA-6 size engineered fill should be placed in essentially horizontal lifts not exceeding 10 inches in loose thickness. Each

lift should be compacted and tested to achieve 95 % of maximum dry density as determined in laboratory by the “Standard Proctor” compaction test AASHTO T99.

All excavations should meet applicable OSHA standards.

ATTACHMENTS

Preliminary TS&L

Plan and Profile Drawing

Boring Logs (Boring #1 and Boring #2)

Benchmark: Sta. 692+16.99, 27.22' Lt., Chiseled "□" in top of NW wingwall of SN 019-5309. Elev. 762.84

Sta. 692+20.09, 45.11' Rt., Chiseled "X" in top of 36" RCCP in SW Quad of US 30 & Crego Rd. Elev. 761.74

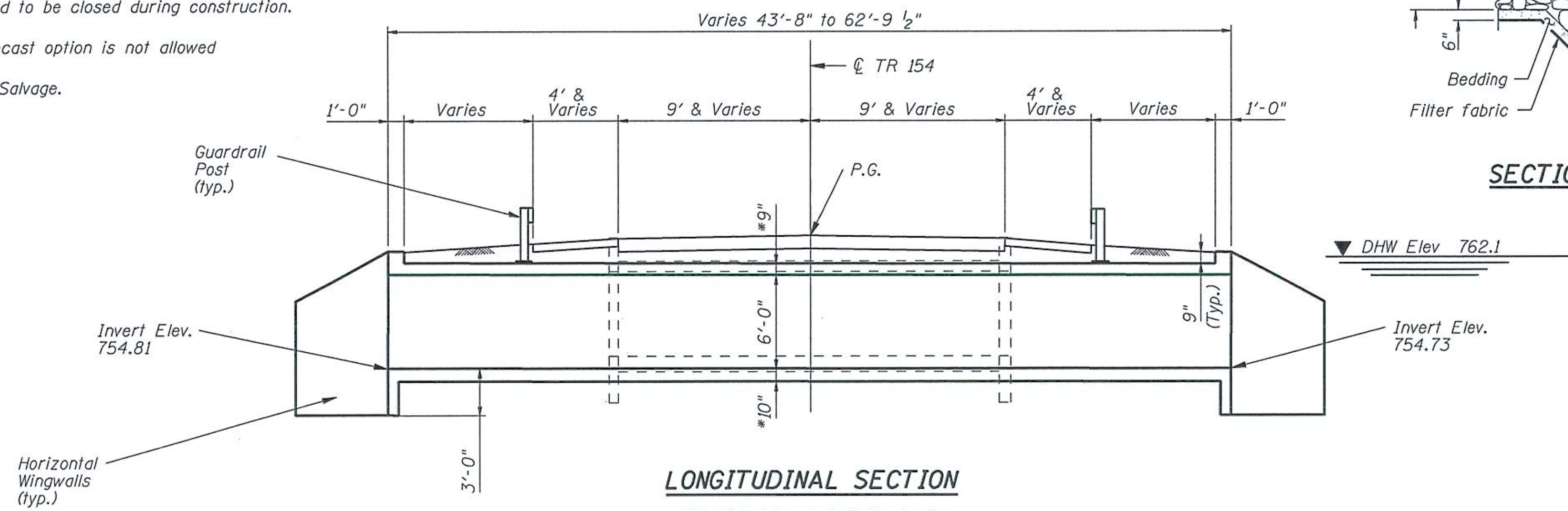
STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

Existing Structure: S.N. 019-5309, Sta. 10+37.96, built in 1929 as SBI 71 Section 116. as a double 10'-0" x 5'-6" R.C. box culvert with a culvert length of 25'-8". To be removed and replaced with a double 10'-0" x 6'-0" R.C. box culvert.

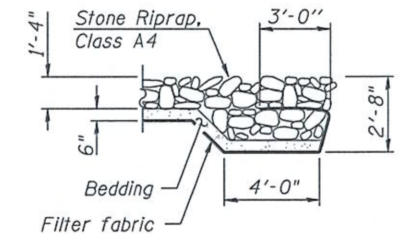
Road to be closed during construction.

Precast option is not allowed

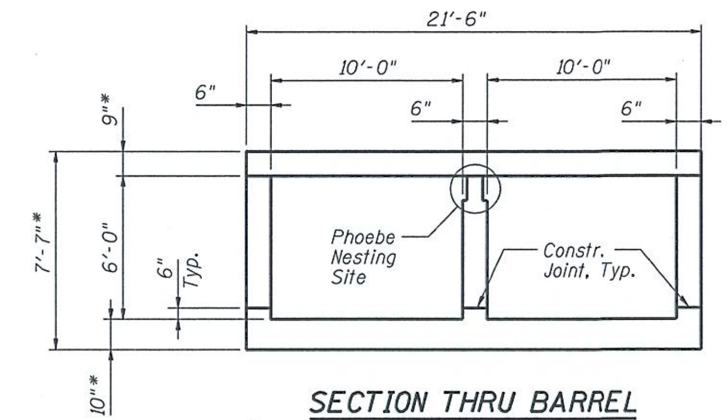
No Salvage.



LONGITUDINAL SECTION



SECTION A-A



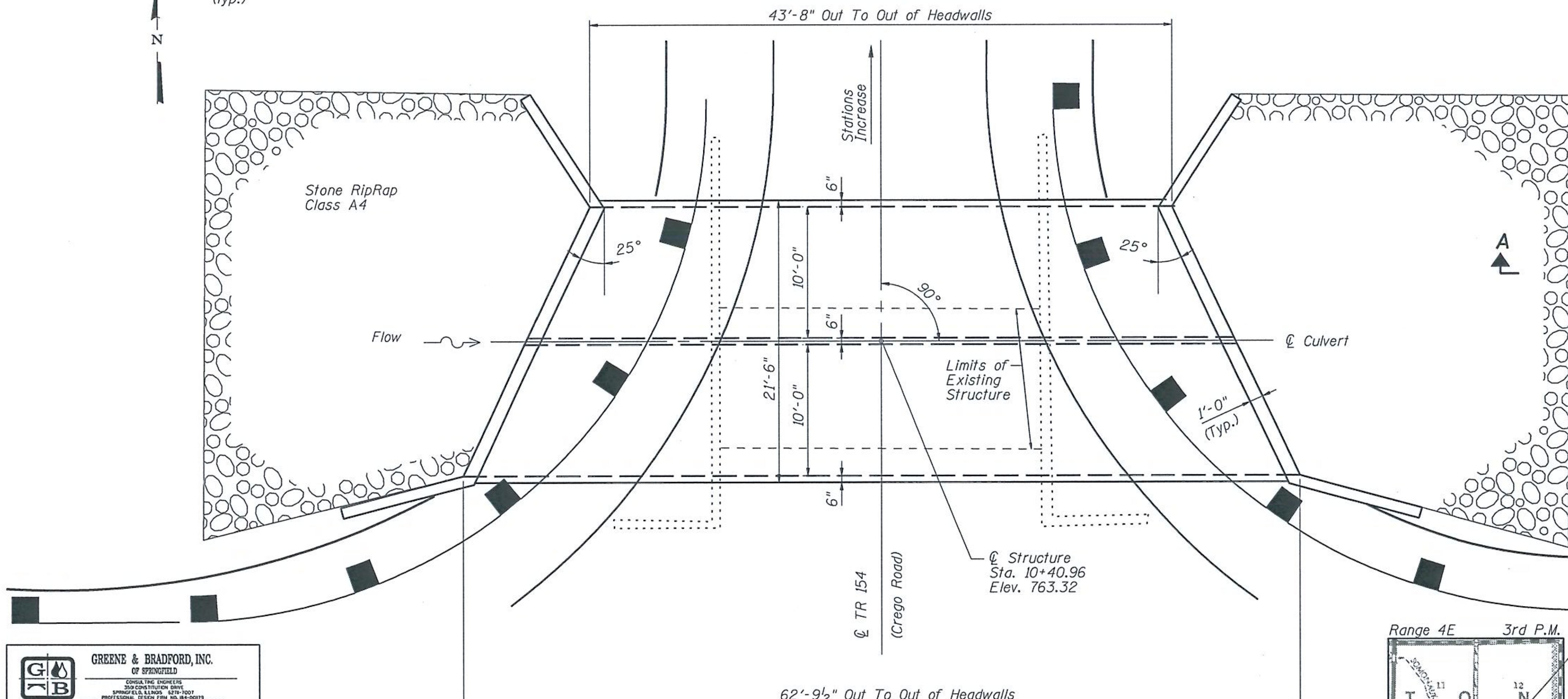
SECTION THRU BARREL

* Slab thickness may be refined in final design

WATERWAY INFORMATION

Drainage Area = 6.5 sq. mi.
Existing Low Grade Elev. 763.11 @ Sta. 10+50
Proposed Low Grade Elev. 763.20 @ Sta. 10+87

Flood	Freq. Yr.	Q C.F.S.	Opening Sq. Ft. Exist.	Opening Sq. Ft. Prop.	Nat. H.W.E.	Head - Ft. Exist.	Head - Ft. Prop.	Headwater El. Exist.	Headwater El. Prop.
	10	591	110	120	761.5	0.3	0.3	761.9	761.8
Local Road Design	15	655	110	120	761.7	0.6	0.5	762.3	762.1
Design	50	885	110	120	762.1	1.6	1.5	763.7	763.6
Base	100	1000	110	120	762.3	1.9	1.8	764.2	764.1
Overtopping IL 30	60	950	110	120	762.3	1.8	1.6	764.1	764.0
Overtopping Crego Rd	40	820	110	120	762.2	1.4	1.2	763.6	763.4
Max. Calc.	500	1280	110	120	762.8	2.4	2.2	765.2	765.0



PLAN

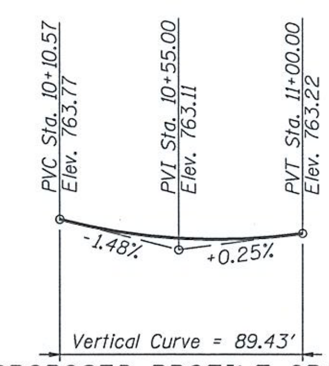
DESIGN SPECIFICATIONS

2002 AASHTO

DESIGN STRESSES

FIELD UNITS

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



PROPOSED PROFILE GRADE

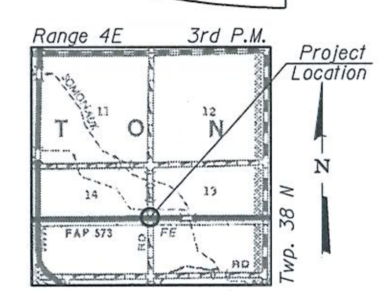
(along ℄ Roadway)

LOADING HS 20-44

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

HIGHWAY CLASSIFICATION

TR 154 - Crego Road
ADT: 10 (2008); 75 (2031)
DHV: 1 (2008); 7(2031)
Functional Class: Local Road, (Non-Urban)
Design Speed: 30 m.p.h.



LOCATION SKETCH

GENERAL PLAN & ELEVATION
TR 154 (CREGO ROAD) OVER BRANCH OF SOMONAUK CREEK
SEC. (116)I DEKALB COUNTY
STATION 10+40.96
STRUCTURE NO. 019-XXXX

GREENE & BRADFORD, INC. OF SPRINGFIELD
CONSULTING ENGINEERS

DESIGNED	NIEWINSKI
CHECKED	PERKINS
DRAWN	VERENSKI
CHECKED	TRELLO

- 200
EXAMINED
ENGINEER OF BRIDGE DESIGN
PASSED
ENGINEER OF BRIDGES AND STRUCTURES

SHEET NO.	F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
SHEETS	-	(116)I	DEKALB	1	1
			CONTRACT NO.		
	FED. ROAD DIST. NO.	ILLINOIS FED. AID PROJECT			

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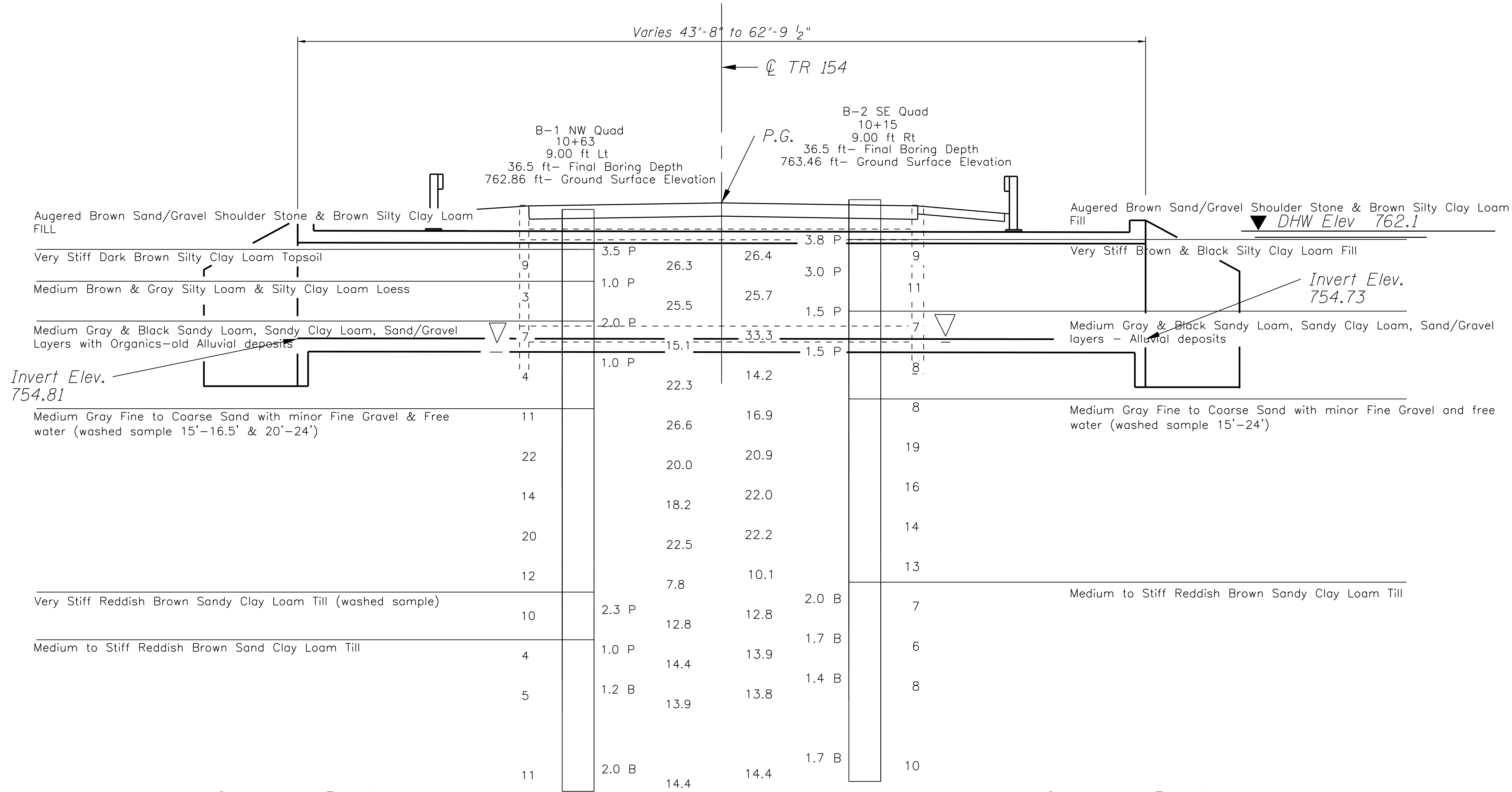

LONGITUDINAL SECTION

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	G&B PROJECT: 08227 W04	PLOT DATE = 7/28/2009	CHECKED -	REVISED -
	PLOT DRIVER = V8i_PDF.pltcfg		DATE - 07/09/09	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

BORING LOGS SN 019-5309

SCALE:	SHEET NO. 1 OF 1 SHEETS	STA.	TO STA.

F.A. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
-	(116)I	DEKALB	1	1
			CONTRACT NO.	
FED. ROAD DIST. NO.	ILLINOIS	FED. AID PROJECT		

Illinois Department of Transportation
Division of Highways
District #3, Ottawa

SOIL BORING LOG

Date 3/26/09

ROUTE Crego Road (1100E) **DESCRIPTION** Crego Rd. over Branch of Somonauk Creek **LOGGED BY** LM

SECTION SEC 116I **LOCATION** West 1/2, **SEC.** 13, **TWP.** 38N, **RNG.** 4E, 3rd **PM**

COUNTY Dekalb **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 019-5309 (Exist.)
Station 10+37.96

BORING NO. 1 (NW Quad)
Station 10+63
Offset 9.00ft Lt.
Ground Surface Elev. 762.86 ft

Surface Water Elev. 757.01 ft
Stream Bed Elev. 755.46 ft

Groundwater Elev.:
First Encounter ft
Upon Completion 753.9 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Description
				Augered Brown Sand/Gravel Shoulder Stone & Brown Silty Clay Loam Fill
760.36				
	3			Very Stiff Dark Brown Silty Clay Loam Topsoil
	4 5	3.5 P	26.3	
758.36				
-5	wh			Medium Brown & Gray Silty Loam & Silty Clay Loam Loess
	1 2	1.0 P	25.5	
755.86				
	1			Medium Gray & Black Sandy Loam, Sandy Clay Loam, Sand/Gravel layers with Organics - old Alluvial deposits
	4 3	2.0 P	15.1	▽
-10	3			
	1 3	1.0 P	22.3	
750.36				
	1			Medium Gray Fine to Coarse Sand with minor Fine Gravel & free water (washed sample 15'-16.5' & 20'-24')
	5 6		26.6	
-15	7			
	10 12		20	
	4			
	6 8		18.2	
-20				
	4			Medium Gray Fine to Coarse Sand with minor Fine Gravel & free water (washed sample 15'-16.5' & 20'-24') *(continued)*
	8 12		22.5	
	8			
	6 6		7.8	
738.86				
-25	6			Very Stiff Reddish Brown Sandy Clay Loam Till (washed sample)
	4 6	2.3 P	12.8	
735.86				
	2			Medium to Stiff Reddish Brown Sand Clay Loam Till
	2 2	1.0 P	14.4	
-30	3			
	2 3	1.2 B	13.9	
-35	3			
	5 6	2.0 B	14.4	
726.36				
				End of Boring
-40				

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

BBS, from 137 (Rev. 8-99)

Illinois Department of Transportation
Division of Highways
District #3, Ottawa

SOIL BORING LOG

Date 3/26/09

ROUTE Crego Road (1100E) **DESCRIPTION** Crego Rd. over Branch of Somonauk Creek **LOGGED BY** LM

SECTION SEC 116I **LOCATION** West 1/2, **SEC.** 13, **TWP.** 38N, **RNG.** 4E, 3rd **PM**

COUNTY Dekalb **DRILLING METHOD** Hollow Stem Auger **HAMMER TYPE** CME Automatic

STRUCT. NO. 019-5309 (Exist.)
Station 10+37.96

BORING NO. 2 (SE Quad)
Station 10+15
Offset 9.00ft Rt.
Ground Surface Elev. 763.46 ft

Surface Water Elev. 757.01 ft
Stream Bed Elev. 755.36 ft

Groundwater Elev.:
First Encounter ft
Upon Completion 755.5 ft ▽
After Hrs. ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material Description
				Augered Brown Sand/Gravel Shoulder Stone & Brown Silty Clay Loam Fill
760.96				
	3			Very Stiff Brown & Black Silty Clay Loam Fill
	4 5	3.8 P	26.4	
-5				
	3			
	5 6	3.0 P	25.7	
756.46				
	3			Medium Gray & Black Sandy Loam, Sandy Clay Loam, Sand/Gravel layers - Alluvial deposits ▽
	4 3	1.5 P	33.3	
-10				
	2			
	5 3	1.5 P	14.2	
750.96				
	2			Medium Gray Fine to Coarse Sand with minor Fine Gravel and free water (washed sample 15'-24')
	4 4		16.9	
-15				
	6			
	9 10		20.9	
	5			
	7 9		22.0	
-20				
	4			Medium Gray Fine to Coarse Sand with minor Fine Gravel and free water (washed sample 15'-24') *(continued)*
	6 8		22.2	
	4			
	6 7		10.1	
739.46				
-25				Medium to Stiff Reddish Brown Sandy Clay Loam Till (washed sample 25'-26.5')
	2			
	3 4	2.0 B	12.8	
	2			
	2 4	1.7 B	13.9	
-30				
	3			
	3 5	1.4 B	13.8	
-35				
	3			
	4 6	1.7 B	14.4	
726.96				
				End of Boring
-40				

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

BBS, from 137 (Rev. 8-99)