



Original Report Date: 05/22/18 Proposed SN: 026-2022 Route: FAP 322/US 51  
 Revised Date: 06/22/18, 11/29/18 Existing SN: 026-0088 Section: (23-3)-B  
 Geotechnical Engineer: Suhaib Ibrahim/Brad Hessing County: Fayette  
 Structural Engineer: Nick Barnett Contract: 94519

**Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing):**

The proposed structure is a cast-in-place (Cast in Place is preferred by the district) double barrel box culvert with 12'x10' cells with a total length of 55'-0" out-to-out, at Station 174+33.15. It will replace a single span slab bridge carrying US 51 over an unnamed stream. The preliminary Type, Size, and Location in the form of a Plan and Profile is attached. The proposed structure (SN: 026-2022) will be designed using 2017 AASHTO LRFD Bridge Design Specifications.

**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):**

No existing borings were available. The existing structure is a single span slab bridge with stub abutments carrying US 51 over unnamed stream. New boring data was acquired in November 2017. The data consisted of two borings: Boring 1 (NW) at Station 174+03, 19.5' Right (West) and Boring 2 (SE) at Station 174+62, 18.0' Left (East). Each boring extended to 26 feet below existing grade.

**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 proposed Plan and Profile is showing U.S. invert elevation = 460.4 ft. and the D.S. Invert elevation = 460.2 ft. and D.H.W.E = 472.5

To avoid settlement or bearing capacity problems in the Silty Clay below the culvert, we recommend 1.5 feet of removal and replacement (to Elevation 457.6) under the entire culvert. Horizontal limits of removal shall extend two feet (2') beyond the entire footprint of the box. With removal and replacement, settlement is not a concern at this site.

**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:**

No issues concerning cuts, fills, or heights. Grade raise is less than 4 inches (~ 0.3 feet). No further testing, analysis, or ground improvement is required.

**Indicate at each substructure, the 100-year and 200-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:**

Not required as per ABD Memo 14.2.

**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 required for buried structures per the Bridge Manual.

**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 factored unit side and tip resistance values shall be indicated when drilled shafts are proposed:**

As per the Culvert Manual Figure 4.1.3.1-2, based on the "H<sub>L</sub>" and the 0° skew, Horizontal Cantilever Wingwalls are feasible (up to 16 ft. in length). Horizontal Cantilever Wings require no foundation treatment. The only geotechnical issue of concern is the need for removal and replacement of medium clay soil possessing high moisture under the box (discussed above).

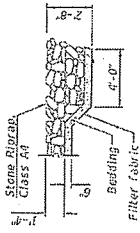
**Calculate the estimated water surface elevation and determine the need for Cofferdams (Type 1 or 2), and seal coat:**

Not required.

**Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns:**

Stage construction will be utilized. Soil retention will be needed to facilitate stage construction. Based on excavation depth and the soil profile, the ***Temporary Sheet Piling*** pay item will be feasible.





SECTION A-A

WATERWAY INFORMATION

Drainage Area = 1.82 Sq. Mi. Existing Overtopping Elev. 472.81 ft. at Sta. 17+40.0  
Proposed Overtopping Elev. 472.81 ft. at Sta. 17+40.0

Flood	Freq.	Yr.	C.F.S.	Elev.	Prop.	H.W.E.	Risk		Headwater El.
							Exist.	Prop.	
	70	296	168	234	470.6	0.1	0.0	470.7	470.6
Design	50	461	172	234	472.5	0.2	0.0	472.7	472.5
10-year	50	461	172	234	472.6	0.2	0.1	472.8	472.9
10-year	50	461	172	234	472.6	0.2	0.1	472.8	472.9
Base	160	534	172	234	473.5	0.1	0.0	473.6	473.9
Secur. Design Check	200	609	172	234	473.5	0.1	0.0	473.6	473.9
Max. C.B.S.C.	500	707	172	234	473.9	0.1	0.0	474.0	473.9

10-year outlet velocity from existing structure = 1.7 fps  
10-year outlet velocity from proposed structure = 1.3 fps

APPROVED

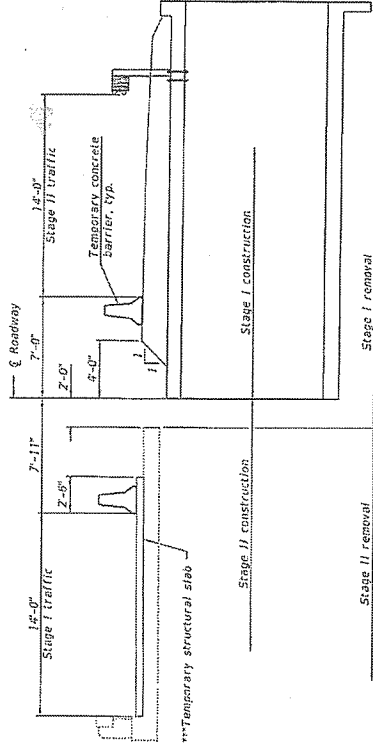
NOV 01 2018

AS A BASIS FOR  
PREPARATION OF DETAILED PLANS

DETAILS

U.S. ROUTE 51 OVER UNNAMED STREAM  
F.A.P. ROUTE 322 - SEC. (23-3)B

FAYETTE COUNTY  
STATION 17+4-33.15  
STRUCTURE NO. 026-2022



STAGE CONSTRUCTION  
(Looking South)

\*\*\* Temporary structural slab shall be designed to carry 100% of the dead and live load of stage I traffic. Parameters to be determined during final design.

STATE OF ILLINOIS  
DEPARTMENT OF TRANSPORTATION

8/2018 - 2/24/18

DRAWN BY: MICHAEL A. BARNETT  
CHECKED BY: MICHAEL D. BARNETT  
DESIGNED BY: MICHAEL A. BARNETT  
APPROVED BY: MICHAEL A. BARNETT

F.A.P. NO.	SECTION	SHEET NO.	TOTAL SHEETS
026-2022	026-2022	2	2

SHEET 2 OF 2



# SOIL BORING LOG

ROUTE FAP 322 (US 51) DESCRIPTION Un-named Stream LOGGED BY E. Sandschafer

SECTION (23-3)B LOCATION Section 33 - SE, Section 34 - SW, SEC. , TWP. 6 N, RNG. 1 E, 3 PM

COUNTY Fayette DRILLING METHOD Hollow stem auger & split spoon HAMMER TYPE Auto 140#

STRUCT. NO. 026-2022  
 Station 174+33

BORING NO. 1 (NW)  
 Station 174+03  
 Offset 19.5ft West  
 Ground Surface Elev. 472.18 ft

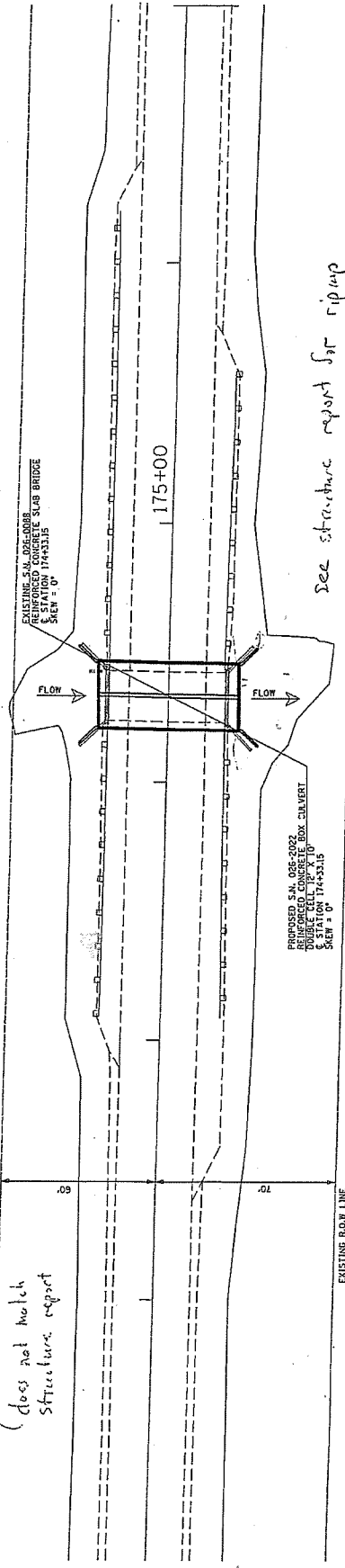
DEPTH (ft)	BLOW S	UCS (tsf)	MOIST (%)	Soil Description			
				DEPTH (ft)	BLOW S	UCS (tsf)	MOIST (%)
				Surface Water Elev. <u>Dry</u> ft			
				Stream Bed Elev. <u>461.58</u> ft			
				Groundwater Elev.:			
				▽ First Encounter <u>Dry</u> ft			
				▽ Upon Completion <u>Dry</u> ft			
				▽ After <u>24</u> Hrs. <u>457.7</u> ft			
471.48				Very stiff to medium, damp, gray, CLAY. (continued)	4	0.82	30
					4	B	
	1				2		
	2	1.24	23		3	1.03	29
	4	B			3	B	
	2				2		
	3	1.32	27		3	0.66	21
	4	B		Medium, damp, gray, SILTY CLAY.	3	B	
				Extent of exploration.			
	2						
	3	1.57	27				
	4	B		Benchmark: BM 101 Chiseled square on SE corner of existing structure Sta 174+00, Lt (East) = 472.67'			
462.18	2				-30		
	2	0.58	33				
	3	B					
460.18	1						
	3	2.06	25				
	4	B					
	2						
	4	1.81	23				
	5	B					
	2						
	4	1.40	26				
	5	B					
	2						
-20					-40		

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer, E-Estimated) Abbreviations W.O.H - Sampler Advanced By Weight of Hammer, W.O.P - Advanced by Weight of Pipe, B.S. - Before Seating 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)



BENCHMARK 101: CHISELED SQUARE ON SE CORNER OF STR. NO. 026-0088  
ELEVATION 472.87, STA 174+32.19 LT.

EXISTING R.O.W LINE



Does not match  
Structure report

See structure report for riprap

EXISTING R.O.W LINE

STA	ELEV	171+00	171+50	172+00	172+50	173+00	173+50	174+00	174+50	175+00	175+50	176+00	176+50	177+00
480	473.05													473.22
475	473.05													473.27
470	473.05													473.27
465	473.05													473.27
460	473.05													473.27
455	473.05													473.27
450	473.05													473.27
445	473.05													473.27
440	473.05													473.27

STATE OF ILLINOIS  
DEPARTMENT OF TRANSPORTATION

PLAN & PROFILE  
S.N. 026-0088 (EXISTING), 026-2022 (PROPOSED)

SHEET 1 OF 1 SHEETS STA. 171+00 TO STA. 177+00

DATE: 12-14-2017

DATE	07
PROJECT	
DESCRIPTION	
SCALE	
BY	
CHECKED	
APPROVED	

DATE	07
PROJECT	
DESCRIPTION	
SCALE	
BY	
CHECKED	
APPROVED	