Illinois Department of Transportation

Abbreviated Structure Geotechnical Report

Original Report Date: April 18, 2014	Proposed SN: 027-2019	Route:	FAP 798 (IL 115)
Revised Date: August 8, 2014	Existing SN: 027-2506	Section:	(107) CR-6
Geotechnical Engineer: Michael Short; IDOT District 3		County:	Ford
Structural Engineer: Mark Wylie; Farnsworth Group, Inc.		Contract:	66C03

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): *The proposed structure is a double 8-feet by 6-feet precast concrete box culvert with a 40° right forward skew and an upstream cast in place drop structure.*

Discuss the existing boring data, existing plans foundation information, new subsurface exploration and need for any additional exploration to be provided with SGR Technical Memo (attach all data and subsurface profile plot): *The existing structure consists of a double 6-feet by 4-feet concrete box culvert with an upstream drop structure and no skew. Two soil borings were performed by IDOT in 2012. A copy of the soil borings is attached.*

Provide the location and maximum height of any new soil fill or magnitude of footing bearing pressure. Estimate the amount and time of the expected settlement. Indicate if further testing, analysis, and/or ground improvement/treatment is necessary: *The profile of the of the roadway is not expected to change, therefore there will not be any significant load applied to the soils. A site visit indicated no signs of settlement problems with the existing structure. No further settlement analysis is required.*

Identify any new cuts or fill slope angles and heights. Estimate the factor of safety against slope failure. Indicate if further testing, analysis or ground improvement/treatment is necessary. *The proposed side slopes are expected to be flatter than existing. Proposed slopes range from 1:3 to 1:4 and will be a maximum of 9-feet high at culvert ends. A site visit indicated no stability problems with the existing structure. No further slope stability analysis is warranted.*

Indicate at each substructure, the 100-year and 500-year total scour depths in the Hydraulics report, the non-granular scour depth reduction, the proposed ground surface, and the recommended foundation design scour elevations. *The design scour elevations at the upstream and downstream ends of culvert are 701.15 and 700.90, respectively. The elevations are based on a 3-feet deep cut-off wall below invert elevation. If the drop structure is constructed, then the scour elevation is only applicable to the downstream end of the culvert.*

Determining the seismic soil site class, the seismic performance zone, the 0.2 and 1.0 second design spectral accelerations and indicate if that the soils are liquefiable. *Not applicable to box culverts.*

Confirm feasibility of the proposed foundation or wall type and provide design parameters. Attach a pile design table indicating feasible pile types, various nominal required bearings, factored resistances available and corresponding estimated lengths at locations where piles will be used. Provide factored bearing resistance and unit sliding resistance at various elevations and confirm no ground improvement/treatment is necessary where spread footings are proposed. Estimated top of rock elevations as well as preliminary skin friction and end bearing values shall be indicated when drilled shafts are proposed. *Horizontal cantilever wingwalls are feasible on the downstream end of the box culvert. If the length of the wingwall exceeds the maximum allowable length for horizontal cantilever wingwalls, then L-type wingwalls or a horizontal cantilever wingwall with gabion extensions are feasible. If one of these options is selected, please contact the SGR author to provide the factored bearing resistance and unit sliding resistance values for the foundation soils under the wingwall. In addition, it may be possible to construct horizontal cantilever wingwalls that slightly exceed the 14 foot length limitation outlined in the Culvert Manual. The drop structure at the upstream end of the box culvert does not require any special geotechnical considerations. The only aggregate needed under the precast concrete box culvert is the 6 inches required by Article 540.06 of the Standard Specifications.*

Calculate the estimated water surface elevation and determine the need for cofferdam(s) and seal coat: *The structure can be constructed using conventional methods for water diversion.*

Assess the need for sheeting/soil retention versus using a temporary construction slope and provide recommendation for the most feasible option. *The new structure will be constructed using stage construction. Soil strengths exceed 4.5 tsf, therefore the pay item "Temporary Soil Retention System" should be used.*

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IDOT

SOIL BORING LOG

Date 12/19/12

ROUTE IL 115 (FAP 798) **DESCRIPTION** IL 115 over a Stream, 4.1 miles South of US 24 **LOGGED BY** Larry Myers

SECTION 107 & 107B **LOCATION** NE 1/4, **SEC.** 33, **TWP.** 26N, **RNG.** 9E,
Latitude 40.68927, **Longitude** -88.180212

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

STRUCT. NO. 027-2506 (Exist.)
Station 215+47

BORING NO. 1 (N.W. Quad.)
Station 215+03
Offset 13.0 ft Rt.
Ground Surface Elev. 711.82 ft

Surface Water Elev. 703.73 ft
Stream Bed Elev. 706.51 ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After ____ **Hrs.** ____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
Augered Shoulder Stone, Black & Brown Silty Clay Loam Fill			
709.32			
Stiff to Very Stiff Black & Brown Silty Clay Loam Fill	3		
707.82	3 3	2.0 P	28
Stiff to Very Stiff Black Silty Clay/Silty Clay Loam Topsoil			
-5	3		
	3 3	2.0 P	32
704.32			
Very Stiff Brown & Gray Silty Clay Loess	3		
	3 3	2.0 P	29
702.32			
Stiff Brown & Gray Silty Clay Loam Till			
-10	1		
	2 2	1.5 P	24
699.82			
Hard Brownish Gray Silty Clay Loam Till	5		
	8 10	5.9 S	16
-15			
	7		
	10 12	5.9 S	17
	5		
	6 7	4.5 S	17
-20			
Hard Brownish Gray Silty Clay Loam Till *(continued)*	3		
	5 7	4.5 S	19
	4		
	6 8	4.5 S	18
-25			
	5		
	7 7	4.5 S	19
	6		
	7 8	4.4 S	22
-30			
	6		
	6 8	4.5 S	23
-35			
	7		
675.32	8 9	4.7 S	23
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, form 137 (Rev. 8-99)

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SOIL BORING LOG

Date 12/19/12

ROUTE IL 115 (FAP 798) **DESCRIPTION** IL 115 over a Stream, 4.1 miles South of US 24 **LOGGED BY** Larry Myers

SECTION 107 & 107B **LOCATION** NW 1/4, **SEC.** 34, **TWP.** 26N, **RNG.** 9E,
Latitude 40.689037, **Longitude** -88.18011

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

STRUCT. NO. 027-2506 (Exist.)
Station 215+47

BORING NO. 2 (S.E. Quad.)
Station 215+87
Offset 13.0 ft Lt.
Ground Surface Elev. 712.17 ft

Surface Water Elev. 703.73 ft
Stream Bed Elev. 706.11 ft

Groundwater Elev.:
First Encounter Dry ft
Upon Completion Dry ft
After ____ **Hrs.** ____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
				Augered Shoulder Stone, Black Silty Clay Loam Fill
709.67				
	3			Very Stiff Black Silty Clay Loam Fill
	2 3	2.5 P	29	
-5				
	3			
	2 4	2.5 P	30	
705.67				
				Very Stiff Brown & Gray Silty Clay Loess
704.67				
	3			Very Stiff Brown & Gray Silty Clay Loam Till
	3 5	2.5 P	23	
702.67				
-10				Hard Brownish Gray Silty Clay Loam Till
	7			
	10 14	7.1 S	19	
	6			
	9 14	6.8 S	17	
-15				
	6			
	8 12	6.1 S	16	
695.17				
	6			Hard Gray Silty Clay Loam Till
	8 12	6.2 S	16	
-20				

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)	Material
	5			Hard Gray Silty Clay Loam Till *(continued)*
	7 8	5.7 S	16	
	6			
	6 9	5.3 S	18	
-25				
	5			
	7 9	5.3 S	17	
	5			
	7 9	5.1 S	17	
-30				
	5			
	7 7	5.1 S	17	
-35				
	6			
	6 8	5.1 S	17	
675.67				
				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)

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