

PIPE CULVERT / FLUME
LETTING DATE
08-17-2021
NHSN-034-7(152)--2R-90

IOWA DOT
TRANSPORTATION DEVELOPMENT DIVISION
PLANS OF PROPOSED IMPROVEMENTS ON THE

PRIMARY ROAD SYSTEM

WAPELLO COUNTY

PIPE CULVERT / FLUME
ON US 34, 1.9 MI. EAST
OF US 63 (EB)

LEGEND	
INTERSTATE HIGHWAY	
PRIMARY HIGHWAY-DIVIDED	
PRIMARY HIGHWAY	
PORTLAND CEMENT CONCRETE ROAD	
ASPHALT ROAD	
BITUMINOUS ROAD	
GRAVEL ROAD	
EARTHEN ROAD	
INTERSTATE HIGHWAY	
UNITED STATES HIGHWAY	
STATE HIGHWAY	
COUNTY HIGHWAY	
RAILROAD	
PIPELINE	
AIRPORT	
HYDROLOGY	
BRIDGE	
STATE BOUNDARY	
COUNTY BOUNDARY	
CORPORATE BOUNDARY	
TOWNSHIP LINE	
SECTION LINE	
ROAD NAMES	
UNINCORPORATED PLACE	
ABBAY ROAD	
ELWOOD	

THE IOWA DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGE CONSTRUCTION, SERIES 2015, PLUS APPLICABLE GENERAL SUPPLEMENTAL SPECIFICATIONS, DEVELOPMENTAL SPECIFICATIONS, SUPPLEMENTAL SPECIFICATIONS AND SPECIAL PROVISIONS SHALL APPLY TO CONSTRUCTION WORK ON THIS PROJECT.

TOTAL SHEETS	16
PROJECT NUMBER	NHSN-034-7(152)--2R-90
R.O.W. PROJECT NUMBER	
PROJECT IDENTIFICATION NUMBER	21-90-034-010

INDEX OF SHEETS	
NO.	DESCRIPTION
1	TITLE SHEET
2	ESTIMATE SHEET - DESIGN 322
2-7	DESIGN 322
C.1	ESTIMATE SHEET FOR ROADWAY
A.1-U.2	ROADWAY SHEETS

REVISIONS

IOWA ONE CALL
1-800-292-8989
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811 Know what's below. Call before you dig.

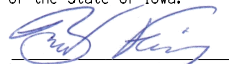
STANDARD ROAD PLANS
STANDARD ROAD PLANS ARE LISTED ON SHEET NUMBER C.1

DESIGN DATA RURAL
2019 AADT 11,600 V.P.D.
TRUCKS 18 %
INCLUDES BOTH EB & WB TRAFFIC

INDEX OF SEALS		
SHEET NO.	NAME	TYPE
I	BRADLEY J. FLEMING	STRUCTURAL DESIGN
A.1	BRIAN J. BIRKLAND	ROADWAY DESIGN

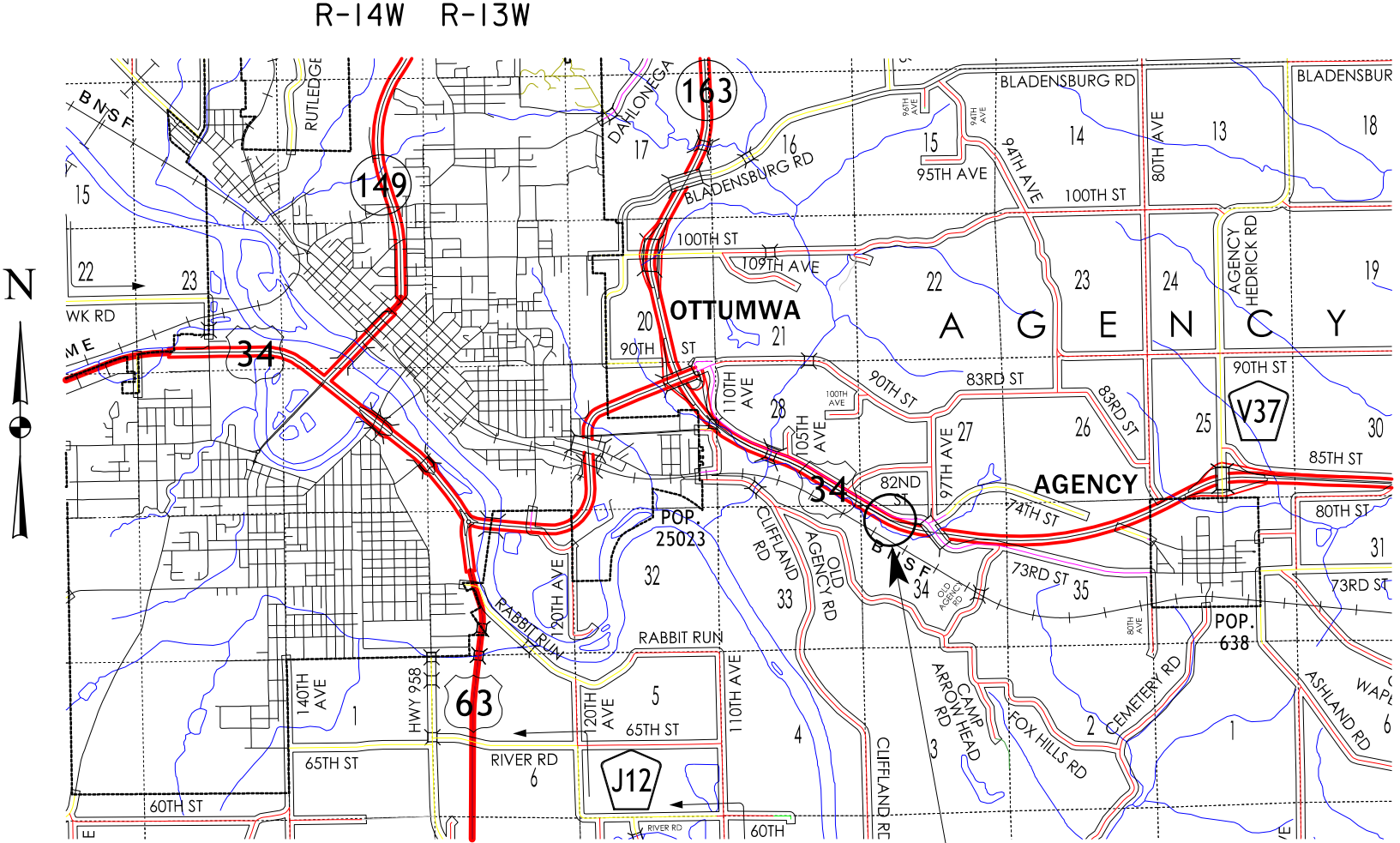
STRUCTURAL DESIGN

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

 7/26/2021
Signature Date
Bradley J. Fleming
Printed or Typed Name

My license renewal date is December 31, 2022

Pages or sheets covered by this seal: SHEETS I-7



LOCATION MAP

PROJECT DIRECTORY NAME: 9003401021

WAPELLO COUNTY - DESIGN 322

General Notes:

It is the intent of this design to extend the existing 60" & 12" reinforced concrete pipes and replace the existing 6'-0" x 5'-0" flume chute and basin. Electronic copies of original design plans are available to the Contractor as part of the e-files supplied with the contract documents. Dimensions shown on these plans are based on design plans (Original Design No. 1300). Faint lines on plans indicate existing structure. Utility companies and municipalities whose facilities are shown on the plans or known to be within the construction limits shall be notified by the Contractor of the construction starting date.

Vertical earth pressure, EV=0.120 kcf.
Horizontal earth pressure, EHmax = 0.060 kcf max, EHmin = 0.030 kcf.
The Contractor may submit alternate frost trough dimensions for approval. Any additional costs due to change in the frost trough dimensions is to be paid for by the Contractor.

All reinforcing bars and bars noted as dowels supplied for this structure shall be deformed reinforcement unless otherwise noted or shown. Class 20 excavation material unsuitable for backfilling shall be disposed of in a manner that will leave the site in a neat condition.

The price bid for "Removals as Per Plan" shall include the cost for removals of the existing flume chute and basin, existing rip rap and any incidental materials.

All dimensions and details shown on these plans pertinent to new construction in relation to existing portions of the structure shall be verified in the field by the Contractor before starting construction.

All removals shall be carefully accomplished and any concrete damaged by the Contractor that is not to be removed shall be repaired by the Contractor at no extra cost to the state. Removals shall be in accordance with Section 2401 of the Standard Specifications.

The roadway will be open to traffic during construction. Since the highway will not be closed to traffic during this construction, the Contractor may feel temporary shoring (sheet pile or other) is necessary to ensure that the shoulder will not slough in while culvert is being extended. However, if for any reason such shoring is deemed necessary, the Contractor shall submit the shoring plan to the Engineer for approval. Cost of shoring, if required, will be considered incidental to construction and no direct payment will be made. Therefore, all material used for shoring shall remain the property of the Contractor. In addition to the requirements noted above, Article 1107.07, of the Standard Specifications, still applies.

Traffic will be maintained at all times in accordance with the traffic control plans shown in these plans.

When de-watering presents a problem for placing the curtain walls as detailed, alternate methods such as steel sheet pile and precast concrete walls may be approved but at no additional cost. The Contractor is to submit to the Engineer for approval complete drawings of the proposed curtain wall alternate before beginning construction.

Flume Notes:

- Reinforcing bar clearances will be as follows:
Edge clearances: 2" except
Top of floor 2¼" to near transverse reinforcing bar
Bottom of floor 3½" to near transverse reinforcing bar
End clearances:
Vertical top 2"
Vertical bottom 3½"
Transverse 2"
- Floor of flume is to be finished smooth. Sides of footing are to be formed to ensure correct line and grade.
- All floor reinforcing steel is to be supported at intervals of not more than 3'-0" in either direction as outlined in the Standard Specifications.
- The vertical bars in the walls may be spliced above the footing at the contractor's option as follows:

Bar Size Number	4	5	6	7	8
Minimum Splice Length	20"	24"	29"	34"	38"

This splice, if used will be at the contractor's expense.

- Beveled 2"x4" keyways are to be used for 9" walls except at bell joints and 2"x6" keyways are used for 12" walls except at bell joints.
- Keyway dimensions shown on the plans are based on nominal dimensions unless stated otherwise. In addition, the bevel used on the keyway shall be limited to a maximum of 10 degrees from vertical.
- These flume standards label all reinforcing steel with English notation (5a1 is ½ inch diameter bar). English reinforcing received in the field may display the following "bar designation". The "bar designation" is the stamped impression on the reinforcing bars, and is equivalent to the bar diameter in millimeters.

English Size	4	5	6	7	8
Bar Designation	13	16	19	22	25

Specifications:

Design:
AASHTO LRFD Bridge Design Specifications, 8th Ed., Series of 2017.

Construction:
Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction, current series, plus applicable General Supplemental Specifications, Developmental Specifications, Supplemental Specifications and Special Provisions

Design Stresses:

Design stresses for the following materials are in accordance with the AASHTO LRFD Bridge Design Specifications, 8th Ed., Series of 2017:
Reinforcing steel in accordance with AASHTO LRFD Section 5, Grade 60.
Concrete in accordance with AASHTO LRFD Section 5, f'c = 4.0 ksi.

ESTIMATED CULVERT QUANTITIES

ITEM NO.	ITEM CODE	ITEM	UNITS	QUANTITY	AS BUILT QUANTITY
1	2401-6750001	REMOVALS, AS PER PLAN	LS	1.00	
2	2402-2720000	EXCAVATION, CLASS 20	CY	46	
3	2402-2724000	EXCAVATION, CLASS 24	CY	233	
4	2403-0100020	STRUCTURAL CONCRETE (RCB CULVERT)	CY	41.6	
5	2404-7775000	REINFORCING STEEL	LB	7,262	
6	2507-3250005	ENGINEERING FABRIC	SY	217.8	
7	2507-6800061	REVTMENT, CLASS E	TON	145.3	
8	2533-4980005	MOBILIZATION	LS	1.00	

ESTIMATE REFERENCE INFORMATION

DATA LISTED BELOW IS FOR INFORMATIONAL PURPOSES ONLY AND SHALL NOT CONSTITUTE A BASIS FOR ANY EXTRA WORK ORDERS.

ITEM NO.	DESCRIPTION
1	INCLUDES ALL WORK FOR REMOVAL AND OFF-SITE DISPOSAL OF THE EXISTING FLUME, FLUME BASIN, AND ANY EXISTING RIP RAP OR INCIDENTAL MATERIALS. REMOVAL OF SCHEDULED ITEMS SHALL BE IN ACCORDANCE WITH SECTION 2401, OF THE STANDARD SPECIFICATIONS. ANY DAMAGE TO MATERIAL NOT TO BE REMOVED SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR AND REPAIRED AT NO EXTRA COST TO THE STATE.
2	INCLUDES EXCAVATION AROUND FLUME BASIN AND PORTION OF CHUTE. DOES NOT INCLUDE THE VOLUME OF THE EXISTING FLUME BASIN AND CHUTE.
3	INCLUDES THE FILL IN ERODED AND UNDERMINED AREAS AND UNDER THE EXISTING FLUME CHUTE. INCLUDES FILLING AND COMPACTING LOW AREAS TO THE TOP OF FLUME WALLS AND EVEN WITH ADJACENT GRADE. COMPACTION AND MOISTURE CONTROL IS REQUIRED.
4	INCLUDES ALL RESILIENT JOINT FILLER REQUIRED.
6	ENGINEERING FABRIC SHALL BE MATERIAL AS SPECIFIED FOR EMBANKMENT EROSION CONTROL IN ACCORDANCE WITH ARTICLE 4196.01, B, 3, OF THE STANDARD SPECIFICATIONS. MATERIAL SHALL BE MEASURED IN SQ. YARD OF ACTUAL AREA COVERED. REFER TO DETAILS ON DESIGN SHEET 6.
7	ESTIMATED AT 1.6 TON/CY.

Listed Bars

4a1	5b5	4b6	5c1	Bar 5c3
88 Bars	4 Bars	4 Bars	72 Bars	28 Bars
46 Bars @ 4'-5"			44 Bars @ 16'-0"	
42 Bars Var.	4 Bars Var.	4 Bars Var.	28 Bars Var.	28 Bars Var.
2 Ea. Lgth.	2 Ea. Lgth.	2 Ea. Lgth.	1 Ea. Lgth.	2 Ea. Lgth.
7'-8"	10'-11"	10'-11"	18'-10"	6'-6"
7'-4"	5'-9"	5'-9"	18'-8"	6'-4"
7'-1"			18'-6"	6'-2"
6'-9"			18'-4"	6'-1"
6'-6"			18'-2"	5'-11"
6'-3"			18'-0"	5'-9"
6'-1"			17'-10"	5'-8"
5'-10"			17'-8"	5'-6"
5'-8"			17'-6"	5'-5"
5'-6"			17'-4"	5'-3"
5'-4"			17'-2"	5'-2"
5'-2"			17'-0"	5'-0"
5'-0"			17'-0"	4'-11"
4'-11"			16'-10"	4'-10"
4'-9"			16'-8"	
4'-8"			16'-8"	
4'-7"			16'-6"	
4'-7"			16'-6"	
4'-6"			16'-4"	
4'-6"			16'-4"	
4'-5"			16'-4"	
			16'-2"	
			16'-2"	
			16'-2"	
			16'-2"	
			16'-0"	
			16'-0"	
			16'-0"	

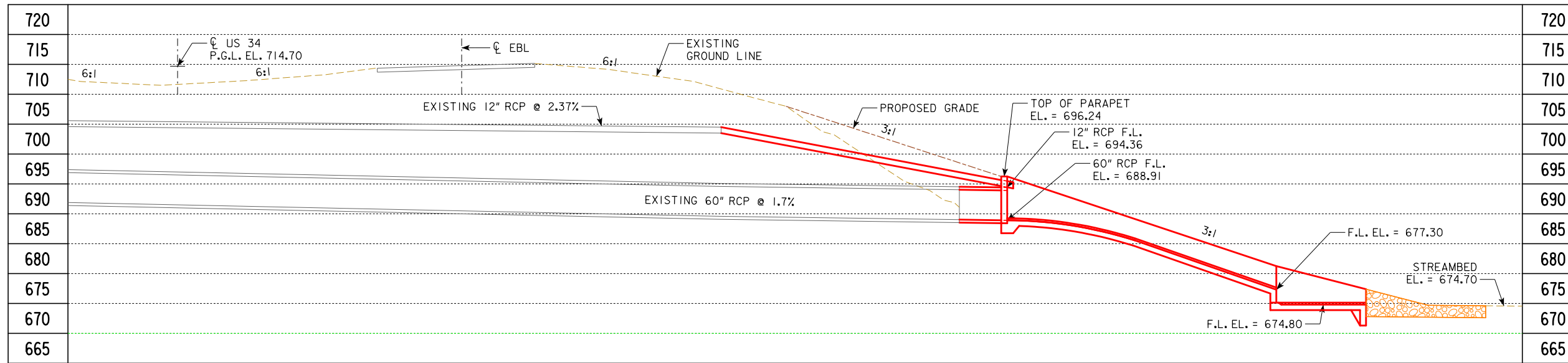
DESIGN HISTORY AT THIS SITE (INCLUDES THIS DESIGN)	
DES. NO.	TYPE OF WORK
1300	ORIGINAL DESIGN
322	PIPE/FLUME REPAIR

TRAFFIC CONTROL PLAN:
THE ROADWAY WILL BE OPEN TO THRU TRAFFIC. REFER TO THE TRAFFIC CONTROL PLAN SHOWN ELSEWHERE IN THESE PLANS.

ROADWAY QUANTITIES SHOWN ELSEWHERE IN THESE PLANS.

DESIGN FOR REPAIRS TO A 14° SKEW L.A.
60"Φ CONCRETE PIPE WITH 6'-0 x 5'-0 FLUME AND BASIN
GENERAL NOTES & QUANTITIES
STA. 940+31.96 (E US 34) JULY, 2021
WAPELLO COUNTY
IOWA DOT - TRANSPORTATION DEVELOPMENT DIVISION
DESIGN SHEET NO. 1 OF 6 FILE NO. 32081 DESIGN NO. 322





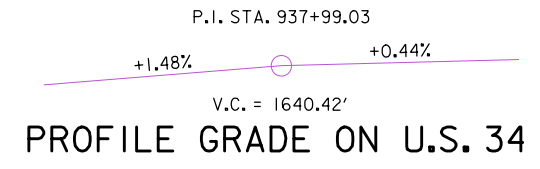
BENCH MARK NO. 1: STA. 939+63.71, 103.99'
RT. EL. = 707.763
SET 60D 8" COTTONWOOD.

BENCH MARK NO. 2: STA. 939+73.35, 230.26'
RT. EL. = 677.191
SET RR SPIKE E. SIDE
12" LOCUST.

NOTE:
SEE ROAD SHEETS FOR ADDITIONAL PIPE
CULVERT CONSTRUCTION DETAILS.

ORIGINAL PLANS WERE DEVELOPED AS A
METRIC PROJECT. STATIONING ON THESE
PLANS (US SURVEY FEET) IS A BEST FIT
OFFICE ALIGNMENT BASED ON
TOPOGRAPHIC SURVEY. ELEVATIONS ARE
BASED ON NAVD88 DATUM. SEE SHEET G.1
FOR ADDITIONAL INFORMATION.

LONGITUDINAL SECTION ALONG ϕ FLUME



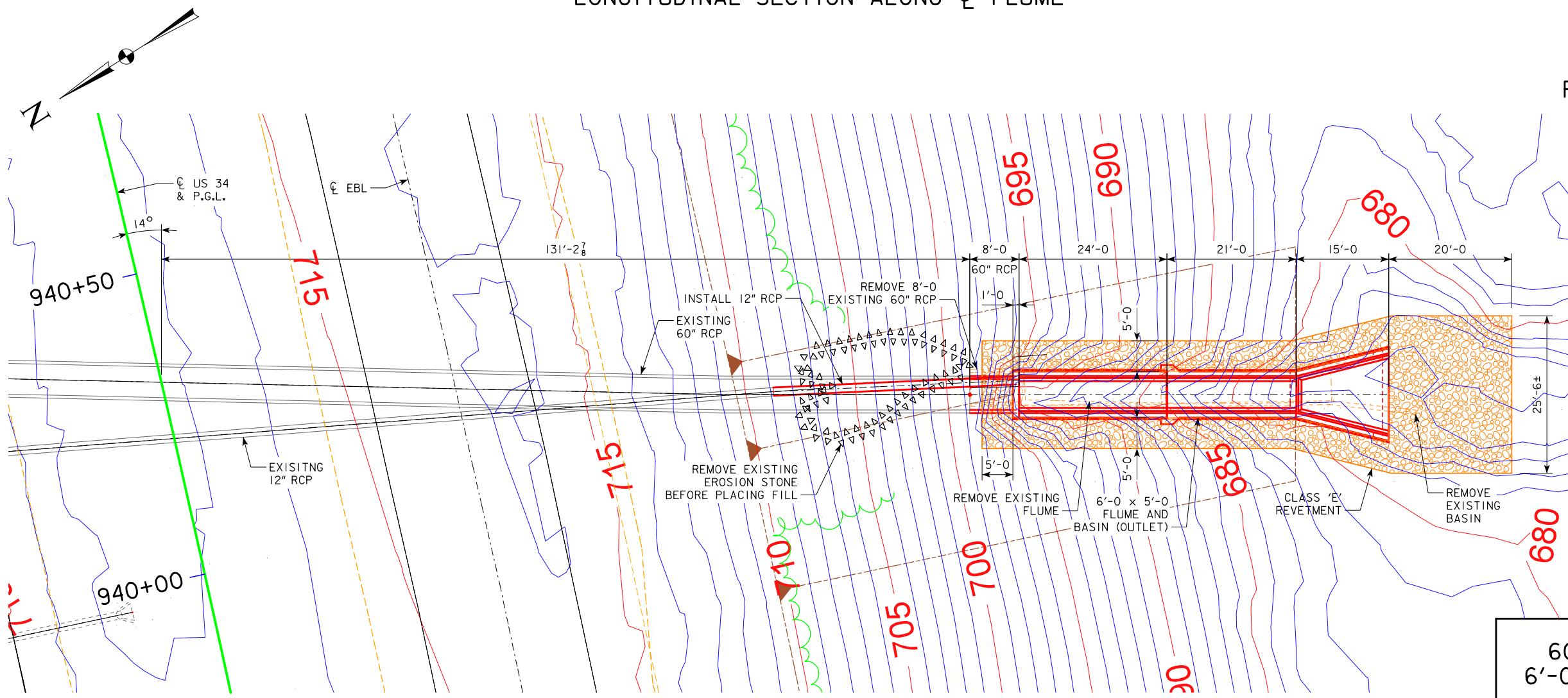
HYDRAULIC DATA
DISCHARGE FROM IOWA RUNOFF CHART
DRAINAGE AREA (D.A.) = 34.86 ACRES

Q_{50} = 111 CFS
HEADWATER (HW) STAGE = 703.58

Q_{100} = 134 CFS
HW STAGE = 704.23

TRAFFIC ESTIMATE
2019 AADT 11,600 V.P.D.
TRUCKS 18 %
INCLUDES BOTH EB & WB TRAFFIC

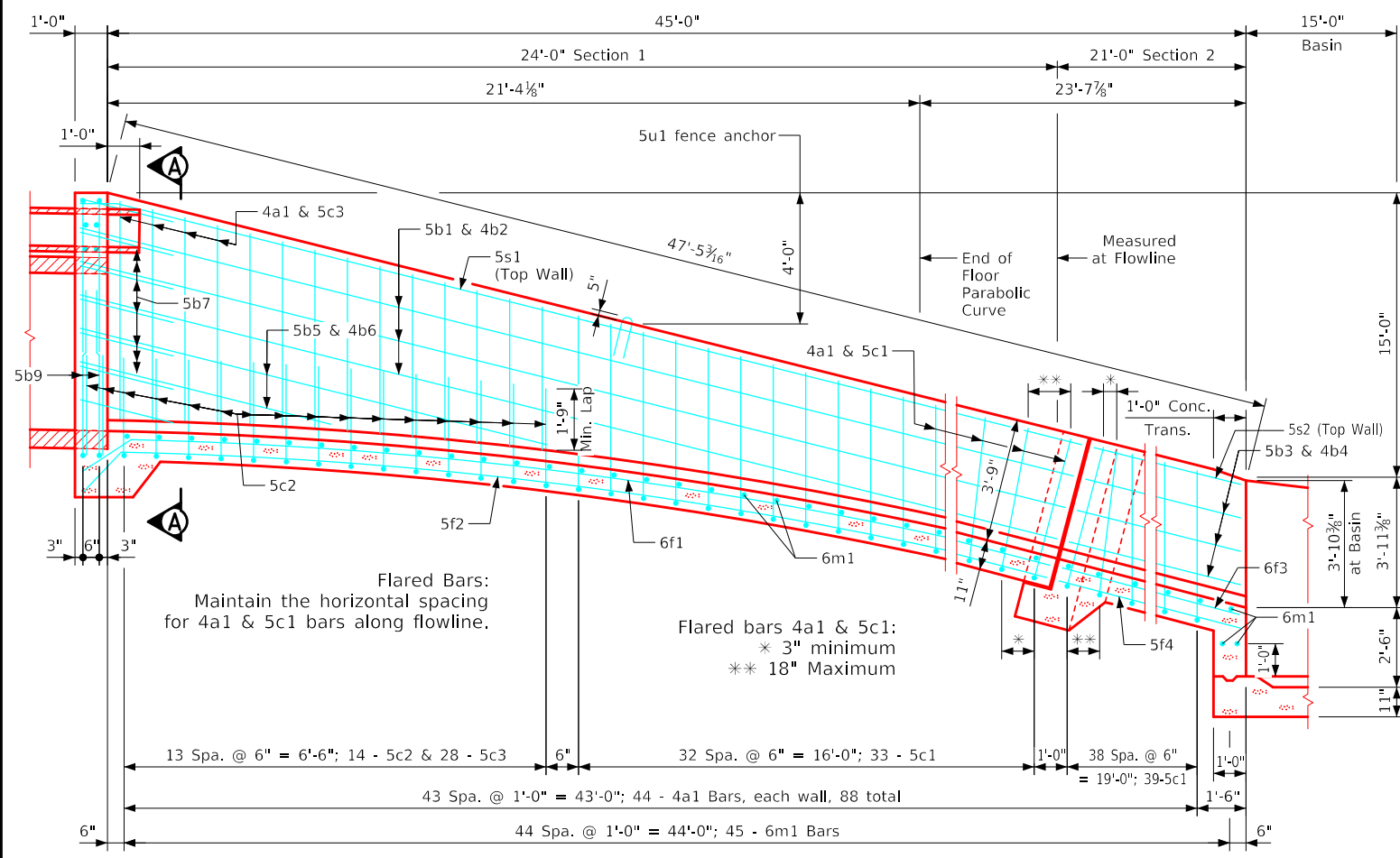
LOCATION
US 34 (EB)
T-72N R-13W
SECTION 34
AGENCY TOWNSHIP
WAPELLO COUNTY
LATITUDE 41.000099°
LONGITUDE -92.347267°



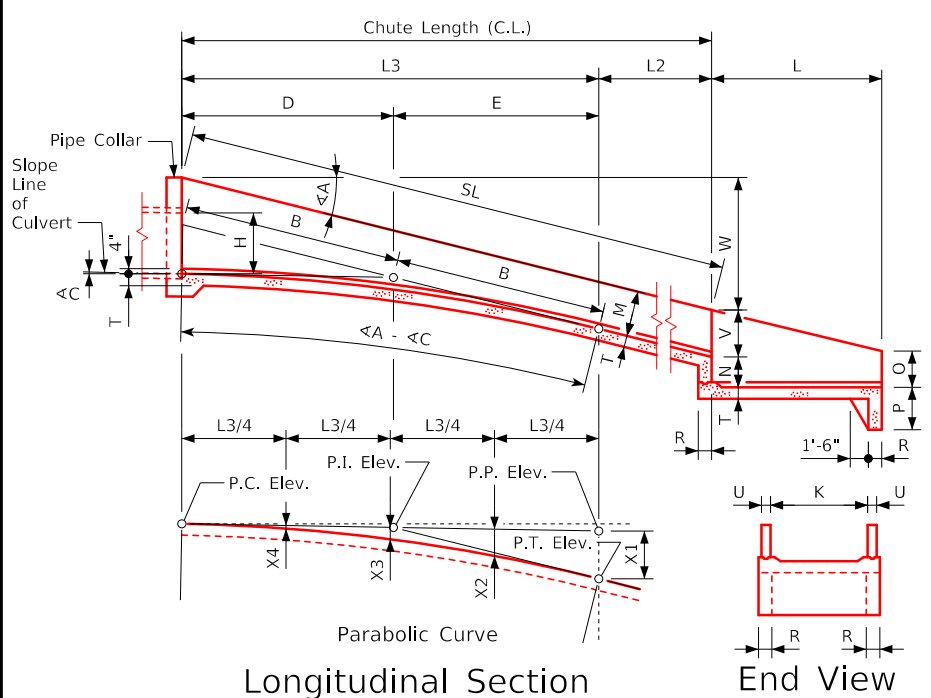
SITUATION PLAN

DESIGN FOR REPAIRS TO A 14° SKEW L.A.
**60" ϕ CONCRETE PIPE WITH
6'-0" x 5'-0" FLUME AND BASIN**
SITUATION PLAN
STA. 940+31.96 (ϕ US 34) JULY, 2021
WAPELLO COUNTY
IOWA DOT - TRANSPORTATION DEVELOPMENT DIVISION
DESIGN SHEET NO. 2 OF 6 FILE NO. 32081 DESIGN NO. 322



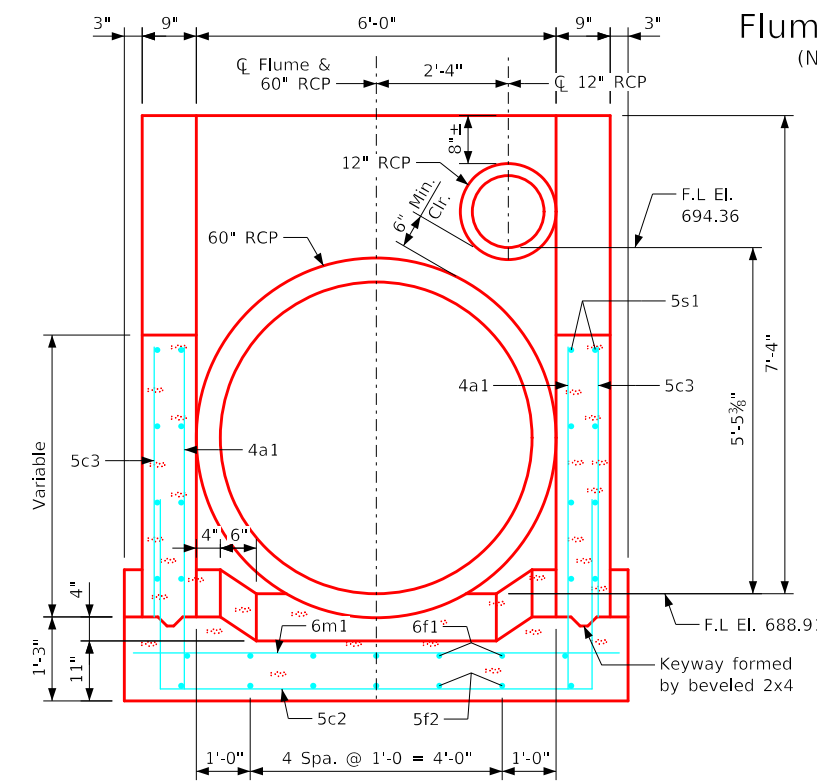


6'x5' Flume Chute - Longitudinal Section



Longitudinal Section

End View



Section A-A

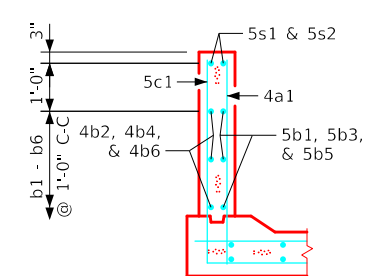
Flume Data Curve Data

Flume Data
 $\angle A = 18^\circ 26'$
 $\angle C = 1^\circ 00'$
 $B = 11'-2\frac{1}{2}''$
 $SL = 47'-5\frac{3}{16}''$
 $H = 5'-0''$
 $K = 13'-6''$
 $L = 15'-0''$
 $M = 3'-9''$
 $N = 2'-6''$
 $O = 2'-7''$
 $P = 3'-6''$
 $R = 1'-0''$
 $T = 0'-11''$
 $U = 0'-9''$
 $V = 3'-11\frac{3}{8}''$
 $W = 15'-0''$

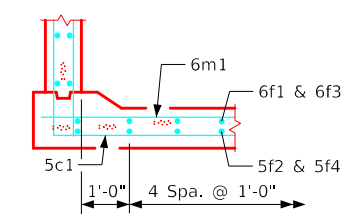
Curve Data
 $C.L. = 45'-0''$
 $L2 = 23'-7\frac{7}{8}''$
 $L3 = 21'-4\frac{1}{8}''$
 $D = 10'-8\frac{7}{16}''$
 $E = 10'-7\frac{1}{16}''$
 $P.C. Elev. = 688.91$
 $P.I. Elev. = 688.73$
 $P.P. Elev. = 688.54$
 $P.T. Elev. = 685.18$
 $X1 = 3'-4\frac{3}{16}''$
 $X2 = 1'-10\frac{1}{16}''$
 $X3 = 0'-10\frac{1}{16}''$
 $X4 = 0'-2\frac{1}{2}''$
 $L3/4 = 5'-4\frac{1}{16}''(-)$

Notes:

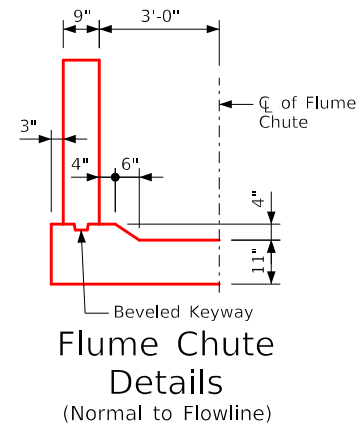
- See Design Sheet 5 for bell joint information and details not shown.
- See Design Sheet 4 for flume basin information and details not shown.
- 4-5b9 bars are in the flume chute footing. 5b7 bars are in the flume chute walls. 5b9 and 5b7 bars are included in quantities for the pipe collar. See design sheet 5 for details.
- Field trim flared 4a1 & 5c1 bars to 2" min. cl. at top of wall.



Flume Wall Section (Normal to Flowline)



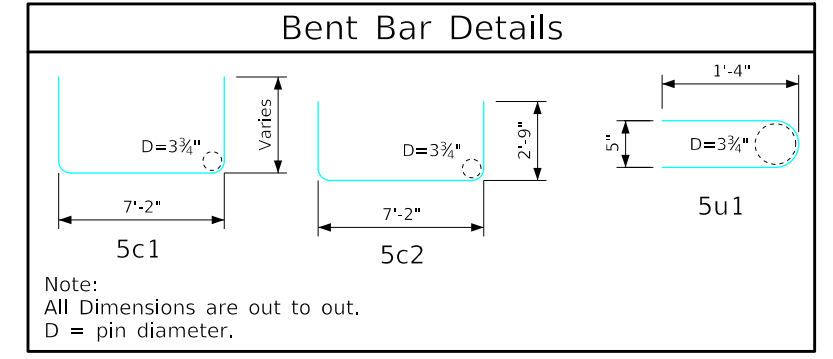
Flume Floor Half Section (Normal to Flowline)



Flume Chute Details (Normal to Flowline)

Reinforcing Bar List - Flume					
Bar	Location	Shape	No.	Length	Weight
4a1	Walls FFV	—	88	Listed	292
5b1	Walls FFH - Section 1	—	6	26'-2": 26'-10"	166
4b2	Walls BFH - Section 1	—	6	26'-2": 26'-10"	106
5b3	Walls FFH - Section 2	—	6	20'-11": 21'-8"	133
4b4	Walls BFH - Section 2	—	6	20'-11": 21'-8"	85
5b5	Walls FFH - Section 1	—	4	Listed	35
4b6	Walls BFH - Section 1	—	4	Listed	22
5c1	Bott. Floor & Walls BFV	—	72	Listed	1,232
5c2	Bott. Floor & Walls BFV - Spliced	—	16	12'-8"	211
5c3	Walls BFV	—	28	Listed	164
6f1	Floor Longit. Top - Section 1	—	7	25'-3"	265
5f2	Floor Longit. Bott. - Section 1	—	7	25'-3"	184
6f3	Floor Longit. Top - Section 2	—	7	21'-11"	230
5f4	Floor Longit. Bott. - Section 2	—	7	21'-11"	160
6m1	Floor Transv. Top	—	47	7'-8"	541
5s1	Walls Both F Along Slope - Section 1	—	4	27'-2"	113
5s2	Walls Both F Along Slope - Section 2	—	4	20'-6"	86
5u1	Fence Anchors (Galvanized)	—	2	2'-10"	6
Total (LBS.)					4,031

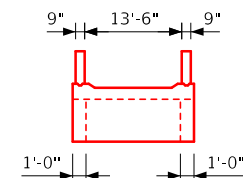
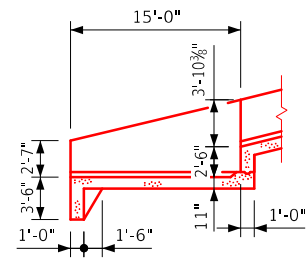
† See design sheet 1 for listed bars



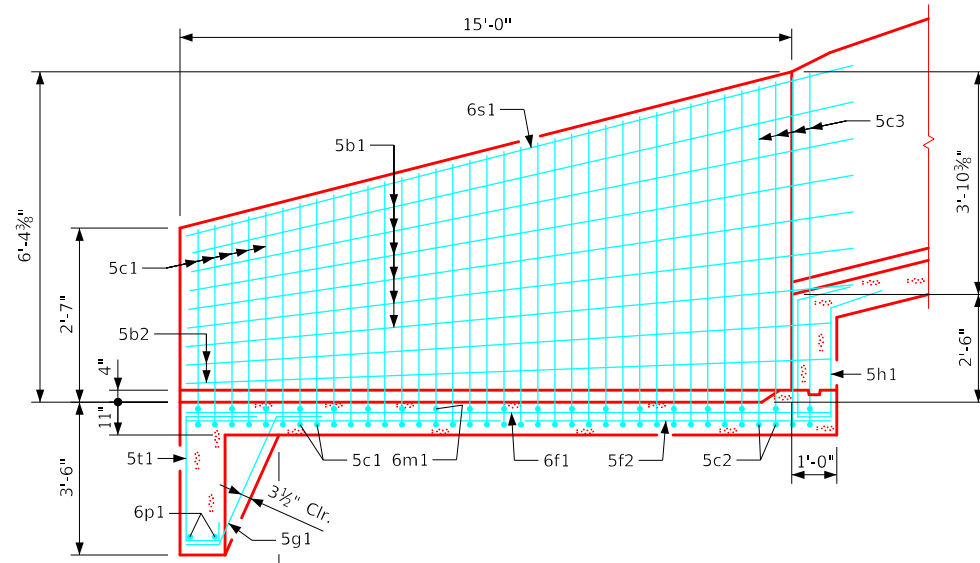
Concrete Placement Quantities		
Location	Total	
Footing - Section 1	7.9	
Footing - Section 2	7.3	
Walls - Section 1; 2 @ 3.2 CY	6.4	
Walls - Section 2; 2 @ 2.0 CY	4.0	
Total (CY)		25.6

DESIGN FOR REPAIRS TO A 14° SKEW L.A.
**60" Φ CONCRETE PIPE WITH
 6'-0" x 5'-0" FLUME AND BASIN**
FLUME DETAILS
 STA. 940+31.96 (C US 34) JULY, 2021
WAPELLO COUNTY
 IOWA DOT - TRANSPORTATION DEVELOPMENT DIVISION
 DESIGN SHEET NO. 3 OF 6 FILE NO. 32081 DESIGN NO. 322





End Details

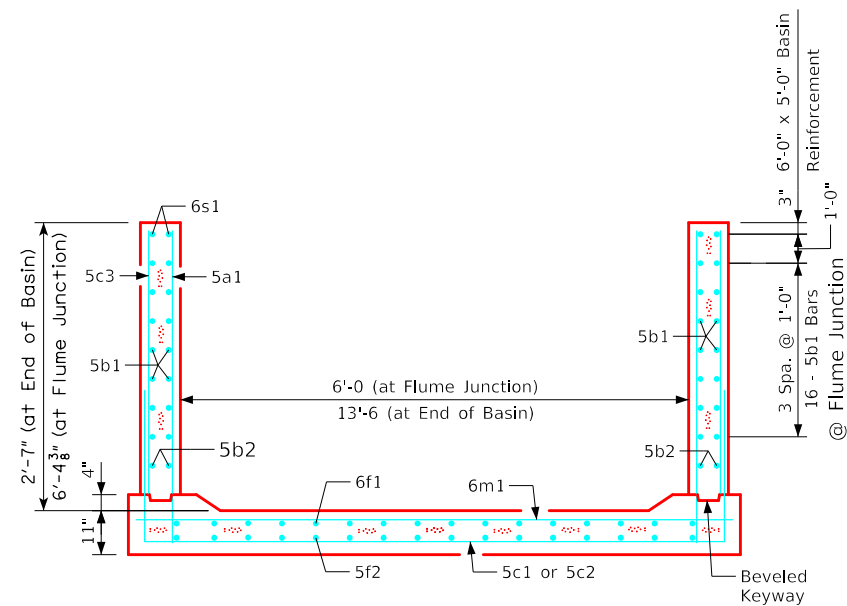


Longitudinal Section

6'-0" x 8'-0" Basin Reinforcement shown,
6'-0" x 5'-0" Basin Reinforcement is similar.

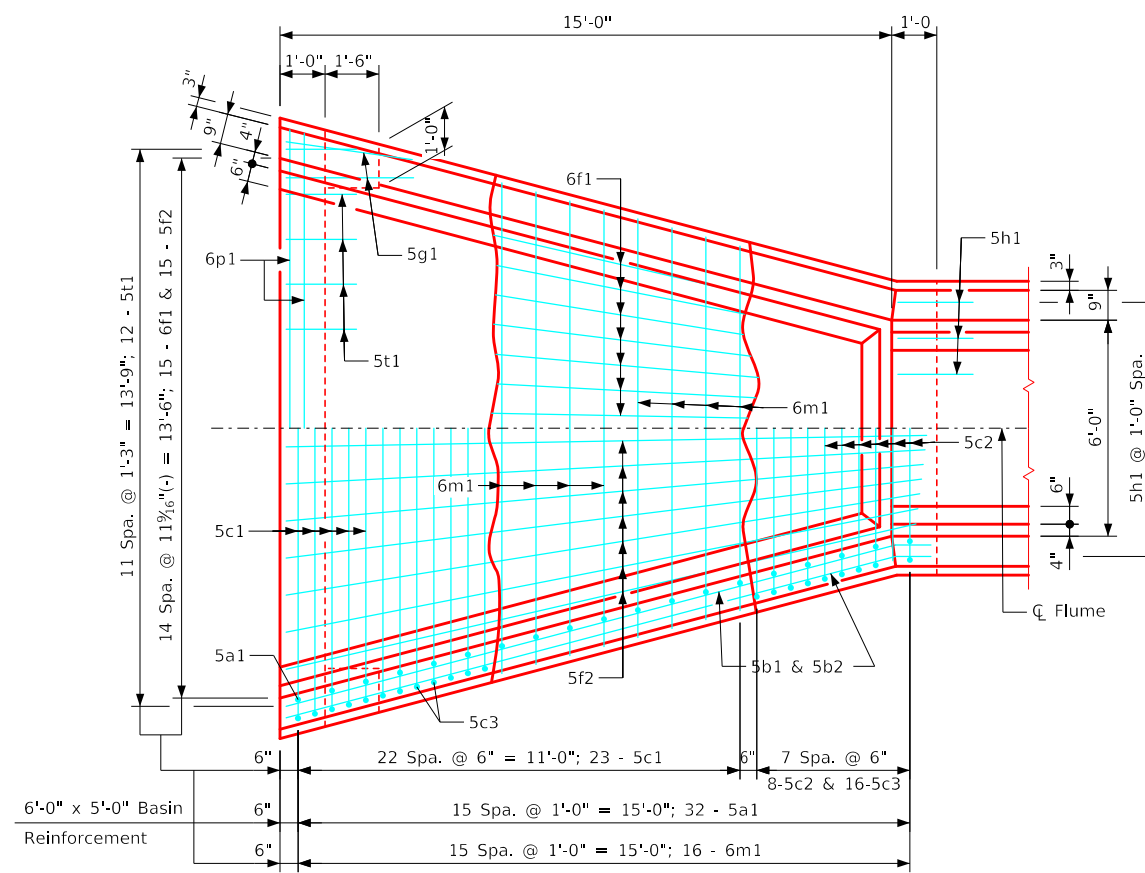
Estimate of Quantities - Flume Basin

Bar	Location	Shape	No.	Length	Weight
5a1	Walls - Vert. - F.F.	—	32	3'-2":6'-11"	168
5b1	Walls - Longit. - F.F. & B.F.	—	16	17'-6"	292
5b2	Walls - Longit. - F.F. & B.F.	—	4	16'-1"	67
5c1	Walls - Vert. - B.F.	—	23	20'-9":21'-1"	502
5c2	Walls - Vert. - B.F.	—	8	13'-1":14'-10"	116
5c3	Walls - Vert. - B.F.	—	16	5'-1":6'-0"	92
6f1	Floor - Longit. - Top	—	15	15'-8"	353
5f2	Floor - Longit. - Bott.	—	15	15'-8"	245
5g1	Curtain Bracket - Vert.	—	4	5'-6"	23
5h1	Basin Backwall - Vert.	—	8	8'-7"	72
6m1	Floor Trans. - Top	—	16	7'-8":14'-11"	271
6p1	Curtain - Trans.	—	2	14'-10":15'-0"	45
6s1	Wall - Top Slope	—	4	17'-9"	107
5t1	Curtain - Vert.	—	12	6'-4"	79
Total Weight (LB)					2,432
Concrete (CY)	Footing				8.7
	Walls				3.6
	Total				12.3



Flume Basin Section

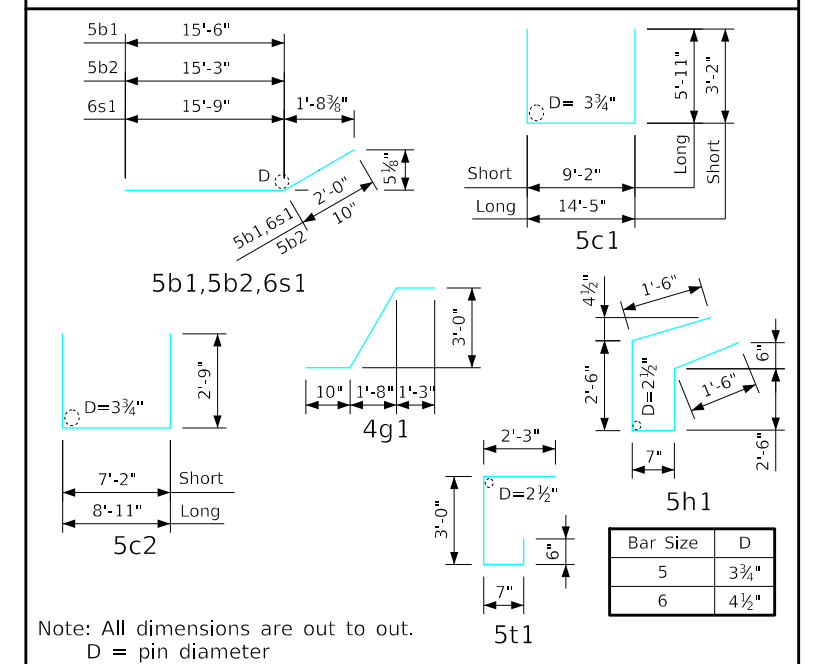
6'-0" x 8'-0" Basin Reinforcement shown,
6'-0" x 5'-0" Basin Reinforcement is similar.



Plan View

6'-0" x 8'-0" Basin Reinforcement shown,
6'-0" x 5'-0" Basin Reinforcement is similar.

Bent Bar Details



Note: All dimensions are out to out.
D = pin diameter

DESIGN FOR REPAIRS TO A 14° SKEW L.A.
**60"Φ CONCRETE PIPE WITH
6'-0" x 5'-0" FLUME AND BASIN**
FLUME BASIN DETAILS
STA. 940+31.96 (C US 34) JULY, 2021
WAPELLO COUNTY
IOWA DOT - TRANSPORTATION DEVELOPMENT DIVISION
DESIGN SHEET NO. 4 OF 6 FILE NO. 32081 DESIGN NO. 322

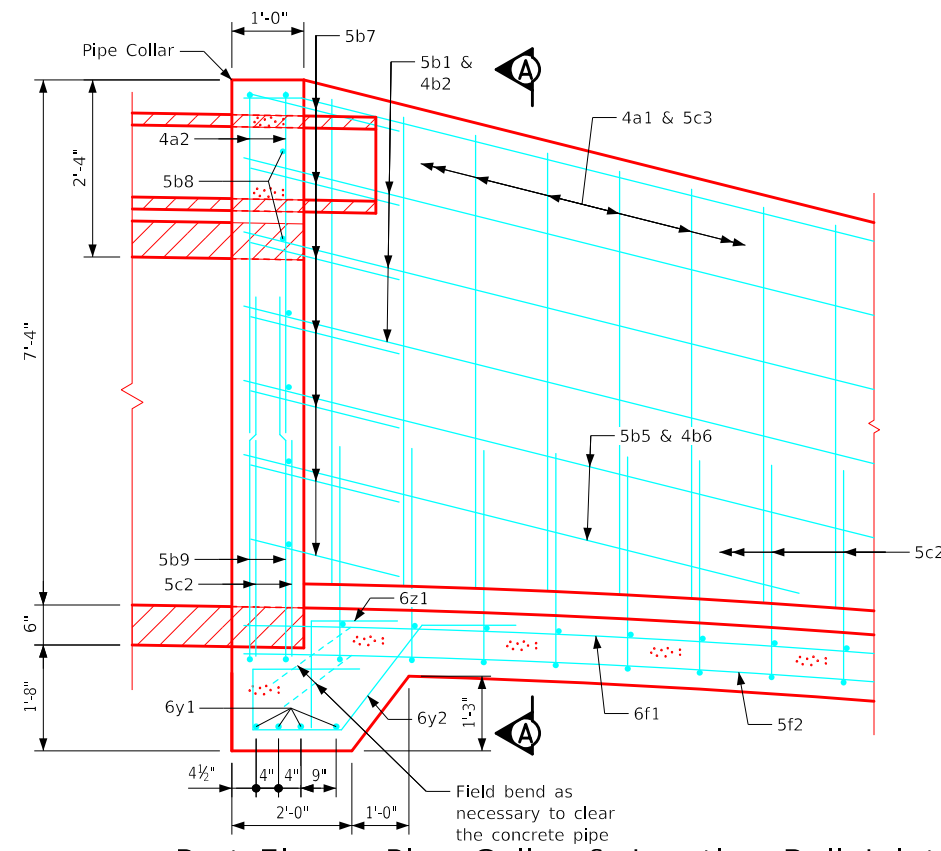
Estimate of Quantities - Pipe Collar

Bar	Location	Shape	No.	Length	Weight
4a2	Wall Vert.		12	3'-6"	28
5b7	Wall Horiz.		7	12'-8"	92
5b8	Wall Horiz.		7	7'-2"	52
5b9	60" RCP Opening		8	8'-0"	67
5b10	12" RCP Opening		8	2'-3"	19
5c5	Wall Vert.		4	6'-8"	28
Total Weight (LB)					286
Concrete (CY)					0.9

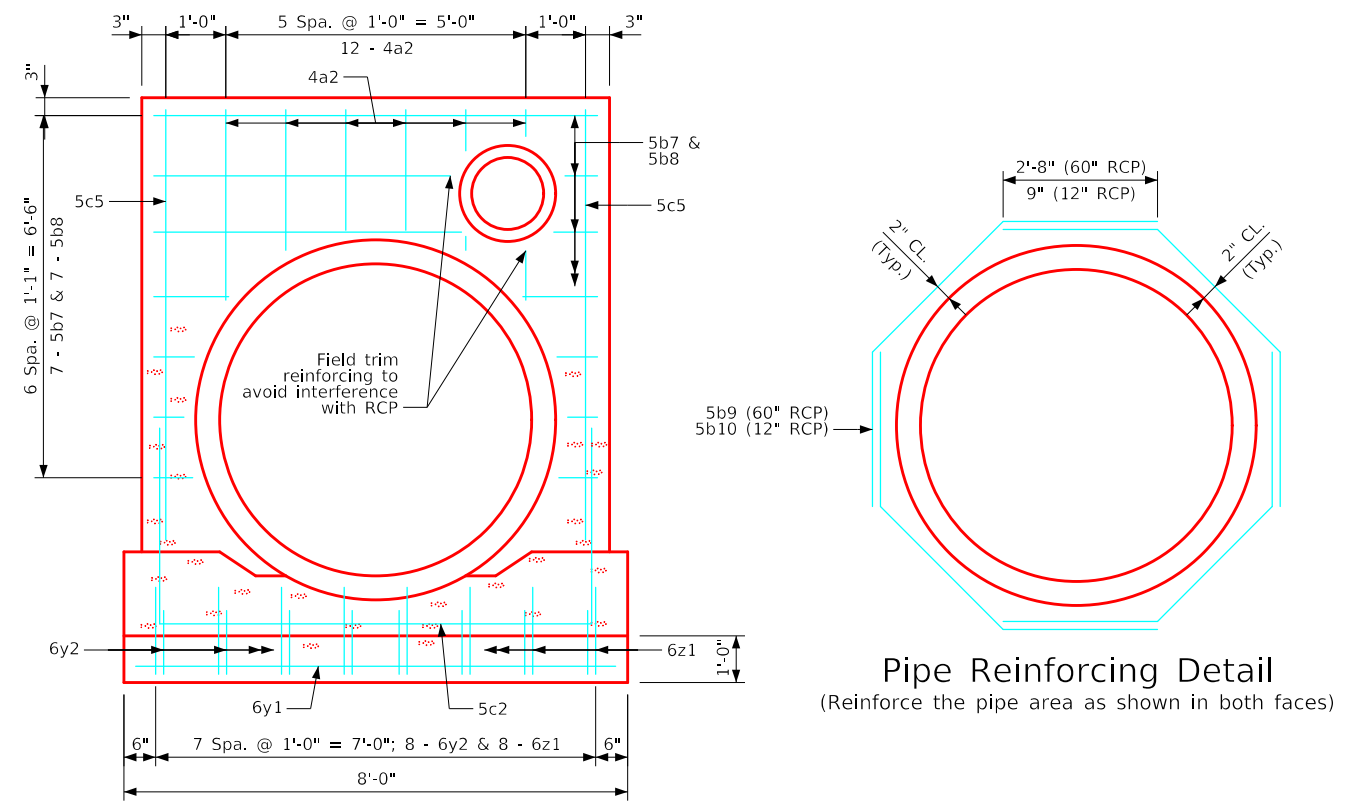
Estimate of Quantities - Flume Bell Joint & Junction Bell Joint

Flume Chute Bell Joint					
Bar	Location	Shape	No.	Length	Weight
6w2	Walls & Floor		4	19'-10"	119
6y3	Walls Horiz.		10	6'-2"	93
6y4	Floor Vert.		8	7'-2"	86
6z1	Floor Vert.		8	3'-3"	39
Total Weight (LB)					337
Concrete (CY)					1.3
Footing					0.6
Total					1.9

Junction Bell Joint					
Bar	Location	Shape	No.	Length	Weight
6y1	Floor Horiz.		4	7'-8"	46
6y2	Floor Vert.		8	7'-7"	91
6z1	Floor Vert.		8	3'-3"	39
Total Weight (LB)					176
Concrete (CY)					0.9



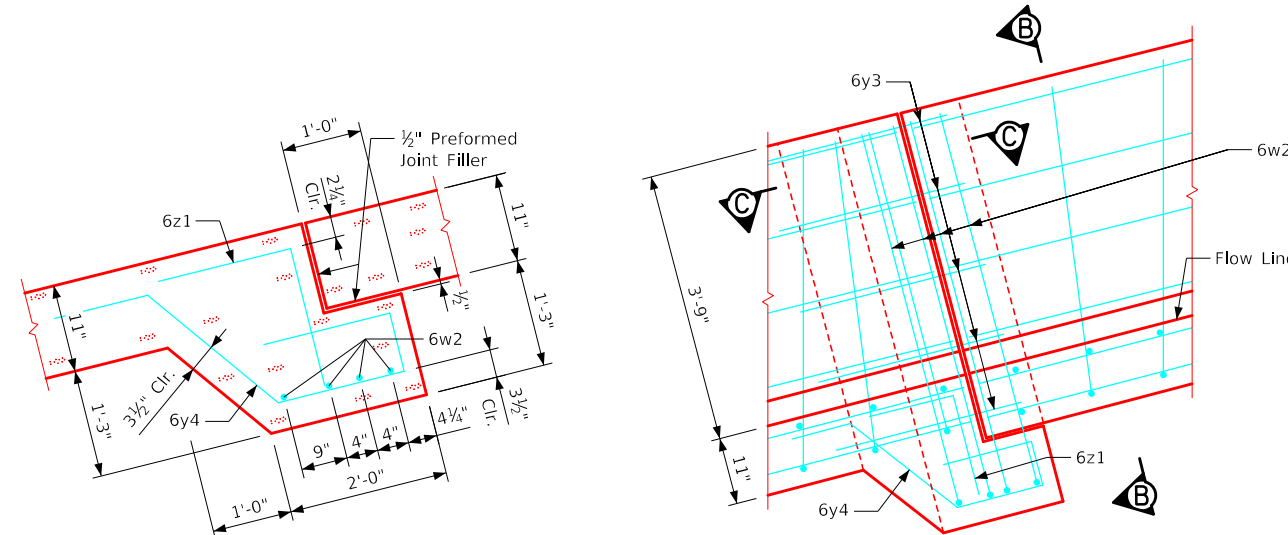
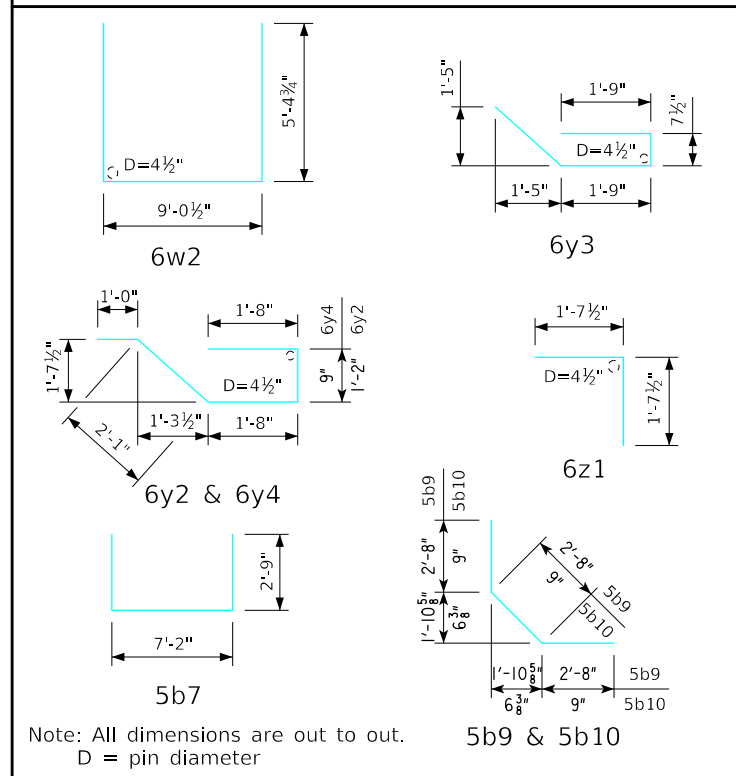
Part Elev. - Pipe Collar & Junction Bell Joint



Section A-A

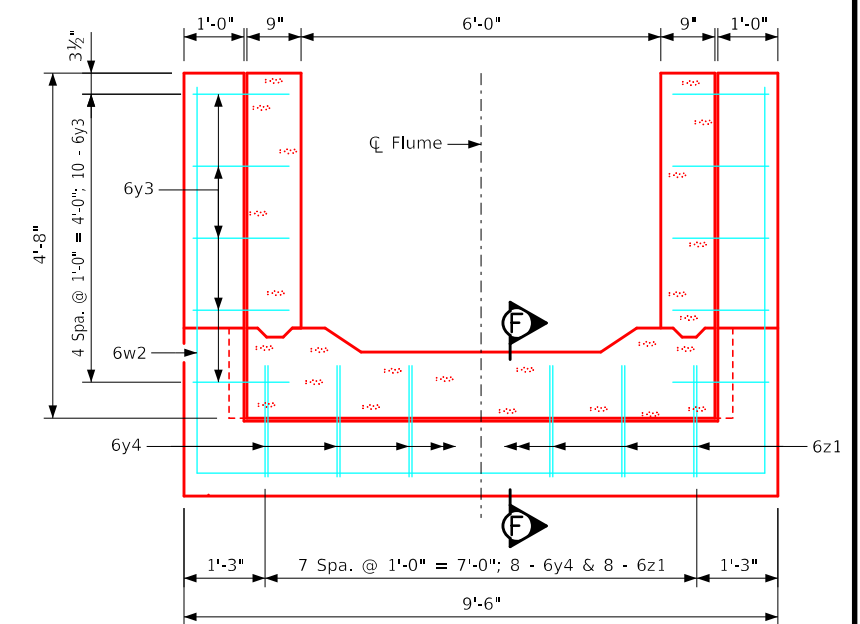
Pipe Reinforcing Detail
(Reinforce the pipe area as shown in both faces)

Bent Bar Details

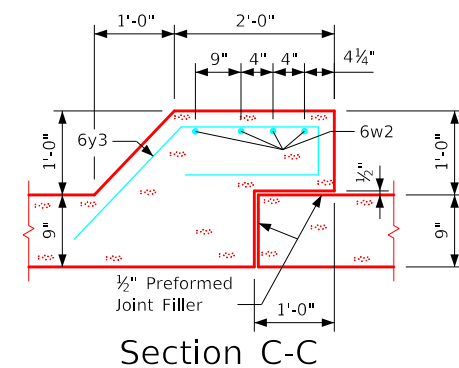


Section F-F

Part Elevation - Chute Bell Jt.



Section B-B

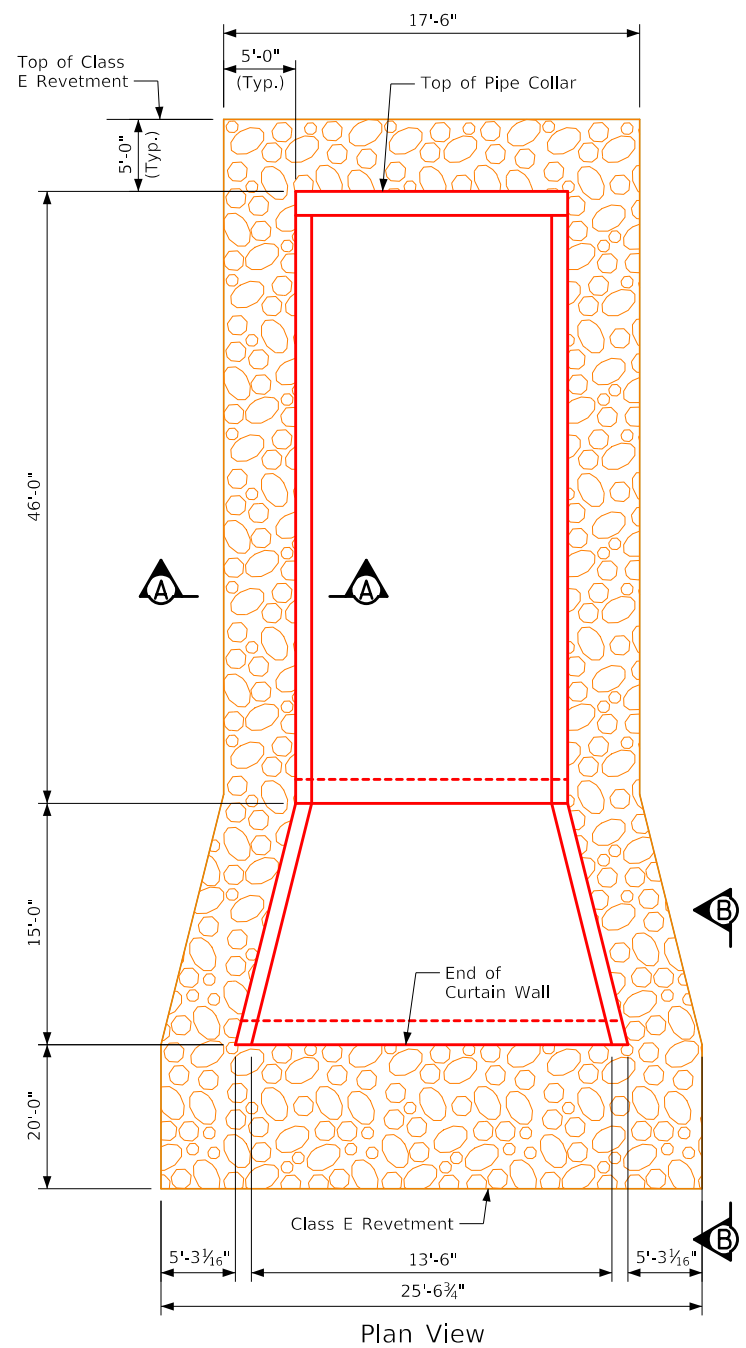


Section C-C

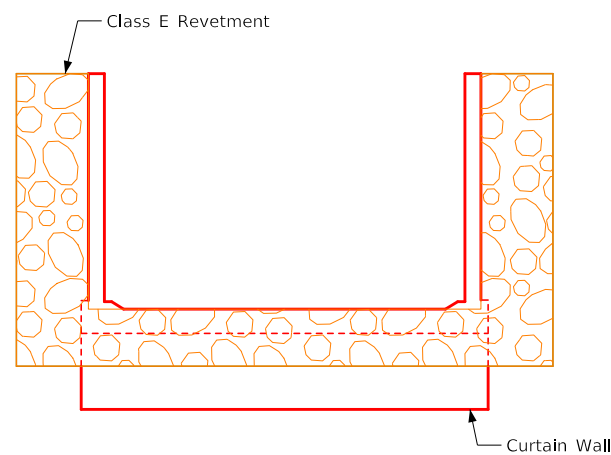
Notes:

1. Floor bars 6m1 are to be shortened 6" at bell joints.
2. Bell joint shall be placed on upstream end of flume chute sections.

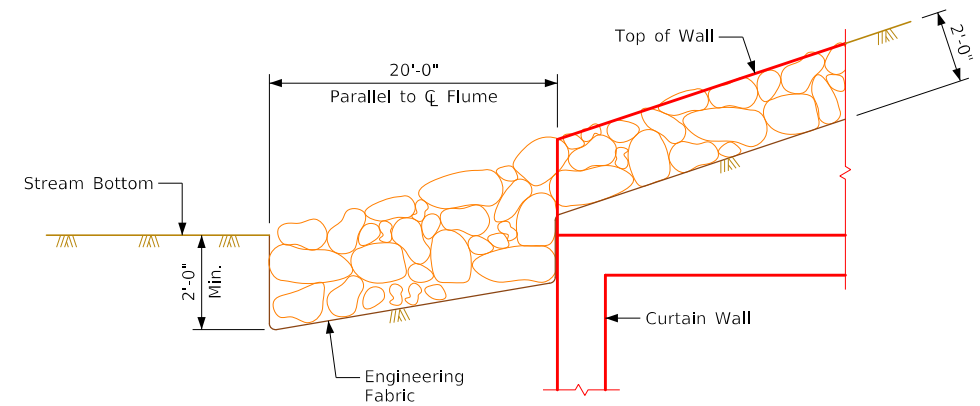
DESIGN FOR REPAIRS TO A 14° SKEW L.A.
**60" Φ CONCRETE PIPE WITH
 6'-0" x 5'-0" FLUME AND BASIN**
PIPE COLLAR & BELL JOINT DETAILS
 STA. 940+31.96 (C US 34) JULY, 2021
WAPELLO COUNTY
 IOWA DOT - TRANSPORTATION DEVELOPMENT DIVISION
 DESIGN SHEET NO. 5 OF 6 FILE NO. 32081 DESIGN NO. 322



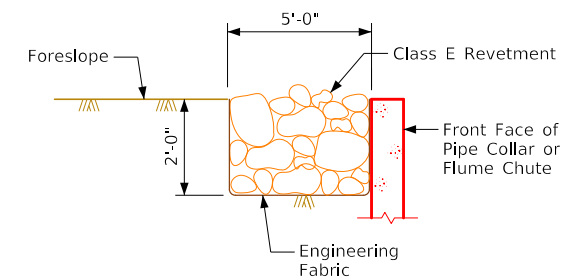
Plan View



Elevation View



View B-B



Section A-A

Typical Details

Construction Notes:

Class E Revetment shall be used and placed according to Article 2507.03, of the Standard Specifications. The engineering fabric shall meet the material requirements in accordance with Article 4196.01,B,3, of the Standard Specifications.


DESIGN FOR REPAIRS TO A 14° SKEW L.A.
**60"Φ CONCRETE PIPE WITH
 6'-0 x 5'-0 FLUME AND BASIN**
REVETMENT PROTECTION DETAILS
 STA. 940+31.96 (C US 34) JULY, 2021
WAPELLO COUNTY
 IOWA DOT - TRANSPORTATION DEVELOPMENT DIVISION
 DESIGN SHEET NO. 6 OF 6 FILE NO. 32081 DESIGN NO. 322



INDEX OF SHEETS	
No.	DESCRIPTION
A Sheets	Title Sheets
A.1	Roadway Title Sheet
C Sheets	Quantities and General Information
C.1	Project Description
C.1	Estimated Roadway Quantities
C.1	Estimate Reference Information
C.1	Standard Road Plans
C.1	Index of Tabulations
C.2 - 3	Tabulations
C.3	General Notes
D Sheets	Mainline Plan and Profile Sheets
* D.1	US 34 Plan Sheet
G Sheets	Survey Sheets
G.1	Alignment, Control Points, and Bench Marks
J Sheets	Traffic Control and Staging Sheets
J.1	Traffic Control Plan
J.1	511 Travel Restrictions
J.1	Coordinated Operations
U Sheets	500 Series, Mod.Stds. and Detail Sheets
* U.1	Clearing and Grubbing
* U.2	Erosion Control Details
	* Color Plan Sheets



Design No. 322
File No. 31906



I hereby certify that this plan was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

Signature: Brian J. Birkland Date: 7-29-21

Printed or Typed Name: Brian J. Birkland

My license renewal date is December 31, 2022

Pages or sheets covered by this seal: A.1, C.1-C.3, D.1, G.1, J.1, U.1-U.2

100-1D 10-18-05
PROJECT DESCRIPTION
This project is for the removal and replacement of a concrete flume and other repairs to correct the erosive slide on the south foreslope south of the US 34 EB lanes, east of Ottumwa, 1.9 miles East of US 63. The repairs include, but are not limited to, removal and replacement of the flume and flume basin and connection of the 60-inch and 12-inch culverts to the flume headwall.

100-0A 10-28-97					
ESTIMATED ROADWAY QUANTITIES (1 DIVISION PROJECT)					
Item No.	Item Code	Item	Unit	Total	As Built Qty.
1	2101-0850001	CLEARING AND GRUBBING	ACRE	0.26	
2	2102-2625000	EMBANKMENT-IN-PLACE	CY	31	
3	2105-8425015	TOPSOIL, STRIP, SALVAGE AND SPREAD	CY	10	
4	2402-2720100	EXCAVATION, CL 20, RDWY PIPE CULV	CY	10	
5	2416-1180060	CULV, CONC RDWY PIPE, 60"	LF	8	
6	2503-0200036	REMOVE STORM SEWER PIPE LESS THAN OR EQUAL TO 36 IN.	LF	8	
7	2503-0200136	REMOVE STORM SEWER PIPE GREATER THAN 36 IN.	LF	8	
8	2526-8285000	CONSTRUCTION SURVEY	LS	1.00	
9	2528-8445110	TRAFFIC CONTROL	LS	1.00	
10	2599-9999009	CULV, CONC ROADWAY PIPE, 12"	LF	43	
11	2601-2638352	SLOPE PROTECTION, WOOD EXCELSIOR MAT	SQ	97	
12	2601-2642100	STABILIZING CROP SEEDING AND FERTILIZING	ACRE	0.26	
13	2602-0000030	SILT FENCE FOR DITCH CHECKS	LF	64	
14	2602-0000071	REMOVAL OF SILT FENCE OR SILT FENCE FOR DITCH CHECKS	LF	64	
15	2602-0000101	MAINTENANCE OF SILT FENCE OR SILT FENCE FOR DITCH CHECK	LF	64	
16	2602-0000320	PERIMETER AND SLOPE SEDIMENT CONTROL DEVICE, 20 IN. DIA.	LF	350	
17	2602-0000351	REMOVAL OF PERIMETER AND SLOPE OR DITCH CHECK SEDIMENT CONTROL DEVICE	LF	350	

111-25 10-18-11		
INDEX OF TABULATIONS		
Tabulation	Tabulation Title	Sheet No.
C Sheets		
100-0A	ESTIMATED ROADWAY QUANTITIES (1 DIVISION PROJECT)	C.1
100-1D	PROJECT DESCRIPTION	C.1
100-4A	ESTIMATE REFERENCE INFORMATION	C.1
100-18	SILT FENCES FOR DITCH CHECKS	C.2
100-19	PERIMETER, SLOPE AND DITCH CHECK SEDIMENT CONTROL DEVICES	C.3
100-22	ROLLED EROSION CONTROL	C.3
103-10	TOPSOIL STRIPPING AND PLACEMENT	C.2
104-3	DRAINAGE STRUCTURE BY ROAD CONTRACTOR	C.2
105-4	STANDARD ROAD PLANS	C.1
110-2	REMOVAL OF EXISTING STRUCTURES	C.2
110-17	CLEARING AND GRUBBING	C.2

105-4 10-18-11		
STANDARD ROAD PLANS		
The following Standard Road Plans apply to construction work on this project.		
Number	Date	Title
DR-101	04-18-17	Pipe Culvert (Bedding and Backfill)
DR-102	04-21-15	Pipe Culvert (Cover and Camber)
DR-103	04-21-15	Pipe Culvert (Installation Details)
DR-111	04-17-18	Box Culvert (Backfill)
DR-121	10-17-17	Connected Pipe Joints
DR-122	10-18-16	Construction of Type "C" Concrete Adaptors for Pipe Culvert Connections
DR-621	04-18-17	Pipe Extension
EC-103	04-21-15	Wood Excelsior Mat for Slope Protection
EC-201	04-20-21	Silt Fence
EC-204	10-19-21	Perimeter, Slope and Ditch Check Sediment Control Devices
EC-502	04-21-15	Seeding in Rural Areas
TC-1	10-15-19	Work Not Affecting Traffic (Two-Lane or Multi-Lane)
TC-402	10-19-21	Work Within 15 ft of Traveled Way
TC-418	04-21-20	Lane Closure on Divided Highway

100-4A 10-29-02		
ESTIMATE REFERENCE INFORMATION		
Item No.	Item Code	Description
1	2101-0850001	CLEARING AND GRUBBING Refer to Tab. 110-17, sheet D.1 and sheet U.1. Clearing shall be in accordance with Standard Specification 2101.01 A (between October 1 and March 31).
2	2102-2625000	EMBANKMENT-IN-PLACE Provide borrow material according to Section 2102 of the Standard Specifications. No cross sections are provided. The surface of the embankment shall match the roadway foreslope and shall allow for topsoil placement.
3	2105-8425015	TOPSOIL, STRIP, SALVAGE AND SPREAD Refer to Tab. 103-10. Item is for placement over embankment-in-place on the foreslopes. The surface of the topsoil placement shall match the adjacent existing roadway foreslope.
4	2402-2720100	EXCAVATION, CL 20, RDWY PIPE CULV Refer to Tab. 104-3.
5	2416-1180060	CULV, CONC RDWY PIPE, 60" Refer to Tab. 104-3 and sheet D.1.
6	2503-0200036	REMOVE STORM SEWER PIPE LESS THAN OR EQUAL TO 36 IN.
7	2503-0200136	REMOVE STORM SEWER PIPE GREATER THAN 36 IN. Refer to Tab. 110-2. Removal of an estimated 2 sections of 12" pipe dislodged and displaced by erosion shall be considered incidental to this item.
8	2526-8285000	CONSTRUCTION SURVEY
9	2528-8445110	TRAFFIC CONTROL Refer to Tab. 108-23A on sheet J.1.
10	2599-9999009	CULV, CONC ROADWAY PIPE, 12" Refer to Tab. 104-3 and sheet D.1. Standard Specification Section 2416 shall apply. Item includes connecting pipe outlet to flume headwall and wrapping asphaltic roffing felt fabric around the pipe outlet at the headwall connection to prevent bonding. Method of measurement and basis of payment shall be per Standard Specification Section 2416.
11	2601-2638352	SLOPE PROTECTION, WOOD EXCELSIOR MAT Refer to Tab. 100-22.
12	2601-2642100	STABILIZING CROP SEEDING AND FERTILIZING Item is for seeding of disturbed areas initially estimated for clearing and grubbing areas.
13	2602-0000030	SILT FENCE FOR DITCH CHECKS
14	2602-0000071	REMOVAL OF SILT FENCE OR SILT FENCE FOR DITCH CHECKS
15	2602-0000101	MAINTENANCE OF SILT FENCE OR SILT FENCE FOR DITCH CHECK Refer to Tab. 100-18 for details. Prior to excavation, two rows of silt fence shall be placed 5 and 10 feet downstream of the proposed revetment basin. Silt fence may be removed for areas that have achieved 70% growth. Verify the specific locations with the Engineer prior to beginning placement. Maintenance includes clean-out and repair of silt fence or silt fence for ditch checks.
16	2602-0000320	PERIMETER AND SLOPE SEDIMENT CONTROL DEVICE, 20 IN. DIA.
17	2602-0000351	REMOVAL OF PERIMETER AND SLOPE OR DITCH CHECK SEDIMENT CONTROL DEVICE Refer to Tab. 100-19. The tabulation includes estimated locations for placement of "Perimeter and Slope Sediment Control Device, 20 in. dia." to address erosion to be encountered during construction. Verify the specific locations with the Engineer prior to beginning placement. Bid item includes 25% additional quantity for field adjustments and replacements. Use Perimeter and Slope Sediment Control Devices fabricated using wood excelsior.

CLEARING AND GRUBBING

Location		Work and Material Type	Trees, Stumps, and Logs and Down Timber Material Diameters											All Other Materials		Estimated Quantities			Remarks		
Station to Station or Ref. Loc. Sign to Ref. Loc. Sign or Description	Direction of Travel		3"-6"	>6"-9"	>9"-12"	>12"-15"	>15"-18"	>18"-24"	>24"-30"	>30"-36"	>36"-42"	>42"-48"	>48"-60"	>60"-72"	>72"	Length	Width	Units		Area	Herbicide Application
			FT	FT	Units	Acres	Each														
939+57 to 940+38	EB	Trees - Clearing and Grubbing																	0.26		

DRAINAGE STRUCTURE BY ROAD CONTRACTOR

Length of unclassified pipe calculated is based on using Reinforced Concrete Pipe.

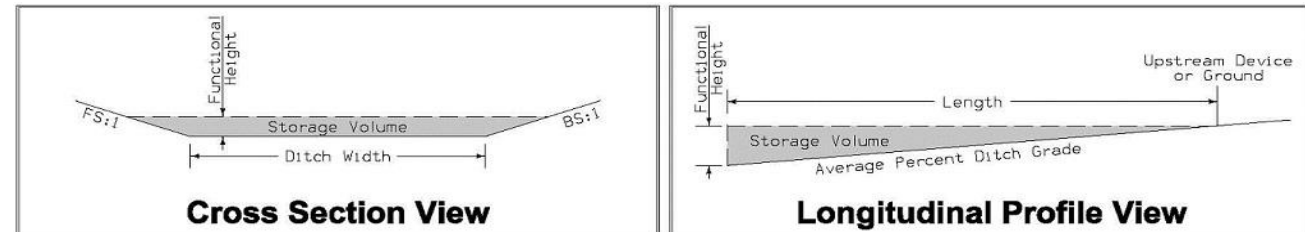
- * Not a bid item
- ① Diameter or equivalent diameter
- ② UNCL = Unclassified Pipe CMP = Corrugated Metal Pipe RCP = Reinforced Concrete Pipe LCP = Arch or Elliptical Low Clearance Pipe SARC = Steel Arch Pipe
- ③ Backfill according to DR-101

Drainage Area ACRE	Location	Type	Size ① IN	Kind of Pipe ②	Length New Const. LF	Bedding Class	Design Cover (H) FT	Camber* (DR-102) FT	Apron No. IN OUT	Apron Guard* (DR-213) No.	Elbow* (DR-141) No.	Diaphragm* (DR-501) No.	Tee Section* (DR-142) No.	"D" Section* (DR-141) No.	Reducer* No.	Type 'C' Connections* (DR-122) Type No.	Connected Pipe Joint* (DR-121) Type	4" Perforated Subdrain* FT	Flow Line Elevations				Dimensions Lin. Ft.				Skew Ahead Degrees			Dike			Class 20 CY	Flowable Mortar CY	Floodable* Backfill (A) CY	Porous* Backfill (B) CY	Flooded Backfill (A+B) CY	Remarks			
																			Lt.	Rt.	Other	Other	Lt.	Rt.	Lt.	Rt.	Lt.	Rt.	Lt.	Rt.	Rt.	Location Station							Top Elevation	Type	
																			Total	Extensions																					
34.9	940+22.58	DR-621	60	RCP	8		1.0									C-1	1	Type 2		688.91		689.02																		(4)	
7.7	940+31.96	DR-621	12	RCP	43		1.0	0.08								C-1	1	Type 2		694.36		~703.5																			(4)

(4) Connect to flume headwall. Install 1 ft. beyond inside face of headwall. Flow Line El. at Headwall

SILT FENCES FOR DITCH CHECKS

Possible Standard: EC-201



* The functional height used in the volume equation is 85% of effective height. Effective height is 1.58 feet as shown on EC-201.
* Volume equation: $[0.5 * Spacing * (0.5 * H^2 * FS + DW * H + 0.5 * H^2 * BS)]$

Basin No.	Type	Location		Bid Items			Stormwater Storage Volume Summary					Remarks	
		Station	Side	Installation LF	Maintenance LF	Removal LF	Foreslope FS:1	Backslope BS:1	Ditch Width FT	Avg. % Slope Ditch Grade	Volume* CF		
NA	1	939+83.50	Rt.	32.0			3.0	3.0	13.5				
NA	1	939+84.50	Rt.	32.0			3.0	3.0	13.5				
		Total:		64.0									

REMOVAL OF EXISTING STRUCTURES

Location	Description	Remarks
Sta. 940+09, 97' Rt.	8 LF of 12" RCP	
Sta. 940+02, 128' Rt.	8 LF of 60" RCP	
940+02, 136' Rt.	66' x 8' Flume and Basin Including Headwall	Refer to Sheets 2 and 3.

TOPSOIL STRIPPING AND PLACEMENT

Location				Topsoil Stripping Thickness	Topsoil Placement Thickness	Remarks
Road Identification	Dir. of Traffic	Begin Station	End Station	IN	IN	
US 34	EB	939+81.00	940+38.00	6.0	4.0	

PERIMETER, SLOPE AND DITCH CHECK SEDIMENT CONTROL DEVICES

100-19
10-19-21

Possible Standards: EC-204

Location			Perimeter and Slope			Ditch Check		Remarks
Begin Station	End Station	Side	Length of Installation			Length of Installation		
			9 inch Dia	12 inch Dia	20 inch Dia	12 inch Dia	20 inch Dia	
			LF	LF	LF	LF	LF	
939+31.00	940+85.00	Rt.			160.0			95' Rt. +/-
939+73.00	939+93.00	Rt.			20.0			129' Rt. +/-
939+63.00	939+83.00	Rt.			20.0			177' Rt. +/-
939+57.00	939+72.00	Rt.			20.0			211' Rt. +/-
940+09.00	940+29.00	Rt.			20.0			133' Rt. +/-
939+99.00	940+19.00	Rt.			20.0			181' Rt. +/-
939+95.00	940+10.00	Rt.			20.0			218' Rt. +/-
					Subtotal	280.0		
					+25%	70.0		
					Bid	350.0		

100-22
04-21-15

ROLLED EROSION CONTROL

Refer to EC-101, EC-103, and EC-104.

Location				L	W	Turf Reinforcement Mat (TRM) (EC-104)				Slope Protection (EC-103)	Special Ditch Control (EC-101)	Remarks	
Road Identification	Begin Station	End Station	Side			Type 1	Type 2	Type 3	Type 4				
				FT	FT	Squares	Squares	Squares	Squares	Squares	Squares		
US 34	939+30.00	939+80.00	Rt.	50	25							13	
US 34	939+80.00	940+00.00	Rt.	20	141							28	
US 34	940+00.00	940+18.00	Rt.	18	65							12	
US 34	940+18.00	940+38.00	Rt.	20	155							31	
US 34	940+38.00	940+88.00	Rt.	50	25							13	
												Total:	97

262-6
10-18-05

**UTILITIES
(NOT A POINT 25 PROJECT)**

This is NOT a POINT 25 project and is not subject to the provisions of IAC 761-115.25.

(AGY) AGENCY, CITY OF
Contact Name : Cindy VanAntwerp
Contact Phone: 6419375215
Contact Email: cityofagency@mchsi.com

(CTLIA01) CENTURYLINK
Contact Name : SADIE HULL
Contact Phone: 9185470147
Contact Email: sadie.hull@lumen.com

(M55G) MIDAMER-GAS
Contact Name : JASON LOUGH
Contact Phone: 6416834171
Contact Email: jelough@midamerican.com

(TC8) MEDIACOM CABLE
Contact Name : Darrin Walker
Contact Phone: 3197593786
Contact Email: dwalker@mediacomcc.com

(WAP) WAPELLO RURAL WATER ASSOCIATIO
Contact Name : Kathy Alex or Donnie Johnston
Contact Phone: 6416828351
Contact Email: onecall@wrh2o.com

232-3C
04-16-19

**EROSION CONTROL
(NATIVE GRASS SEEDING)**

Following the completion of work in a disturbed area and according to the seeding dates in Section 2601 of the Standard Specifications, place seed and mulch on the disturbed area lying 8 feet or more beyond the shoulder as follows:

SEED MIX:
Big bluestem (Andropogon geradii) 6 lbs. PLS/Acre (7.0 kg/ha)
Indiangrass (Sorghastrum nutans) 6 lbs. PLS/Acre (7.0 kg/ha)
Little bluestem (Schizachyrium scoparium) 6 lbs. PLS/Acre (7.0 kg/ha)
Partridge Pea (Chamaecrista fasciculata) 4 lbs. PLS/Acre (4.5 kg/ha)
Sideoats grama (Bouteloua curtipendula) 4 lbs. PLS/Acre (4.5 kg/ha)
Canada wildrye (Elymus canadensis) 2 lbs. PLS/Acre (2.2 kg/ha)
Switchgrass (Panicum virgatum) 1 lbs. PLS/Acre (1.1 kg/ha)
Oats (Avena sativa) 32 lbs./Acre (36.0 kg/ha)

Furnish Big bluestem, Indiangrass, Canada wildrye and Little bluestem that is debarbed or equal to facilitate the application of seed.

Furnish seed certified as Source Identified Class (Yellow Tag) Source G0-Iowa. Oats are excluded from this requirement.

Place seed according to the requirements of Article 4169.02 of the Standard Specifications.

Place mulch according to the requirements of Articles 2601.03,E,2,a and 4169.07,A of the Standard Specifications.

Preparing the seedbed, furnishing and applying seed and mulch are incidental to mobilization and will not be paid for separately.

232-3A
04-16-19

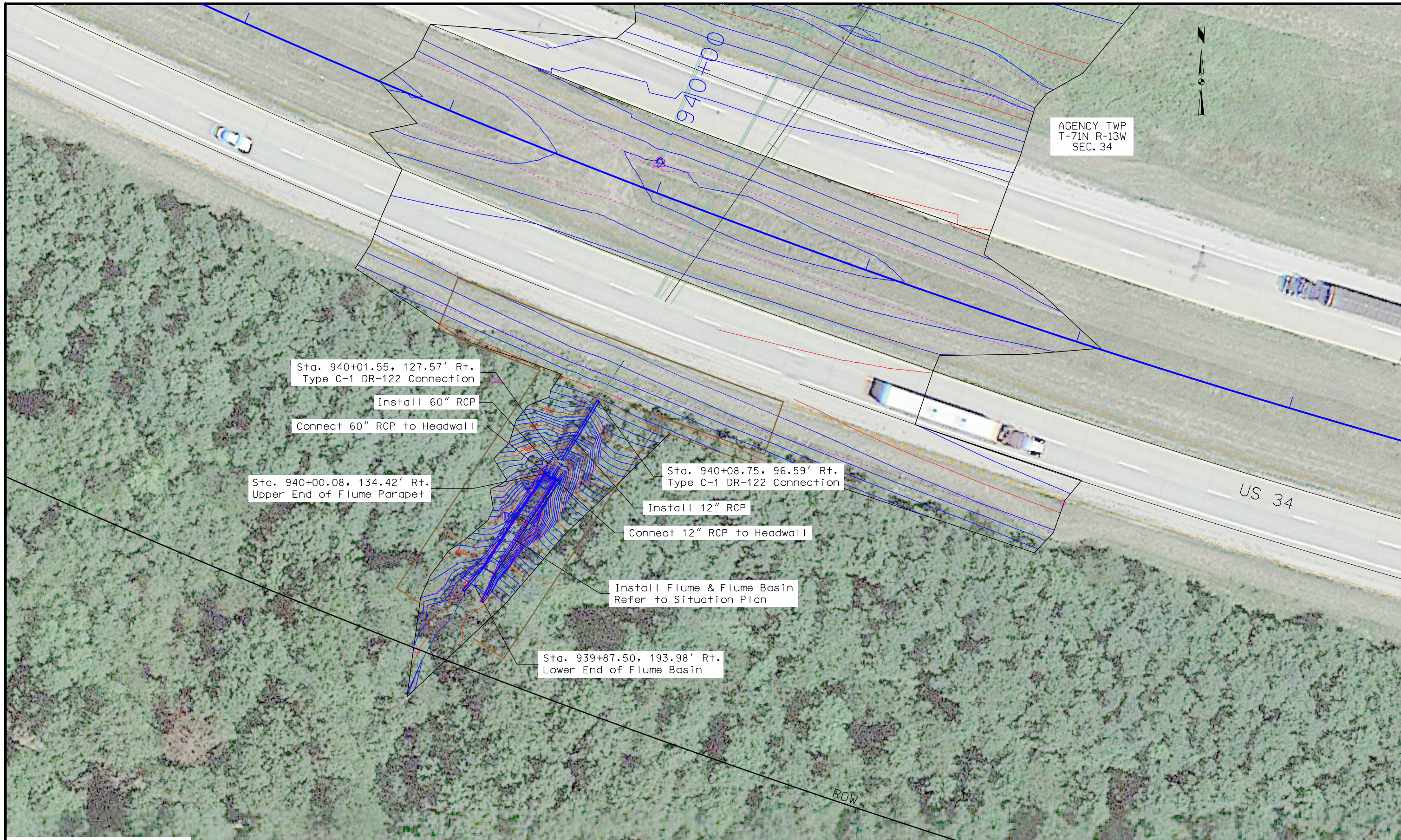
**EROSION CONTROL
(RURAL SEEDING)**

Following the completion of work in a disturbed area and according to the seeding dates in Section 2601 of the Standard Specifications, place seed, fertilizer, and mulch on the disturbed area lying 8 feet adjacent to shoulder and median as follows:

Place seed and fertilize according to the requirements of Article 2601.03,C,3 and Section 4169 of the Standard Specifications.

Place mulch according to the requirements of Articles 2601.03,E,2,a and 4169.07,A of the Standard Specifications.

Preparing the seedbed, furnishing and applying seed, fertilizer, and mulch are all incidental to mobilization and will not be paid for separately.



AGENCY TWP
T-71N R-13W
SEC. 34

Sta. 940+01.55, 127.57' Rt.
Type C-1 DR-122 Connection

Install 60" RCP

Connect 60" RCP to Headwall

Sta. 940+00.08, 134.42' Rt.
Upper End of Flume Parapet

Sta. 940+08.75, 96.59' Rt.
Type C-1 DR-122 Connection

Install 12" RCP

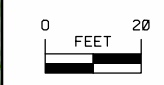
Connect 12" RCP to Headwall

Install Flume & Flume Basin
Refer to Situation Plan

Sta. 939+87.50, 193.98' Rt.
Lower End of Flume Basin

US 34

ROW

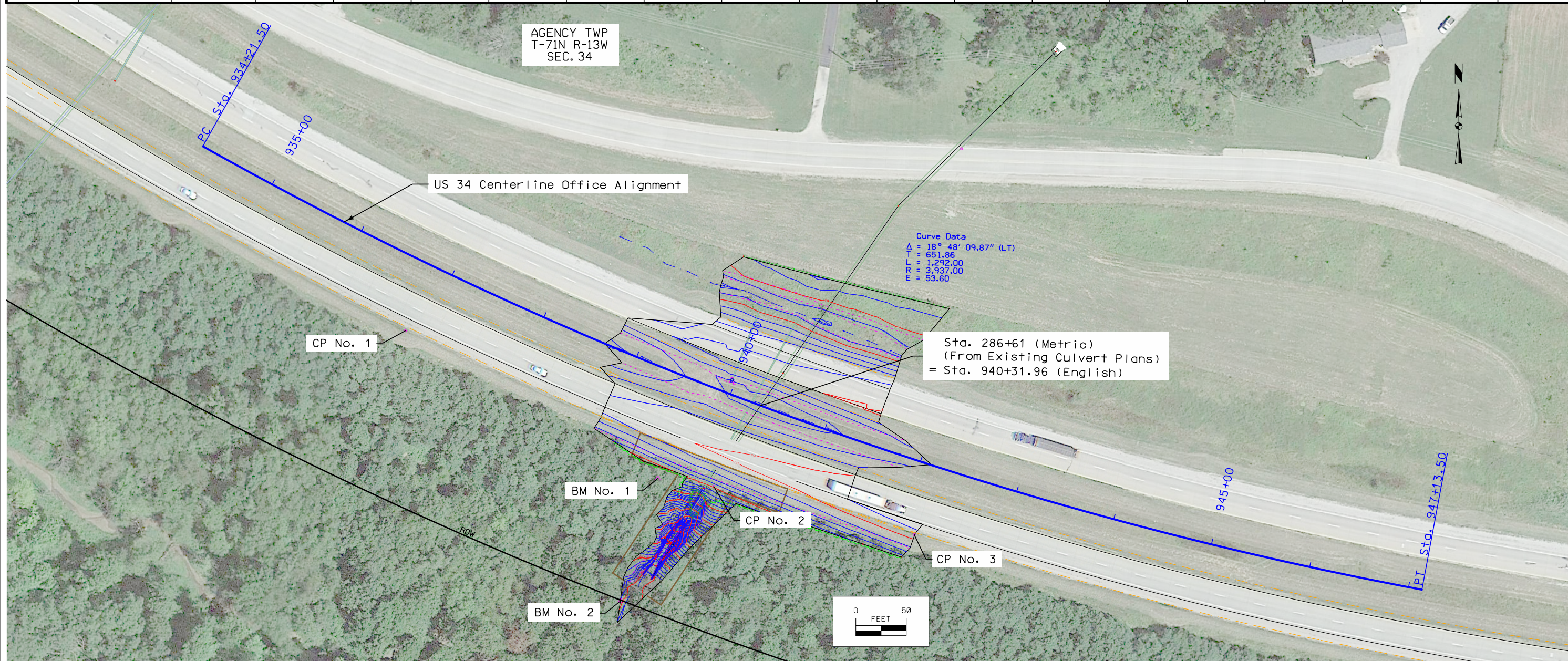


**Flume / Slide Repair
Site Plan**

ALIGNMENT COORDINATES

101-16
10-20-09

Name	Location	Point on Tangent		Begin Spiral		Begin Curve		Simple Curve PI or Master PI of SCS			End Curve		End Spiral			
		Station	Coordinates		Station	Coordinates		Station	Coordinates		Station	Coordinates		Station	Coordinates	
			Y (Northing)	X (Easting)		Y (Northing)	X (Easting)		Y (Northing)	X (Easting)		Y (Northing)	X (Easting)		Y (Northing)	X (Easting)
CURVE 1	US 34 C.L.					PC 934+21.50	6,233,743.2157	22,886,663.6206	PI 940+73.36	6,233,433.0508	22,887,236.9643	PT 947+13.50	6,233,324.2333	22,887,879.6805		



CONTROL POINTS	
Point No.	Description
1	STA. 936+81.82, 69.70' RT. EL. = 712.097, SET REBAR
2	STA. 940+16.89, 91.29' RT. EL. = 710.237, SET REBAR
3	STA. 942+16.33, 70.83' RT. EL. = 715.548, SET REBAR
BENCHMARKS	
Point No.	Description
1	STA. 939+63.71, 103.99' RT. EL.=707.763 SET 60D 8" COTTONWOOD
2	STA. 939+73.35, 230.26' RT. EL.=677.191 SET RR SPIKE E. SIDE 12" LOCUST

US 34 in this area was constructed as a Metric project. As-built plans are available from the Resident Construction Engineer's Office.
 The US 34 centerline office alignment, (in US survey feet) is best fit based on surveyed pipe locations and US 34 topographic survey.

The project coordinate system for this survey is the Iowa RCS Zone 12 (U.S. Survey Feet). This survey control is relative to the IARTN reference stations. IARTN Reference Station coordinates are relative to the National Reference station network datum: NAD83 (2011). The vertical datum for this survey is relative to the NAVD88.

Verify Survey Control Point Positions and Elevations Prior to Performing Construction Survey.

SURVEY INFORMATION



108-23A
08-01-08

TRAFFIC CONTROL PLAN

Traffic shall be maintained on US 34 at all times.
Traffic control on this project shall be in accordance with the TC series of the Standard Road Plans on Tab. 105-4.

111-01
04-17-12

COORDINATED OPERATIONS

Other work in progress during the same period of time will include the construction of the projects listed. Coordinate operations with those of other contractors working within the same area.

Project	Type of Work
None Provided	

108-25
10-21-14

511 TRAVEL RESTRICTIONS

Route	Direction	County	Location Description	Feature Crossed	Object Type	Maint. Bridge No., Structure ID, or FHWA No.	Type of Restriction	Existing Measurement	Construction Measurement	Construction Measurement as Signed	Projected As Built Measurement	Remarks
			No Restrictions Expected									

LEGEND

Clearing and Grubbing

AGENCY TWP
T-71N R-13W
SEC. 34



939

940

941

942

943

Sta. 939+30, 93.0' Rt.

Sta. 939+80, 93.0' Rt.

Sta. 939+57, 207.5' Rt.

25'

Sta. 940+88, 93.0' Rt.

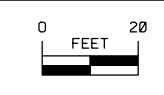
Sta. 940+38, 93.0' Rt.

Sta. 940+10, 219.7' Rt.

57.5'



US 34

ROW

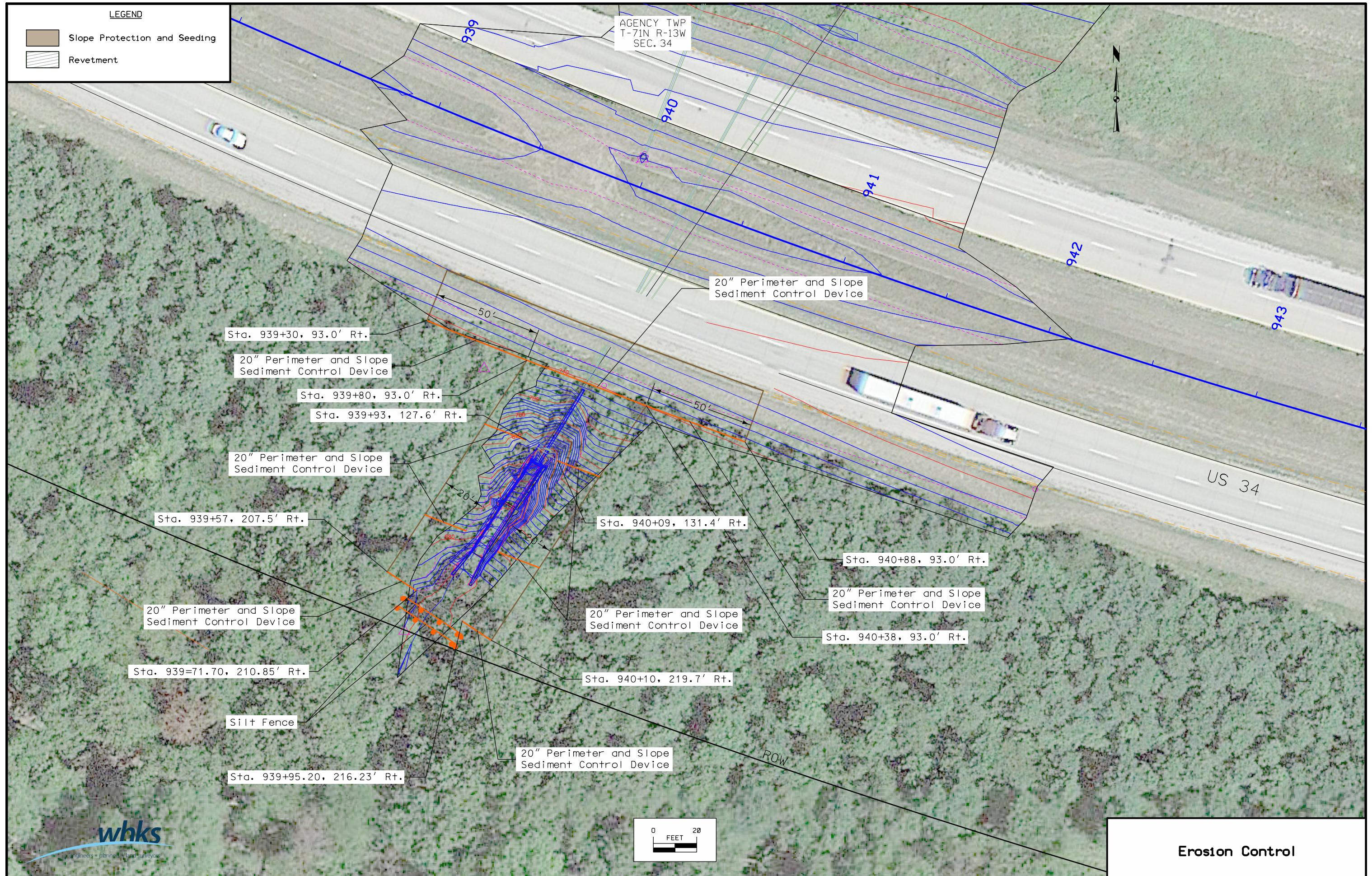


Clearing and Grubbing

LEGEND

-  Slope Protection and Seeding
-  Revetment

AGENCY TWP
T-71N R-13W
SEC. 34



US 34

Sta. 939+30, 93.0' Rt.

20" Perimeter and Slope
Sediment Control Device

Sta. 939+80, 93.0' Rt.

Sta. 939+93, 127.6' Rt.

20" Perimeter and Slope
Sediment Control Device

Sta. 939+57, 207.5' Rt.

20" Perimeter and Slope
Sediment Control Device

Sta. 939+71.70, 210.85' Rt.

Silt Fence

Sta. 939+95.20, 216.23' Rt.

20" Perimeter and Slope
Sediment Control Device

Sta. 940+09, 131.4' Rt.

20" Perimeter and Slope
Sediment Control Device

Sta. 940+10, 219.7' Rt.

Sta. 940+88, 93.0' Rt.

20" Perimeter and Slope
Sediment Control Device

Sta. 940+38, 93.0' Rt.

Erosion Control

