



Original Report Date: 4/5/2021 Proposed SN: 047-2050 Route: FAP 311 (IL 71)
 Revised Date: N/A Existing SN: 047-0059 Section: (1-1)R, BR1
 Geotechnical Engineer: Jeremy Brown, P.E., IDOT District 3 County: Kendall
 Structural Engineer: Brad Rotherham PE, SE (BFW Engineering) Contract: 66D26

Indicate the proposed structure type, substructure types, and foundation locations (attach plan and elevation drawing): The proposed structure is a triple 12-foot by 10-foot cast-in-place concrete box culvert with an 8° right forward skew located at station 688+30.

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 is a single span PCC I beam bridge supported by H-piles and integral abutments. Two soil borings and a rock core log were performed by IDOT on 1993. The soil boring logs are 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 proposed culvert will require a fill of approximately 12-feet high to reach existing gradeline at the right end and a fill of approximately 7-feet high at the left end of the culvert. Soil properties below the culvert structure indicate a layer of low moisture, high strength shale rock material followed by dolomite rock. These layers are not compressible, therefore no settlement issues are expected. A site visit also indicated no signs of settlement at existing structure. No further settlement analysis is warranted.

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 maximum embankment height at the structure is approximately 22-feet high. The proposed side slopes are expected to range from 1V:3H to 1V:4H, which is the same or flatter than the existing side slopes, therefore slope stability is not a concern. A site visit indicated no slope stability problems near the structure.

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 for closed bottom culverts.

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 factored unit side and tip resistance values shall be indicated when drilled shafts are proposed: Based on the proposed cast-in-place box culvert dimensions shown on the preliminary TS&L, the wingwall lengths at each end were determined to be approximately 15'-3" and 17'-6" long using section 4 from the IDOT Culvert Manual. Horizontal cantilever wingwalls are feasible for the shorter, 15'-3" wingwalls since this type can be utilized for wingwalls up to 16' in length. Two-way L-type cantilever wingwalls are feasible for the longer, 17'-6" wingwalls. This type of wingwall is used when the design length is between 14' and 30' long. Two-way L-type wingwalls may also be used for the shorter wingwalls if the designer wishes to utilize the same design type for all the wingwalls. The soils/rock under the proposed box culvert and wingwalls is adequate and will not require removal and replacement to support the proposed structure. While excavating for the proposed structure it is likely that the contractor will encounter weathered dolomite and the pay item "Rock Excavation For Structures" should be used for its removal.

Calculate the estimated water surface elevation and determine the need for cofferdams (type 1 or 2), and seal coat: The structure can be constructed using conventional methods for water diversion.

Assess the need for sheeting or soil retention or temporary construction slope and provide recommendation for other construction concerns: Soil properties below the culvert consist of shale and dolomite rock, therefore Temporary Sheet Piling is not feasible. If stage construction is used, the pay item "Temporary Soil Retention System" should be used.

Bench Mark: Chiseled "□" on top of SW wingwall of SN 047-0059. Sta. 688+09.00, 22' LT. Elev 621.28.

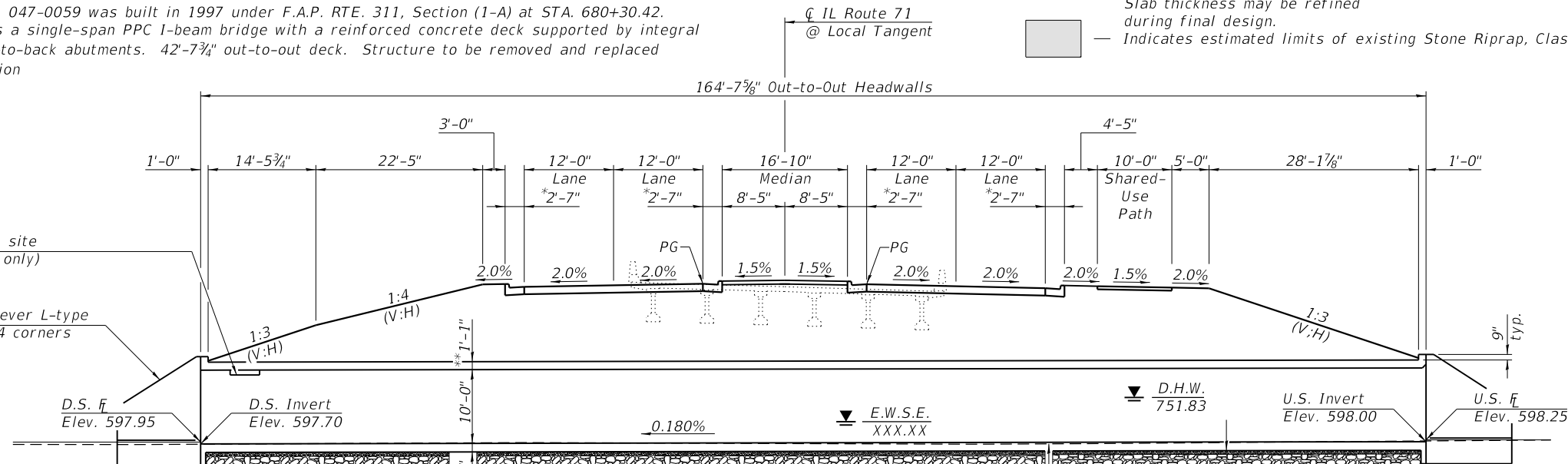
Existing Structure: S.N. 047-0059 was built in 1997 under F.A.P. RTE. 311, Section (1-A) at STA. 680+30.42. The existing structure is a single-span PPC I-beam bridge with a reinforced concrete deck supported by integral abutments. 88'-6 1/4" back-to-back abutments. 42'-7 3/4" out-to-out deck. Structure to be removed and replaced utilizing stage construction

No Salvage

Precast alternate is not allowed.

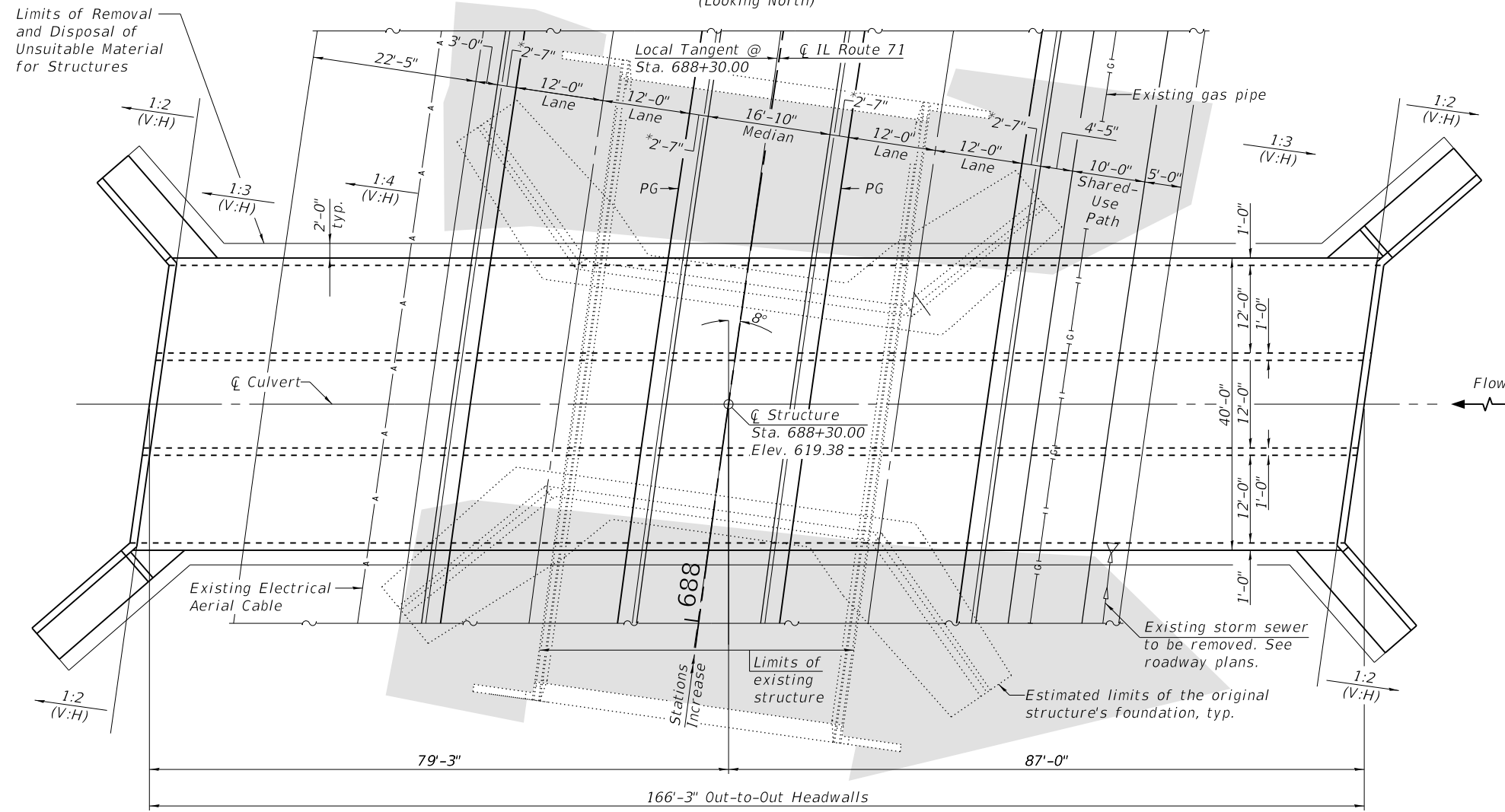
Phoebe nesting site (Interior walls only)

Two-way cantilever L-type wingwalls, all 4 corners



LONGITUDINAL SECTION

(Dimensions are at right angles to \bar{C} IL Route 71 at Local Tangent) (Looking North)



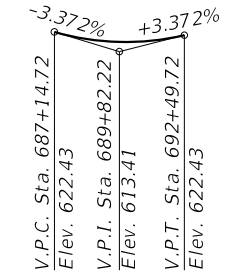
PLAN

*Combination concrete curb and gutter, Type B-6.24.

**Slab thickness may be refined during final design.

— Indicates estimated limits of existing Stone Riprap, Class A4.

PI STA. = 687+52.85
 Δ = 27° 08' 43" (RT)
 D = 1° 23' 59"
 R = 4,093.50'
 L = 988.25'
 T = 1,939.39'
 E = 117.60'
 e = ----
 T.R. = ----
 S.E. RUN = ----
 P.C. STA. = 677+64.60
 P.T. STA. = 697+03.99



PROP. CURVE PR71-7

PROFILE GRADE

(Along roadway median edge of pavement)

HIGHWAY CLASSIFICATION

F.A.P. Rte. 311 - IL Rte. 71
 Functional Class: Other Principal Arterial
 ADT: 11948 (2022); 14268 (2042)
 ADTT: 1267 (2022); 1513 (2042)
 DHV: 1285 (2042)
 Design Speed: 45 m.p.h.
 Posted Speed: 45 m.p.h.
 Two-Way Traffic
 Directional Distribution: 59:41

LOADING HL-93

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

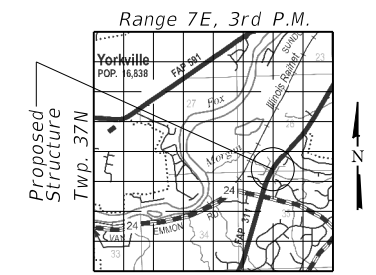
DESIGN SPECIFICATIONS

2020 AASHTO LRFD Bridge Design Specifications, 9th Edition

DESIGN STRESSES

FIELD UNITS

f'_c = 3,500 psi
 f_y = 60,000 psi (Reinforcement)



LOCATION SKETCH

GENERAL PLAN & ELEVATION
IL ROUTE 71 OVER MORGAN CREEK
F.A.P. RTE. 311 - SEC. (1-1)R, BR1
KENDALL COUNTY
STATION 688+30.00
S.N. 047-2050

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BACON | FARMER | WORKMAN
 ENGINEERING & TESTING, INC.
 403 NORTH COURT STREET
 MARION, ILLINOIS 62959
 PHONE - 618.997.9190

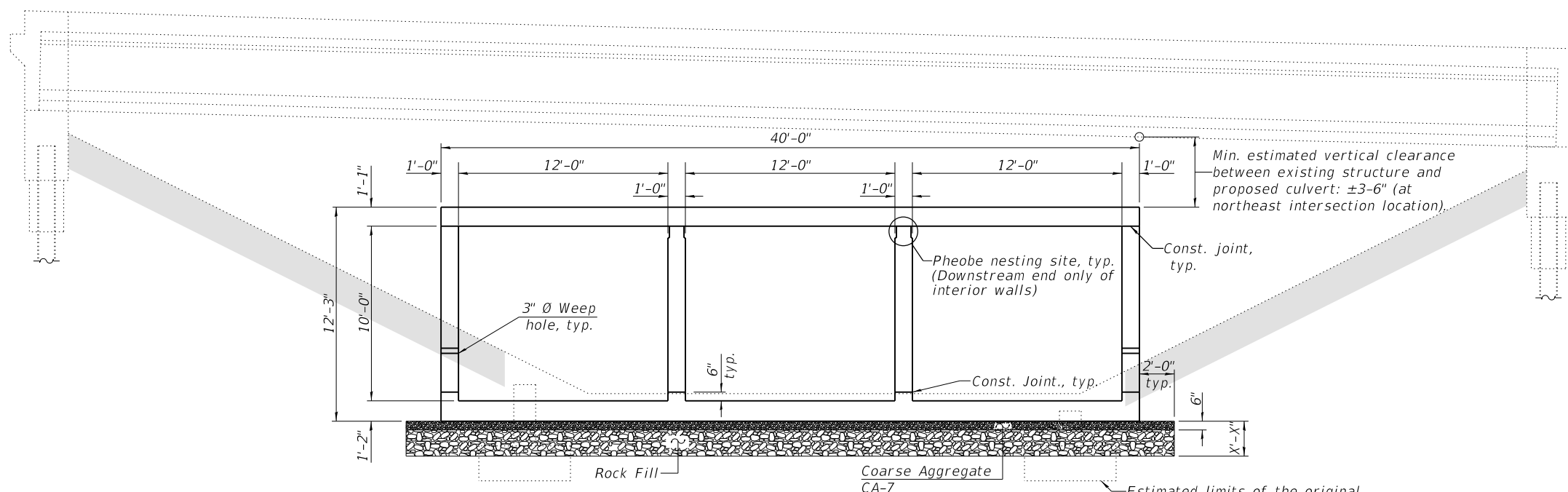
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PLOT DATE	-	CHECKED	- JGY	REVISED	-

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
311	(1-1)RBR 1	KENDALL	2	1

CONTRACT NO. 66D26	
ILLINOIS	FED. AID PROJECT

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SECTION THRU BARREL
 (Thickness of top and bottom slabs are subject to refinement during final design.)
 (Looking West)

WATERWAY INFORMATION

Existing Low Grade Elev. = 617.1 @ Sta. 690+00.00
 Drainage Area = 17.8 sq. mi. Prop. Low Grade Elev. = 617.1 @ Sta. 690+00.00

Flood	Freq. Yr.	Q C.F.S.	Opening Sq. Ft.		Nat. H.W.E.		Head - Ft.		Headwater El.	
			Exist.	Prop.	Exist.	Prop.	Exist.	Prop.	Exist.	Prop.
Ten-Year	10	1030	176	189	603.3	0.3	0.0	603.6	603.3	
Design	50	1510	212	216	604.0	0.7	0.0	604.7	604.1	
Base	100	1700	226	226	604.3	0.8	0.3	605.1	604.6	
Overtopping Proposed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Max. Calc.	500	2160	256	247	604.9	1.1	0.9	606.0	605.8	

Existing 10 Year Outlet Velocity = 6.1 ft/s Proposed 10 Year Outlet Velocity = 6.0 ft/s

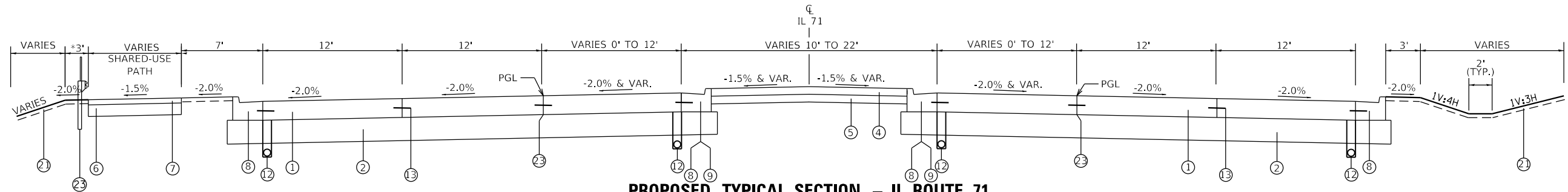
— Indicates estimated limits of existing Stone Riprap, Class A4.

DETAILS
IL ROUTE 71 OVER MORGAN CREEK
F.A.P. RTE. 311 - SEC. (1-1)R, BR1
KENDALL COUNTY
STATION 688+30.00
S.N. 047-2050

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

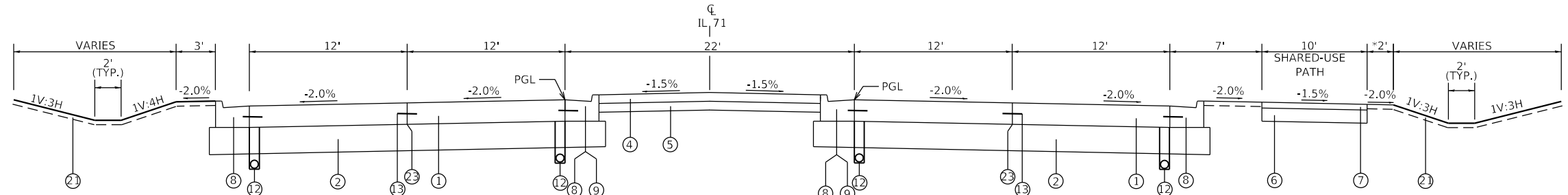
SHEET 2 OF 2 SHEETS

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
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CONTRACT NO. 66D26				
ILLINOIS FED. AID PROJECT				



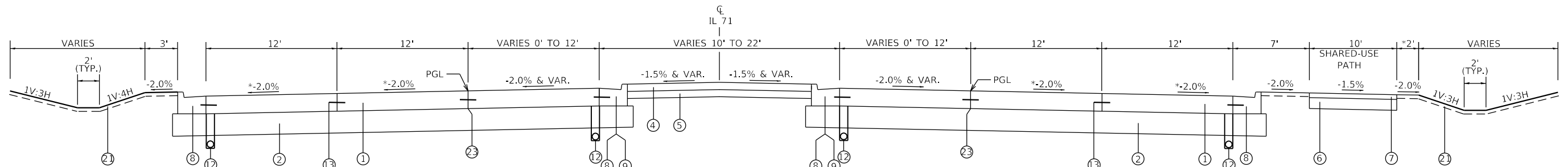
PROPOSED TYPICAL SECTION – IL ROUTE 71

STA. 613+78.25 TO 620+17.21
 * WHEN DITCH DEPTH GREATER THAN 6' USE 5' WIDTH;
 AT LOCATIONS WITH GUARDRAIL USE 4' WIDTH MINIMUM



PROPOSED TYPICAL SECTION – IL ROUTE 71

STA. 650+80.85 TO 655+16.94
 STA. 666+15.76 TO 667+32.80
 STA. 683+04.77 TO 689+31.01
 STA. 709+12.43 TO 710+60.15
 STA. 718+75.13 TO 730+83.93
 STA. 734+58.99 TO 741+91.21
 STA. 754+07.17 TO 761+28.74
 STA. 769+53.43 TO 770+90.28
 * WHEN DITCH DEPTH GREATER THAN 6' USE 5' WIDTH;
 AT LOCATIONS WITH GUARDRAIL USE 4' WIDTH MINIMUM



PROPOSED TYPICAL SECTION – IL ROUTE 71

STA. 629+91.50 TO 650+80.85
 STA. 655+16.94 TO 666+15.76
 STA. 671+32.78 TO 683+04.77- *PAVEMENT SLOPES VARIES 2% TO 1% 671+35.40 TO 673+88.86
 STA. 689+31.01 TO 709+12.43
 STA. 710+60.15 TO 718+75.13
 STA. 730+83.93 TO 734+58.99
 STA. 741+91.21 TO 754+07.17
 STA. 761+28.74 TO 769+53.43
 STA. 770+90.28 TO 786+13.70
 * WHEN DITCH DEPTH GREATER THAN 6' USE 5' WIDTH

- ① PORTLAND CEMENT CONCRETE PAVEMENT, 9 1/2" (JOINTED)
- ② AGGREGATE SUBGRADE IMPROVEMENT, 12"
- ③ CONCRETE MEDIAN, TYPE SB (SPECIAL)
- ④ CONCRETE MEDIAN SURFACE, 4" (RAISED MEDIAN)
- ⑤ AGGREGATE BASE COURSE TYPE B, 4"
- ⑥ AGGREGATE BASE COURSE TYPE A, 6" (WITH COMPACTED SUBGRADE)
- ⑦ INCIDENTAL HOT-MIX ASPHALT SURFACING, 2"

- ⑧ COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.24
- ⑨ COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.12
- ⑩ COMBINATION CONCRETE CURB AND GUTTER, TYPE B-6.06
- ⑪ PORTLAND CEMENT CONCRETE SIDEWALK, 4"
- ⑫ PIPE UNDERDRAINS, TYPE 3

- ⑭ POLYMERIZED HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N90 (11 1/4")
- ⑮ HOT-MIX ASPHALT SHOULDERS, 6"
- ⑯ POLYMERIZED HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N90 (2")
- ⑰ POLYMERIZED HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N90 (9")
- ⑱ HOT-MIX ASPHALT SURFACE COURSE, MIX "C", N70 (2")
- ⑲ HOT-MIX ASPHALT BINDER COURSE, IL-19.0, N70 (5 1/4")

- ⑳ TOPSOIL PLACEMENT, 4"
- ㉑ AGGREGATE SHOULDERS, TYPE B 6"
- ㉒ PAVEMENT JOINT (TYP.)
- ㉓ POLYMERIZED HOT-MIX ASPHALT SURFACE COURSE, MIX "D", N90 (1 1/2")
- ㉔ POLYMERIZED LEVELING BINDER (MACHINE METHOD), N90 (3/4")
- ㉕ HOT-MIX ASPHALT SURFACE REMOVAL, 2 1/4"

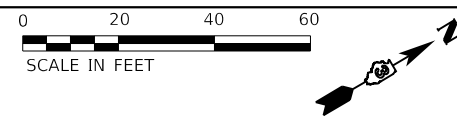
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**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

IL 71 PROPOSED TYPICAL SECTION	
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STA.	TO STA.

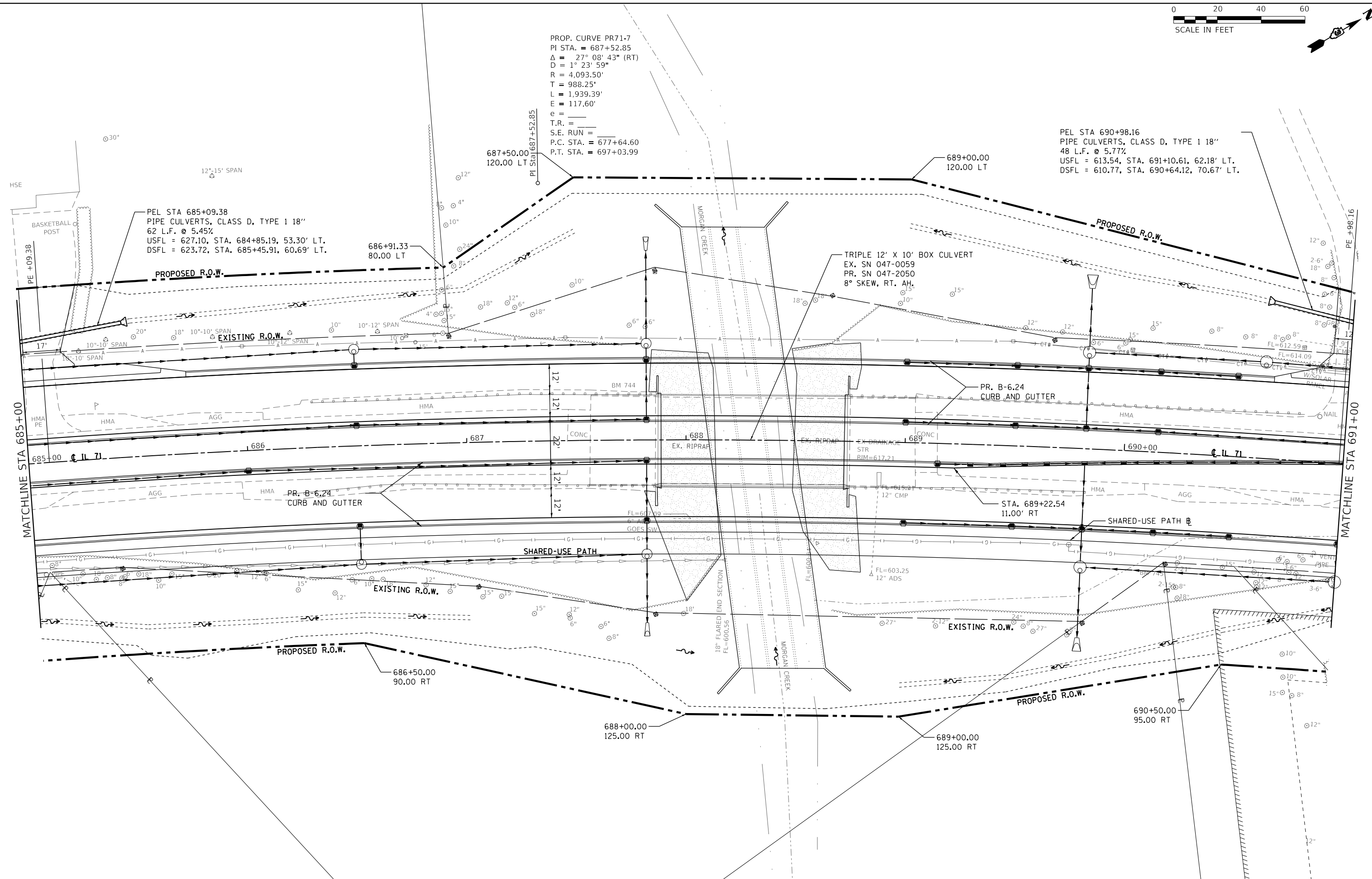
F.A.P. RTE. 311	SECTION (1-1)R.BR1	COUNTY KENDALL	TOTAL SHEETS 755	SHEET NO. 31
CONTRACT NO. 66D26				
ILLINOIS FED. AID PROJECT				



PROP. CURVE PR71-7
 PI STA. = 687+52.85
 $\Delta = 27^\circ 08' 43''$ (RT)
 $D = 1^\circ 23' 59''$
 $R = 4,093.50'$
 $T = 988.25'$
 $L = 1,939.39'$
 $E = 117.60'$
 $e =$
 $T.R. =$
 $S.E. RUN =$
 $P.C. STA. = 677+64.60$
 $P.T. STA. = 697+03.99$

PEL STA 690+98.16
 PIPE CULVERTS, CLASS D, TYPE 1 18"
 48 L.F. @ 5.77%
 USFL = 613.54, STA. 691+10.61, 62.18' LT.
 DSFL = 610.77, STA. 690+64.12, 70.67' LT.

PEL STA 685+09.38
 PIPE CULVERTS, CLASS D, TYPE 1 18"
 62 L.F. @ 5.45%
 USFL = 627.10, STA. 684+85.19, 53.30' LT.
 DSFL = 623.72, STA. 685+45.91, 60.69' LT.



MATCHLINE STA 685+00

MATCHLINE STA 691+00

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**STATE OF ILLINOIS
 DEPARTMENT OF TRANSPORTATION**

**IL 71
 PLAN**

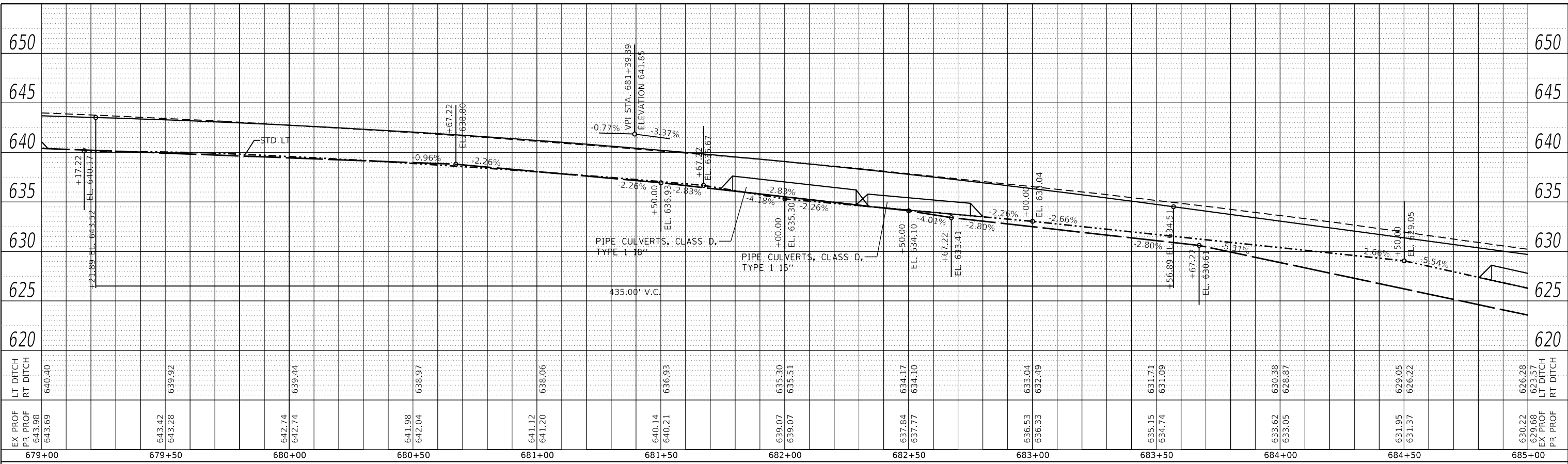
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CONTRACT NO. 66D26				
ILLINOIS FED. AID PROJECT				

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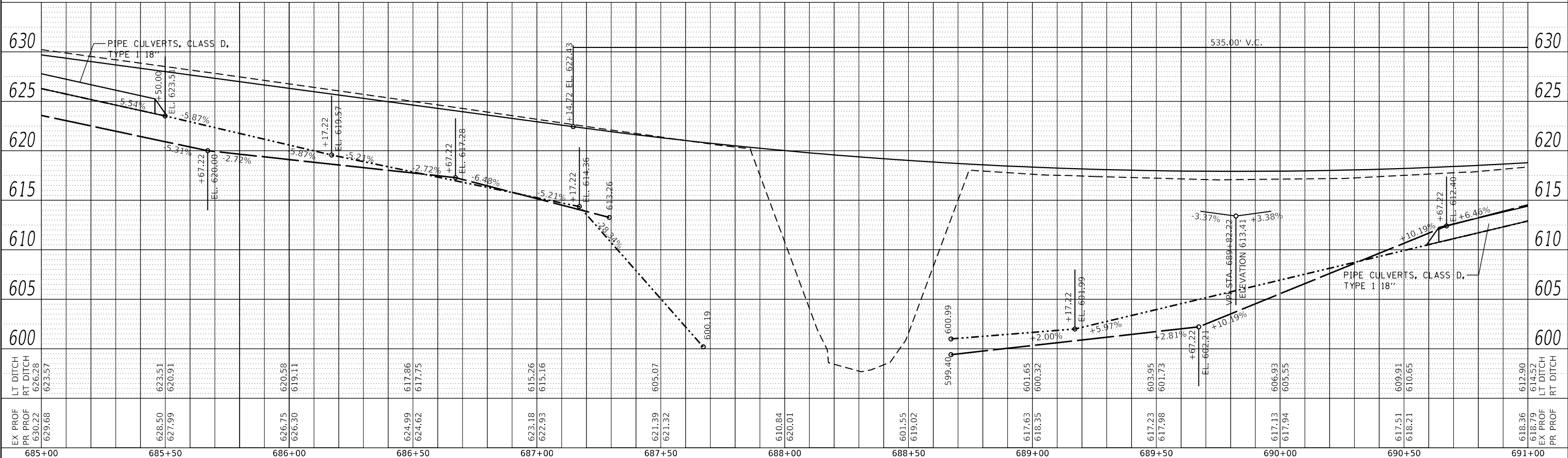
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PROFILE LEGEND

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	SPECIAL DITCH LEFT



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**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

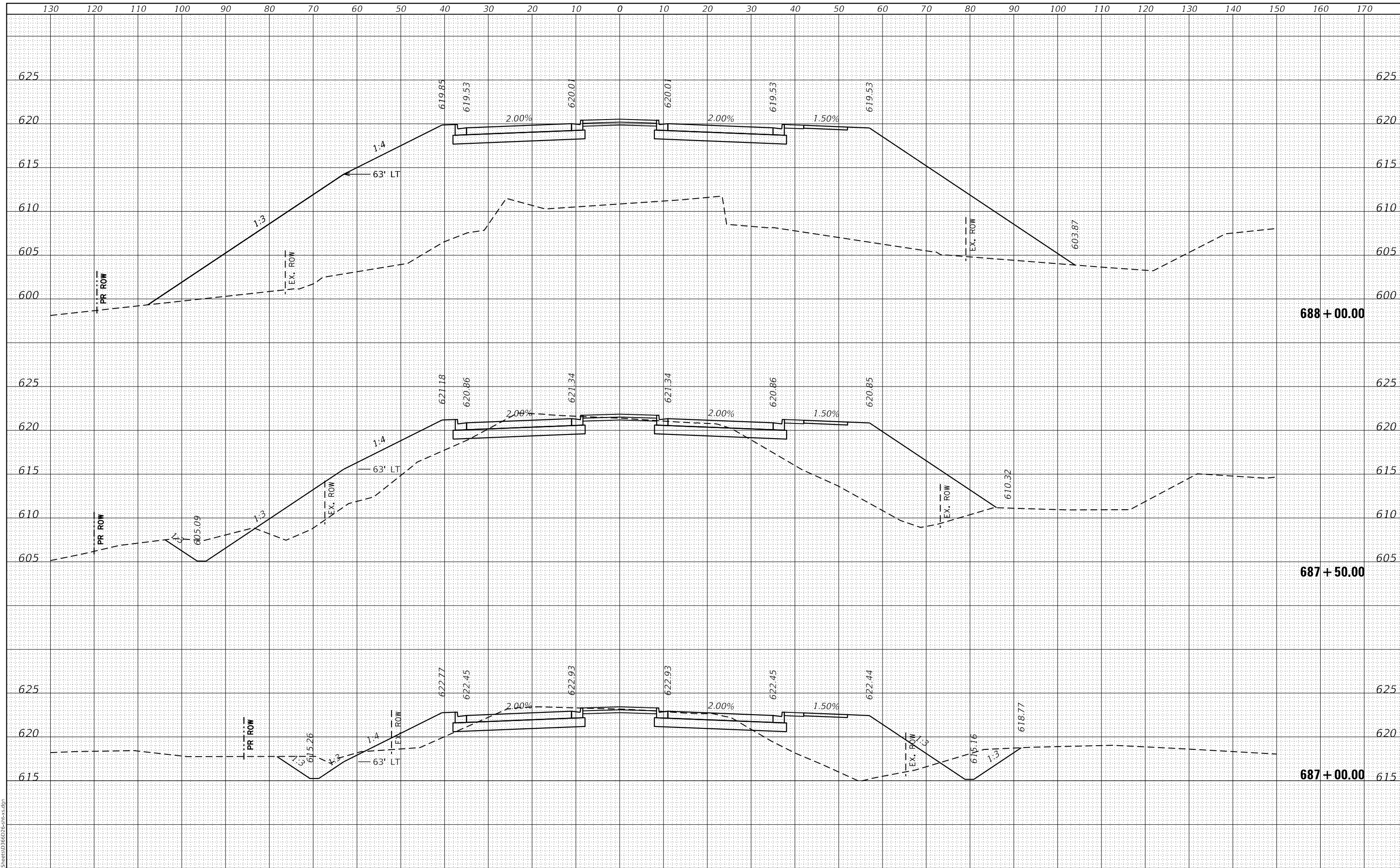
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**IL 71
PROFILE**

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CONTRACT NO. 66D26				
ILLINOIS		FED. AID PROJECT		

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AREAS CHECKED	TEMPLATE	
	AREAS CHECKED	

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**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

**IL 71
CROSS SECTIONS**

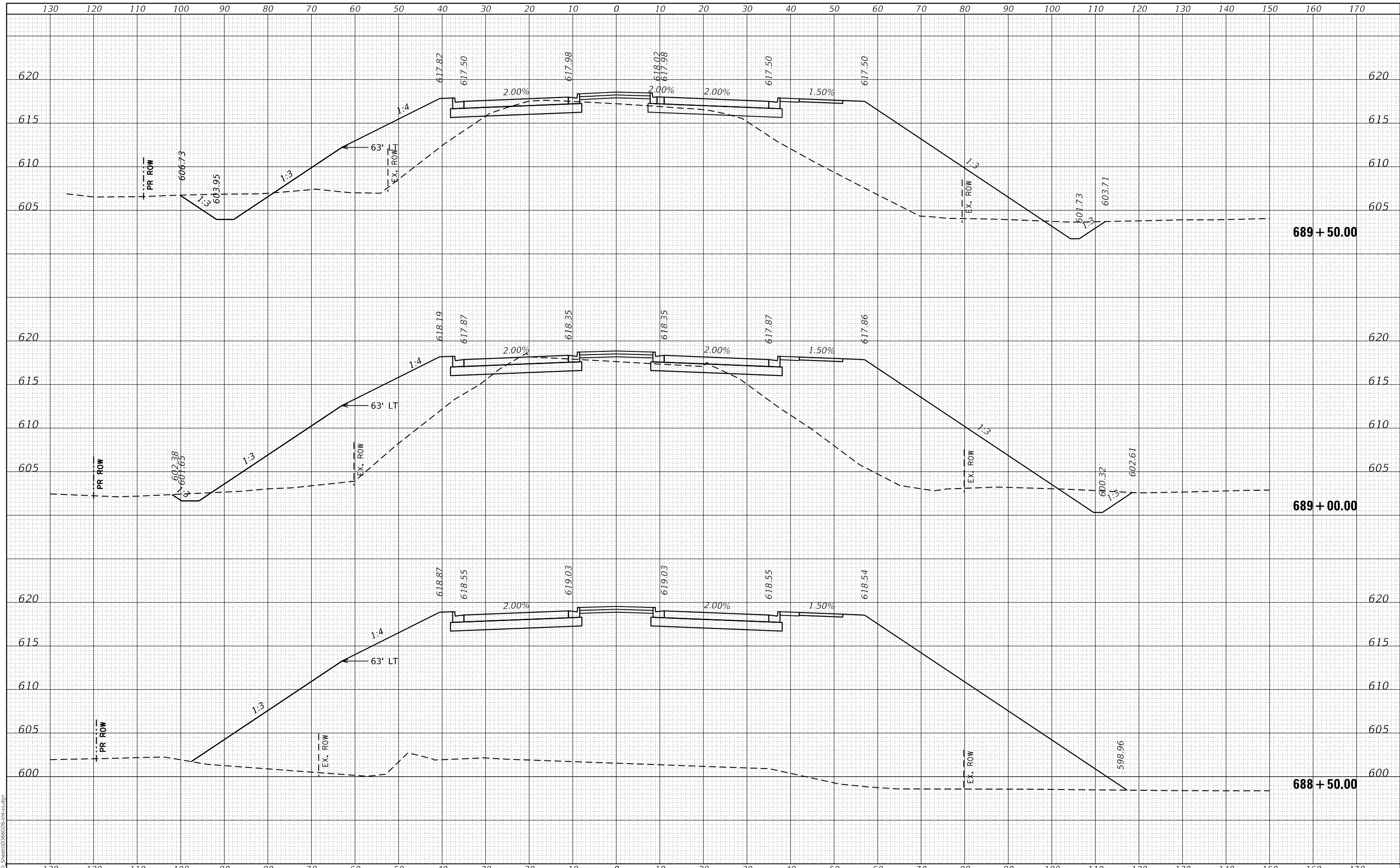
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311	(1-1)R,BR1	KENDALL	755	685
CONTRACT NO. 66D26				
ILLINOIS FED. AID PROJECT				

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DATE	
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**STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION**

SCALE: 1"=10'		SHEET	OF	SHEETS	STA. 688+50.00	TO STA. 689+50.00
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**IL 71
CROSS SECTIONS**

F.A.P. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
311	(1-1)R,BR1	KENDALL	755	686
CONTRACT NO. 66D26				
ILLINOIS				FED. AID PROJECT



SOIL BORING LOG

ROUTE FAP 311 (IL 71) DESCRIPTION IL 71 Over Morgan Creek, East of Yorkville LOGGED BY K Whittington

SECTION 1-A BR LOCATION SW1/4, SEC. 26, TWP. 37, RNG. 7, 3rd PM

COUNTY Kendall DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME

STRUCT. NO. 047-0059
Station 688+33
BORING NO. 1 (N. Abut.)
Station 689+03
Offset 17.00ft Left
Ground Surface Elev. 616.20 ft

DEPTH (ft)	BLOW COUNT (/6")	UCS (tsf)	MOISTURE (%)	Surface Water Elev. ft	Stream Bed Elev. ft	GROUNDWATER ELEV. (ft)	BLOW COUNT (/6")	UCS (tsf)	MOISTURE (%)
613.70	3					594.20	18		
	2	0.7	14.0				14		9.0
	3	P					10		
611.70									
	2	<0.5	20.0						
	2	P							
608.20	4	0.7	14.0			589.70			
	8	P							
	7		6.0						
606.70									
	3								
	3	1.5	20.0						
	8	P							
	6								
	5	2.0	12.0						
	8	P							
601.70									
	3								
	2	0.7	24.0						
	3	P							
599.20									
	7								
	12		12.0						
	9								
-20									

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)



SOIL BORING LOG

ROUTE FAP 311 (IL 71) DESCRIPTION IL 71 Over Morgan Creek, East of Yorkville LOGGED BY K Whittington

SECTION 1-A BR LOCATION SW1/4, SEC. 26, TWP. 37, RNG. 7, 3rd PM

COUNTY Kendall DRILLING METHOD Hollow Stem Auger HAMMER TYPE CME

STRUCT. NO. <u>047-0059</u>	D E P T H H	B L O W S	U C S Qu	M O I S T	Surface Water Elev. <u>597.90</u> ft	D E P T H H	B L O W S	U C S Qu	M O I S T
Station <u>688+63</u>					Stream Bed Elev. <u>597.40</u> ft				
BORING NO. <u>3 (Bridge Deck)</u>	(ft)	(/6")	(tsf)	(%)	Groundwater Elev.:	(ft)	(/6")	(tsf)	(%)
Station <u>688+63</u>					First Encounter <u>597.9</u> ft ▼				
Offset <u>5.50ft Left</u>					Upon Completion _____ ft				
Ground Surface Elev. <u>617.40</u> ft					After _____ Hrs. _____ ft				

Bridge Deck	-				Streambed. Augered 5'	-			
					592.40				
	-5				Borehole continued with rock coring.				20/5"
	-10								
	-15								
	-20								
Top of Water @ 597.9	597.90 ▼								

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)

