US Army Corps of Engineers®

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

VOLUME 1 - SOUTHERN EMBANKMENT REACH SE-3
VOLUME 2 - COUNTY ROAD 81

SOLICITATION NO.: W192ES23B0016
CONTRACT NO.:
ISSUE DATE: SEPTEMBER 2024

ENGINEERING SEAL FOR SHEETS: VOLUME 2; SECTIONS 1, 2, 4 & SHEET 1, 20 SHEETS 7 TO 10, 40, 60, 120 & 200 REGISTERED PROFESSIONAL ENGINEER ADAM M. RUUD PE 10407 DATE NORTH DAKOTA ADAM M. RUUD 9/3/2024 BY DATE	ENGINEERING SEAL FOR SHEETS: VOLUME 2; SECTION 170 REGISTERED PROFESSIONAL ENGINEER WESLEY J. KELLER PE-27400 DATE NORTH DAKOTA WESLEY J. KELLER 9/3/2024 BY DATE	ENGINEERING SEAL FOR SHEETS: VOLUME 2; SECTION 81 REGISTERED LAND SURVEYOR JAMES A. SCHLIEMAN LS-5089 DATE NORTH DAKOTA JAMES A. SCHLIEMAN 9/4/2024 BY DATE
ENGINEERING SEAL FOR SHEETS: VOLUME 2; SECTION 70 REGISTERED PROFESSIONAL ENGINEER STEVEN L. STRACK PE-10621 DATE NORTH DAKOTA STEVEN L. STRACK 9/3/2024 BY DATE	ENGINEERING SEAL FOR SHEETS: VOLUME 2; SECTIONS 3, SHEETS 3 TO 4 20 SHEETS 3 TO 14, 77, 180 & 199 REGISTERED PROFESSIONAL ENGINEER DYLAN ENSRUDE PE-29066 DATE NORTH DAKOTA DYLAN ENSRUDE 9/3/2024 BY DATE	

VOLUME 1 OF THIS PROJECT WAS DESIGNED BY THE ST PAUL DISTRICT CORPS OF ENGINEERS. VOLUME 2 OF THIS PROJECT WAS DESIGNED BY HOUSTON-MOORE GROUP FOR THE ST. PAUL DISTRICT CORPS OF ENGINEERS. THE INITIALS OR SIGNATURES AND REGISTRATION DESIGNATIONS OF INDIVIDUALS APPEAR ON THESE PROJECT DOCUMENTS WITHIN THE SCOPE OF THEIR EMPLOYMENT AS REQUIRED BY ER 1110-1-8152. SIGNATURES INDICATE OFFICIAL RECOMMENDATION OF ALL DRAWINGS IN THIS SET.

APPROVED BY:

Kari Hauck — Digitally signed by Kari Hauck Date: 2024.10.01 15:16:35 -05'00'
CHIEF ENGR & CONST DIVISION

APPROVAL RECOMMENDED BY:

SENTZ.JAMES.D.1231191743 — Digitally signed by SENTZ.JAMES.D.1231191743 Date: 2024.09.26 18:20:35 -05'00'
CHIEF EC-D BRANCH

BEHLING.CHRISTOPHER.W.1230533535 — Digitally signed by BEHLING.CHRISTOPHER.W.1230533535 Date: 2024.09.13 10:07:07 -05'00'
CHIEF EC-G BRANCH

Heather Henneman — Digitally signed by Heather Henneman Date: 2024.09.05 16:13:31 -05'00'
CHIEF EC-H BRANCH

CSAJKO.WILLIAM.L.1228659599 — Digitally signed by CSAJKO.WILLIAM.L.1228659599 Date: 2024.09.26 12:27:17 -05'00'
PROJECT MANAGER

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN
DRAWN BY: P. MORKEN
CHECKED BY: B. SPRANG
SUBMITTED BY:
SIZE:
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.:
CONTRACT NO.:
AS-BUILT NO.:
FILE NAME: FMMSE3 G-001xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

HMG Houston-Moore Group
925 10TH AVE E
WEST FARGO, ND

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND
COVER SHEET

SHEET ID
G-001

%PRODUCTION DATA 1%
%PRODUCTION DATA 4%
%PRODUCTION DATA 3%
%PRODUCTION DATA 2%

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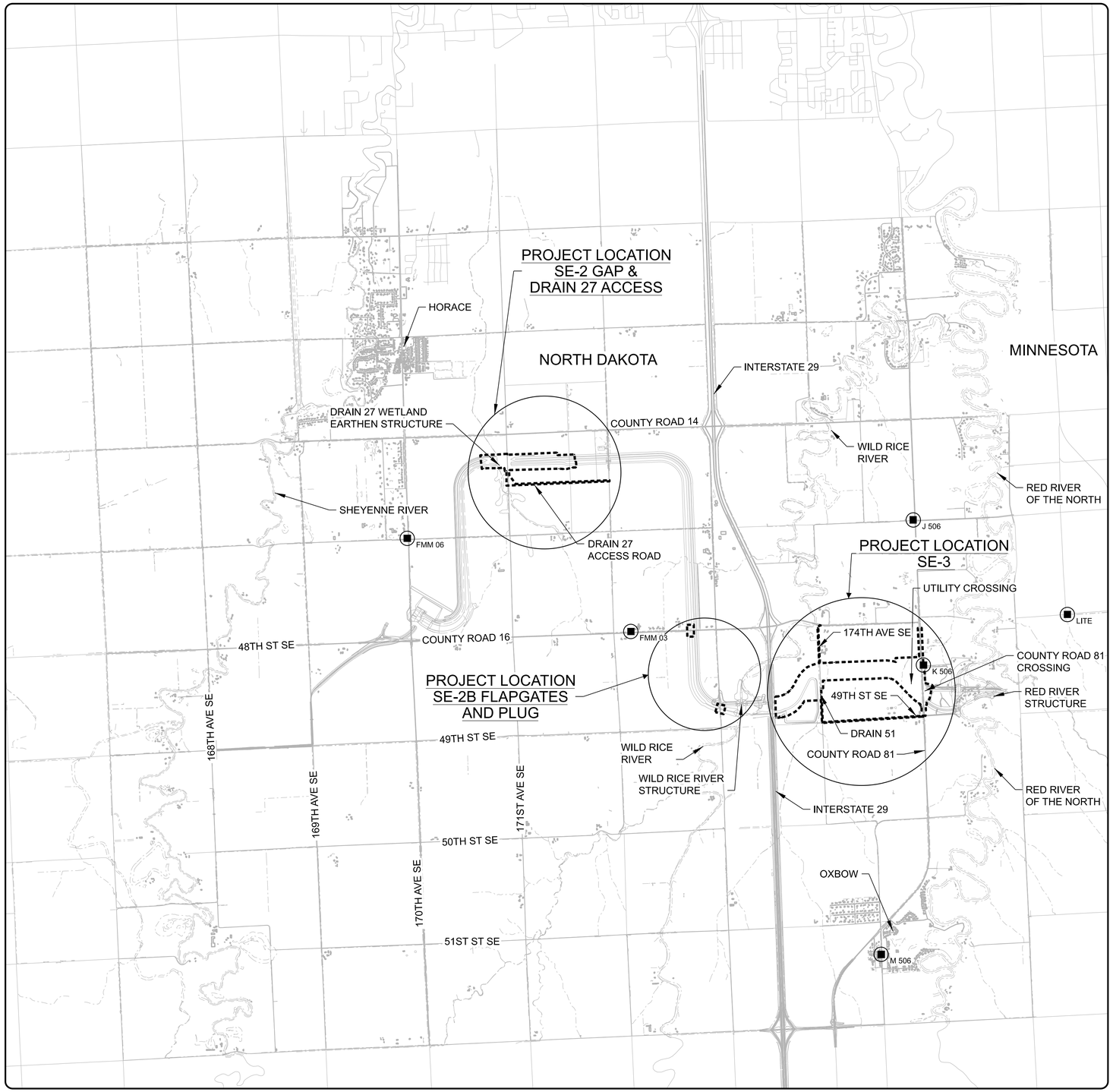
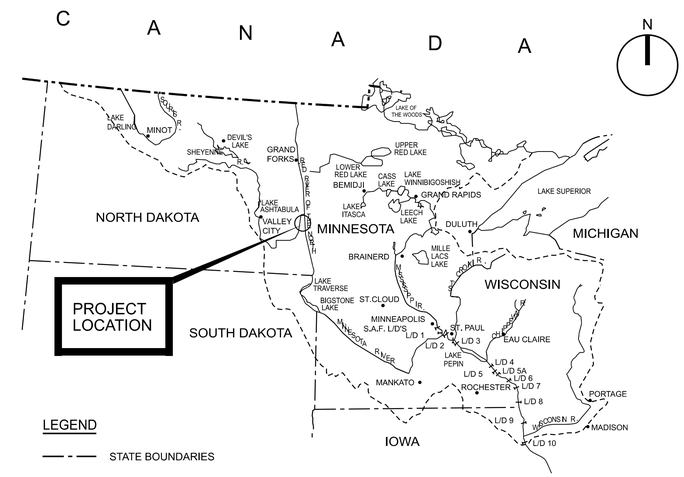


A1 PLAN - VICINITY MAP

SCALE: 1"=3000'

0 3000' 6000'

N



LEGEND

- STATE BOUNDARIES
- RIVERS & LAKES
- DISTRICT BOUNDARIES
- NATIONAL BOUNDARIES
- L/D LOCK AND DAM

H14 LOCATION MAP

N.T.S.

N

VERTICAL AND HORIZONTAL CONTROL POINTS

NAME	NORTHING	EASTING	ELEVATION	DESCRIPTION
K 506	402484.50	2896687.53	909.01'	NGS PID RP1148
J 506	410048.70	2896161.18	909.64'	NGS PID RP1147
FMM 03	404233.76	2881426.36	910.54'	NGS PID DN4357
FMM 06	409089.26	2869767.84	916.65'	NGS PID DN4360
LITE	405117.67	2904198.29	912.05'	NGS PID DM1837
M 506	387402.83	2894483.93	917.94'	NGS PID RP1150

F14 VERTICAL AND HORIZONTAL CONTROL POINTS

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NGS PID: SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN	ISSUE DATE: 3 SEPT 2024
DRAWN BY: P. MORKEN	SOLICITATION NO.: W912ES23B0016
CHECKED BY: B. SPRANG	CONTRACT NO.:
SUBMITTED BY: R. MCGARVEY	AS-BUILT NO.:
SIZE: ANSI D	FILE NAME: FMMSE3_G-002xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

LOCATION AND VICINITY MAP

SHEET ID

G-002

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11:06:26 AM 9/3/2024

CONSTRUCTION DRAWING INDEX

AS-BUILT DRAWING NO.	SHEET REF.	DESCRIPTION	PRODUCT I.D.
		GENERAL DRAWINGS	
	G-001	COVER SHEET	FMMSE3_G-001XXX.dgn
	G-002	LOCATION AND VICINITY MAP	FMMSE3_G-002XXX.dgn
	G-003	INDEX	FMMSE3_G-003XXX.dgn
	G-004	GENERAL NOTES AND LEGEND	FMMSE3_G-004XXX.dgn
	G-100	SEQUENCING AND EXCLUSION ZONE PLAN	FMMSE3_G-100XXX.dgn
	G-101	GENERAL SITE PLAN 1	FMMSE3_G-101XXX.dgn
	G-102	GENERAL SITE PLAN 2	FMMSE3_G-102XXX.dgn
		GEOTECHNICAL DRAWINGS	
	B-101	BORING LOCATIONS	FMMSE3_B-101XXX.dgn
	B-301	BORING LOGS 15-228M AND 15-229M	FMMSE3_B-301XXX.dgn
	B-302	BORING LOGS 19-328M, 19-342M, AND 20-406M/MU	FMMSE3_B-302XXX.dgn
	B-303	BORING LOGS 20-425M, 20-426M, AND 15-230M	FMMSE3_B-303XXX.dgn
		LANDSCAPE DRAWINGS	
	LS120	DRAIN 27 SEEDING PLAN	FMMSE3_LS120XXX.dgn
		VOLUME 1	
		CIVIL DRAWINGS	
	G-001	COVER SHEET	FMMSE3_VOL1_G-001XXX.dgn
	CD100	DEMOLITION KEY PLAN	FMMSE3_VOL1_CD100XXX.dgn
	CD101	GENERAL DEMOLITION PLAN 1	FMMSE3_VOL1_CD101XXX.dgn
	CD102	GENERAL DEMOLITION PLAN 2	FMMSE3_VOL1_CD102XXX.dgn
	CD401	SE2 BORROW DITCH CULVERT FLAPGATE REMOVAL	FMMSE3_VOL1_CD401XXX.dgn
	CD402	TEMPORARY DAM REMOVAL	FMMSE3_VOL1_CD402XXX.dgn
	CS100	KEY PLAN	FMMSE3_VOL1_CS100XXX.dgn
	CS101	SE3 DAM EMBANKMENT PLAN AND PROFILE STA SE3 0+00 TO SE3 15+00	FMMSE3_VOL1_CS101XXX.dgn
	CS102	SE3 DAM EMBANKMENT PLAN AND PROFILE STA SE3 15+00 TO SE3 36+00	FMMSE3_VOL1_CS102XXX.dgn
	CS103	SE3 DAM EMBANKMENT PLAN AND PROFILE STA SE3 36+00 TO SE3 56+00	FMMSE3_VOL1_CS103XXX.dgn
	CS104	SE3 DAM EMBANKMENT PLAN AND PROFILE STA SE3 56+00 TO SE3 76+00	FMMSE3_VOL1_CS104XXX.dgn
	CS105	SE3 DAM EMBANKMENT PLAN AND PROFILE STA SE3 76+00 TO SE3 92+16	FMMSE3_VOL1_CS105XXX.dgn
	CS106	DITCH B1 PLAN AND PROFILE STA B1 0+00 TO B1 24+00	FMMSE3_VOL1_CS106XXX.dgn
	CS107	DITCH B1 PLAN AND PROFILE STA B1 72+00 TO B1 93+00	FMMSE3_VOL1_CS107XXX.dgn
	CS108	TOPSOIL DISPOSAL SITE	FMMSE3_VOL1_CS108XXX.dgn
	CS110	SE-2B WEIR REVETMENT ACB PLAN	FMMSE3_VOL1_CS110XXX.dgn
	CS120	SE2 EMBANKMENT PLAN AND PROFILE	FMMSE3_VOL1_CS120XXX.dgn
	CS121	DITCH AB PLAN AND PROFILE STA 0+00 TO 50+00	FMMSE3_VOL1_CS121XXX.dgn
	CS122	DITCH ED PLAN, PROFILE, AND SECTION	FMMSE3_VOL1_CS122XXX.dgn
	CS123	ACCESS ROAD PLAN	FMMSE3_VOL1_CS123XXX.dgn
	CS201	BORROW DITCH B1 PROFILE STA 24+00 TO 72+00	FMMSE3_VOL1_CS201XXX.dgn
	CS202	DRAINAGE DITCH D1 PROFILE	FMMSE3_VOL1_CS202XXX.dgn
	CS203	DRAINAGE DITCH D2 AND D3 PROFILES	FMMSE3_VOL1_CS203XXX.dgn
	CS204	PROFILE DRAIN 51 STA 0+00 TO 19+00	FMMSE3_VOL1_CS204XXX.dgn
	CS205	DRAIN 27 ACCESS ROAD PROFILE	FMMSE3_VOL1_CS205XXX.dgn
	CS206	SE-2B WEIR ACB PROFILES	FMMSE3_VOL1_CS206XXX.dgn
	CS301	TYPICAL SECTIONS STA SE3 0+00 TO 16+20	FMMSE3_VOL1_CS301XXX.dgn
	CS302	TYPICAL SECTIONS STA SE3 16+20 TO 31+60	FMMSE3_VOL1_CS302XXX.dgn
	CS303	TYPICAL SECTIONS STA SE3 31+60 TO 53+00	FMMSE3_VOL1_CS303XXX.dgn
	CS304	TYPICAL SECTIONS STA SE3 53+00 TO 74+40	FMMSE3_VOL1_CS304XXX.dgn
	CS305	TYPICAL SECTIONS STA SE3 74+40 TO 85+00	FMMSE3_VOL1_CS305XXX.dgn
	CS306	TYPICAL SECTIONS STA SE3 85+00 TO 89+20	FMMSE3_VOL1_CS306XXX.dgn
	CS307	SECTIONS BORROW DITCH B1	FMMSE3_VOL1_CS307XXX.dgn
	CS308	SECTIONS EMBANKMENT SE-2	FMMSE3_VOL1_CS308XXX.dgn
	CS309	SECTIONS DITCH AB	FMMSE3_VOL1_CS309XXX.dgn
	CS310	TYPICAL SECTIONS ACCESS ROAD (AD) AND DITCH ED	FMMSE3_VOL1_CS310XXX.dgn
	CS401	SE3 EMBANKMENT PLAN AND PROFILE DAM TIE-IN DETAILS	FMMSE3_VOL1_CS401XXX.dgn
	CS402	SE2 EMBANKMENT PLAN AND PROFILE DAM TIE-IN DETAILS	FMMSE3_VOL1_CS402XXX.dgn
	CS403	MAINTENANCE ROAD PLAN AND PROFILE	FMMSE3_VOL1_CS403XXX.dgn
	CS404	DROP STRUCTURE SE-3I PLAN, PROFILE, AND SECTIONS	FMMSE3_VOL1_CS404XXX.dgn
	CS405	DROP STRUCTURE SE-3D PLAN, PROFILE, AND SECTIONS	FMMSE3_VOL1_CS405XXX.dgn
	CS406	WEIR SE-3H PLAN AND PROFILE	FMMSE3_VOL1_CS406XXX.dgn
	CS407	T-TERMINATIONS PLAN AND PROFILE	FMMSE3_VOL1_CS407XXX.dgn
	CS501	DETAILS TURF REINFORCEMENT MAT AND INSPECTION TRENCH	FMMSE3_VOL1_CS501XXX.dgn
	CS502	CIVIL DETAILS	FMMSE3_VOL1_CS502XXX.dgn
	CS503	ARTICULATED CONCRETE BLOCK (ACB) DETAILS	FMMSE3_VOL1_CS503XXX.dgn

CONSTRUCTION DRAWING INDEX

AS-BUILT DRAWING NO.	SHEET REF.	DESCRIPTION	PRODUCT I.D.
	CS601	HORIZONTAL CONTROL TABLE 1	FMMSE3_VOL1_CS601XXX.dgn
	CS602	HORIZONTAL CONTROL TABLE 2	FMMSE3_VOL1_CS602XXX.dgn
	CS603	HORIZONTAL CONTROL TABLE 3	FMMSE3_VOL1_CS603XXX.dgn
	CS604	HORIZONTAL CONTROL TABLE 4	FMMSE3_VOL1_CS604XXX.dgn
		STRUCTURAL DRAWINGS	
	S-001	CULVERT SE-3C NOTES	FMMSE3_VOL1_S-001XXX.dgn
	S-401	CULVERT SE-3C PRECAST CONCRETE BOX CULVERT LAYOUT	FMMSE3_VOL1_S-401XXX.dgn
	S-501	CULVERT SE-3C EXCAVATION AND FOUNDATION FILL DETAIL	FMMSE3_VOL1_S-501XXX.dgn
	S-502	CULVERT SE-3C EXCAVATION AND FOUNDATION FILL DETAIL	FMMSE3_VOL1_S-502XXX.dgn

REFERENCE DRAWING INDEX

DRAWING NO.		DESCRIPTION	PRODUCT I.D.
		WILD RICE RIVER FLOW HYDROGRAPHS, JANUARY 01 - DECEMBER 31 2012 - 2021	
		WILD RICE RIVER, FLOW DURATION CURVES, JANUARY - JUNE 1932 - 2021	
		WILD RICE RIVER, FLOW DURATION CURVES, JULY - DECEMBER 1932 - 2021	
		WILD RICE RIVER STAGE HYDROGRAPHS, JANUARY 01 - DECEMBER 31 2012 - 2021	
		WILD RICE RIVER STAGE DURATION CURVES JANUARY - JUNE 1932 - 2021	
		WILD RICE RIVER STAGE DURATION CURVES JULY - DECEMBER 1932 - 2021	
		EMBANKMENT PLAN AND PROFILE STA SE-2A 104+00 TO STA SE-2A 122+29	
		EMBANKMENT PLAN AND PROFILE STA SE-2B 116+14.68 TO STA SE-2B 137+00	
		EMBANKMENT PLAN AND PROFILE STA SE-2B 137+00 TO STA SE-2B 158+00	
		EMBANKMENT PLAN AND PROFILE STA SE-2B 158+00 TO STA SE-2B 179+00	
		EMBANKMENT PLAN AND PROFILE STA SE-2B 284+00 TO STA SE-2B 305+00	
		BORROW CULVERT PROFILE STA B 348+30 TO STA B 351+00	
		BORROW DITCH PROFILE STA B 118+00 TO STA B 178+00	
		BORROW DITCH PROFILE STA B 298+00 TO STA B 357+97.97	
		BORROW CULV PROF STA B 348+80 TO349.40 AND STA B 349+70 TO 350+70	
		EMBANKMENT TYPICAL SECTIONS	
		DETAILS HEADWALL UPSTREAM AND DOWNSTREAM	
		DETAILS HEADWALL REBAR LOCATION UPSTREAM AND DOWNSTREAM	
		DETAILS HEADWALL SLAB	
		ASSEMBLY BULKHEAD	
		DETAILS BULKHEAD	
		DETAILS BULKHEAD	
		DETAILS BULKHEAD	
		DETAILS BULKHEAD	

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
UTM ZONE 14 SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN
DRAWN BY: P. MORKEN
CHECKED BY: BDS
SUBMITTED BY: R. MCGARVEY
SIZE: ANSI D
FILE NAME: FMMSE3_G-003xxx.dgn
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
AS-BUILT NO.:

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

INDEX

SHEET ID
G-003

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GENERAL PROJECT NOTES:

1. TIE DIAGRAMS AND DESCRIPTIONS OF HORIZONTAL AND VERTICAL CONTROL POINTS ARE AVAILABLE BY REQUEST TO THE CONTRACTING OFFICER UPON CONTRACT AWARD.
2. ORIGINAL DATA COMPILED NAD 83 US SURVEY FEET. COORDINATES BASED ON NORTH DAKOTA STATE PLANE GRID SYSTEM, SOUTH ZONE.
3. ELEVATIONS REFER TO NAVD 88, GEOID12B.
4. ORIGINAL DATA FROM 2017 AND 2020 LIDAR AND 2022 FIELD SURVEY DATA, WITH THE EXCEPTION OF REACH SE-1, REACH SE-1B, REACH SE-2A, REACH SE-2B, I-29 GRADE RAISE, RED RIVER STRUCTURE, AND UTILITY RELOCATIONS (WP 47B AND E) WHICH ARE TAKEN FROM AS-BUILT AND DESIGN FILES.
5. THE COMBINED FACTOR (CF) SHALL BE USED TO CONVERT THE GRID COORDINATES SHOWN IN THE PLANS TO GROUND COORDINATES FOR PROPER LAYOUT OF THE PROJECT. DIVIDE GRID COORDINATES BY THE CF TO OBTAIN GROUND COORDINATES.
6. THE INFORMATION ON THESE DRAWINGS CONCERNING TYPE AND LOCATION OF UTILITIES MAY NOT BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING THE DETERMINATION AS TO THE TYPE AND LOCATION OF UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE TO THESE UTILITIES.
7. UNDER THE LIMITS OF IMPERVIOUS FILL, GRAVEL AND ROAD EMBANKMENTS MUST BE REMOVED TO MATCH THE ADJACENT GROUND ELEVATION AT TOE OF ROAD EMBANKMENT.
8. STRIPPING LIMITS ARE AS INDICATED ON THE PLAN SHEETS. TOPSOIL STRIPPING QUANTITIES ESTIMATED ASSUMING A TOPSOIL DEPTH OF 18". CONTRACTOR SHALL REFER TO SOIL BORING LOGS FOR ESTIMATED TOPSOIL DEPTH WITHIN THE PROJECT FOOTPRINT.
9. EXCAVATION FOR DITCHES SHALL BE LIMITED TO ELEVATIONS SHOWN IN THE PROFILES AND SECTIONS. IF ADDITIONAL MATERIAL IN REQUIRED, MATERIAL SHALL BE TAKEN FROM THE AREA SHOWN AS 'DASHED' IN IN THE BORROW DITCH SECTIONS.
10. PROVIDE ZONE 1 SEEDING TO ALL DISTURBED AREAS NOT OTHERWISE IDENTIFIED ON THE PLAN AS REQUIRING SEEDING. 1
11. "VOLUME 2" REFERS TO PLANS TITLED FMM SOUTHERN EMB. REACH SE-3 CASS COUNTY ROAD 81, UNDER SEPARATE COVER.
12. FOR VOLUME 1, EMBANKMENTS WILL BE SEEDED WITH ZONE 1 SEED MIX, DITCHES WILL BE SEEDED WITH ZONE 2 SEED MIX UNLESS OTHERWISE NOTED. SEE SPECIFICATIONS FOR SEED MIX INFORMATION. 1

ABBREVIATIONS

* UNLESS OTHERWISE NOTED ON EACH SHEET

APPROX	APPROXIMATE	L/W	LANDWARD
ALT W/	ALTERNATE WITH	MAX	MAXIMUM
ALUM	ALUMINUM	MIN	MINIMUM
ABUT	ABUTMENT	MIRR	MIRRORED
ALTER	ALTERNATING	MISC	MISCELLANEOUS
BITUM	BITUMINOUS	MECH	MECHANICAL
BOT	BOTTOM	NF	NEAR FACE
C/L	CENTER LINE	NO	NUMBER
C&G	CURB & GUTTER	NTS	NOT TO SCALE
CLR	CLEAR	OF	OUTSIDE FACE
CJ	CONSTRUCTION JOINT	OC	ON CENTER
CMP	CORRUGATED METAL PIPE	O/S	OFFSET
CONC	CONCRETE	PL	PLATE
CONN	CONNECTION	PLAT	PLATFORM
DIA	DIAMETER	RT	RIGHT
DS	DOWNSTREAM	R/W	RIVERWARD
DWG	DRAWING	SAN	SANITARY
EF	EACH FACE	SPEC	SPECIFICATIONS
EJ	EXPANSION JOINT	SST OR S.S	STAINLESS STEEL
EL	ELEVATION	T&B	TOP AND BOTTOM
ELEV	ELEVATION	TRM	TURF REINFORCEMENT MAT
EST	ESTIMATED	TYP	TYPICAL
EW	EACH WAY	UNO	UNLESS NOTED OTHERWISE
EXIST	EXISTING	UGND	UNDERGROUND
FF	FAR FACE	US	UPSTREAM
FES	FLARED END SECTION	W	WIDTH
GALV	GALVANIZED	WM	WATER MAIN
HT	HEIGHT		
IF	INSIDE FACE		
LG	LONG		
LT	LEFT		

GENERAL CROSS-REFERENCING SYMBOLS

D5 — DETAIL/SECTION — SUPPLEMENTAL INFORMATION — SCALE:
SECTION/DETAIL TITLE ON SAME DRAWING (CENTERED UNDER SECTION/DETAIL)

D5 / C-102 — DETAIL/SECTION — SUPPLEMENTAL INFORMATION — SCALE:
SECTION/DETAIL TITLE ON ANOTHER DRAWING (CENTERED UNDER SECTION/DETAIL)

TOP FRONT SIDE
ELEVATION SECTION
VIEW SUBTITLE (CENTERED UNDER EACH VIEW)

D5 — SECTION CUT W/ VIEW SHOWN ON SAME DRAWING

D5 / C-302 — SECTION CUT W/ VIEW SHOWN ON ANOTHER DRAWING

A — DETAIL SYMBOL W/ VIEW SHOWN ON SAME DRAWING

A / C-501 — DETAIL SYMBOL W/ VIEW SHOWN ON ANOTHER DRAWING

GENERAL LEGEND

△	P.I. POINT	97-41M	BORING LOCATION AND NUMBER
—— SAN ——	EXISTING SANITARY SEWER	##	1 DIMENSIONAL PROJECT CONTROL POINT
—— SD ——	EXISTING STORM SEWER	##	3 DIMENSIONAL PROJECT CONTROL POINT
— W ——	WATERMAIN		WORK LIMITS
—E——	EXISTING OVERHEAD P0WER		FILL
—E— — — —	EXISTING UNDER-GROUND DUCT		CUT
——	EXISTING GAS	SHEET ID X-000	DWG OUTLINE AND NUMBER
— — — —	EXISTING COMMUNICATION		DAM EMBANKMENT
	SIGN		
	RIPRAP		
	BEDDING		

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88 GEOID12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011) NAD83 (2011) SOUTH ZONE U.S. SURVEY FT. COMBINED FACTOR (CF): 0.999956656

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE
1	DRAWING REISSUED WITH AMENDMENT NO. 4	2024-11-07

DESIGNED BY: P. MORKEN
DRAWN BY: P. MORKEN
CHECKED BY: B. SPRANG
SUBMITTED BY: M. MCGARVEY
SIZE: ANSI D
FILE NAME: FMMSE3 G-004xxx.dgn
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
AS-BUILT NO.:

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

GENERAL NOTES AND LEGEND

SHEET ID
G-004

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3:31:23 PM 11/7/2024

GENERAL PROJECT NOTES:

1. TIE DIAGRAMS AND DESCRIPTIONS OF HORIZONTAL AND VERTICAL CONTROL POINTS ARE AVAILABLE BY REQUEST TO THE CONTRACTING OFFICER UPON CONTRACT AWARD.
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6. THE INFORMATION ON THESE DRAWINGS CONCERNING TYPE AND LOCATION OF UTILITIES MAY NOT BE ACCURATE OR ALL INCLUSIVE. THE CONTRACTOR IS RESPONSIBLE FOR MAKING THE DETERMINATION AS TO THE TYPE AND LOCATION OF UTILITIES AS MAY BE NECESSARY TO AVOID DAMAGE TO THESE UTILITIES.
7. UNDER THE LIMITS OF IMPERVIOUS FILL, GRAVEL AND ROAD EMBANKMENTS MUST BE REMOVED TO MATCH THE ADJACENT GROUND ELEVATION AT TOE OF ROAD EMBANKMENT.
8. STRIPPING LIMITS ARE AS INDICATED ON THE PLAN SHEETS. TOPSOIL STRIPPING QUANTITIES ESTIMATED ASSUMING A TOPSOIL DEPTH OF 18". CONTRACTOR SHALL REFER TO SOIL BORING LOGS FOR ESTIMATED TOPSOIL DEPTH WITHIN THE PROJECT FOOTPRINT.
9. EXCAVATION FOR DITCHES SHALL BE LIMITED TO ELEVATIONS SHOWN IN THE PROFILES AND SECTIONS. IF ADDITIONAL MATERIAL IN REQUIRED, MATERIAL SHALL BE TAKEN FROM THE AREA SHOWN AS 'DASHED' IN IN THE BORROW DITCH SECTIONS.
10. PROVIDE DRY MIX SEEDING TO ALL DISTURBED AREAS NOT OTHERWISE IDENTIFIED ON THE PLAN AS REQUIRING SEEDING.
11. "VOLUME 2" REFERS TO PLANS TITLED FMM SOUTHERN EMB. REACH SE-3 CASS COUNTY ROAD 81, UNDER SEPARATE COVER.

ABBREVIATIONS

* UNLESS OTHERWISE NOTED ON EACH SHEET

APPROX	APPROXIMATE	L/W	LANDWARD
ALT W/	ALTERNATE WITH	MAX	MAXIMUM
ALUM	ALUMINUM	MIN	MINIMUM
ABUT	ABUTMENT	MIRR	MIRRORED
ALTER	ALTERNATING	MISC	MISCELLANEOUS
BITUM	BITUMINOUS	MECH	MECHANICAL
BOT	BOTTOM	NF	NEAR FACE
C/L	CENTER LINE	NO	NUMBER
C&G	CURB & GUTTER	NTS	NOT TO SCALE
CLR	CLEAR	OF	OUTSIDE FACE
CJ	CONSTRUCTION JOINT	OC	ON CENTER
CMP	CORRUGATED METAL PIPE	O/S	OFFSET
CONC	CONCRETE	PL	PLATE
CONN	CONNECTION	PLAT	PLATFORM
DIA	DIAMETER	RT	RIGHT
DS	DOWNSTREAM	R/W	RIVERWARD
DWG	DRAWING	SAN	SANITARY
EF	EACH FACE	SPEC	SPECIFICATIONS
EJ	EXPANSION JOINT	SST OR S.S	STAINLESS STEEL
EL	ELEVATION	T&B	TOP AND BOTTOM
ELEV	ELEVATION	TRM	TURF REINFORCEMENT MAT
EST	ESTIMATED	TYP	TYPICAL
EW	EACH WAY	UNO	UNLESS NOTED OTHERWISE
EXIST	EXISTING	UGND	UNDERGROUND
FF	FAR FACE	US	UPSTREAM
FES	FLARED END SECTION	W	WIDTH
GALV	GALVANIZED	WM	WATER MAIN
HT	HEIGHT		
IF	INSIDE FACE		
LG	LONG		
LT	LEFT		

GENERAL CROSS-REFERENCING SYMBOLS

D5 — DETAIL/SECTION — SUPPLEMENTAL INFORMATION — SCALE:
SECTION/DETAIL TITLE ON SAME DRAWING (CENTERED UNDER SECTION/DETAIL)

D5 / C-102 — DETAIL/SECTION — SUPPLEMENTAL INFORMATION — SCALE:
SECTION/DETAIL TITLE ON ANOTHER DRAWING (CENTERED UNDER SECTION/DETAIL)

TOP FRONT SIDE
ELEVATION SECTION
VIEW SUBTITLE (CENTERED UNDER EACH VIEW)

D5 — SECTION CUT W/ VIEW SHOWN ON SAME DRAWING

D5 / C-302 — SECTION CUT W/ VIEW SHOWN ON ANOTHER DRAWING

A — DETAIL SYMBOL W/ VIEW SHOWN ON SAME DRAWING

A / C-501 — DETAIL SYMBOL W/ VIEW SHOWN ON ANOTHER DRAWING

GENERAL LEGEND

Δ	P.I. POINT	97-41M	BORING LOCATION AND NUMBER
SAN	EXISTING SANITARY SEWER	##	1 DIMENSIONAL PROJECT CONTROL POINT
SD	EXISTING STORM SEWER	##	3 DIMENSIONAL PROJECT CONTROL POINT
W	WATERMAIN		WORK LIMITS
E	EXISTING OVERHEAD P0WER		FILL
E	EXISTING UNDER-GROUND DUCT		CUT
	EXISTING GAS	SHEET ID X-000	DWG OUTLINE AND NUMBER
	EXISTING COMMUNICATION		DAM EMBANKMENT
	SIGN		
	RIPRAP		
	BEDDING		

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NDGPS - SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956656

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN
DRAWN BY: P. MORKEN
CHECKED BY: B. SPRANG
SUBMITTED BY: R. MCGARVEY
SIZE: ANSI D
FILE NAME: FMMSE3_G-004xxx.dgn
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
AS-BUILT NO.:

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

GENERAL NOTES AND LEGEND

SHEET ID
G-004

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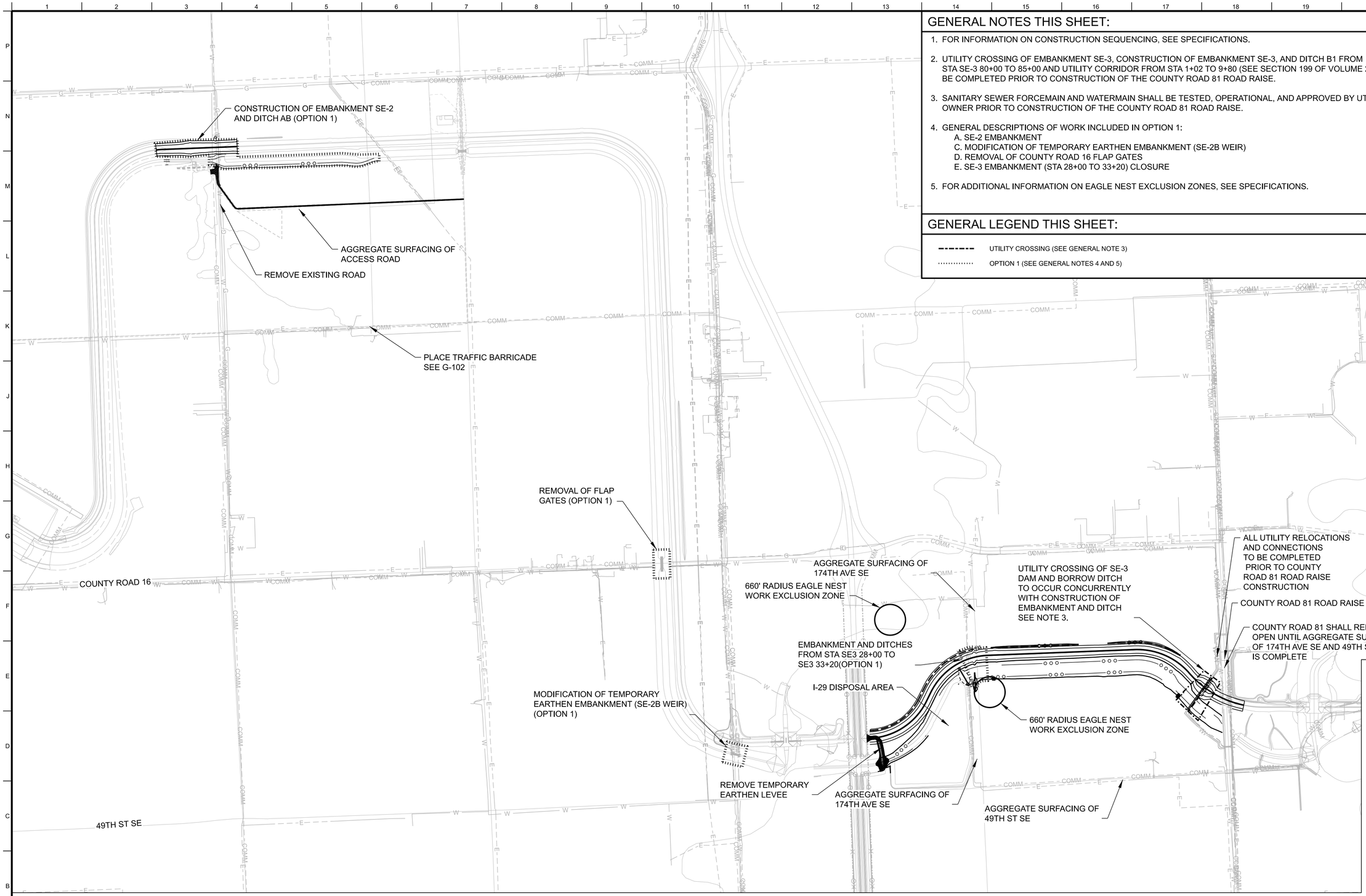

GENERAL NOTES THIS SHEET:

1. FOR INFORMATION ON CONSTRUCTION SEQUENCING, SEE SPECIFICATIONS.
2. UTILITY CROSSING OF EMBANKMENT SE-3, CONSTRUCTION OF EMBANKMENT SE-3, AND DITCH B1 FROM STA SE-3 80+00 TO 85+00 AND UTILITY CORRIDOR FROM STA 1+02 TO 9+80 (SEE SECTION 199 OF VOLUME 2) SHALL BE COMPLETED PRIOR TO CONSTRUCTION OF THE COUNTY ROAD 81 ROAD RAISE.
3. SANITARY SEWER FORCEMAIN AND WATERMAIN SHALL BE TESTED, OPERATIONAL, AND APPROVED BY UTILITY OWNER PRIOR TO CONSTRUCTION OF THE COUNTY ROAD 81 ROAD RAISE.
4. GENERAL DESCRIPTIONS OF WORK INCLUDED IN OPTION 1:
   - A. SE-2 EMBANKMENT
   - C. MODIFICATION OF TEMPORARY EARTHEN EMBANKMENT (SE-2B WEIR)
   - D. REMOVAL OF COUNTY ROAD 16 FLAP GATES
   - E. SE-3 EMBANKMENT (STA 28+00 TO 33+20) CLOSURE
5. FOR ADDITIONAL INFORMATION ON EAGLE NEST EXCLUSION ZONES, SEE SPECIFICATIONS.

GENERAL LEGEND THIS SHEET:

- - - - - - UTILITY CROSSING (SEE GENERAL NOTE 3)
..... OPTION 1 (SEE GENERAL NOTES 4 AND 5)

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U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

SEQUENCING AND EXCLUSION ZONE PLAN

SHEET ID
G-100

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NDSPCS, SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956656

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

A1 PLAN - SEQUENCING AND EXCLUSION ZONE
SCALE: 1"=1000'

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GENERAL NOTES THIS SHEET:

1. CONTRACTOR OFFICE, LAY DOWN YARD, AND GOVERNMENT FIELD OFFICE SHALL BE LOCATED WITHIN THE STAGING AREA.

COUNTY ROAD 16 CROSSING OVER SE-2B BORROW DITCH (FLAPGATE AND BULKHEAD REMOVAL)

COUNTY ROAD 16

WORK LIMITS

PLACE "LEFT TURN" SIGN AND SUPPORT ASSEMBLY W1-1 (L)-30 AND W13-1P-18 SUPPLEMENTAL SPEED PLAQUE FOR 10 MPH. INSTALL 275 FT IN ADVANCE OF HORIZONTAL CURVE.

NDDOT ROW

PLACE "ONE DIRECTION LARGE ARROW" SIGN AND SUPPORT ASSEMBLY W1-6(L)-48

END DITCH D2

SE-3 EMBANKMENT

BEGIN DITCH D2

BEGIN DITCH D3

END DRAINAGE DITCH D3

COUNTY ROAD 81 ROAD RAISE SEE VOLUME 2

STAGING AREA

UTILITY CROSSING SEE VOLUME 2

END DITCH D1

BEGIN DRAINAGE DITCH D1

WILD RICE RIVER STRUCTURE

DROP STRUCTURE SE-3I

WORK LIMITS

PLACE "ONE DIRECTION LARGE ARROW" SIGN AND SUPPORT ASSEMBLY W1-6(L)-48

174TH AVE SE (CONTROL LINE M) DRAIN 51 & CULVERT SE-3C

DROP STRUCTURE SE-3D

END SE-3 EMBANKMENT

PLACE "LEFT TURN" SIGN AND SUPPORT ASSEMBLY W1-1 (L)-30 AND W13-1P-18 SUPPLEMENTAL SPEED PLAQUE FOR 10 MPH. INSTALL 275 FT IN ADVANCE OF HORIZONTAL CURVE.

WEIR STRUCTURE SE-3H

WORK LIMITS

EXCESS TOPSOIL AND IMPERVIOUS MATERIAL DISPOSAL AREA

ADD OVERTOPPING PROTECTION OVER SE-2B WEIR ACROSS BORROW DITCH SEE CS110

SE-3 EMBANKMENT

BEGIN DITCH B1

END DITCH B1

49TH ST SE

174TH AVE SE

DRAIN 51

173RD AVE SE

INTERSTATE 29

WILD RICE RIVER

COUNTY ROAD 81 (175TH AVE SE)

N

0 500' 1000'

A1 PLAN - GENERAL SITE 1

SCALE: 1"=500'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NAD 83 (2011) SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956555

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U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

GENERAL SITE PLAN 1

SHEET ID

G-101

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PLACE "DEAD END" SIGN AND SUPPORT ASSEMBLY NO. 19 W14-1-30

57TH AVE W

COUNTY ROAD 14

CONSTRUCT T-TERMINATION AFTER REMOVAL OF 57TH ST S

EXISTING SE-2B EMBANKMENT & DITCH

T4005

T4000

BEGIN EMBANKMENT SE-2

T4010

T4015

T4020

END EMBANKMENT SE-2

F4030

F4035

F4040

F4025

F4045

T4025

END DITCH AB

T4030

T4035

T4050

T4045

T4040

T4115

T4110

BEGIN DITCH AB

T4105

T4100

T4095

T4090

DRAIN 27

T4085

T4080

T4055

T4060

SEE CS122 FOR EXISTING AGGREGATE REMOVAL ALONG ACCESS ROAD ALIGNMENT

T4065

T4070

T4075

172ND AVE SE

DRAIN 27 WETLAND RESTORATION AREA

WORK LIMITS

PLACE AGGREGATE SURFACE ON MAINTENANCE ROAD AND REGRADE

PLACE "DEAD END" SIGN AND SUPPORT ASSEMBLY NO. 19 W14-1-30

EXISTING SE-2A EMBANKMENT & DITCH

112TH AVE S

INSTALL 20 FT OF MUTCD TYPE 3 BARRICADE

N

0 500' 1000'

A1 PLAN - GENERAL SITE 2

SCALE: 1"=500'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NAD 83 (2011) MN SPCS SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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CONTRACT NO.:
AS-BUILT NO.:

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

GENERAL SITE PLAN 2

SHEET ID

G-102

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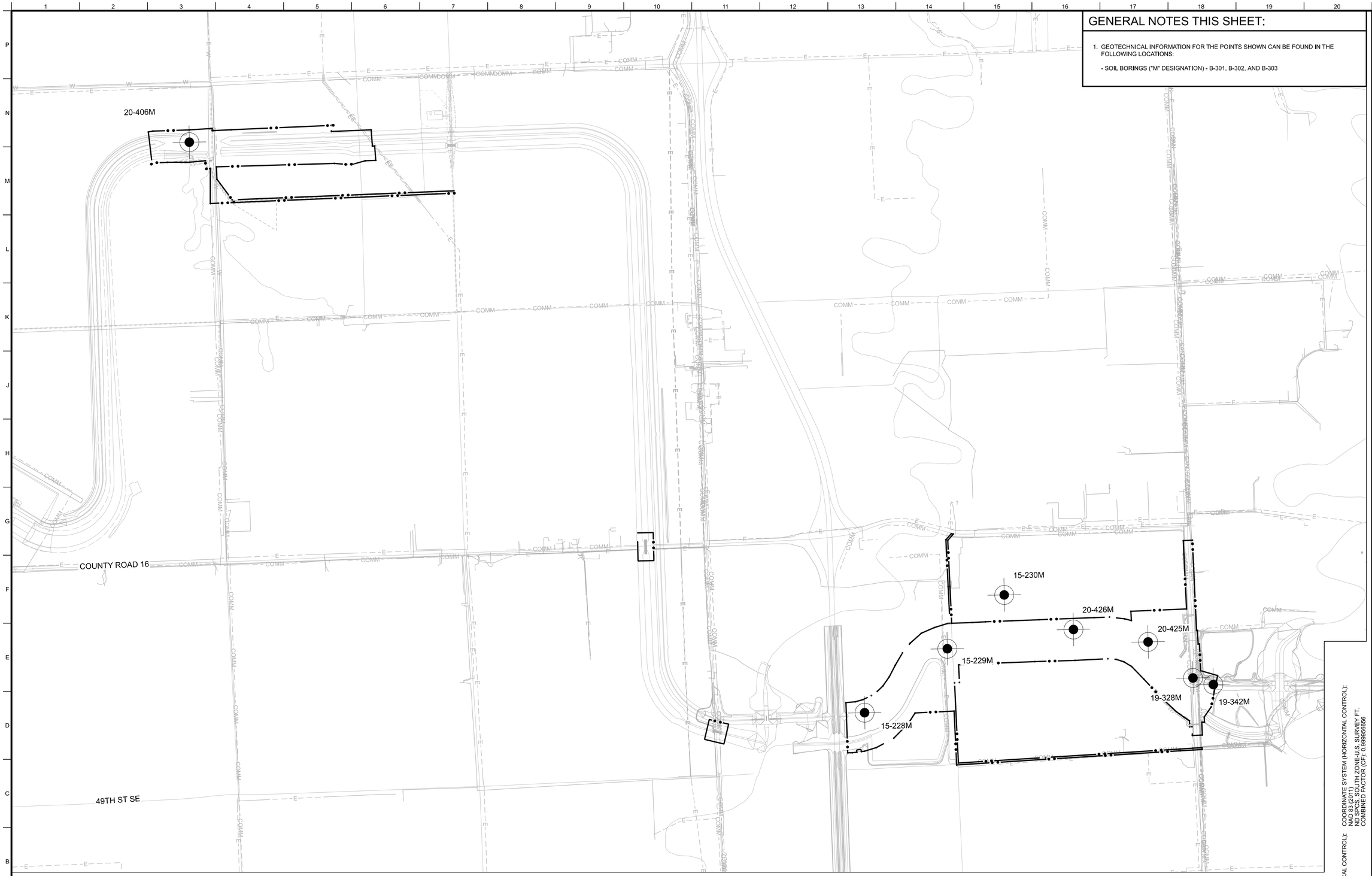
GENERAL NOTES THIS SHEET:

1. GEOTECHNICAL INFORMATION FOR THE POINTS SHOWN CAN BE FOUND IN THE FOLLOWING LOCATIONS:

   - SOIL BORINGS ("M" DESIGNATION) - B-301, B-302, AND B-303



A1 PLAN - BORING LOCATIONS

SCALE: 1"=1000'

0 1000' 2000'

N

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID: 12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NAD 83 (2011) SOUTH ZONE U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956656

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SUBMITTED BY: J. FOSS	AS-BUILT NO.:
SIZE: ANSI D	FILE NAME: FMMSE3_B-101xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

BORING LOCATIONS

SHEET ID

B-101

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15-228M

23-26 JAN 15

SPT	D_{10}	MC	LL	PL	Elevation	Description
					G.S. 910.9	
		OH				**0' TO 1'** (OH) ORGANIC CLAY, BLACK. **(TOPSOIL)**
					909.9	TOP OF SHERACK FM.
6	33	98	23			
8	42	96	23			
7	49	101	25	CH		**1' TO 27.8'** (CH) FAT CLAY, SILTY, MEDIUM STIFF, MOIST, LAMINATED, OCCASIONAL CALCAREOUS NODULES, GYPSUM CRYSTALS, AND FE NODULES, GYPSUM FILLED FRACTURES COMMON, TAN MOTTLED WITH GRAY. **(GLACIO-LACUSTRINE)**
6	48	82	24			
					W. L. 889.7	
6	41	80	24			
					883.1	TOP OF BRENNA FM.
6	48	76	22			
5	52	88	25	CH		**27.8' TO 42.1'** (CH) FAT CLAY, MEDIUM STIFF, WET, SLICKENSIDED, SILTY LAMINATIONS, GRAY. **(GLACIO-LACUSTRINE)**
6	39	65	22			
6	35	44	21	CL		**42.1' TO 47.7'** (CL) LEAN CLAY, MEDIUM STIFF, WET, LAMINATED, GRAY. **(GLACIO-LACUSTRINE)**
					863.2	TOP OF ARGUSVILLE FM.
5	48	81	24			
6	48	72	24	CH		**47.7' TO 63'** (CH) FAT CLAY, SILTY, MEDIUM STIFF, WET, LAMINATED, OCCASIONAL TILL INCLUSIONS AND SILT NODULES, OCCASIONAL SAND, GRAY. **(GLACIO-LACUSTRINE)**
6	43	79	20			
					847.9	TOP OF UNIT 'A' TILL
12				CL		**63' TO 68.5'** (CL) SANDY LEAN CLAY, SAND FINE TO MEDIUM, STIFF, MOIST, OCCASIONAL GRAVEL AND COARSE SAND, GRAY. **(TILL)**
126/0.4				SP		**68.5' TO 71.5'** (SP) POORLY GRADED GRAVEL, SAND FINE TO MEDIUM, VERY DENSE, SATURATED, TANNISH GRAY. **(OUTWASH)**
101		836.4		CL		**71.5' TO 74.5'** (CL) SANDY LEAN CLAY WITH GRAVEL, SAND FINE TO COARSE, HARD, MOIST, GRAY. **(TILL)**

NOTES:
1. WATER LEVEL DETERMINED AFTER 7 DAYS IN OPEN HOLE BOTTOM OF HOLE EL. 889.3
2. HOLE STABILIZED WITH HOLLOW STEM AUGER TO EL. 897.9 DRILLING MUD USED BELOW EL. 897.9
3. BACKFILLED BORING WITH TREMIED BENTONITE-CEMENT GROUT

15-229M

26-28 JAN 15

SPT	D_{10}	MC	LL	PL	Elevation	Description
					G.S. 910.7	
		OH				**0' TO 1'** (OH) ORGANIC CLAY, BLACK. **(TOPSOIL)**
					909.7	TOP OF SHERACK FM.
7	33	83	22			
7	46	101	25			
					W. L. 898.3	
6	46	92	25	CH		**1' TO 29.7'** (CH) FAT CLAY, SILTY, MEDIUM STIFF, MOIST TO WET, LAMINATED, OCCASIONAL CALCAREOUS NODULES AND GYPSUM CRYSTALS, TAN MOTTLED WITH GRAY. **(GLACIO-LACUSTRINE)**
2	53	83	25			
5	46	78	24			
					881.0	TOP OF BRENNA FM.
6						
5	38	61	24	CH		**29.7' TO 42'** (CH) FAT CLAY, MEDIUM STIFF, WET, LAMINATED, GRAY. **(GLACIO-LACUSTRINE)**
5	45	71	23			
5	39	58	23	CH		**42' TO 49.3'** (CH) FAT CLAY, SILTY, MEDIUM STIFF, WET, SILTY LAMINATIONS, GRAY. **(GLACIO-LACUSTRINE)**
				CH		
					861.4	TOP OF ARGUSVILLE FM.
5	47	85	24			
4	47	81	25			
6	49	96	26	CH		**49.3' TO 67.4'** (CH) FAT CLAY, SILTY, MEDIUM STIFF, WET, GRITTY, OCCASIONAL SAND AND GRAVEL, OCCASIONAL TILL SEAMS, GRAY. **(GLACIO-LACUSTRINE)**
6	39	71	22			
					843.3	TOP OF UNIT 'A' TILL
6				CL		**67.4' TO 69.8'** (CL) LEAN CLAY, SILTY, SAND FINE TO COARSE, MEDIUM STIFF, WET, BLOCKY, GRAY. **(TILL)**
				CL		
70				CL		**69.8' TO 83.3'** (CL) SANDY LEAN CLAY, SAND FINE TO COARSE, VERY STIFF TO HARD, MOIST, SOME GRAVEL, GRAY. **(TILL)**
145/0.8		826.4		SC-SM		**83.3' TO 84.3'** (SC-SM) CLAYEY SILTY SAND, SAND FINE TO MEDIUM, VERY DENSE, SATURATED, STRATIFIED, GRAY. **(OUTWASH)**

NOTES:
1. WATER LEVEL DETERMINED AFTER 16 DAYS IN OPEN HOLE BOTTOM OF HOLE EL. 892.7
2. HOLE STABILIZED WITH HOLLOW STEM AUGER TO EL. 897.7 DRILLING MUD USED BELOW EL. 897.7
3. BACKFILLED BORING WITH TREMIED BENTONITE-CEMENT GROUT

GENERAL BORING NOTES:

1. NOT ALL MATERIALS DESCRIBED IN THE GENERAL BORING LEGEND AND THE NOTES BELOW APPLY TO THIS PROJECT.
2. GENERAL: THE UNIFIED SOIL CLASSIFICATION SYSTEM IS USED TO IDENTIFY BASIC SOIL TYPE. THE LEGEND REPRESENTS ONLY THE BASIC SOILS. TO COMPLETE THE CLASSIFICATION, PERTINENT INFORMATION IS ADDED TO THE RIGHT OF THE BORING STAFF. NOTES PERTAINING TO A SPECIFIC BORING ARE SHOWN BELOW THE BORING STAFF.
3. MOISTURE CONTENT: THE NATURAL MOISTURE CONTENT IN PERCENT OF DRY WEIGHT (MC) IS SHOWN TO THE LEFT OF THE BORING STAFF.
4. BLOW COUNT (SPT): BLOW COUNTS ARE SHOWN TO THE LEFT OF THE BORING STAFF AND, EXCEPT AS NOTED, ARE THE NUMBER OF BLOWS NECESSARY TO DRIVE THE SAMPLER USED A DISTANCE OF 12-INCHES. STANDARD BLOW COUNTS ARE FOR A STANDARD PENETRATION TEST (SPT) USING A 1-3/8 X 2-INCH SAMPLER, 140 LB. HAMMER, AND A 30-INCH DROP. FOR NON-STANDARD BLOW COUNTS SAMPLER SIZE, HAMMER WEIGHT, AND HEIGHT OF DROP ARE AS SHOWN.
5. ATTERBERG LIMITS: LIQUID LIMIT (LL) AND PLASTIC LIMIT (PL) ARE SHOWN TO THE RIGHT OF THE BORING STAFF.
6. D_{10} SIZE: THE GRAIN SIZE IN MILLIMETERS OF WHICH 10% OF THE SAMPLE IS FINER IS SHOWN TO THE LEFT OF THE BORING STAFF.
7. RQD: ROCK QUALITY DESIGNATION (RQD) IS SHOWN TO THE LEFT OF THE PERCENT RECOVERY COLUMN. RQD IS THE PERCENT RECOVERY CONSISTING OF UNBROKEN PIECES LONGER THAN 4-INCHES.
8. % RECOVERY: PERCENT CORE RECOVERY IS SHOWN TO THE LEFT OF THE BORING STAFF. PERCENT RECOVERY IS LENGTH OF CORE RECOVERED/LENGTH OF CORE CUT X 100. UNLESS SPECIFIED OTHERWISE, ALL CORE IS 4-INCH DIAMETER.
9. THE BORINGS SHOW SUMMARIES OF INFORMATION RECORDED ON THE ORIGINAL FIELD LOGS. THESE LOGS ARE AVAILABLE FOR INSPECTION BY REQUEST TO THE CONTRACTING OFFICER.

GENERAL BORING LEGEND:

84-1M — YEAR OF BORING-BORING NUMBER, BORING TYPE (EG: M=MACHINE, A=AUGER, TP=TEST PIT, P=PIEZOMETER).

1 MAY 1984 — DATE OF BORING

W.S. 1026.7	WATER SURFACE ELEVATION ON DAY OF BORING
G.S. 1020.2	GROUND SURFACE ELEVATION AT BORING
GW	WELL GRADED GRAVELS, GRAVEL - SAND MIXTURE, LITTLE OR NO FINES
GP	POORLY GRADED GRAVELS, LITTLE OR NO FINES
GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SM	SILTY SANDS, SAND - SILT MIXTURES
SC	CLAYEY SANDS, SAND - CLAY MIXTURES
ML	INORGANIC SILTS, LIQUID LIMIT LESS THAN 50
MH	INORGANIC SILTS, LIQUID LIMIT GREATER THAN 50
CL	INORGANIC CLAYS, LOW TO MEDIUM PLASTICITY, LIQUID LIMIT LESS THAN 50
CH	INORGANIC CLAYS, HIGH PLASTICITY, LIQUID LIMIT GREATER THAN 50
OL	ORGANIC SILTS OR CLAYS, LOW PLASTICITY, LIQUID LIMIT LESS THAN 50
OH	ORGANIC SILTS OR CLAYS, MEDIUM TO HIGH PLASTICITY, LIQUID LIMIT GREATER THAN 50
PT	PEAT
SP-SM	BORDERLINE MATERIAL
SP&SM	STRATIFIED MATERIAL
1	LOCATION AND SAMPLE NUMBER FOR UNDISTURBED SAMPLE
	NO RECOVERY
W.L. 726.7	WATER LEVEL ON DATE OF BORING
700.1	ELEVATION AT BOTTOM OF BORING
(238.56)	ELEVATION IN METERS

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88 GEOID12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011) NAD 83(2011) SOUTH ZONE U.S. SURVEY FT. COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

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DRAWN BY: P. MORKEN
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AS-BUILT NO.:
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U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

BORING LOGS
15-228M AND 15-229M

SHEET ID
B-301

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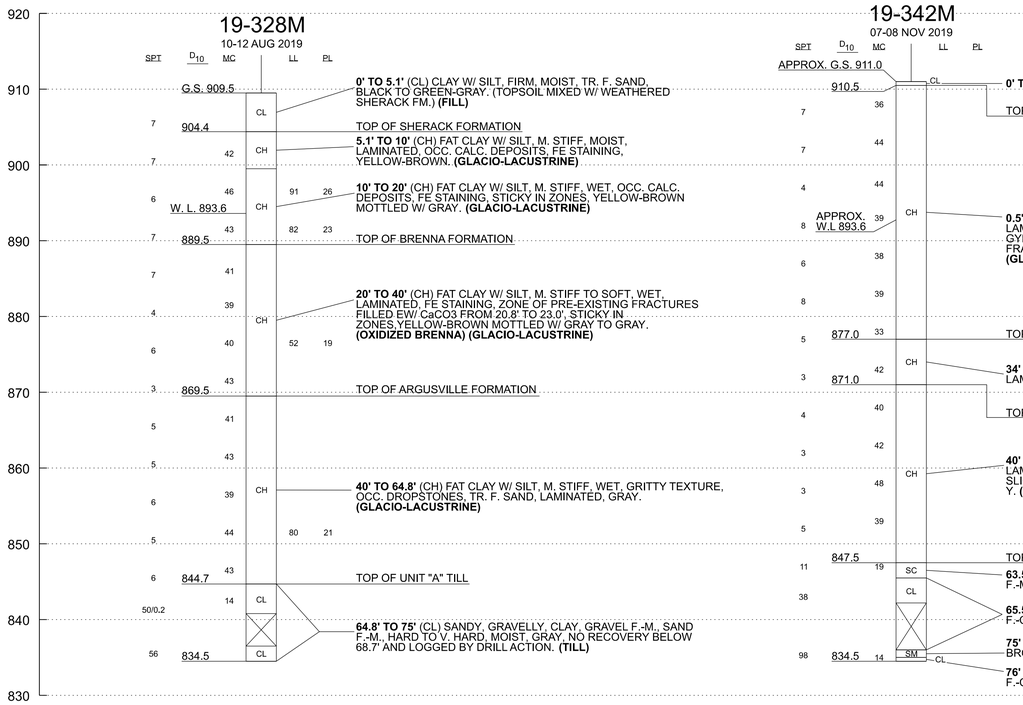
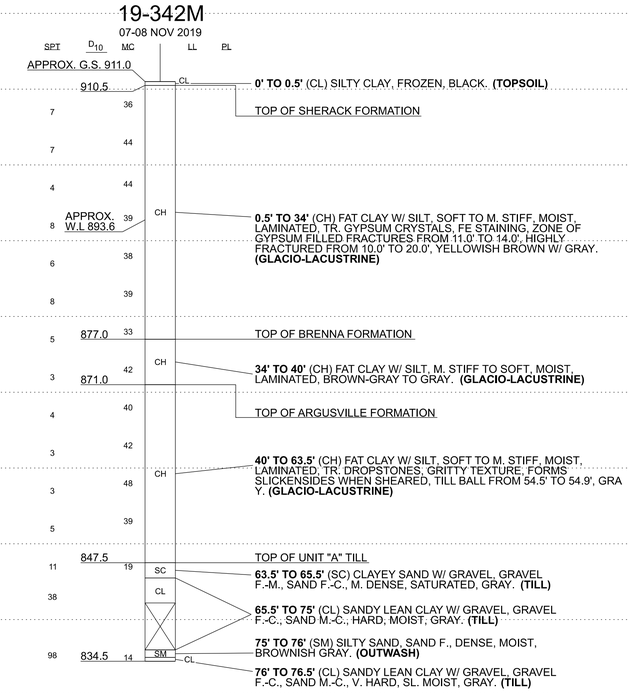
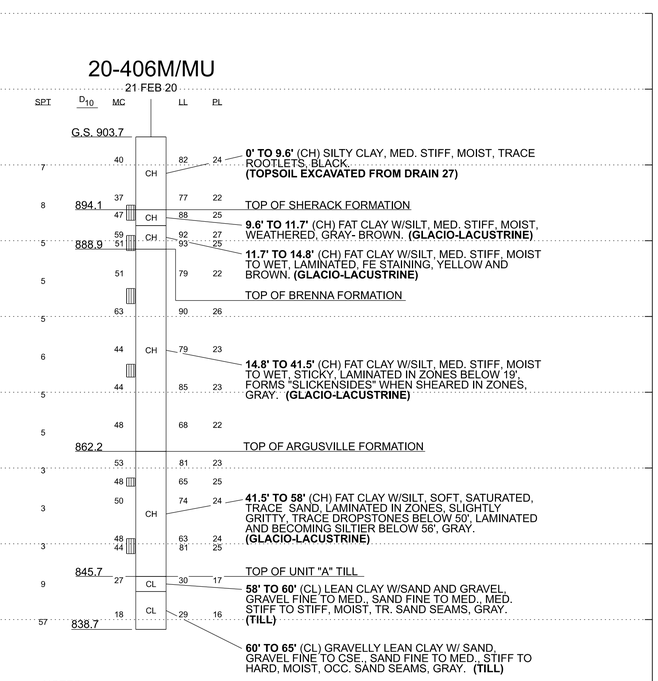


NOTES:
1. WATER LEVEL DETERMINED AFTER 43.5 HOURS
2. HOLE STABILIZED WITH HOLLOW STEM AUGER TO EL. 889.5, BENTONITE DRILLING FLUID USED BELOW EL. 889.5
3. BACKFILLED BORING WITH TREMIED BENTONITE-CEMENT GROUT



NOTES:
1. WATER LEVEL DETERMINED AFTER 23 HOURS IN OPEN HOLE BOTTOM OF HOLE EL. 890.0
2. HOLE STABILIZED WITH HOLLOW STEM AUGER TO EL. 881.0 DRILLING MUD USED BELOW EL. 881.0
3. BACKFILLED BORING WITH TREMIED BENTONITE-CEMENT GROUT
4. G.S. ELEV. ESTIMATED FROM GOOGLE EARTH



NOTES:
1. WATER LEVEL NOT DETERMINED
2. HOLE STABILIZED WITH HOLLOW STEM AUGER TO EL. 893.7 DRILLING MUD USED BELOW EL. 893.7
3. UNDISTURBED SAMPLES TAKEN IN OFFSET HOLE
4. BORING BACKFILLED WITH TREMIED BENTONITE-CEMENT GROUT.

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NVD GRS, SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956658

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DESIGNED BY: T. ADAMS	ISSUE DATE: 3 SEPT 2024
DRAWN BY: P. MORKEN	SOLICITATION NO.: W912ES23B0016
CHECKED BY:	CONTRACT NO.:
SUBMITTED BY: J. FOSS	AS-BUILT NO.:
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ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

BORING LOGS
19-328M, 19-342M, AND 20-406M/MU

SHEET ID
B-302

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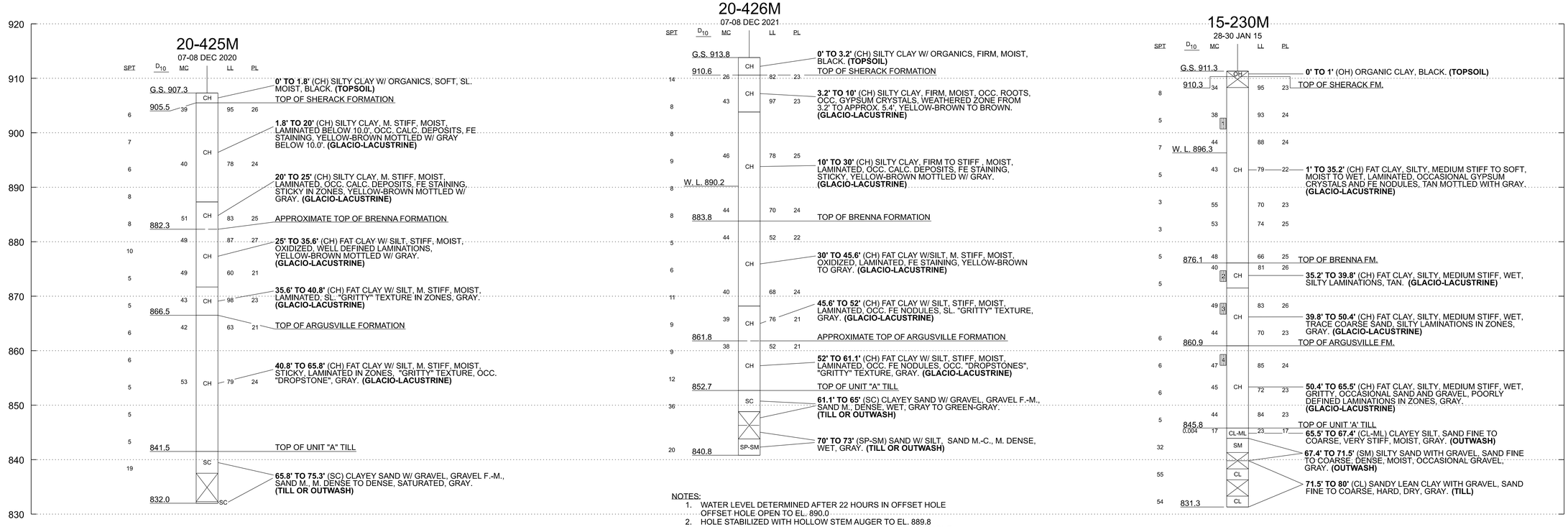

NOTES:
1. WATER LEVEL NOT DETERMINED. AFTER 24 HRS OFFSET BOREHOLE DRY. OFFSET BOREHOLE OPEN TO EL. 883.7
2. HOLE STABILIZED WITH HOLLOW STEM AUGER TO EL. 892.3
3. BACKFILLED BORING WITH TREMIED CEMENT-BENTONITE GROUT

NOTES:
1. WATER LEVEL DETERMINED AFTER 22 HOURS IN OFFSET HOLE OFFSET HOLE OPEN TO EL. 890.0
2. HOLE STABILIZED WITH HOLLOW STEM AUGER TO EL. 889.8
3. BACKFILLED BORING WITH TREMIED CEMEN-BENTONITE GROUT

NOTES:
1. WATER LEVEL DETERMINED AFTER 16 DAYS IN OPEN HOLE BOTTOM OF HOLE EL. 892
2. HOLE STABILIZED WITH HOLLOW STEM AUGER TO EL. 898.3 DRILLING MUD USED BELOW EL. 898.3
3. UNDISTURBED SAMPLES TAKEN IN OFFSET HOLE
4. BACKFILLED BORING WITH TREMIED BENTONITE-CEMENT GROUT

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88 GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011) NDSPC SOUTH ZONE-U.S. SURVEY FT. COMBINED FACTOR (CF): 0.999956658

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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

BORING LOGS
20-425M, 20-426M, AND 15-230M

SHEET ID
B-303

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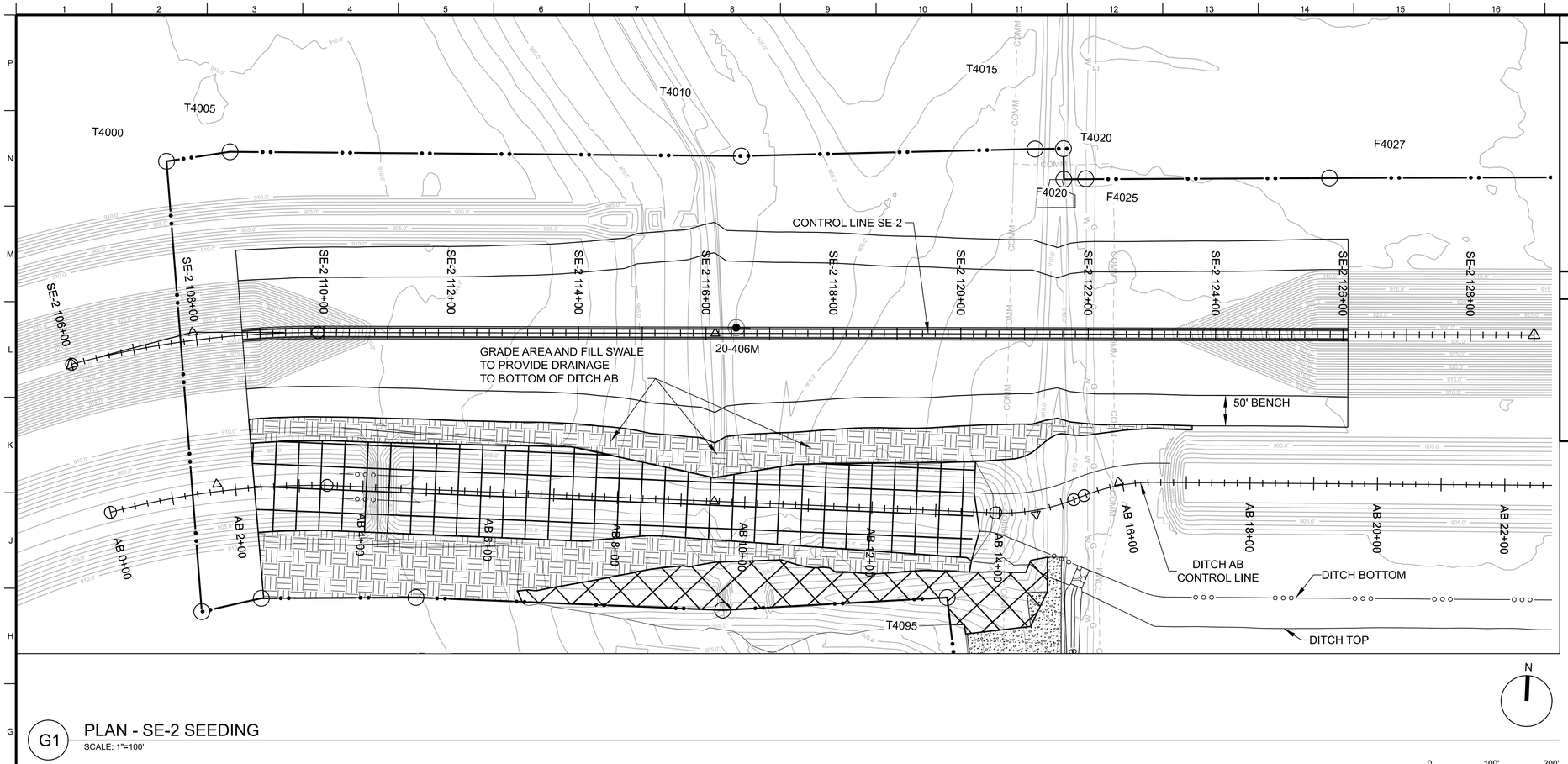

G1 PLAN - SE-2 SEEDING

SCALE: 1"=100'

GENERAL NOTES THIS SHEET:

1. SEEDING PLACED IN THE AREAS SHOWN SHALL BE AS FOLLOWS (SEE SPECIFICATIONS FOR ADDITIONAL DETAIL):

   ZONE 1 - MESIC PRAIRIE GENERAL (APPROXIMATELY 15' FROM WORK LIMITS TO 50' UPLAND OF EL 907.3')

   ZONE 2 - WET PRAIRIE (50' UPLAND OF EL 907.3' TO EL 907.3')

   ZONE 4 - WET MEADOW SOUTH & WEST (12' UPLAND OF EL 907.3' TO EL 906.3')

2. TURF ESTABLISHMENT SHALL BE IN ACCORDANCE TO THE SPECIFICATIONS.

3. WHERE SEEDING ZONES INTERSECT, BLEND SEED MIXES 15' ON EACH SIDE OF THE INTERSECTION LINE.

GENERAL LEGEND THIS SHEET:

ZONE 1

ZONE 2

ZONE 4

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NDORS - SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956155

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ST. PAUL DISTRICT

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
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DRAIN 27 SEEDING PLAN

SHEET ID

LS120

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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

VOLUME 1

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID 12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NDSPCS SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.9999596556

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ST. PAUL, MINNESOTA

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CHECKED BY: B. SPRANG
SUBMITTED BY: R. MORKEN
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RED RIVER OF THE NORTH RIVER BASIN
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COVER SHEET

SHEET ID
VOL. 1
G-001

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A1 DEMOLITION KEY PLAN - VOLUME 1

SCALE: 1"=1000'

0 1000' 2000'

N

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID: 12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NAD 83 (2011) SPCS, SOUTH ZONE, U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956155

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

KEY PLAN

SHEET ID
VOL. 1
CD100

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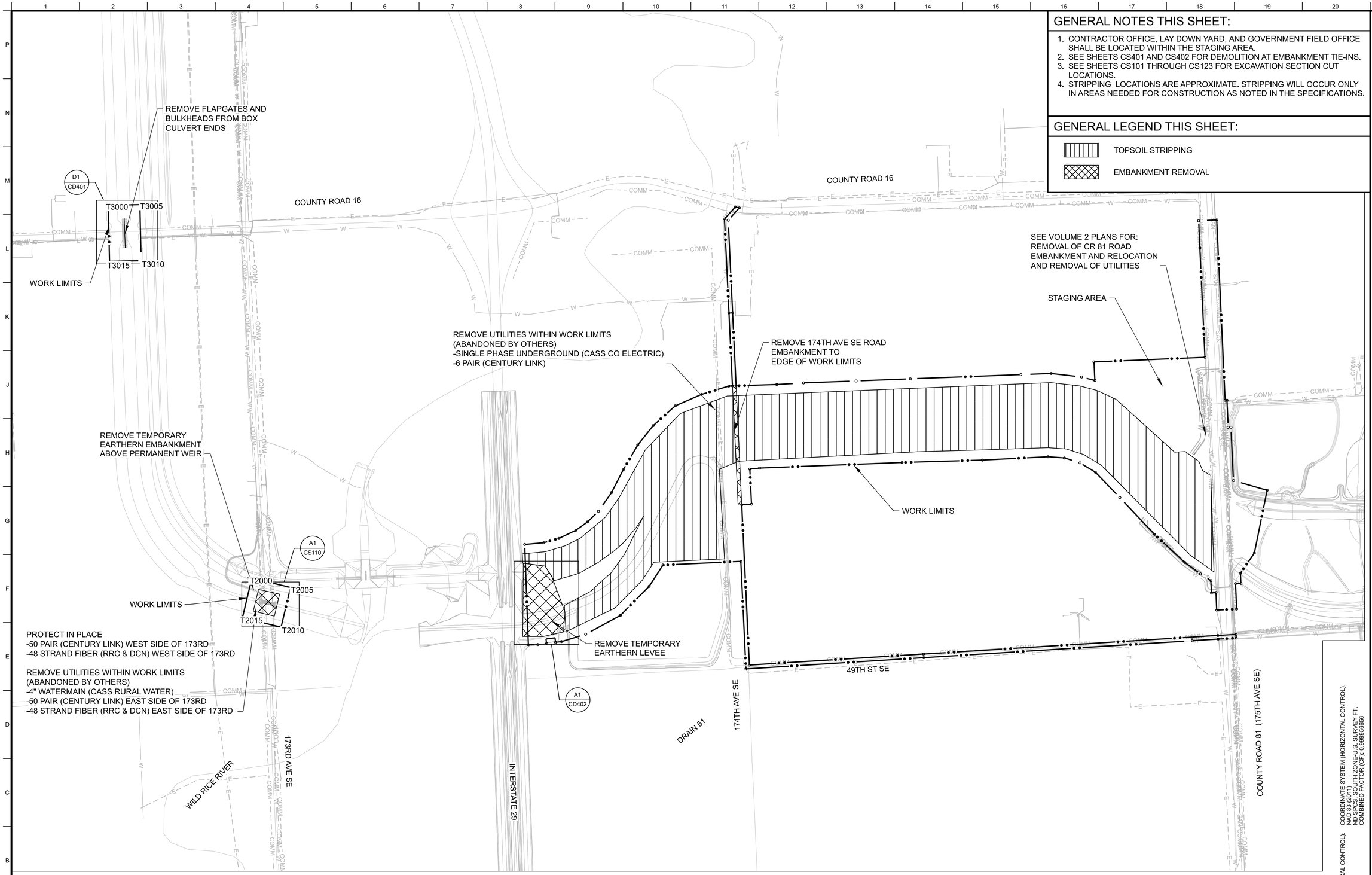
GENERAL NOTES THIS SHEET:

1. CONTRACTOR OFFICE, LAY DOWN YARD, AND GOVERNMENT FIELD OFFICE SHALL BE LOCATED WITHIN THE STAGING AREA.
2. SEE SHEETS CS401 AND CS402 FOR DEMOLITION AT EMBANKMENT TIE-INS.
3. SEE SHEETS CS101 THROUGH CS123 FOR EXCAVATION SECTION CUT LOCATIONS.
4. STRIPPING LOCATIONS ARE APPROXIMATE. STRIPPING WILL OCCUR ONLY IN AREAS NEEDED FOR CONSTRUCTION AS NOTED IN THE SPECIFICATIONS.

GENERAL LEGEND THIS SHEET:

TOPSOIL STRIPPING

EMBANKMENT REMOVAL



A1 PLAN - GENERAL DEMOLITION 1

SCALE: 1"=500'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID: 12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NAD 83 (2011) US SURVEY FT. SOUTH ZONE U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
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GENERAL DEMOLITION PLAN 1

SHEET ID
VOL. 1
CD101

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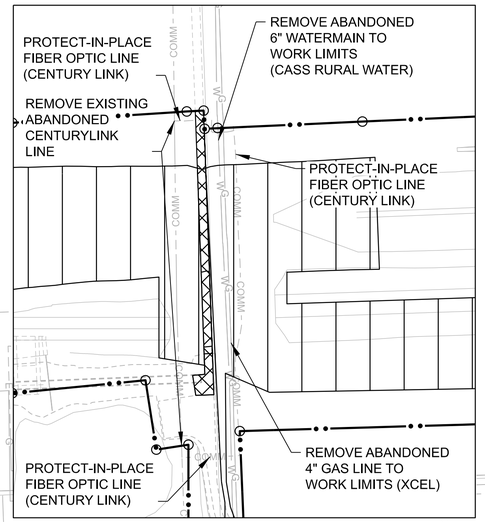
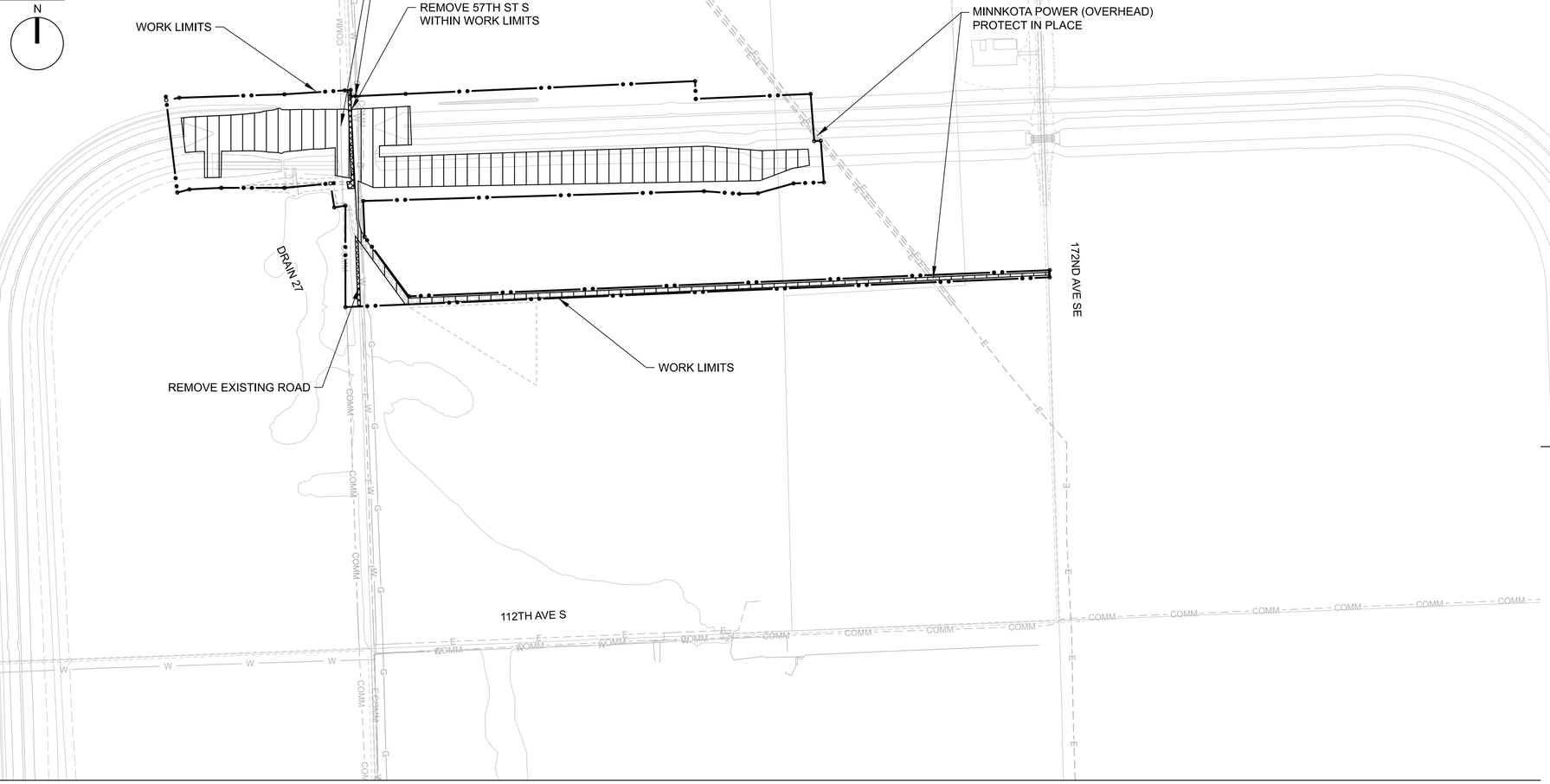


J1 ENLARGED PLAN
SCALE: 1"=200'



A1 PLAN - GENERAL DEMOLITION 2
SCALE: 1"=500'

GENERAL NOTES THIS SHEET:

1. SEE SHEETS CS401 AND CS402 FOR DEMOLITION AT EMBANKMENT TIE-INS.
2. SEE SHEETS CS101 THROUGH CS123 FOR EXCAVATION SECTION CUT LOCATIONS.
3. STRIPPING LOCATIONS ARE APPROXIMATE. STRIPPING WILL OCCUR ONLY IN AREAS NEEDED FOR CONSTRUCTION AS NOTED IN THE SPECIFICATIONS.
4. COORDINATE WITH XCEL GAS NO LESS THAN ONE WEEK PRIOR FOR 4" GAS LINE REMOVALS. SEE SPECIFICATIONS FOR ADDITIONAL DETAILS.
   CONTACT INFORMATION:
   TRAVIS LILL - 701.241.8663
   JADE BROWN - 701.241.8695

GENERAL LEGEND THIS SHEET:

TOPSOIL STRIPPING

EMBANKMENT REMOVAL

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
UTM ZONE 14 SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956656

0 500' 1000'

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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
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GENERAL DEMOLITION PLAN 2

SHEET ID
VOL. 1
CD102

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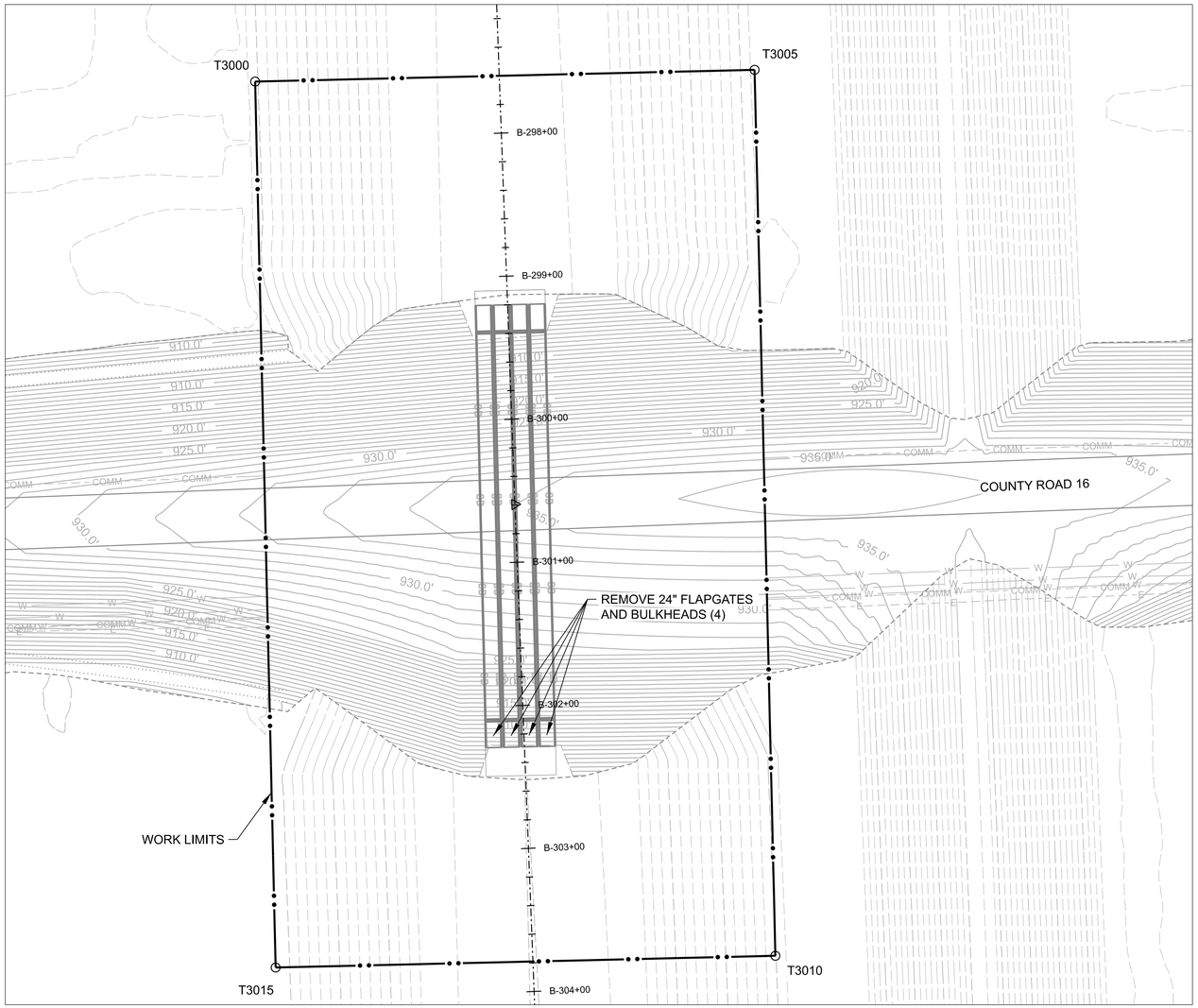
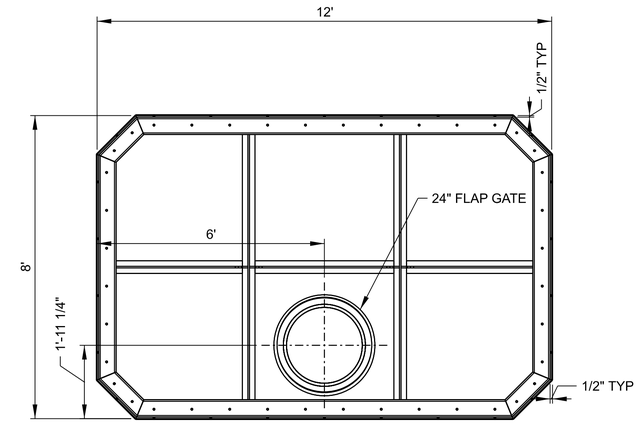


D1 PLAN - REMOVAL SE-2B (CR-16) FLAPGATES

SCALE: 1"=50'

0 50' 100'



K14 TYPICAL DETAIL - BULKHEAD DS FACE

N.T.S.

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NAD 83 (2011) SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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SE2 BORROW DITCH
CULVERT FLAPGATE REMOVAL

SHEET ID
VOL. 1
CD401

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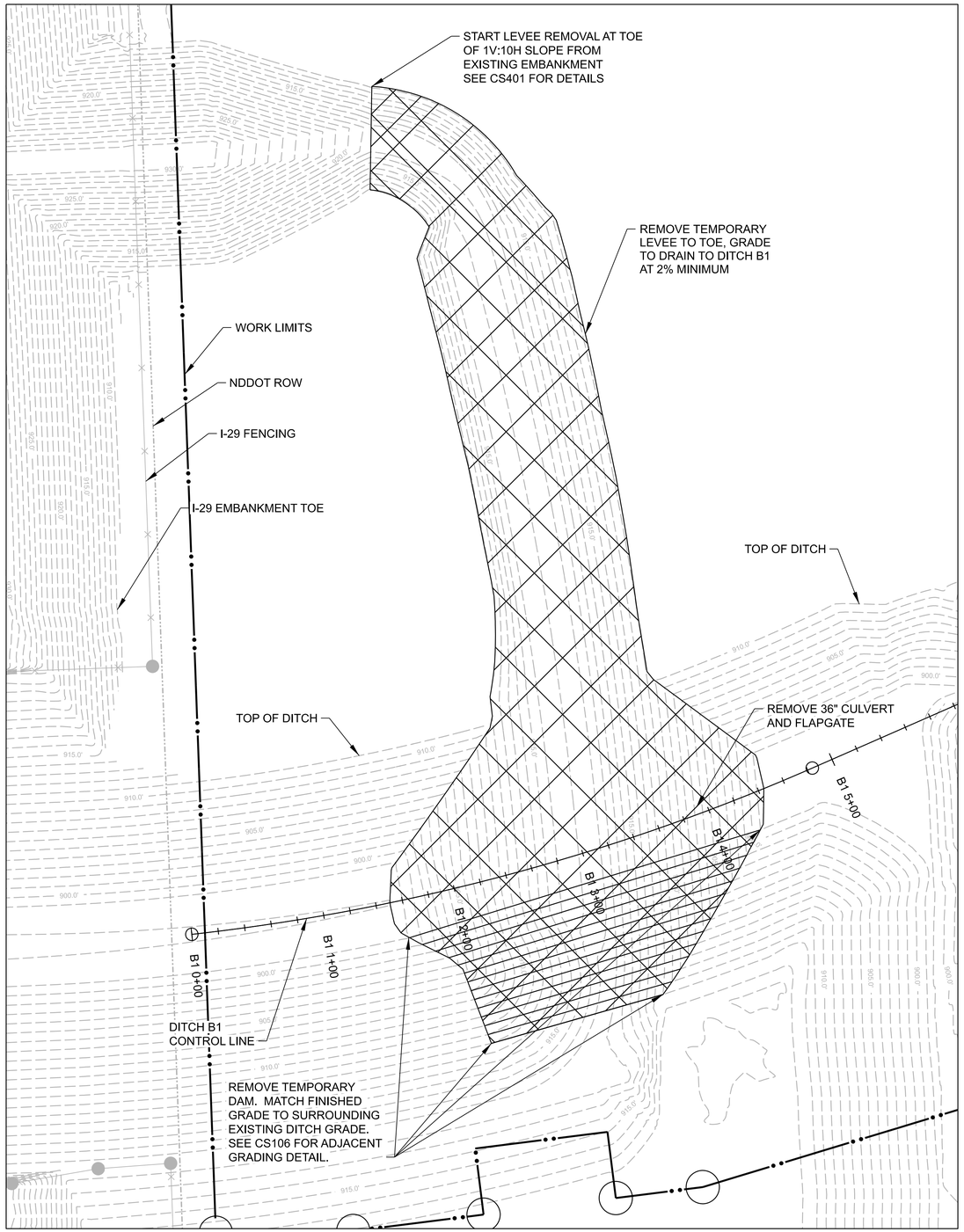

A1 PLAN - TEMPORARY EARTHEN LEVEE REMOVAL

SCALE: 1"=50'

GENERAL LEGEND THIS SHEET:

TEMPORARY EARTHEN LEVEE REMOVAL EXTENTS

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NORTH DAKOTA SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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FMM SOUTHERN EMBANKMENT REACH SE-3
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TEMPORARY DAM REMOVAL

SHEET ID
VOL. 1
CD402

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A1 KEY PLAN - VOLUME 1

SCALE: 1"=1000'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NAD 83 (2011) SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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SUBMITTED BY: B. MCGARVEY
SIZE: ANSI D
FILE NAME: FMMSE3_VOL1_CS100xxx.dgn
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
AS-BUILT NO.:

FMM SOUTHERN EMBANKMENT REACH SE-3
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FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

KEY PLAN

SHEET ID
VOL. 1
CS100

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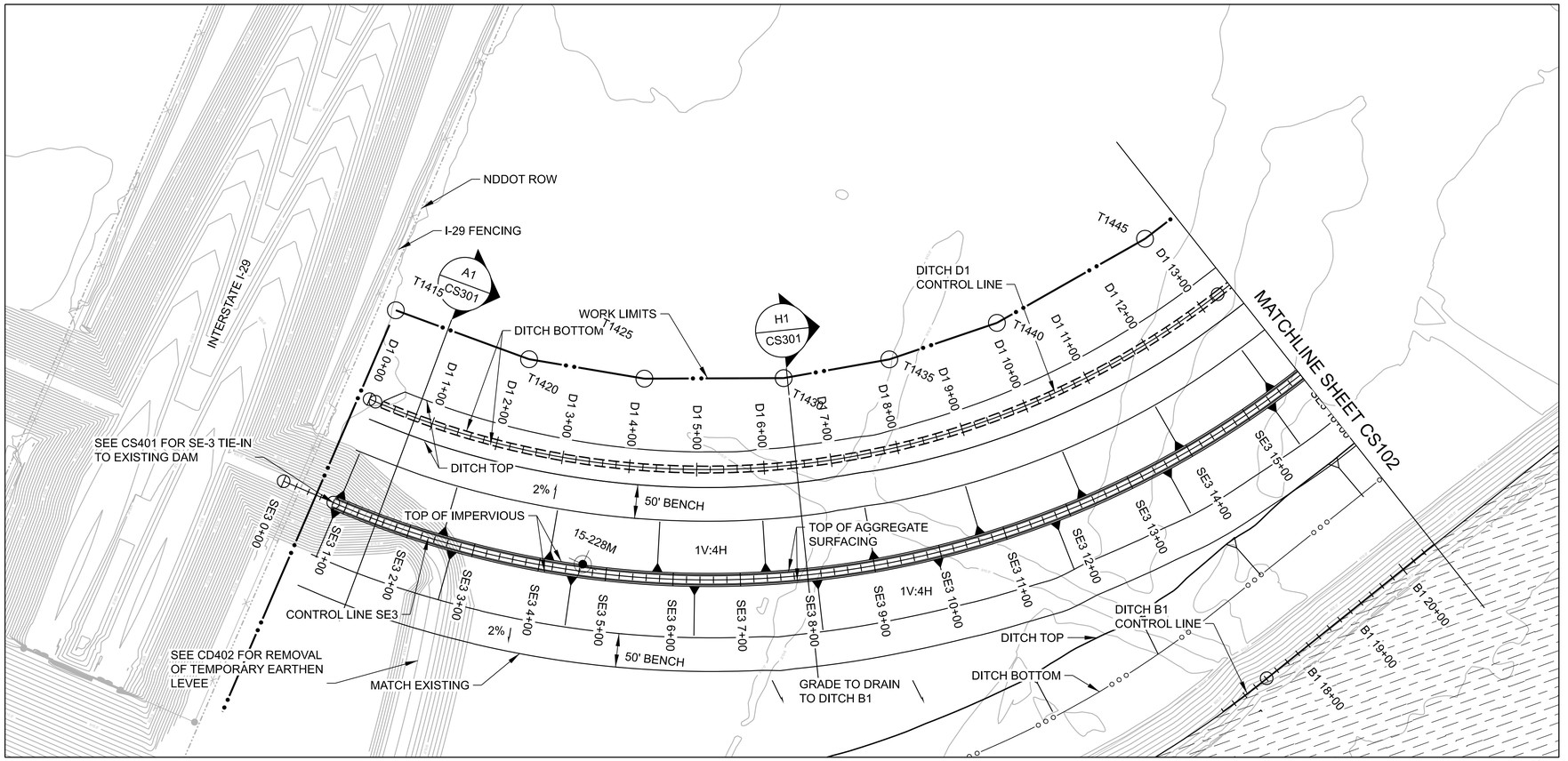
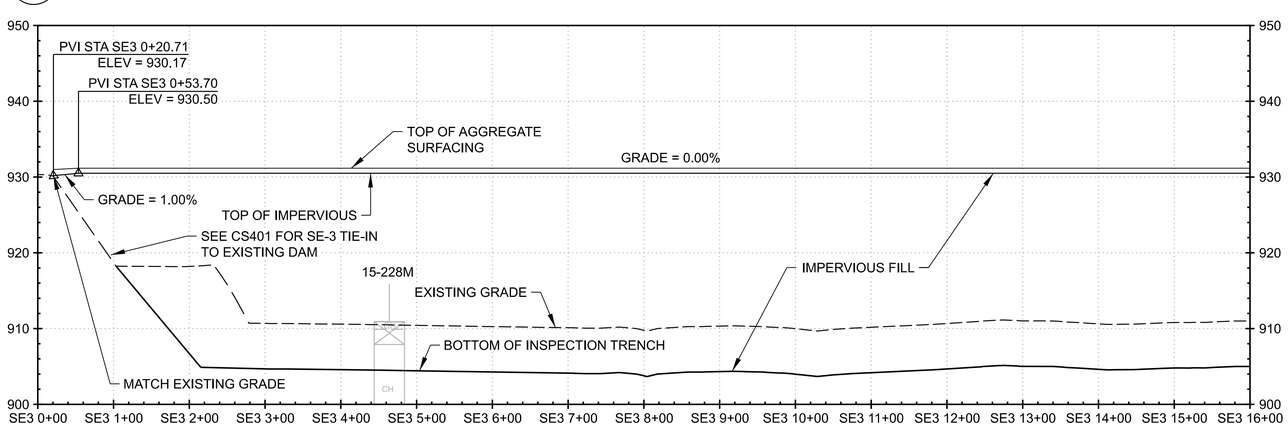


F1 PLAN - SE3 EMBANKMENT STA SE3 0+00 TO SE3 15+00

SCALE: 1"=100'



A1 PROFILE - SE3 EMBANKMENT

SCALE: 1"=100'

0 100' 200'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NDDOT SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

SE3 DAM EMBANKMENT
PLAN AND PROFILE
STA SE3 0+00 TO SE3 15+00

SHEET ID
VOL. 1
CS101

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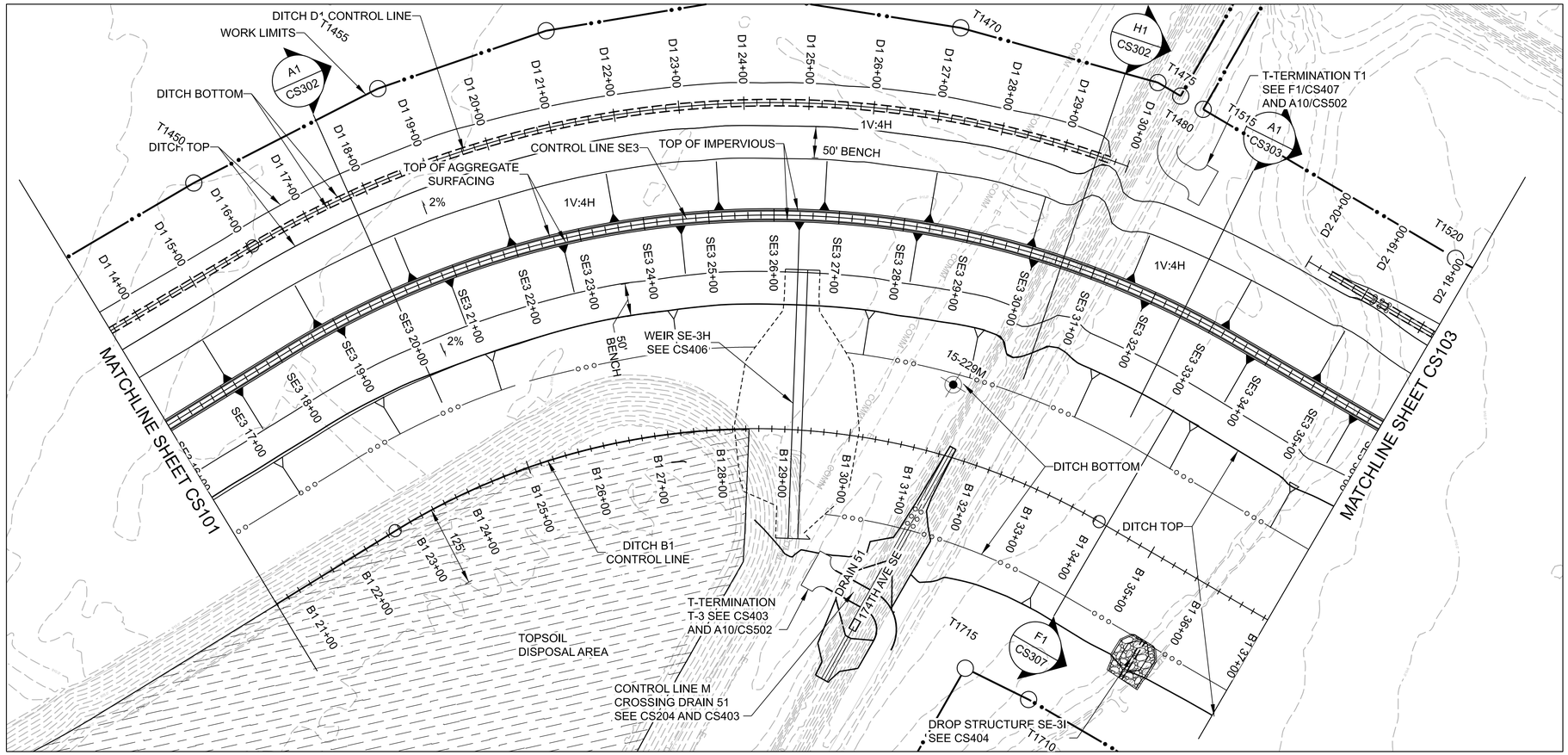
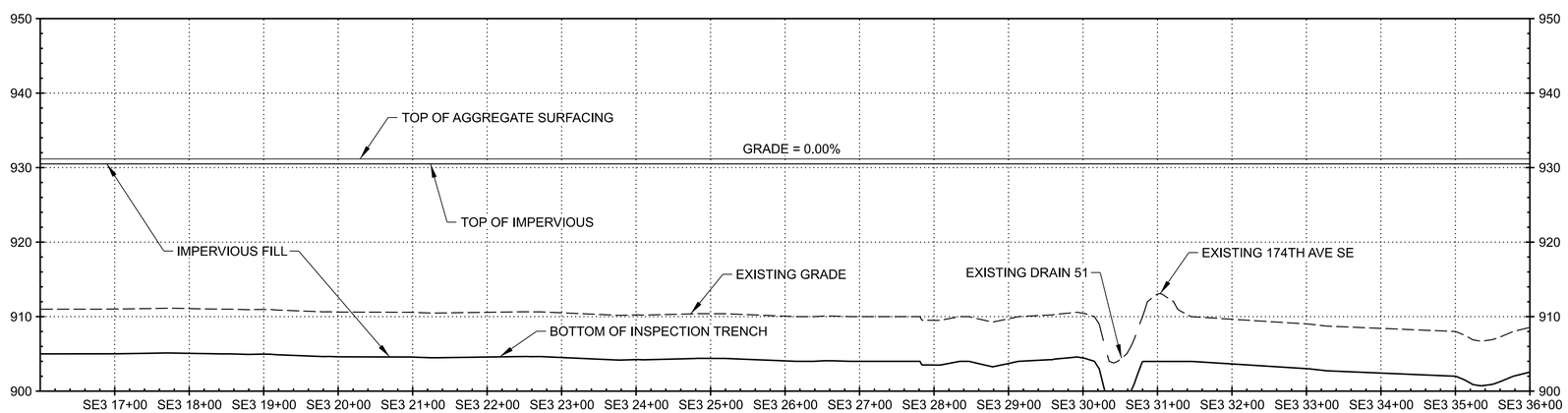


F1 PLAN - SE3 EMBANKMENT STA SE3 15+00 TO SE3 36+00

SCALE: 1"=100'

0 100' 200'



A1 PROFILE - SE3 EMBANKMENT

SCALE: 1"=100'

0 100' 200'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID: 12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NAD 83 SPCS - SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956555

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN	ISSUE DATE: 3 SEPT 2024
DRAWN BY: P. MORKEN	SOLICITATION NO.: W912ES23B0016
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SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS102xxx.dgn

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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

SE3 DAM EMBANKMENT
PLAN AND PROFILE
STA SE3 15+00 TO SE3 36+00

SHEET ID
VOL. 1
CS102

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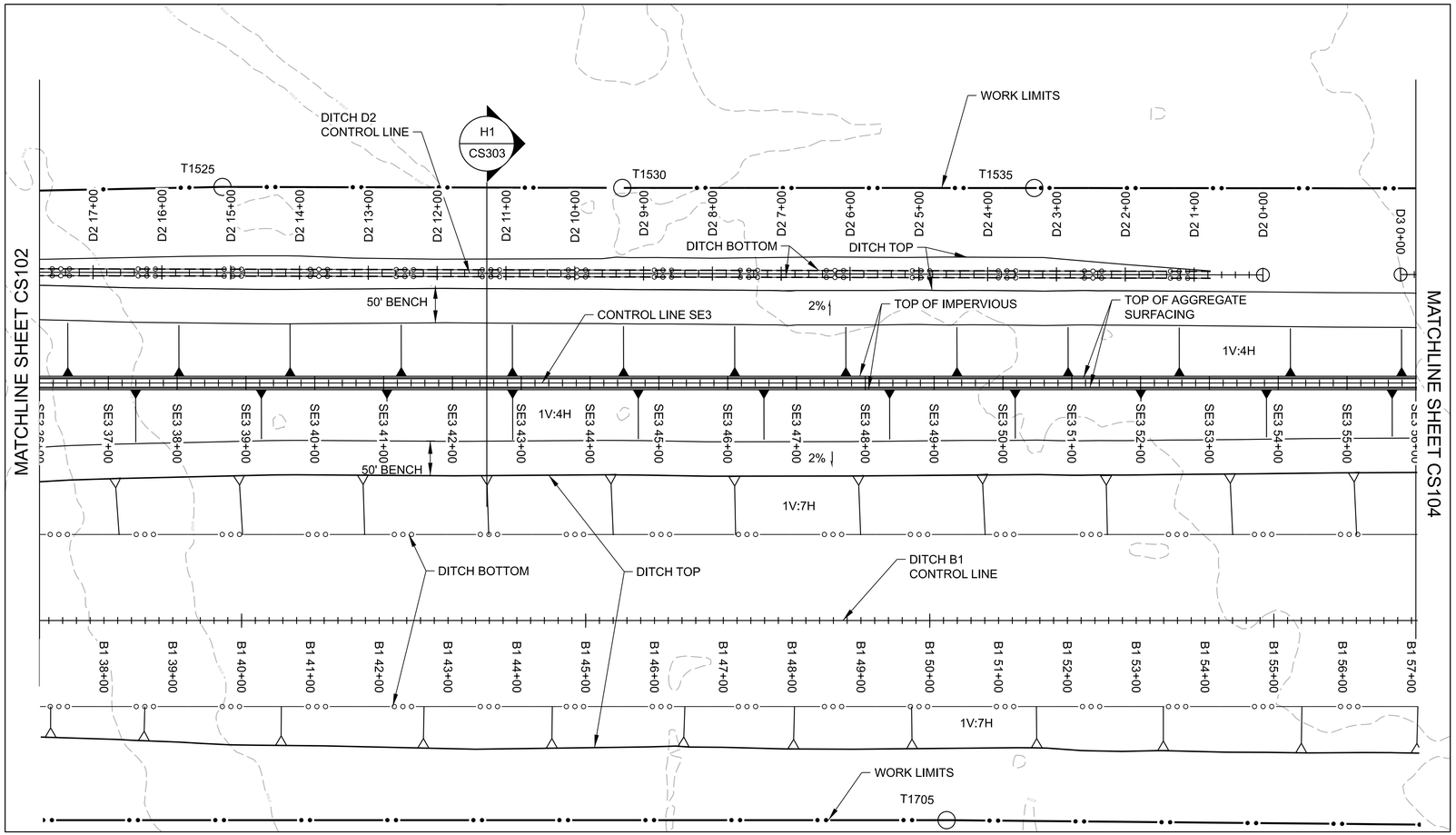
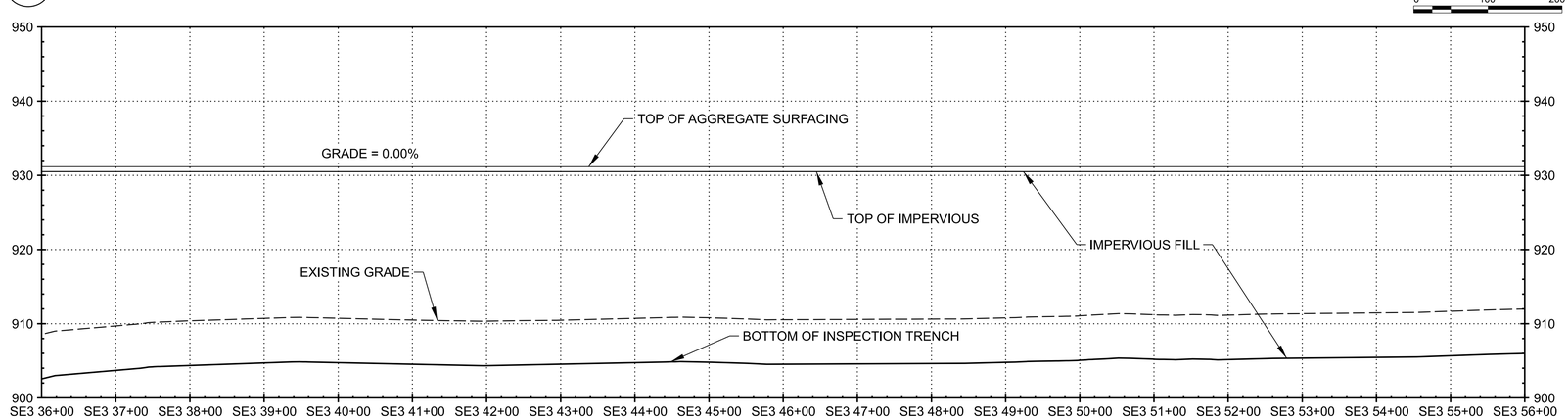


E1 PLAN - SE3 EMBANKMENT STA SE3 35+00 TO SE3 56+00

SCALE: 1"=100'



A1 PROFILE - SE3 EMBANKMENT

SCALE: 1"=100'

0 100' 200'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NAD 83(2011) SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956555

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RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

SE3 DAM EMBANKMENT
PLAN AND PROFILE
STA SE3 36+00 TO SE3 56+00

SHEET ID
VOL. 1
CS103

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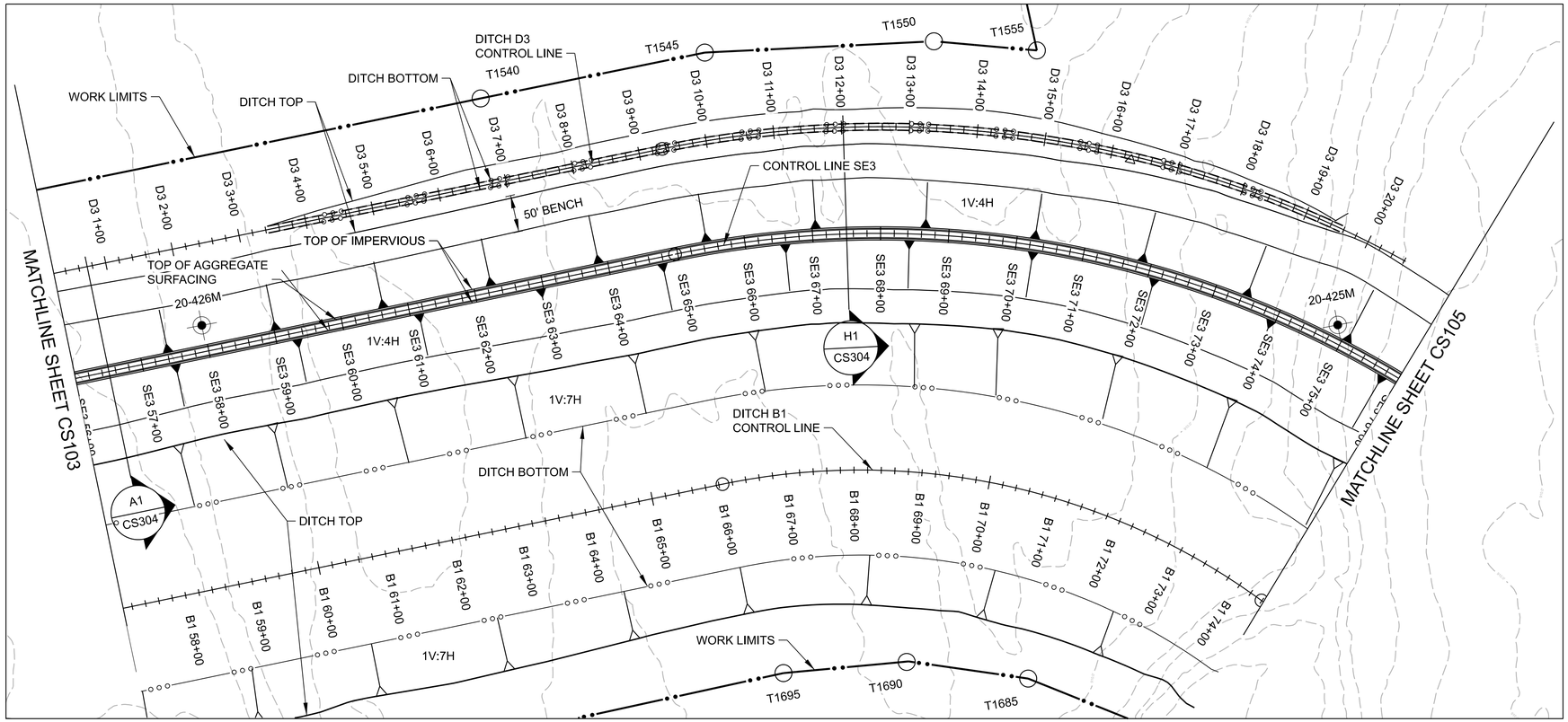
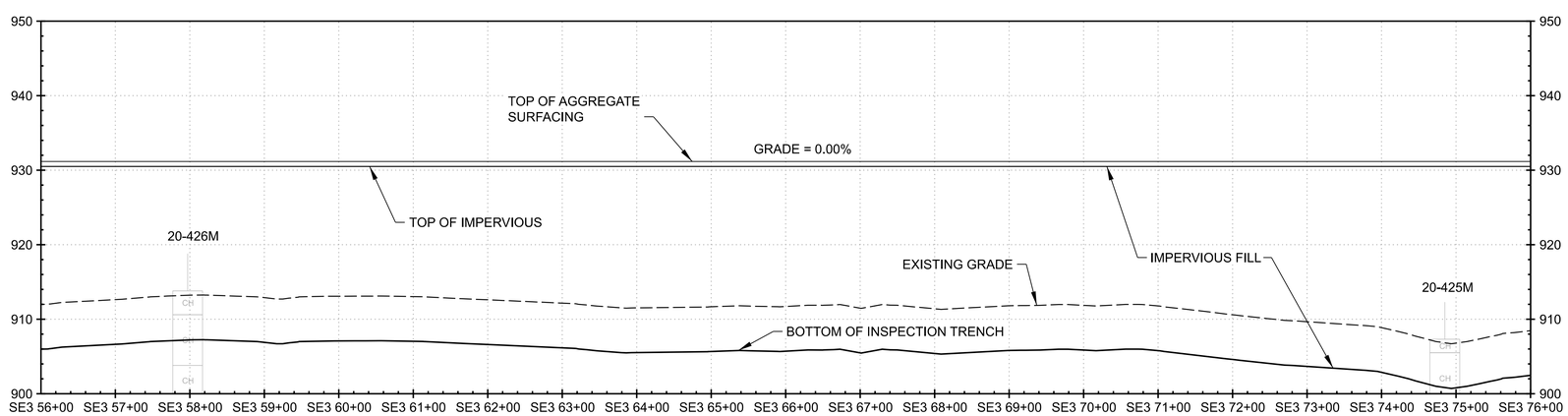


F1 PLAN - SE3 EMBANKMENT STA SE3 56+00 TO SE3 76+00

SCALE: 1"=100'



A1 PROFILE - SE3 EMBANKMENT

SCALE: 1"=100'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NAD83 SPCS SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.9999556556

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FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

SE3 DAM EMBANKMENT
PLAN AND PROFILE
STA SE3 56+00 TO SE3 76+00

SHEET ID
VOL. 1
CS104

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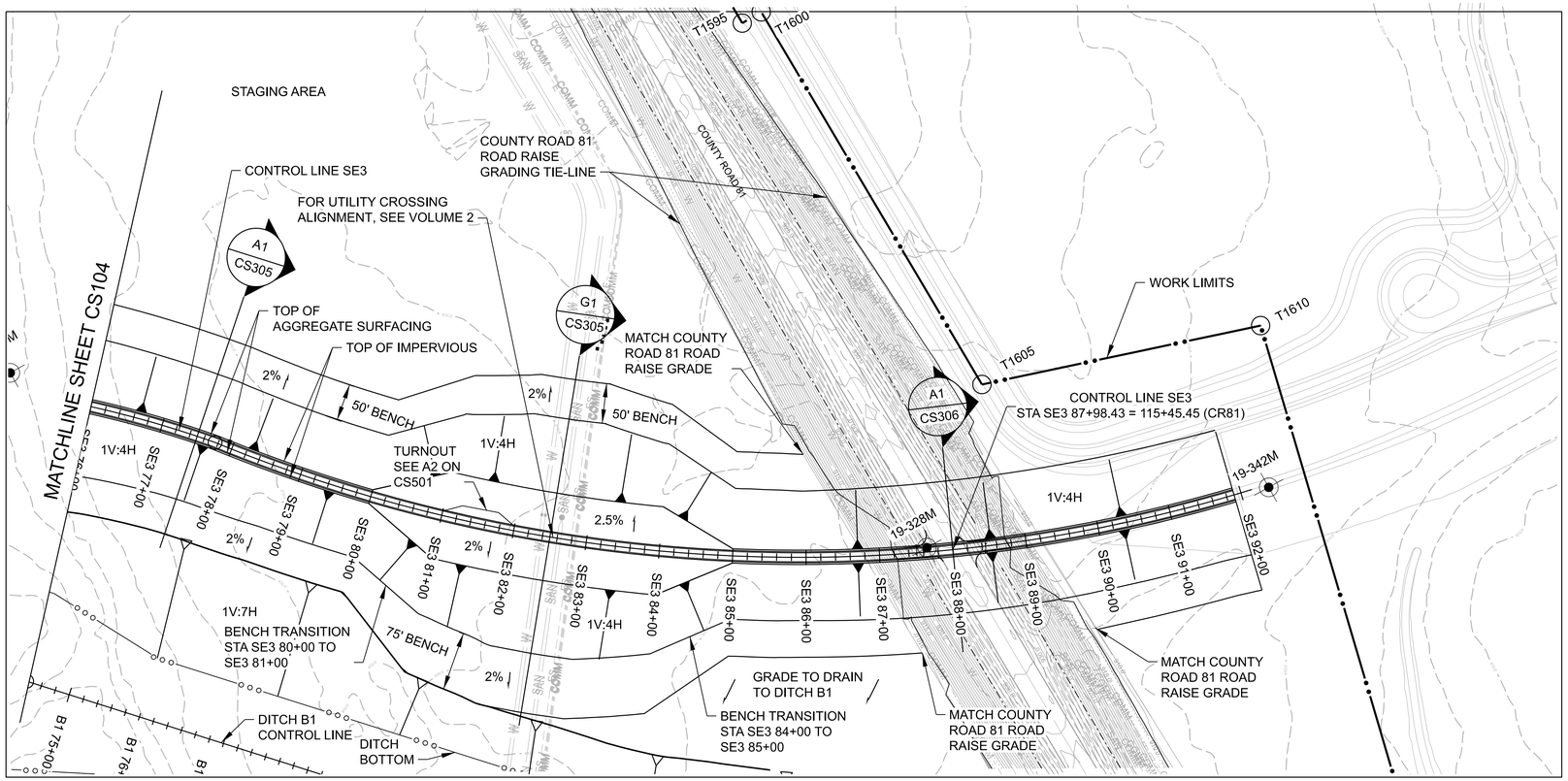
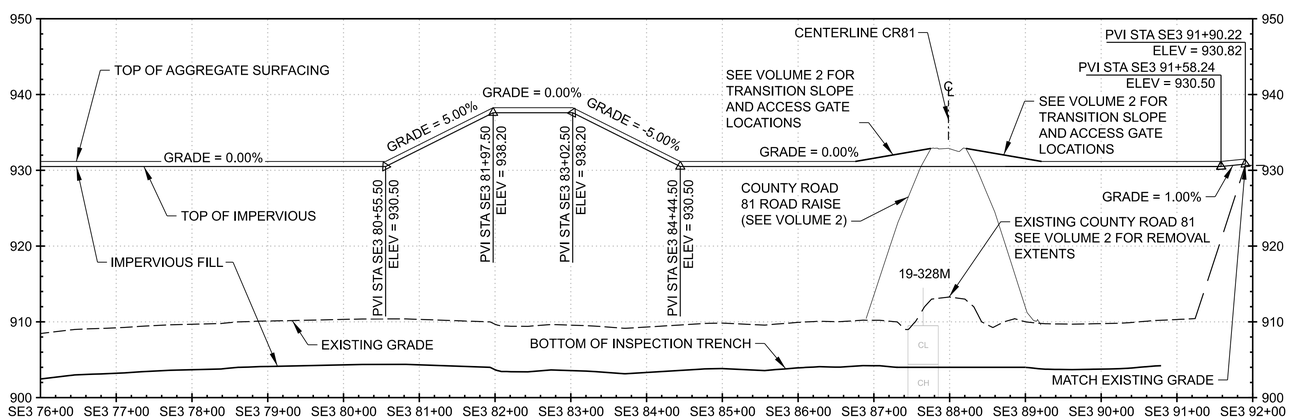


PLAN - SE3 EMBANKMENT STA SE3 76+00 TO SE3 92+16

F1

SCALE: 1"=100'

0 100' 200'



PROFILE - SE3 EMBANKMENT

A1

SCALE: 1"=100'

0 100' 200'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88 GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011) MN SPCS SOUTH ZONE-U.S. SURVEY FT. COMBINED FACTOR (CF): 0.999956556

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SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS105xxx.dgn

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FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

SE3 DAM EMBANKMENT
PLAN AND PROFILE
STA SE3 76+00 TO SE3 92+16

SHEET ID
VOL. 1
CS105

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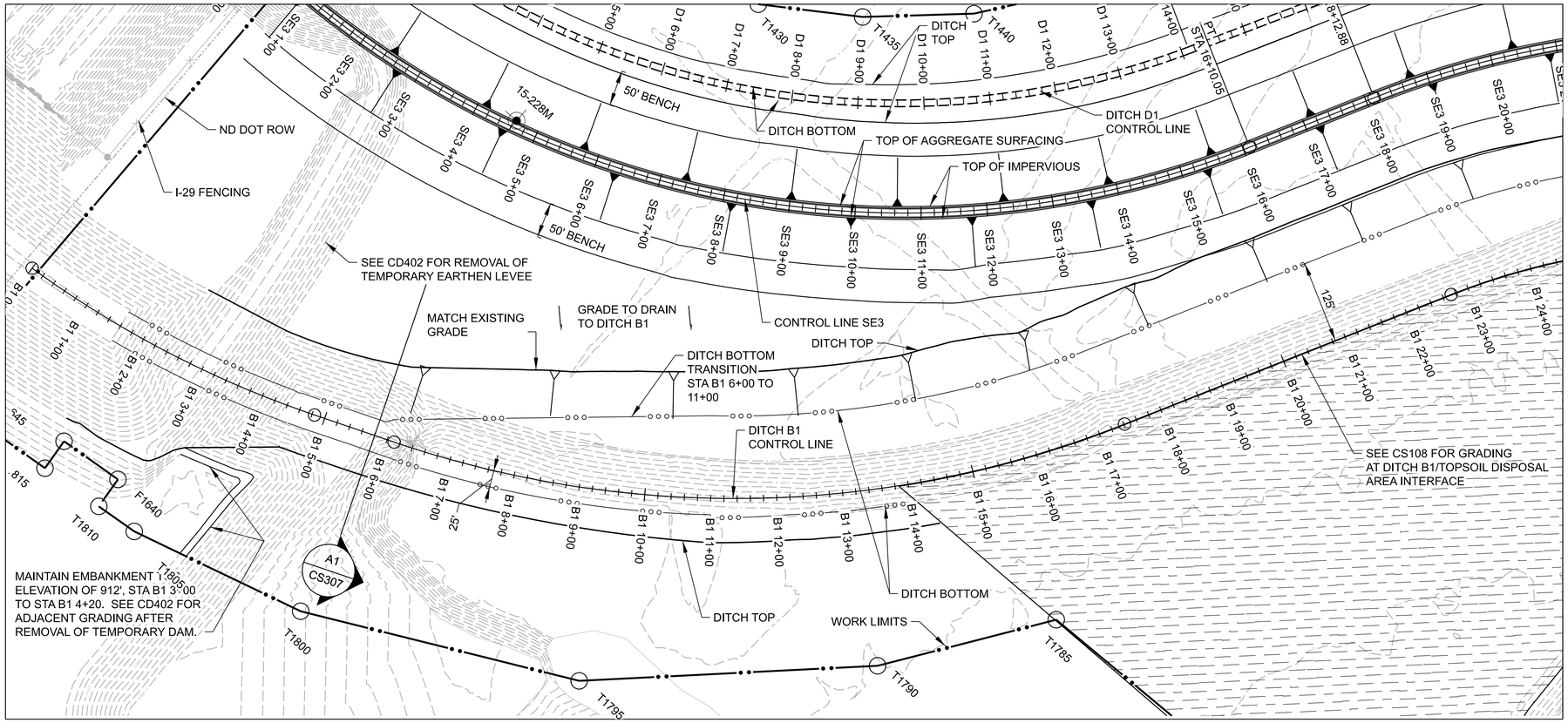
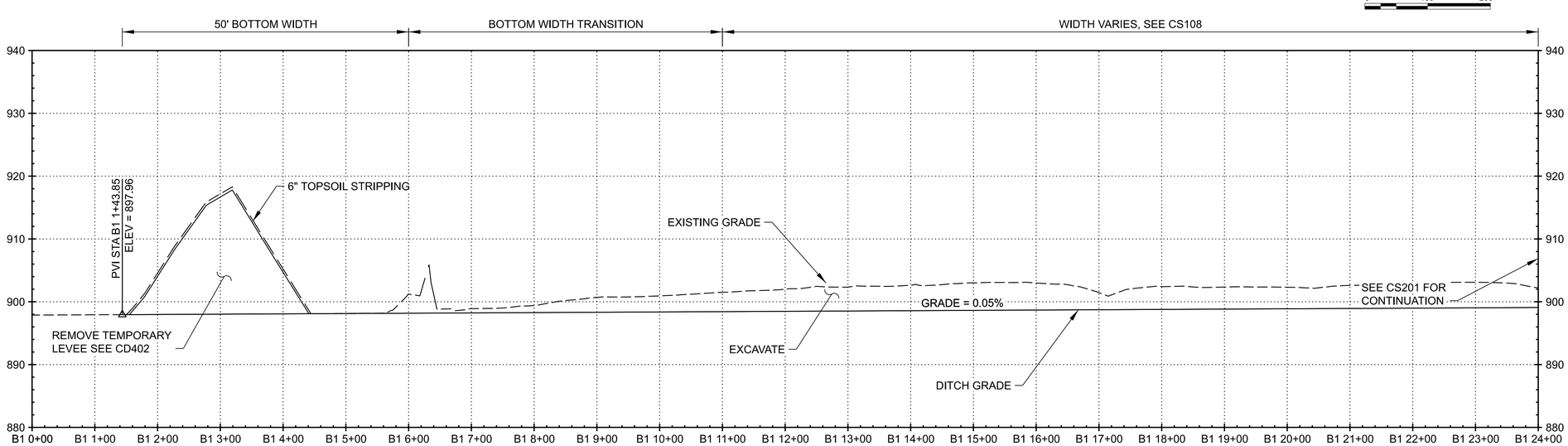


F1 PLAN - DITCH B1 STA B1 0+00 TO B1 24+00

SCALE: 1"=100'



A1 PROFILE - DITCH B1 STA 0+00 TO 24+00

SCALE: 1"=100'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88 GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011) NAD 83(2011) SOUTH ZONE-U.S. SURVEY FT. COMBINED FACTOR (CF): 0.999956558

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SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS106xxx.dgn

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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DITCH B1
PLAN AND PROFILE
STA B1 0+00 TO B1 24+00

SHEET ID
VOL. 1
CS106

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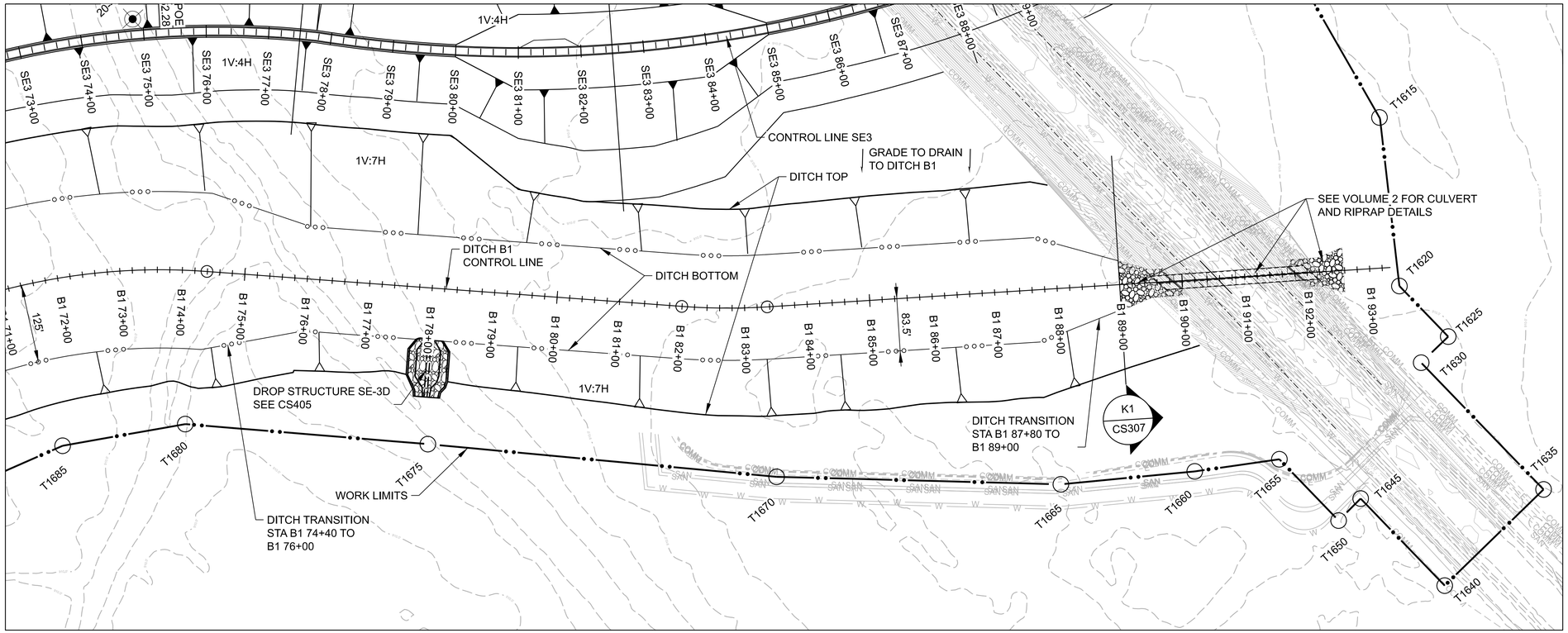
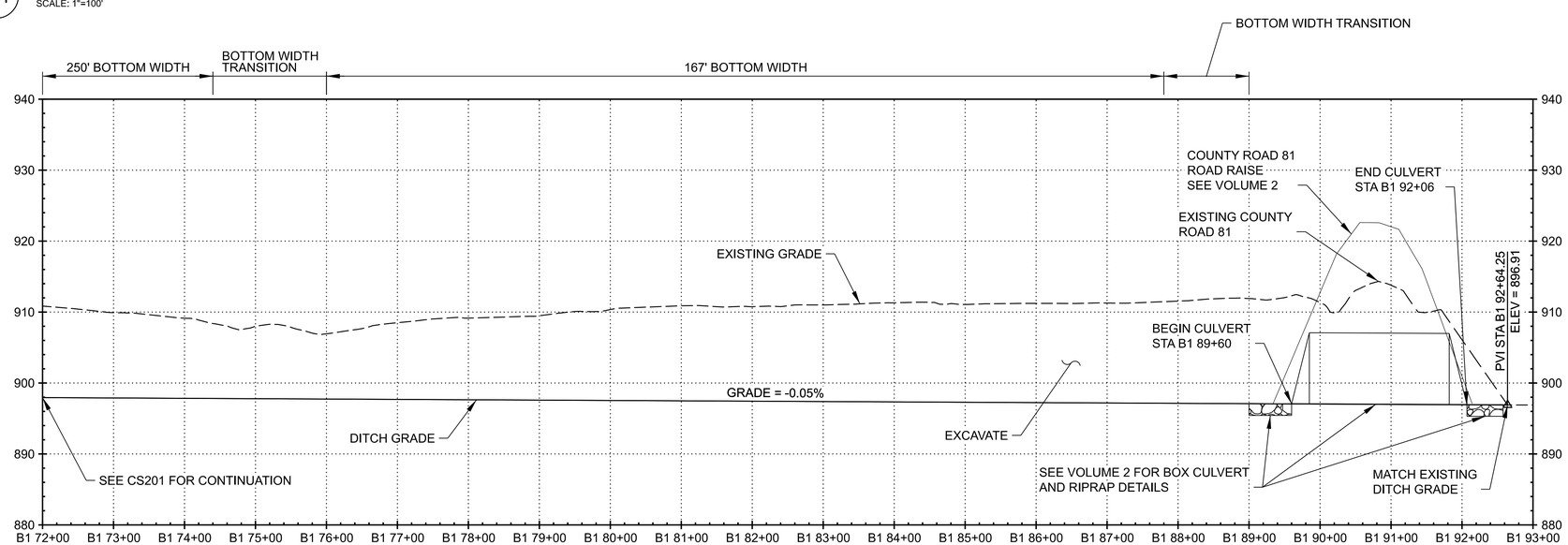


G1 PLAN - DITCH B1 STA 72+00 TO 93+00

SCALE: 1"=100'

0 100' 200'



A1 PROFILE - DITCH B1 STA 72+00 TO 93+87

SCALE: 1"=100'

0 100' 200'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NAD 83 (2011) SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS107xxx.dgn

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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DITCH B1
PLAN AND PROFILE
STA 72+00 TO 93+00

SHEET ID
VOL. 1
CS107

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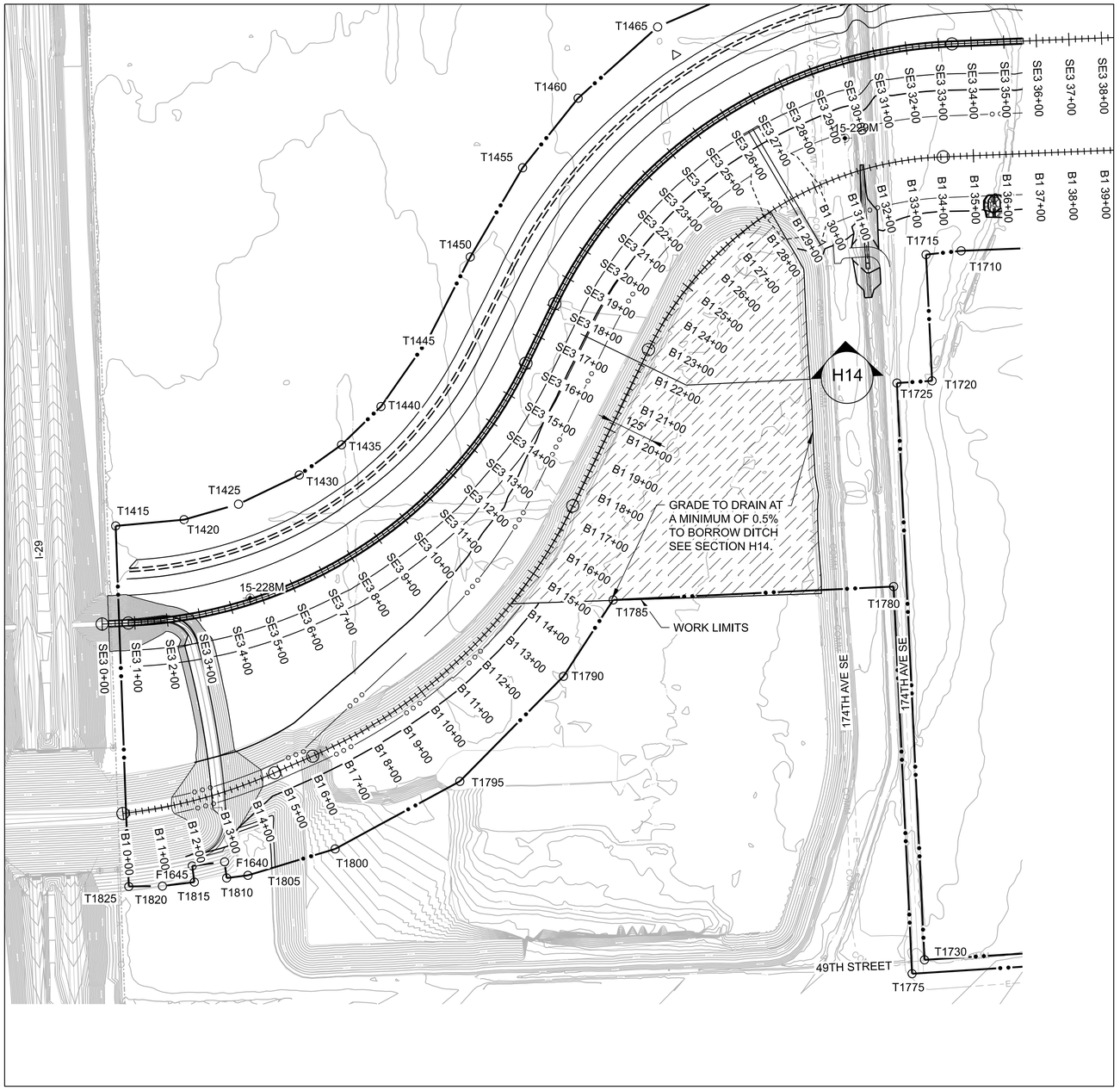


B1 PLAN - TOPSOIL DISPOSAL SITE

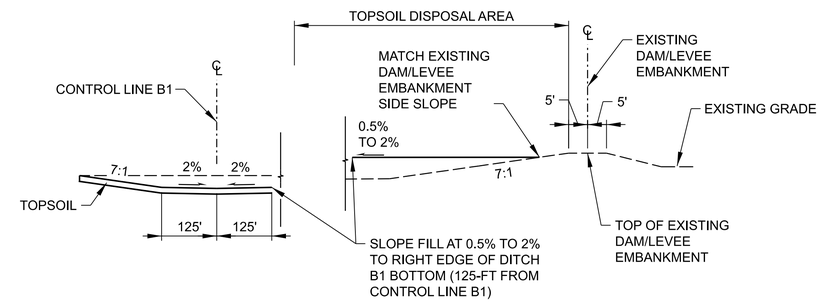
SCALE: 1"=200'

GENERAL NOTES THIS SHEET:

1. SEE SPECIFICATIONS FOR MATERIAL APPROVED FOR PLACEMENT IN THE TOPSOIL DISPOSAL SITE.
2. PLACE MATERIAL IN TOPSOIL DISPOSAL SITE TO CONSTRUCT AN UNDULATING BOTTOM WITH THE SITE, WHILE MAINTAINING POSITIVE DRAINAGE TO THE BORROW DITCH. VARY UNDULATIONS A MINIMUM OF 18" ABOVE THE SHOWN EXCAVATED CHANNEL BOTTOM. UTILIZE TOPSOIL MATERIAL TO CONSTRUCT UNDULATION WHILE MAINTAINING A MINIMUM TOPSOIL DEPTH OF 6". THE MINIMUM 18" UNDULATION ELEVATION SHALL COMPRISE OF BETWEEN 50% AND 60% OF THE EXCAVATED BORROW SITE BOTTOM AREA AND SHALL BE TRANSITIONED AT A MAXIMUM SLOPE OF 1V:10H.
3. TOPSOIL DISPOSAL AREA WEST EXTENT FOLLOWS THE RIGHT EDGE OF THE DITCH B1 BOTTOM (125-FT FROM CONTROL LINE B1), STA B1 14+50 TO B1 28+00.

GENERAL LEGEND THIS SHEET:

TOPSOIL DISPOSAL AREA



H14 SECTION - TYPICAL GRADING

SCALE: 1"=20'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NORTH DAKOTA SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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U.S. ARMY CORPS OF ENGINEERS
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ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

TOPSOIL DISPOSAL SITE

SHEET ID
VOL. 1
CS108

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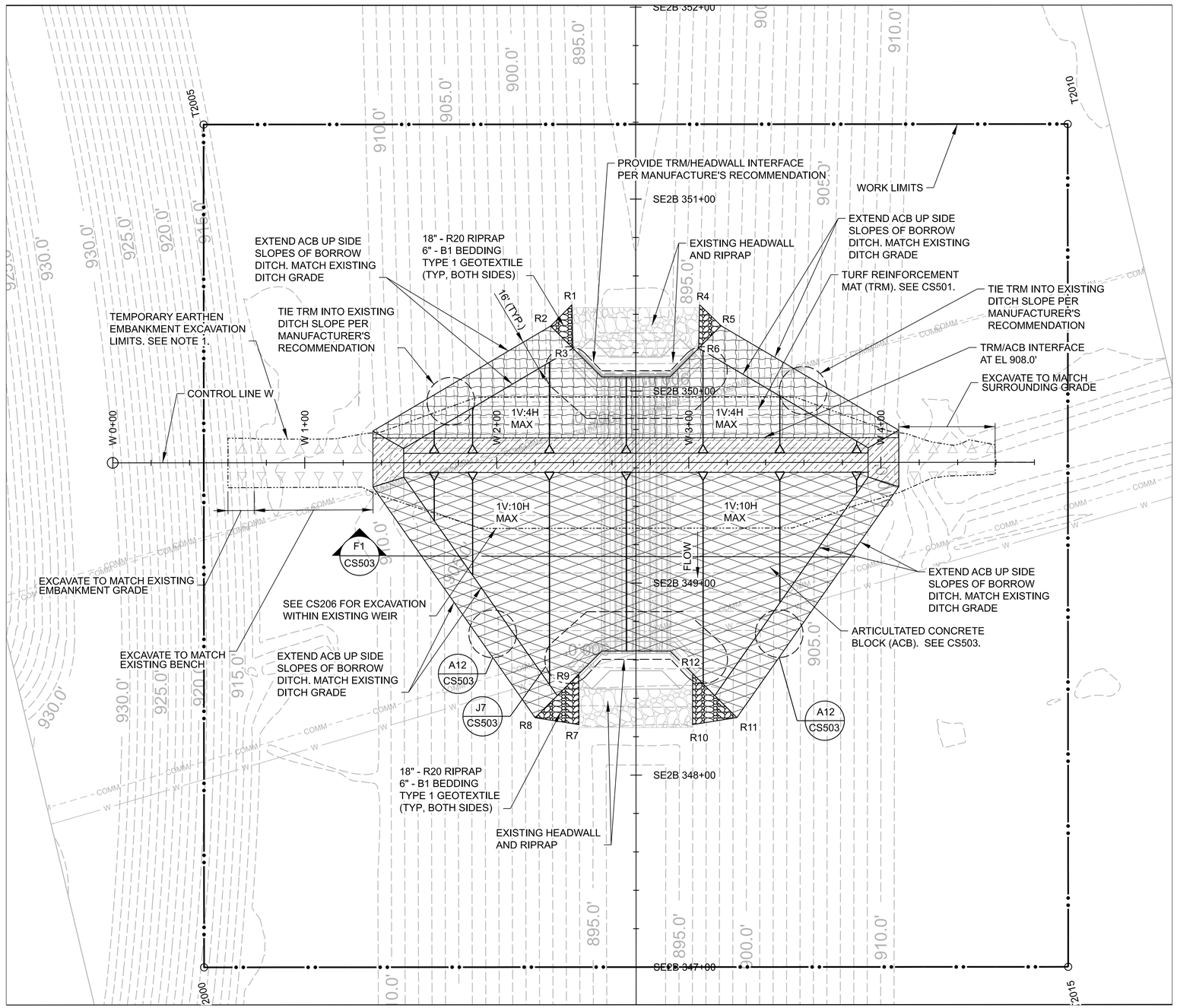
GENERAL NOTES THIS SHEET:

1. FOR WEIR SE-2B PROFILES (SE2B AND W CONTROL LINES) SEE CS206
2. FOR ACB SECTIONS AND INTERFACE WITH HEADWALLS, TRM, AND SIDE SLOPES SEE CS503.

GENERAL LEGEND THIS SHEET:

- TAPERED ARTICULATED CONCRETE BLOCK (ACB)
- NON-TAPERED ARTICULATED CONCRETE BLOCK (ACB)
- TURF REINFORCEMENT MAT (TRM)



A1 PLAN - SE-2B WEIR REVETMENT

SCALE: 1"=30'

SE-2 WEIR RIPRAP GRADING POINTS			
POINT ID	NORTHING (Y)	EASTING (X)	ELEVATION (FEET)
R1	400199.53	2886237.63	892.21
R2	400212.87	2886229.40	897.64
R3	400204.42	2886214.73	892.21
R4	400134.85	2886222.13	892.21
R5	400126.54	2886208.89	897.64
R6	400140.60	2886200.25	892.21
R7	400246.93	2886024.10	892.52
R8	400268.24	2886032.91	899.29
R9	400240.83	2886049.63	892.52
R10	400189.37	2886010.31	892.52
R11	400166.10	2886008.51	899.29
R12	400183.22	2886035.81	892.52

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NDSPC2011, SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956658

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DRAWN BY: J. MOSER
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FILE NAME: FMMSE3_VOL1_CS110xxx.dgn
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
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FARGO, ND

SE-2B WEIR REVETMENT
ACB PLAN

SHEET ID
VOL. 1
CS110

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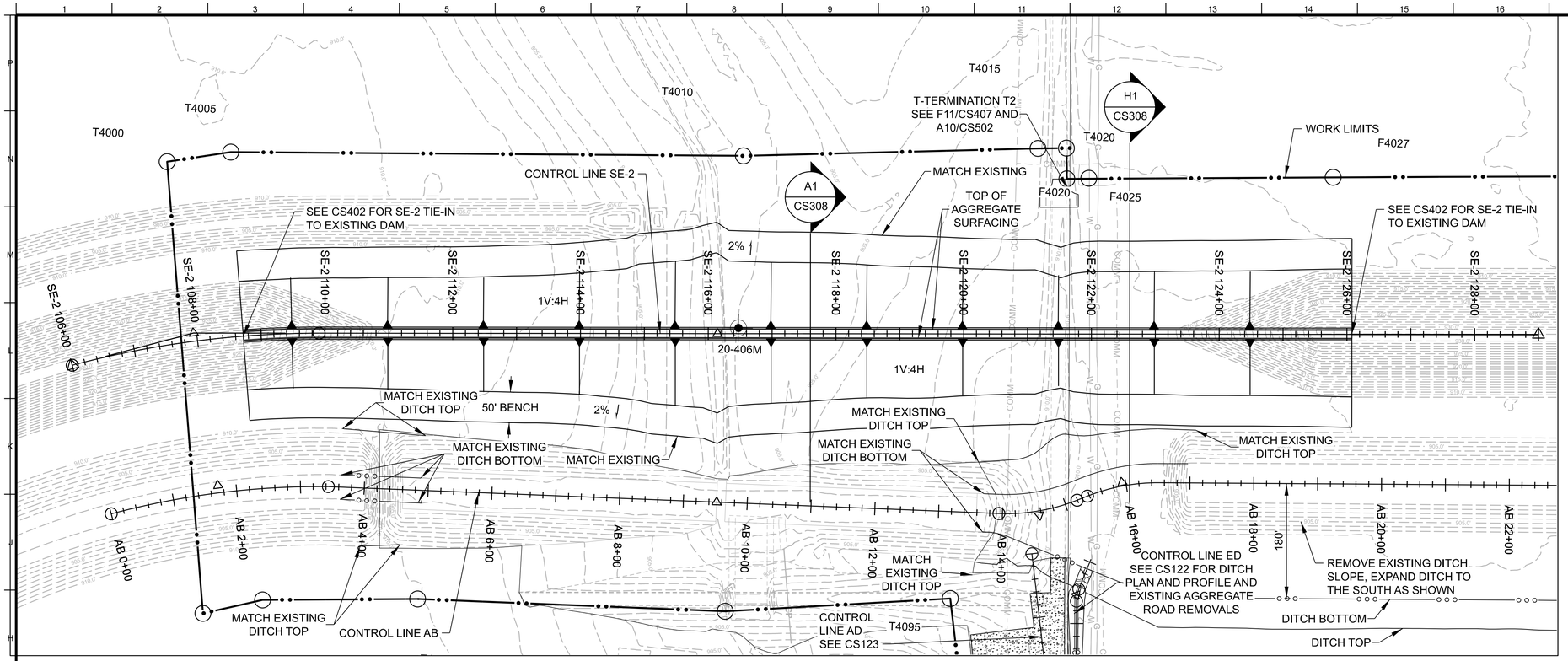
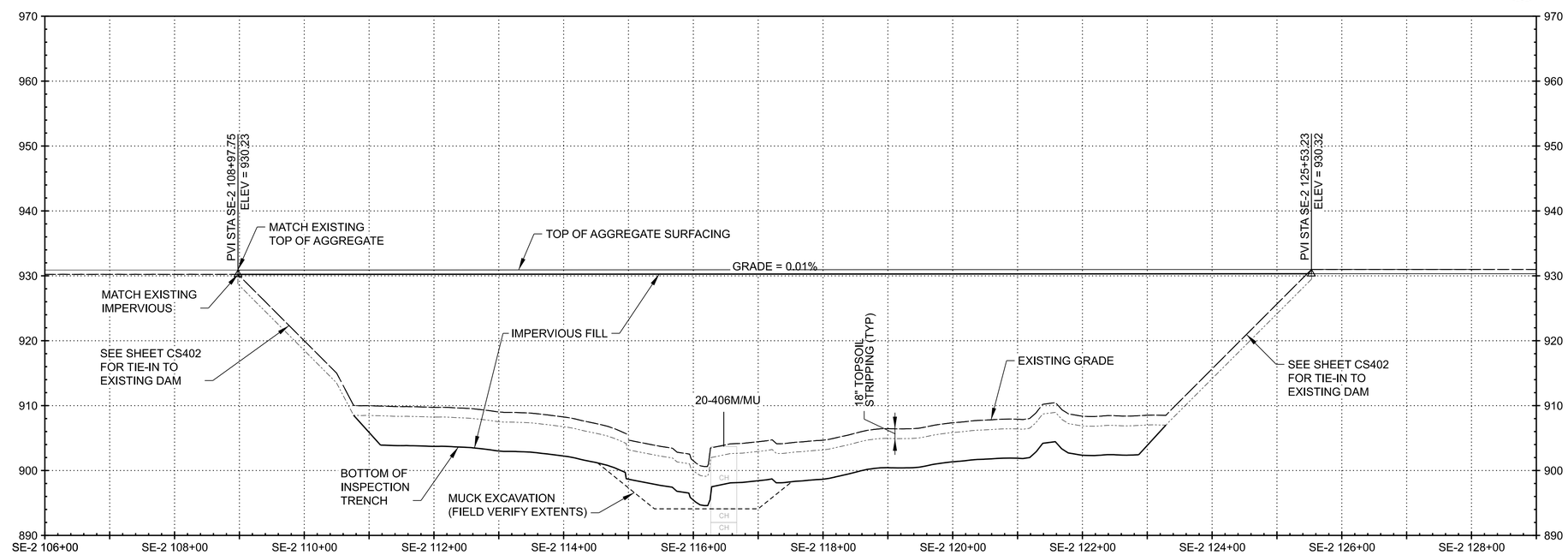


G1 PLAN - SE2 EMBANKMENT

SCALE: 1"=100'



A1 PROFILE - SE2 EMBANKMENT

SCALE: 1"=100'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NORTH DAKOTA SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956555

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RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

SE2 EMBANKMENT
PLAN AND PROFILE

SHEET ID
VOL. 1
CS120

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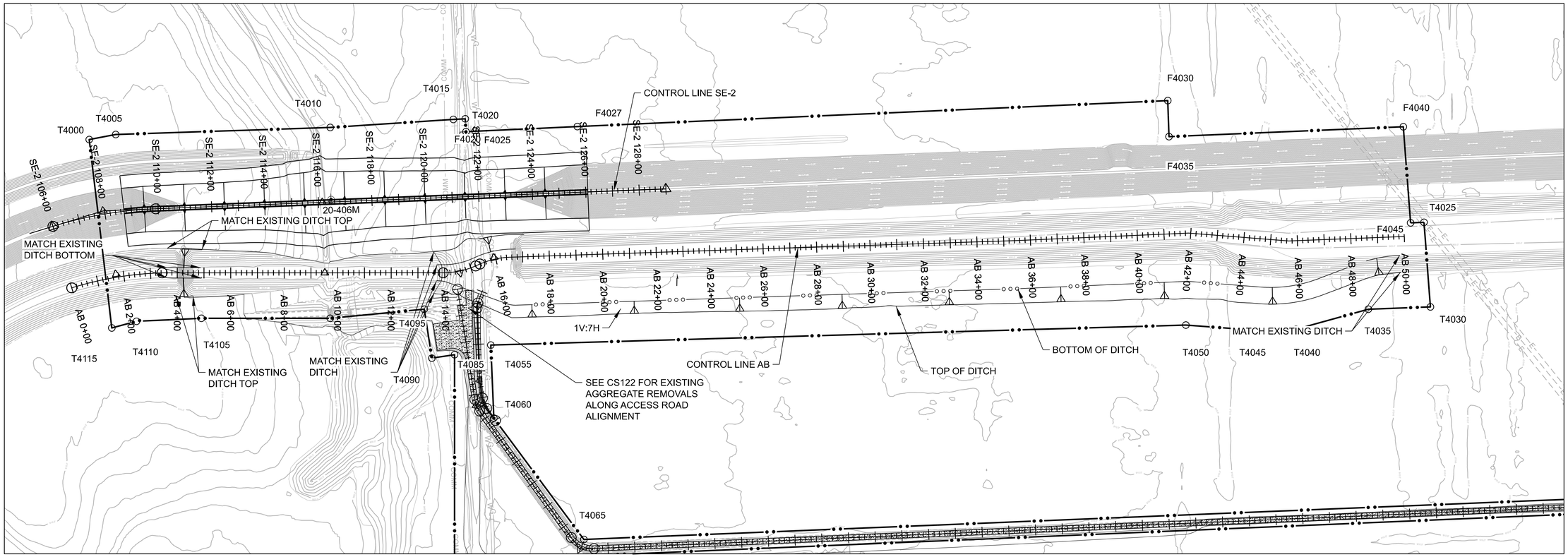
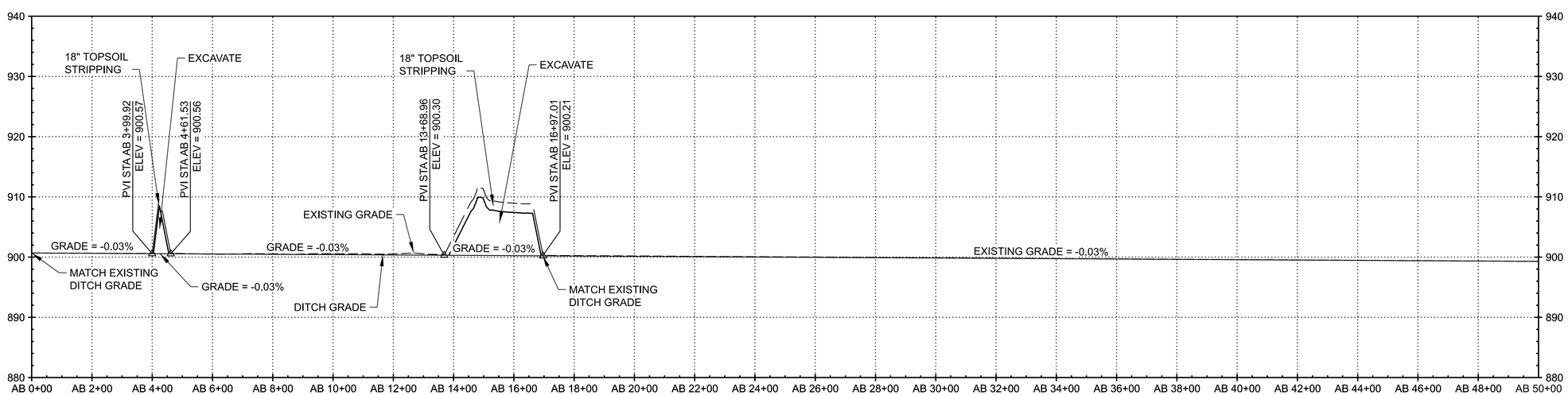


G1 PLAN - DITCH AB STA 0+00 TO 50+00

SCALE: 1"=200'



NOTE:
STATION AB 0+00 TO 3+99.92 AND AB 4+61.53 TO 13+68.96 - PERFORM MINOR TOPSOIL GRADING TO PROVIDE POSITIVE DRAINAGE TO THE EAST.

A2 PROFILE - DITCH AB (CONTROL LINE AB)

SCALE: 1"=200'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NAD 83 (2011) SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS121xxx.dgn

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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DITCH AB
PLAN AND PROFILE
STA 0+00 TO 50+00

SHEET ID
VOL. 1
CS121

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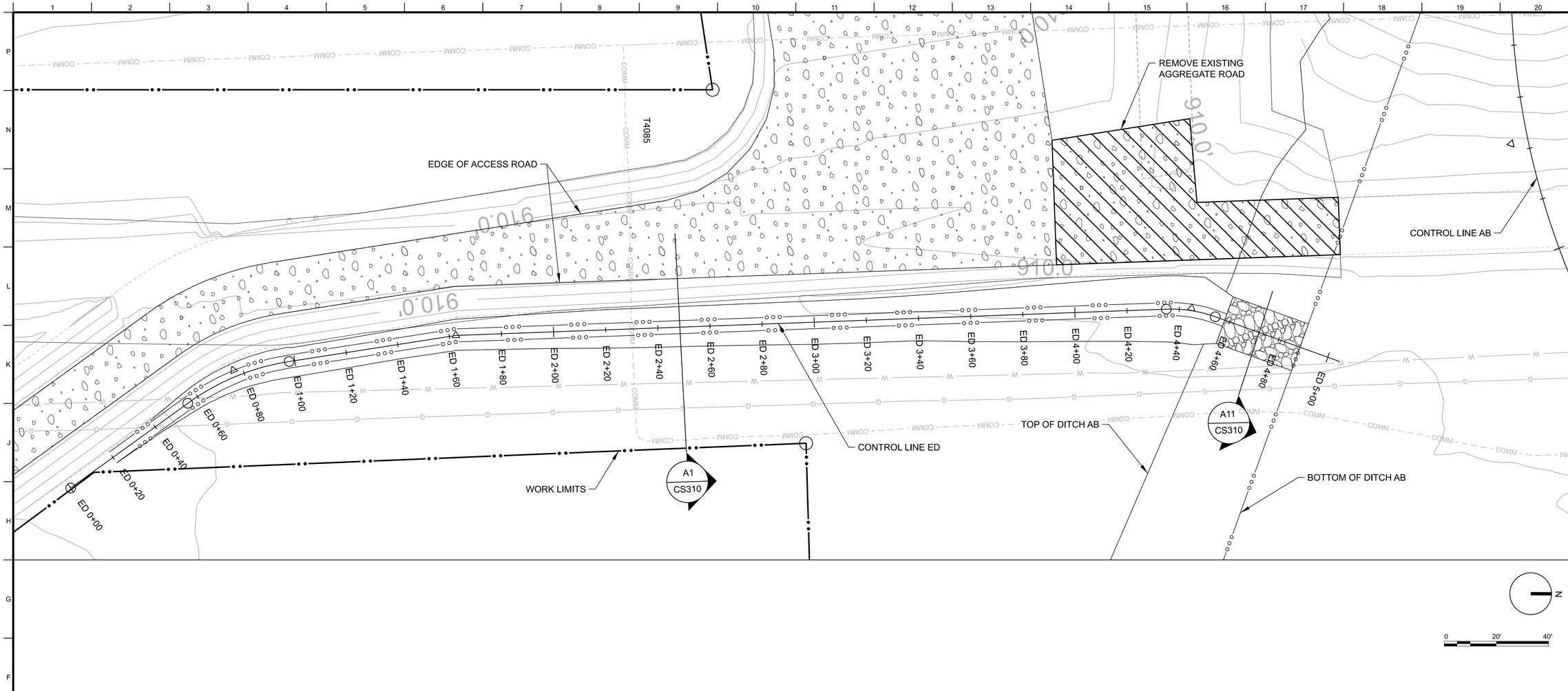

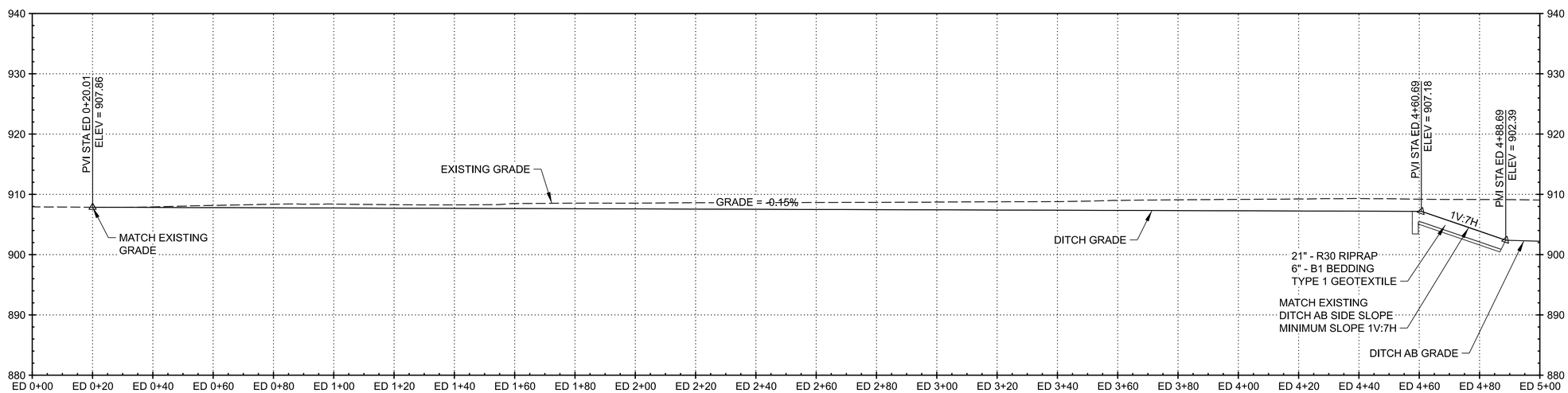

A1 PROFILE - DITCH ED

SCALE: 1"=20'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NDORS - SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN	ISSUE DATE: 3 SEPT 2024
DRAWN BY: P. MORKEN	SOLICITATION NO.: W912ES23B0016
CHECKED BY: B. SPRANG	CONTRACT NO.:
SUBMITTED BY:	AS-BUILT NO.:
SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS122xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
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ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DITCH ED
PLAN, PROFILE, AND SECTION

SHEET ID
VOL. 1
CS122

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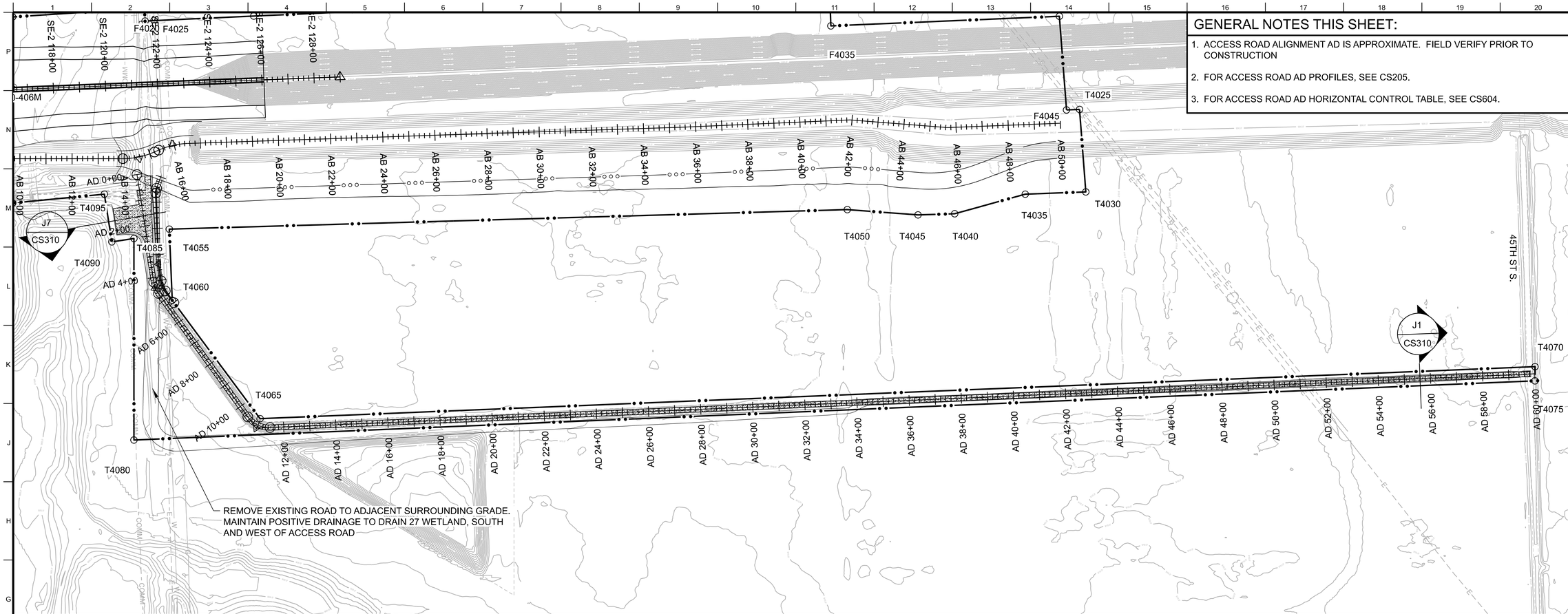
GENERAL NOTES THIS SHEET:

1. ACCESS ROAD ALIGNMENT AD IS APPROXIMATE. FIELD VERIFY PRIOR TO CONSTRUCTION
2. FOR ACCESS ROAD AD PROFILES, SEE CS205.
3. FOR ACCESS ROAD AD HORIZONTAL CONTROL TABLE, SEE CS604.



F1 PLAN - ACCESS ROAD

SCALE: 1"=200'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NAD 83(2011) SPCS, SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.9999956556

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DESIGNED BY: P. MORKEN	ISSUE DATE: 3 SEPT 2024
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SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS123xxx.dgn

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ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
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FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

ACCESS ROAD PLAN

SHEET ID
VOL. 1
CS123

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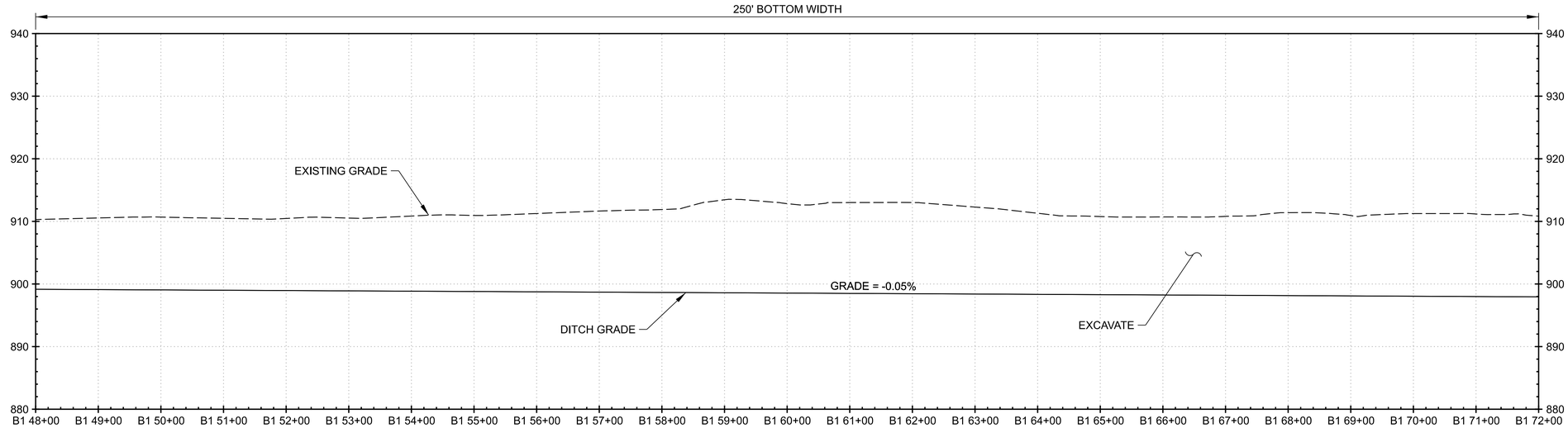
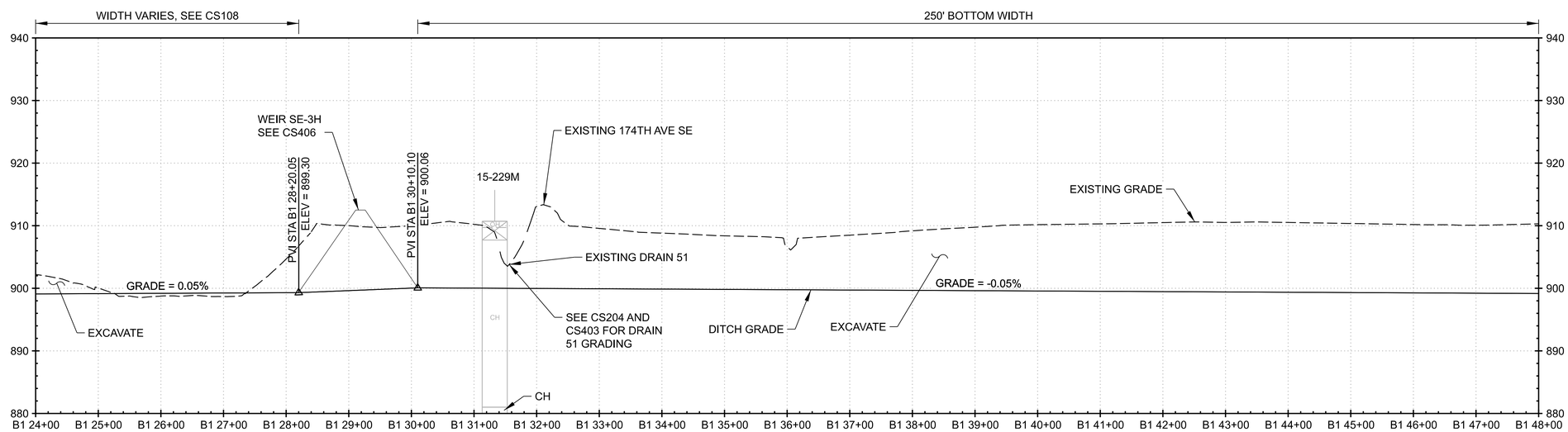


H1 PROFILE - DITCH B1 STA 48+00 TO 72+00

SCALE: 1"=100'

0 100' 200'



A1 PROFILE - DITCH B1 STA 24+00 TO 48+00

SCALE: 1"=100'

0 100' 200'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NORTH DAKOTA SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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BORROW DITCH B1 PROFILE
STA 24+00 TO 72+00

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VOL. 1
CS201

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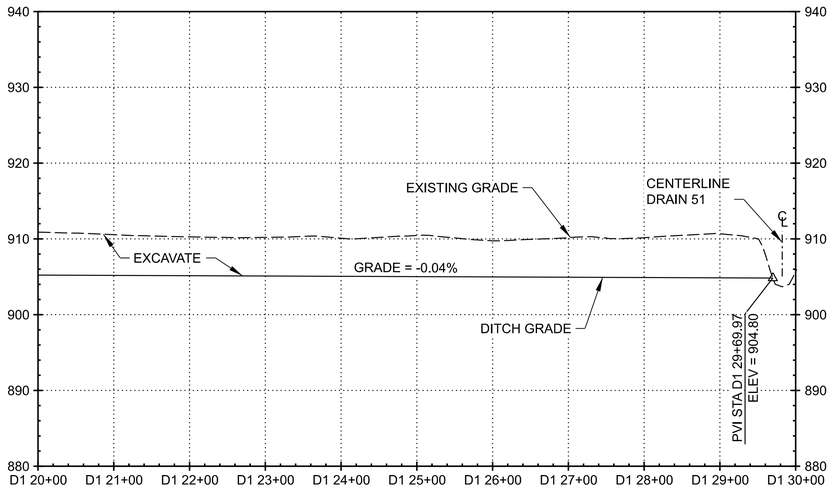
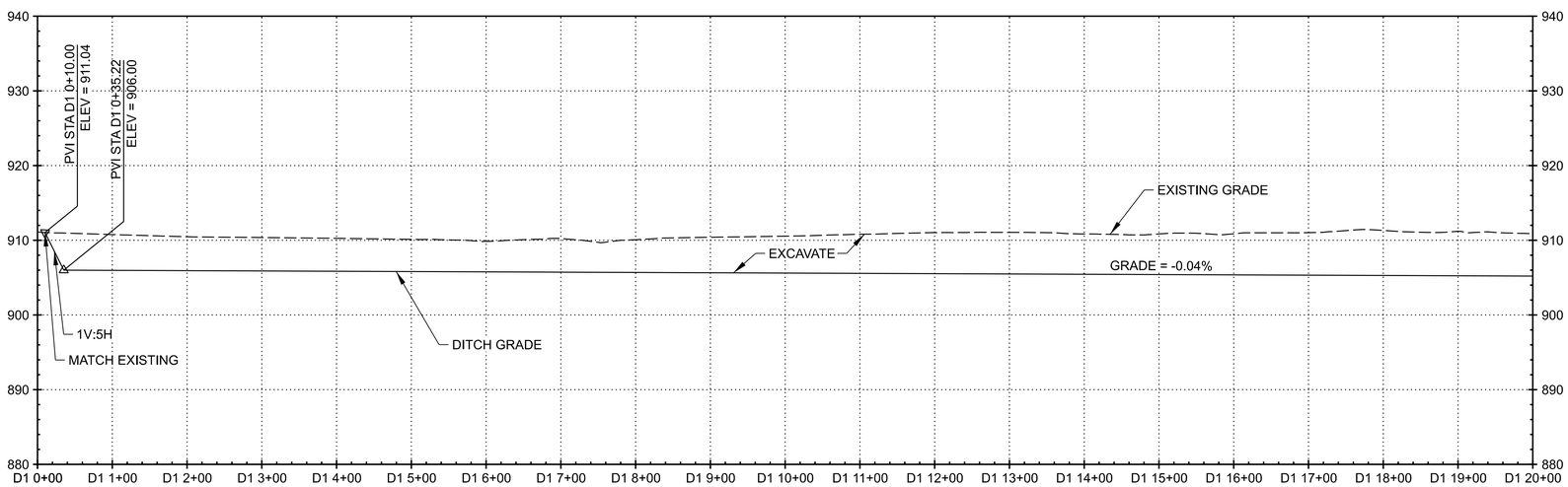


H1 PROFILE - DITCH D1 STA 20+00 TO 31+00

SCALE: 1"=100'

0 100' 200'



A1 PROFILE - DITCH D1 STA 0+00 TO 20+00

SCALE: 1"=100'

0 100' 200'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NDSPCS - SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956656

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U.S. ARMY CORPS OF ENGINEERS
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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DRAINAGE DITCH D1 PROFILE

SHEET ID
VOL. 1
CS202

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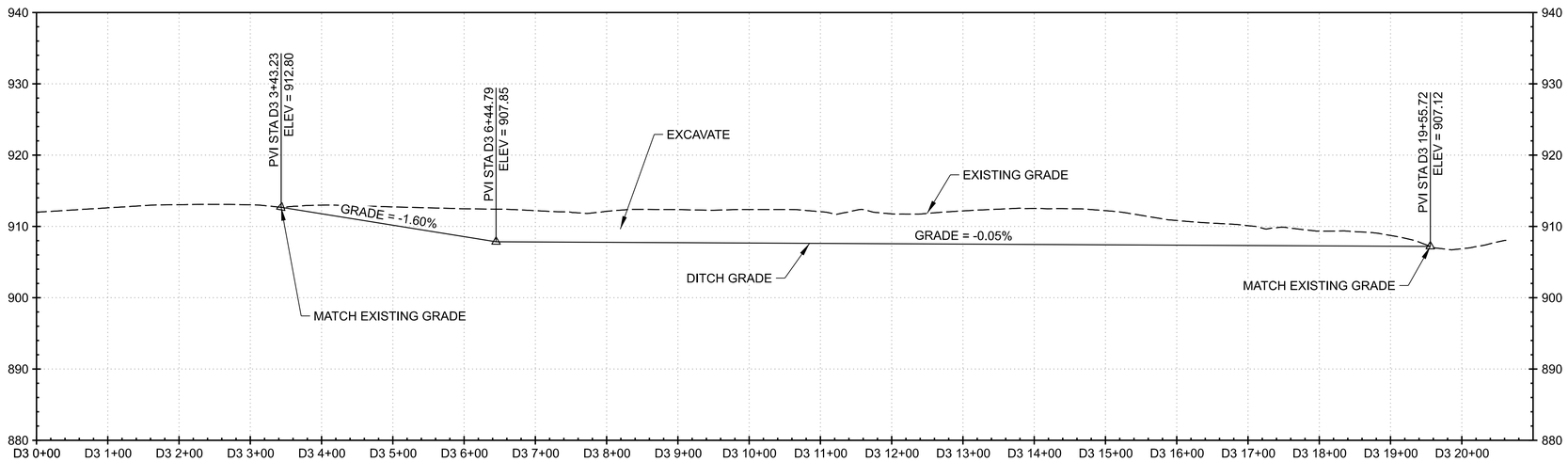
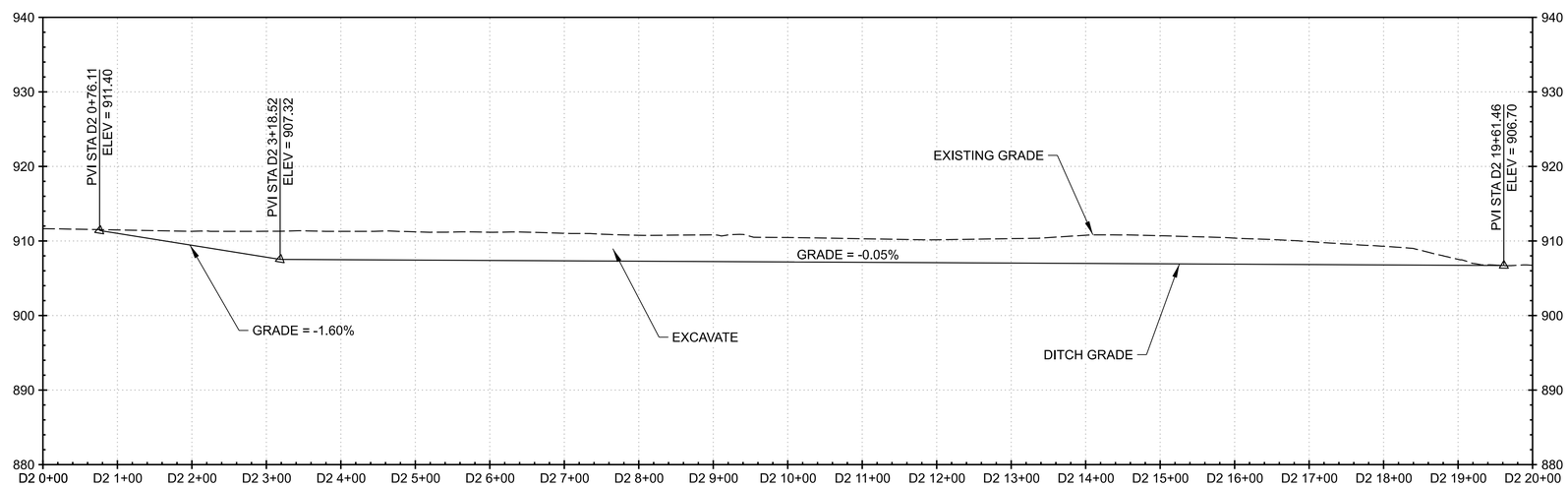


H1 PROFILE - DITCH D3

SCALE: 1"=100'

0 100' 200'



A1 PROFILE - DITCH D2

SCALE: 1"=100'

0 100' 200'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NDSPCS - SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956656

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DESIGNED BY: P. MORKEN	ISSUE DATE: 3 SEPT 2024
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SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS203xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DRAINAGE DITCHES D2 AND D3
PROFILES

SHEET ID
VOL. 1
CS203

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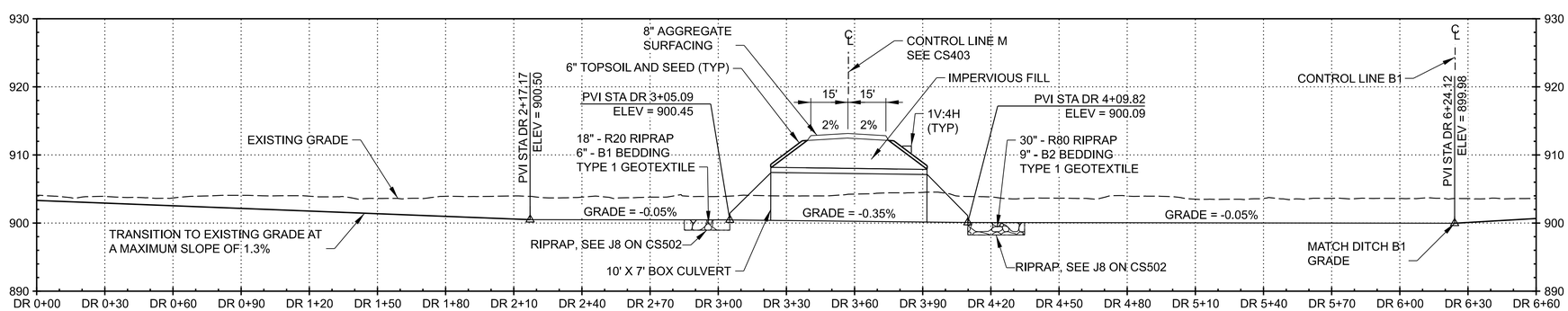

A1 PROFILE - DRAIN 51 (CONTROL LINE DR)

SCALE: 1"=30'

0 30' 60'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NORTH DAKOTA SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956656

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FILE NAME: FMMSE3_VOL1_CS204xxx.dgn
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
AS-BUILT NO.:

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

PROFILE
DRAIN 51

SHEET ID
VOL. 1
CS204

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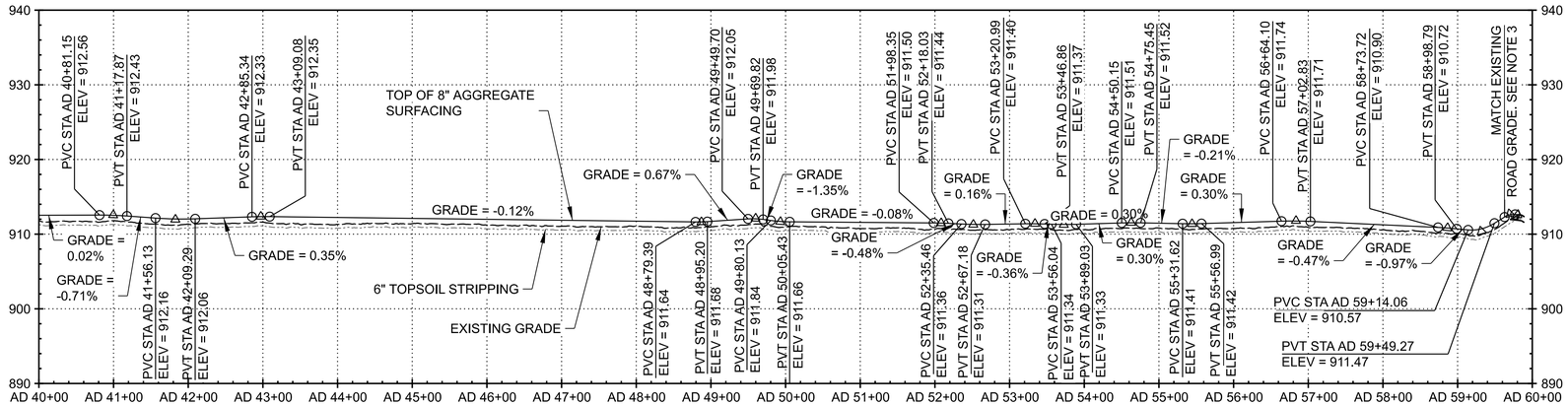
GENERAL NOTES THIS SHEET:

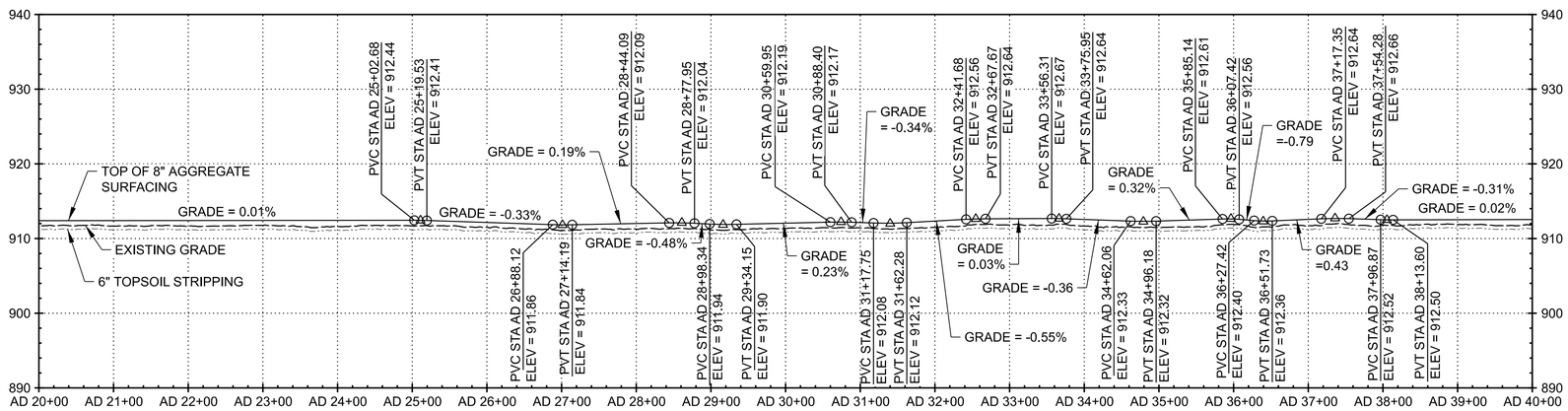
1. STRIP TOPSOIL ALONG ALIGNMENT AD, AS SHOWN. FILL WITH IMPERVIOUS FILL TO EXISTING GRADE, THEN PLACE 8" OF AGGREGATE SURFACING.
2. VERTICAL ALIGNMENT AD SHOWS APPROXIMATE EXISTING GRADE, PLUS 8" AGGREGATE SURFACING.
3. MATCH EXISTING GRADE OF 45TH STREET S AND 57TH ST AT INTERSECTIONS.



K1 PROFILE - ACCESS ROAD STA AD 40+00 TO 60+00

SCALE: 1"=100'

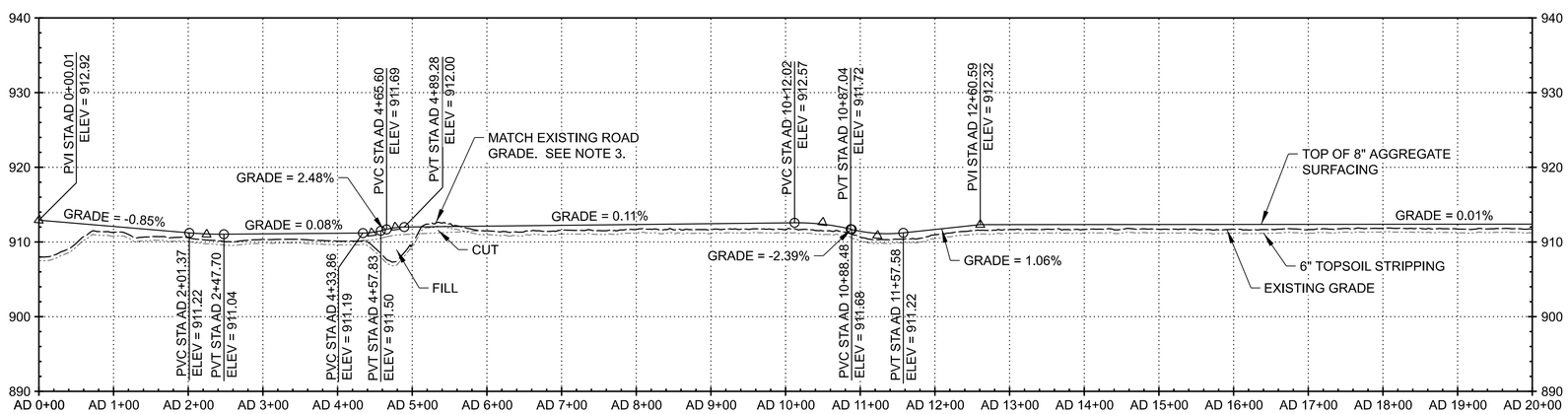
0 100' 200'



E1 PROFILE - ACCESS ROAD (AD) STA 20+00 TO 40+00

SCALE: 1"=100'

0 100' 200'



A1 PROFILE - ACCESS ROAD (AD) STA 0+00 TO 20+00

SCALE: 1"=100'

0 100' 200'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NGS: USA SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

ACCESS ROAD (AD) PROFILE

SHEET ID
VOL. 1
CS205

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

DESIGNED BY: J. MOSER	ISSUE DATE: 3 SEPT 2024
DRAWN BY: J. MOSER	SOLICITATION NO.: W912ES23B0016
CHECKED BY: B. SPRANG	CONTRACT NO.:
SUBMITTED BY: R. MCCARVEL	AS-BUILT NO.:
SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS205xxx.dgn

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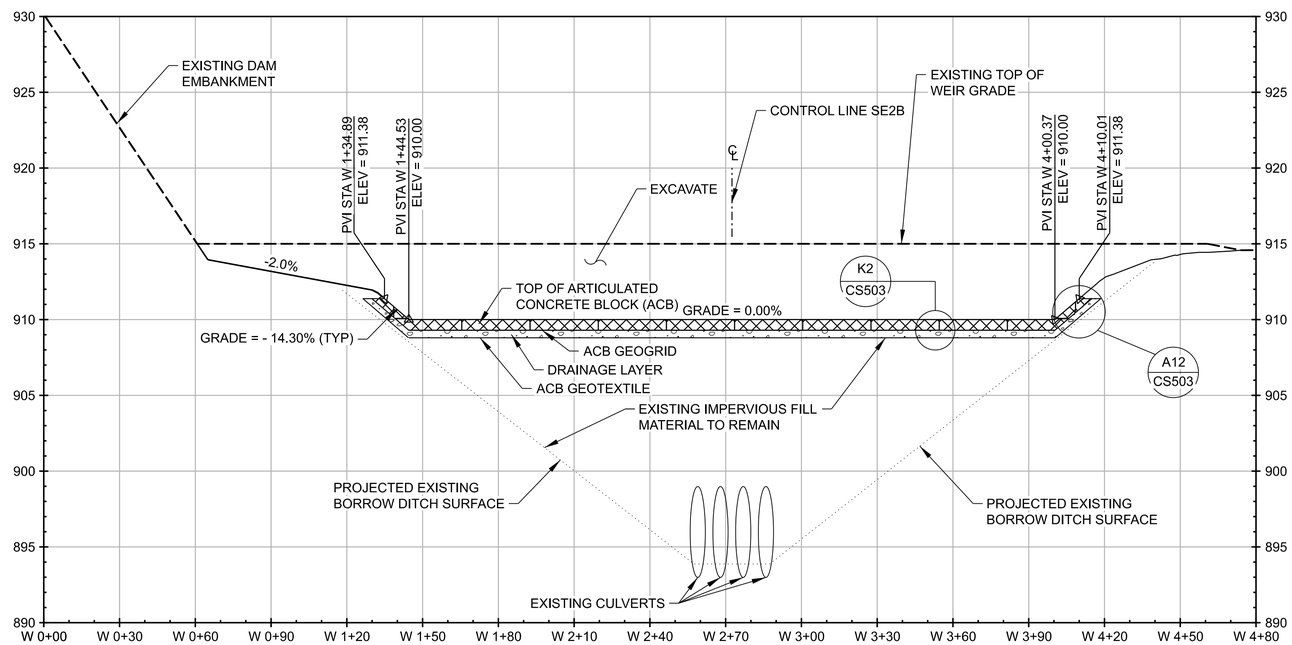
GENERAL NOTES THIS SHEET:

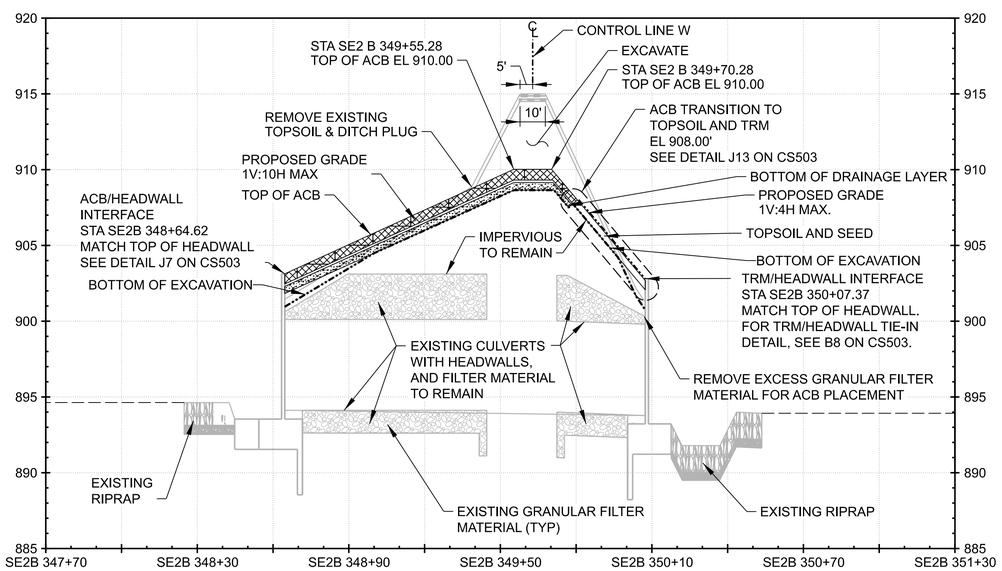
1. FOR TAPERED VERSUS NON-TAPERED ACB PLACEMENT LOCATIONS, SEE CS110.



H1 PROFILE- SE-2B WEIR CREST

SCALE: 1"=30'

0 30' 60'



A1 PROFILE- SE-2B WEIR

SCALE: 1"=30'

0 30' 60'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88 GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011) NGS PROJ: SOUTH ZONE-U.S. SURVEY FT. COMBINED FACTOR (CF): 0.999956656

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DESIGNED BY: J. MOSER
DRAWN BY: J. MOSER
CHECKED BY: B. SPRANG
SUBMITTED BY: R. MCGARVEY
SIZE: ANSI D
FILE NAME: FMMSE3_VOL1_CS206xxx.dgn
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

SE-2B WEIR
ACB PROFILES

SHEET ID
VOL. 1
CS206

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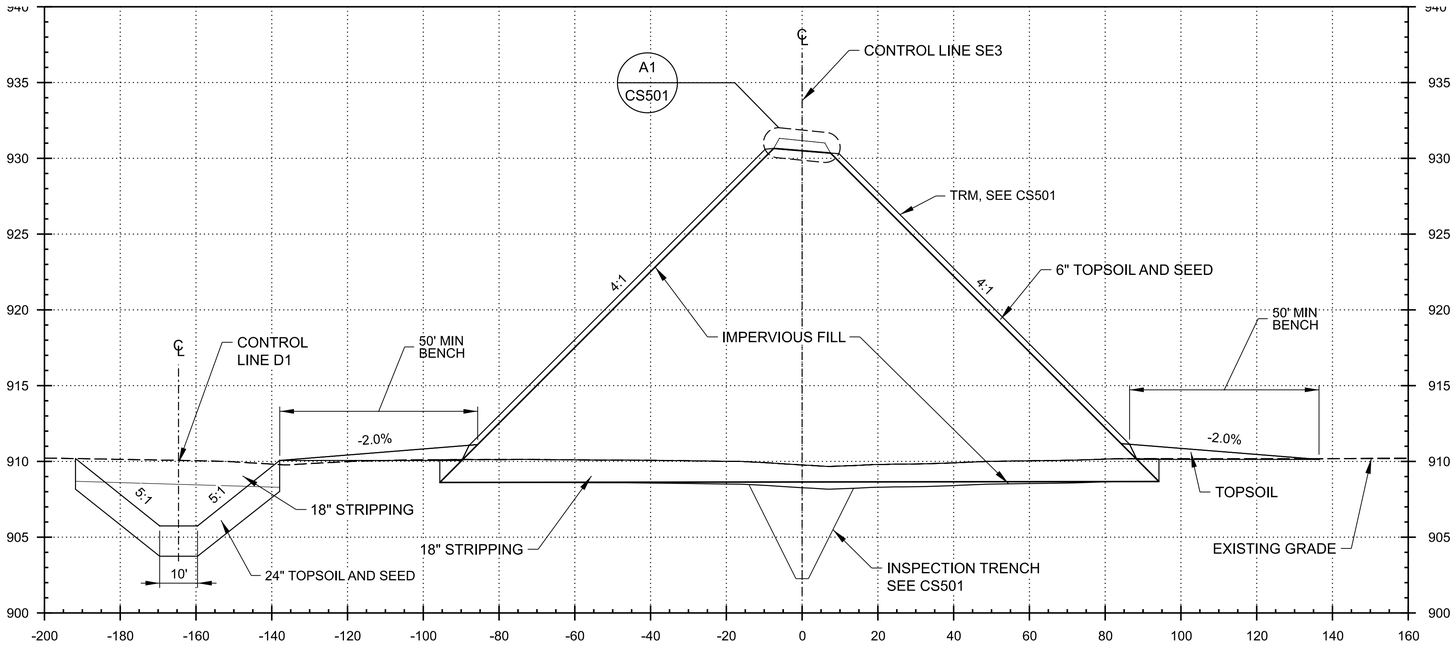
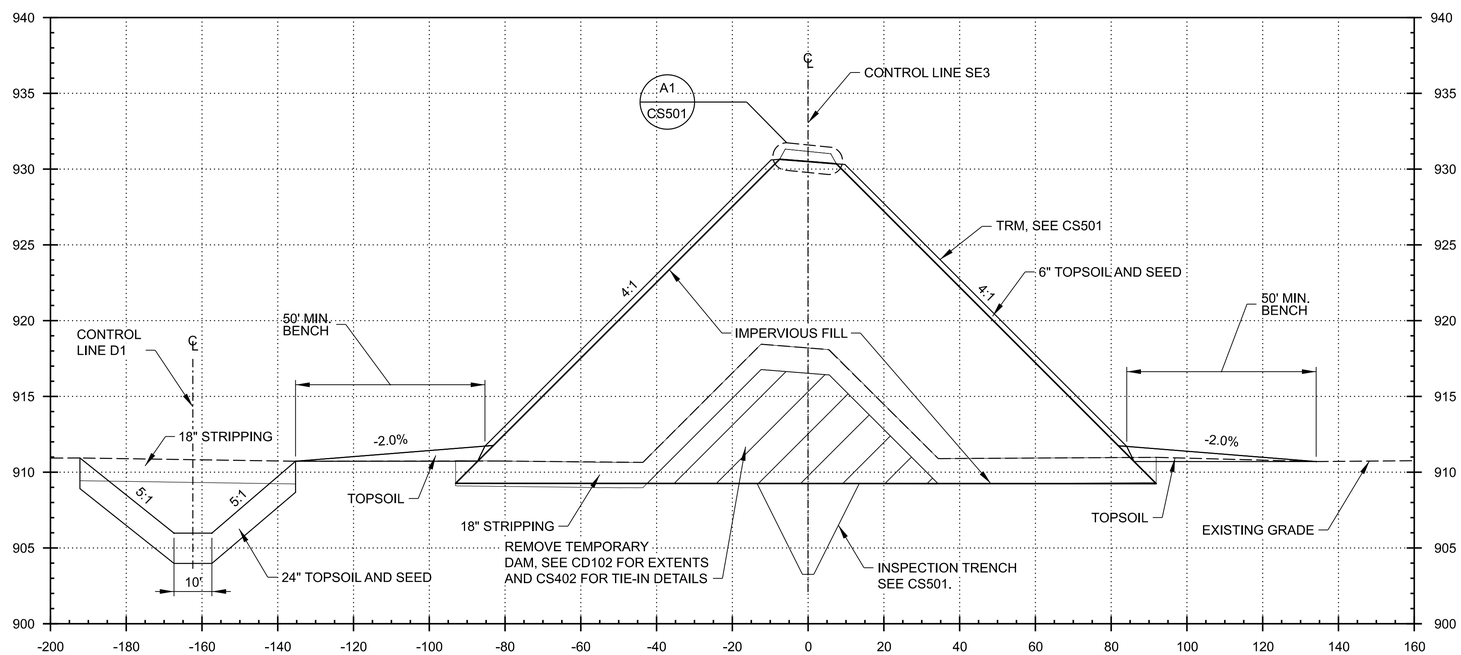


H1 TYPICAL SECTIONS STA SE3 3+10 TO 15+00

SCALE: 1"=20'



A1 TYPICAL SECTIONS STA SE3 0+00 TO 3+10

SCALE: 1"=20'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NDSPCS - SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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FMM SOUTHERN EMBANKMENT REACH SE-3
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FARGO, ND

TYPICAL SECTIONS
STA SE3 0+00 TO 16+20

SHEET ID
VOL. 1
CS301

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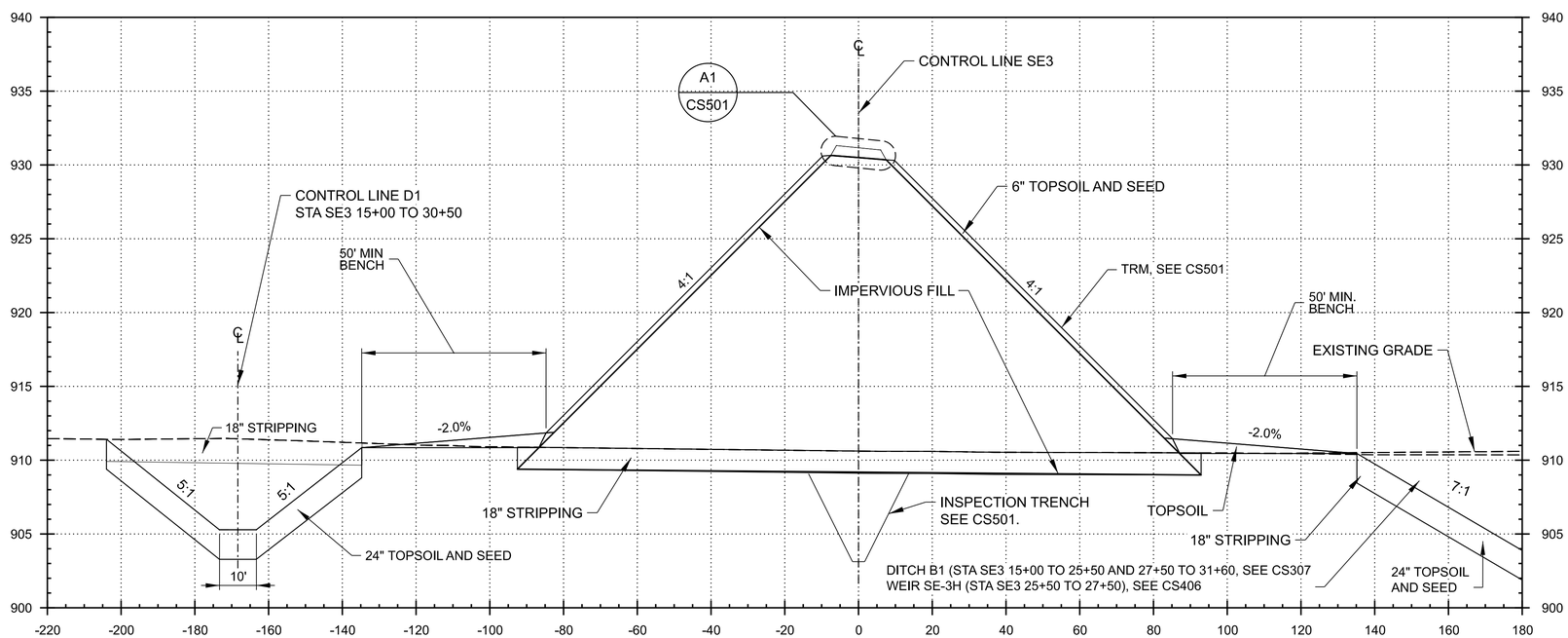

A1 TYPICAL SECTIONS STA SE3 15+00 TO 31+60

SCALE: 1"=20'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NORTH DAKOTA SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS302xxx.dgn

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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
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FARGO, ND

TYPICAL SECTIONS
STA SE3 16+20 TO 31+60

SHEET ID
VOL. 1
CS302

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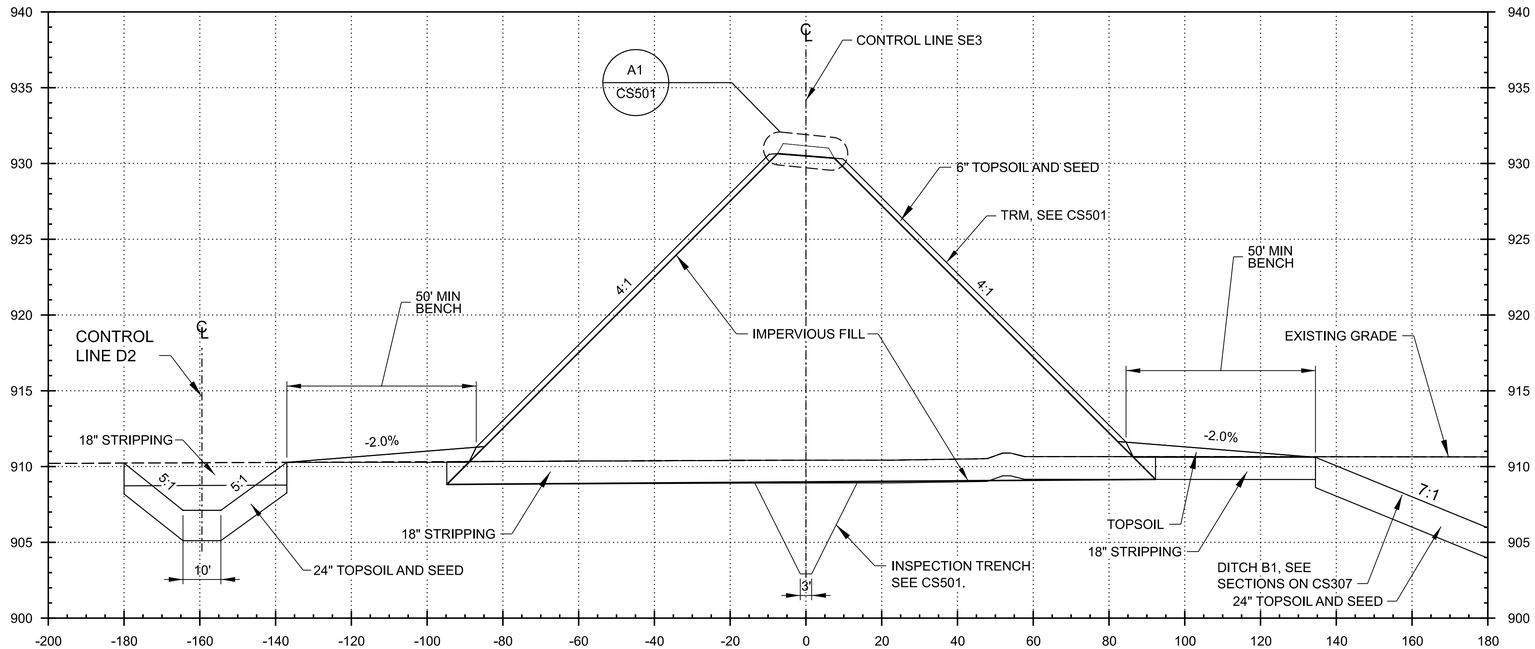
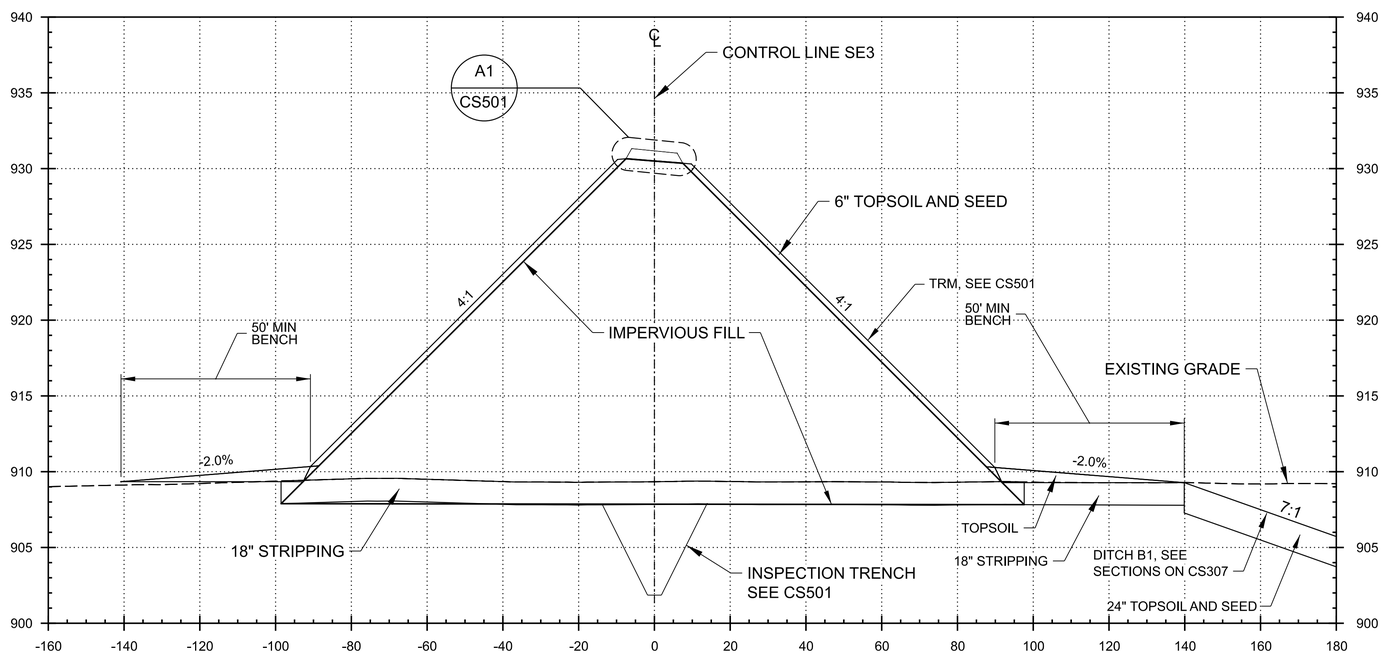
11:20:05 AM 9/3/2024 PD: AEC_pdf.pltcfg DS: AEC_Screen_FullSize.dscript



H1 TYPICAL SECTIONS STA SE3 34+20 TO 53+00

SCALE: 1"=20'



A1 TYPICAL SECTIONS STA SE3 31+60 TO 34+20

SCALE: 1"=50'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NORTH DAKOTA SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956656

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SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS303xxx.dgn

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ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

TYPICAL SECTIONS
STA SE3 31+60 TO 53+00

SHEET ID
VOL. 1
CS303

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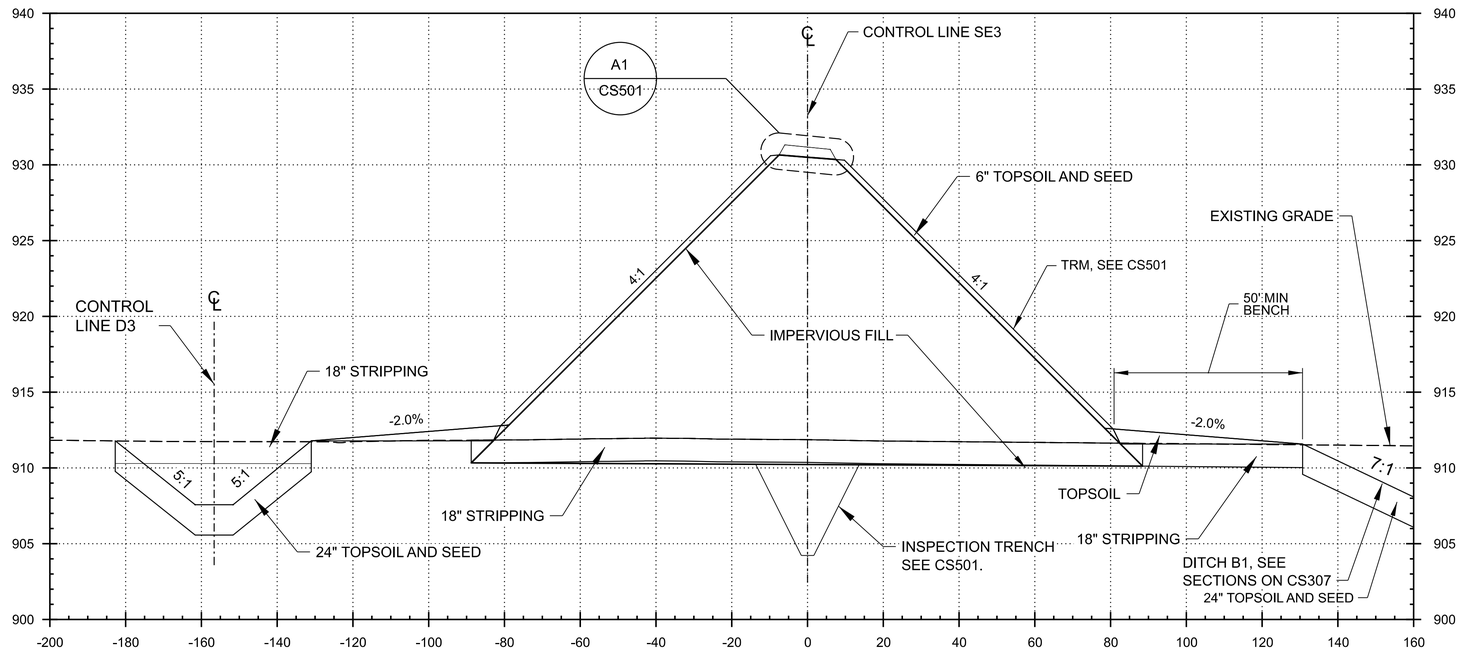
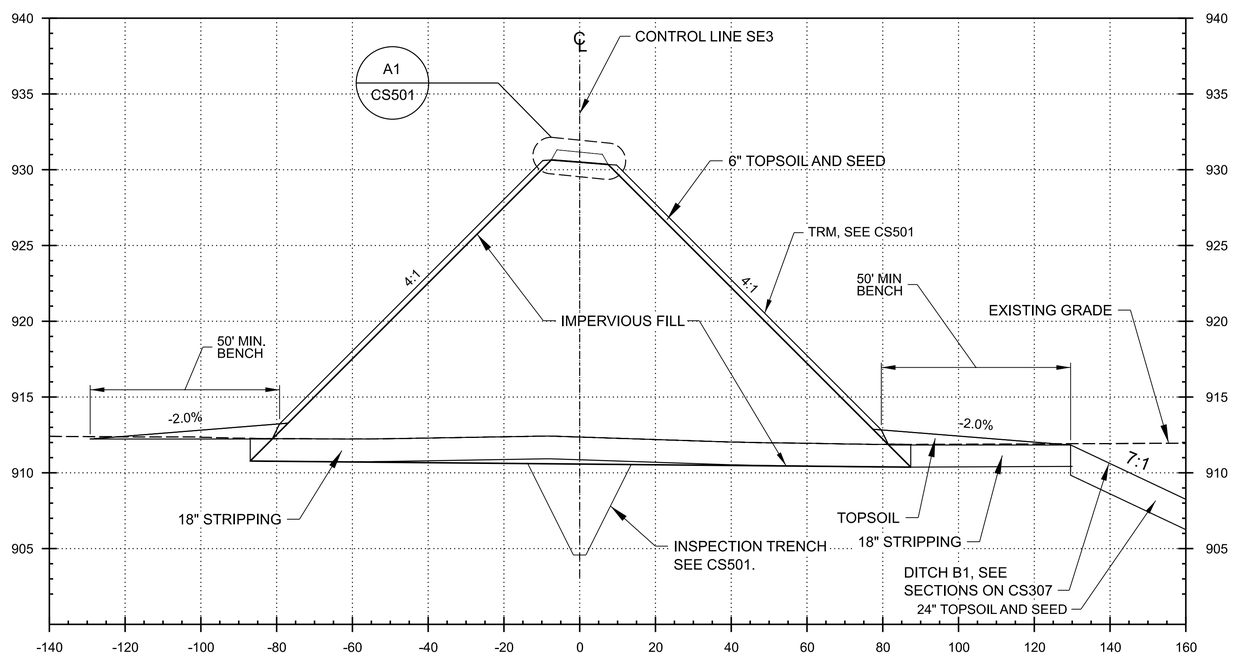


H1 TYPICAL SECTIONS STA SE3 59+20 TO 74+40

SCALE: 1"=20'



A1 TYPICAL SECTIONS STA SE3 53+00 TO 59+20

SCALE: 1"=20'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NORTH DAKOTA SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN	ISSUE DATE: 3 SEPT 2024
DRAWN BY: P. MORKEN	SOLICITATION NO.: W912ES23B0016
CHECKED BY: B. SPRANG	CONTRACT NO.:
SUBMITTED BY: R. MCGARVEY	AS-BUILT NO.:
SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS304xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

TYPICAL SECTIONS
STA SE3 53+00 TO 74+40

SHEET ID
VOL. 1
CS304

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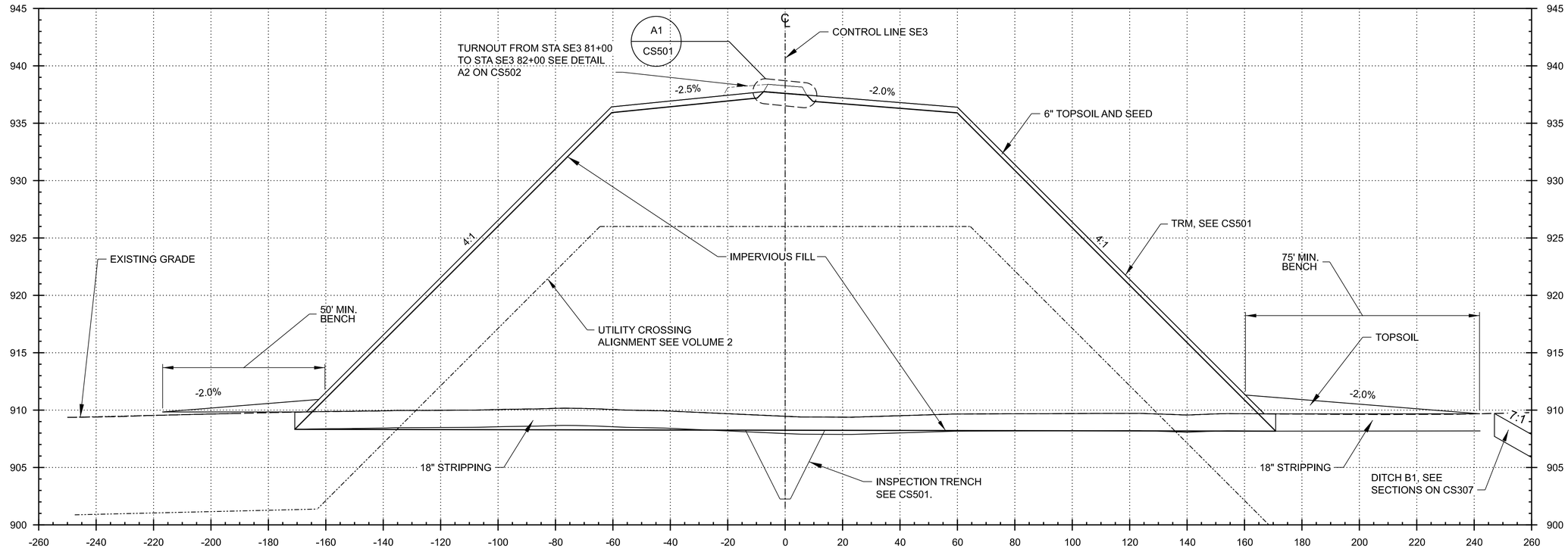
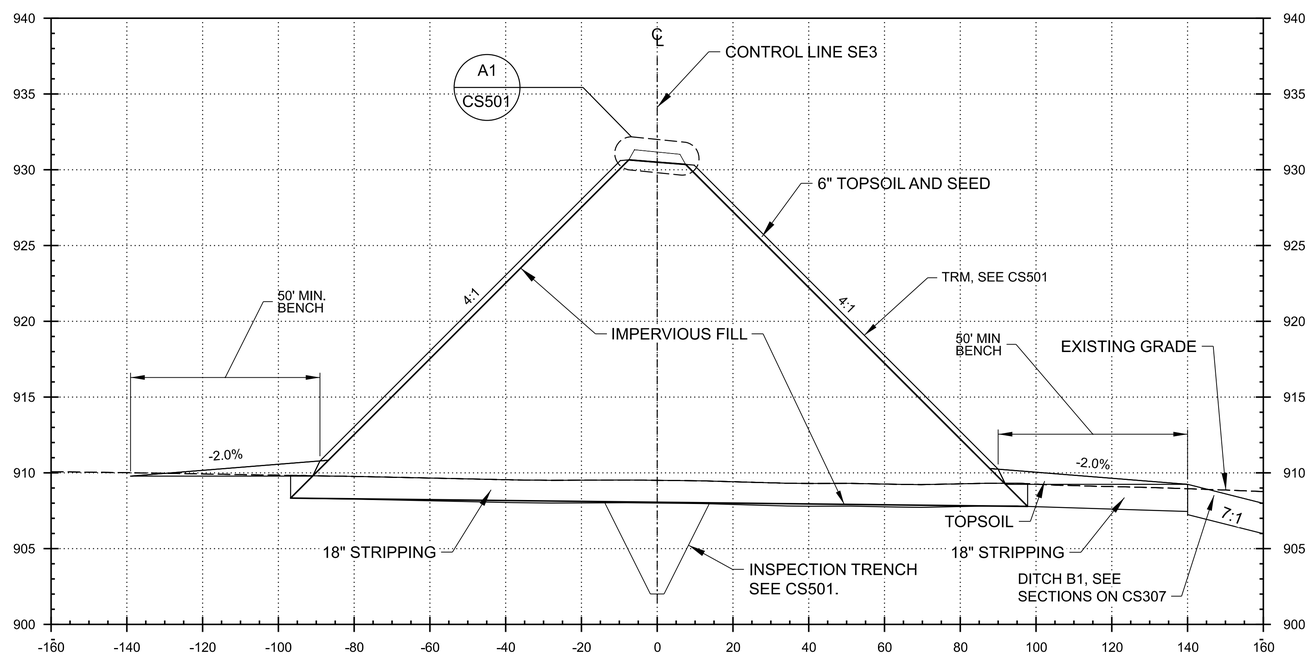


G1 TYPICAL SECTIONS STA SE3 81+00 TO 84+00

SCALE: 1"=20'



A1 TYPICAL SECTIONS STA SE3 74+40 TO 80+00

SCALE: 1"=20'

GENERAL NOTES THIS SHEET:

1. EMBANKMENT WIDTH AND RIGHT BENCH TRANSITION OCCUR FROM SE3 80+00 TO 81+00 AND FROM SE3 84+00 TO 85+00.

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88, GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011), NAD 83 (2011) SOUTH ZONE-U.S. SURVEY FT., COMBINED FACTOR (CF): 0.999956556

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DESIGNED BY: P. MORKEN	ISSUE DATE: 3 SEPT 2024
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SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS305xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

TYPICAL SECTIONS
STA SE3 74+40 TO 85+00

SHEET ID
VOL. 1
CS305

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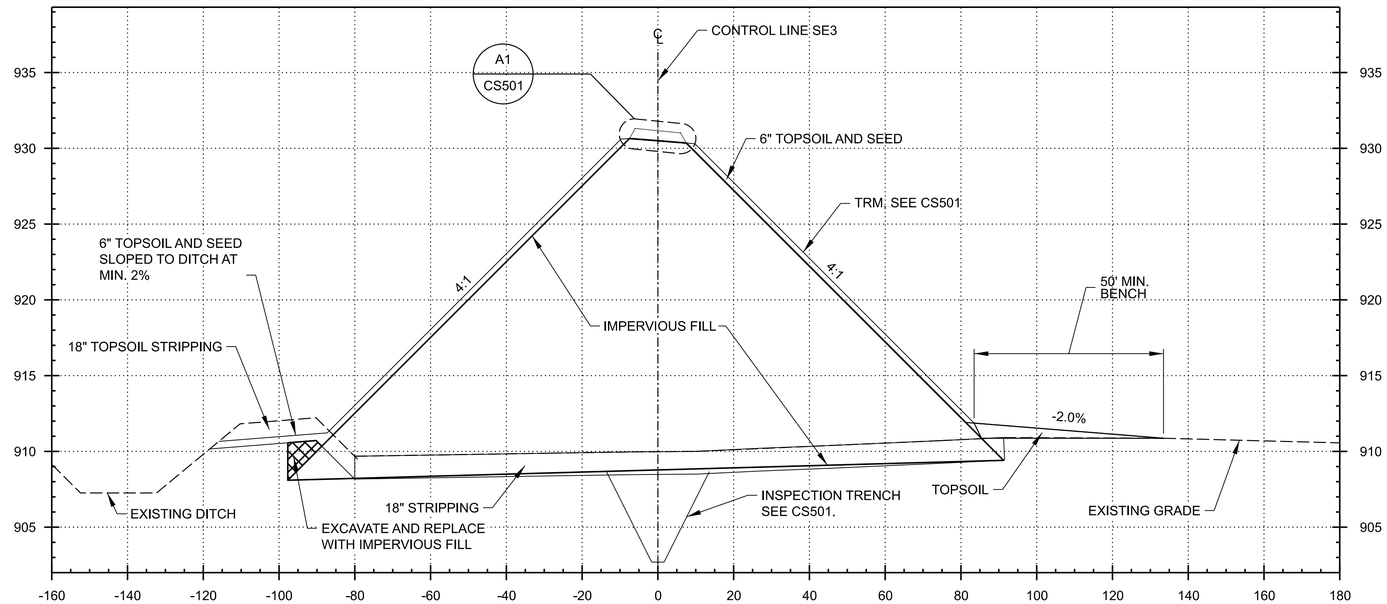
11:21:12 AM 9/3/2024

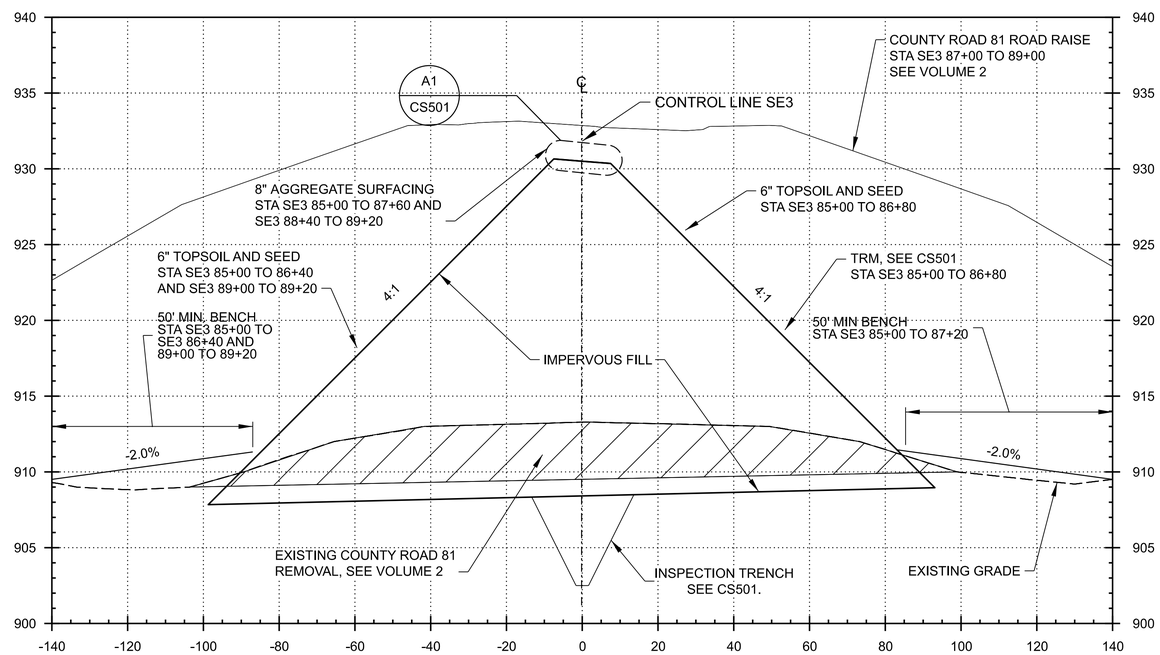
GENERAL NOTES THIS SHEET:

1. EMBANKMENT WIDTH AND RIGHT BENCH TRANSITION OCCUR FROM SE3 80+00 TO 81+00 AND FROM SE3 84+00 TO 85+00.



H1 TYPICAL SECTIONS STA SE3 89+20 TO 91+90

SCALE: 1"=20'



A1 TYPICAL SECTIONS STA SE3 85+00 TO 89+20

SCALE: 1"=20'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NORTH DAKOTA SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956656

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SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS306xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

TYPICAL SECTIONS
STA SE3 85+00 TO 89+20

SHEET ID
VOL. 1
CS306

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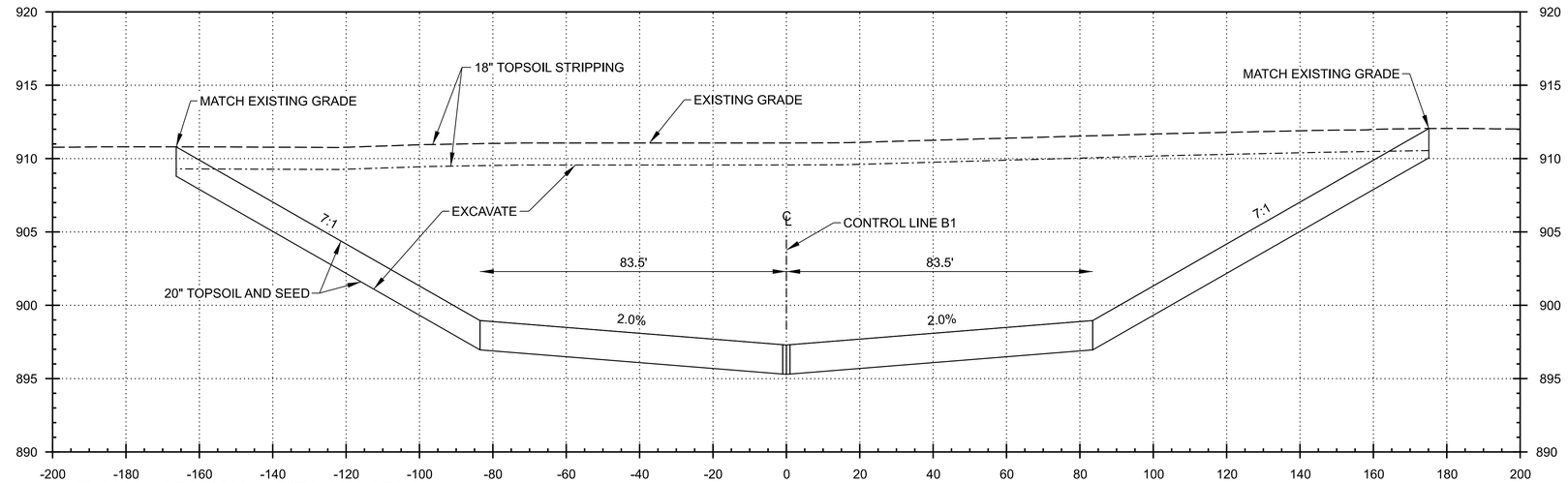
PD: AEC_pdf.pltcfg DS: AEC_Screen_FullSize.dscript
11:21:36 AM 9/3/2024

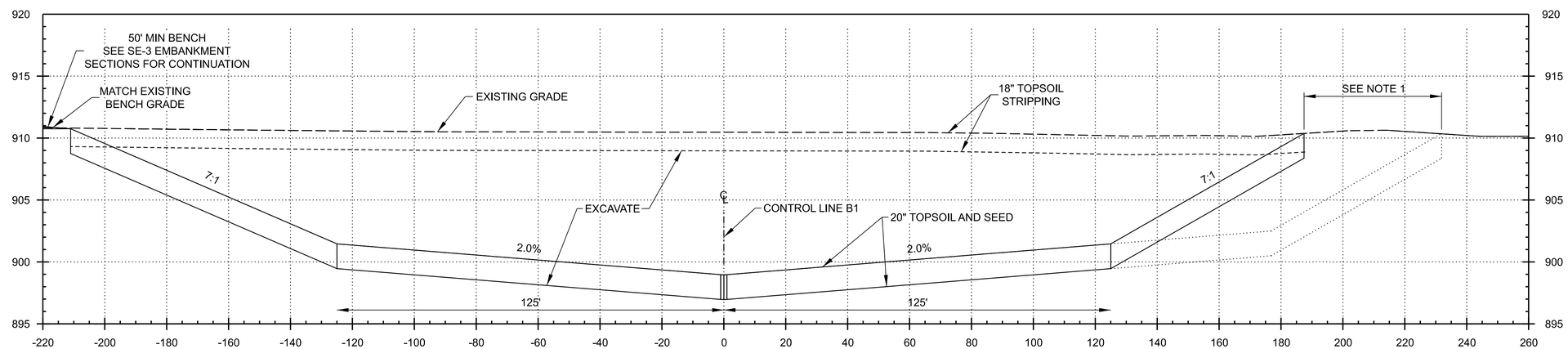
GENERAL NOTES THIS SHEET:

1. DITCH B1 BOTTOM WIDTH TRANSITIONS OCCUR IN THE FOLLOWING AREAS:
   - STA B1 6+00 TO B1 11+00 (SEE CS106)
   - STA B1 13+80 TO B1 28+20 (SEE CS108)
   - STA B1 74+40 TO B1 76+00 (SEE CS107)
   - STA B1 87+80 TO B1 89+00 (SEE CS107)



K1 TYPICAL SECTIONS - DITCH B1 STA B1 89+00 TO STA B1 90+00

SCALE: 1"=20'

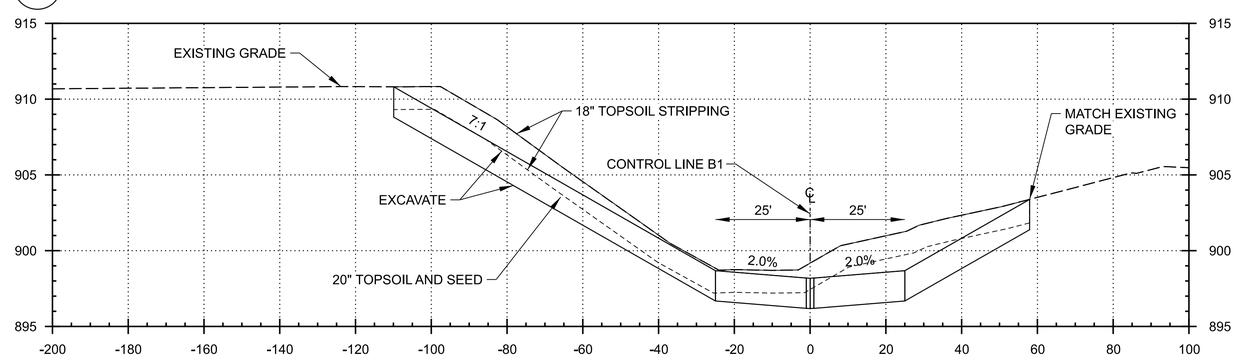


NOTE:

1. DITCH B1 MAY BE WIDENED AS SHOWN BETWEEN STA B1 37+20 AND B1 73+00 IF ADDITIONAL IMPERVIOUS FILL IS REQUIRED, BEYOND WHAT IS PROVIDED BY EXCAVATION OF PROJECT FEATURES, TO CONSTRUCT PROJECT FEATURES. PROVIDE A GRADUAL (MAX 1 LONGITUDINAL: 3 LATERAL) TRANSITION BACK TO ORIGINAL DESIGN DITCH AT EACH END OF WIDENING.

E1 TYPICAL SECTIONS - DITCH B1 STA B1 29+00 TO STA B1 87+00

SCALE: 1"=20'



A1 TYPICAL SECTIONS - BORROW DITCH B1 STA B1 0+00 TO STA B1 29+00

SCALE: 1"=20'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NDSPC2011 SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS307xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

SECTIONS
BORROW DITCH B1

SHEET ID
VOL. 1
CS307

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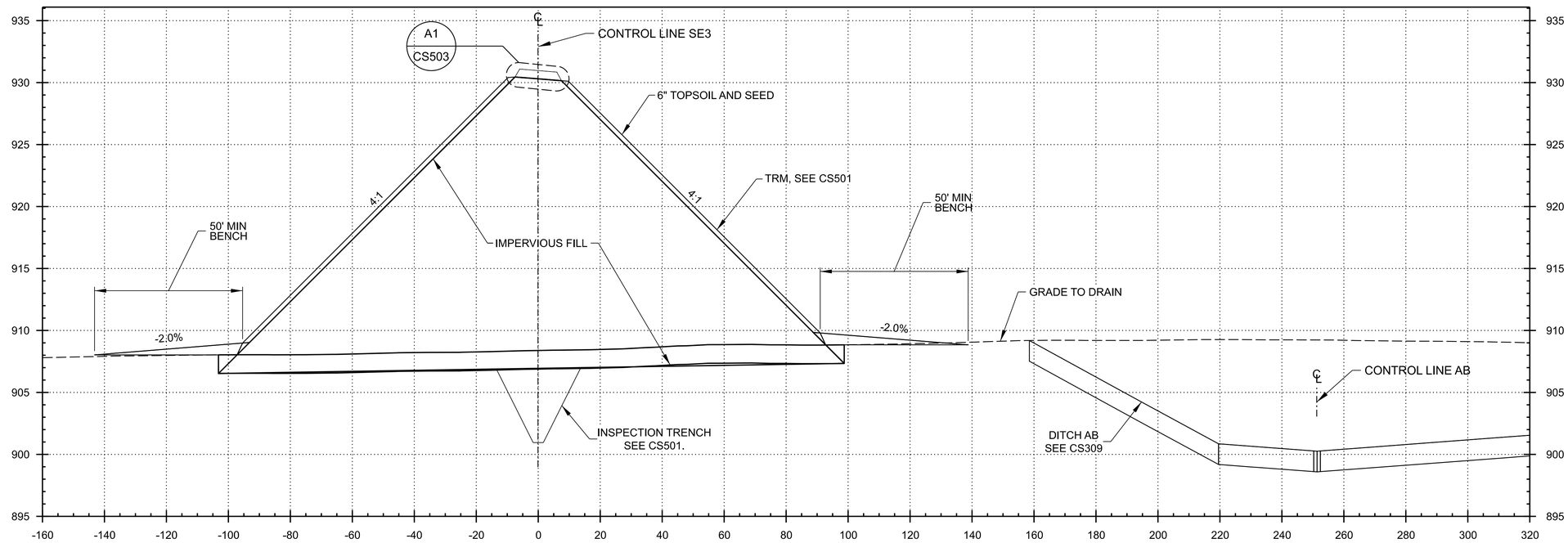
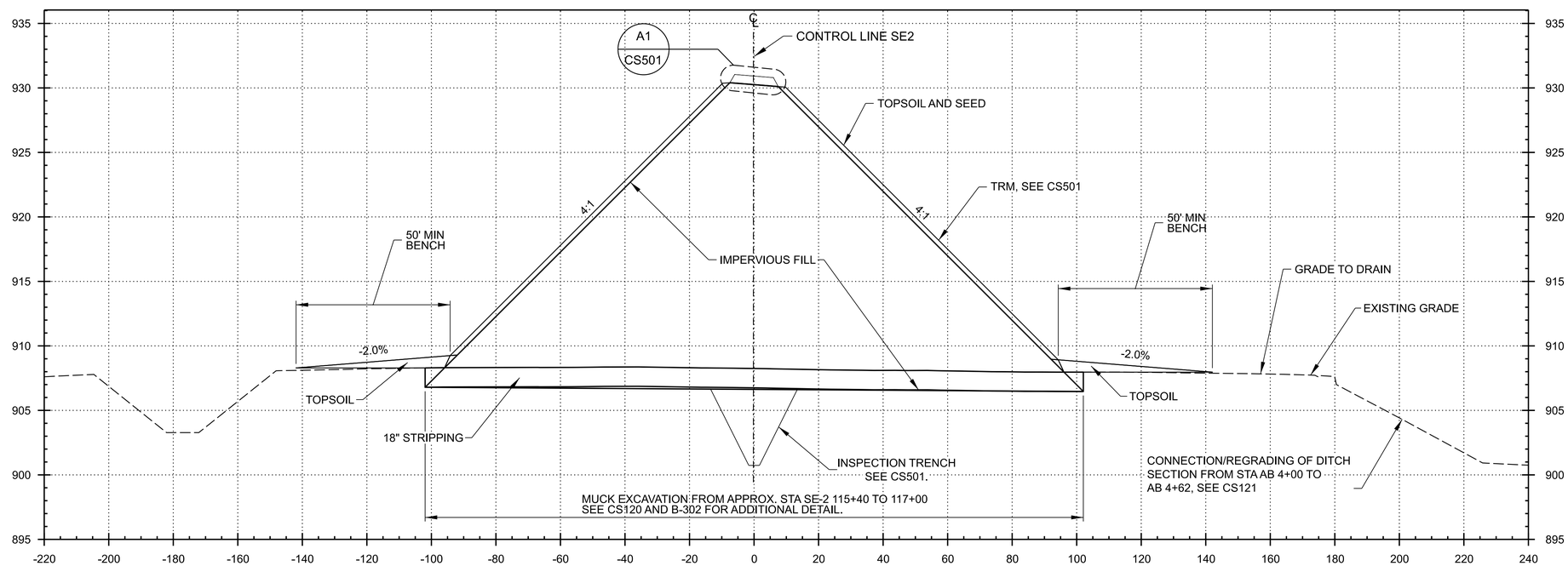


H1 TYPICAL SECTION EMBANKMENT SE-2 STA 120+40 TO 123+25

SCALE: 1"=20'



A1 TYPICAL SECTION EMBANKMENT SE-2 STA 109+00 TO 120+40

SCALE: 1"=20'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88 GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011) NAD83 US SURVEY FT. SOUTH ZONE U.S. SURVEY FT. COMBINED FACTOR (CF): 0.999956656

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SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS308xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

SECTIONS
EMBANKMENT SE-2

SHEET ID
VOL. 1
CS308

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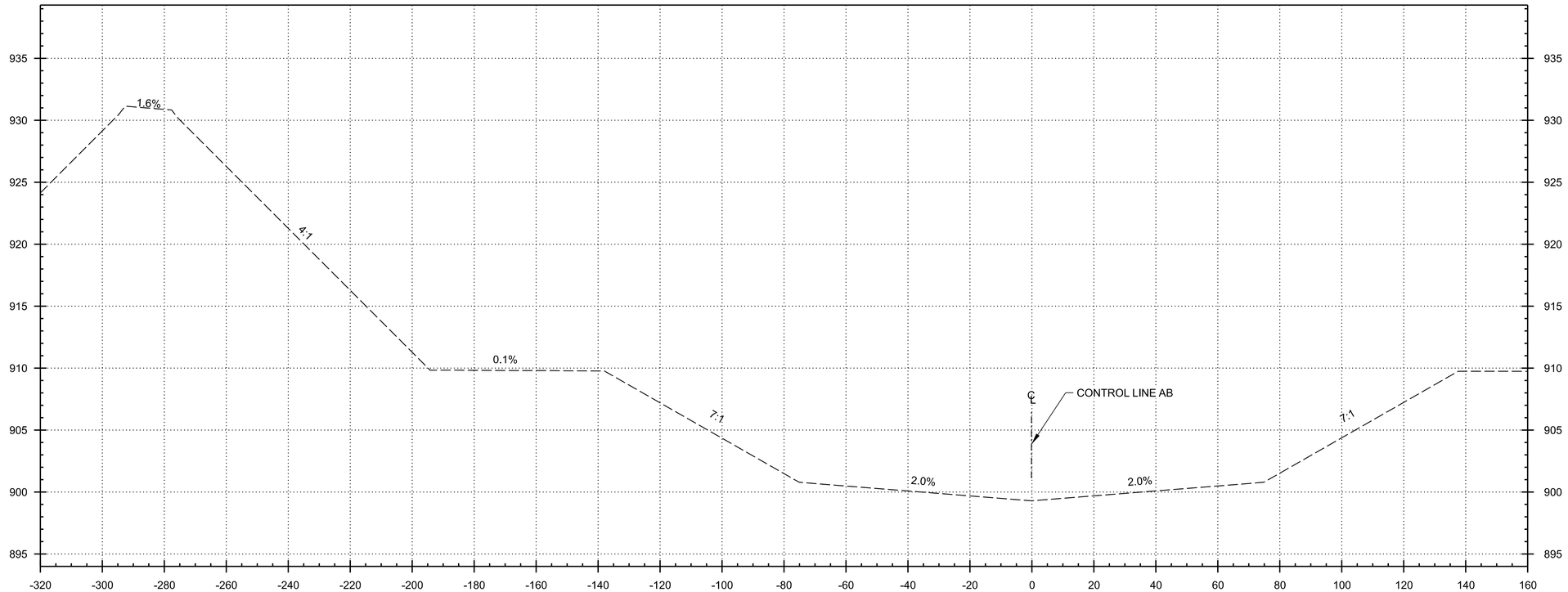
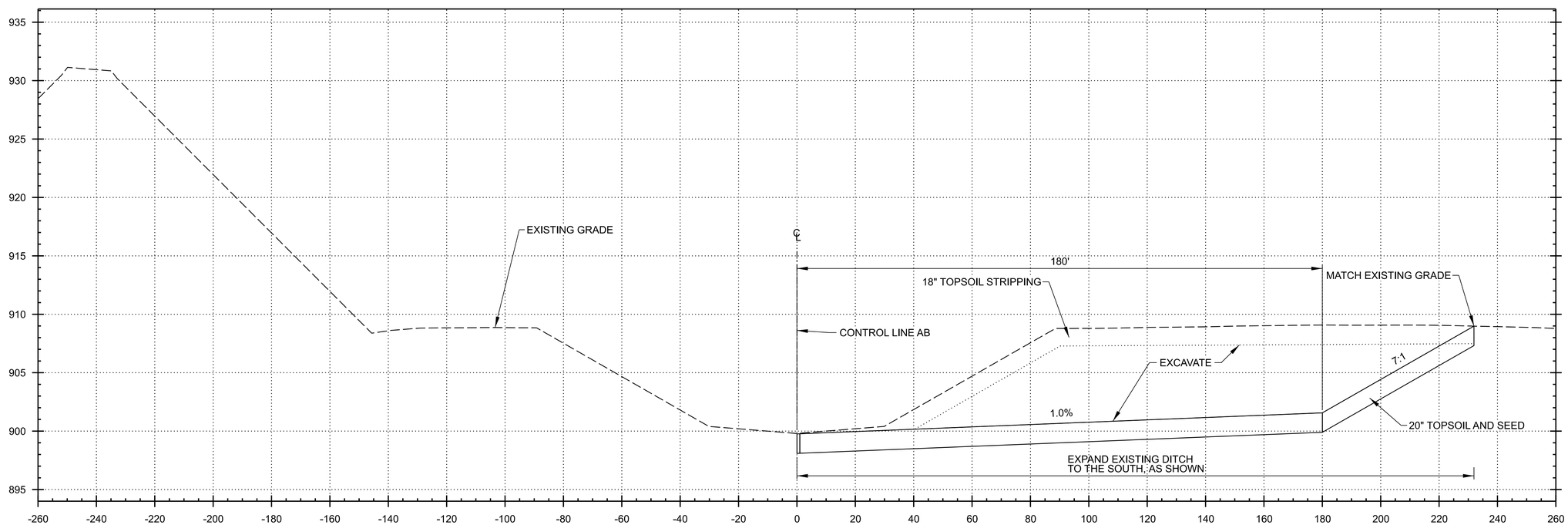


H1 TYPICAL SECTION - EXISTING DITCH AB STA 50+00

SCALE: 1"=20'



A1 TYPICAL SECTION - DITCH AB STA 17+00 TO 44+80

SCALE: 1"=20'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NDSP83 SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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SUBMITTED BY:	AS-BUILT NO.:
SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS309xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

SECTIONS
DITCH AB

SHEET ID
VOL. 1
CS309

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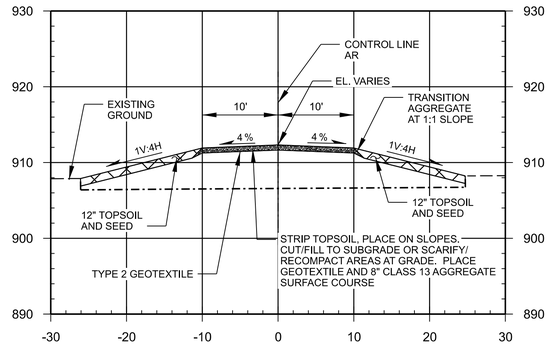
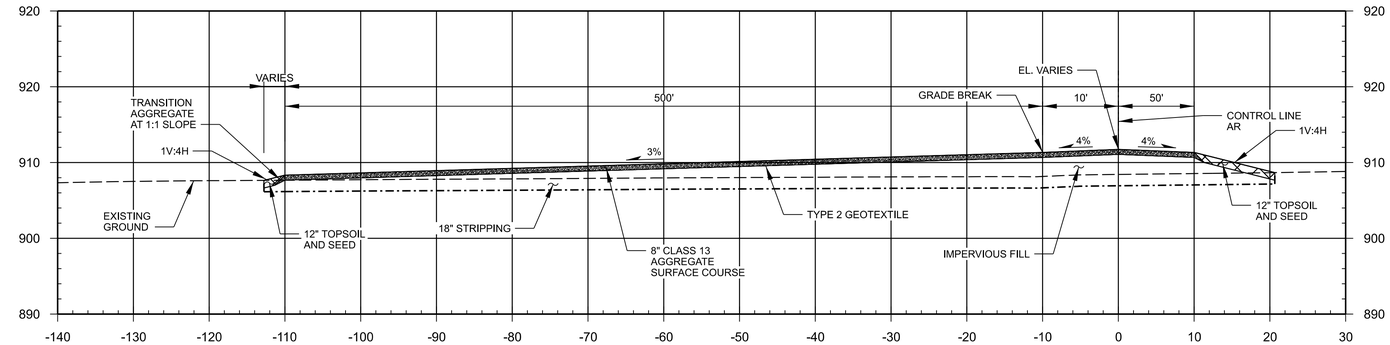


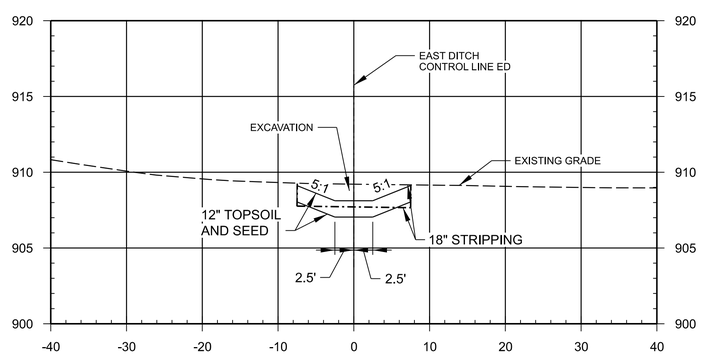
J1 TYPICAL SECTION - ACCESS ROAD (CONTROL LINE AD)

SCALE: 1"=10'



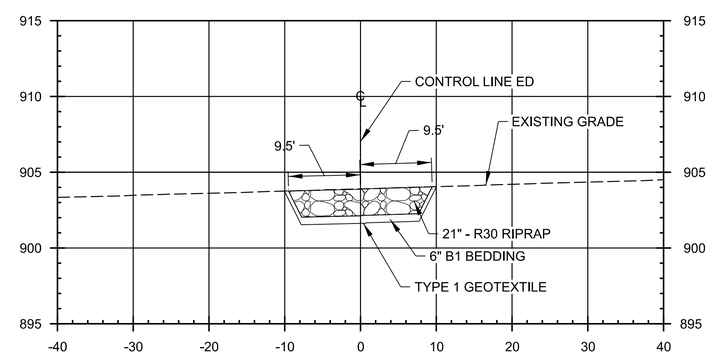
J7 TYPICAL SECTION: ACCESS ROAD TURNAROUND

SCALE: 1"=10'



A1 TYPICAL SECTION - EAST DITCH STA ED 0+20 TO 4+58

SCALE: 1"=10'



A11 TYPICAL SECTION - EAST DITCH STA ED 4+60 TO 4+89

SCALE: 1"=10'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88 GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011) NGS/CORS SOUTH ZONE-U.S. SURVEY FT. COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

DESIGNED BY: P. MORKEN	ISSUE DATE: 3 SEPT 2024
DRAWN BY: P. MORKEN	SOLICITATION NO.: W912ES23B0016
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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

TYPICAL SECTIONS
ACCESS ROAD (AD)
AND DITCH ED

SHEET ID
VOL. 1
CS310

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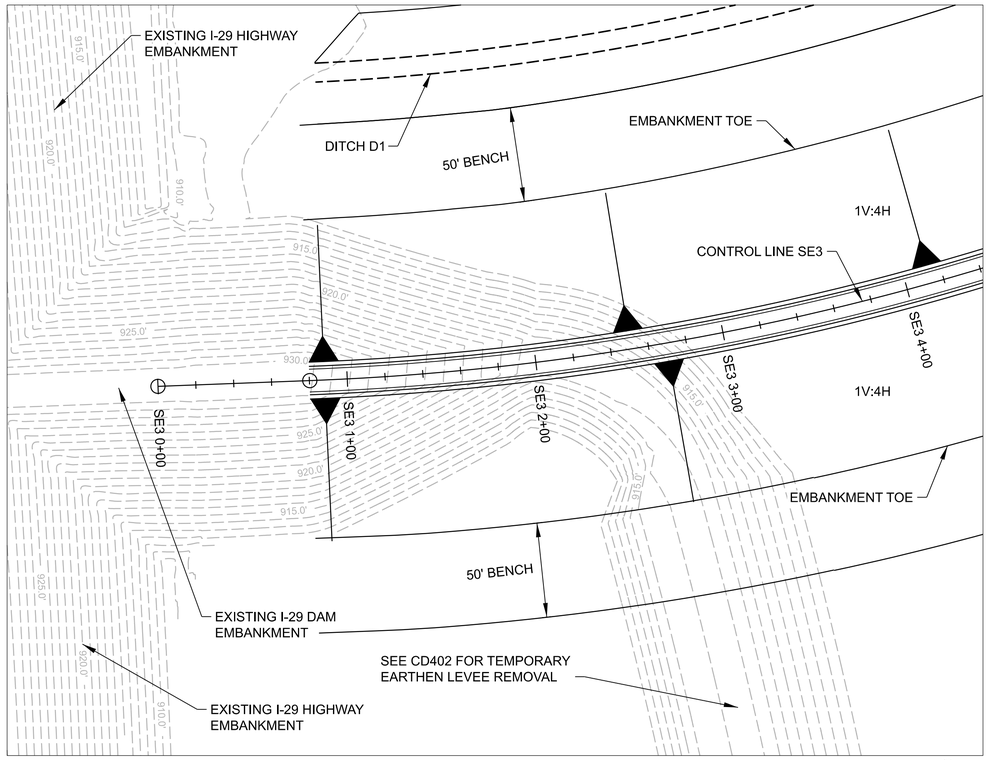
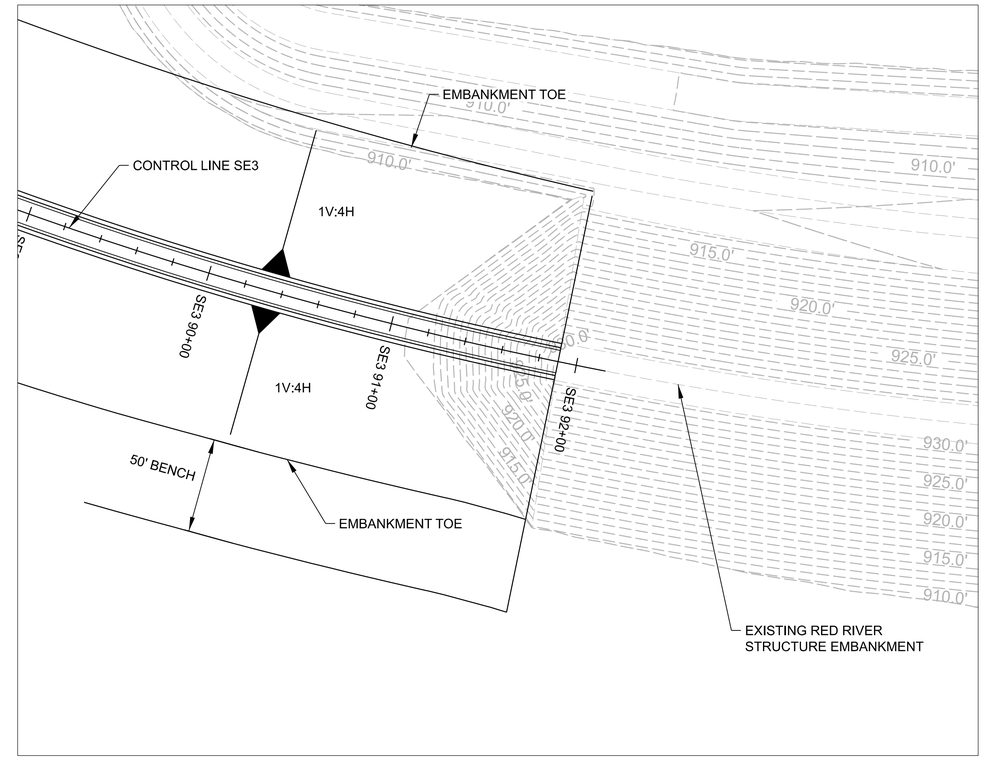


NOTE:
1. TOPSOIL SHALL BE REMOVED FROM THE END TRANSITION PRIOR TO BENCHING. ANY EXISTING TRM IN THE BENCHING AREA SHALL BE REMOVED, AND PROJECT TRM SHALL BE TIED IN EXISTING TRM PER MANUFACTURER INSTRUCTIONS.

G1 PLAN - TRANSITION TO I-29 EMBANKMENT

SCALE: 1"=40'

0 40' 80'

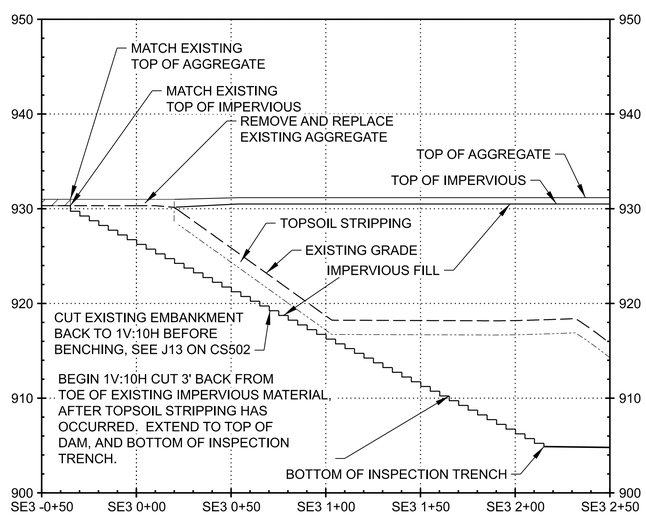


NOTE:
1. TOPSOIL SHALL BE REMOVED FROM THE END TRANSITION PRIOR TO BENCHING. ANY EXISTING TRM IN THE BENCHING AREA SHALL BE REMOVED, AND PROJECT TRM SHALL BE TIED IN EXISTING TRM PER MANUFACTURER INSTRUCTIONS.

G11 PLAN - TRANSITION TO RRS DAM EMBANKMENT

SCALE: 1"=40'

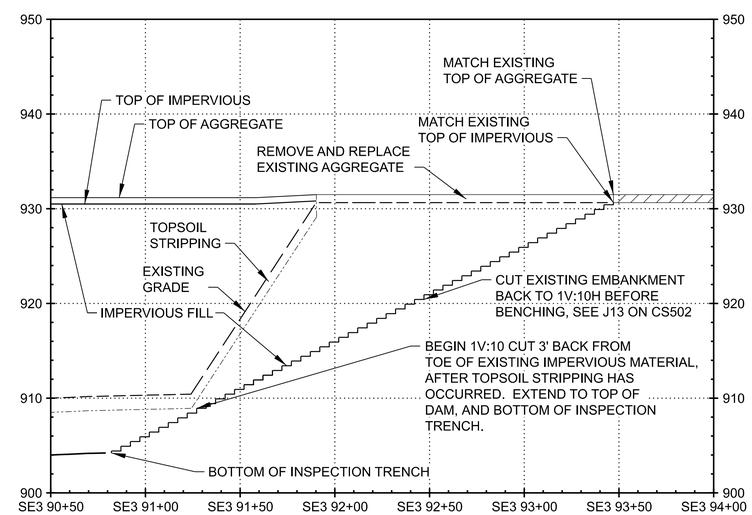
0 40' 80'



A1 PROFILE - SE-3 EMBANKMENT TIE-IN DETAIL

SCALE: 1"=40'

0 40' 80'



A11 PROFILE - SE-3 EMBANKMENT TIE-IN DETAIL

SCALE: 1"=40'

0 40' 80'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NDSPS: NORTH DAKOTA ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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DESIGNED BY: P. MORKEN	ISSUE DATE: 3 SEPT 2024
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U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

SE3 EMBANKMENT
PLAN AND PROFILE
DAM TIE-IN DETAILS

SHEET ID
VOL. 1
CS401

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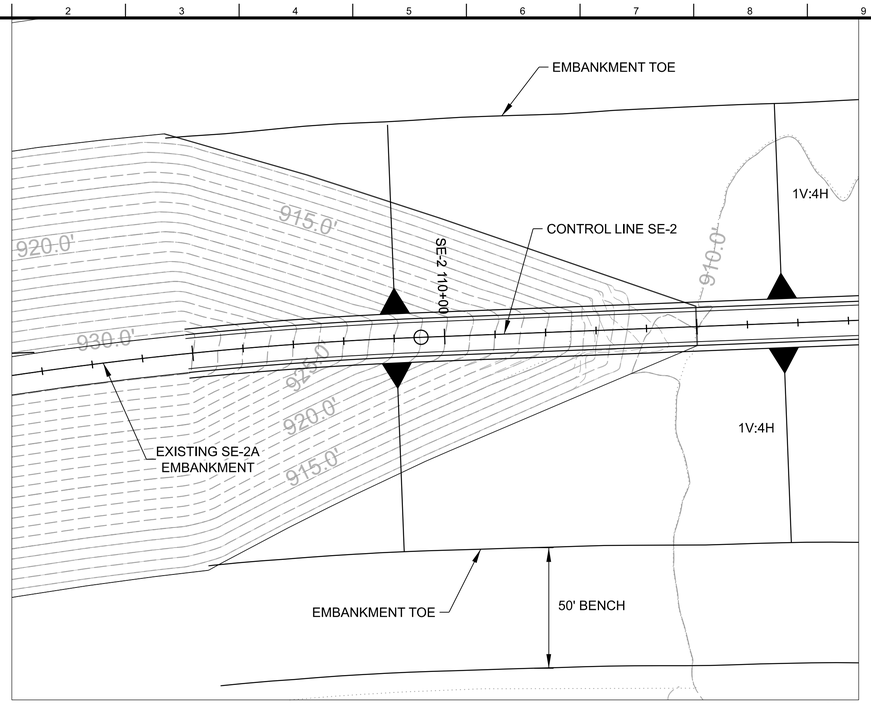
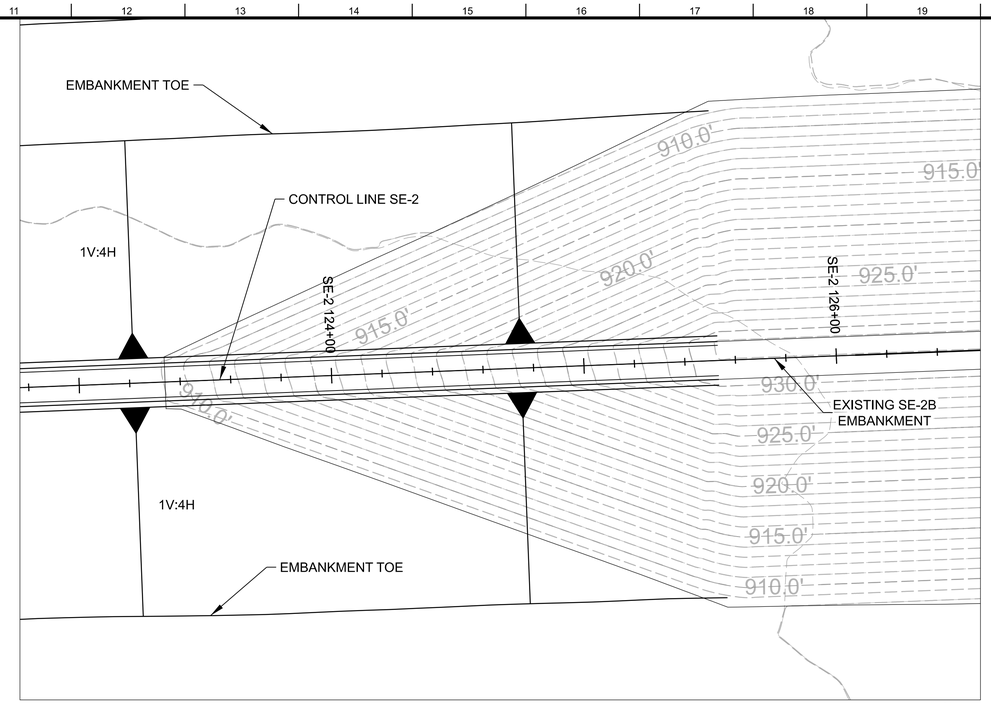


NOTE:
1. TOPSOIL SHALL BE REMOVED FROM THE END TRANSITION PRIOR TO BENCHING. ANY EXISTING TRM IN THE BENCHING AREA SHALL BE REMOVED, AND PROJECT TRM SHALL BE TIED IN EXISTING TRM PER MANUFACTURER INSTRUCTIONS.

H1 PLAN - SE-2 WEST TRANSITION TO SE-2A EMBANKMENT
SCALE: 1"=30'

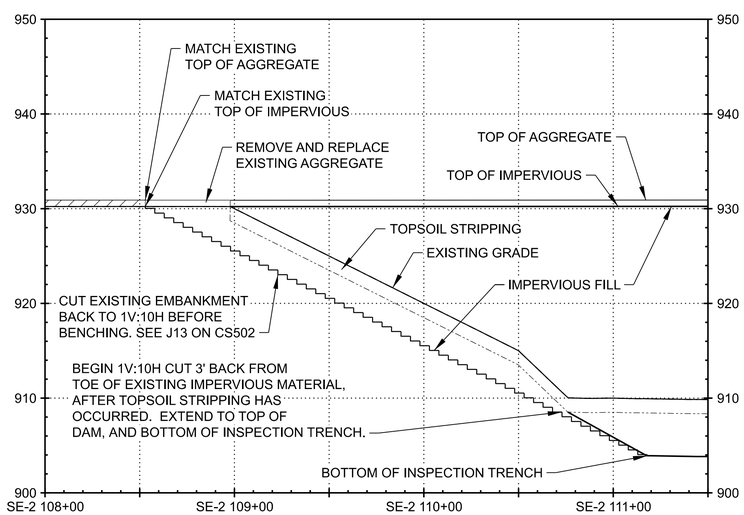
0 40' 80'



NOTE:
1. TOPSOIL SHALL BE REMOVED FROM THE END TRANSITION PRIOR TO BENCHING. ANY EXISTING TRM IN THE BENCHING AREA SHALL BE REMOVED, AND PROJECT TRM SHALL BE TIED IN EXISTING TRM PER MANUFACTURER INSTRUCTIONS.

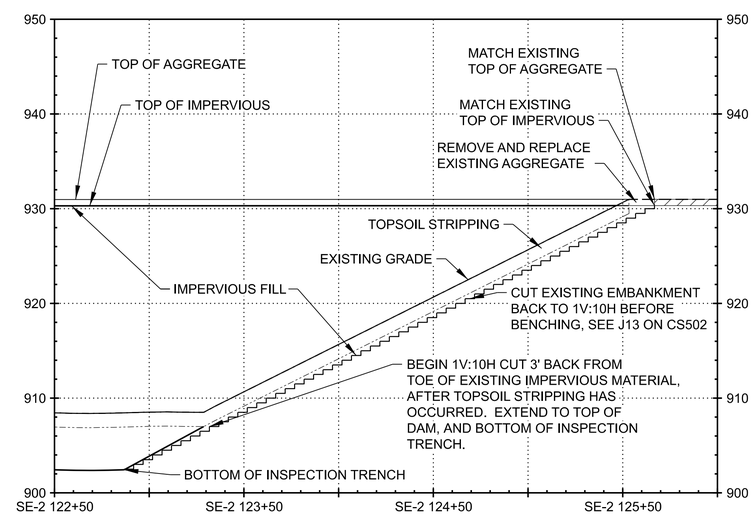
H11 PLAN - SE-2 EAST TRANSITION TO SE-2B EMBANKMENT
SCALE: 1"=30'

0 40' 80'



A1 PROFILE - SE-2 EMBANKMENT TIE-IN DETAIL
SCALE: 1"=30'

0 40' 80'



A11 PROFILE - SE-2 EMBANKMENT TIE-IN DETAIL
SCALE: 1"=30'

0 40' 80'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NDSPCS, SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: J. MOSER	ISSUE DATE: 3 SEPT 2024
DRAWN BY: J. MOSER	SOLICITATION NO.: W912ES23B0016
CHECKED BY: B. SPRANG	CONTRACT NO.:
SUBMITTED BY: R. MCGARVEY	AS-BUILT NO.:
SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS402xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

SE2 EMBANKMENT
PLAN AND PROFILE
DAM TIE-IN DETAILS

SHEET ID
VOL. 1
CS402

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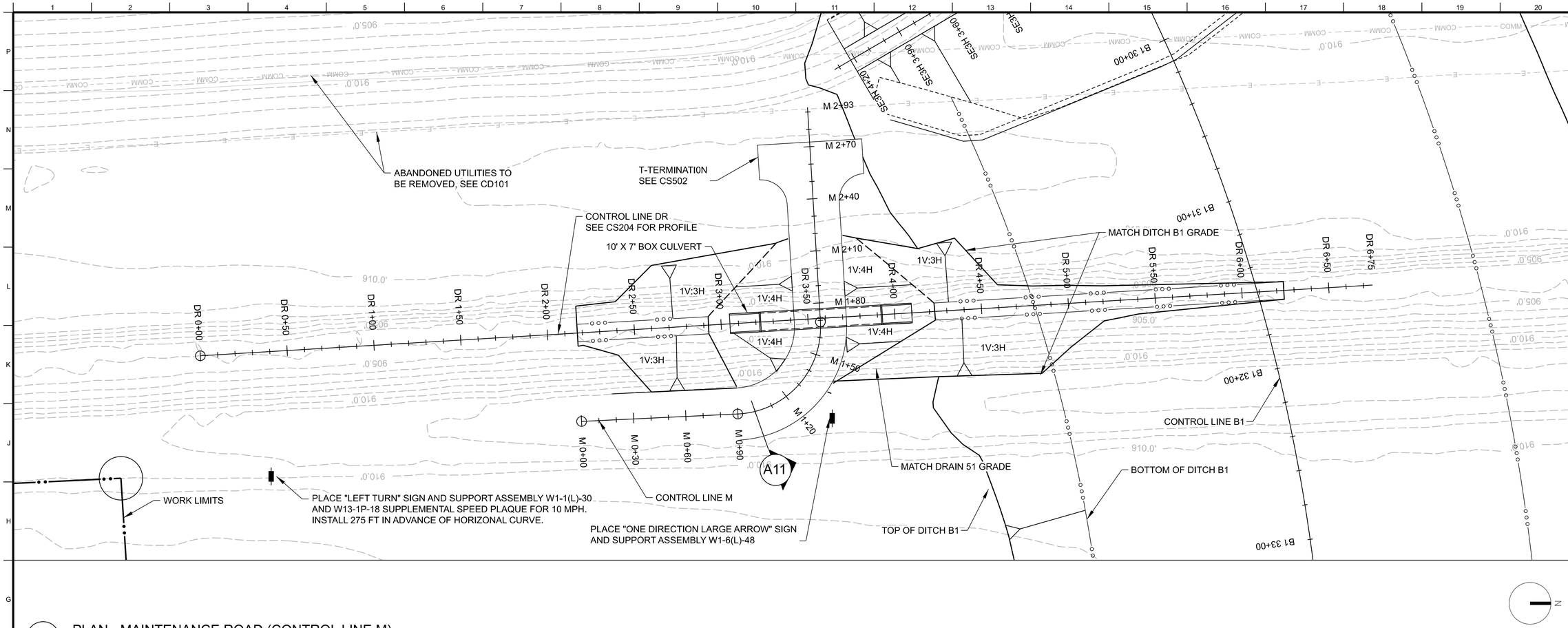
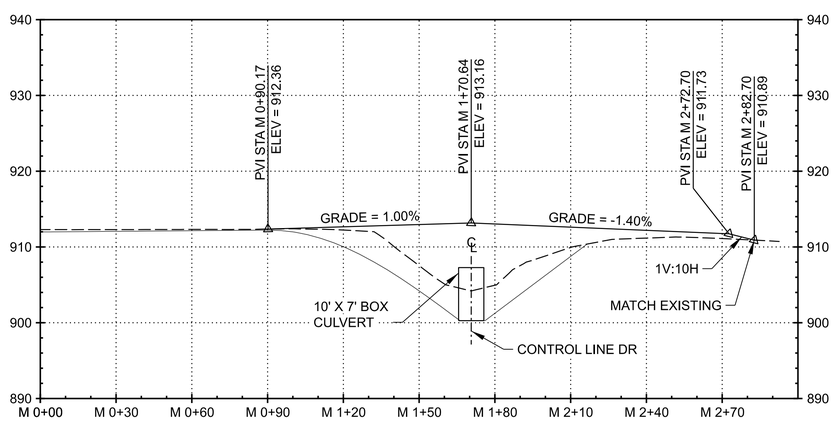


G1 PLAN - MAINTENANCE ROAD (CONTROL LINE M)

SCALE: 1"=30'

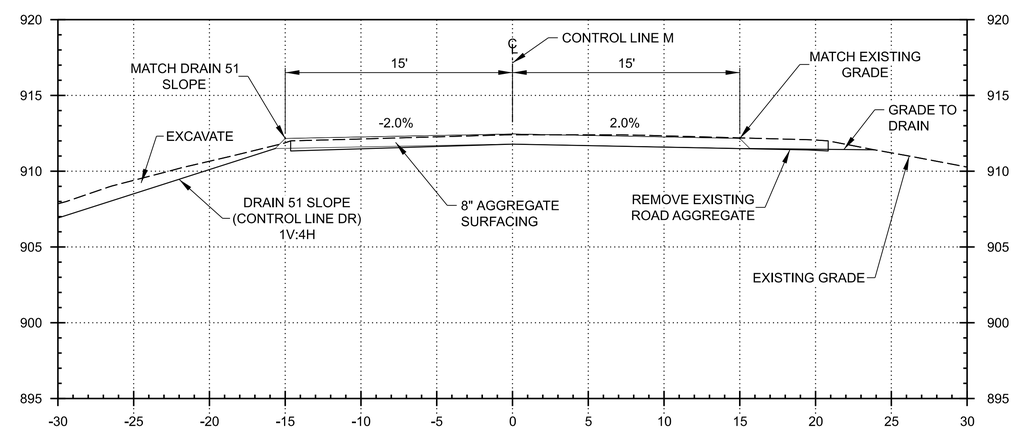
0 30' 40'



A1 PROFILE - CONTROL LINE M

SCALE: 1"=30'

0 30' 60'



A11 TYPICAL SECTIONS STA M 0+90 TO STA M 1+35

SCALE: 1"=5'

0 5' 10'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88 GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011) MN STATE PLANE SOUTH ZONE-U.S. SURVEY FT. COMBINED FACTOR (CF) 0.999956556

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MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN	ISSUE DATE: 3 SEPT 2024
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U.S. ARMY CORPS OF ENGINEERS
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ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

MAINTENANCE ROAD
PLAN AND PROFILE

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CS403

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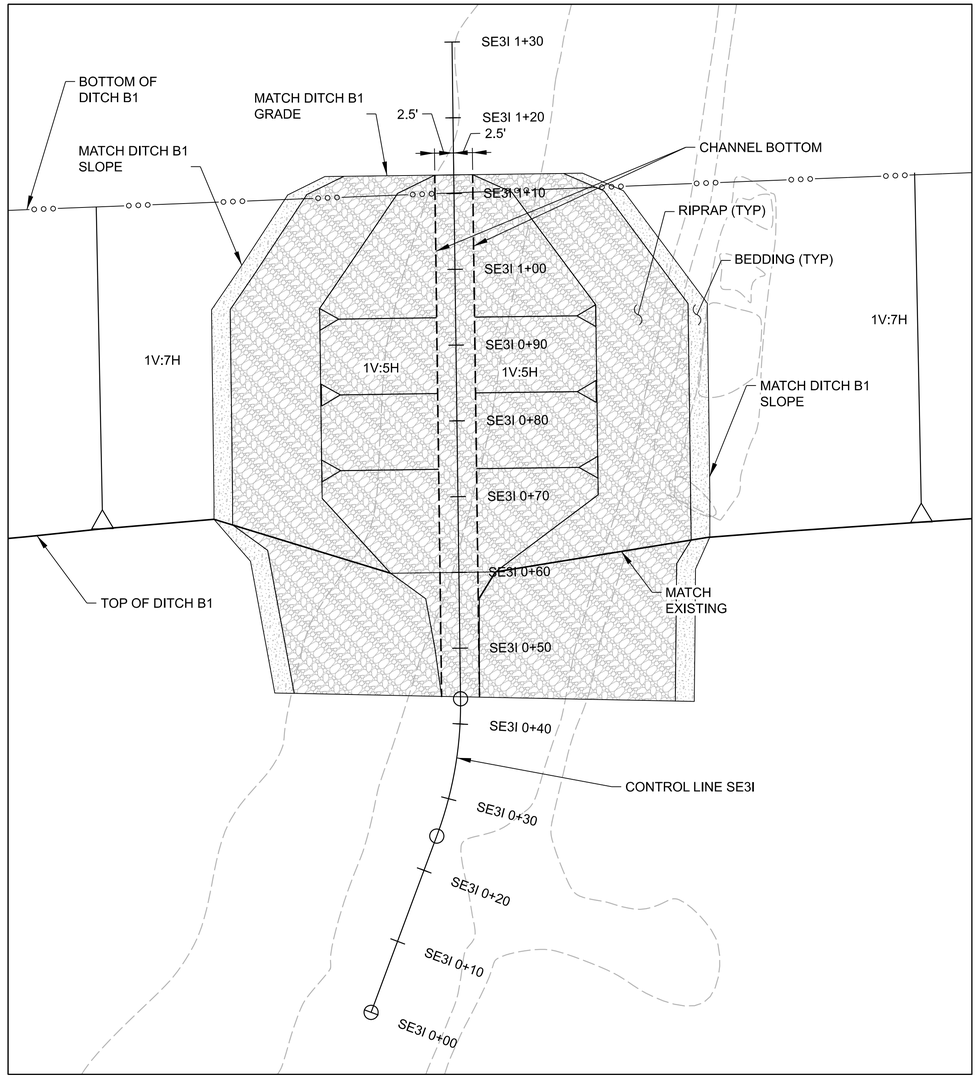
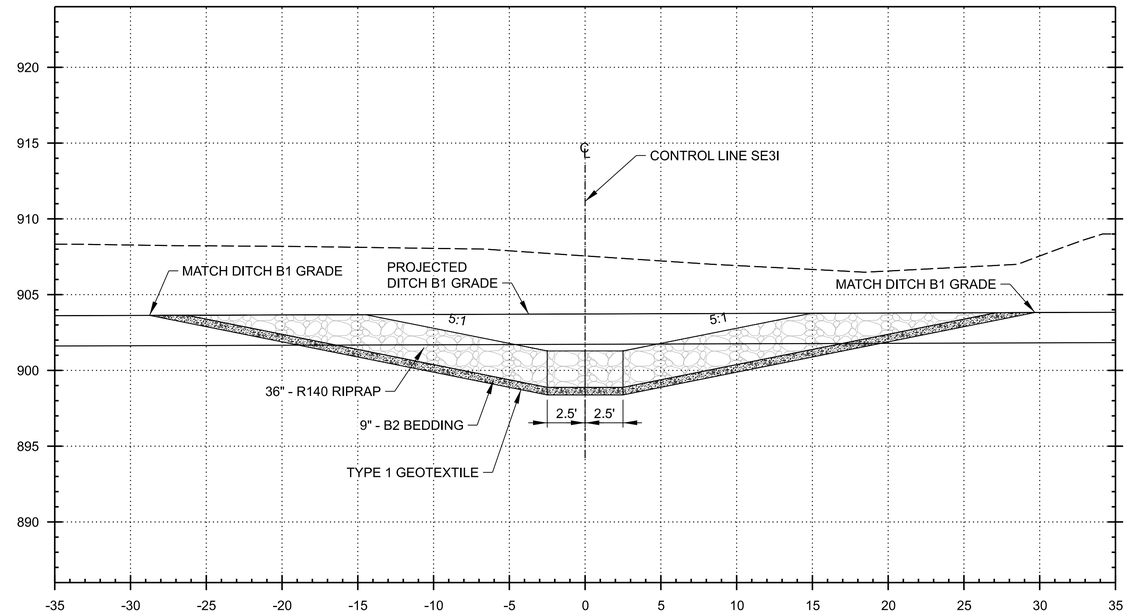


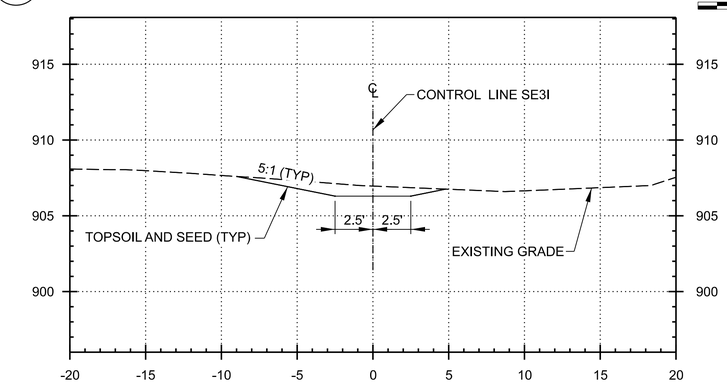
E1 PLAN - DROP STRUCTURE SE-3I
SCALE: 1"=10'

0 10' 20'

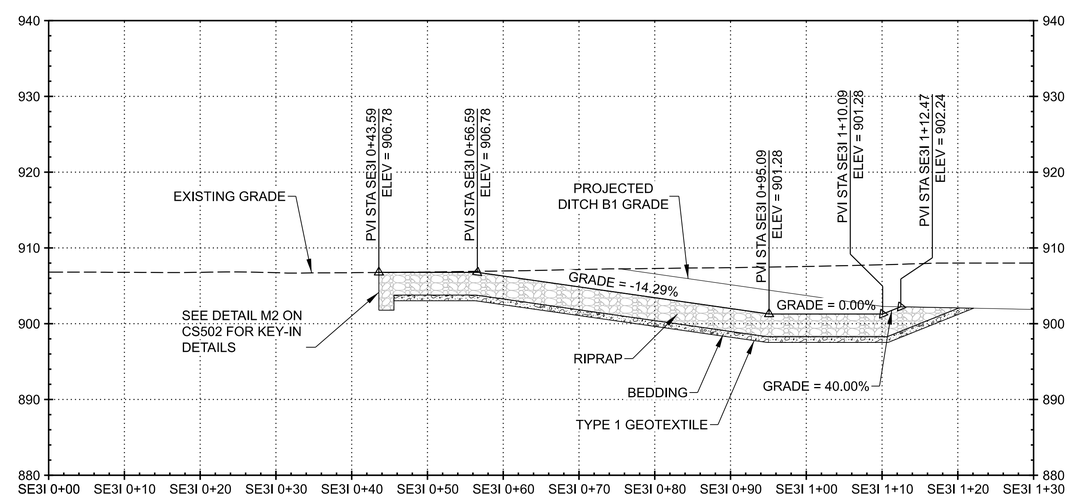
N



H11 TYPICAL SECTION - DROP STRUCTURE SE-3I
STA 0+60 TO 1+10
SCALE: 1"=5'



A1 TYPICAL SECTION - DROP STRUCTURE SE-3I
0+43
SCALE: 1"=10'



A11 PROFILE - DROP STRUCTURE SE-3I
SCALE: 1"=10'

0 10' 20'

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88 GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011) NAD 83 (2011) SOUTH ZONE-U.S. SURVEY FT. COMBINED FACTOR (CF): 0.99996556

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN	ISSUE DATE: 3 SEPT 2024
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U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DROP STRUCTURE SE-3I
PLAN, PROFILE, AND SECTIONS

SHEET ID
VOL. 1
CS404

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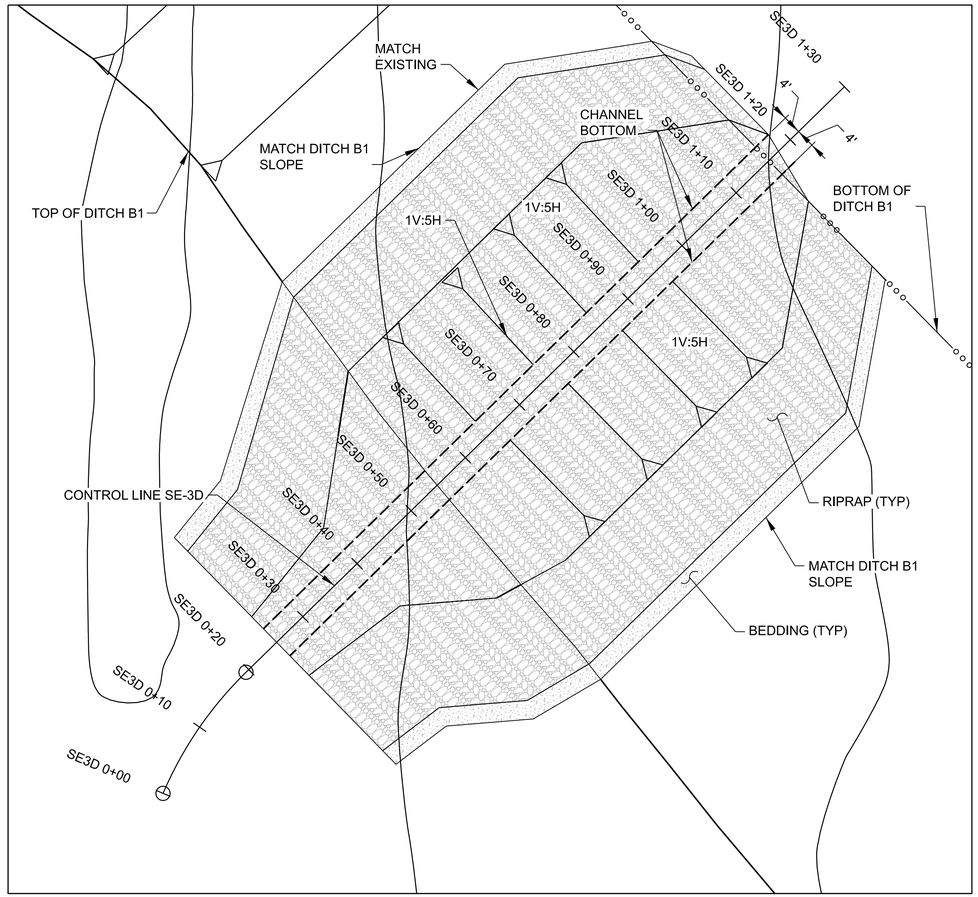
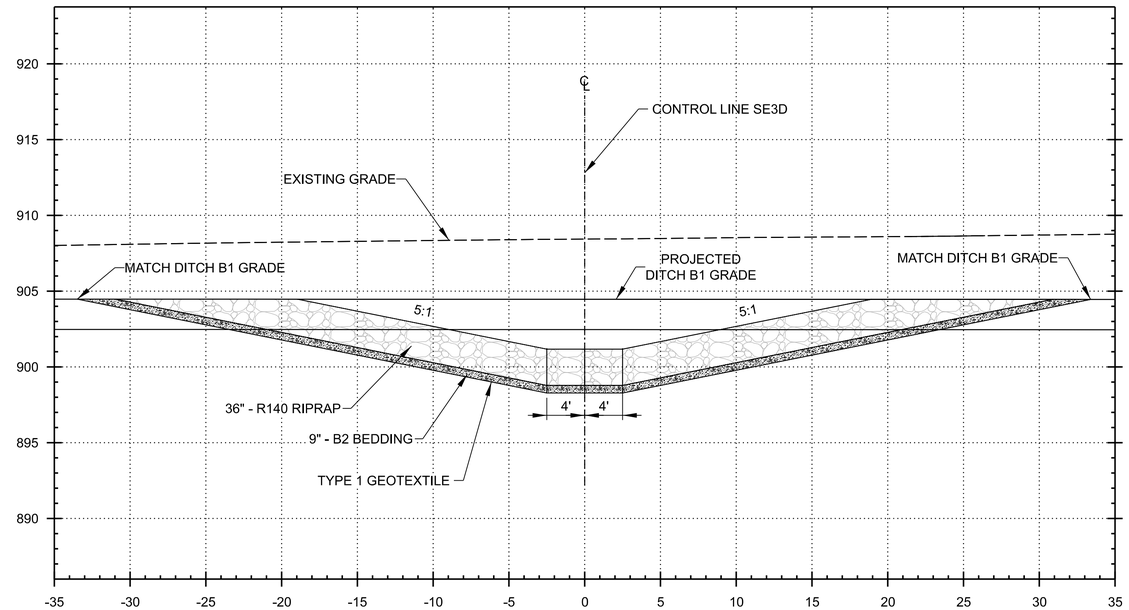
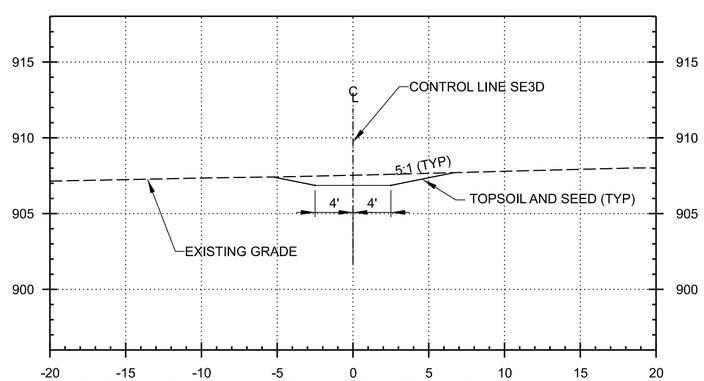


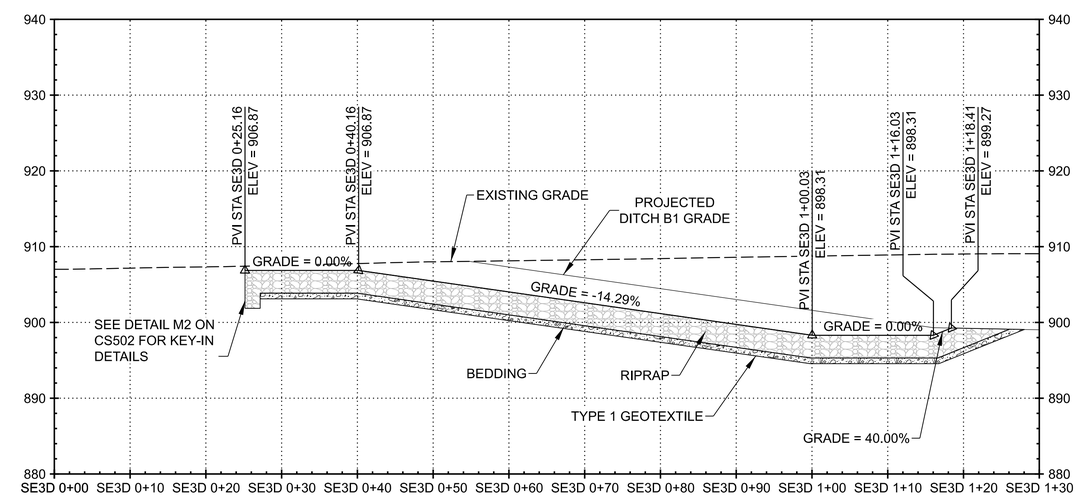
F1 PLAN - DROP STRUCTURE SE-3D
SCALE: 1"=10'



G11 TYPICAL SECTION - DROP STRUCTURE SE-3D
STA 0+70
SCALE: 1"=5'



A1 TYPICAL SECTION - DROP STRUCTURE SE-3D
STA 0+25
SCALE: 1"=5'



A11 PROFILE - DROP STRUCTURE SE-3D
SCALE: 1"=10'

0 10' 20'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NAD83 (2011) SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.99995556

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U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DROP STRUCTURE SE-3D
PLAN, PROFILE, AND SECTIONS

SHEET ID
VOL. 1
CS405

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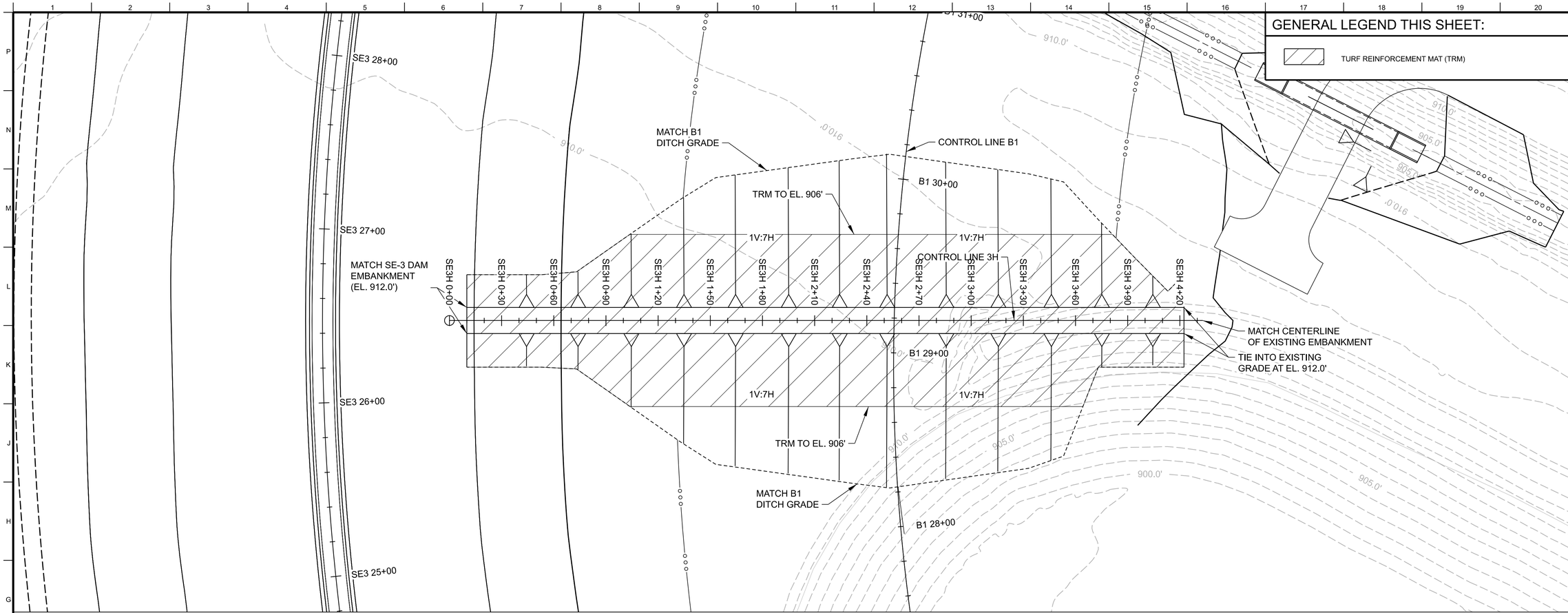
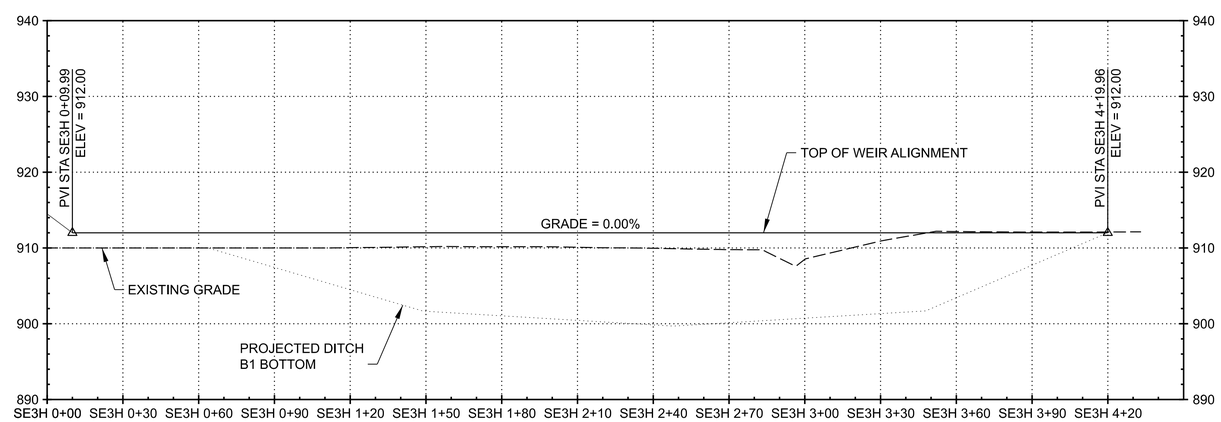


F1 PLAN - WEIR SE-3H

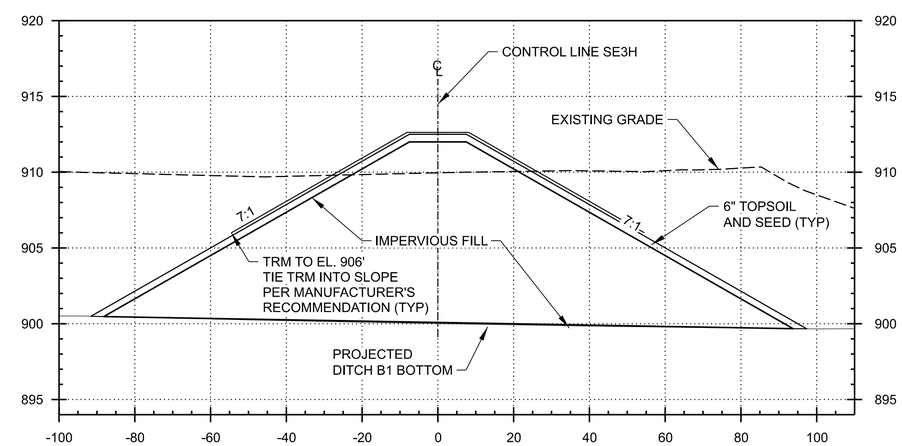
SCALE: 1"=30'



A1 PROFILE - WEIR SE-3H

SCALE: 1"=30'

0 30' 60'



A12 TYPICAL SECTION - WEIR SE-3H

SCALE: 1"=20'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NORTH DAKOTA SOUTH ZONE,U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

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U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

WEIR SE-3H
PLAN AND PROFILE

SHEET ID
VOL. 1
CS406

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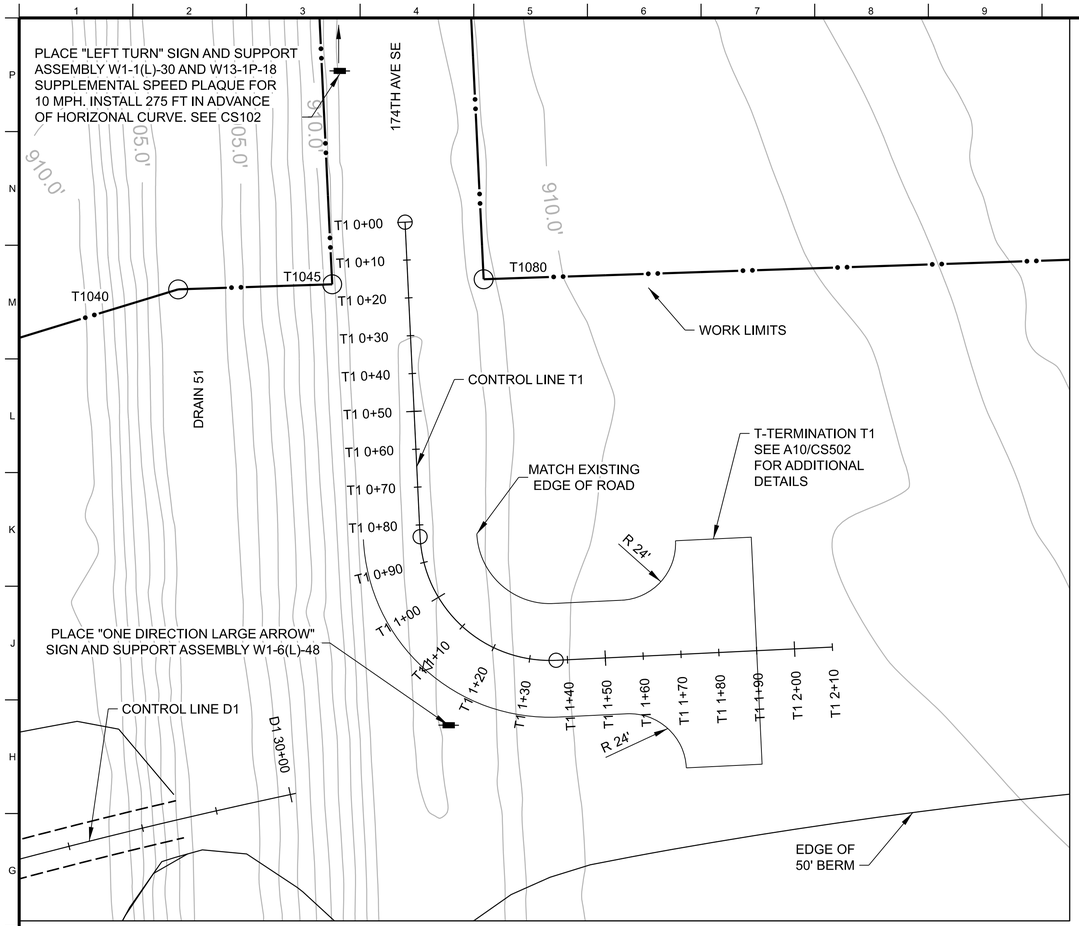
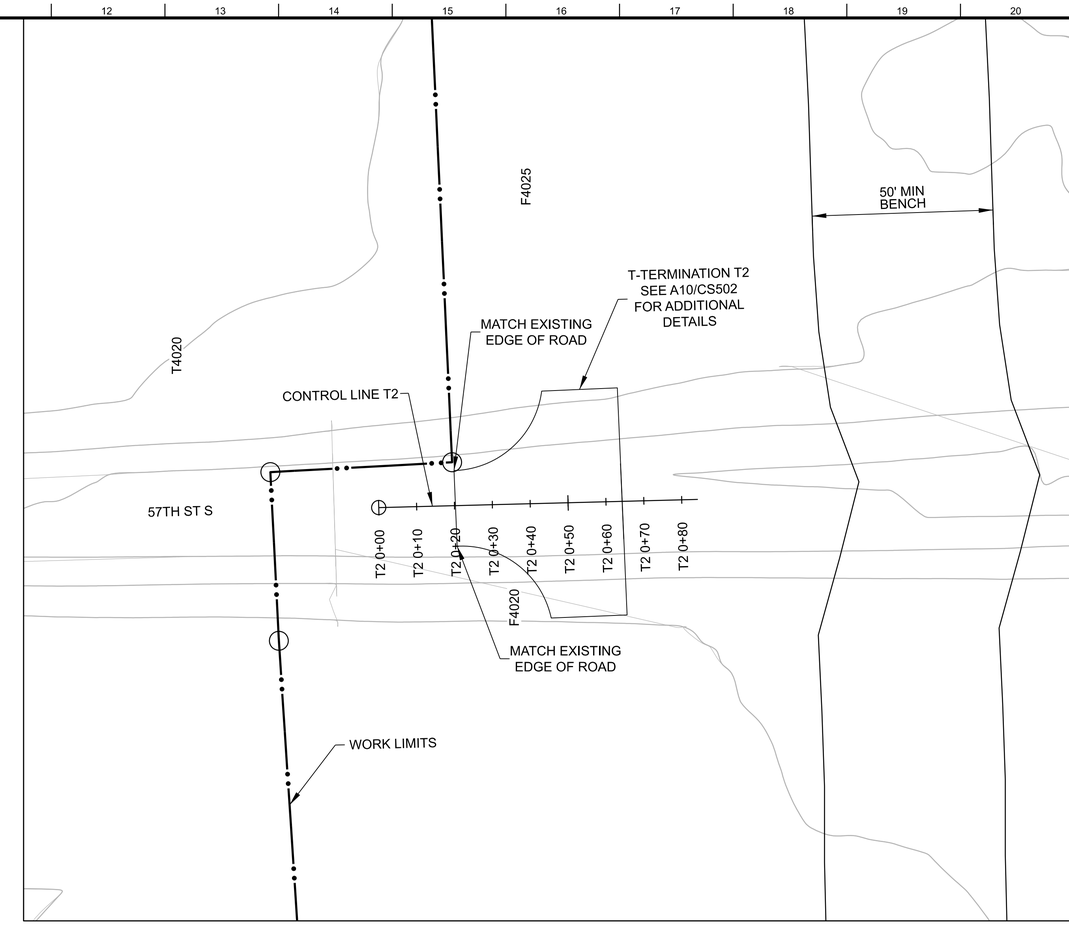


F1 PLAN - T-TERMINATION T1

SCALE: 1"=20'

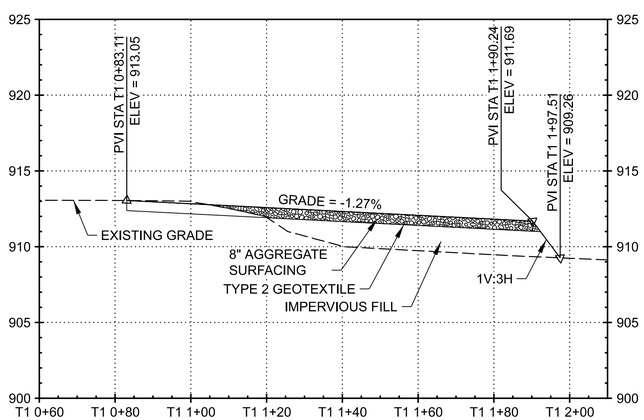
0 20' 40'



F11 PLAN - T-TERMINATION T2

SCALE: 1"=20'

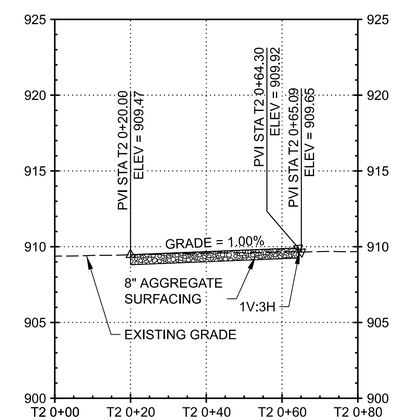
0 20' 40'



A3 PROFILE - CONTROL LINE T1

SCALE: 1"=20'

0 20' 40'



A11 PROFILE - CONTROL LINE T2

SCALE: 1"=20'

0 20' 40'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NAD 83 (2011) SOUTH ZONE,U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

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MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN	ISSUE DATE: 3 SEPT 2024
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U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

PLAN AND PROFILE
T-TERMINATION T1 AND T2

SHEET ID
VOL. 1
CS407

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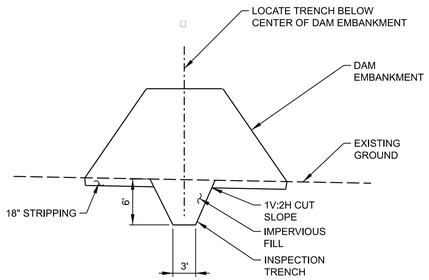
GENERAL SHEET NOTES

1. USE 8" LONG TWIST PINS SPACED PER MANUFACTURER'S RECOMMENDATIONS.
2. USE 12" TWIST PINS SPACED PER MANUFACTURERS RECOMMENDATIONS FOR ALL ANCHOR TRENCHES.
3. USE 12 INCH MINIMUM, LONG STEEL T OR U-SHAPED PINS AT 2 FEET.
4. TRM SHALL BE INSTALLED PER MANUFACTURER'S METHOD FOR SLOPE APPLICATION WITH THE EXCEPTION OF THE ANCHOR TRENCH AT THE TOE OF SLOPE.
5. TRM SHALL BE PLACED ON THE UPSTREAM SLOPE EMBANKMENT FOR THE ENTIRE SE-2 AND SE-3 EMBANKMENTS.
6. TRM SHALL BE PLACED ON THE SE-2B WEIR AND SE-3H WEIR, AS SHOWN ON CS110, CS206, AND CS406.

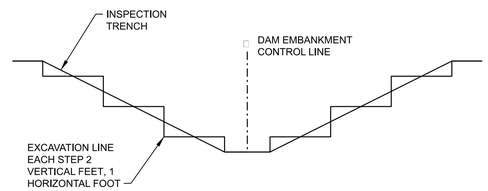


NOTES:

1. DIMENSIONS PROVIDED ARE MINIMUM DIMENSIONS.
2. MASS BALANCE CALCULATIONS ARE BASED ON A 3' TRENCH BOTTOM WIDTH.

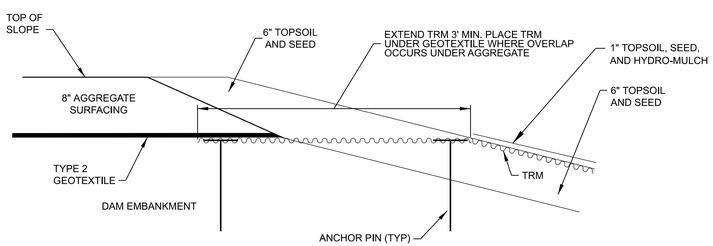
J1 DETAIL - INSPECTION TRENCH AND BENCHING SECTION

SCALE : NTS



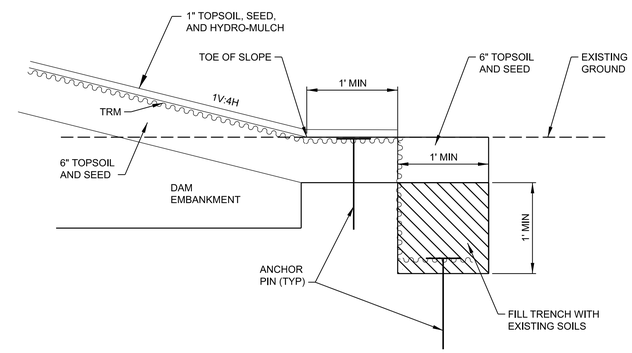
J7 DETAIL - EXCAVATION AND BENCHING

SCALE : NTS



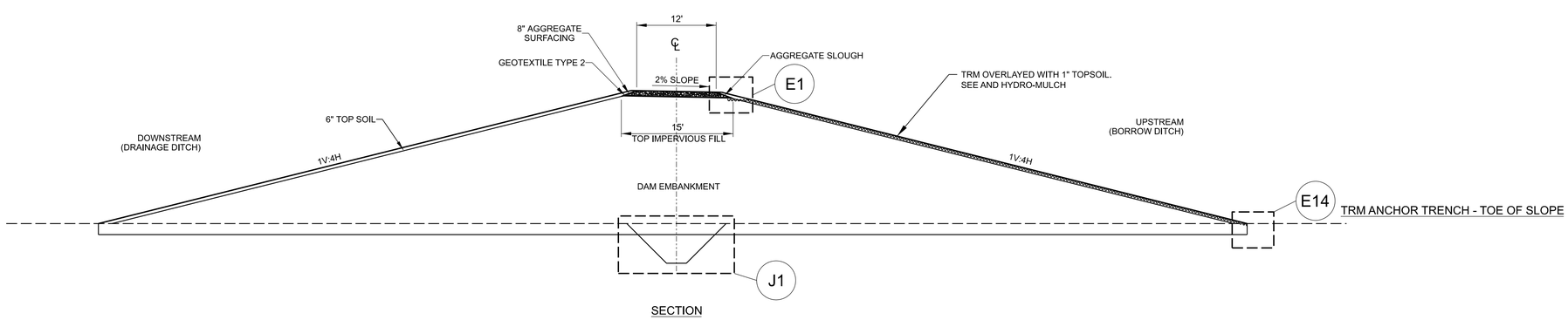
E1 DETAIL - TRM ANCHORING AT TOP OF SLOPE

SCALE : NTS



E14 DETAIL - TRM ANCHOR TRENCH TOE OF SLOPE

SCALE : NTS



A1 DETAIL - DAM EMBANKMENT TRM

SCALE : NTS

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NAD83 (2011) SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

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DESIGNED BY: P. MORKEN
DRAWN BY: P. MORKEN
CHECKED BY: B. SPRANG
SUBMITTED BY:
SIZE: ANSI D
FILE NAME: FMMSE3_VOL1_CS501xxx.dgn
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
AS-BUILT NO.:

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DETAILS
TURF REINFORCEMENT MAT AND INSPECTION TRENCH

SHEET ID
VOL. 1
CS501

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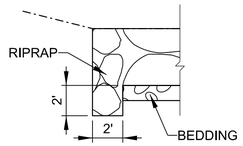
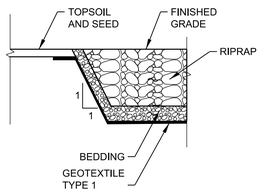
GENERAL SHEET NOTES

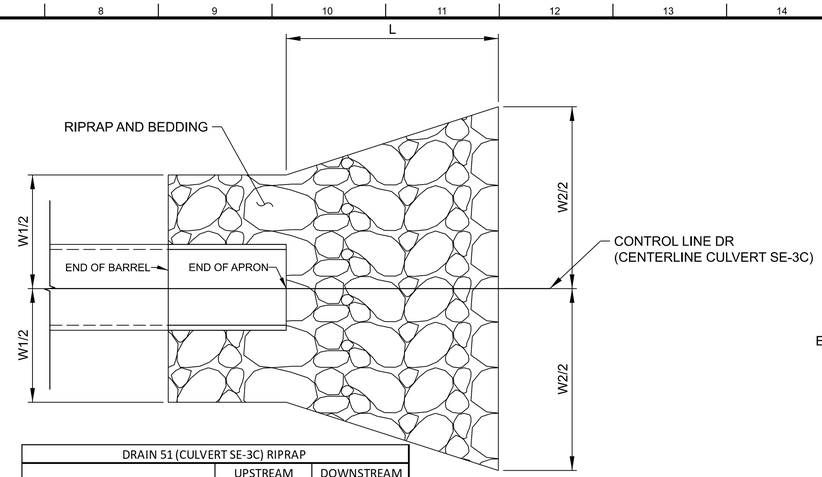
1. TOPSOIL SHALL BE REMOVED FROM THE END TRANSITION PRIOR TO BENCHING. ANY EXISTING TRM IN THE BENCHING AREA SHALL BE REMOVED, AND PROJECT TRM SHALL BE TIED IN EXISTING TRM PER MANUFACTURER INSTRUCTIONS. SEE CS401 AND CS402 FOR LOCATIONS.
2. PRIOR TO A WINTER SHUTDOWN, 1V:10H SLOPE TRANSITIONS SHALL BE CONSTRUCTED AT THE END OF ANY CONSTRUCTED PORTION OF DAM EMBANKMENT. DETAIL J15 SHALL BE UTILIZED UPON RE-START OF EMBANKMENT CONSTRUCTION AFTER A WINTER SHUTDOWN PERIOD.



M2 DROP STRUCTURE KEY-IN
N.T.S.



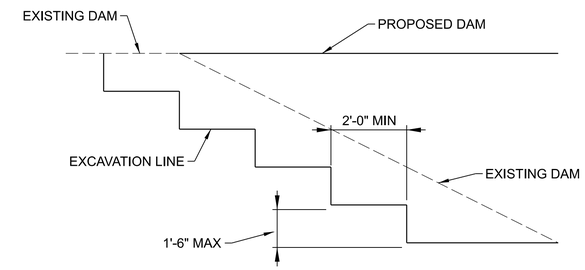
K2 TYPICAL DETAIL - RIPRAP-TOPSOIL TRANSITION
N.T.S.



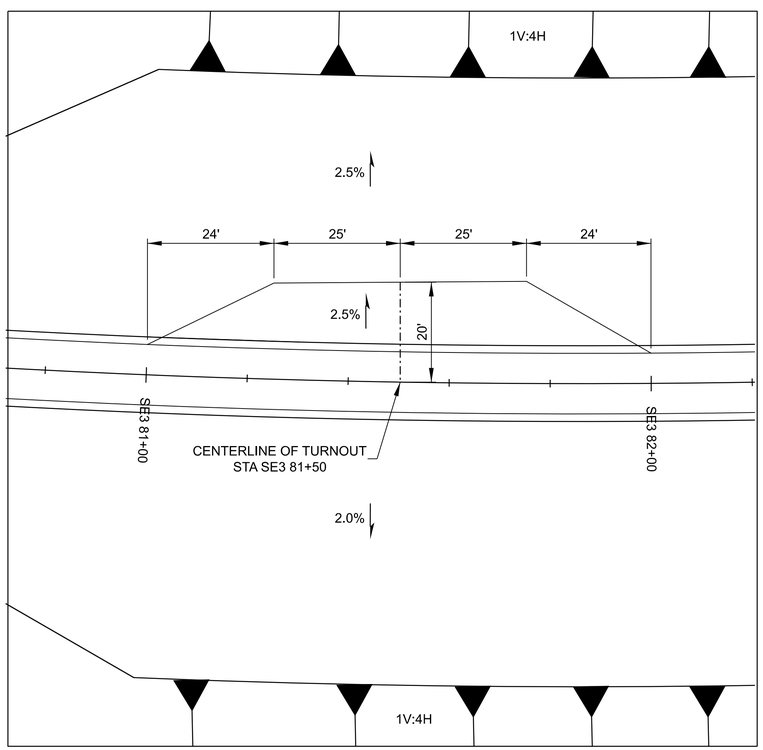
DRAIN 51 (CULVERT SE-3C) RIPRAP		
	UPSTREAM	DOWNSTREAM
GRADATION	R20	R80
APRON DEPTH (IN)	18	30
BEDDING	B1	B2
BEDDING DEPTH (IN)	6	9
APRON LENGTH L (FT)	28	42
APRON END WIDTH W1 (FT)	30	30
APRON END WIDTH W2 (FT)	48	58

TYPE 1 GEOTEXTILE SHALL BE PLACED UNDER UPSTREAM & DOWNSTREAM BEDDING

J8 DETAIL - DRAIN 51 RIPRAP
NTS

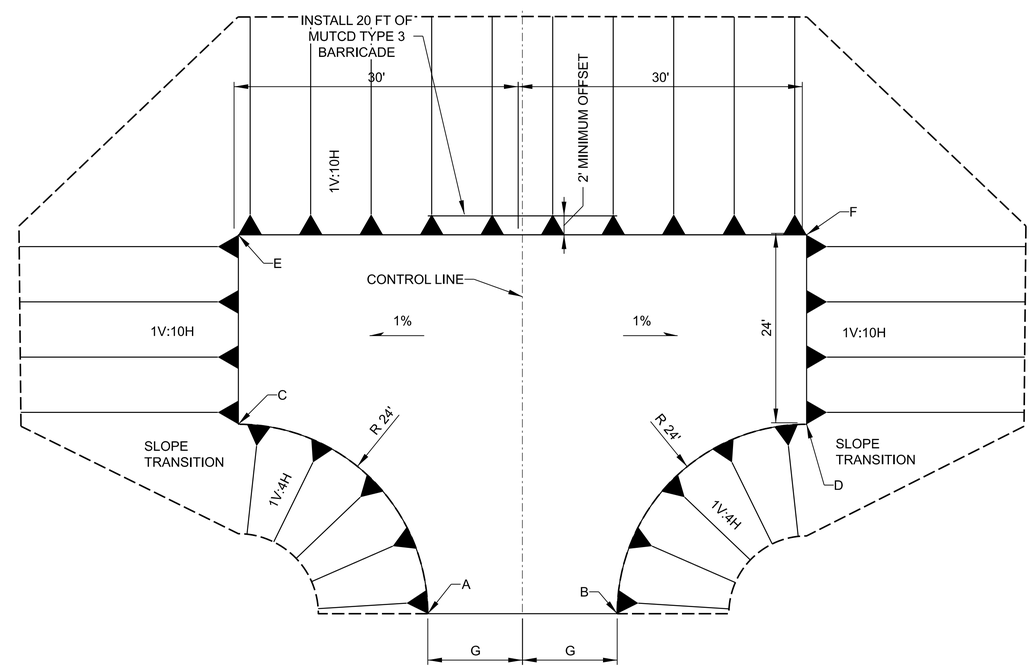


J15 TYPICAL DETAIL - EXISTING EMBANKMENT BENCHING
N.T.S.



NOTES:
SEE CS305 FOR SECTION SHOWING TURNOUT.

A1 DETAIL - TURNOUT
SCALE: 1"=15'



T-TERMINATION GRADING POINT ELEVATIONS								
	A	B	C	D	E	F	G	PLAN & PROFILE
T1	912.95'	912.95'	912.44	912.44	911.39'	911.39'	15'	CS407
T2	909.37'	909.37'	909.41'	909.41'	909.62	909.62	15'	CS407
T3	911.86	911.86	911.17	911.17	910.76	910.76	10'	CS403

A10 TYPICAL DETAIL - T-TERMINATION
N.T.S.

0 4' 8' 16'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NORTH DAKOTA SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN	ISSUE DATE: 3 SEPT 2024
DRAWN BY: P. MORKEN	SOLICITATION NO.: W912ES23B0016
CHECKED BY: B. SPRANG	CONTRACT NO.:
SUBMITTED BY:	AS-BUILT NO.:
SIZE: ANSI D	FILE NAME: FMMSE3_VOL1_CS502xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

CIVIL DETAILS

SHEET ID
VOL. 1
CS502

ADVERTISEMENT

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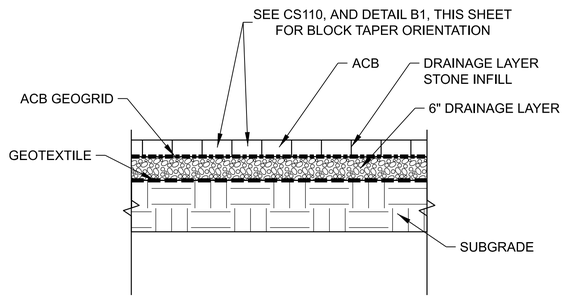
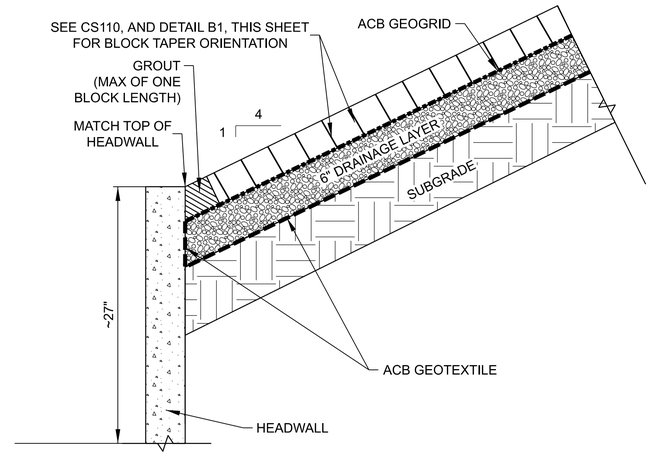
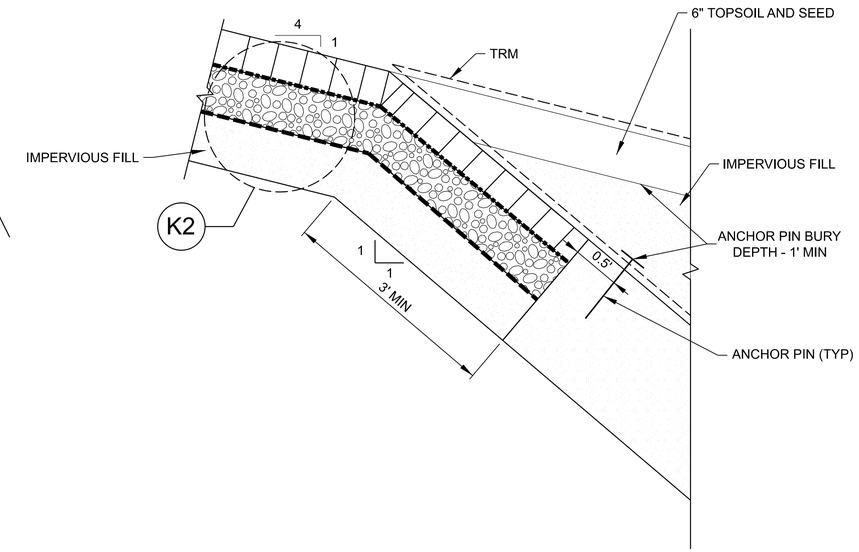


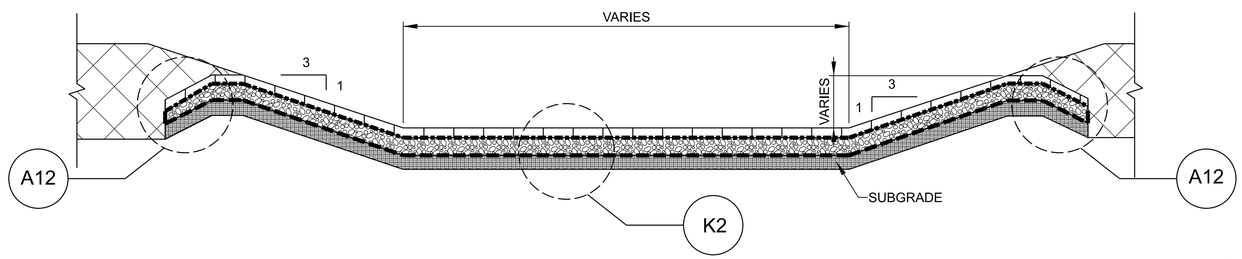
K2 TYPICAL SECTION - ACB
NTS



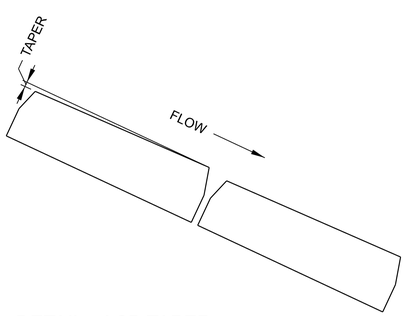
J7 DETAIL - ACB HEADWALL TIE-IN
NTS



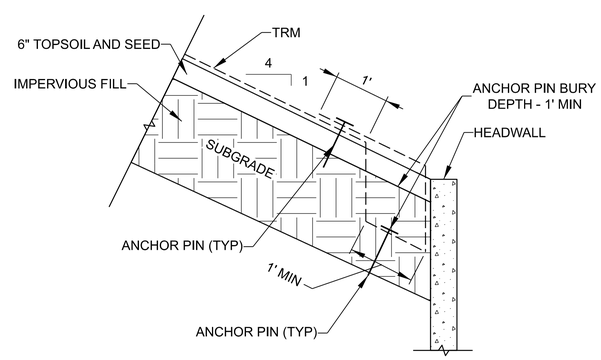
J13 DETAIL - ACB-TRM TIE-IN
NTS



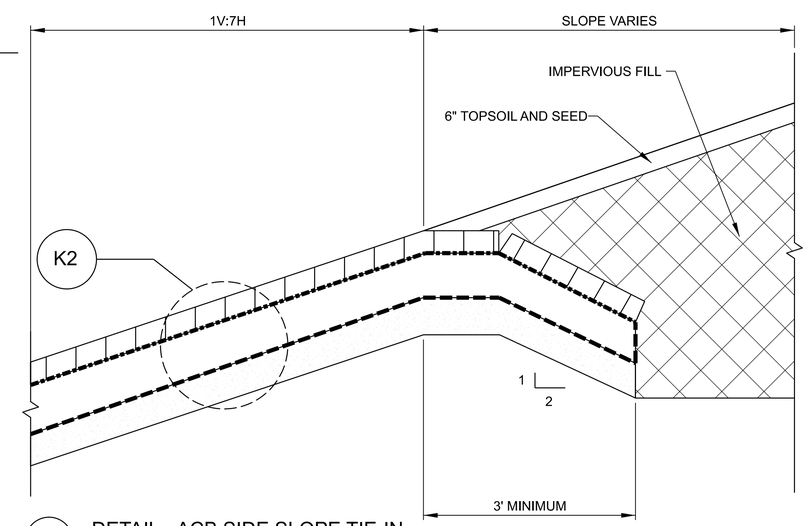
F1 TYPICAL SECTION - SE-2B WEIR
NTS



B1 DETAIL - ACB TAPER
NTS



B8 DETAIL - TRM HEADWALL TIE-IN
N.T.S.



A12 DETAIL - ACB SIDE SLOPE TIE-IN
NTS

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NAD 83 (2011) SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN
DRAWN BY: P. MORKEN
CHECKED BY: B. SPRANG
SUBMITTED BY:
SIZE: ANSI D
FILE NAME: FMMSE3_VOL1_CS503xxx.dgn
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
AS-BUILT NO.:

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

ARTICULATED CONCRETE BLOCK (ACB)
DETAILS

SHEET ID
VOL. 1
CS503

ADVERTISEMENT

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PD: AEC_pdf.pltcfg DS: AEC_Screen_FullSize.dscript
1:27:30 PM 9/5/2024

CONTROL LINE DATA - WORK LIMITS A

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)
T1000			400837.85	2888958.94
	N84°45'42"E	210.63 '		
T1005			400857.08	2889168.7
	N74°06'53"E	173.55 '		
T1010			400904.58	2889335.62
	N64°22'15"E	206.72 '		
T1015			400994	2889522
	N54°29'28"E	159.20 '		
T1020			401086.46	2889651.59
	N45°50'00"E	168.64 '		
T1025			401203.96	2889772.56
	N34°58'28"E	252.79 '		
T1030			401411.1	2889917.46
	N27°08'45"E	282.29 '		
T1035			401662.3	2890046.26
	N30°24'35"E	317.19 '		
T1040			401935.85	2890206.81
	N38°34'34"E	272.90 '		
T1045			402149.2	2890376.98
	N48°09'26"E	327.48 '		
T1050			402367.66	2890620.95
	N66°26'21"E	316.63 '		
T1055			402494.23	2890911.19
	N73°03'12"E	313.75 '		
T1060			402585.68	2891211.32
	N88°06'01"E	40.69 '		
T1065			402587.03	2891251.98
	N02°44'04"W	806.97 '		
T1070			403393.09	2891213.49
	N02°44'04"W	1037.88 '		
T1075			404429.78	2891163.98
	N41°54'55"E	176.48 '		
T1080			404561.11	2891281.87
	S79°00'28"E	46.63 '		
T1085			404552.22	2891327.64
	S41°54'55"W	184.02 '		
T1090			404415.28	2891204.71
	S02°44'04"E	1021.45 '		
T1095			403394.99	2891253.44
	S02°44'04"E	807.56 '		
T1100			402588.36	2891291.97
	N88°06'01"E	449.47 '		
T1105			402603.26	2891741.19
	N86°36'32"E	295.72 '		
T1110			402620.75	2892036.39
	N87°53'46"E	581.01 '		
T1115			402642.08	2892617.02
	N87°46'12"E	598.74 '		
T1120			402665.38	2893215.3
	N87°48'28"E	1220.54 '		
T1125			402712.07	2894434.95
	N87°53'12"E	336.03 '		
T1130			402724.46	2894770.75
	S83°21'25"E	337.03 '		
T1135			402685.47	2895105.52
	S75°27'55"E	151.76 '		
T1140			402647.39	2895252.42
	N02°41'08"W	204.40 '		
T1145			402851.56	2895242.84
	N87°35'36"E	1226.33 '		
T1150			402903.06	2896468.09
	N02°40'07"W	1208.71 '		
T1155			404110.45	2896411.81
	N02°38'17"W	299.09 '		
T1160			404409.22	2896398.05
	N87°19'49"E	200.00 '		

CONTROL LINE DATA - WORK LIMITS A (CONT'D)

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)
T1165			404418.54	2896597.83
	S02°40'11"E	1991.80 '		
T1170			402428.9	2896690.6
	N86°26'26"E	20.00 '		
T1175			402430.14	2896710.57
	S02°40'11"E	300.52 '		
T1180			402129.94	2896724.56
	N87°19'49"E	30.00 '		
T1185			402131.34	2896754.53
	S02°40'11"E	589.13 '		
T1190			401542.85	2896781.97
	S73°57'47"E	387.44 '		
T1195			401435.82	2897154.34
	S11°30'59"W	707.64 '		
T1200			400742.42	2897013.06
	S34°43'12"W	269.34 '		
T1205			400521.04	2896859.65
	S02°40'11"E	112.25 '		
T1210			400408.91	2896864.88
	S87°19'49"W	60.00 '		
T1215			400406.12	2896804.94
	S02°40'11"E	281.37 '		
T1220			400125.05	2896818.05
	S87°06'25"W	220.25 '		
T1225			400113.93	2896598.08
	N02°40'06"W	193.25 '		
T1230			400306.98	2896589.09
	S86°23'40"W	49.77 '		
T1235			400303.85	2896539.42
	N02°40'11"W	136.12 '		
T1240			400439.82	2896533.08
	N56°50'46"W	136.57 '		
T1245			400514.51	2896418.74
	N54°11'46"W	214.74 '		
T1250			400640.14	2896244.58
	N47°09'44"W	454.06 '		
T1255			400948.86	2895911.62
	N43°19'15"W	559.33 '		
T1260			401355.79	2895527.88
	N43°57'32"W	388.69 '		
T1265			401635.58	2895258.07
	N58°41'33"W	198.88 '		
T1270			401738.93	2895088.15
	N72°22'37"W	177.46 '		
T1275			401792.66	2894919.01
	N85°52'37"W	184.58 '		
T1280			401805.93	2894734.91
	S87°06'11"W	724.69 '		
T1285			401769.3	2894011.15
	S88°17'37"W	887.68 '		
T1290			401742.87	2893123.86
	S87°45'22"W	1573.47 '		
T1295			401681.26	2891551.59
	S83°48'23"W	108.34 '		
T1300			401669.57	2891443.88
	S02°44'04"E	387.33 '		
T1305			401282.69	2891462.36
	S86°23'04"W	107.93 '		
T1310			401275.88	2891354.65
	S02°44'04"E	1770.25 '		
T1315			399507.65	2891439.1
	N86°23'03"E	1926.19 '		
T1320			399629.13	2893361.45
	N86°23'03"E	2970.82 '		
T1325			399816.48	2896326.36
	N86°23'03"E	284.99 '		

CONTROL LINE DATA - WORK LIMITS A (CONT'D)

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)
T1330			399834.46	2896610.86
	N86°37'53"E	199.97 '		
T1335			399846.21	2896810.49
	S03°22'07"E	40.00 '		
T1340			399806.28	2896812.84
	S86°37'53"W	199.97 '		
T1345			399794.53	2896613.3
	S86°23'03"W	284.99 '		
T1350			399776.56	2896328.88
	S86°23'03"W	2970.82 '		
T1355			399589.2	2893363.98
	S86°23'03"W	1966.81 '		
T1360			399465.17	2891401.08
	N02°44'04"W	1188.15 '		
T1365			400651.97	2891344.4
	S87°16'04"W	860.83 '		
T1370			400610.93	2890484.55
	S33°03'16"W	279.40 '		
T1375			400376.75	2890332.15
	S44°37'53"W	452.48 '		
T1380			400054.74	2890014.26
	S61°33'33"W	434.75 '		
T1385			399847.69	2889631.98
	S73°09'02"W	279.49 '		
T1390			399766.68	2889364.5
	S82°50'50"W	65.74 '		
T1395			399758.49	2889299.27
	N07°09'10"W	50.00 '		
T1400			399808.1	2889293.04
	S82°50'50"W	100.00 '		
T1405			399795.65	2889193.82
	S07°09'10"E	50.00 '		
T1410			399746.04	2889200.05
	S82°50'50"W	98.55 '		
T1415			399733.77	2889102.27
	S89°15'47"W	103.10 '		
T1420			399732.45	2888999.18
	N02°05'05"W	1106.13 '		
T1000			400837.85	2888958.94

CONTROL LINE DATA - WORK LIMITS B

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)
T2000			400466.21	2885946.65
	S76°33'40"E	438.95 '		
T2005			400364.19	2886373.58
	S13°26'20"W	450.00 '		
T2010			399926.52	2886269.00
	N76°33'40"W	438.95 '		
T2015			400028.53	2885842.07
	N13°26'20"E	450.00 '		
T2000			400466.21	2885946.65

CONTROL LINE DATA - WORK LIMITS C

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)
T3000			404580.04	2884361.43
	N88°39'19"E	348.95 '		
T3005			404588.22	2884710.29
	S01°20'41"E	619.00 '		
T3010			403969.40	2884724.81
	S88°39'19"W	349.16 '		
T3015			403961.20	2884375.75
	N01°19'32"W	619.00 '		
T3000			404580.04	2884361.43

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
NAD 83(2011) SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956555

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN
DRAWN BY: P. MORKEN
CHECKED BY: B. SPRANG
SUBMITTED BY:
SIZE: ANSI D
FILE NAME: FMMSE3_VOL1_CS601xxx.dgn
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
AS-BUILT NO.:

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

HORIZONTAL CONTROL TABLES 1

SHEET ID
VOL. 1
CS601

ADVERTISEMENT

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CONTROL LINE DATA - WORK LIMITS D

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)
T4000			413415.92	2873577.85
	N79°08'06.03"E	100.79 '		
T4005			413434.92	2873676.83
	N88°07'19.51"E	802.66 '		
T4010			413461.22	2874479.06
	N86°16'01.58"E	461.30 '		
T4015			413491.26	2874939.39
	N87°07'01.47"E	44.57 '		
T4020			413493.50	2874983.90
	S03°06'46.66"E	48.05 '		
F4020			413445.52	2874986.51
	N86°07'17.31"E	34.35 '		
F4025			413447.84	2875020.77
	N87°29'03.88"E	382.59 '		
F4027			413464.64	2875403.00
	N87°29'03.88"E	2209.70 '		
F4030			413561.62	2877610.57
	S02°00'43.76"E	134.83 '		
F4035			413426.88	2877615.30
	N87°35'11.21"E	876.81 '		
F4040			413463.80	2878491.34
	S04°20'47.15"E	360.23 '		
F4045			413104.61	2878518.64
	N87°46'10.16"E	50.03 '		
T4025			413106.56	2878568.63
	S04°20'47.15"E	317.14 '		
T4030			412790.33	2878592.67
	S87°51'16.48"W	232.28 '		
T4035			412781.63	2878360.55
	S74°29'33.58"W	280.80 '		
T4040			412706.55	2878089.97
	S88°13'07.03"W	140.67 '		
T4045			412702.18	2877949.36
	N85°44'01.03"W	271.81 '		
T4050			412722.40	2877678.30
	S88°21'02.38"W	2599.96 '		
T4055			412647.57	2875079.42
	S02°20'39.78"E	273.16 '		
T4060			412374.64	2875090.59
	S36°34'48.94"E	565.09 '		
T4065			411920.86	2875427.36
	N87°39'52.23"E	4891.22 '		
T4070			412120.18	2880314.51
	S00°00'00.00"W	54.27 '		
T4075			412065.91	2880314.51
	S87°34'48.46"W	5375.45 '		
T4080			411838.95	2874943.86
	N00°00'00.00"W	772.77 '		
T4085			412611.72	2874943.86
	S81°20'42.46"W	85.76 '		
T4090			412598.81	2874859.08
	N08°53'42.44"W	185.20 '		
T4095			412781.79	2874830.44
	S84°27'26.12"W	353.03 '		
T4100			412747.69	2874479.06
	N90°00'00.00"W	481.90 '		
T4105			412747.69	2873997.15
	S87°20'43.74"W	242.75 '		
T4110			412736.45	2873754.66
	S75°00'00.00"W	95.71 '		
T4115			412711.68	2873662.22
	N06°49'53.82"W	709.28 '		
T4000			413415.92	2873577.85

CONTROL LINE DATA - DITCH AB

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
AB-1			412912.76	2873677.67	AB 0+00.00	AB 1+72.93	AB 3+43.75	15°31'42.18"	1268.33 '	343.75 '	172.93 '
	N88°19'16"E	781.15 '									
AB-2			412917.83	2874458.75		AB 9+51.96					
	N89°59'58"E	442.42 '									
AB-3			412917.83	2874964.61	AB 13+94.38	AB 14+57.82	AB 15+19.41	23°52'44.63"	-300.00 '	125.03 '	63.44 '
	N66°07'13"E	80.91 '									
AB-4			412974.16	2875091.83	AB 15+36.89	AB 15+95.11	AB 16+51.91	21°58'00.72"	300.00 '	115.02 '	58.22 '
	N88°05'14"E	1052.38 '									
AB-5			413009.16	2876143.63		AB 26+46.07					
	N88°08'52"E	900.67 '									
AB-6			413038.28	2877043.83		AB 35+46.74					
	N87°30'41"E	645.66 '									
AB-7			413066.31	2877688.88		AB 41+92.40					
	S85°29'12"E	374.88 '									
AB-8			413036.81	2878062.60		AB 45+67.28					
	N87°46'10"E	432.72 '									
AB-9			413053.65	2878495.00		AB 50+00.00					

CONTROL LINE DATA - DITCH B1

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
B1-1			399983.28	2889223.42	B1 0+00.00	B1 2+43.76	B1 4+83.80	17°19'29.87"	-1600.00 '	483.80 '	243.76 '
	N66°20'00"E	371.02 '									
B1-2			400368.90	2890103.29	B1 6+11.06	B1 12+00.71	B1 17+40.93	40°27'37.91"	-1600.00 '	1129.87 '	589.65 '
	N25°52'22"E	1121.87 '									
B1-3			401944.68	2890867.52	B1 22+73.16	B1 29+02.61	B1 34+07.23	61°53'00.54"	1050.00 '	1134.07 '	629.45 '
	N87°45'22"E	3827.63 '									
B1-4			402111.88	2895134.78	B1 66+05.41	B1 70+48.32	B1 74+39.29	47°46'39.33"	1000.00 '	833.88 '	442.91 '
	S44°27'58"E	1203.14 '									
B1-5			401204.44	2896025.47	B1 81+99.52	B1 82+67.91	B1 83+36.09	07°49'28.96"	-1000.00 '	136.57 '	68.39 '
	S52°17'27"E	1065.55 '									
B1-6			400552.69	2896868.46		B1 93+33.25					

CONTROL LINE DATA - DITCH D1

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
D1-1			400701.97	2888980.41		D1 0+00.00					
	N87°49'41"E	9.55 '									
D1-2			400730.04	2889720.8	D1 0+09.55	D1 7+40.93	D1 13+31.14	61°03'56.42"	-1240.00 '	1321.59 '	731.37 '
	N26°45'45"E	1007.15 '									
D1-3			402296.98	2890511.04	D1 16+06.92	D1 23+54.70	D1 30+01.51	51°13'14.37"	1560.00 '	1394.59 '	747.77 '

CONTROL LINE DATA - DITCH D2

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
D2-1			402552.22	2893552.17		D2 0+00.00					
	S87°52'55"W	2000.00 '									
D2-2			402478.3	2891553.54		D2 20+00.00					

CONTROL LINE DATA - DITCH D3

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
D3-1			402560.61	2893752.00		D3 0+00.00					
	N87°52'55"E	934.58 '									
D3-2			402616.90	2895273.95	D3 9+34.58	D3 15+22.99	D3 20+62.28	40°22'58.07"	1600.00 '	1127.70 '	588.41 '

CONTROL LINE DATA - DITCH ED

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
ED-1			412365.67	2875096.59		ED 0+00.00					
	N35°54'36"W	55.40 '									
ED-2			412428.05	2875051.42	ED 0+55.40	ED 0+77.02	ED 0+97.84	27.01°	90.00 '	42.43 '	21.62 '
	N08°53'42"W	86.32 '									
ED-3			412513.34	2875038.07		ED 1+62.54					
	N02°07'06"W	272.51 '									
ED-4			412795.34	2875027.64	ED 4+35.05	ED 4+44.73	ED 4+54.18	21.92°	50.00 '	19.13 '	9.68 '
	N19°47'56"E	60.31 '									
ED-5			412852.08	2875048.07		ED 5+04.81					

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
MN SPCS SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956656

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN
DRAWN BY: P. MORKEN
CHECKED BY: B. SPRANG
SUBMITTED BY:
SIZE: ANSI D
FILE NAME: FMMSE3_VOL1_CS602xxx.dgn
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
AS-BUILT NO.:

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

HORIZONTAL CONTROL TABLES 2

SHEET ID
VOL. 1
CS602

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CONTROL LINE DATA - DRAIN 51 and CULVERT SE-3C

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
DR-1			401321.53	2891284.21		DR 0+00.00					
	N03°27'08"W	675.20 '									
DR-2			401995.51	2891243.55		DR 6+75.20					

CONTROL LINE DATA - DROP STRUCTURE SE3I

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
SE3I-1			401742.19	2891641.43		SE3I 0+00.00					
	N20°26'22"E	24.83 '									
SE3I-2			401774.22	2891653.36	SE3I 0+24.83	SE3I 0+34.18	SE3I 0+43.32	21°11'29.46"	-50.00 '	18.49 '	9.35 '
	N00°45'08"W	96.03 '									
SE3I-3			401870.25	2891652.10		SE3I 1+30.00					

CONTROL LINE DATA - DROP STRUCTURE SE3D

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
SE3D-1			401403.97	2895563.52	SE3D 0+00.00	SE3D 0+09.87	SE3D 0+19.50	22°20'36.47"	50.00 '	19.50 '	9.87 '
	N45°35'27"E	120.38 '									
SE3D-2			401488.16	2895649.56		SE3D 1+30.00					

CONTROL LINE DATA - EMBANKMENT SE-2

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
SE-2-1			413149.48	2873629.91	SE-2 106+00.00	SE-2 107+96.44	SE-2 109+90.66	14°55'19.76"	1500.00 '	390.66 '	196.44 '
	N87°46'05"E	820.46 '									
SE-2-2			413181.43	2874449.75		SE-2 116+14.68					
	N87°46'10"E	1285.32 '									
SE-2-3			413231.45	2875734.09		SE-2 129+00.00					

CONTROL LINE DATA - SE3 EMBANKMENT

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
SE3-1			400537.14	2888917.54		SE3 0+00.00					
	N87°49'06"E	80.22 '									
SE3-2			400572.53	2889846.39	SE3 0+80.22	SE3 9+29.52	SE3 16+10.05	61°56'43.74"	-1415.00 '	1529.83 '	849.30 '
	N25°52'22"E	1052.13 '									
SE3-3			402282.43	2890675.67	SE3 18+12.88	SE3 26+61.14	SE3 33+41.18	61°53'00.54"	1415.00 '	1528.30 '	848.26 '
	N87°45'22"E	4752.65 '									
SE3-4			402466.04	2895361.79	SE3 64+95.96	SE3 71+79.29	SE3 77+75.78	49°42'50.49"	1475.00 '	1279.82 '	683.33 '
	S42°31'47"E	2123.33 '									
SE3-5			401386.46	2896303.40	SE3 77+75.78	SE3 85+25.39	SE3 92+15.78	39°17'18.72"	-2100.00 '	1440.00 '	749.61 '

CONTROL LINE DATA - MAINTENANCE ROAD (M)

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
M-1			401540.74	2891321.98		M 0+00.00					
	N02°44'04"W	89.93 '									
M-2			401681.14	2891315.27	M 0+89.93	M 1+40.56	M 1+69.10	90.72°	-50.00 '	79.17 '	50.63 '
	S86°32'52"W	174.23 '									
M-3			401670.65	2891141.36		M 2+92.70					

CONTROL LINE DATA - 2B WEIR TOP

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
W-1			400451.27	2886213.26		W 0+00.00					
	S13°26'20"W	480.00 '									
W-2			399984.41	2886101.71		W 4+80.00					

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
MN SPCS SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN
DRAWN BY: P. MORKEN
CHECKED BY: B. SPRANG
SUBMITTED BY:
SIZE: ANSI D
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
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FILE NAME: FMMSE3_VOL1_CS603xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

HORIZONTAL CONTROL TABLES 3

SHEET ID
VOL. 1
CS603

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CONTROL LINE DATA - DITCH SE2B (EXISTING)

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
B-1			412917.83	2874506.79		B 119+00.00					
	N89°59'58"E	457.82 '									
B-2			412917.83	2874964.61		B 123+57.82					
	N66°07'13"E	139.14 '									
B-3			412974.16	2875091.83		B 124+96.95					
	N88°05'14"E	1052.38 '									
B-4			413009.28	2876143.63		B 135+49.34					
	N88°08'52"E	900.67 '									
B-5			413038.40	2877043.83		B 144+50.01					
	N87°30'41"E	645.66 '									
B-6			413066.43	2877688.88		B 150+95.67					
	S85°29'12"E	374.88 '									
B-7			413036.93	2878062.60		B 154+70.55					
	N87°46'10"E	4849.11 '									
B-8			413276.29	2884207.98	B 203+19.65	B 216+20.59	B 223+62.63	90°02'29.03"	1300.00 '	2042.97 '	1300.94 '
	S02°11'21"E	5467.63 '									
B-9			407812.65	2884416.84		B 265+29.32					
	S02°01'40"E	2499.95 '									
B-10			405314.26	2884505.29		B 290+29.27					
	S02°05'23"E	1030.29 '									
B-11			404284.65	2884542.86		B 300+59.57					
	S02°15'23"E	2540.18 '									
B-12			400535.01	2884690.61	B 325+99.75	B 338+12.12	SE2B 346+74.73	74°18'16.88"	-1600.00 '	2074.98 '	1212.37 '
	S76°33'40"E	2335.61 '									
B-13			399992.19	2886962.26		SE2B 357+97.97					

CONTROL LINE DATA - WEIR SE3H

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
SE3H-1			402059.98	2890900.83		SE3H 0+00.00					
	S30°21'01"E	433.11 '									
SE3H-2			401686.23	2891119.67		SE3H 4+33.11					

CONTROL LINE DATA - T-TERMINATION 1

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
T1-1			402603.42	2891271.22		T1 0+00.00					
	S02°44'04"E	83.11 '									
T1-2			402486.15	2891276.83	T1 0+83.11	T1 1+17.41	T1 1+36.99	90°00'00.07"	-34.30 '	53.88 '	34.30 '
	N87°15'56"E	107.31 '									
T1-3			402491.27	2891384.02		T1 2+10.00					

CONTROL LINE DATA - T-TERMINATION 2

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
T2-1			413464.89	2874974.55		T2 0+00.00					
	S01°27'29"E	84.26 '									
T2-2			413380.65	2874976.69		T2 0+84.26					

CONTROL LINE DATA - ACCESS ROAD

POINT ID	BEARING	DISTANCE (FEET)	NORTHING (Y)	EASTING (X)	PC	PI	PT	DELTA	R	L	T
AD1			412856.926	2874955.323		AD 0.000					
	S8.895°E	417.853 '									
AD2			412420.366	2875023.649	AD 417.853	AD 441.874	AD 465.002	27.015°	-100.000 '	47.150 '	24.021 '
	S35.910°E	607.919 '									
AD3			411884.446	2875411.731	AD 1048.900	AD 1102.659	AD 1147.554	56.524°	-100.000 '	98.653 '	53.759 '
	N87.566°E	4906.206 '									
AD4			412092.817	2880313.51		AD 6000.000					

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NORTH DAKOTA SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956656

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: P. MORKEN
DRAWN BY: P. MORKEN
CHECKED BY: B. SPRANG
SUBMITTED BY:
SIZE: ANSI D
FILE NAME: FMMSE3_VOL1_CS604xxx.dgn
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
AS-BUILT NO.:

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

HORIZONTAL CONTROL TABLES 4

SHEET ID
VOL. 1
CS604

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GENERAL NOTES - CULVERT SE-3C

1. SCOPE OF WORK:
   WORK AT THIS SITE CONSISTS OF BUILDING A NEW SINGLE BARREL 10' x 7', 69'-0" PRECAST CONCRETE BOX CULVERT AS PART OF THE VOLUME 1 WORK.

2. WORK DRAWINGS:
   WORK DRAWINGS PROVIDED TO THE CONTRACTING OFFICER FOR REVIEW INCLUDE THE FOLLOWING ITEMS.

   1. 10FT x 7FT PRECAST RCB CULVERT, SEE SPECIFICATIONS FOR REQUIREMENTS
   2. INLET AND OUTLET WINGWALLS, APRONS, PARAPETS, AND CUTOFF WALLS, SEE SPECIFICATIONS FOR REQUIREMENTS
   3. JOINT DETAILING, SEE SPECIFICATIONS FOR REQUIREMENTS

3. IMPERVIOUS FILL:
   COMPACT MATERIAL AS SPECIFIED IN SPECIFICATION SECTION 31 00 00.00 13 CONSISTENT WITH THE DAM/ROADWAY EMBANKMENT.

4. JOINTS:
   PROVIDE JOINTS IN ACCORDANCE WITH PLAN JOINT DETAILS AND SPEC 03 42 13.00 10.

5. PROVIDE 36" GEOTEXTILE JOINT WRAP AROUND THE EXTERIOR SURFACES OF THE BOX CULVERT WALLS AND ROOF, CENTERED ON THE JOINTS. GEOTEXTILE TO BE GEOTEXTILE - TYPE 2 IN ACCORDANCE WITH SPECIFICATION SECTION 31 05 19.

6. PRECAST SECTION:
   TIE THE BARREL SECTIONS TOGETHER WITH 1" DIA. TIE BOLTS AS SHOWN ON STANDARD DRAWING S-004. PLACE TWO TIES PER EXTERIOR WALL JOINT, LOCATED AT THIRD POINTS OF THE WALL CLEAR HEIGHT.

   ATTACH THE APRON TO THE LAST BARREL SECTION, THE WINGWALLS AND THE CUTOFF WALL. ATTACH THE WINGWALLS TO THE LAST BARRE SECTION. PROVIDE A WELDED TIE TYPE SYSTEM FOR THE CONNECTIONS OF THE APRON TO THE BOX AND WINGWALLS. CONNECT THE WINGWALLS TO THE LAST BARREL SECTION BY THE USE OF TIE BOLTS, STEEL-BOLTS PLATES OR OTHER APPROVED METHOD SO THE INSIDE CORNER SURFACE IS SMOOTH.

   USE ASTM A36 STEEL FOR BOLTS, PLATES, ANGLES, AND STUDS. USE HEAVY HEX NUTS MEETING THE REQUIREMENTS OF ASTM A563 AND WASHERS MEETING ASTM F436, TYPE 1. PROVIDE WELDED PIPE SLEEVES MEETING THE REQUIREMENTS OF ASTM A53, GRADE B. GALVANIZE HARDWARE AND STRUCTURAL STEEL ACCORDING TO SPECIFICATION SECTION 03 42 13.00 10.

   WELDERS ARE TO MEET THE REQUIREMENTS OF SPECIFICATION SECTION 03 42 13.00 10. GALVANIZE FIELD WELDS ACCORDING TO SPECIFICATION SECTION 03 42 13.00 10.

   CAST HOLES AT 3'-0" CENTERS THROUGH THE APRON AND INTO THE CUTOFF WALL TO RECEIVE 3/4" DIAMETER REINFORCING BARS. CAST HOLES IN THE LAST BARREL SECTION AT 1'-0" CENTERS FOR 1/2" DIAMETER REINFORCING BARS TO ATTACH THE PARAPET. CAST PARAPET AGAINST THE SECTION. INSTALL THE BARS ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS, WITH A HIGH STRENGTH ADHESIVE SPECIFICALLY INTENDED FOR CONCRETE ANCHORAGE, IN ACCORDANCE WITH SPECIFICATION SECTION 03 42 13.00 10.

11. DESIGN LOADS
    A. HL-93 LOADING
    B. MAXIMUM FILL HEIGHT = 7'-0"

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NGS/CORS - SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956656

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: C. WESTON	ISSUE DATE: 3 SEPT 2024
DRAWN BY: D. FORD	SOLICITATION NO.: W912ES23B0016
CHECKED BY: B. SPRANG	CONTRACT NO.:
SUBMITTED BY:	AS-BUILT NO.:
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U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

CULVERT SE-3C
NOTES

SHEET ID
VOL. 1
S-001

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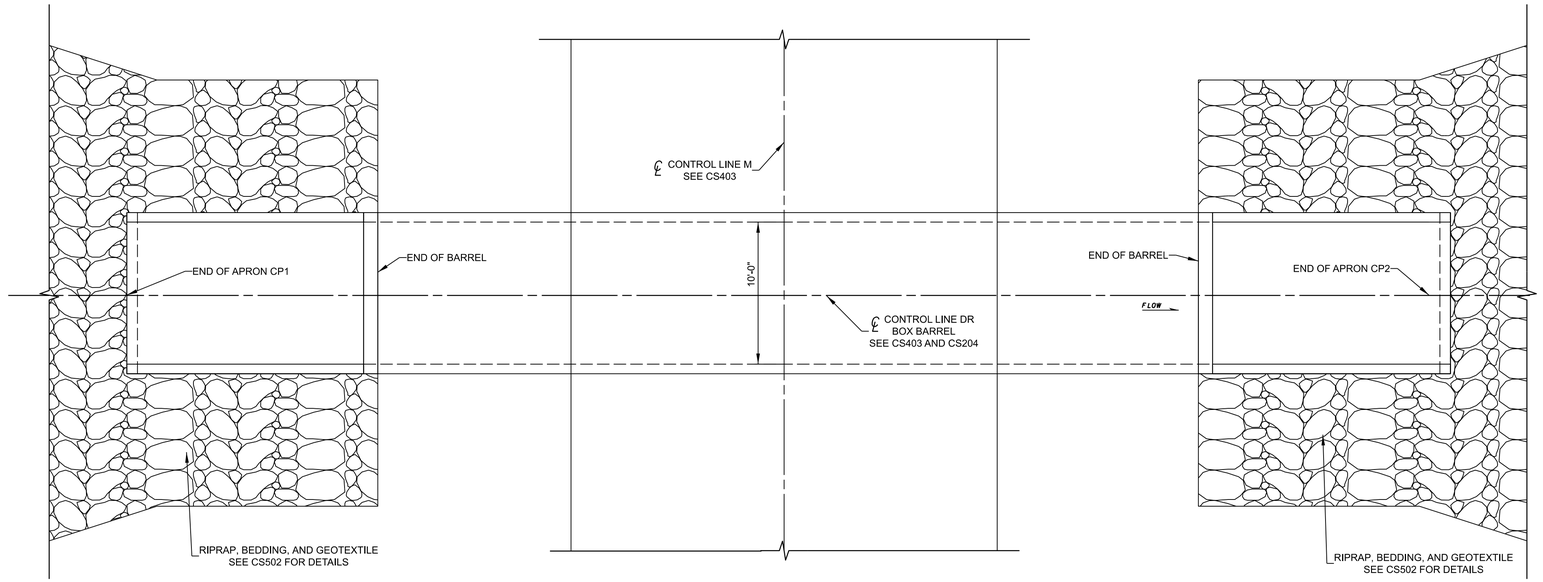
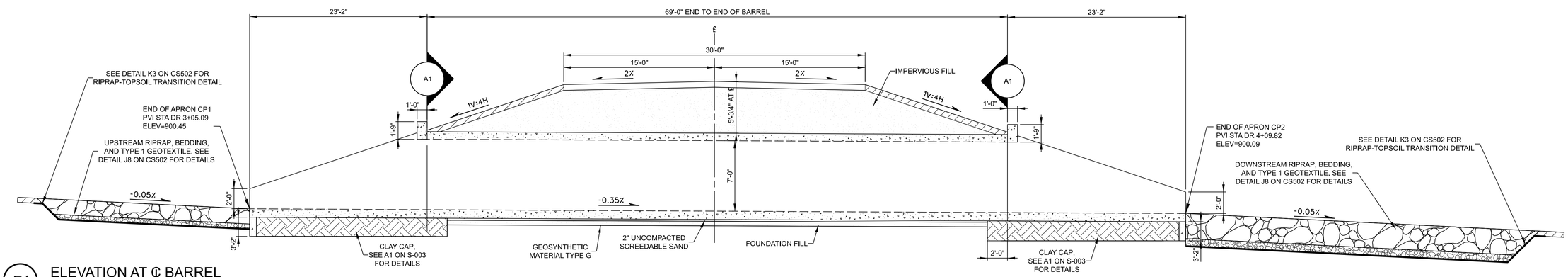


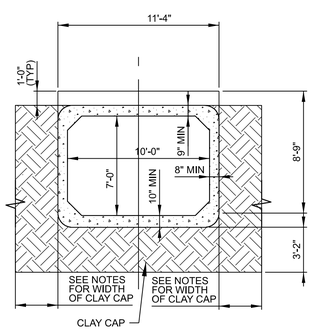
J1 PLAN
SCALE: 3/16" = 1'-0"

0 4' 8' 16'



E1 ELEVATION AT ℄ BARREL
SCALE: 3/16" = 1'-0"

0 4' 8' 16'



A1 END VIEW
SCALE: 3/16" = 1'-0"

0 4' 8' 16'

GENERAL NOTES

1. FOR A SINGLE BARREL BOX CULVERT WITH MINIMUM THICKNESSES OF 9" THICK ROOF, 10" FLOOR, AND 8" WALLS, FOLLOWING TOTAL FACTORED MOMENTS AND SHEARS WOULD RESULT FROM THE APPLICATION OF THE REQUIRED LOADS:

2. CONCRETE STRENGTH = 5,000 PSI

3. FACTORED DESIGN MOMENTS

WALL MOMENT	-17,474 ft-lbs
ROOF MOMENTS	
CORNER	9,659 ft-lbs
BOTTOM	-14,206 ft-lbs
FLOOR MOMENTS	
CORNER	-17,474 ft-lbs
TOP	20,900 ft-lbs

FACTORED DESIGN SHEARS

WALL SHEAR	5,809 lbs
ROOF SHEARS	
CORNER	8,098 lbs
FLOOR SHEARS	
CORNER	13,564 lbs

FACTORED DESIGN AXIAL FORCES

WALL AXIAL	9,188 lbs
ROOF AXIAL	3,576 lbs
FLOOR AXIAL	5,809 lbs

4. CONCRETE MEMBER THICKNESS WAS DETERMINED WITHOUT SHEAR REINFORCEMENT. ALTERNATIVE DESIGNS INCORPORATING SHEAR REINFORCEMENT TO BE SUBMITTED TO AND APPROVED BY THE CONTRACTING OFFICER.

5. CLAY CAP EXTENDS OUTWARD 10' FROM THE FACE OF BOTH WALLS.

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011)
UNITS: US SURVEY FEET, ZONE=U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

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DRAWN BY: D. FORD
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SUBMITTED BY:
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FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

CULVERT SE-3C
PRECAST CONCRETE
BOX CULVERT LAYOUT

SHEET ID
VOL. 1
S-401

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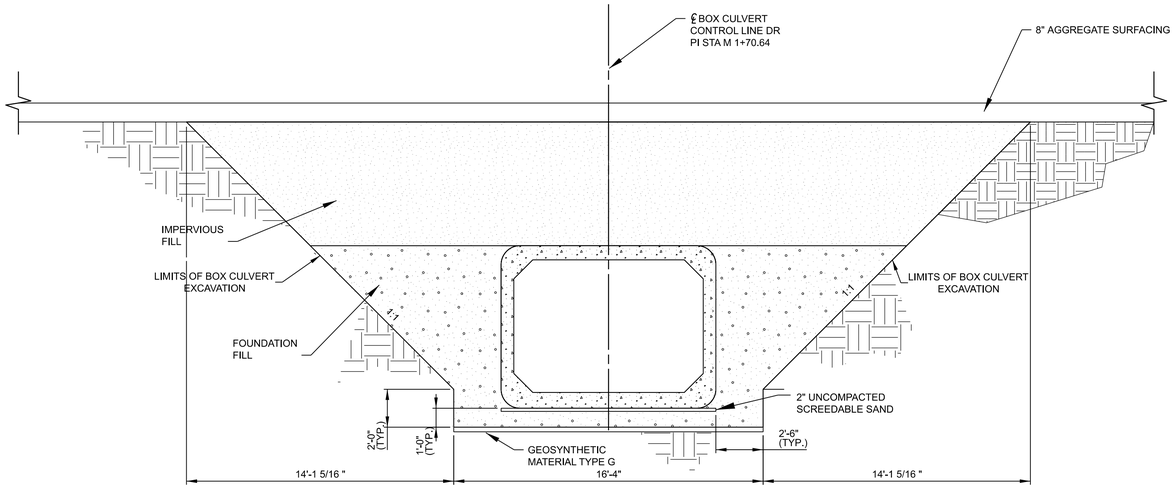


NOTES:

PLACE A 1'-0" MINIMUM DEPTH OF FOUNDATION FILL AND SCREEDABLE SAND BEDDING UNDER THE CULVERT. PROVIDE BEDDING WITH MINIMUM OF 2 INCH THICKNESS THAT CONSISTS OF UNCOMPACTED AND SCREEDABLE SAND MATERIAL. REMOVE AND REPLACE ALL UNSOUND MATERIAL UNDER THE BOX WITH IMPERVIOUS FILL. THE CONTRACTING OFFICER WILL DETERMINE THE DEPTH REQUIRED.

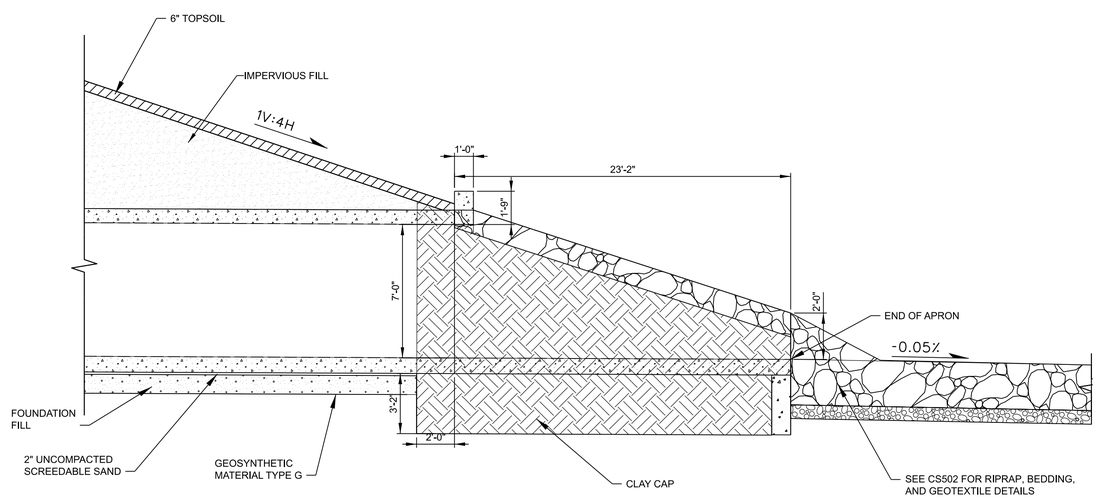
PLACE ALL BEDDING PRIOR TO PLACING BOX CULVERT SECTIONS.

EXTEND THE GEOSYNTHETIC MATERIAL, UNCOMPACTED SCREEDABLE SAND, AND FOUNDATION FILL TO CLAY CAP AS SHOWN IN DETAIL A1.

G1 GEOSYNTHETIC GEOGRID PLACEMENT AND FOUNDATION FILL THROUGH CONTROL LINE M

SCALE: 1/4" = 1'-0" (SHOWING SECTION ALONG ℄ OF ROADWAY)

0 2' 4' 8'



NOTES:
CLAY CAP MATERIAL SHALL BE CLASSIFIED AS CL, CH, OR OH AS APPROVED BY THE CONTRACTING OFFICER.
COMPACTION OF THE CLAY CAP MATERIAL WILL BE THE SAME AS IMPERVIOUS FILL SPECIFICATIONS.

A1 INLET & OUTLET DETAIL

SCALE: 1/4" = 1'-0"

0 2' 4' 8'

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
NDSPCS - SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: C. WESTON	ISSUE DATE: 3 SEPT 2024
DRAWN BY: D. FORD	SOLICITATION NO.: W912ES23B0016
CHECKED BY: B. SPRANG	CONTRACT NO.:
SUBMITTED BY:	AS-BUILT NO.:
SIZE:	FILE NAME: FMMSE3_VOL1_S-501xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

CULVERT SE-3C
EXCAVATION AND FOUNDATION
FILL DETAIL

SHEET ID
VOL. 1
S-501

ADVERTISEMENT

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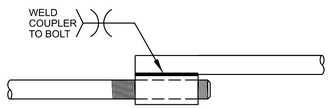
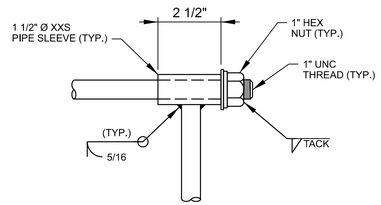
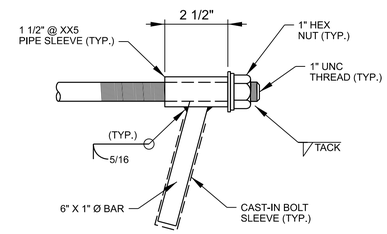


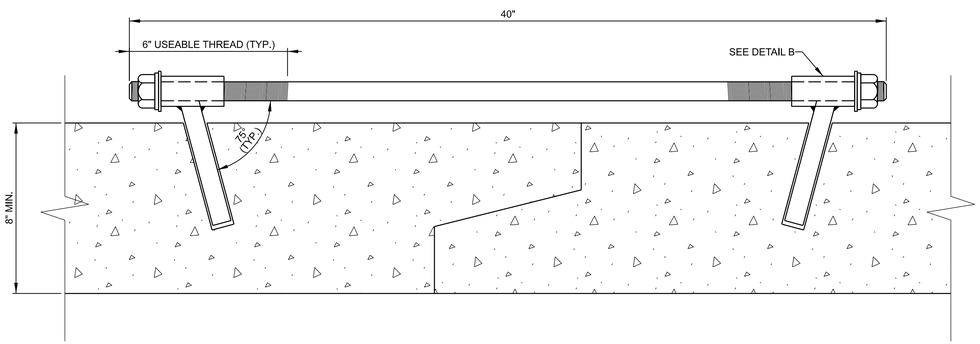
K1 SECTION A-A
SCALE: 3' = 1'- 0"



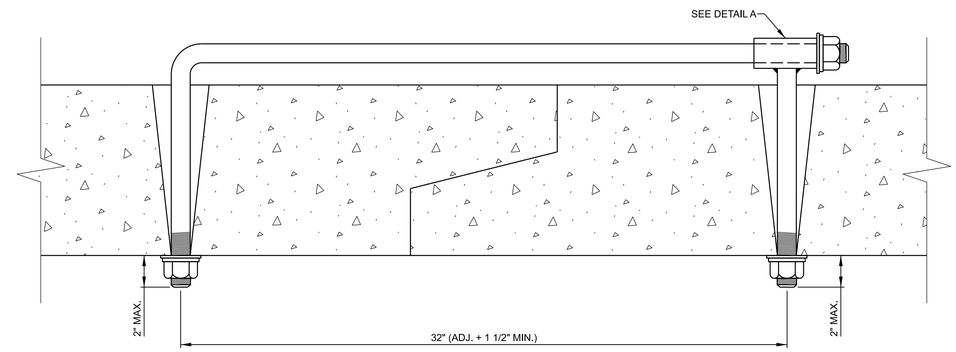
K5 DETAIL A
SCALE: 3' = 1'- 0"



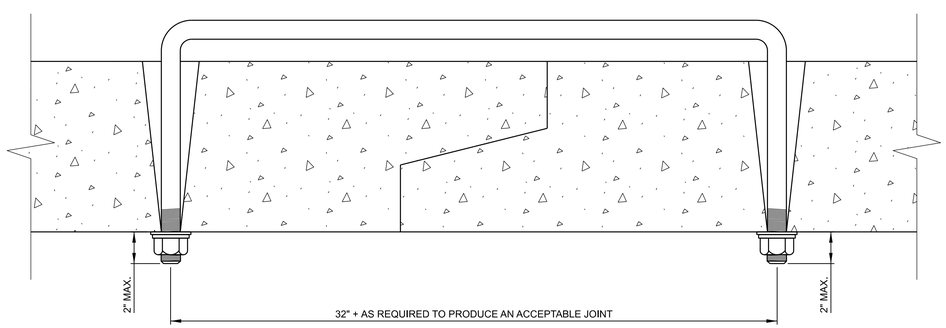
K9 DETAIL B
SCALE: 3' = 1'- 0"



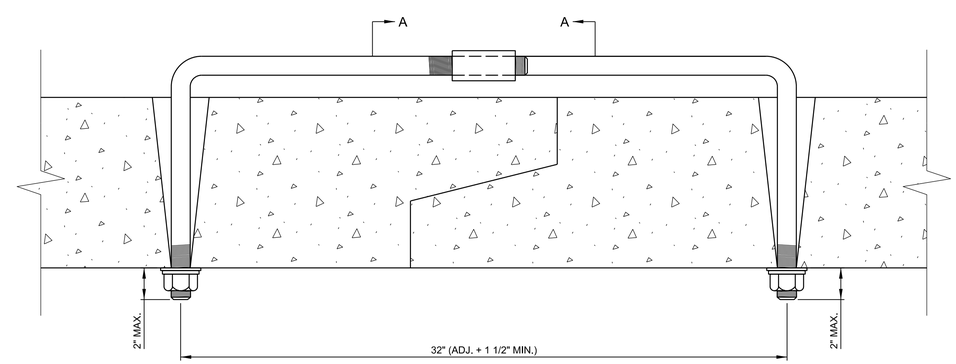
E1 DETAIL - HIDDEN TIE
SCALE: 3' = 1'- 0"



E11 DETAIL - WELD TIE
SCALE: 3' = 1'- 0"



A1 DETAIL - U BOLT TIE
SCASCALE: 3' = 1'- 0"LE:



A11 DETAIL - ADJUSTABLE TIE
SCALE: 3' = 1'- 0"

GENERAL NOTES

1. DO NOT USE PIPE TIES TO PULL THE RCB SECTIONS TIGHT. THE TIES ARE ONLY FOR HOLDING SECTIONS TOGETHER.
2. USE ONLY TIE BOLT ASSEMBLIES THAT HAVE BEEN HOT DIP GALVANIZED IN ACCORDANCE WITH ASTM A 153.
3. USE HOLES THAT CONTAIN CAST-IN BOLTS SLEEVES WITH AN INSIDE DIAMETER OF 1 1/4".
4. SELECT THE TYPE OF TIE BOLT USED FROM THOSE SHOWN.
5. INCLUDE THE COST OF PRECASTING OR DRILLING THE REQUIRED HOLES AND FURNISHING AND INSTALLING THE TIE BOLTS IN THE PRICE BID FOR THE APPROPRIATE CONDUIT OR RCB PAY ITEM.
6. TIE ALL CENTERLINE AND APPROACH RCB CULVERT JOINTS. TIE THE FIRST THREE JOINTS INCLUDING THE END SECTION OF ALL FREE ENDS OF STORM DRAIN SYSTEMS. FREE ENDS ARE DEFINED AS ANY STORM DRAIN END WHICH DOES NOT TERMINATE AT AN INLET OR MANHOLE. OUTFALL CULVERTS WITH END SECTIONS WHICH DRAIN ADJACENT DITCHES ARE EXAMPLES OF FREE ENDS.
7. USE TIE BOLTS THAT CONFORM TO ASTM A 36. USE HEAVY HEX NUTS THAT CONFORM TO ASTM A 563. USE WASHERS CONFORM TO ASTM F 436, TYPE 1. USE WELDED PIPE SLEEVES AND CAST-IN BOLT SLEEVES THAT CONFORM TO ASTM A 53, GRADE B.

REQUIRED SIZE OF TIE BOLTS

THREAD Ø	XXP PIPE SLEEVE INNER Ø
1"	1 1/4"

ELEVATION DATUM (VERTICAL CONTROL):
NAVD 88
GEOID:12B

COORDINATE SYSTEM (HORIZONTAL CONTROL):
NAD 83 (2011)
MN DOT OSS SOUTH ZONE U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956556

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: C. WESTON
DRAWN BY: D. FORD
CHECKED BY: B. SPRANG
SUBMITTED BY:
SIZE:
FILE NAME: FMMSE3_VOL1_S-502xxx.dgn
ISSUE DATE: 3 SEPT 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
AS-BUILT NO.:

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

CULVERT SE-3C
EXCAVATION AND FOUNDATION
FILL DETAIL

SHEET ID
VOL. 1
S-502

ADVERTISEMENT

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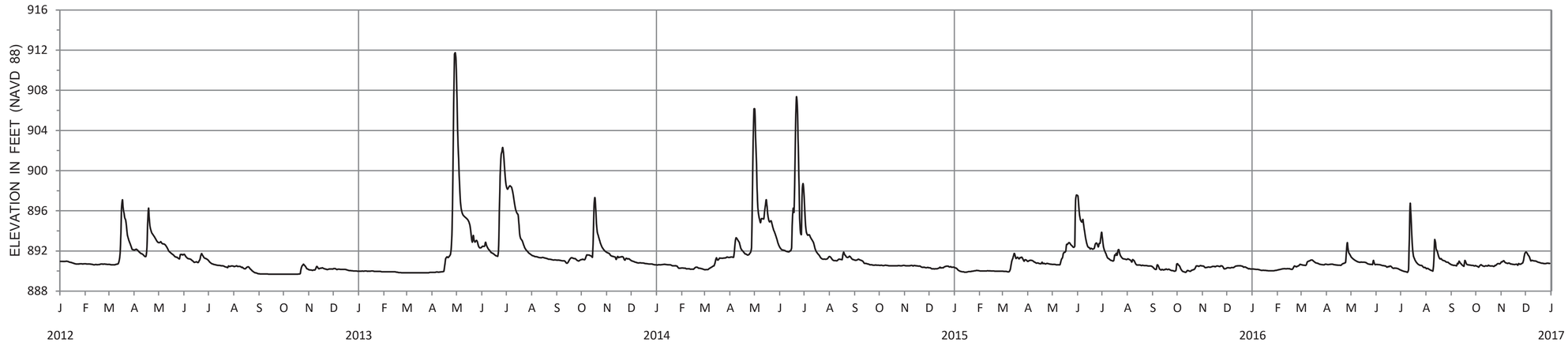
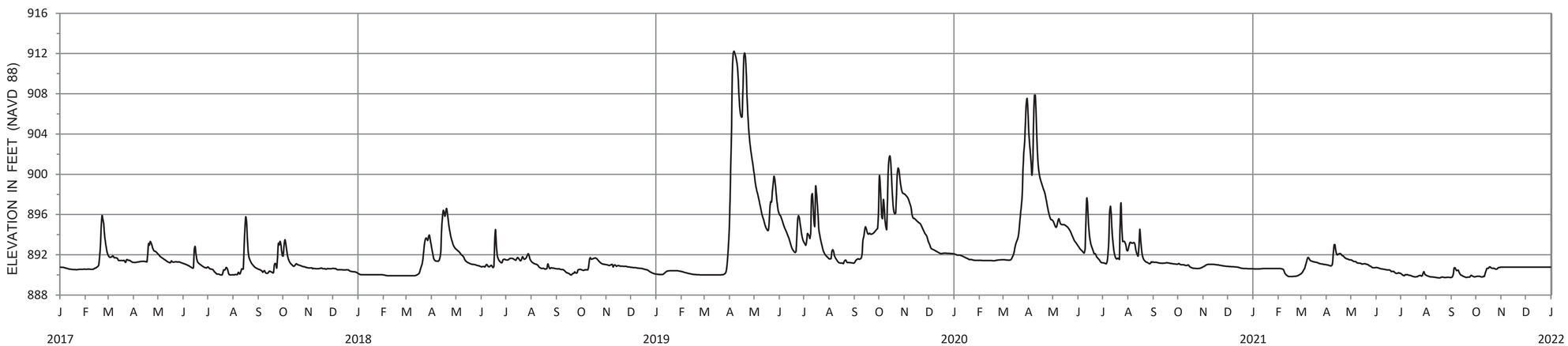




Notes:

1. These daily elevation hydrographs are based on discharge data collected at the Wild Rice River near Abrecrombie, ND USGS gage (05053000). There are 90 years of record (1932-2021). A stage-discharge rating curve at the Wild Rice River Structure extracted from the FMM HEC-RAS model was used to estimate stage at the Wild Rice River Structure, which is near the FMM SE-3 project site. The highest recorded stage at the site occurred on March 25, 2009 (918.25 ft).

2. These daily elevation hydrographs are based on the best information available. These daily elevation hydrographs represent the period shown, and do not necessarily represent all possible future conditions. Questions may be addressed to the office of the Corps of Engineers St. Paul, Minnesota.

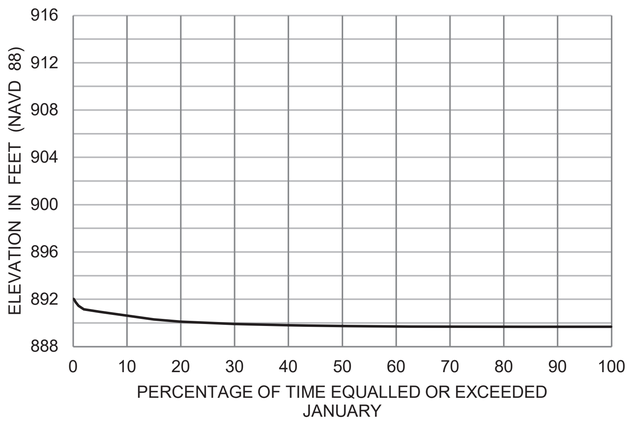
FMM SE-3

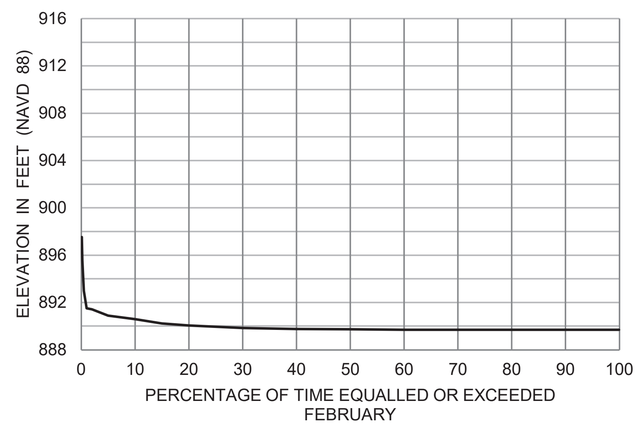
WILD RICE RIVER

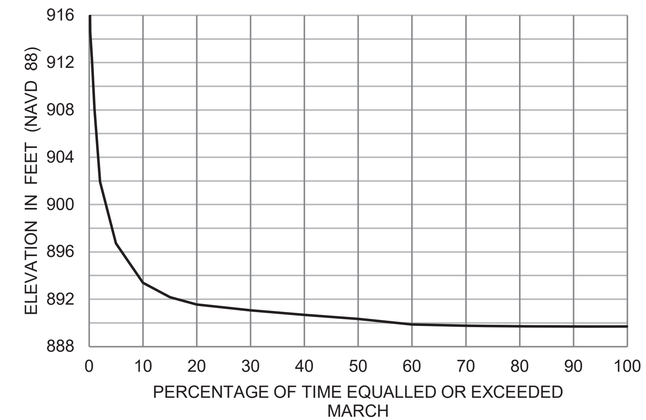
DAILY ELEVATION HYDROGRAPHS

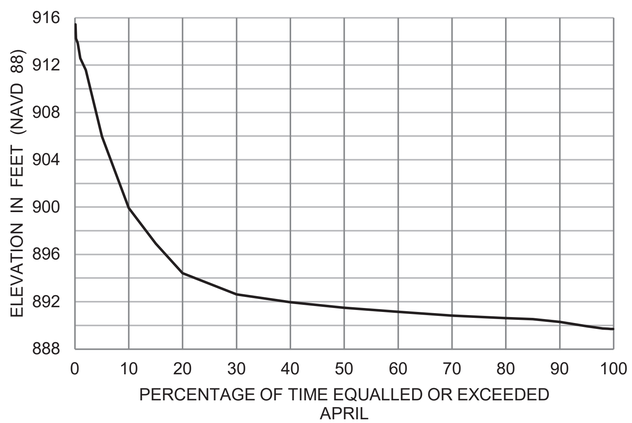
JANUARY 01 - DECEMBER 31
2012 - 2021

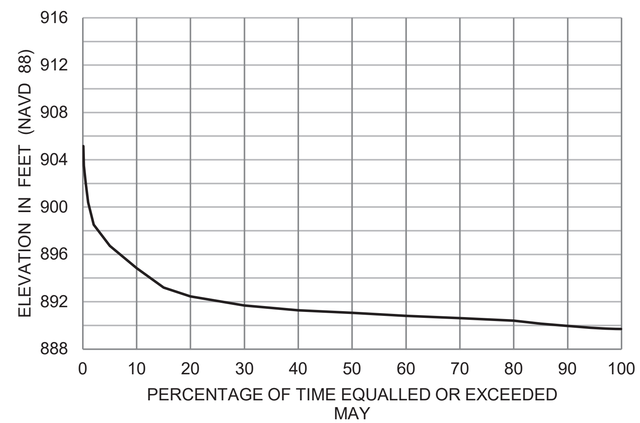
SHEET NUMBER: 1 of 6
WILD RICE STRUCTURE
HYDROLOGIC INFORMATION

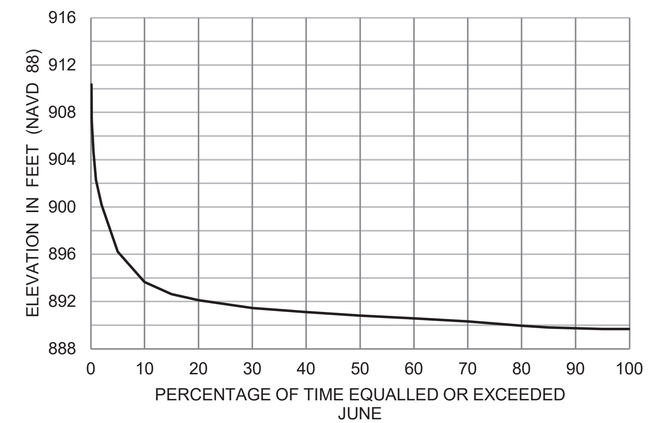












Notes:

1. . These monthly duration curves were derived using data collected at the Wild Rice River near Abercrombie, ND USGS gage (05053000). There are 90 year of record (1932-2021). A stage-discharge rating curve at the Wild Rice River Structure extracted from the FMM HEC-RAS model was used to estimate stage at the Wild Rice River Structure, which is near the FMM SE-3 project site. The 2009 event is the flood of record (918.25 ft).

2. These elevation duration curves are based on the best information available. These elevation duration curves represent the period shown, and do not necessarily represent all possible future conditions. Questions may be addressed to the office of the Corps of Engineers St. Paul, Minnesota.

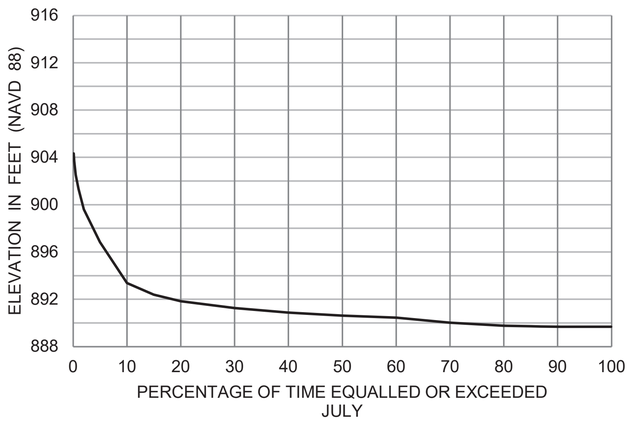
FMM SE-3

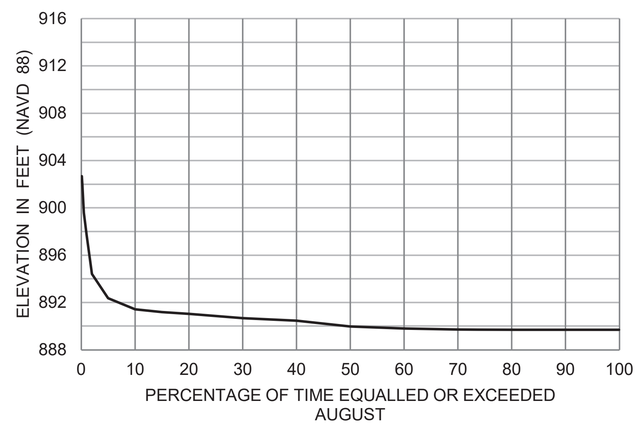
WILD RICE RIVER

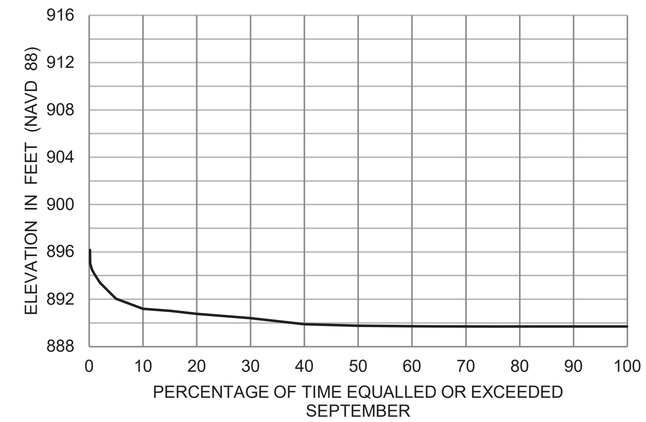
ELEVATION DURATION CURVES

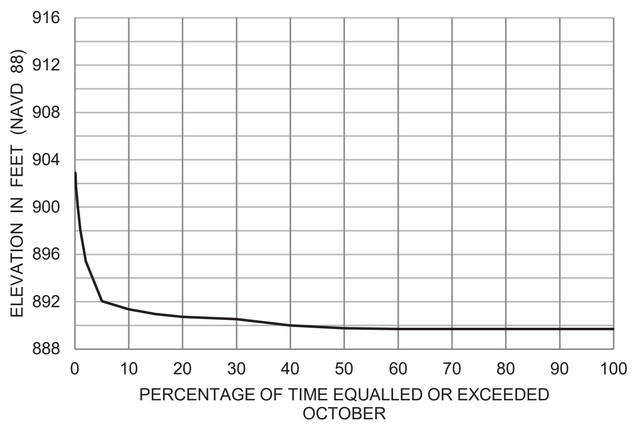
JANUARY - JUNE
1932 - 2021

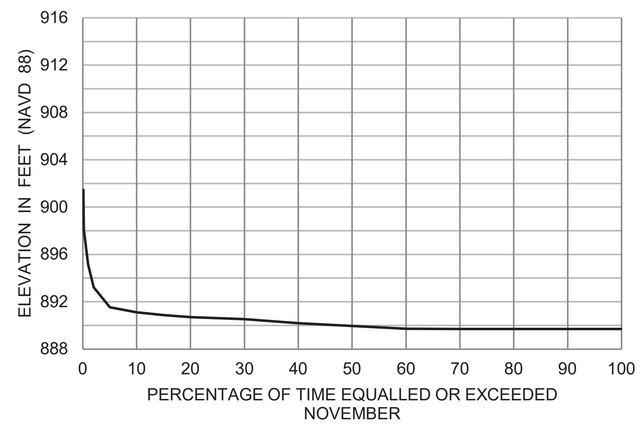
SHEET NUMBER: 2 of 6
WILD RICE RIVER STRUCTURE
HYDROLOGIC INFORMATION

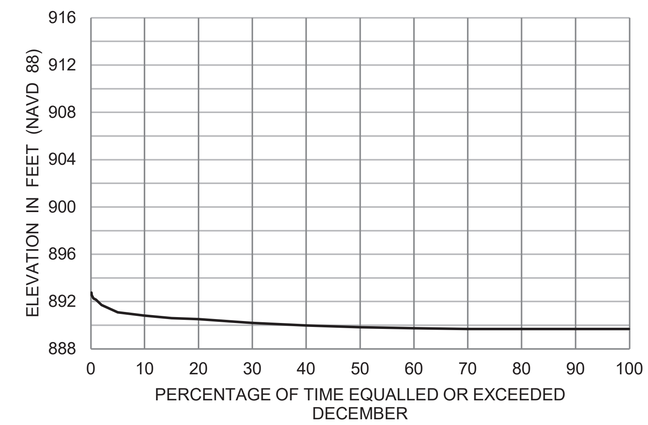












Notes:

1. . These monthly duration curves were derived using data collected at the Wild Rice River near Abercrombie, ND USGS gage (05053000). There are 90 year of record (1932-2021). A stage-discharge rating curve at the Wild Rice River Structure extracted from the FMM HEC-RAS model was used to estimate stage at the Wild Rice River Structure, which is near the FMM SE-3 project site. The 2009 event is the flood of record (918.25 ft).

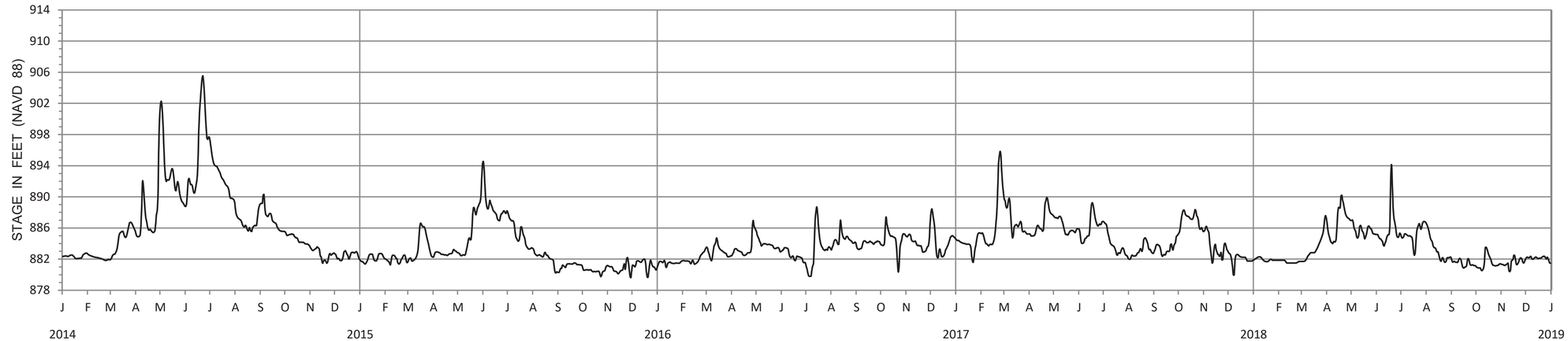
2. These elevation duration curves are based on the best information available. These elevation duration curves represent the period shown, and do not necessarily represent all possible future conditions. Questions may be addressed to the office of the Corps of Engineers St. Paul, Minnesota.

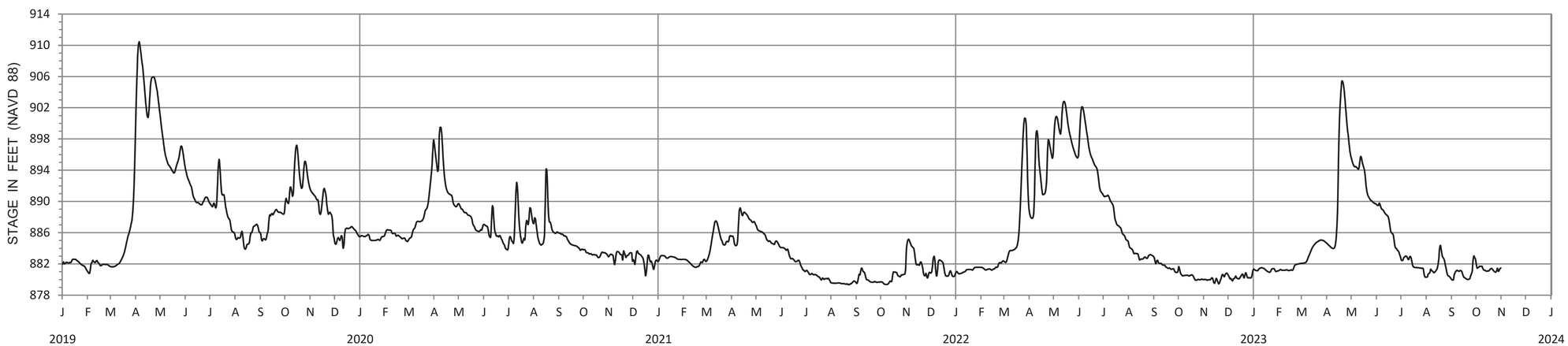
FMM SE-3

WILD RICE RIVER

ELEVATION DURATION CURVES

JULY - DECEMBER
1932 - 2021





Notes:

1. These daily elevation hydrographs are based on discharge data collected at the Red River of the North at Hickson, ND USGS gage (05051522). There are 49 years of record (1975-2023). A stage-discharge rating curve at the Red River Structure extracted from the FMM HEC-RAS model was used to estimate stage at the Red River Structure, which is near the FMM SE-3 project site. The highest peak elevation occurred on March 26, 2009 (914.24 ft NAVD 88).

2. These daily elevation hydrographs are based on the best information available. These daily elevation hydrographs represent the period shown, and do not necessarily represent all possible future conditions. Questions may be addressed to the office of the Corps of Engineers St. Paul, Minnesota.

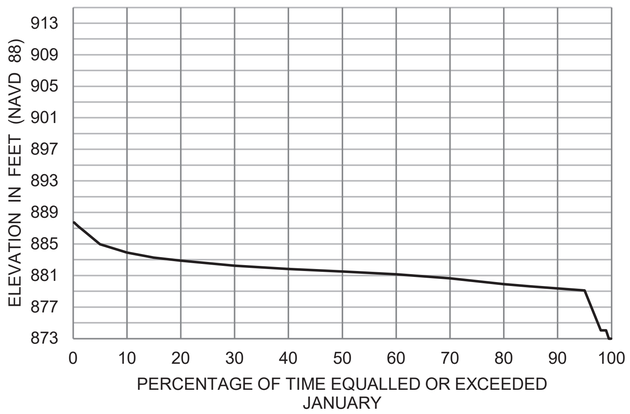
FMM SE-3

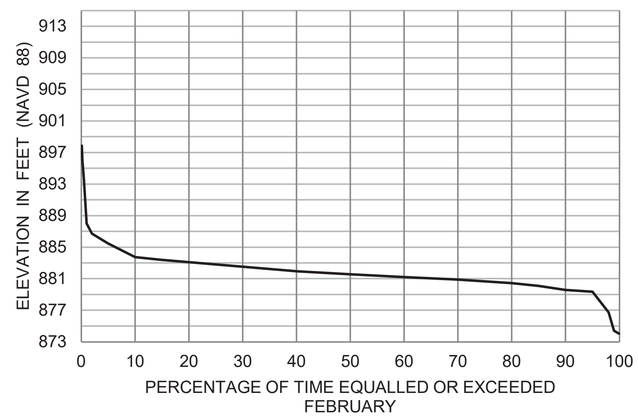
RED RIVER OF THE NORTH

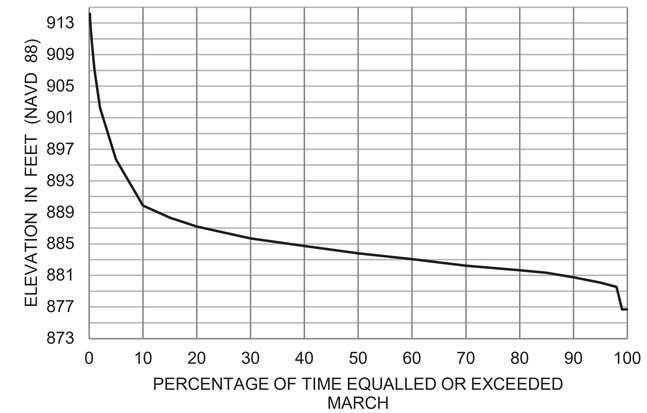
DAILY ELEVATION HYDROGRAPHS

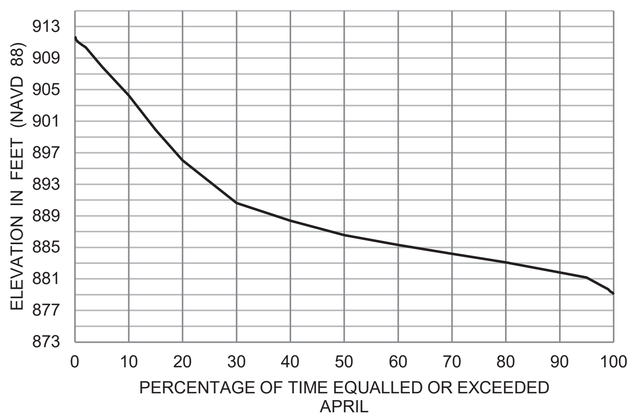
JANUARY 01 - DECEMBER 31
2014 - 2023

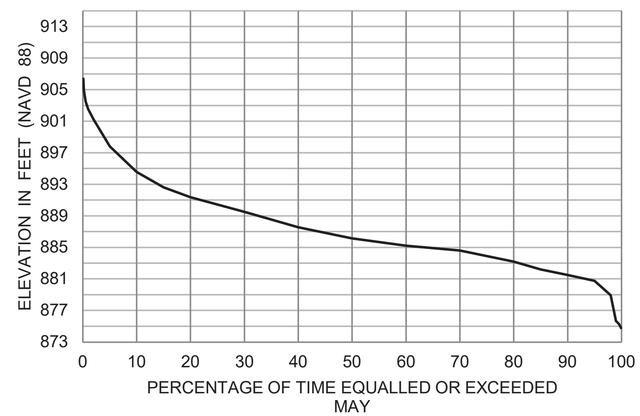
SHEET NUMBER: 4 of 6
RED RIVER STRUCTURE
HYDROLOGIC INFORMATION

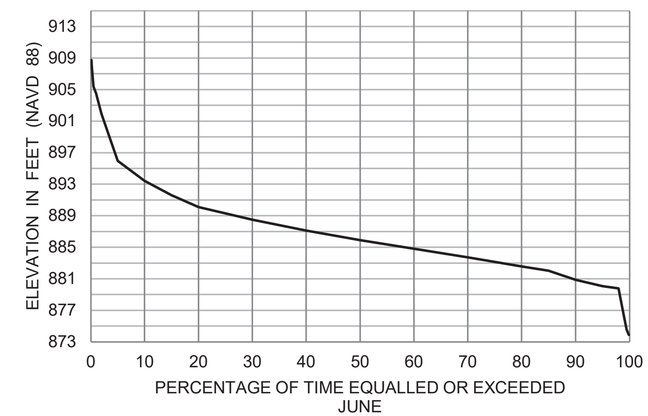












Notes:

1. These monthly duration curves were derived using data collected at the Red River of the North at Hickson, ND USGS gage (05051522). There are 49 years of record (1975-2023). A stage-discharge rating curve at the Red River Structure extracted from the FMM HEC-RAS model was used to estimate stage at the Red River Structure, which is near the FMM SE-3 project site. The 2009 event is the flood of record (914.24 ft NAVD 88).

2. These elevation duration curves are based on the best information available. These elevation duration curves represent the period shown, and do not necessarily represent all possible future conditions. Questions may be addressed to the office of the Corps of Engineers St. Paul, Minnesota.

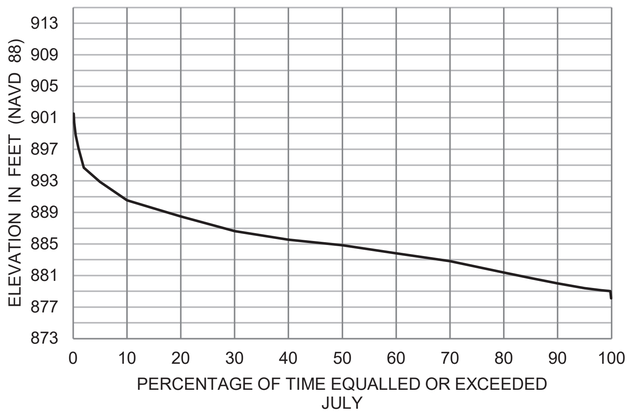
FMM SE-3

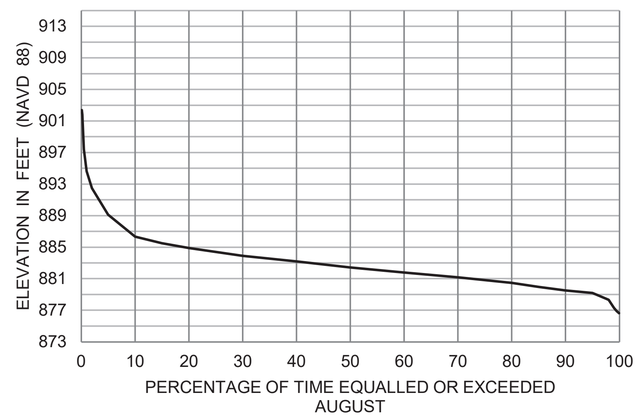
RED RIVER OF THE NORTH

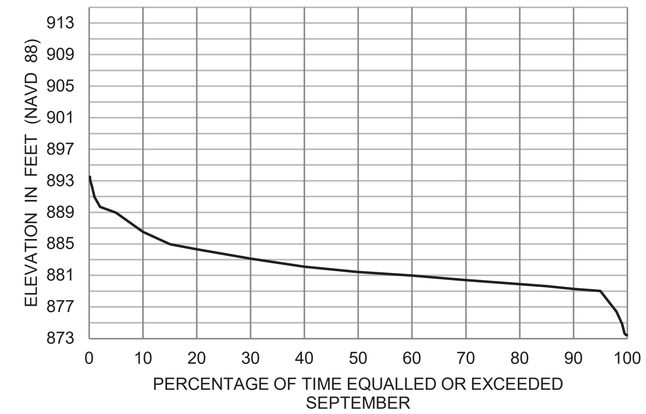
ELEVATION DURATION CURVES

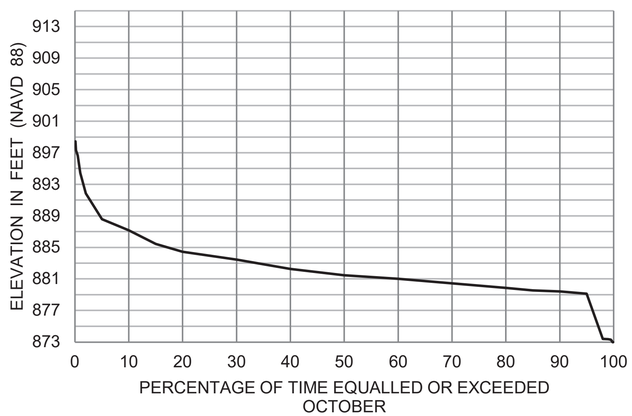
JANUARY - JUNE
1975 - 2023

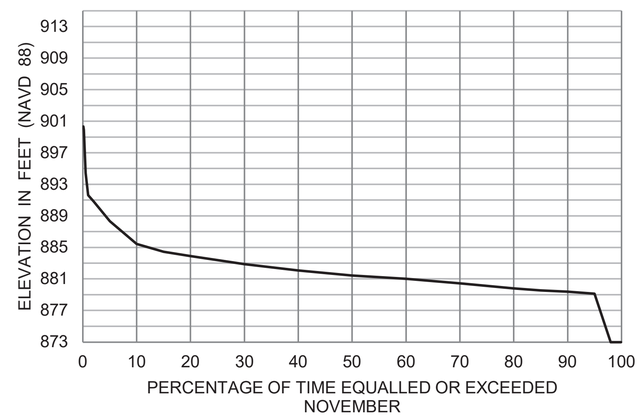
SHEET NUMBER: 5 of 6
RED RIVER STRUCTURE
HYDROLOGIC INFORMATION

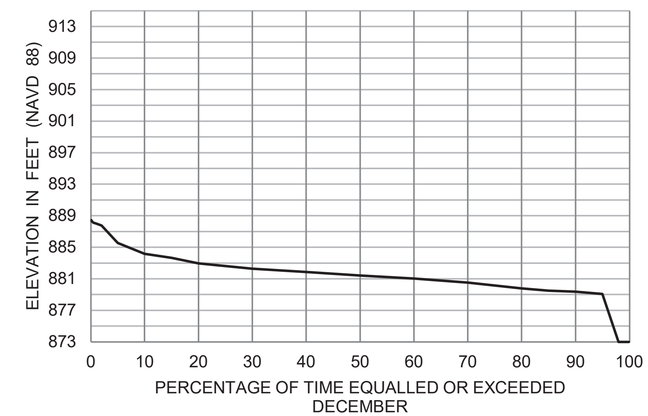












Notes:

1. These monthly duration curves were derived using data collected at the Red River of the North at Hickson, ND USGS gage (05051522). There are 49 years of record (1975-2023). A stage-discharge rating curve at the Red River Structure extracted from the FMM HEC-RAS model was used to estimate stage at the Red River Structure, which is near the FMM SE-3 project site. The 2009 event is the flood of record (914.24 ft NAVD 88).

2. These elevation duration curves are based on the best information available. These elevation duration curves represent the period shown, and do not necessarily represent all possible future conditions. Questions may be addressed to the office of the Corps of Engineers St. Paul, Minnesota.

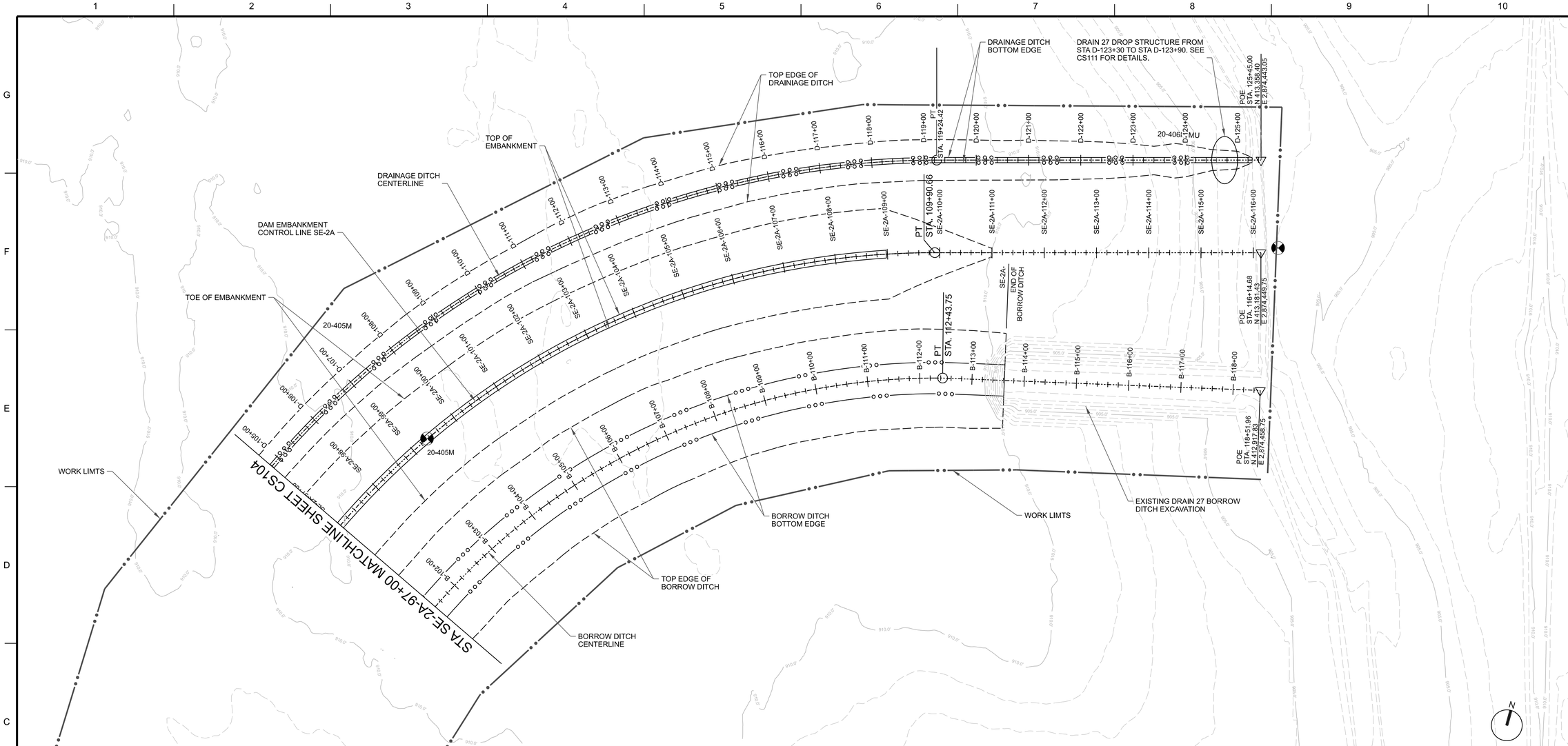
FMM SE-3

RED RIVER OF THE NORTH

ELEVATION DURATION CURVES

JULY - DECEMBER
1975 - 2023

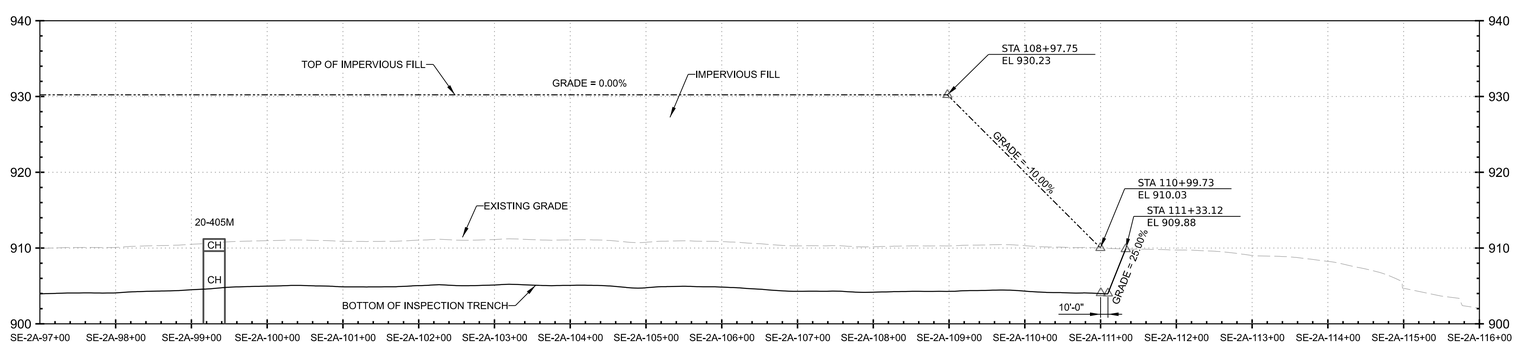
SHEET NUMBER: 6 of 6
RED RIVER STRUCTURE
HYDROLOGIC INFORMATION



D1 PLAN - EMBANKMENT - STA SE-2A-104+00 TO STA SE-2A-122+00

SCALE : 1"=100'-0"

0 100' 200'



A1 PROFILE - EMBANKMENT - STA SE-2A-104+00 TO STA SE-2A-122+00

HORIZONTAL SCALE : 1"=100'-0"
VERTICAL SCALE : 1"=10'-0"

0 100' 200'

NOTE:

PROFILE DEPICTS IMPERVIOUS FILL GRADE AT THE CENTERLINE AND DOES NOT INCLUDE THE 8" OF AGGREGATE.

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956155

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID 12B

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: C. GOCHE	ISSUE DATE: MAY 2022
DRAWN BY: A RODRIGUEZ	SOLICITATION NO.: W912ES21B0014
CHECKED BY: K. SUNDERMAN	CONTRACT NO.: W912ES22C0009
SUBMITTED BY: R. NICKEL	AS-BUILT NO.:
SIZE:	FILE NAME: FMMSE2A_CS105xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

FMM SOUTHERN EMBANKMENT REACH SE-2A
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

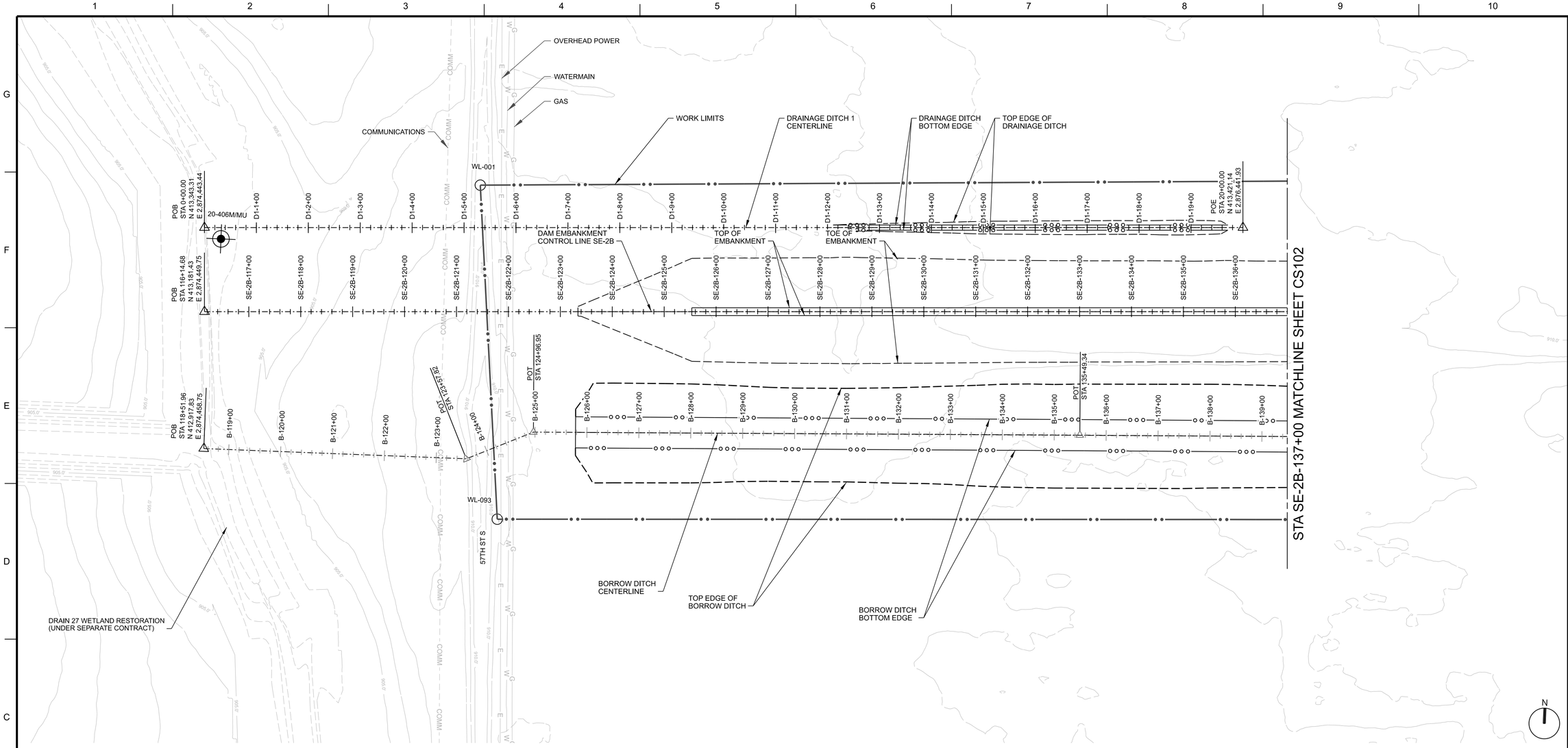
EMBANKMENT
PLAN AND PROFILE
STA SE-2A-104+00 TO STA SE-2A-122+29

SHEET ID

CS105

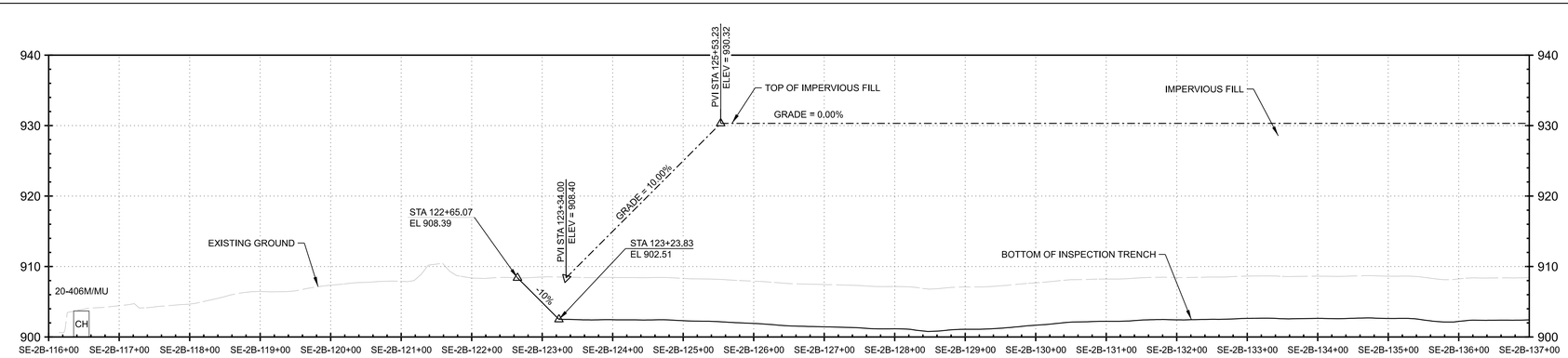
%PRODUCTION DATA 1%
%PRODUCTION DATA 2% %PRODUCTION DATA 3% %PRODUCTION DATA 4%

CONTRACT NO. W912ES22C0009



C1 PLAN - EMBANKMENT - STA SE-2B-116+14.68 TO STA SE-2B-137+00

SCALE : 1"=100'-0"



A1 PROFILE - EMBANKMENT - STA SE-2B-116+14.68 TO STA SE-2B-137+00

HORIZONTAL SCALE : 1"=100'-0"
VERTICAL SCALE : 1"=10'-0"

NOTE:

PROFILE DEPICTS IMPERVIOUS FILL GRADE AT THE CENTERLINE AND DOES NOT INCLUDE THE 8" OF AGGREGATE.

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 US SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956155

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID 12B

%PRODUCTION DATA 1%
%PRODUCTION DATA 2% %PRODUCTION DATA 3% %PRODUCTION DATA 4%

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MARK	DESCRIPTION	DATE

DESIGNED BY: C. GOCHE
DRAWN BY: A. RODRIGUEZ
CHECKED BY: V. CHAMBERS
SUBMITTED BY: R. NICKEL
SIZE: ANSI D
ISSUE DATE: 29 JUN 2023
SOLICITATION NO.:
CONTRACT NO.:
AS-BUILT NO.:
FILE NAME: FMMSE2B_VOL1_CS101xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

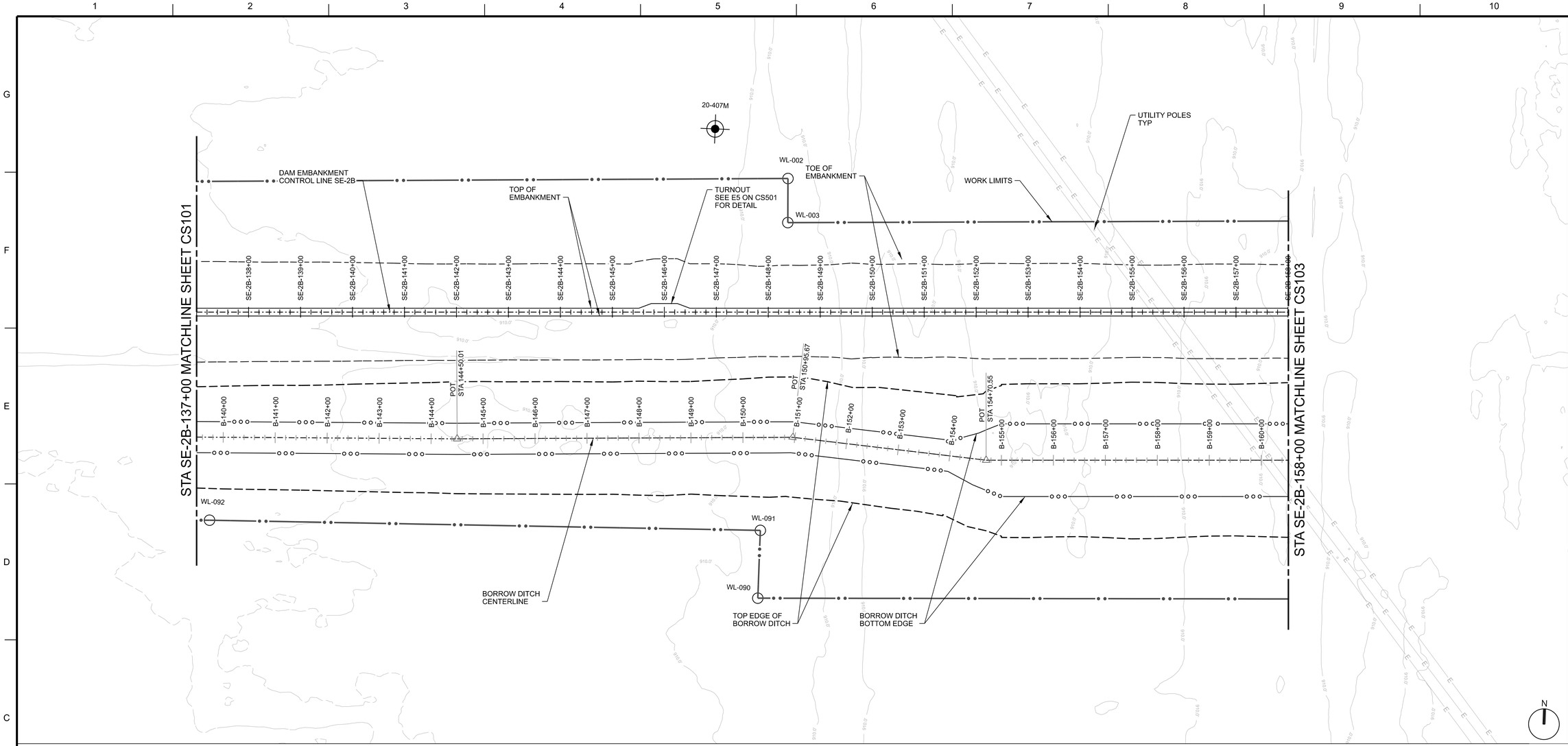
U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

EMBANKMENT
PLAN AND PROFILE
STA SE-2B-116+14.68 TO STA SE-2B-137+00

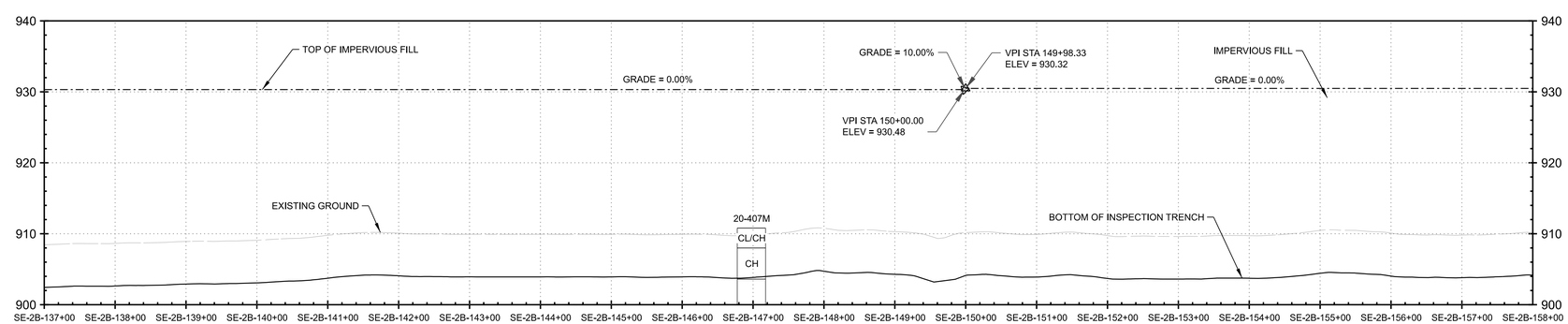
SHEET ID
OPT A
CS101

100% REVIEW



C1 PLAN - EMBANKMENT - STA SE-2B-137+00 TO STA SE-2B-158+00

SCALE : 1"=100'-0"



NOTE:

PROFILE DEPICTS IMPERVIOUS FILL GRADE AT THE CENTERLINE AND DOES NOT INCLUDE THE 8" OF AGGREGATE.

A1 PROFILE - EMBANKMENT - STA SE-2B-137+00 TO STA SE-2B-158+00

HORIZONTAL SCALE : 1"=100'-0"
VERTICAL SCALE : 1"=10'-0"

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011) SOUTH ZONE-U.S. SURVEY FT. COMBINED FACTOR (CF): 0.999956155

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88 GEOID 12B

%PRODUCTION DATA 1%
%PRODUCTION DATA 2% %PRODUCTION DATA 3% %PRODUCTION DATA 4%

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MARK	DESCRIPTION	DATE

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

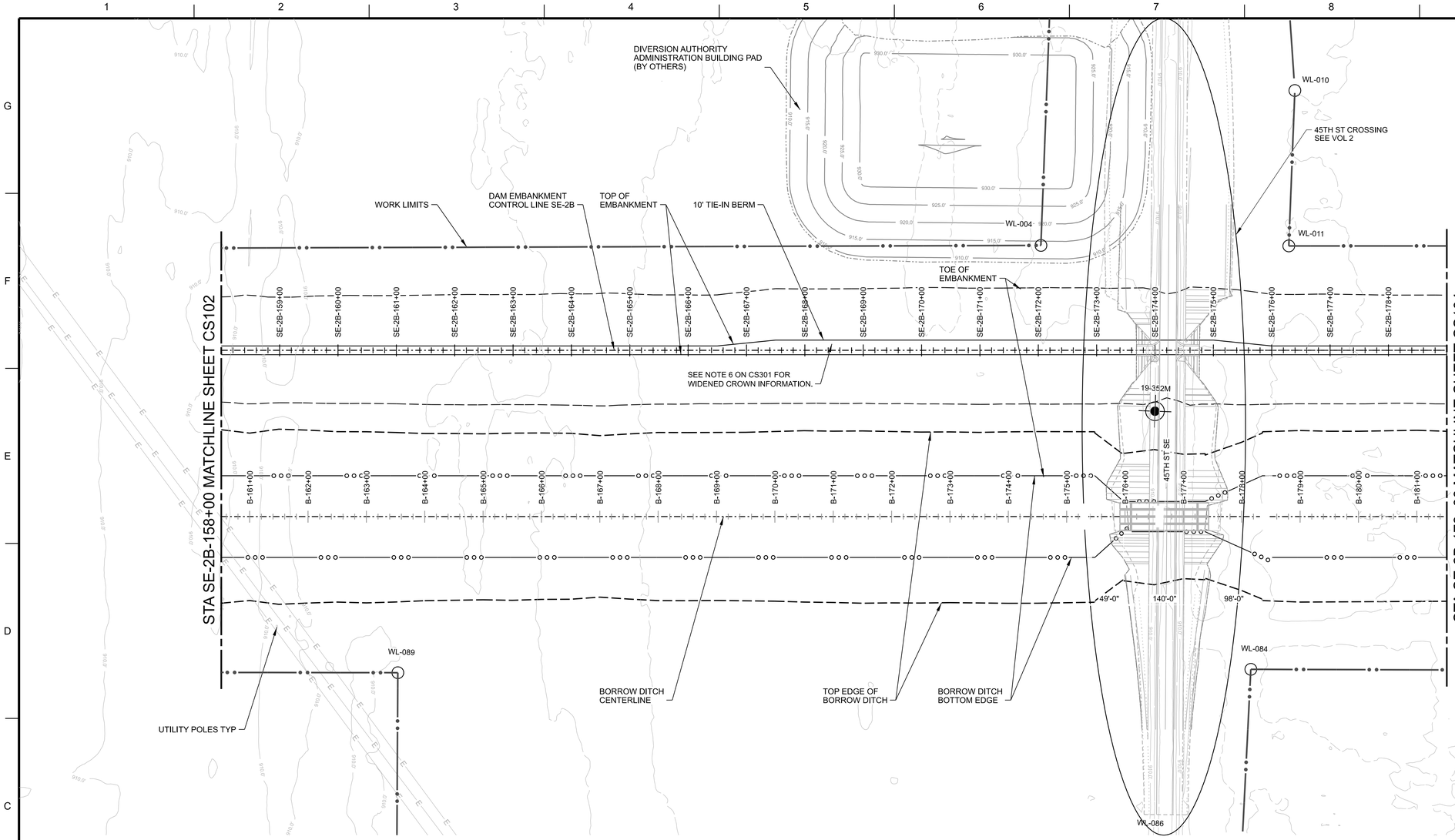
DESIGNED BY: C. GOCHE
DRAWN BY: A. RODRIGUEZ
CHECKED BY: V. CHAMBERS
SUBMITTED BY: R. NICKEL
SIZE: ANSI D
FILE NAME: FMMSE2B_VOL1_CS102xxx.dgn
ISSUE DATE: 29 JUN 2023
SOLICITATION NO.:
CONTRACT NO.:
AS-BUILT NO.:

FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

EMBANKMENT
PLAN AND PROFILE
STA SE-2B-137+00 TO STA SE-2B-158+00

SHEET ID
OPT A
CS102

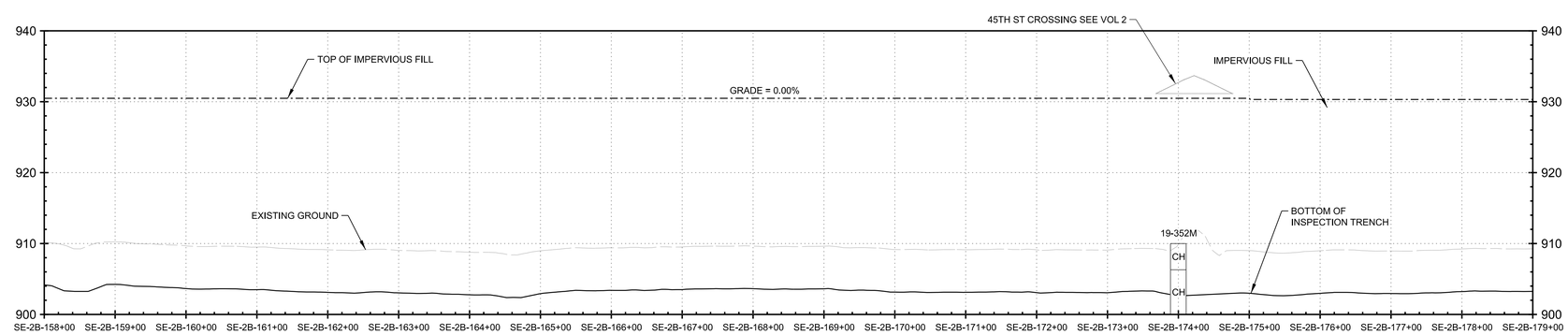
100% REVIEW



C1 PLAN - EMBANKMENT - STA SE-2B-158+00 TO STA SE-2B-179+00

SCALE : 1"=100'-0"

0 100' 200'



NOTE:

PROFILE DEPICTS IMPERVIOUS FILL GRADE AT THE CENTERLINE AND DOES NOT INCLUDE THE 8" OF AGGREGATE.

A1 PROFILE - EMBANKMENT - STA SE-2B-158+00 TO STA SE-2B-179+00

HORIZONTAL SCALE : 1"=100'-0"
VERTICAL SCALE : 1"=10'-0"

0 100' 200'

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD83 (2011)
NDSPCS SOUTH ZONE-U.S. SURVEY FT.
COMBINED FACTOR (CF): 0.999956155

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88
GEOID 12B

%PRODUCTION DATA 1%
%PRODUCTION DATA 2% %PRODUCTION DATA 3% %PRODUCTION DATA 4%

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DESIGNED BY: C. GOCHE
DRAWN BY: A. RODRIGUEZ
CHECKED BY: V. CHAMBERS
SUBMITTED BY: R. NICKEL
SIZE: ANSI D
ISSUE DATE: 29 JUN 2023
SOLICITATION NO.:
CONTRACT NO.:
AS-BUILT NO.:
FILE NAME: FMMSE2B_VOL1_CS103xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
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ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

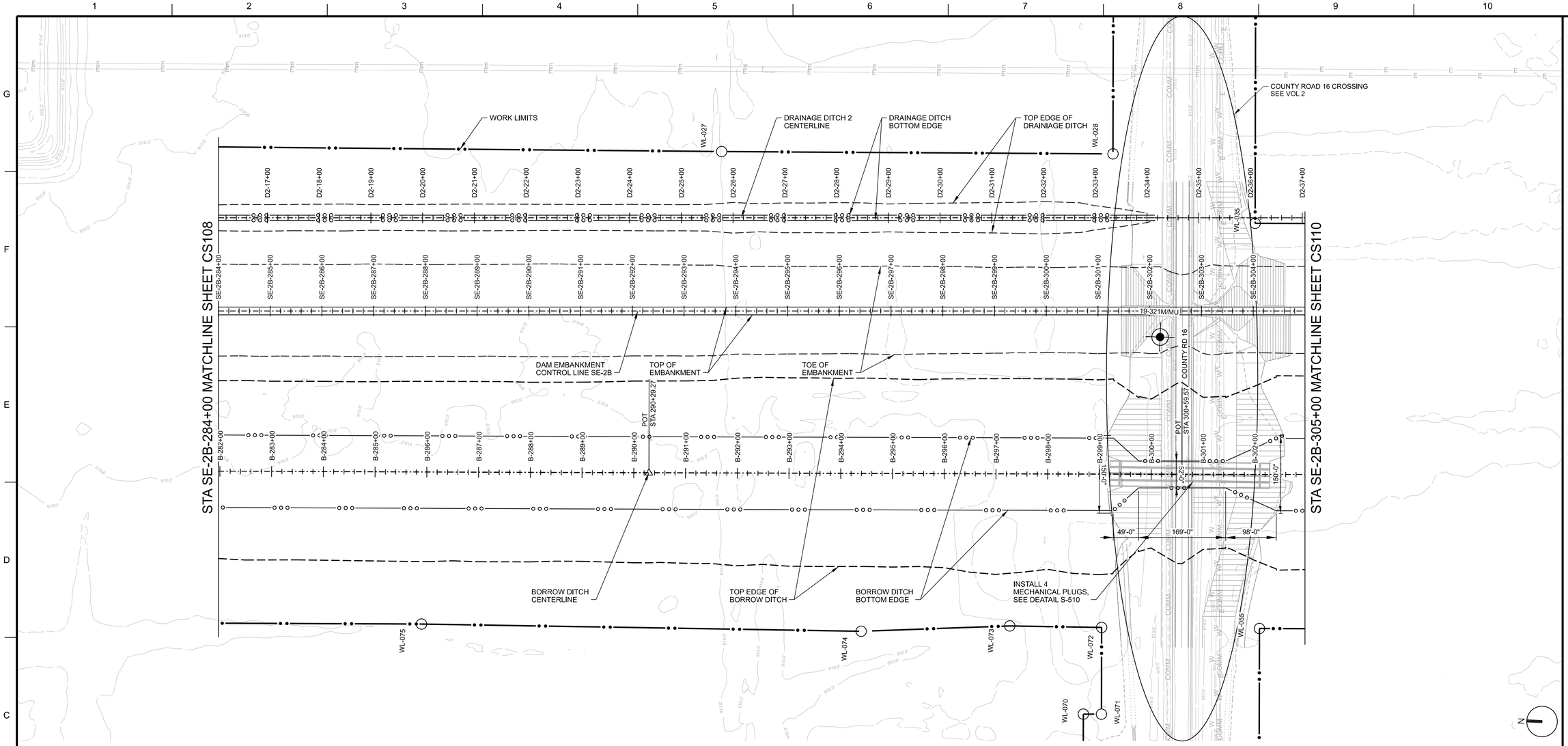
U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

EMBANKMENT
PLAN AND PROFILE
STA SE-2B-158+00 TO STA SE-2B-179+00

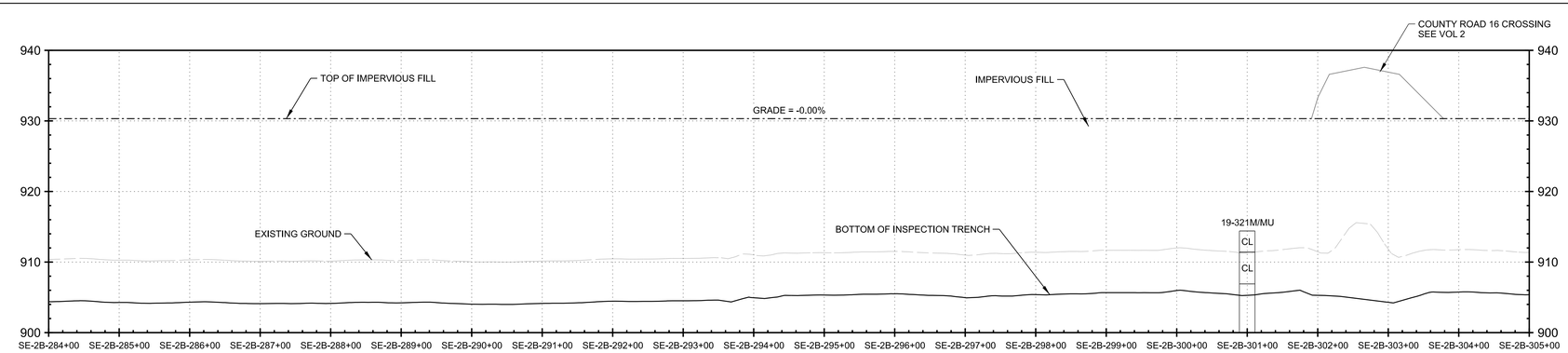
SHEET ID
OPT A
CS103

100% REVIEW



C1 PLAN - EMBANKMENT - STA SE-284-00+00 TO STA SE-2B-305+00

SCALE : 1"=100'-0"



A1 PROFILE - EMBANKMENT - STA SE-284-00+00 TO STA SE-2B-305+00

HORIZONTAL SCALE : 1"=100'-0"
VERTICAL SCALE : 1"=10'-0"

NOTE:

PROFILE DEPICTS IMPERVIOUS FILL GRADE AT THE CENTERLINE AND DOES NOT INCLUDE THE 8" OF AGGREGATE.

COORDINATE SYSTEM (HORIZONTAL CONTROL): NAD 83 (2011) SOUTH ZONE-U.S. SURVEY FT. COMBINED FACTOR (CF): 0.999956155

ELEVATION DATUM (VERTICAL CONTROL): NAVD 88 GEOID 12B

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MARK	DESCRIPTION	DATE

DESIGNED BY: C. GOCHE
DRAWN BY: A. RODRIGUEZ
CHECKED BY: V. CHAMBERS
SUBMITTED BY: R. NICKEL
SIZE: ANSI D
ISSUE DATE: 29 JUN 2023
SOLICITATION NO.:
CONTRACT NO.:
AS-BUILT NO.:
FILE NAME: FMMSE2B_VOL1_CS109xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

EMBANKMENT
PLAN AND PROFILE
STA SE-284-00+00 TO STA SE-2B-305+00

SHEET ID
BASE
CS109

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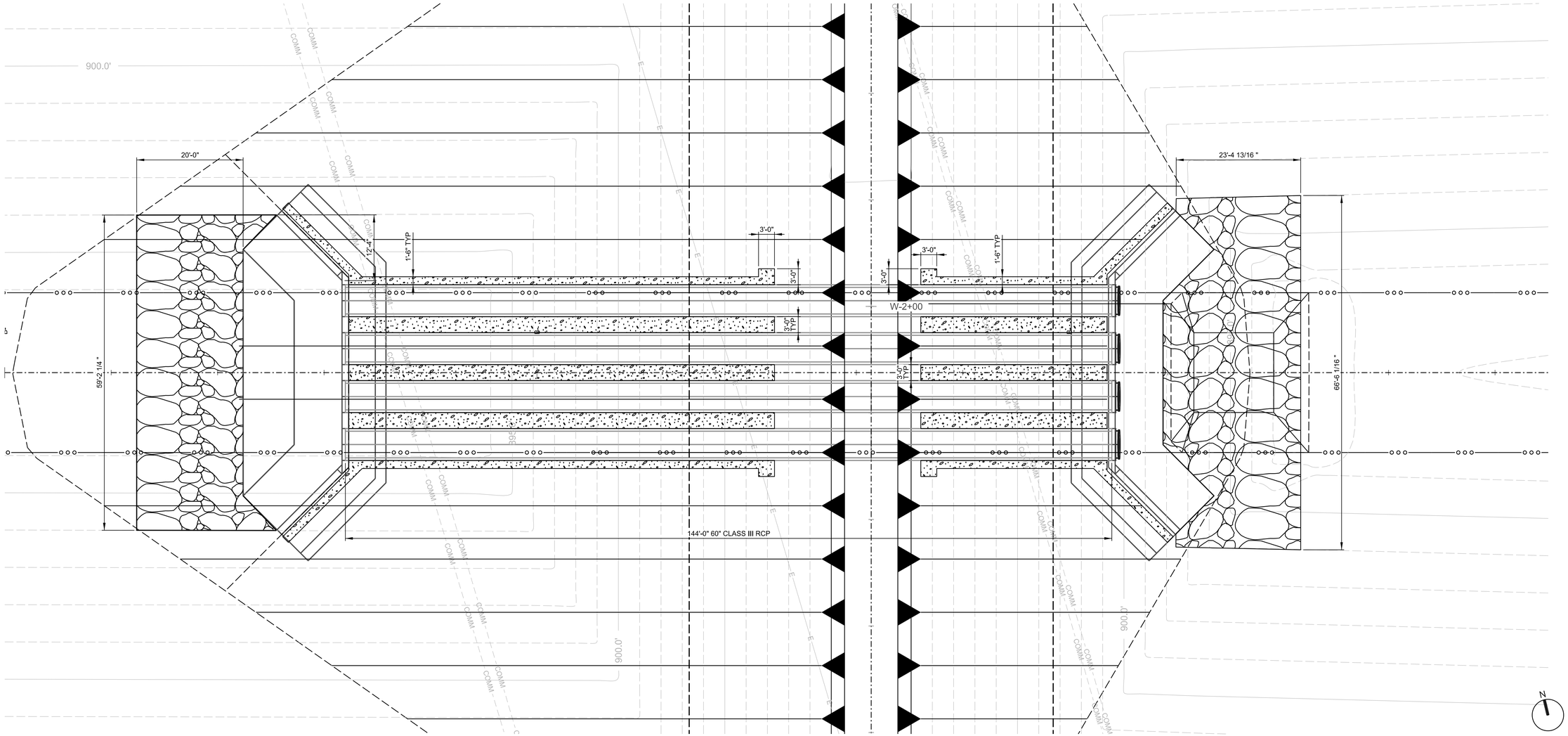
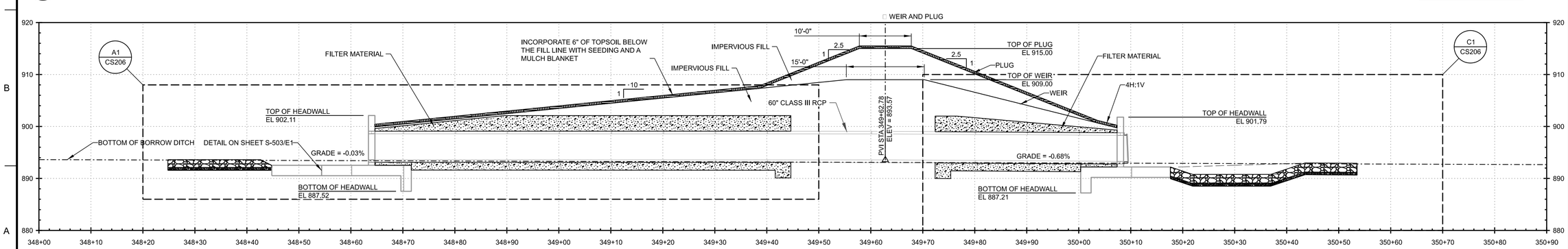


C1 PLAN - CULVERT - STA B-348+80 TO STA B-349+40

SCALE: 1"=10'-0"



A1 PROFILE - CULVERT - STA B-348+30 TO STA B-351+00

SCALE: HORIZONTAL: 1"=10'-0" VERTICAL: 1"=10'-0"

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: C. GOCHE
DRAWN BY: A. RODRIGUEZ
CHECKED BY: V. CHAMBERS
SUBMITTED BY: R. NICKEL
SIZE: ANSI D
ISSUE DATE: 29 JUN 2023
SOLICITATION NO.:
CONTRACT NO.:
AS-BUILT NO.:
FILE NAME: FMMSE2B_VOL1_CS117xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
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ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

BORROW CULVERT PROFILE
STA B-348+30 TO STA B-351+00

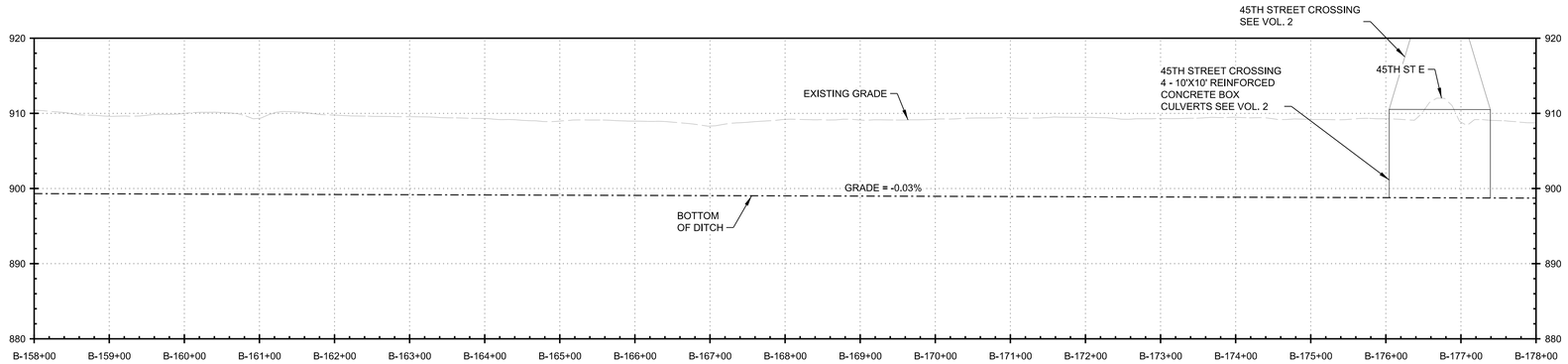
SHEET ID
BASE
CS117

%PRODUCTION DATA 1%
%PRODUCTION DATA 2% %PRODUCTION DATA 3% %PRODUCTION DATA 4%

100% REVIEW

GENERAL SHEET NOTES

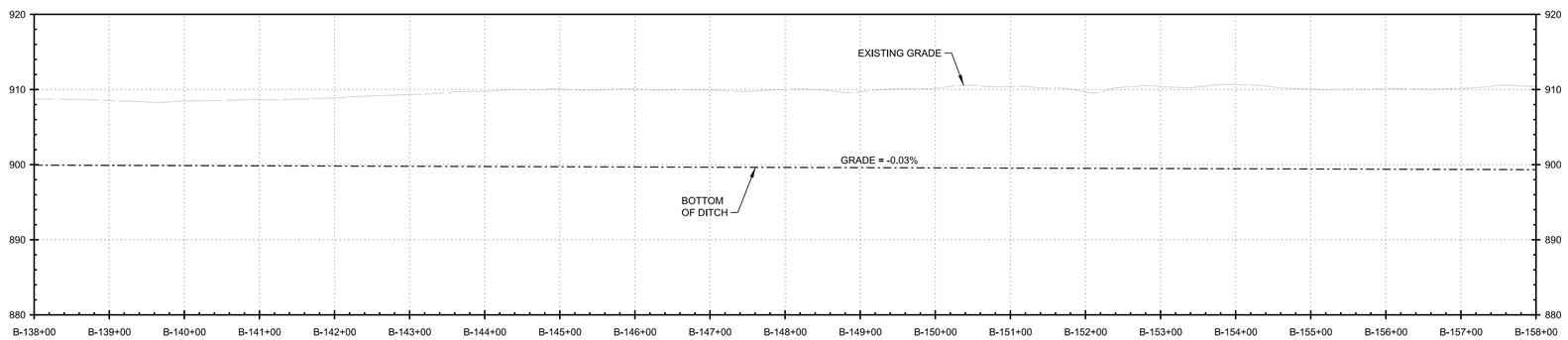
1. PROFILE DEPICTS BOTTOM OF DITCH FINISH GRADE INCLUDING 22 INCHES OF TOPSOIL.



E1 PROFILE - BORROW - STA B-158+00 TO STA B-178+00

HORIZONTAL SCALE : 1"=100'-0"
VERTICAL SCALE : 1"=10'-0"

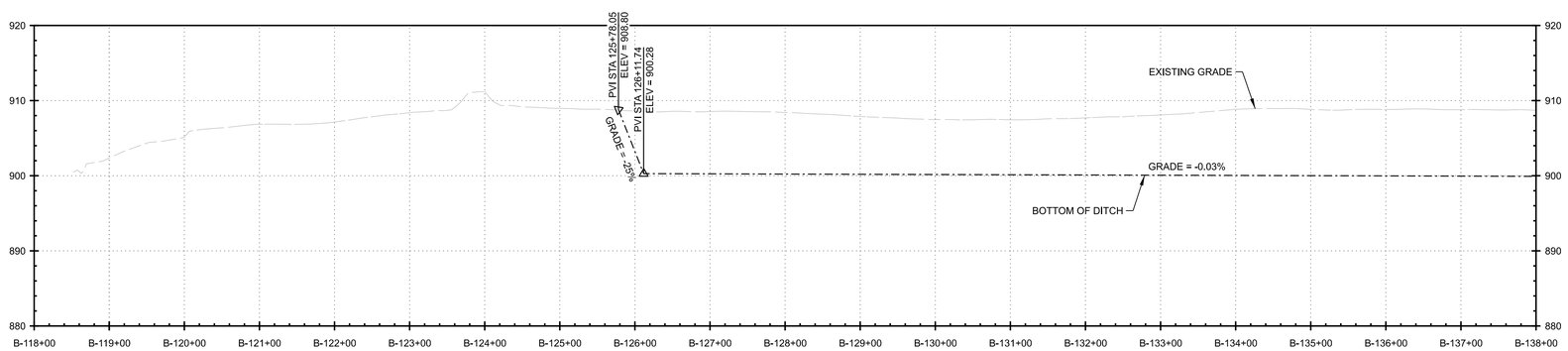
0 100' 200'



C1 PROFILE - BORROW - STA B-138+00 TO STA B-158+00

HORIZONTAL SCALE : 1"=100'-0"
VERTICAL SCALE : 1"=10'-0"

0 100' 200'



A1 PROFILE - BORROW - STA B-118+00 TO STA B-138+00

HORIZONTAL SCALE : 1"=100'-0"
VERTICAL SCALE : 1"=10'-0"

0 100' 200'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: C. GOCHE
DRAWN BY: A. RODRIGUEZ
CHECKED BY: V. CHAMBERS
SUBMITTED BY: R. NICKEL
SIZE: ANSI D
ISSUE DATE: 29 JUN 2023
SOLICITATION NO.:
CONTRACT NO.:
AS-BUILT NO.:
FILE NAME: FMMSE2B_VOL1_CS201xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

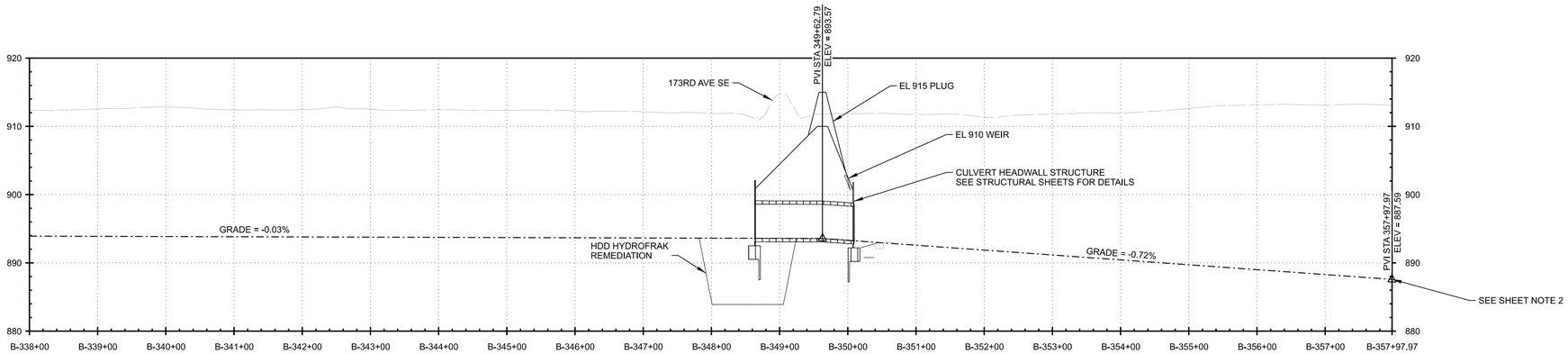
BORROW DITCH PROFILE
STA B-118+00 TO STA B-178+00

SHEET ID
OPT A
CS201

100% REVIEW

GENERAL SHEET NOTES

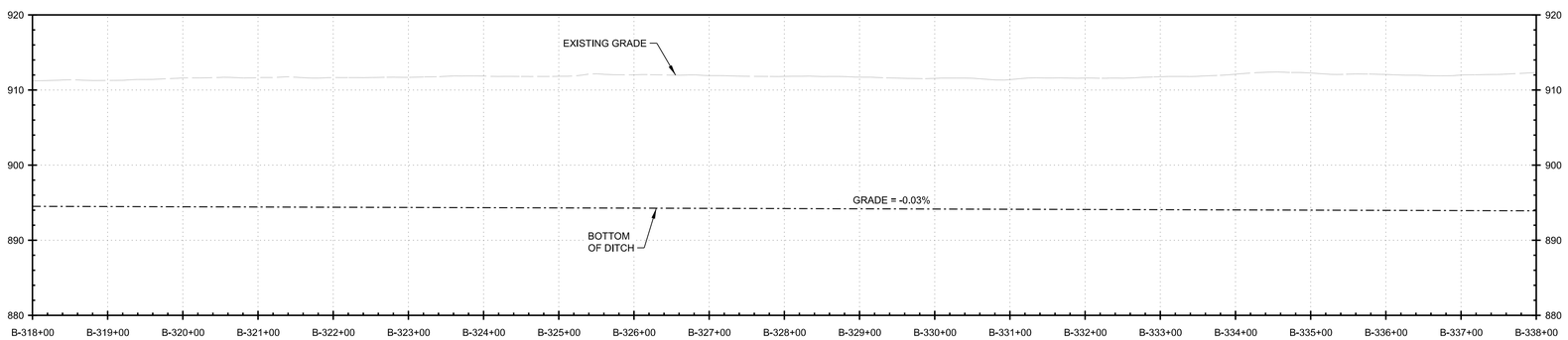
1. PROFILE DEPICTS BOTTOM OF DITCH FINISH GRADE INCLUDING 22 INCHES OF TOPSOIL.
2. BORROW PROFILE TO TIE INTO EXISTING WRRS ENGINEERED CHANNEL PROFILE.



E1 PROFILE - BORROW - STA B-338+00 TO STA B-357+97.97

HORIZONTAL SCALE : 1"=100'-0"
VERTICAL SCALE : 1"=10'-0"

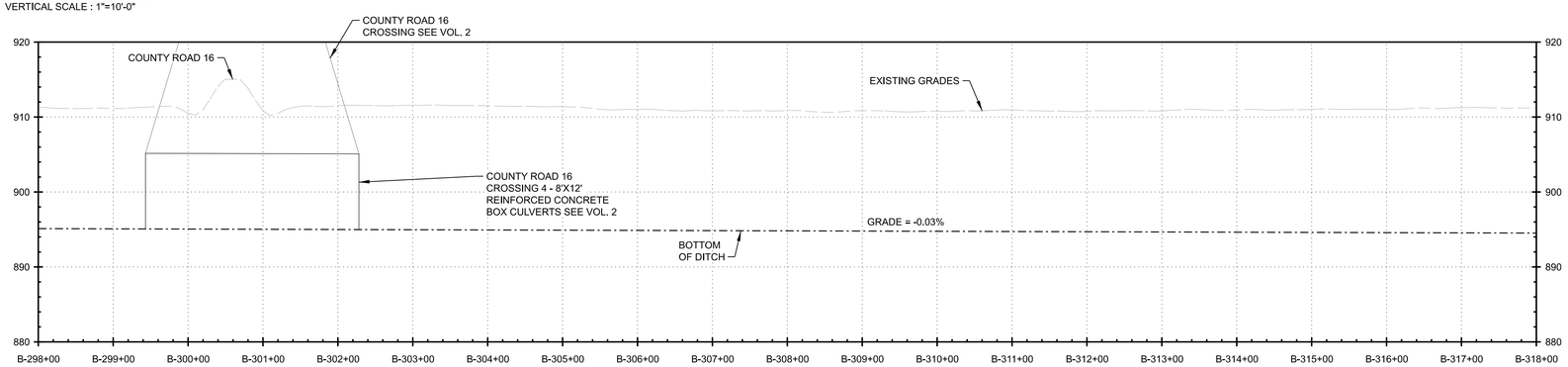
0 100' 200'



C1 PROFILE - BORROW - STA B-318+00 TO STA B-338+00

HORIZONTAL SCALE : 1"=100'-0"
VERTICAL SCALE : 1"=10'-0"

0 100' 200'



A1 PROFILE - BORROW - STA B-298+00 TO STA B-318+00

HORIZONTAL SCALE : 1"=100'-0"
VERTICAL SCALE : 1"=10'-0"

0 100' 200'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: C. GOCHE
DRAWN BY: A. RODRIGUEZ
CHECKED BY: V. CHAMBERS
SUBMITTED BY: R. NICKEL
SIZE: ANSI D
FILE NAME: FMMSE2B_VOL1_CS204xxx.dgn
ISSUE DATE: 29 JUN 2023
SOLICITATION NO.:
CONTRACT NO.:
AS-BUILT NO.:

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

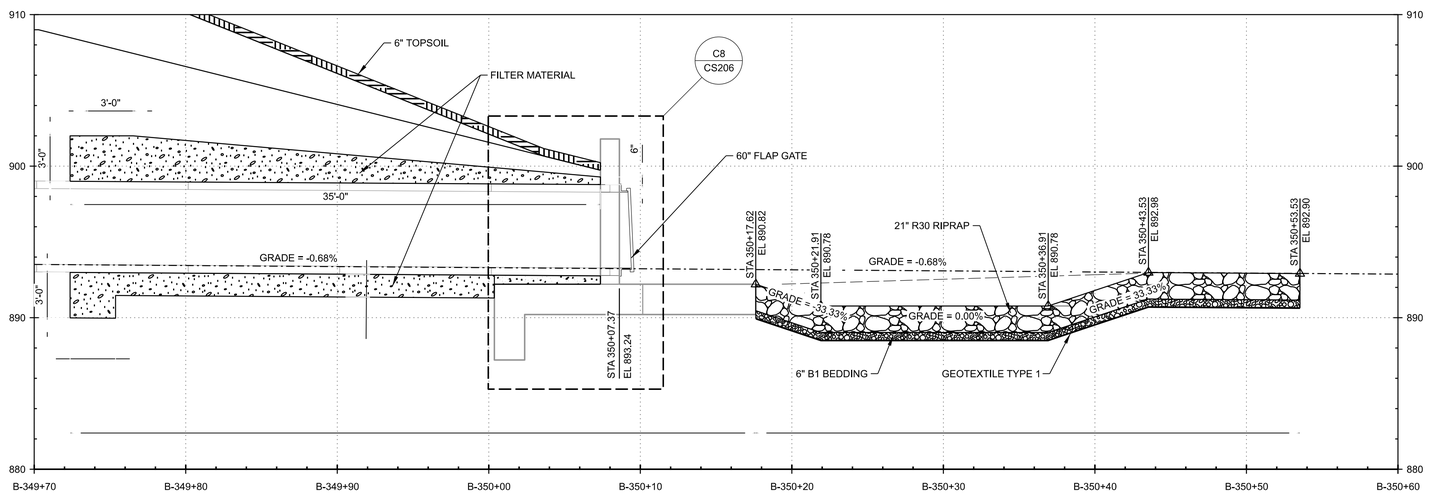
U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

BORROW DITCH PROFILE
STA B-298+00 TO STA B-357+97.97

SHEET ID
BASE
CS204

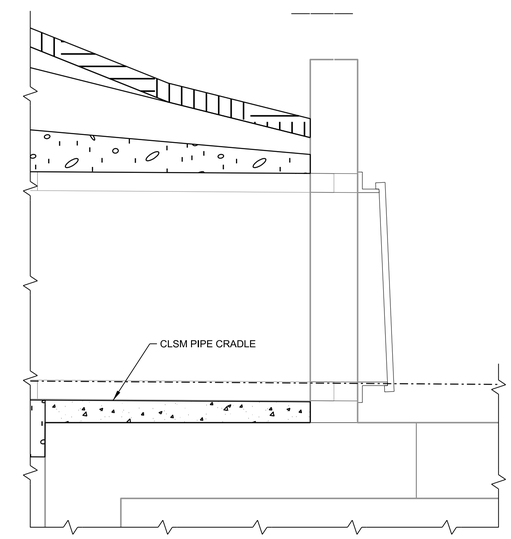
100% REVIEW



C1 PROFILE - CULVERT - STA B-349+70 TO STA B-350+70

SCALE: HORIZONTAL: 1"=5'-0" VERTICAL: 1"=5'-0"

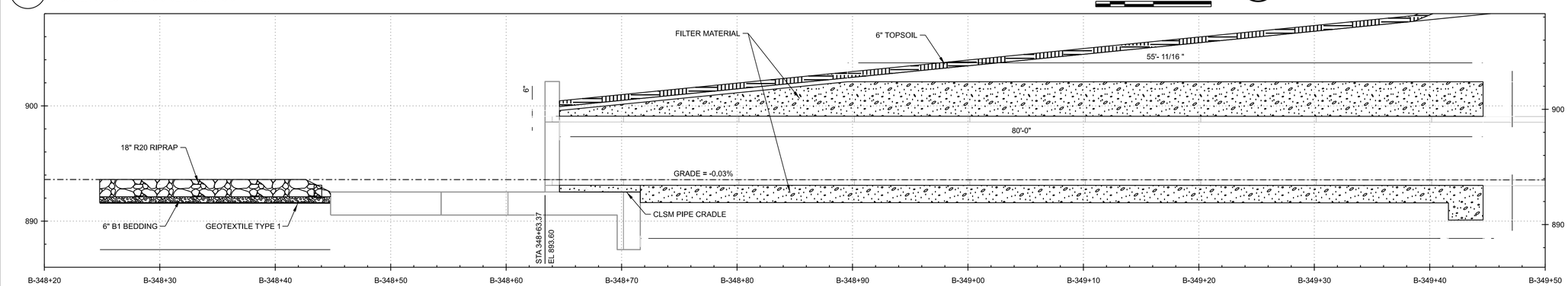
0 5' 10'



C8 DETAIL - PIPE TO HEADWALL CONNECTION

SCALE: 1/2" = 1'-0"

0 1' 2' 4'



A1 PROFILE - CULVERT - STA B-348+80 TO STA B-349+40

SCALE: HORIZONTAL: 1"=5'-0" VERTICAL: 1"=5'-0"

0 10' 20'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: C. GOCHE
DRAWN BY: A. RODRIGUEZ
CHECKED BY: V. CHAMBERS
SUBMITTED BY: R. NICKEL
SIZE: ANSI D
ISSUE DATE: 29 JUN 2023
SOLICITATION NO.:
CONTRACT NO.:
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FILE NAME: FMMSE2B_VOL1_CS206xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
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ST. PAUL, MINNESOTA
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U.S. ARMY CORPS OF ENGINEERS
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ROCK ISLAND, ILLINOIS

FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

BORROW CULVERT PROFILES
STA B-348+80 TO STA B-349+40
AND STA B-349+70 TO STA B-350+70

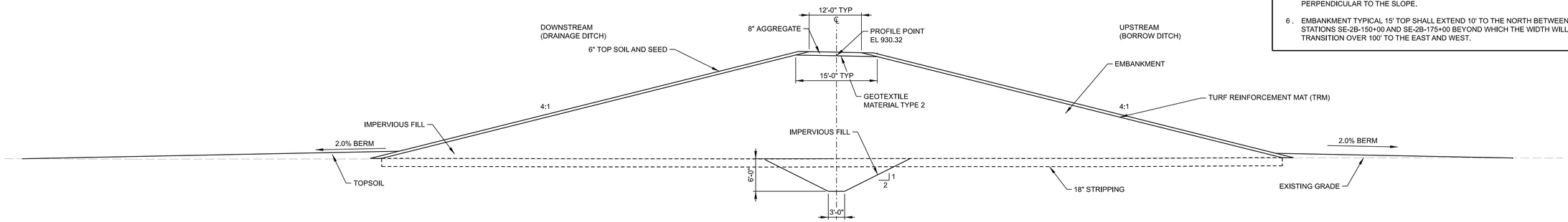
SHEET ID
BASE
CS206

%PRODUCTION DATA 1%
%PRODUCTION DATA 2% %PRODUCTION DATA 3% %PRODUCTION DATA 4%

100% REVIEW

GENERAL SHEET NOTES

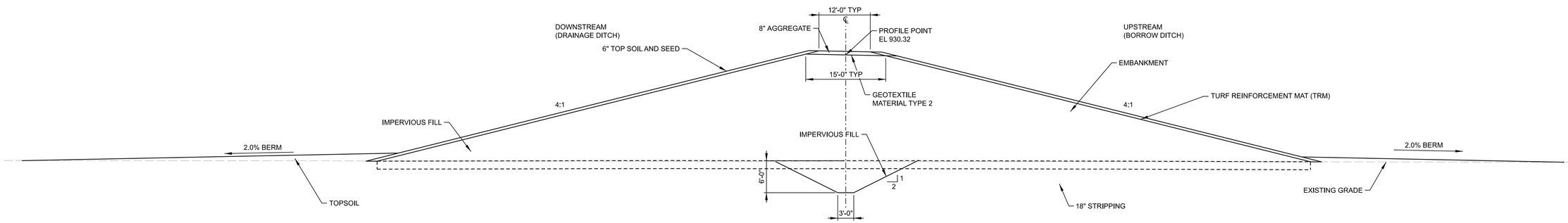
1. REFER TO CS501 FOR ADDITIOINAL DETAILS ASSOCIATED WITH CONSTRUCTION OF THE DAM EMBANKMENT.
2. BORROW DITCH BOTTOM WIDTH STARTS AT 60' AT STATION B-125+78.05 AND EXTENDS TO STATION B-154+00, THEN TRANSITIONS TO 140' BETWEEN STATIONS B-154+00 AND B-155+00.
3. BORROW DITCH BOTTOM WIDTH EXTENDS FROM B-155+00 TO B-339+85 WITH THE EXCEPTION OF NARROWING TO 52' FOR 45TH ST AND CR16 ROAD CROSSINGS.
4. BORROW DITCH BOTTOM WIDTH TRANSITIONS FROM 140' BETWEEN STATIONS B-339+85 AND B-341+00 TO 30' WHICH EXTENDS TO THE WRRS ENGINEERED CHANNEL AT STATION B-357+97.97.
5. 2% BERM GRADED TO DRAIN AWAY FROM THE DAM TOE EXTENDS TO THE ADJACENT DITCH OR IN LOCATIONS WHERE NO ADJACENT DITCH EXISTS FOR A DISTANCE OF 50 FT FROM THE EMBANKMENT TOE MEASURED PERPENDICULAR TO THE SLOPE.
6. EMBANKMENT TYPICAL 15' TOP SHALL EXTEND 10' TO THE NORTH BETWEEN STATIONS SE-2B-150+00 AND SE-2B-175+00 BEYOND WHICH THE WIDTH WILL TRANSITION OVER 100' TO THE EAST AND WEST.



E1 SECTION - EMBANKMENT STA SE-2B-303+00 - STA SE-2B 343+84.72

SCALE: 1"=10'-0"

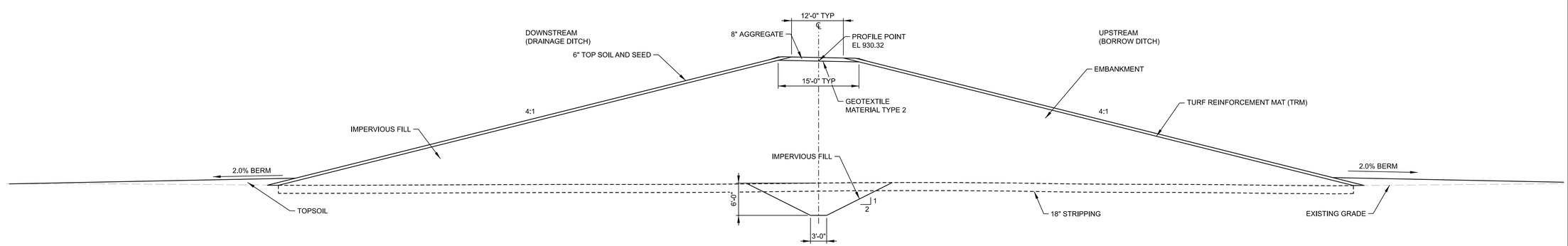
0 10' 20'



D1 SECTION - EMBANKMENT STA SE-2B-210+00 - STA SE-2B 303+00

SCALE: 1"=10'-0"

0 10' 20'



A1 SECTION - EMBANKMENT STA SE-2B-125+53.23 - STA SE-2B 210+00

SCALE: 1"=10'-0"

0 10' 20'

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FILE NAME: FMMSE2B_VOL1_CS301xxx.dgn

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FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

EMBANKMENT
TYPICAL SECTIONS

SHEET ID
BASE/OPT A
CS301

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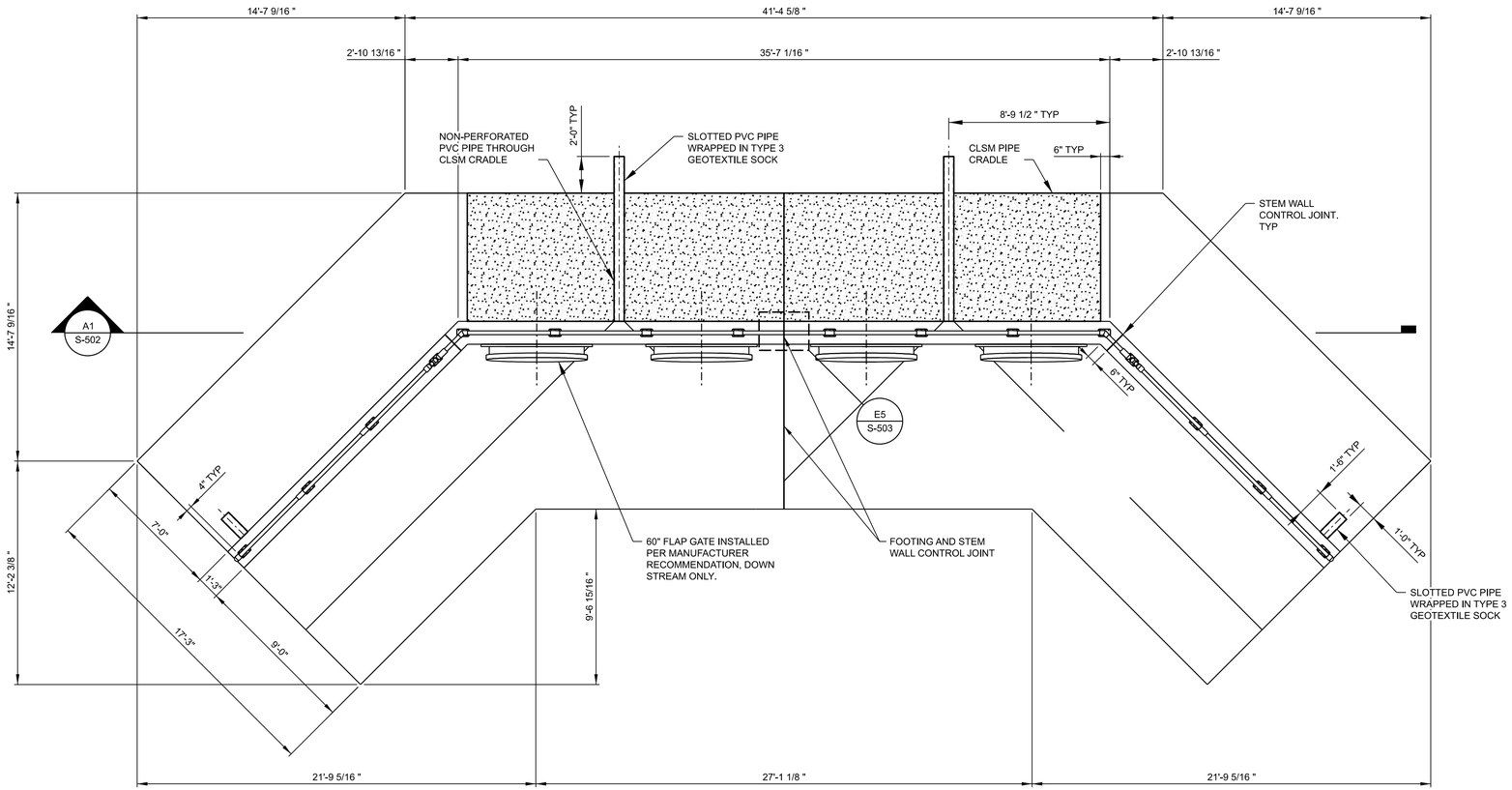
1:21:08 PM 9/18/2023 PD: AEC_pdf.pltcfg DS: AEC_Screen_FullSize.dscript

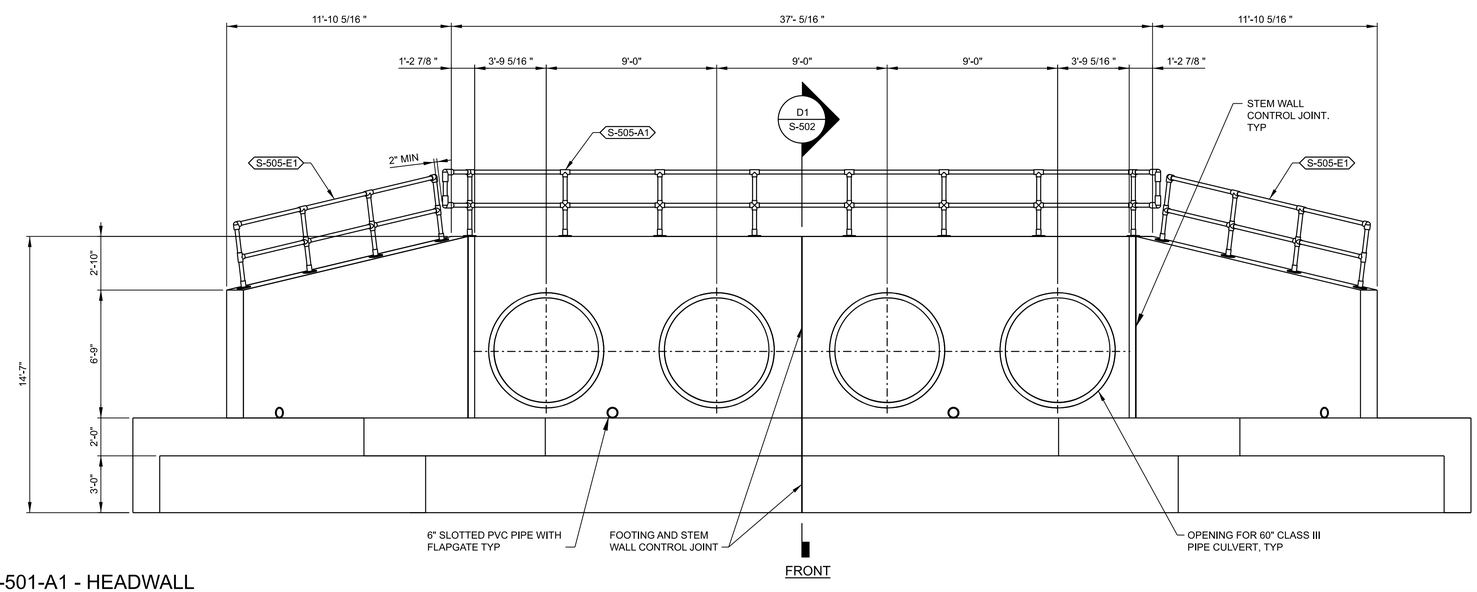
100% REVIEW

GENERAL SHEET NOTES

1. PROVIDE 6" FLAP GATE AND SLOTTED PVC AT BOTH UPSTREAM AND DOWNSTREAM HEADWALLS.



TOP



FRONT

A1 S-501-A1 - HEADWALL

SCALE: 1/4"=1'-0"

0 2' 4' 8'

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FILE NAME: FMMSE2B_VOL1_S-501xxx.dgn

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FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DETAILS
HEADWALL
UPSTREAM AND DOWNSTREAM

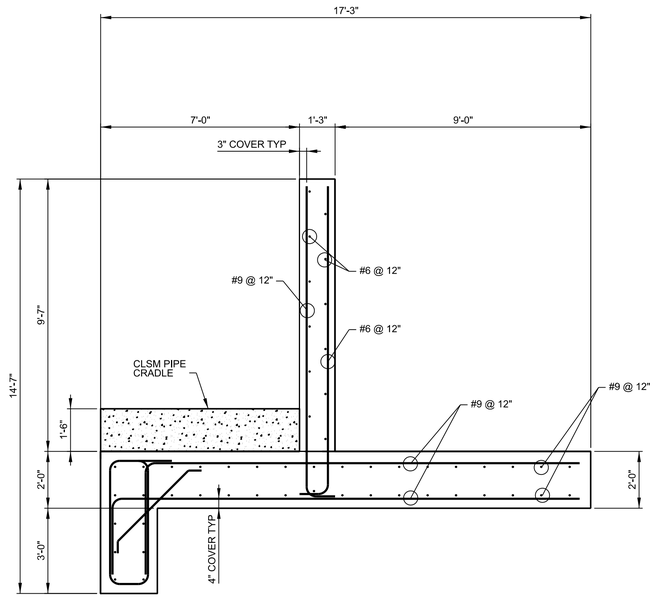
SHEET ID
BASE
S-501

...\AEC_English_WorkSpace\...\AEC_Survey Foot_Template\...\FMMSE2B_VOL1_S-501xxx.dgn
5:41:31 PM 9/15/2023 PD: AEC_pdf.pltcfg DS: AEC_Screen_FullSize.dscript

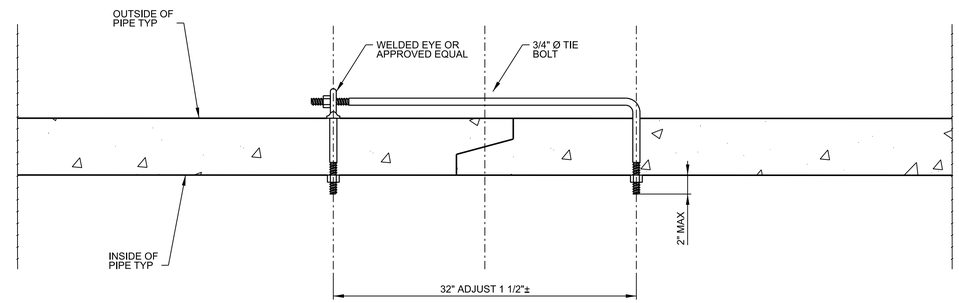
100% REVIEW

GENERAL SHEET NOTES

1. PLACE REINFORCING AROUND CULVERT OPENING AT CENTERLINE OF HEADWALL STEM.
2. INSTALL FOUR (4) 60" FLAP GATES. SEE SPEC 33 40 00.
3. WINGWALL REINFORCEMENT TO BE THE SAME AS HEADWALL REINFORCEMENT AS SHOWN. REINFORCEMENT TO BE CONTINUOUS FROM HEADWALL TO WINGWALL.



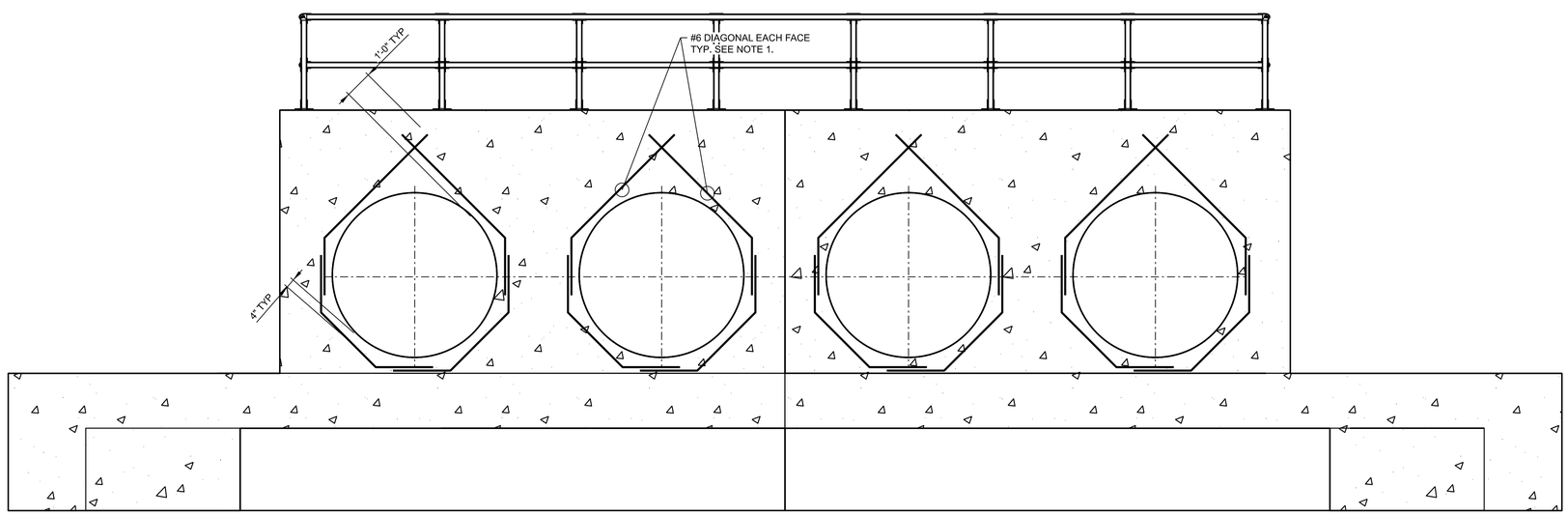
D1 SECTION - HEADWALL
SCALE: 3/8"=1'-0"



NOTES:

1. DO NOT USE TIES TO PULL PIPE TIGHT. TIES ARE ONLY FOR HOLDING SECTIONS TOGETHER.
2. TIE BOLT HOLES IN PIPE MAY BE DRILLED OR PRECAST. TAP CORED HOLES MAY BE USED WHEN PRECAST. HOLES TO BE 1/4" LARGER DIAMETER THAN TIE THREAD DIAMETER.
3. PLACE TIE BETWEEN THE LAST 3 PIPE SECTIONS ON EACH END.
4. PLACE JOINT WRAP PRIOR TO INSTALLING TIES.
5. SEAL DRILLED HOLES WITH APPROVED EPOXY GROUT FROM EPOXY AND ANCHOR BOLT SPECIFICATION.

D5 DETAIL - EYE BOLT TIE
SCALE: NTS



A1 SECTION - HEADWALL
SCALE: 3/8"=1'-0"

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FILE NAME: FMMSE2B_VOL1_S-502xxx.dgn

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FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DETAILS
HEADWALL REBAR LOCATION
UPSTREAM AND DOWNSTREAM

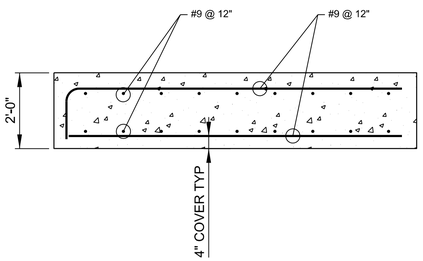
SHEET ID
BASE
S-502

...\AEC_English_WorkSpace\...\AEC_Survey Foot_Template\...\FMMSE2B_VOL1_S-502xxx.dgn
5:43:05 PM 9/15/2023 PD: AEC_pdf.pltcfg DS: AEC_Screen_FullSize.dscript

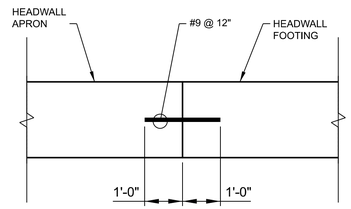
100% REVIEW

GENERAL SHEET NOTES

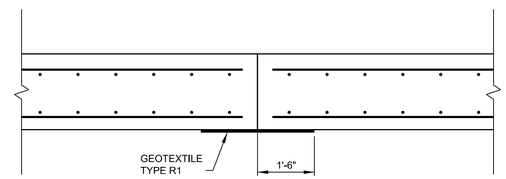
1. E4 DETAIL DEPICTS THE JOINT BETWEEN THE HEADWALL FOOTING AND UPSTREAM HEADWALL APRON.
2. PROVIDE CONTRACTION JOINTS ON APRON SLAB AS SEPCIFIED IN 03 15 14.



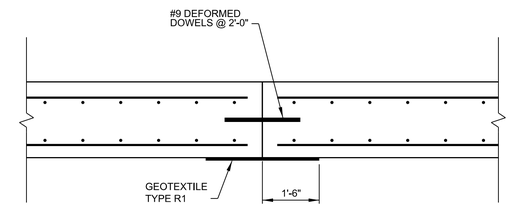
E1 SECTION
SCALE: 1/4" = 1'-0"



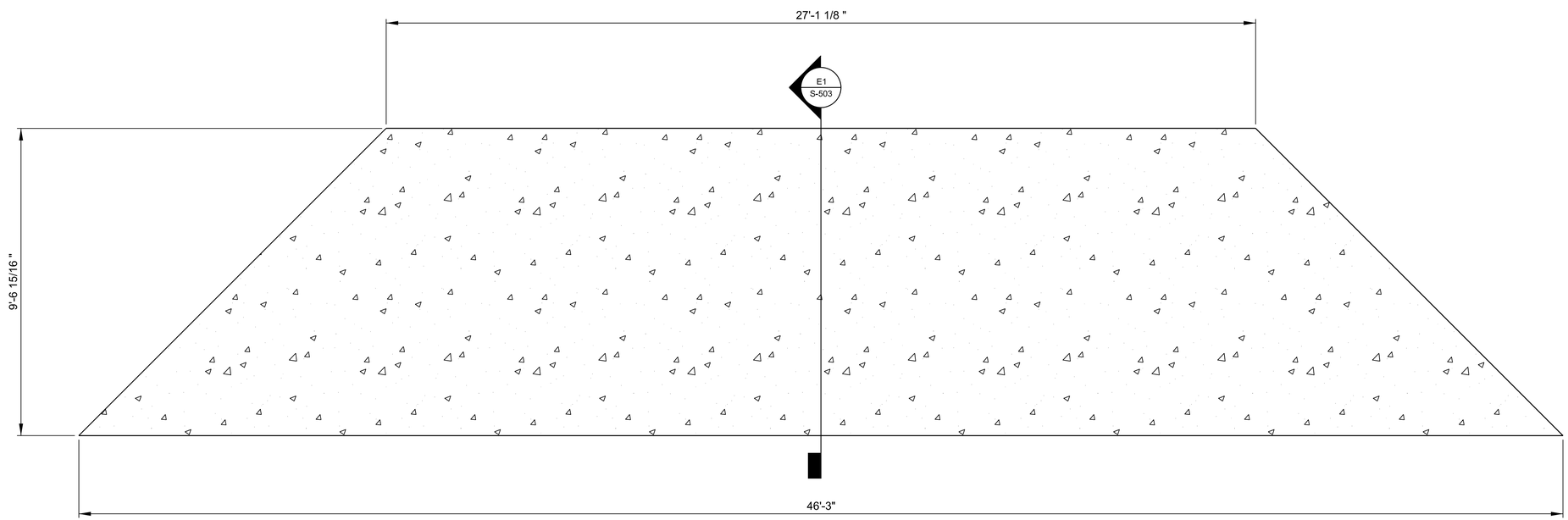
E4 DETAIL
SCALE: 1/4" = 1'-0"



E5 DETAIL - STEM WALL CONTROL JOINT TYPICAL
SCALE: 1/4" = 1'-0"



E8 DETAIL - FOOTING CONTROL JOINT TYPICAL
SCALE: 1/4" = 1'-0"



A1 S-503-A1 - UPSTREAM HEADWALL APRON
SCALE: 1/4" = 1'-0"

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FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

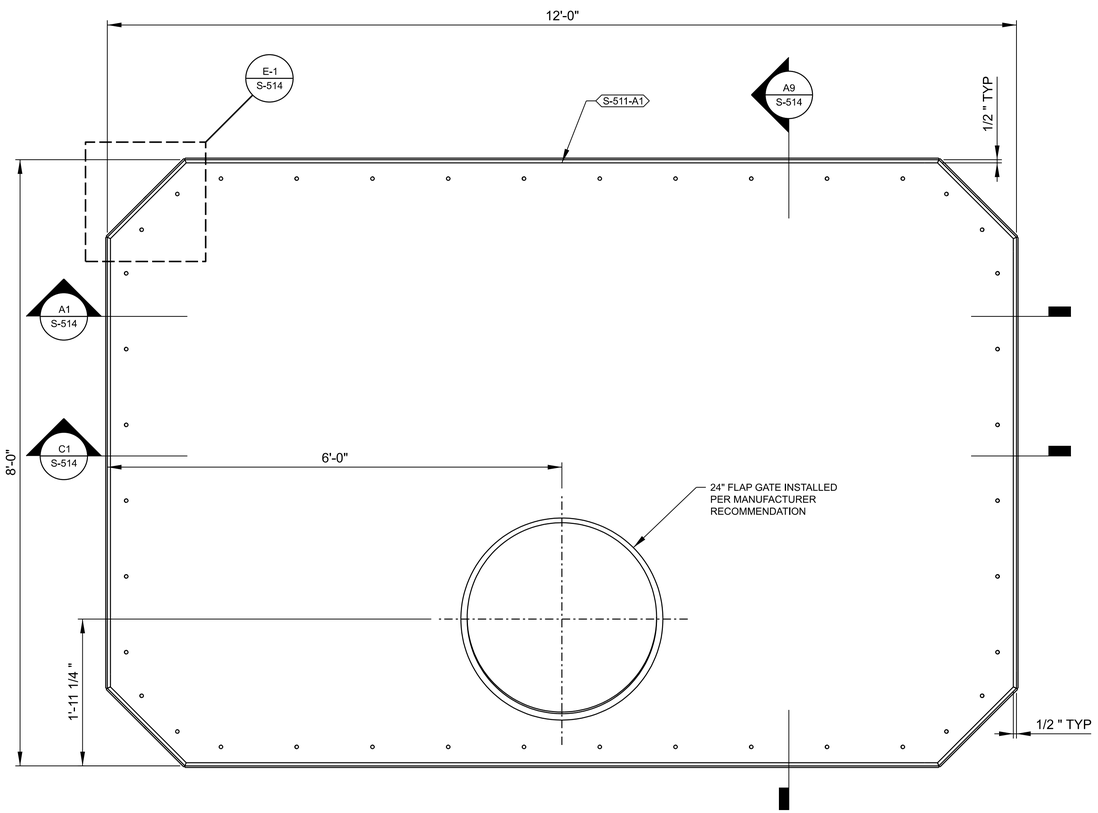
DETAILS
HEADWALL SLAB

SHEET ID
BASE
S-503

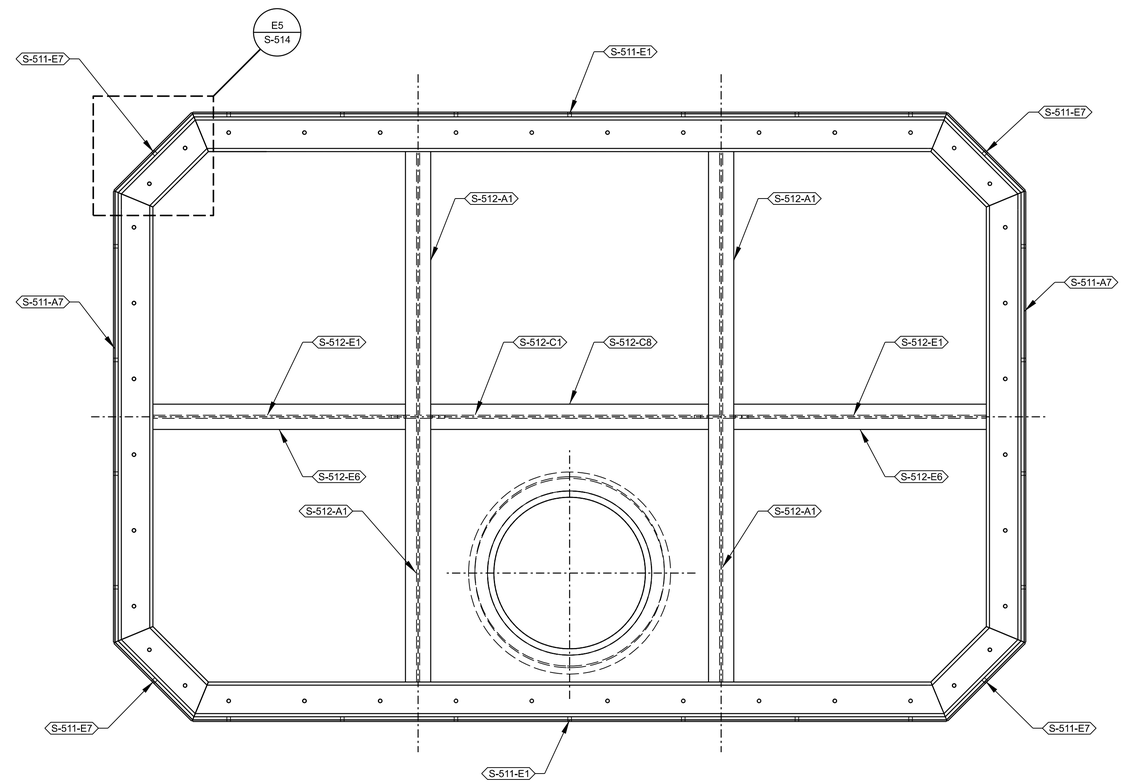
100% REVIEW

GENERAL SHEET NOTES

1. BULKHEADS (4) TO BE INSTALLED IN 8'X12' REINFORCED CONCRETE BOX CULVERTS BEING INSTALLED AT COUNTY ROAD 16 AS PART OF THE VOLUME 2 WORK.
2. ASSEMBLY FOR 1 BULKHEAD SHOWN. TOTAL OFF 4 REQUIRED.
3. PRIOR TO FABRICATION, COORDINATE/VERIFY ACTUAL DIMENSIONS FROM REINFORCED CONCRETE BOX CULVERT SUPPLIER.



DOWNSTREAM FACE



UPSTREAM FACE

A1 ASSEMBLY - BULKHEAD
SCALE: 1" = 1'-0"

0 6" 1' 2'

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FILE NAME: FMMSE2B_VOL1_S-510xxx.dgn

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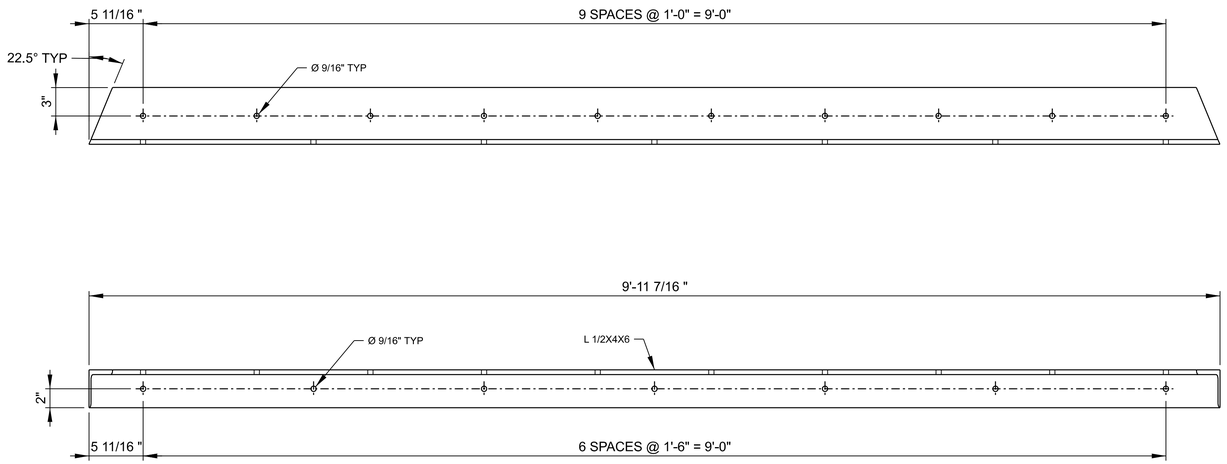
FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

ASSEMBLY
BULKHEAD

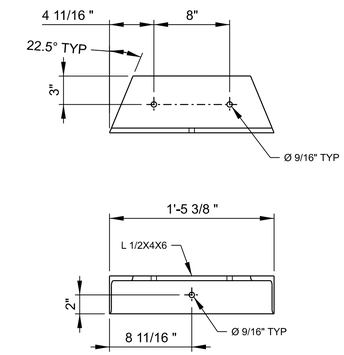
SHEET ID
BASE
S-510

100% REVIEW

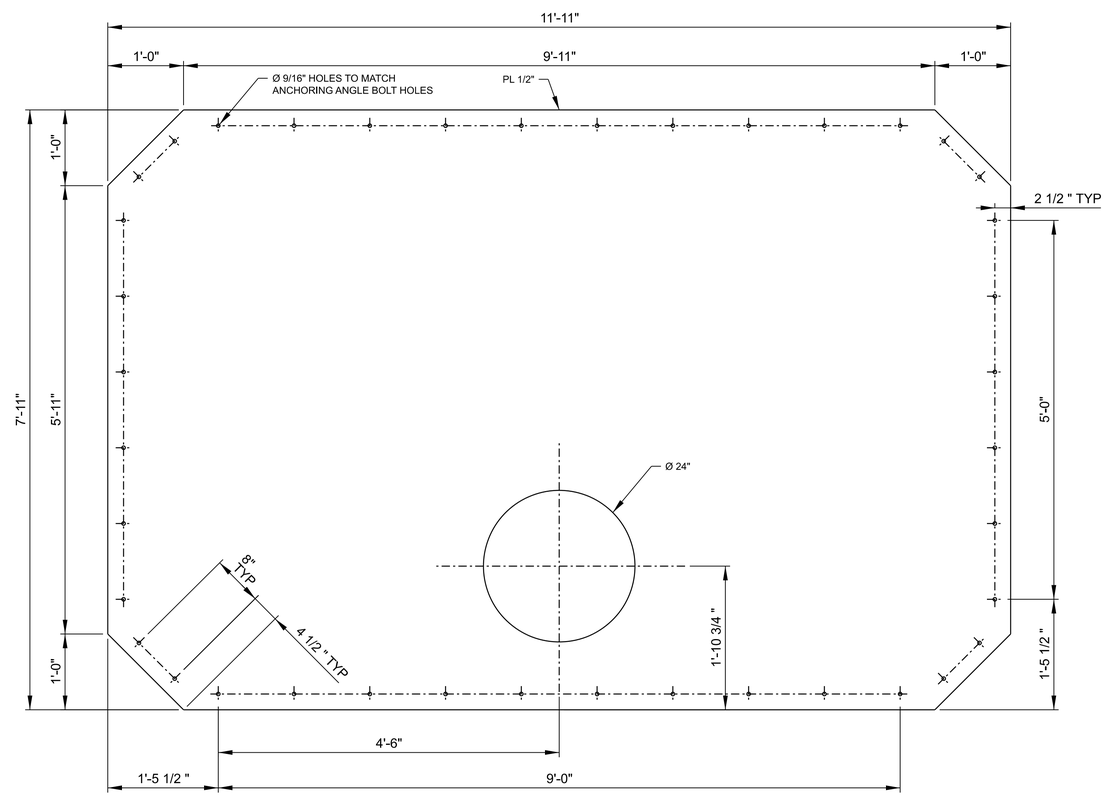
BILL OF MATERIALS				
MARK NO	QTY	TOTAL QTY	DESCRIPTION	MATERIAL
S-511-A1	1	4	SKIN PLATE	ASTM A709 GR50
S-511-A7	2	8	VERTICAL ANCHORING ANGLE	ASTM A572 GR50
S-511-E1	2	8	HORIZONTAL ANCHORING ANGLE	ASTM A572 GR50
S-511-E7	4	16	CORNER ANCHORING ANGLE	ASTM A572 GR50



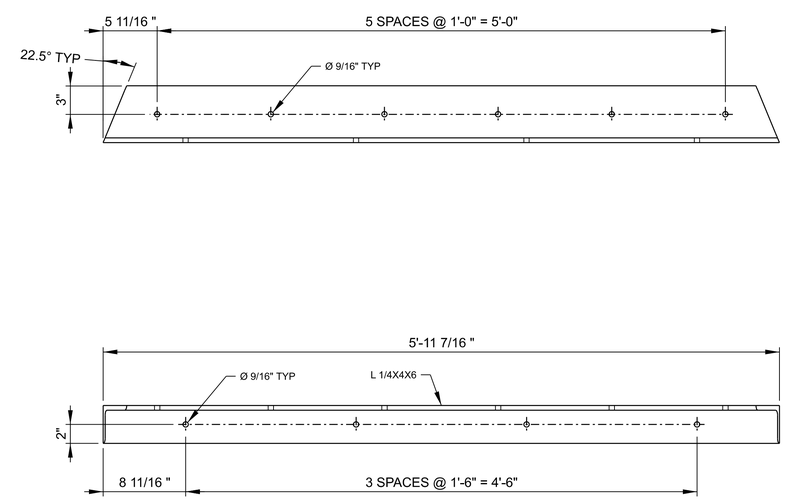
E1 S-511-E1 - HORIZONTAL ANCHORING ANGLE
SCALE: 1 1/2" = 1'-0"



E7 S-511-E7 - CORNER ANCHORING ANGLE
SCALE: 1 1/2" = 1'-0"



A1 S-511-A1 - SKIN PLATE
SCALE:



A7 S-511-A7 - VERTICAL ANCHORING ANGLE
SCALE: 1 1/2" = 1'-0"

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FMM SOUTHERN EMBANKMENT REACH SE-2B
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FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DETAILS
BULKHEAD

SHEET ID
BASE
S-511

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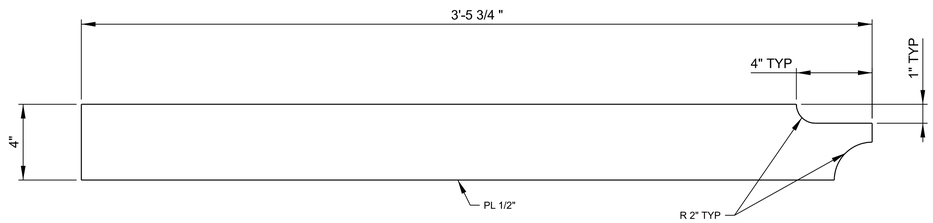
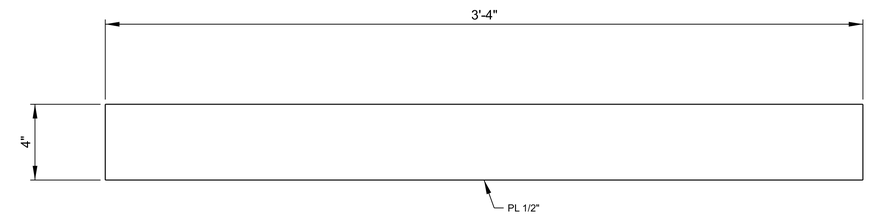
100% REVIEW

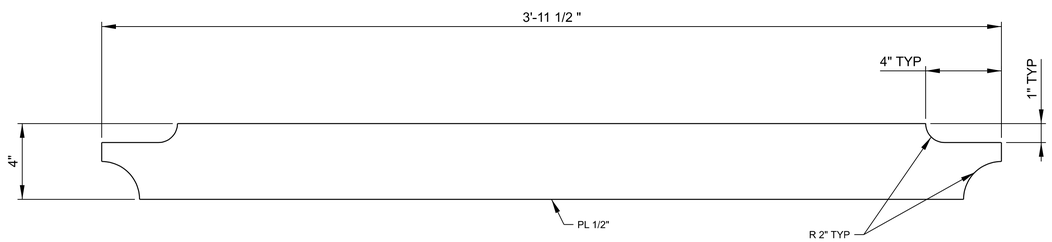
BILL OF MATERIALS				
MARK NO	QTY	TOTAL QTY	DESCRIPTION	MATERIAL
S-511-A1	4	8	VERTICAL STIFFENER PLATE	ASTM A709 GR50
S-511-C1	1	2	CENTER HORIZONTAL STIFFENER	ASTM A709 GR50
S-512-C6	1	2	CENTER HORIZONTAL PLATE	ASTM A709 GR50
S-512-E1	1, 1 OPP HAND	4	SIDE HORIZONTAL STIFFENER	ASTM A709 GR50
S-512-E6	2	4	SIDE HORIZONTAL PLATE	ASTM A709 GR50



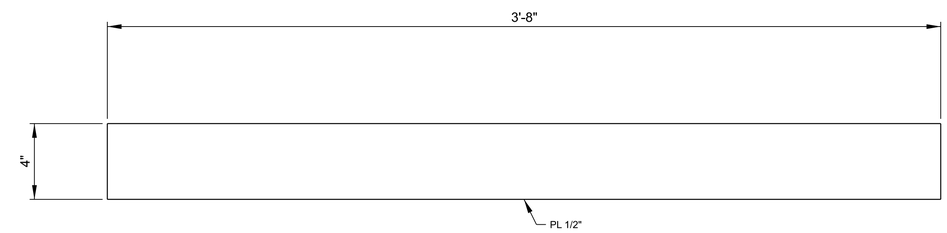
E1 S-512-E1 - HORIZONTAL STIFFENER
SCALE: 3" = 1'-0"



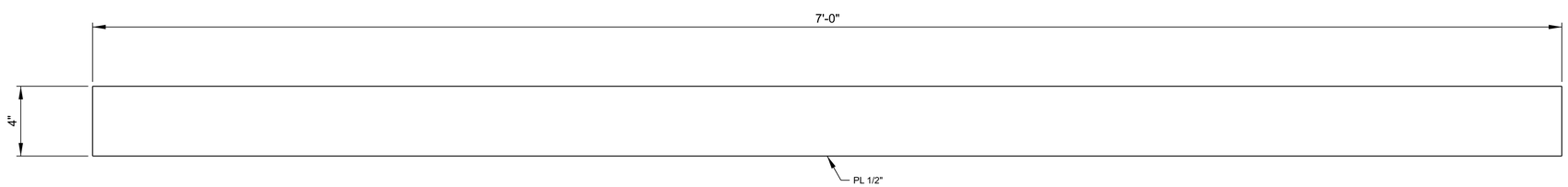
E6 S-512-E6 - HORIZONATAL PLATE
SCALE: 3" = 1'-0"



C1 S-51-C1 - HORIZONTAL STIFFENER
SCALE: 3" = 1'-0"



C6 S-512-C6 - HORIZONATAL PLATE
SCALE: 3" = 1'-0"



A1 S-512-A1 - VERTICAL STIFFENER
SCALE: 3" = 1'-0"

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

ISSUE DATE: 29 JUN 2023
SOLICITATION NO.:
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SUBMITTED BY: B. JONES
SIZE: ANSI D

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FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DETAILS
BULKHEAD

SHEET ID
BASE
S-512

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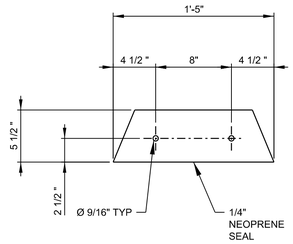
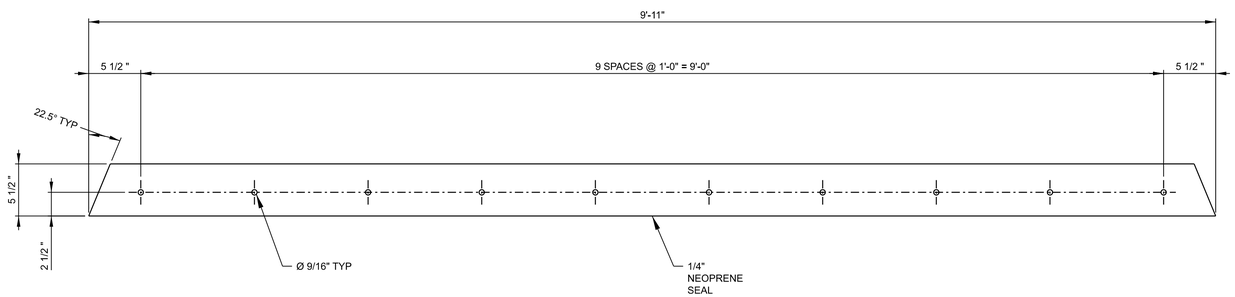
5:57:49 PM 9/15/2023 PD: AEC_pdf.pltcfg DS: AEC_Screen_FullSize.dscript

100% REVIEW

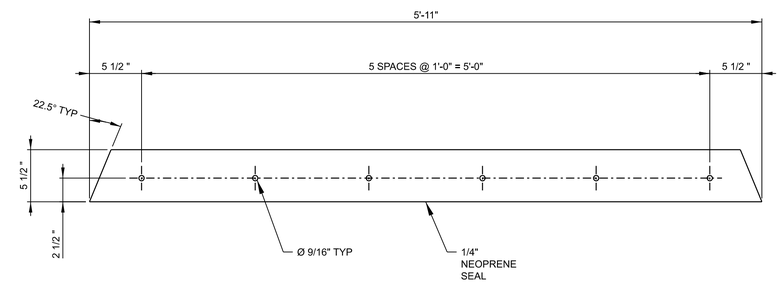
BILL OF MATERIALS				
MARK NO	QTY	TOTAL QTY	DESCRIPTION	MATERIAL
S-513-A1	1	4	ANCHORING ANGLE SEAL	NEOPRENE ROLL
S-513-D1	2	4	HORIZONTAL SKIN PLATE SEAL	NEOPRENE
S-513-D7	2	4	VERTICAL SKIN PLATE SEAL	NEOPRENE
S-513-F1	4	8	CORNER SKIN PLATE SEAL	NEOPRENE



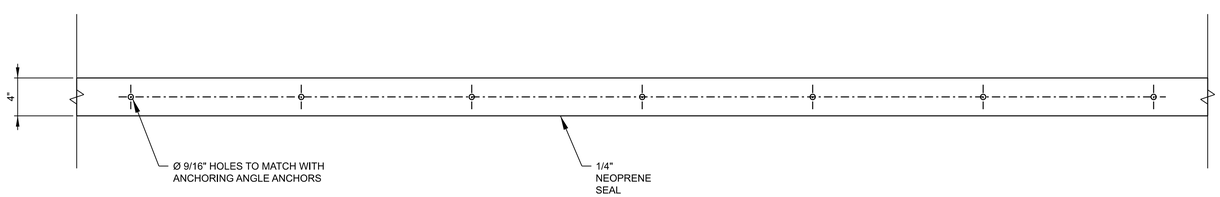
F1 S-51-C1 - CORNER SKIN PLATE SEAL
SCALE: 1 1/2" = 1'-0"



D1 S-513-A1 - HORIZONTAL SKIN PLATE SEAL
SCALE: 1 1/2" = 1'-0"



D7 S-513-C6 - VERTICAL SKIN PLATE SEAL
SCALE: 1 1/2" = 1'-0"



NOTES:

1. PROVIDE CONTINUOUS SEAL WITH 1 OR 2 SPLICE LOCATIONS

A1 S-513-A1 - ANCHORING ANGLE SEAL
SCALE: 1 1/2" = 1'-0"

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: C. CLEMENTS
DRAWN BY: A. RODRIGUEZ
CHECKED BY: K. BUIS
SUBMITTED BY: B. JONES
SIZE: ANSI D
ISSUE DATE: 29 JUN 2023
SOLICITATION NO.:
CONTRACT NO.:
AS-BUILT NO.:
FILE NAME: FMMSE2B_VOL1_S-513xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

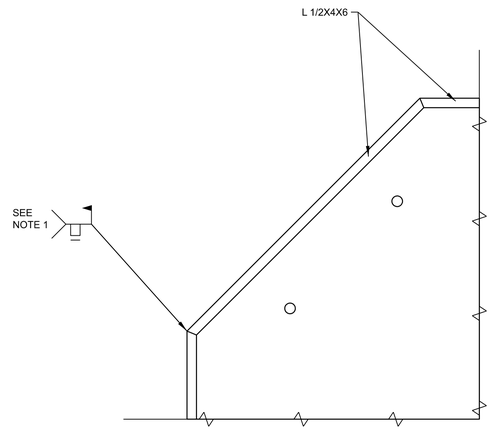
DETAILS
BULKHEAD

SHEET ID
BASE
S-513

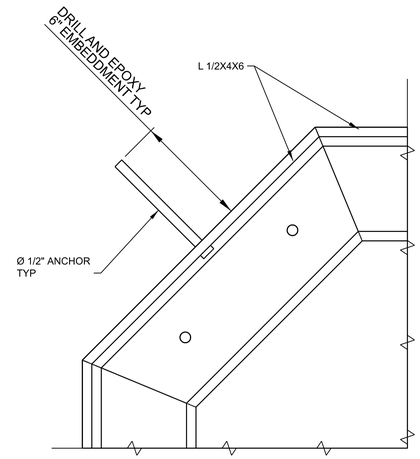
100% REVIEW

GENERAL SHEET NOTES

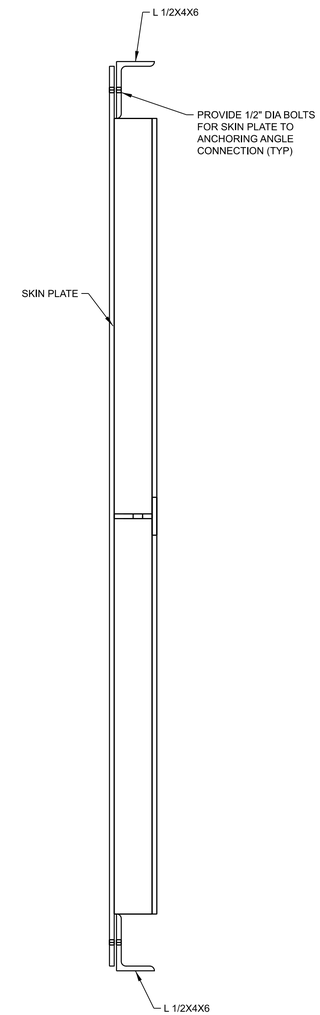
1. FIELD WELD ANCHORING ANGLE AT EACH MITER CORNER. TYPICAL AT 8 LOCATIONS.

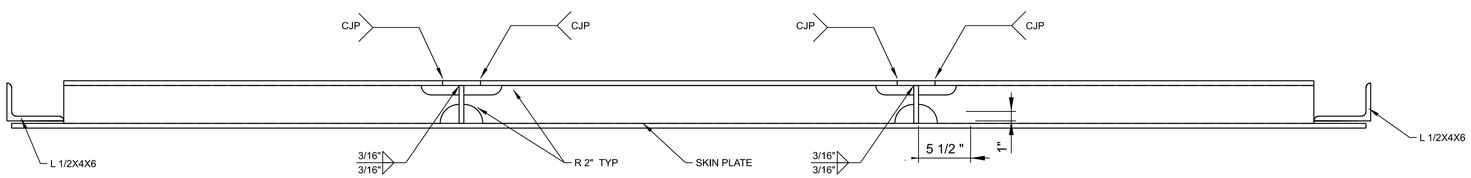


E1 DETAIL - MITERED ANGLE CONNECTION
SCALE: 0 3" 6" 1'

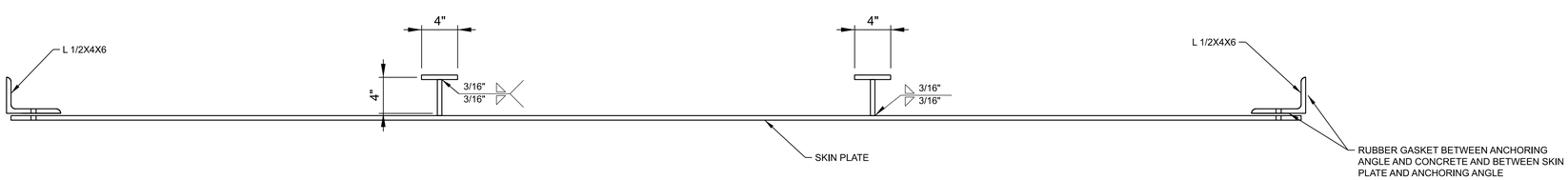


E5 DETAIL - BULKHEAD TO RCB CONNECTION
SCALE: 0 3" 6" 1'





C1 SECTION - STIFFENERS COPE/CONNECTION
SCALE: 0 6" 1' 2'



A1 SECTION - STIFFENERS
SCALE: 0 6" 1' 2'

A9 SECTION -
SCALE: 0 6" 1' 2'

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

DESIGNED BY: C. CLEMENTS
DRAWN BY: A. RODRIGUEZ
CHECKED BY: K. BUIS
SUBMITTED BY: B. JONES
SIZE: ANSI D
ISSUE DATE: 29 JUN 2023
SOLICITATION NO.:
CONTRACT NO.:
AS-BUILT NO.:
FILE NAME: FMMSE2B_VOL1_S-514xxx.dgn

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

U.S. ARMY CORPS OF ENGINEERS
ROCK ISLAND DISTRICT
ROCK ISLAND, ILLINOIS

FMM SOUTHERN EMBANKMENT REACH SE-2B
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

DETAILS
BULKHEAD

SHEET ID
BASE
S-514

100% REVIEW

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

VOLUME 2 - COUNTY ROAD 81 SE-3 CROSSING

ENGINEERING SEAL FOR SHEETS: VOLUME 2 SECTIONS 1, 2, 4, & SHEET 1, 20 SHEETS 3 TO 20, 40, 50, 60, 120, & 200 REGISTERED PROFESSIONAL ENGINEER RUDD PE-10407 DATE NORTH DAKOTA 8/21/2024 BY 8/21/2024 DATE	ENGINEERING SEAL FOR SHEETS: VOLUME 2 SECTION 120 REGISTERED PROFESSIONAL ENGINEER WESLEY J. KELLER PE-27400 DATE NORTH DAKOTA 8/26/2024 BY 8/26/2024 DATE	ENGINEERING SEAL FOR SHEETS: VOLUME 2 SECTION 81 REGISTERED LAND SURVEYOR JAMES A. SCHLIEMAN LS-8066 DATE NORTH DAKOTA 8/22/2024 BY 8/22/2024 DATE
ENGINEERING SEAL FOR SHEETS: VOLUME 2 SECTION 110 REGISTERED PROFESSIONAL ENGINEER STEVEN L. STRACK PE-10621 DATE NORTH DAKOTA 8/21/2024 BY 8/21/2024 DATE	ENGINEERING SEAL FOR SHEETS: VOLUME 2 SECTIONS SHEET 1, 2-4, 20 SHEETS 3 TO 14, 16, 100, & 199 REGISTERED PROFESSIONAL ENGINEER DYLAN ENSRUDE PE-29066 DATE NORTH DAKOTA 8/22/2024 BY 8/22/2024 DATE	

US Army Corps of Engineers®

MARK	DESCRIPTION	DATE

U.S. ARMY CORPS OF ENGINEERS
ST. PAUL DISTRICT
ST. PAUL, MINNESOTA
ST. PAUL DISTRICT

HMG
Houston-Moore Group
925 10TH AVE E
WEST FARGO, ND

DESIGNED BY: AR
DRAWN BY: GC
CHECKED BY: AR
SUBMITTED BY: AR
SIZE: ANSI D
ISSUE DATE: AUGUST 2024
SOLICITATION NO.: W912ES23B0016
CONTRACT NO.:
AS-BUILT NO.:
FILE NAME: FMMSE3_G-001xxx.dgn

FMM SOUTHERN EMBANKMENT REACH SE-3
RED RIVER OF THE NORTH RIVER BASIN
FARGO-MOORHEAD FLOOD RISK MANAGEMENT
FARGO, ND

COVER SHEET
REACH 3 TRANSPORTATION

SHEET ID
VOL 2
G-001

ADVERTISEMENT

DESIGN DATA - County Road 81			
	Average Daily		
Current 2018	Pass: 980	Trucks: 109	Total: 1089
Forecast 2043	Pass: 3319	Trucks: 369	Total: 3688
Clear Zone Distance: 34'		Design Speed: 65 MPH	
Minimum Sight Dist. for Stopping: 645'		Bridges: HL-93	
Sight Dist. for No Passing Zone: 1100'			
Pavement Design Life: 20 years			

Volume 2
County Road 81
SE-3

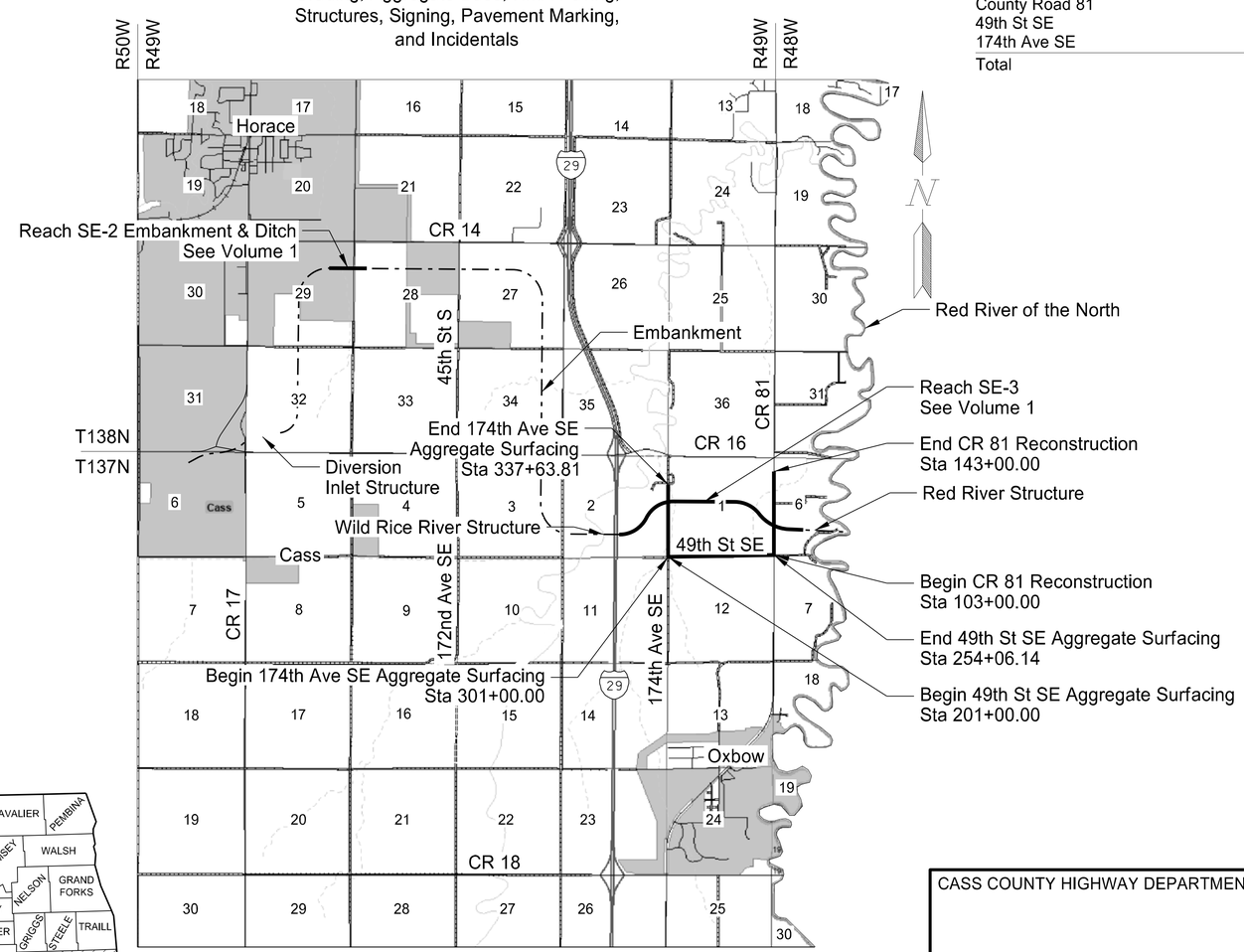
XXXX

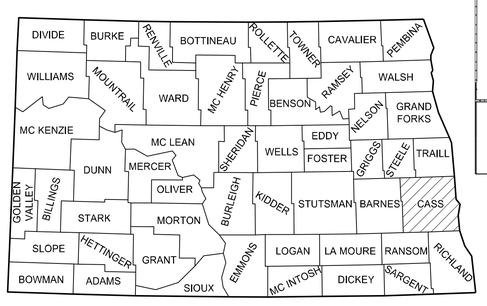
STATE	SOLICITATION NO.	PCN	SECTION NO.	SHEET NO.
ND	W912ES23B0016	-	1	1

Applicable Version of NDDOT Specifications	Date Published and Adopted by the North Dakota Department of Transportation
Standard Specifications	4/1/2023
Supplemental Specifications	NONE

PROJECT NUMBER \ DESCRIPTION	NET MILES	GROSS MILES
County Road 81	0.758	0.758
49th St SE	1.005	1.005
174th Ave SE	0.694	0.694
Total	2.457	2.457

Cass County
County Road 81
Near Oxbow, ND
Grading, Aggregate Base, HMA Paving,
Structures, Signing, Pavement Marking,
and Incidentals





STATE COUNTY MAP

DESIGNER
DESIGNER
DESIGNER

CASS COUNTY HIGHWAY DEPARTMENT

METRO FLOOD DIVERSION AUTHORITY

HOUSTON MOORE GROUP

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE-10407
DATE
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	2	1

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6	1	Notes
6	2	Notes
6	3	Notes
6	4	Notes
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20	2	General Details: Gate Detail
20	3	General Details: Erosion Control at Culvert Flared End Sections
20	4	General Details: TRM Detail
20	5	General Details: Riprap at Culvert Ends
20	6	General Details: Riprap at RCB Ends
20	7	General Details: Utility Markers
20	8	General Details: Utilities
20	9	General Details: Utilities
20	10	General Details: Sanitary Sewer/Watermain
20	11	General Details: Sanitary Sewer
20	12	General Details: Watermain
20	13	General Details: Connections to Existing Sanitary Sewer
20	14	General Details: Connections to Existing Watermain
30	1	Existing Typical Sections
30	2	Proposed Typical Sections
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40	2	Removals: County Road 81
51	1	Allowable Pipe List
60	1	Plan & Profile: County Road 81
60	2	Plan & Profile: County Road 81
60	3	Plan & Profile: County Road 81
60	4	Plan & Profile: 49th St SE
60	5	Plan & Profile: 49th St SE
60	6	Plan & Profile: 49th St SE
60	7	Plan & Profile: 174th Ave SE
60	8	Plan & Profile: 174th Ave SE
77	1	Permanent Sediment and Erosion Control: County Road 81
77	2	Permanent Sediment and Erosion Control: County Road 81
77	3	Permanent Sediment and Erosion Control: County Road 81
81	1	Survey Coordinate and Curve Data
100	1	Work Zone Traffic Control: Potential CR 81 Detour Layout
100	2	Work Zone Traffic Control: CR 81 Detour Layout
100	3	Work Zone Traffic Control: CR 81 Detour Layout
100	4	Work Zone Traffic Control: CR 81 Detour Layout
100	5	Work Zone Traffic Control: Sign Details
110	1	Signing: County Road 81
110	2	Signing: County Road 81
110	3	Signing: 174th Ave SE
110	4	Signing: 174th Ave SE
120	1	Marking: County Road 81
120	2	Marking: County Road 81
170	1	Box Culverts: County Road 81
170	2	Box Culverts: County Road 81

Section	Page	Description
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170	6	Box Culverts: County Road 81
199	1	Plan & Profile: County Road 81 Watermain
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199	3	Plan & Profile: County Road 81 Dry Utilities
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200	18	Cross Sections: County Road 81
200	19	Cross Sections: County Road 81
200	20	Cross Sections: County Road 81
200	21	Cross Sections: County Road 81

Standard Drawings	
D-101-1	NDDOT Abbreviations
D-101-2	NDDOT Abbreviations
D-101-3	NDDOT Abbreviations
D-101-4	NDDOT Abbreviations
D-101-10	NDDOT Utility Company and Organization Abbreviations
D-101-20	Line Styles
D-101-21	Line Styles
D-101-30	Symbols
D-101-31	Symbols
D-101-32	Symbols
D-101-33	Symbols
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D-256-1	Erosion and Siltation Controls
D-260-1	Erosion and Siltation Controls - Silt Fence
D-261-1	Erosion Control - Fiber Roll Placement Dtails
D-704-2	Traffic Control Coring for Hot Bituminous Pavement
D-704-7	Breakaway Systems For Construction Zone Signs - Perforated Tube
D-704-8	Breakaway Systems For Construction Zone Signs - U-Channel Post
D-704-9	Construction Sign Details - Terminal and Guide Signs
D-704-10	Construction Sign Details - Regulatory Signs
D-704-11	Construction Sign Details - Warning Signs
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D-704-14	Construction Sign Punching and Mounting Details
D-704-21	Detour and Roadway Diversion Sign Layouts
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D-704-50	Portable Sign Support Assembly
D-708-6	Erosion and Siltation Controls - Median or Ditch Inlet Protection
D-714-1	Reinforced Concrete Pipe Culverts and End Sections (Round Pipe)
D-714-18	Precast Concrete Headwall Details
D-714-22	Concrete Pipe, Cattle Pass, or Precast Concrete Box Culvert Ties
D-714-25	Transverse Mainline Pipe Installation Detail - Pipes More Than 4 Feet Below Top of Subgrade
D-754-18	Barricade and Advance Signs for Forward Termination
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D-754-24	Mounting Details Perforated Tube
D-754-24A	Breakaway Coupler System for Perforated Tubes
D-754-25	Mounting Details Perforated Tube
D-754-26	Sign Punching, Stringer and Support Location Details Regulatory, Warning and Guide Signs
D-754-27	Sign Punching, Stringer and Support Location Details Regulatory, Warning and Guide Signs
D-754-29	Sign Punching, Stringer and Support Location Details Regulatory, Warning and Guide Signs
D-754-32	Sign Punching, Stringer and Support Location Details Regulatory, Warning and Guide Signs
D-754-37	Sign Punching, Stringer and Support Location Details Regulatory, Warning and Guide Signs
D-754-51	Sign Punching, Stringer and Support Location Details - Route Marker Signs
D-754-53	Sign Punching, Stringer and Support Location Details - Route Marker Signs
D-754-55	Sign Punching, Stringer and Support Location Details - Route Marker Signs
D-754-57	Sign Punching, Stringer and Support Location Details - Route Marker Signs
D-754-58	Sign Punching, Stringer and Support Location Details - Route Marker Signs
D-754-60	Sign Punching, Stringer and Support Location Details - Route Marker Signs
D-754-74	Sign Punching, Stringer and Support Location Details - Route Marker Signs
D-754-83	Object Markers - Culverts
D-760-3	Rumble Strips - Undivided Highways (Shoulders 4' or Greater)
D-762-4	Pavement Marking

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
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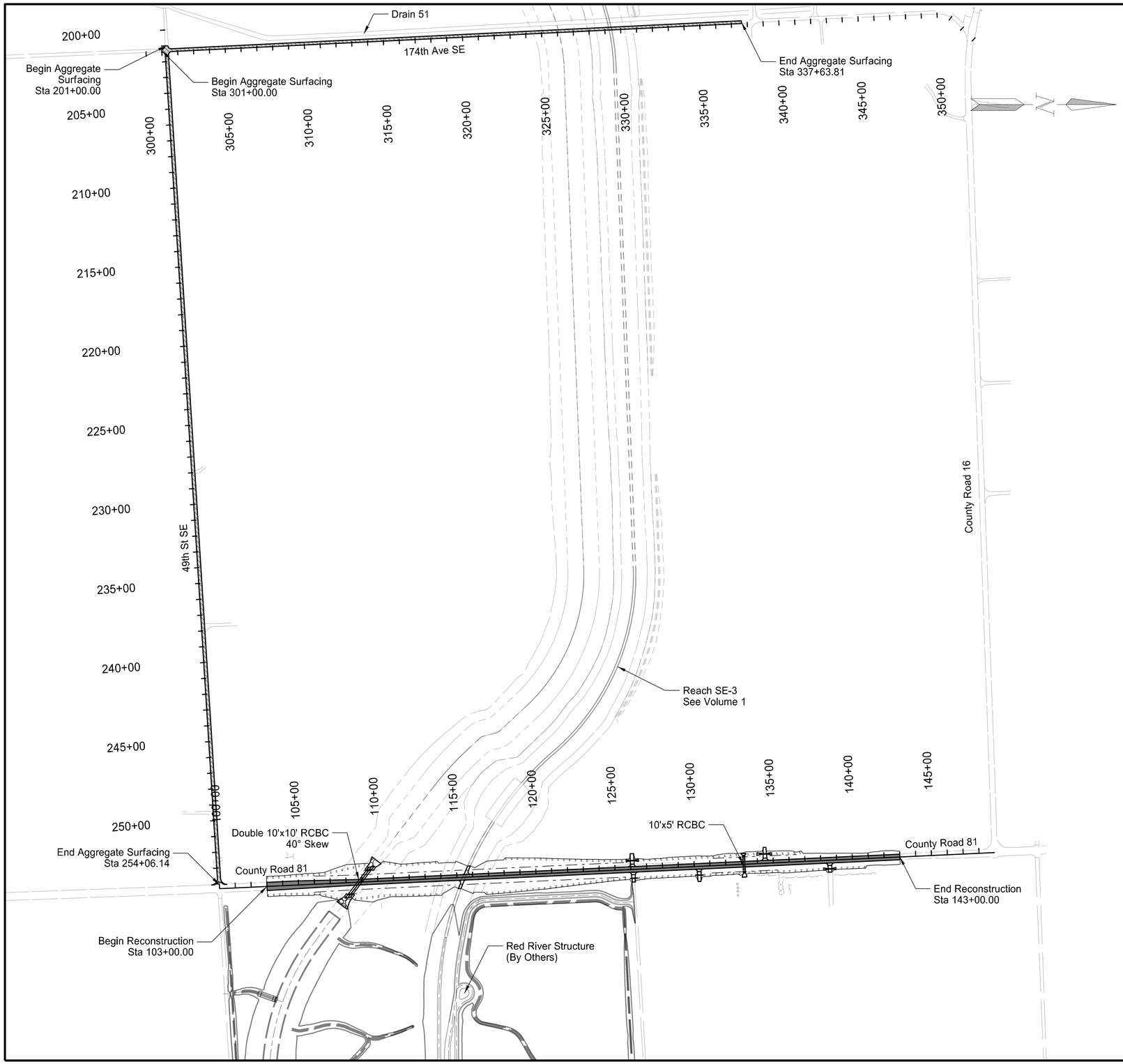

Legend

Asphalt Reconstruction

Aggregate Surfacing

Scope of Work

Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

8/20/2024 11:03:31 AM gcowing H:\JBN\7400\7438\7438_0103 Southern Embankment\Task 4 Reach SE-3\CAD\SE-3\dgn\Design\Sheets\004SW_001.dgn

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	6	1

NOTES

100-P01 REFERENCE SPECIFICATION TERMINOLOGY: The term Engineer as used in the NDDOT specifications and throughout the Standard Drawings indicates Contracting Officer unless otherwise noted. The Contractor shall perform and be responsible for all quality control measures described in NDDOT Standard Specification. Within the quality control sections of the NDDOT Standard Specifications, the term Engineer shall mean Contractor. The measurement and payment as listed in the NDDOT Standard Specifications and Standard Drawings do not apply to this contract.

100-P02 STANDARD DRAWINGS: Any manufacturer specific product specified in the referenced North Dakota Department of Transportation Standard Drawings may be substituted for a product with equivalent salient characteristics.

100-P03 STANDARD DRAWINGS: Specific grading and details shown in Volume 2 of the plans supersedes the information shown in the North Dakota Department of Transportation Standard Drawings. The North Dakota Department of Transportation Standard Drawings do not apply to Volume 1 of the plans.

100-P04 PROJECT COORDINATE SYSTEM: All information and coordinates provided in the plans are in the coordinate system listed in Section 81.

100-P05 COORDINATION OF PROJECTS: Other projects are anticipated to be under construction in the vicinity of this project. Coordinate activities with adjacent contractors.

100-P06 LOCAL ACCESS: Construction activities will eliminate current access to properties adjacent to and within the work limits. The contractor shall maintain access to affected properties during construction activities by providing temporary access or by sequencing work to ensure property owners have access and emergency services can be provided. The temporary access shall be completed prior to disrupting access for the adjacent properties. Any temporary access roads must be 24 feet wide with 4 inches of gravel surfacing. Maintain any access roads in a condition that is free of dips, rutting, and potholes. The contractor is responsible for removal of any temporary access features and restoration of the area to the preconstruction condition.

105-P01 UTILITIES: The Contractor is responsible to coordinate all work activities with the utility companies, verify utility locations, depths, and ownership prior to construction, evaluate construction activities for utility conflicts, and relocation of utilities as needed to facilitate construction operations. Prior to a relocation determination, the Contractor must attempt to protect all utilities in placed to the extent possible.

203-P01 COMPACTION AND DENSITY CONTROL: Compact material as specified in Specification Section 31 00 00.00 13.

203-P02 SCARIFYING AND RECOMPACTION OF EMBANKMENT AREAS: Perform Subgrade Preparation as specified in Specification Section 31 00 00.00 13 under all embankment areas. Compact all areas under the roadway prior to placement of aggregate surfacing.

203-P03 TOPSOIL: Remove topsoil to its full depth from all areas disturbed by the project. Topsoil depth is estimated to be 20” within existing fields and 6” within road right of way and residential areas.

203-P04 OBLITERATE ROADWAY: Fully remove existing roadway embankment within the limits of the Embankment prior to constructing the inspection trench as shown in Section 40.

203-P05 EMBANKMENT: Construct roadway embankment simultaneously with Embankment construction as shown in Volume 1. Construct using continuous uniform lifts between the roadway and Embankment.

754-P01 REMOVE SIGN AND SUPPORT Deliver the removed signs and supports to the Cass County Highway Department Complex located at 1201 Main Ave. West, West Fargo and neatly stack at the location identified in the storage yard. Notify the Cass County Highway Department 24 hours prior to delivery at (701) 298-2370.

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/22/2024

NOTES

704-100 TRAFFIC CONTROL SUPERVISOR: Provide a Traffic Control Supervisor.

704-P01 TRAFFIC CONTROL DEVICES: The Standard Drawings listed below contain layouts utilized for the project:

D-704-21: Type I for detour sign layout
D-704-22: Type K for trucks entering roadway

704-P02 PORTABLE CHANGEABLE MESSAGE SIGNS: Provide, install, and maintain two Portable Changeable Message Signs (PCMS) in Potential Phase 2 of work zone traffic control as shown in Section 100. Install PCMS at locations clearly visible and clear of the traveled way and shoulders as approved by the Contracting Officer two weeks prior to the closing of roadways. Maintain PCMS in place for a minimum of two weeks. Submit the messages to be displayed to the Contracting Officer for approval one week prior to PCMS placement. The operator shall program the message within one hour of the Contracting Officer's request to change the message.

704-P03 TRAFFIC CONTROL LAYOUT: The traffic control details, as indicated on the plans, are a potential layout plan for the project developed to assist with bidding and traffic requirements.

Submit a detailed traffic control layout plan to the Contracting Officer for approval a minimum of 30 days prior to installing traffic control devices. Plans must meet the requirements listed in the Work Restrictions section of the Specifications.

Traffic Control Layout for All Work Except County Road 81 Road Raise:

- No impacts to County Road 81 or road closures will be allowed during this work. Install truck entering signage at construction site access points per Standard Drawing D-704-22, Type K.

Traffic Control Layout for County Road 81 Road Raise:

- Close County Road 81 and implement detours as shown in Section 100 to complete road raise.
- Provide maintenance and dust palliative along 174th Ave SE and 49th St SE as needed to mitigate dust and maintain the roadways free of ruts, potholes and damage. Dust palliative application is anticipated twice during the construction of the County Road 81 Road Raise but shall be applied as needed to mitigate dust.
- No impacts to 174th Ave SE or 49th St SE will be allowed while County Road 81 is closed to traffic. Utilize detours shown in Section 100 for County Road 81 closures.

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENERUDE
PE-22066
DATE:
NORTH DAKOTA
8/22/2024

NOTES

724-P01 The following utility companies will be providing their own markers. Contractor to coordinate with the delivery and installation with the following representatives:

Utility Owner	Name	Phone Number
Sprint	Brian Matson	507-777-2256

724-P02 EXISTING UTILITY REMOVALS: Upon completion of connections of the relocated utilities and confirmation by utility owners that the existing indicated utilities can be removed, the contractor shall excavate and remove the underground lines per plan which could include but not limited to: watermain, sanitary sewer forcemain, dry utility conduits, and direct bury dry utility cables. Contractor to dispose of all removals unless utility owner has indicated they would retrieve any salvaged items. The overhead power lines and poles will be removed by Cass County Electric. Contractor shall strip and replace existing topsoil, backfill, and compact excavated areas. Grade all disturbed areas back to their original conditions with positive drainage.

724-P03 Unless otherwise noted, any removal, relocation, replacement, or bracing of power poles or any other utilities is the responsibility of the Contractor.

724-P04 The subsurface utility information in this plan is Utility Quality Level C. This quality level was determined according to the guidelines of ASCE 38-02 entitled "Standard Guidelines for the Collection and Depiction of Existing Subsurface Utility Data".

724-P05 Any pipe deflections not in accordance with the manufacturer's recommendations shall be made with fittings, or cold field bending as allowed by manufacturer if minimum cover can be maintained. Deflection of pipe joints is not permitted.

724-P06 Not all fittings required for a complete installation may be shown in the plans. Provide all required fittings.

724-P07 Verify all existing pipe sizes and types in the field.

724-P08 Top of water main or sanitary sewer force main to be installed a minimum of 9 feet below final grade, unless otherwise indicated.

724-P09 Allow installed HDPE pipe to reach thermal equilibrium with trench backfill prior to making any mechanical connections to any anchored joints, flanges, fittings, or tie-ins.

724-P10 Perform hydrostatic testing of pressurized utilities in accordance with Specifications. Perform pneumatic testing of non-pressurized utilities in accordance with Specification Section 27 05 33.

724-P11 Before putting any out-of-service (new installation or existing) water main into service: flush, disinfect, and bacteria test water lines prior to activation in accordance with North Dakota Department of Environmental Quality regulations. Perform flushing, disinfection, and testing during Cass Rural Water business hours, unless otherwise instructed.

The existing water system is fed from the north. Flush entire pipeline by making connection on the north end of the system as shown on Section 199 Sheet 6 (right panel, EX_CR81 Station 129+78) , and allow flushing water to discharge through the south connection as shown in Section 199 Sheet 6 (left panel, EX_CR81 Station 105+05). Flush one pipeline at a time, in coordination with Cass Rural Water. Do not make connection to the existing water system on the south end near Sta 105+05 until satisfactory bacteria tests have been achieved and disinfectant concentration matches that of the existing system.

724-P12 Notify Cass Rural Water District and Contracting Officer at least 7 days prior to disruption of water service. Only one of the two existing water mains will be shut down at a time. Contact CRWD to locate the necessary gate valves and to shut the appropriate valves. All connections to be made to the existing water main shall be completed in a singular disruption to water service. The maximum amount of time water service may be disrupted is 4 hours. Coordinate shut down with Cass Rural Water District.

724-P13 Notify City of Fargo and Contracting Officer at least 48 hours prior to disruption of sanitary sewer service. Contact City of Fargo to locate the necessary gate valves and to shut the appropriate valves. Contractor permitted to shut down sanitary sewer force main for connection during normal work hours (8AM to 5PM), with the maximum disruption time of 3 hours. Coordinate shut down with City of Fargo. Sequence work to keep one force main in operation at all times. If shut down exceeds maximum disruption time, contractor is required to pump out upstream lift station and properly dispose wastewater.

Sanitary Sewer Lift Station #56 shut down if required shall be coordinated with the City of Fargo Water Reclamation Utility Staff, Wayne Offerdahl at 701-730-0139 or wofferdahl@fargond.gov. Contractor shall notify the Contracting Officer and City of Fargo a minimum of one week prior if impacting the lift station. The lift station may be able to be taken out of service for periods of time, not to exceed 3 hours during any given service disruption. The number of service disruptions should be limited to the extent possible. If service disruptions exceed 3 hours, the contractor shall be required to provide a permitted liquid waste hauler to remove wastewater entering the lift station, and transport – discharge into downstream sanitary lift station, coordinate with City of Fargo. The Contractor shall have a legal and permitted liquid waste hauler on-site during the connection to existing force mains, that is ready to be used in the event that it is needed.

Lift Station #56 Assumptions:
- It is anticipated that temporary bypass pumping of existing force mains is not feasible.
- LS #56 is located within City of Oxbow, ND
- LS#56 utilizes two pumps with a capacity of approximately 340 gpm each.
- The average daily flow recorded is approximately 30 gpm.

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-22066
DATE:
NORTH DAKOTA
8/22/2024

NOTES

Assume peaking factor at peak hours flows to be 3 to 4 times the average flow.
The liquid waste hauler shall have capacity to handle the inflow. The effluent level shall not exceed a rise of more than 1 foot above the crown of the incoming sanitary pipe.

724-P14 All bolts used shall be 316 stainless steel.

724-P15 All buried metal components shall be securely wrapped in 10 mil polyethylene plastic sheeting.

724-P16 High points in the pipeline are to be avoided except at designated locations as indicated on Drawings.

724-P17 Controlled low strength material (CLSM) shall be placed as shown on the utility details. CLSM shall conform to Specification Section 03 22 70.01

724-P18 Upon notification from utility owners that new utility lines are in service, contractor to proceed with utility removals and abandonment as indicated in the Drawings. Removal/abandonment of overhead power lines and poles to be performed by utility owner. Removal and abandonment to include excavation, removal of pipe, cables/conductors, structures, and restoration of vegetative and improved surfaces. Coordinate with utility owners for any existing structures to be salvaged.

724-P19 Hydrostatic testing of water and sanitary lines will be performed using the existing valves as shown on Section 199 Sheet 6.

8/22/2024

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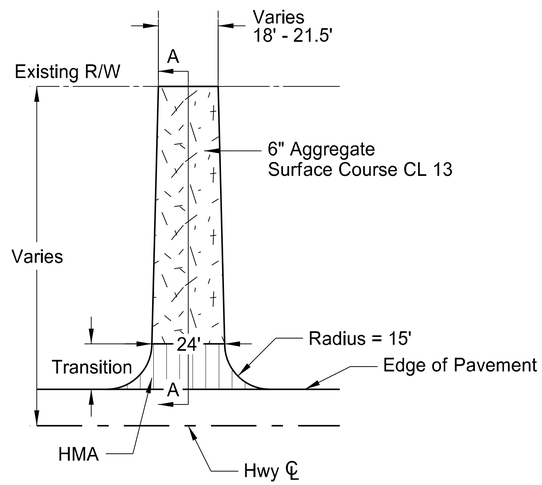
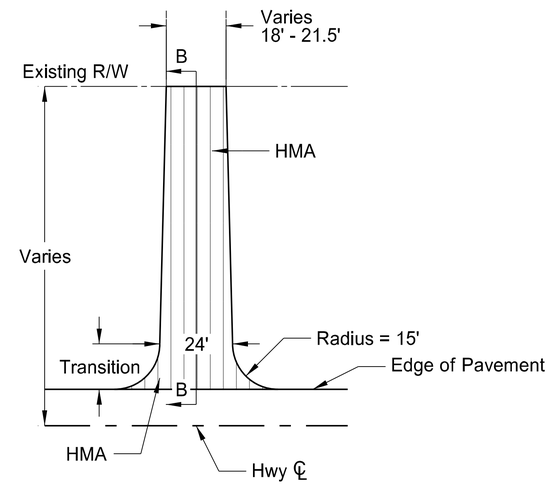
Notes:

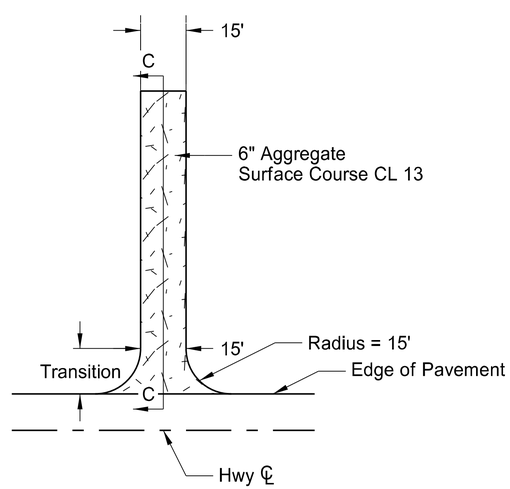
1. HMA paving and salvaged base course limits may vary in the field, as approved by the Contracting Officer.



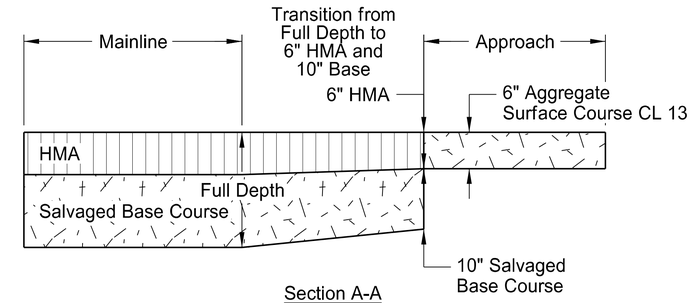
(1) Gravel Private Drive Approach



(2) Paved Private Drive Approach



(3) Southern Embankment Approach



Section A-A
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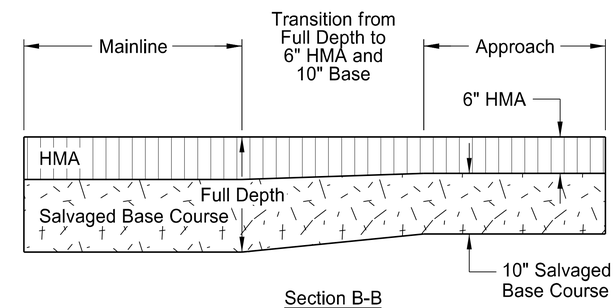
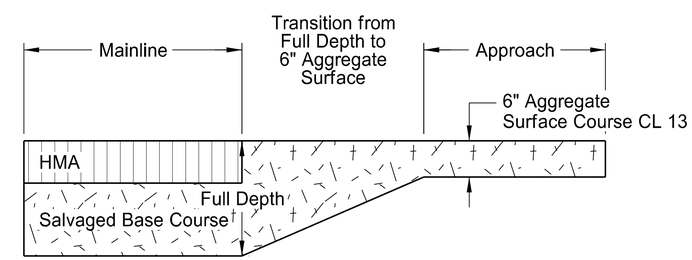


Section B-B
(not to scale)



Section C-C
(not to scale)

Approach Paving Details

Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
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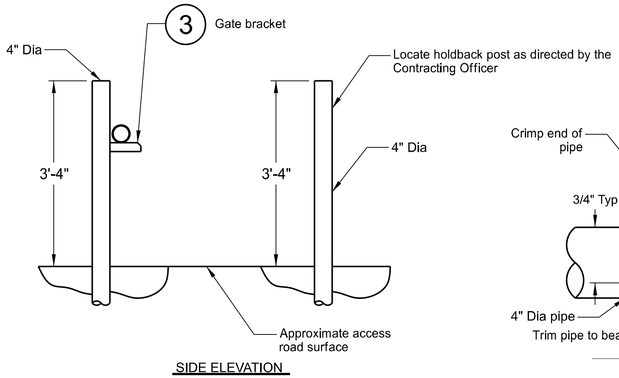
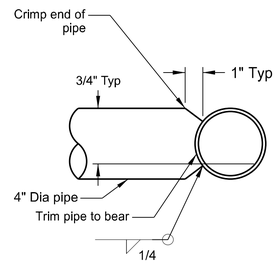


1 Side elevation
Not to scale



2 4" Pipe connection detail
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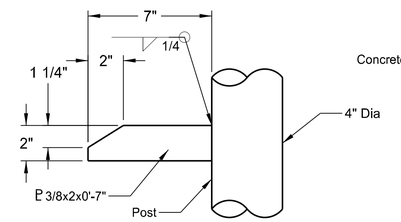
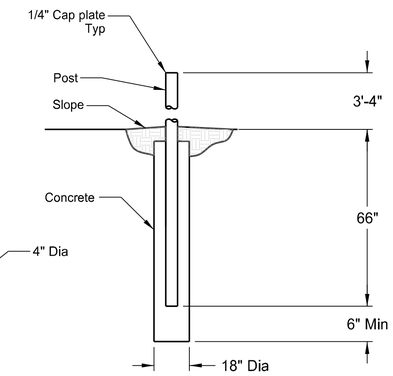
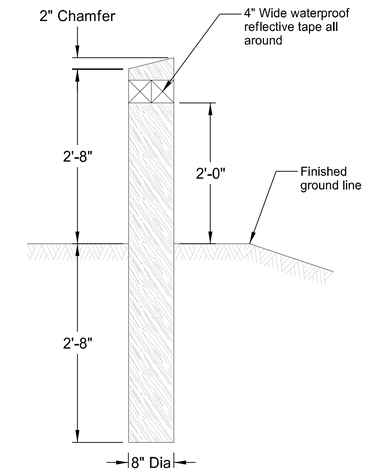


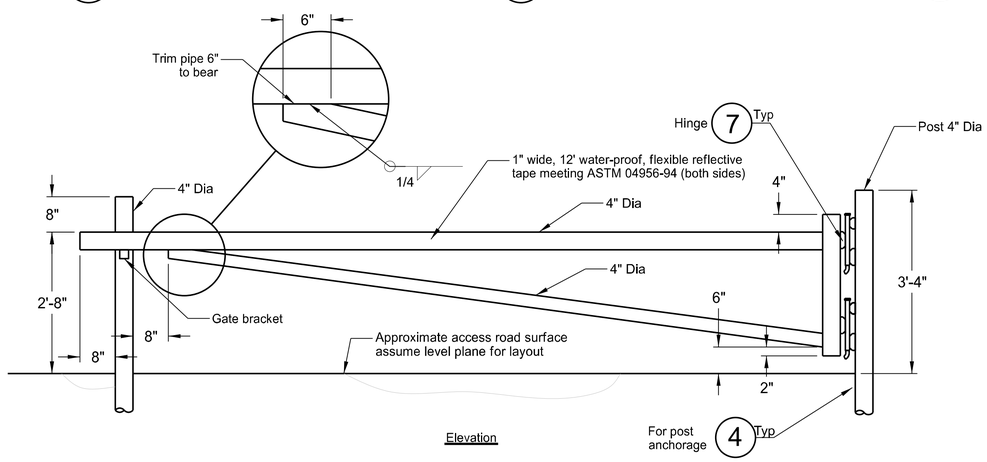
3 Gate bracket detail
Not to scale

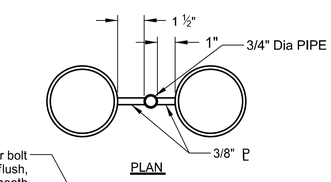


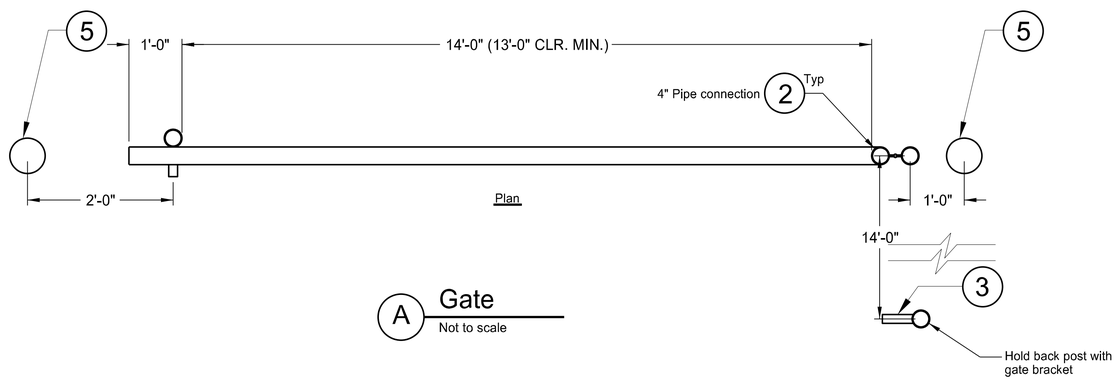
4 Anchorage detail
Not to scale



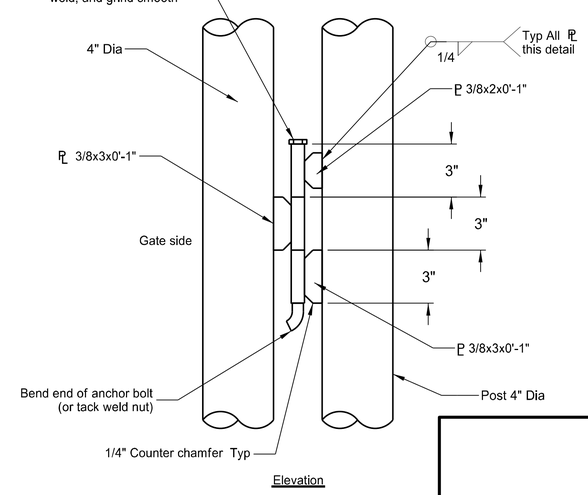
5 Detail
Not to scale







A Gate
Not to scale



7 Hinge detail
Not to scale

Gate Detail

Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

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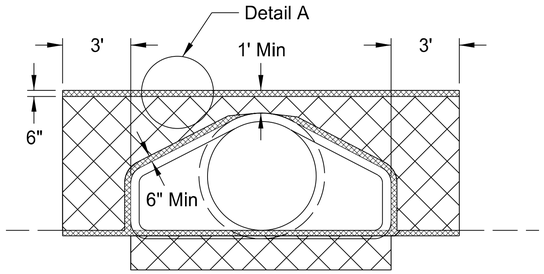
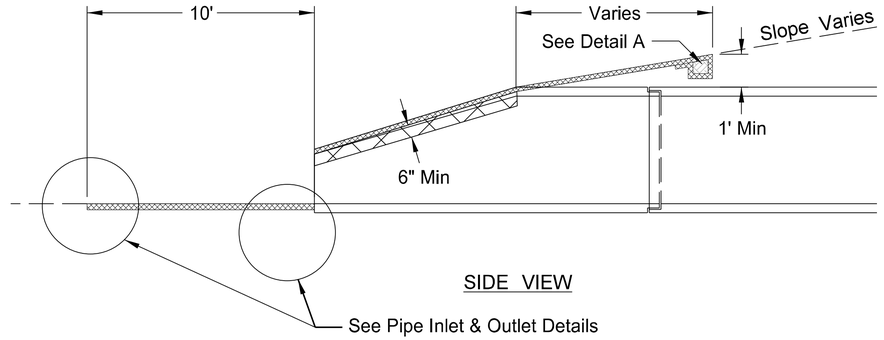
ND	W912ES23B0016	20	3



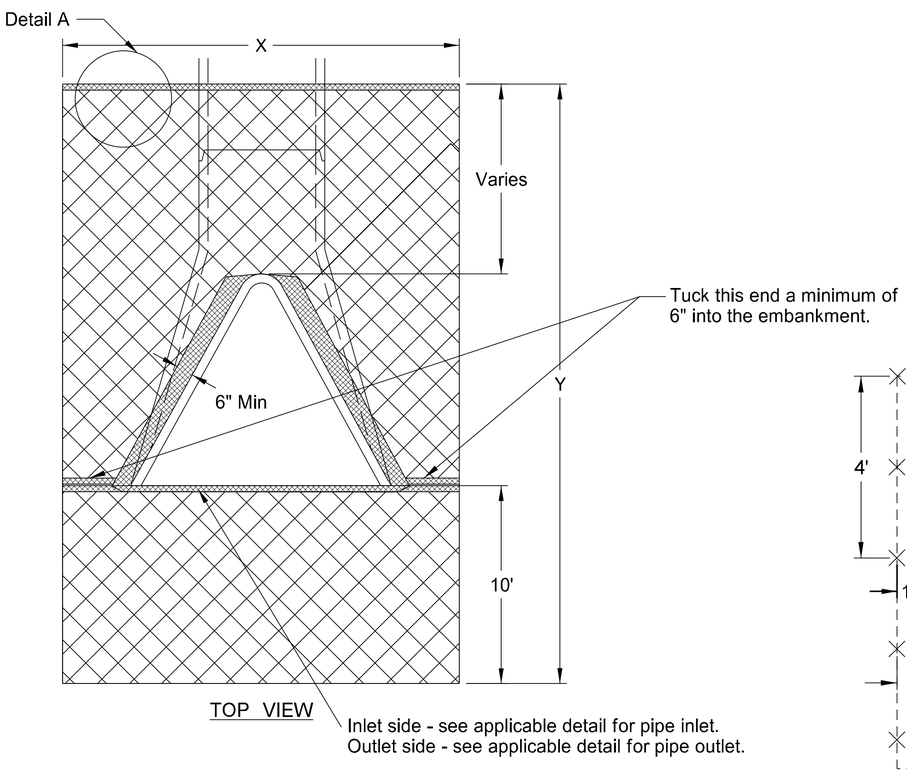
FRONT VIEW



SIDE VIEW

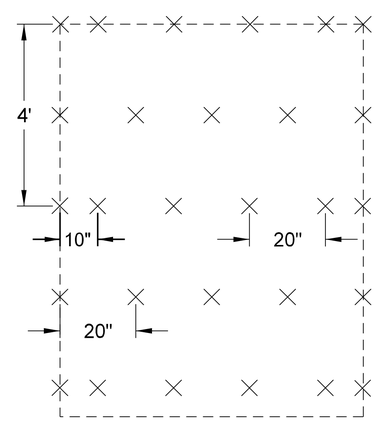
APPROACH CULVERTS		
DIA	X	Y
In	Ft	Ft
24	10.5	21.6

Note: Based on 8:1 slope.



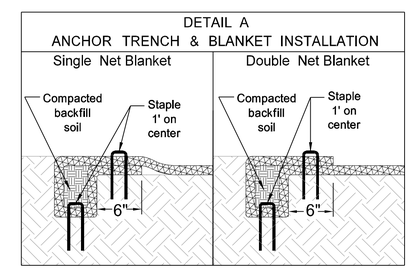
TOP VIEW

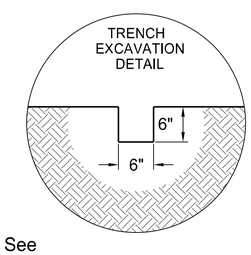
NOTE: Tuck the ECB a minimum of 6" into the embankment (against the flared end section) around the opening of the flared end section.

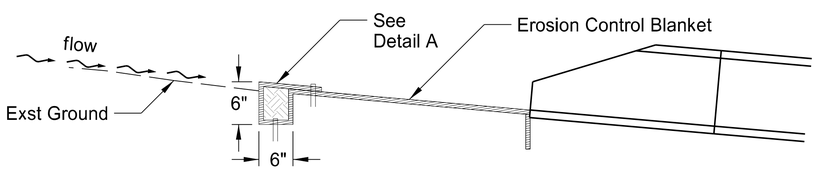


STAPLE PATTERN

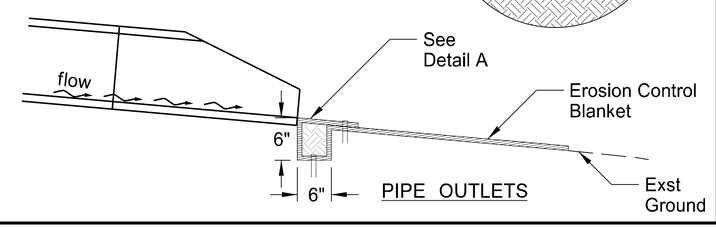
Erosion Control Blanket (ECB Type 3) County Road 81 (Chain: Ex_CR81)			
Location to be Protected Station	Culvert Type Appr/CL	Pipe Diam (Inch)	No
126+17 Rt	Appr	24	2
130+30 Rt	Appr	24	2







PIPE INLETS



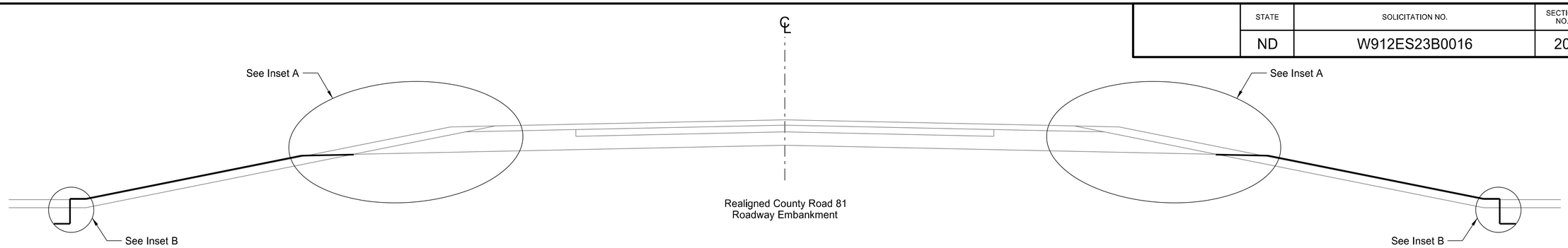
PIPE OUTLETS

Erosion Control at Culvert Flared End Sections

County Road 81
Reach SE-3 Roadway Improvements

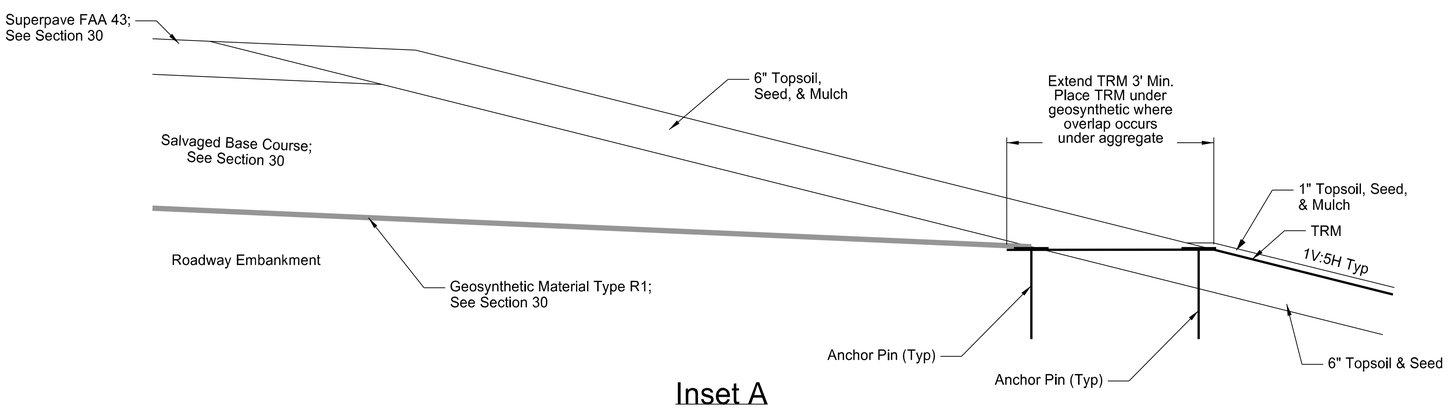
REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-23066
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	20	4

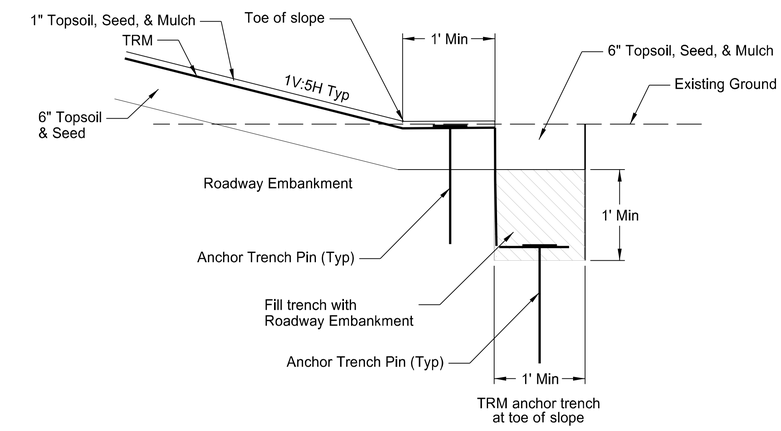


TRM Detail

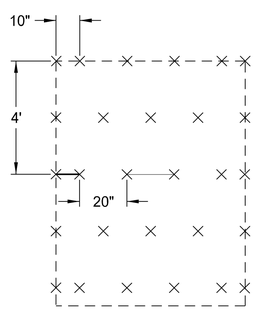
See Section 77 plan sheets for location.



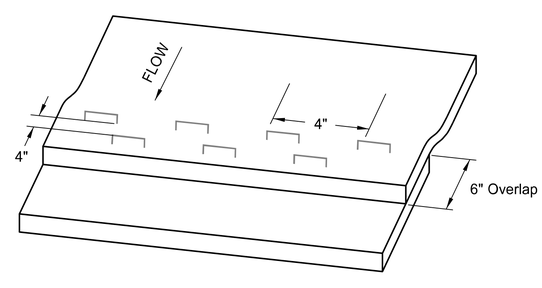
Inset A



Inset B



TRM Staple Pattern



TRM Overlap

Notes:
1. Use 8" long twist anchor pins spaced per manufacturer's recommendation.
2. Use 12" twist anchor pins spaced per manufacturer's recommendation for all anchor trenches.

TRM Detail

County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
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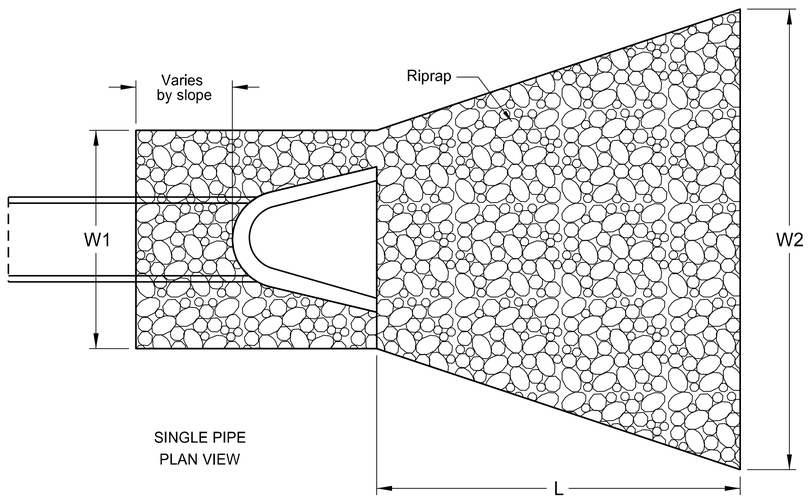
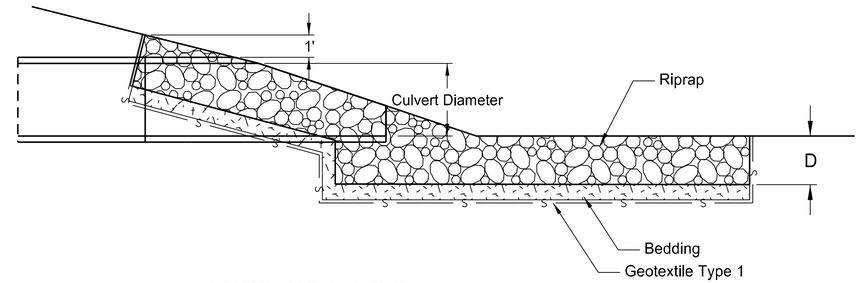
DATE:
NORTH DAKOTA
8/21/2024

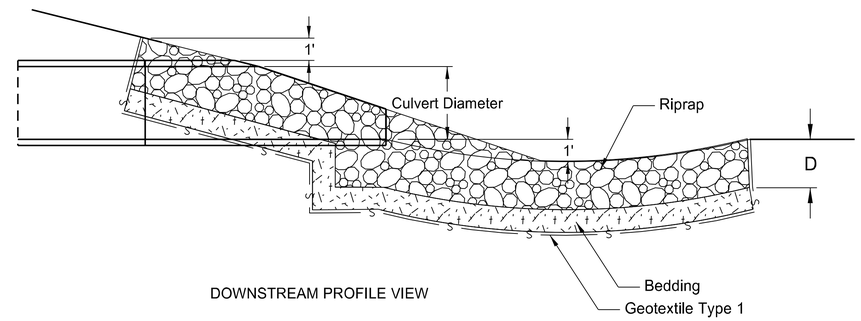
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	20	5



SINGLE PIPE
PLAN VIEW



UPSTREAM PROFILE VIEW



DOWNSTREAM PROFILE VIEW

Location	Dimensions							
	Culvert Diameter (inches)	L (feet)	W1 (feet)	W2 (feet)	Riprap Depth, D (inches)*	Riprap Grade	Bedding Depth (inches)	Bedding Type
Chain: Ex_CR81; Sta 126+10, Lt (Upstream)	30	10	8	15	12	R20	6	B1
Chain: Ex_CR81; Sta 126+10, Lt (Downstream)	30	13	8	16	16	R20	6	B1
Chain: Ex_CR81; Sta 134+49, Lt (Downstream)	36	18	9	21	30	R80	9	B2
Chain: Ex_CR81; Sta 134+49, Lt (Upstream)	36	12	9	17	18	R20	6	B1
Chain: Ex_CR81; Sta 138+56, Rt (Downstream)	30	13	8	16	18	R20	6	B1
Chain: Ex_CR81; Sta 138+56, Rt (Upstream)	30	10	8	15	14	R20	6	B1

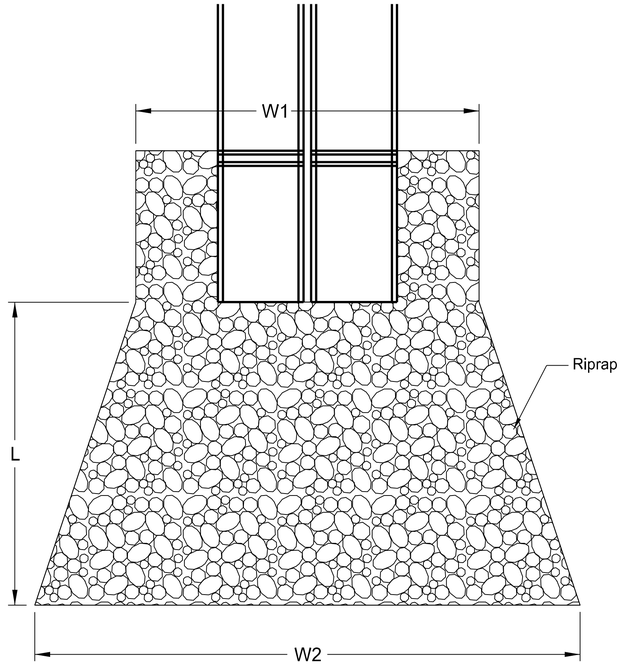
*Riprap depth (D) is based on USACE minimum requirement
See Section 51 and Section 60 for pipe materials

Riprap at Culvert Ends

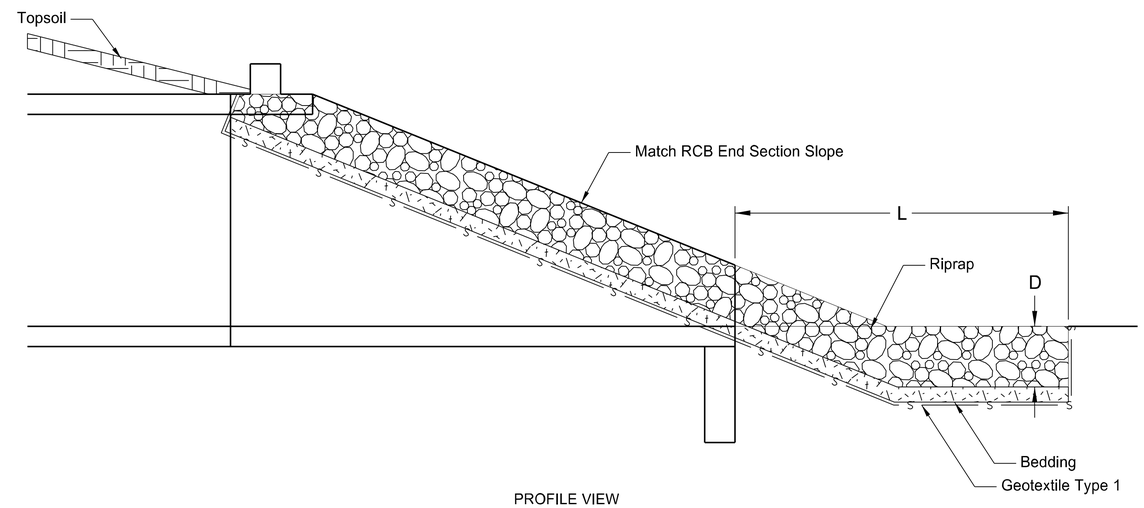
County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-20063
DATE:
NORTH DAKOTA
8/21/2024

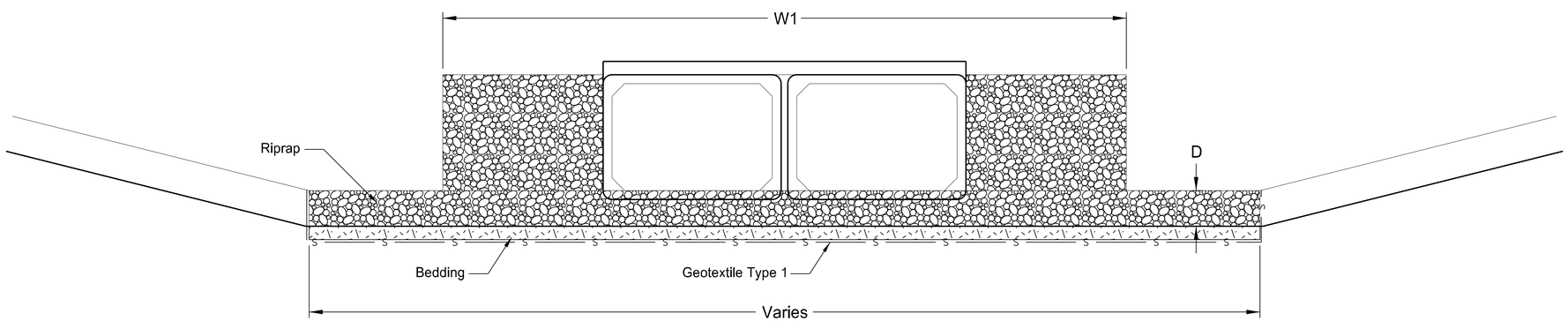
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	20	6



PLAN VIEW



PROFILE VIEW



END VIEW

Location	Dimensions							
	RCB Size (WxH, ft)	L (feet)	W1 (feet)	W2 (feet)	Riprap Depth, D (inches)*	Riprap Grade	Bedding Depth (inches)	Bedding Type
Chain: Ex_CR81; Sta 108+86, Rt (Downstream)	(2)-10'x10'	50	45	80	20	R30	6	B1
Chain: Ex_CR81; Sta 108+86, Lt (Upstream)	(2)-10'x10'	40	45	72	15	R20	6	B1
Chain: Ex_CR81; Sta 133+15, Lt (Upstream)	(1)-10'x5'	20	30	44	21	R20	6	B1
Chain: Ex_CR81; Sta 133+15, Rt (Downstream)	(1)-10'x5'	25	30	44	30	R80	9	B2

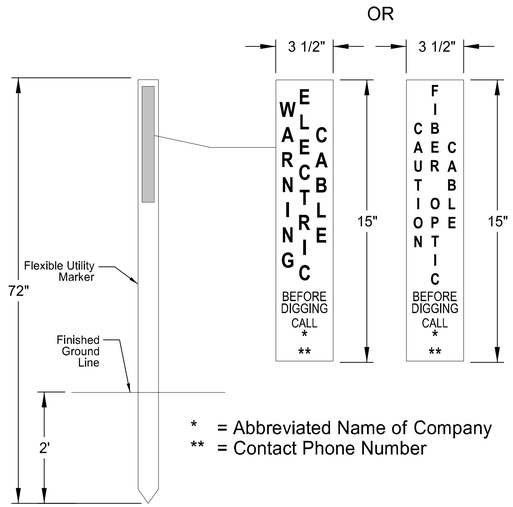
*Riprap depth (D) is based on USACE minimum requirement

Riprap at RCB Ends

County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-22066
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	20	7

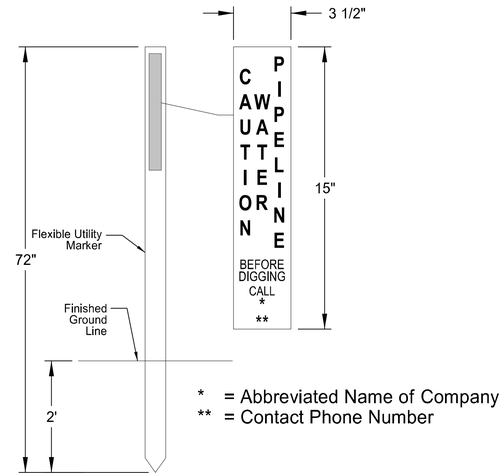


COMPANY	ABBREVIATION	PHONE NUMBER
Century Link	CLINK	877-366-8344
Midco	MIDCO	800-888-1300
MLGC	MLGC	877-893-6542
Cass County Electric Co.	CCEC	701-356-4400

NOTES:
1. Utility marker shall be colorized per the American Public Works Association Guidelines for Uniform Marking of Underground Utilities.
2. Place markers at all road and water crossings, and Structures.
3. Include supplemental decal that lists SE stationing, top of pipe elevation with Datum, utility diameter, and products in pipeline.

Dry Utility Flexible Utility Marker

No Scale

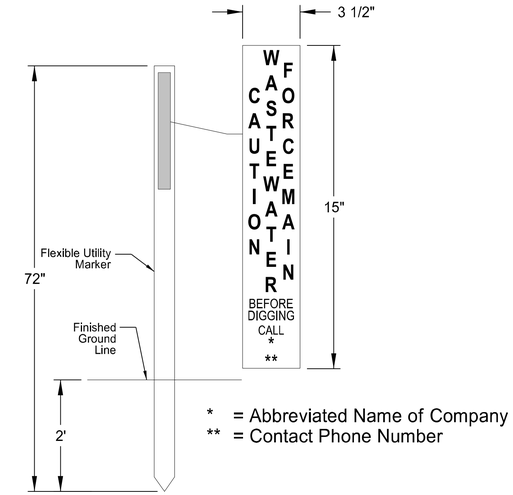


COMPANY	ABBREVIATION	PHONE NUMBER
Cass Rural Water District	CRWD	701-428-3139

NOTES:
1. Utility marker shall be blue in color.
2. Place markers at all valves, air release, blow-offs, curb stops, trace wire boxes, expansion joint locations, and 50' from the embankment toes.
3. Include supplemental decal that lists SE stationing, top of pipe elevation with Datum, utility diameter, and products in pipeline.

Water Flexible Utility Marker

No Scale

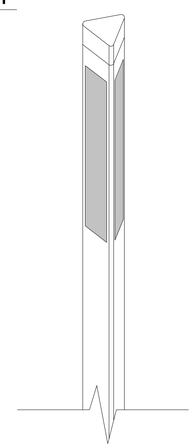


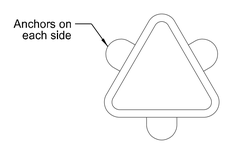
COMPANY	ABBREVIATION	PHONE NUMBER
City of Fargo	CoF	701-241-1454

NOTES:
1. Utility marker shall be green in color.
2. Place markers at all valves, air release, blow-offs, curb stops, trace wire boxes, expansion joint locations, and 50' from the embankment toes.
3. Include supplemental decal that lists SE stationing, top of pipe elevation with Datum, utility diameter, and products in pipeline.

Sewer Flexible Utility Marker

No Scale





TOP VIEW

NOTES:
1. Three sided post, with internal flex rod support.
2. Removable top with minimum two trace wire terminals.
3. Anchors to have three grips.
4. Color per utility, and provide Utility Owners Data - Contact per marker details.

Above Grade Terminal Box

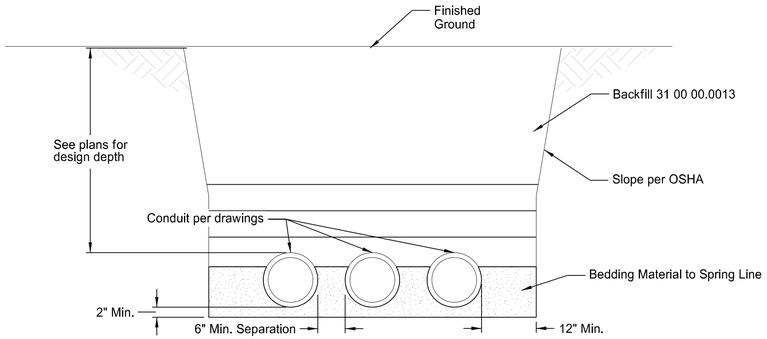
No Scale

General Details
Utility Markers

County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-22066
DATE:
NORTH DAKOTA
8/21/2024

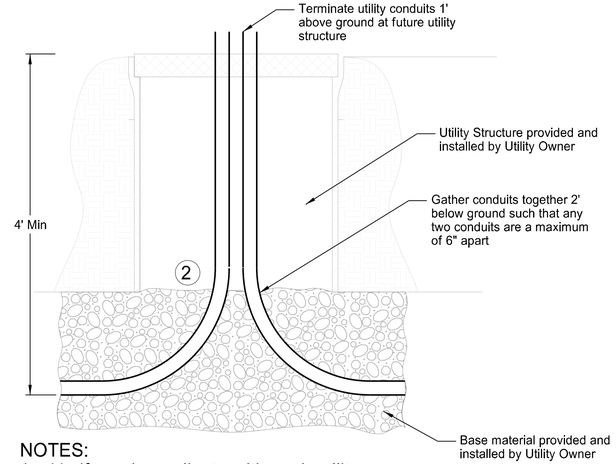
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	20	8



NOTES:
1. Utility conduit to be colorized per the American Public Works Association Guidelines for Uniform Marking of Underground Utilities.
2. Install min 1100lb pull tape in each conduit run.

Utility Conduit Bank

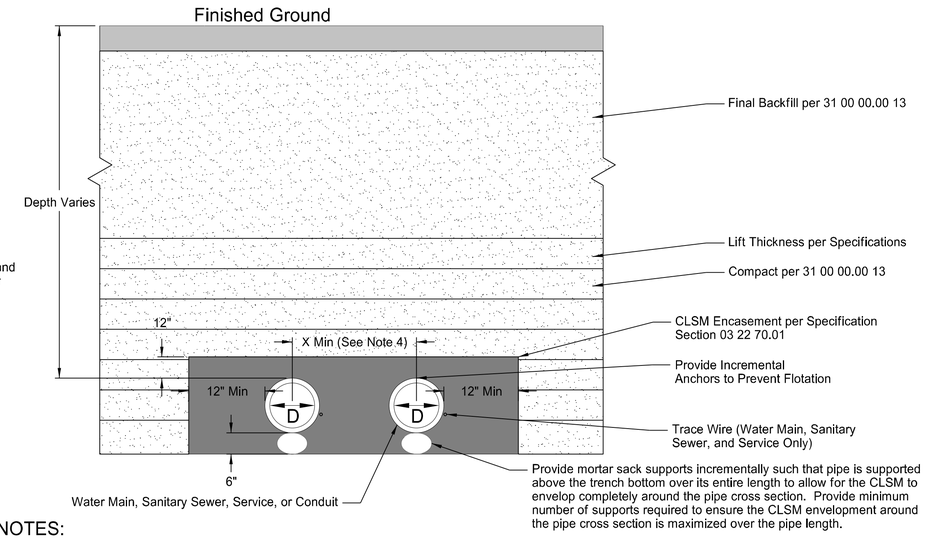
No Scale



NOTES:
1. Verify and coordinate with each utility on requirements for structure installation.
2. Contractor to seal conduit ends after cable installation. Coordinate with utility company on schedule after conductors/cable has been installed.
3. Contractor shall cap conduit end and provide a permanent label to identify utility owner.

Owner Provided Utility Structure

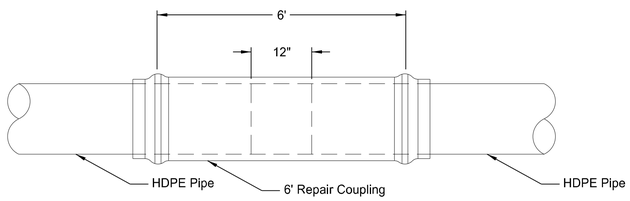
No Scale



NOTES:
1. Use this detail if utilities are installed concurrent with Embankment construction.
2. Dewatering shall be preformed if ground water present.
3. Place and compact material as specified in Specification Section 31 00 00.00 13.
4. Pipe separation (X): Sanitary Sewer = 5 ft , Watermain = 5 ft , Conduit = 6 in

CLSM Encasement (Installed with Embankment)

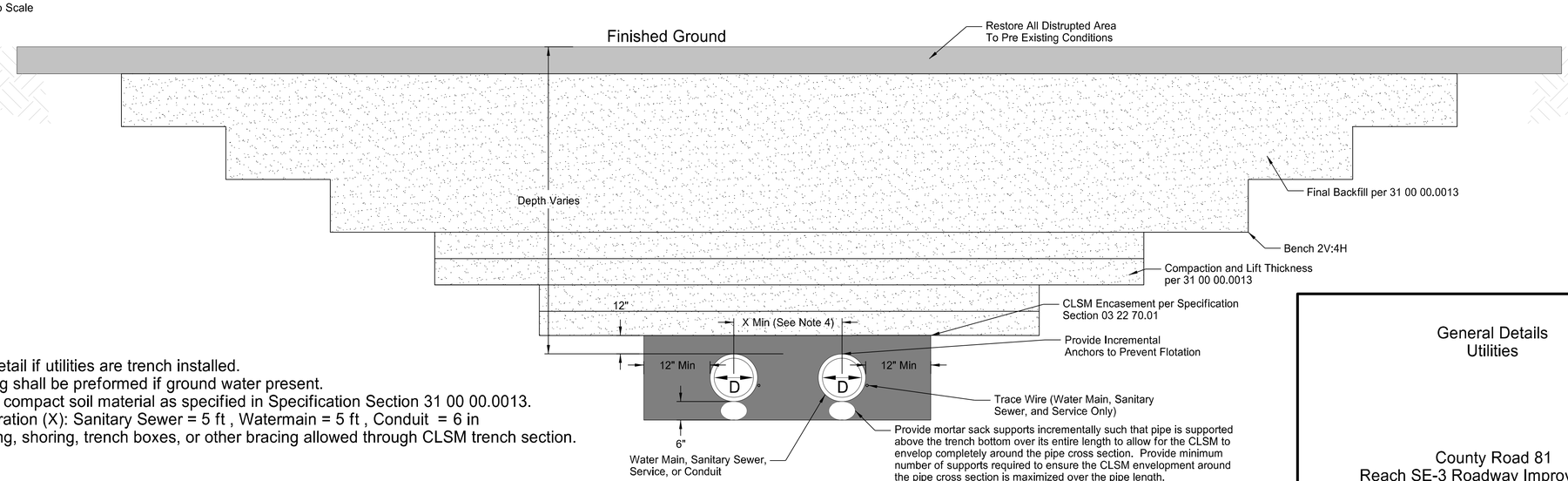
No Scale



NOTES:
1. Rated for 200psi working pressure.
2. Fillet pipe ends for expansion/contraction joints on dry utility conduits.
3. Applies to Notation 1 on Section 199 Sheets 1-4.

Expansion/Contraction Joint Dry Utilites/Sanitary Forcemain

No Scale



NOTES:
1. Use this detail if utilities are trench installed.
2. Dewatering shall be preformed if ground water present.
3. Place and compact soil material as specified in Specification Section 31 00 00.0013.
4. Pipe separation (X): Sanitary Sewer = 5 ft , Watermain = 5 ft , Conduit = 6 in
5. No sheeting, shoring, trench boxes, or other bracing allowed through CLSM trench section.

CLSM Encasement (Trench Installed)

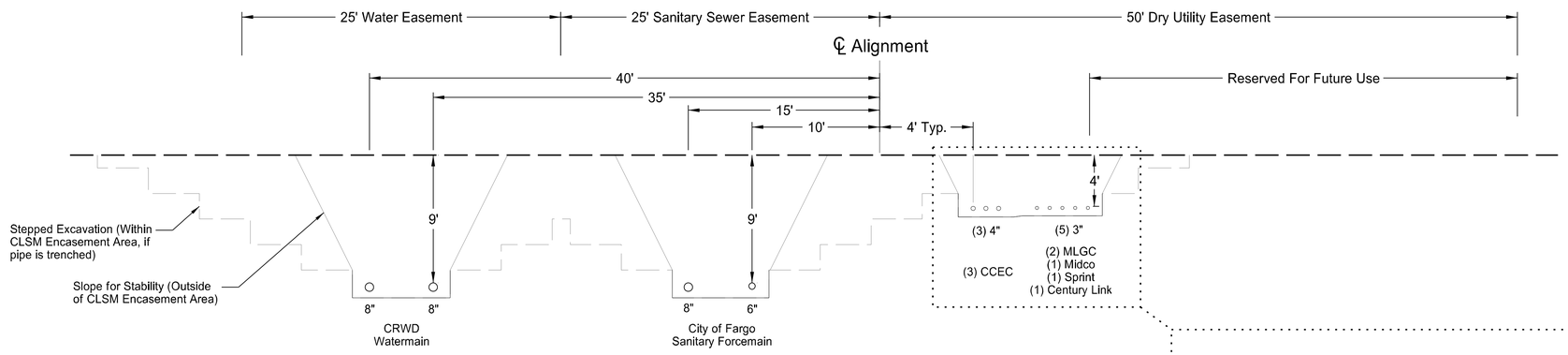
No Scale

General Details
Utilities

County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-22060
DATE:
NORTH DAKOTA
8/21/2024

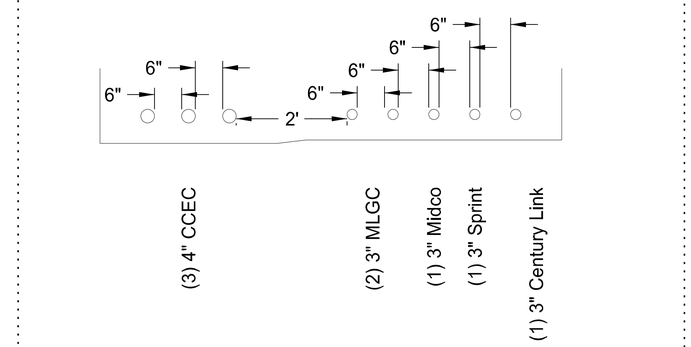
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	20	9

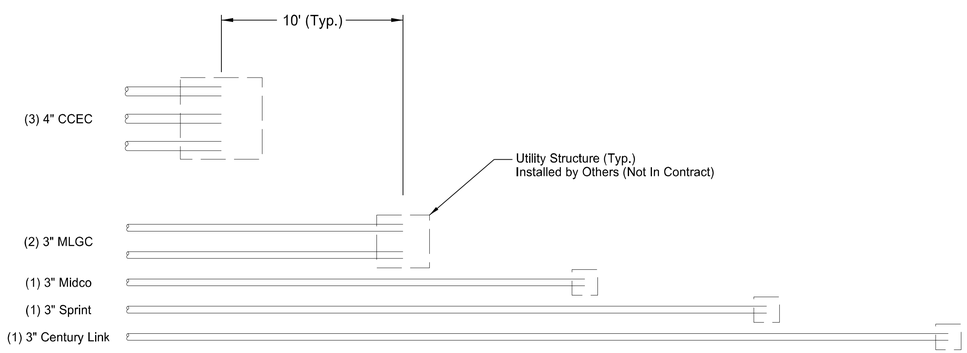


NOTES:
1. Utilities and dimensions shown for spatial layout of utilities only. Refer to details on Section 20 Sheet 8 for all construction requirements.

Utility Section Layout

No Scale





NOTES:
1. Utility Structure provided and installed by Utility Owner. See Detail on Section 20 Sheet 8.

Dry Utility Structure Spacing

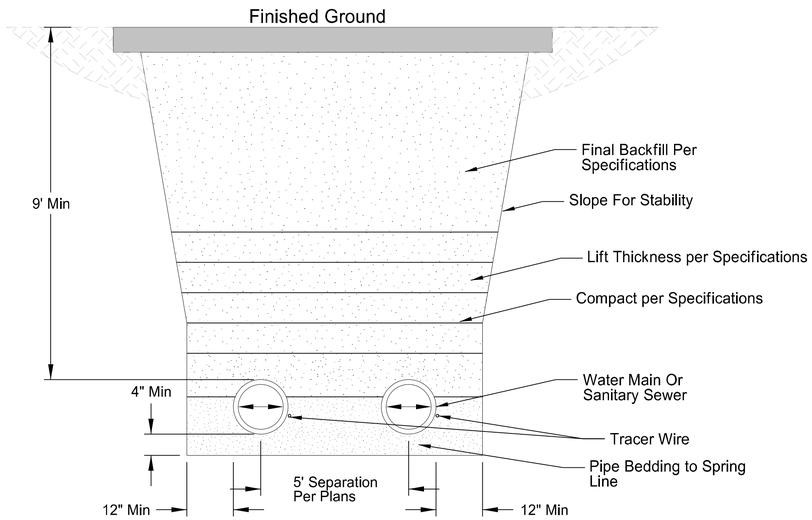
No Scale

General Details
Utilities

County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-23006
DATE:
NORTH DAKOTA
8/21/2024

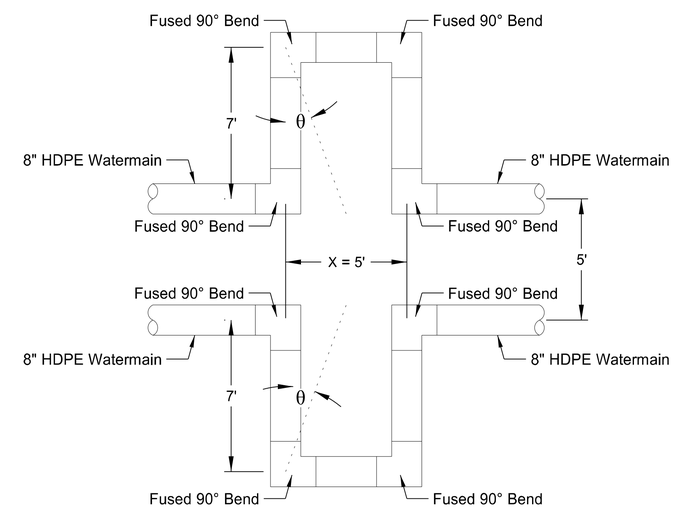
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	20	10



NOTES:
1. Do not allow rocks larger than 1" in diameter to be backfilled against pipe.
2. Dewatering shall be preformed if ground water present.
3. Place and compact material as specified in Specification Section 31 00 00.0013.

Double Water Main/Sanitary Sewer Trench

No Scale RW-01 05.15.20

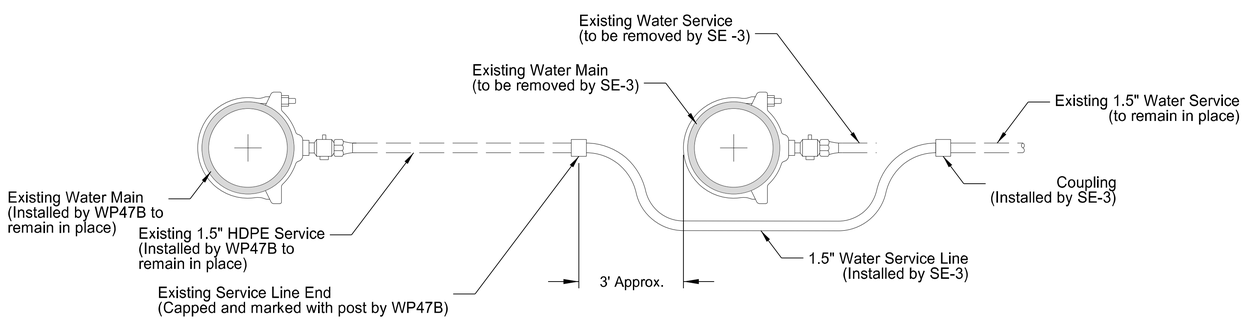


PLAN VIEW

NOTES:
1. θ = max deflection angle = 5°
2. Applies to Notation 1 on Section 199 Sheets 2-3

Expansion Joint - Watermain

No Scale



Connect to Existing Water Service

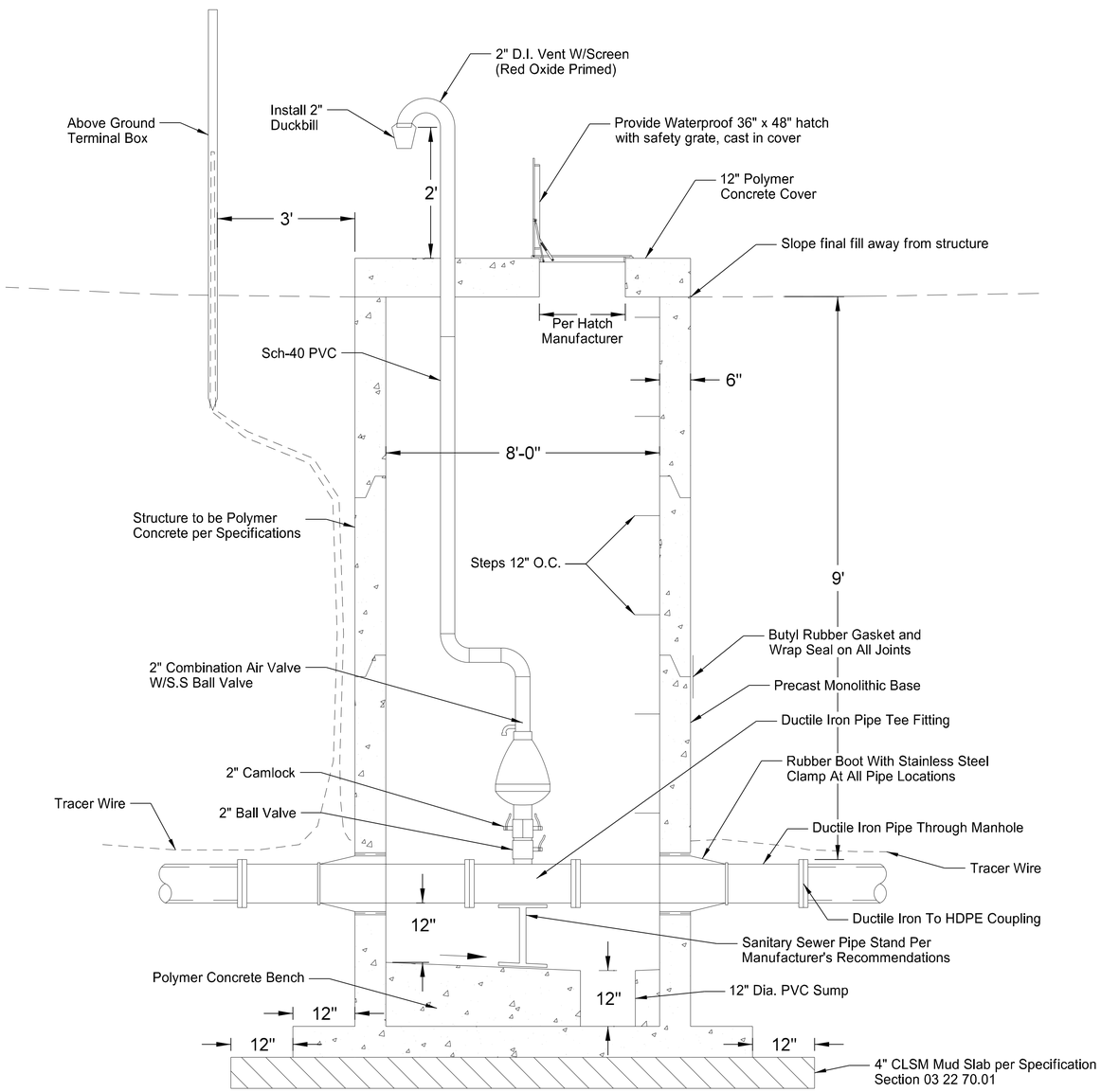
No Scale

General Details
Sanitary Sewer/Watermain

County Road 81
Reach SE-3 Roadway Improvements

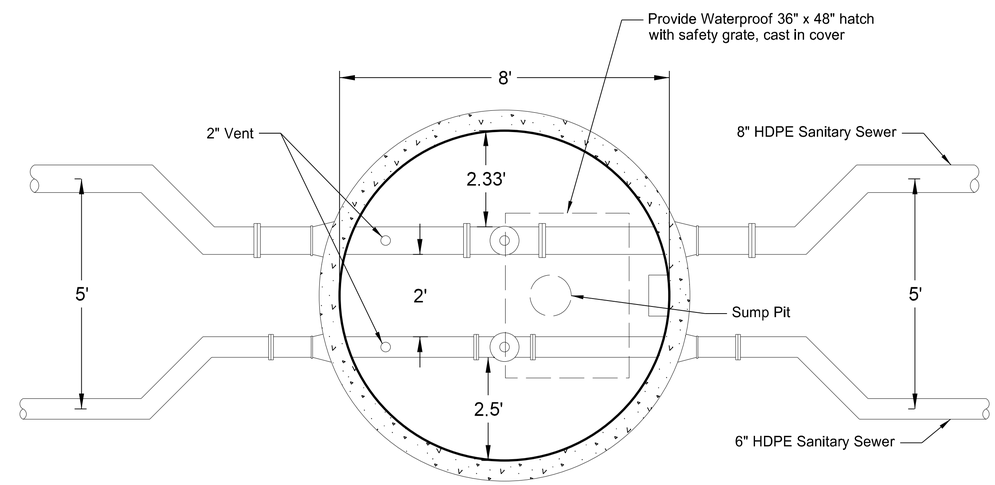
REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-22082
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	20	11



Sanitary Sewer Air Valve Polymer Manhole

No Scale



Air Release Layout (Sewer)

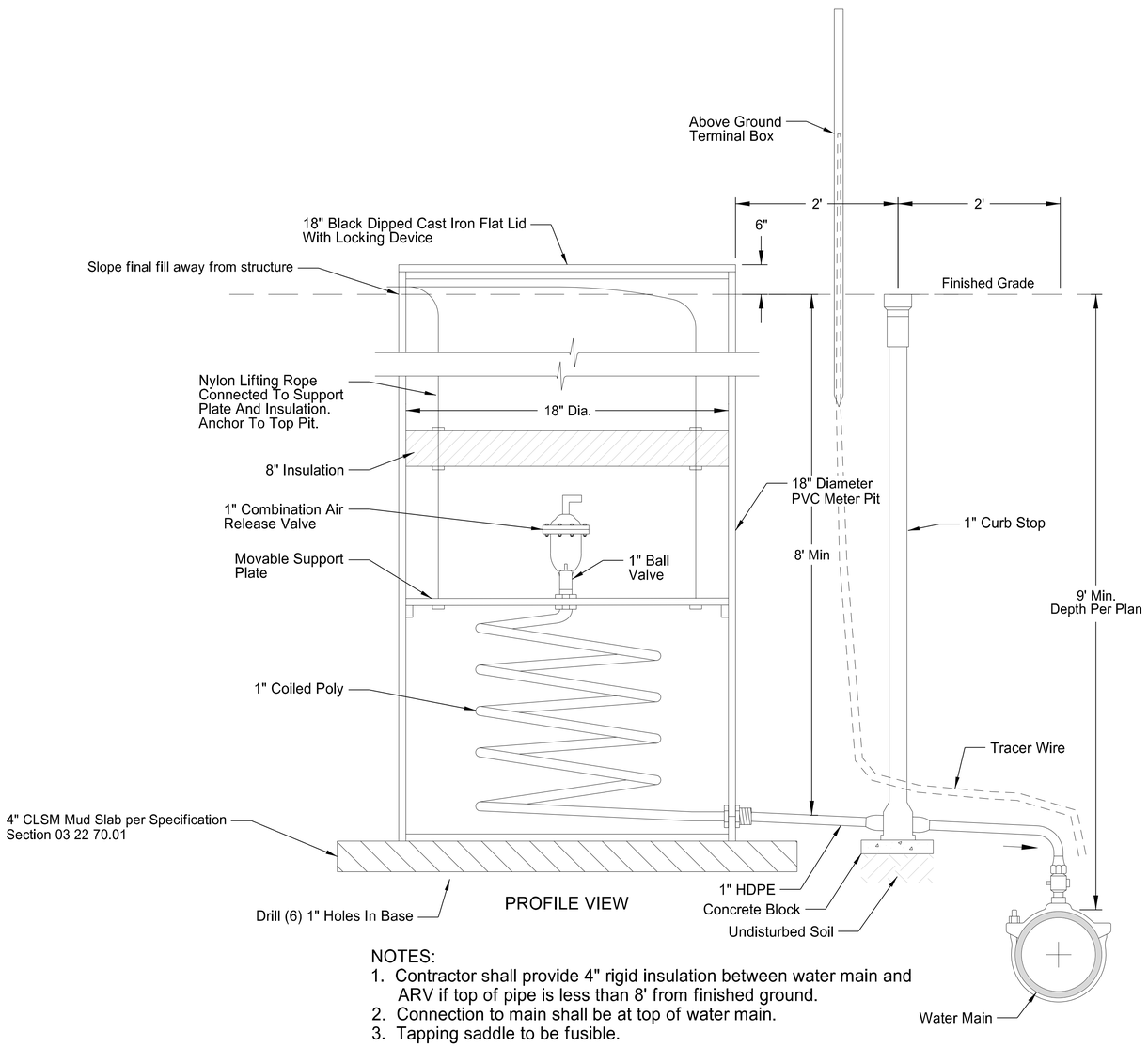
No Scale

General Details
Sanitary Sewer

County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-22066
DATE:
NORTH DAKOTA
8/21/2024

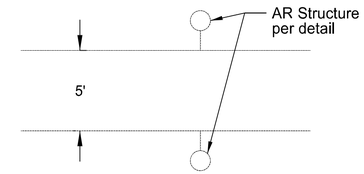
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	20	12



NOTES:
1. Contractor shall provide 4" rigid insulation between water main and ARV if top of pipe is less than 8' from finished ground.
2. Connection to main shall be at top of water main.
3. Tapping saddle to be fusible.

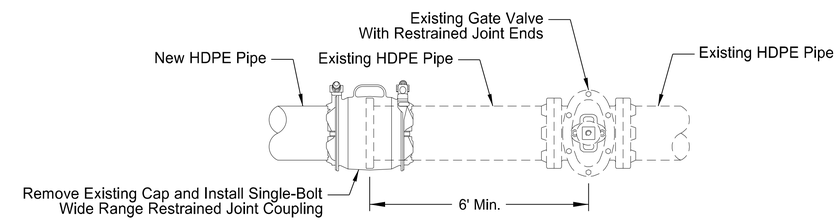
Watermain Air Release Pit

No Scale



Air Release Layout (Water)

No Scale



NOTES:
1. Wrap fitting and gate valve in 10 mil polyethylene.

Connect To Existing

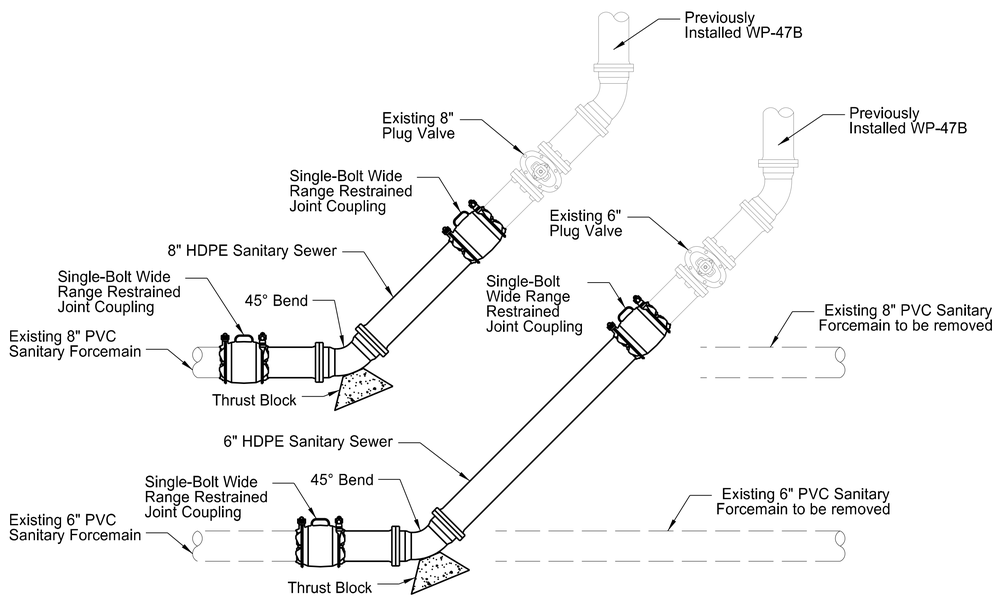
No Scale

General Details
Watermain

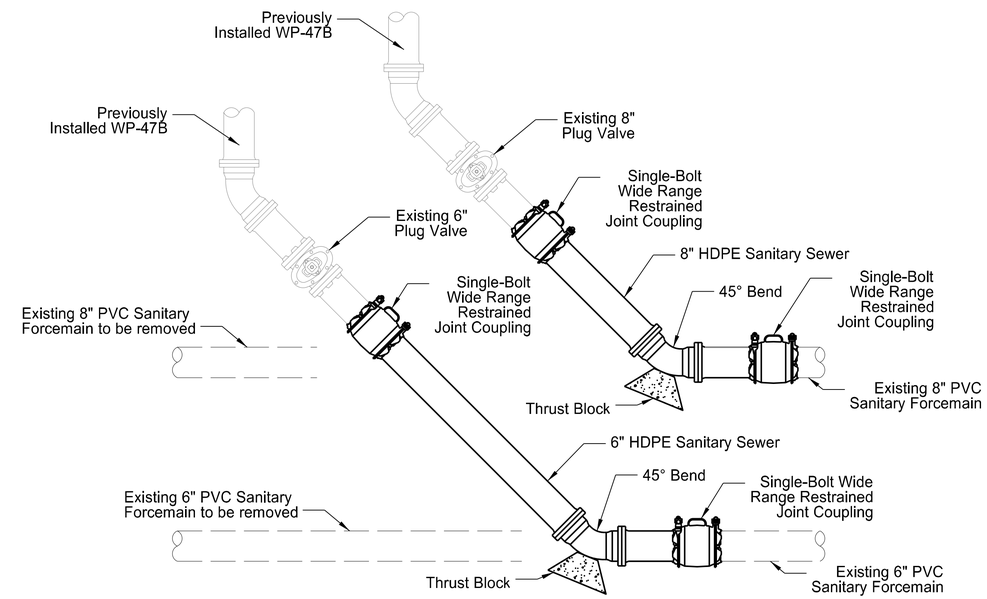
County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-29086
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	20	13



SOUTH CONNECTION



NORTH CONNECTION

NOTES:
1. Wrap fittings and gate valves in 10 mil polyethylene.
2. Contractor to adjust piping in the field to provide clearance at identified conflict point(s).
3. All valves and fittings to be fully tied restrained.

Sanitary Sewer - Connect To Existing

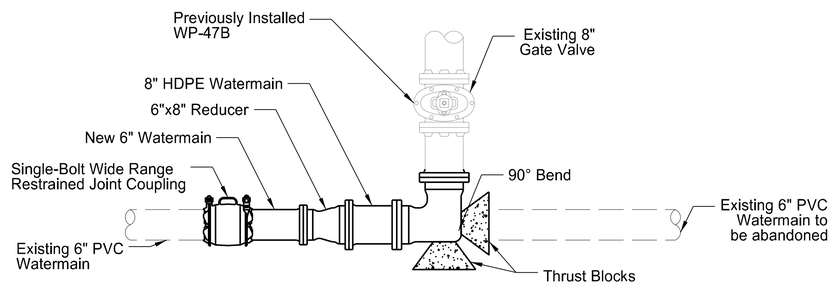
No Scale

General Details
Connections to Existing Sanitary Sewer

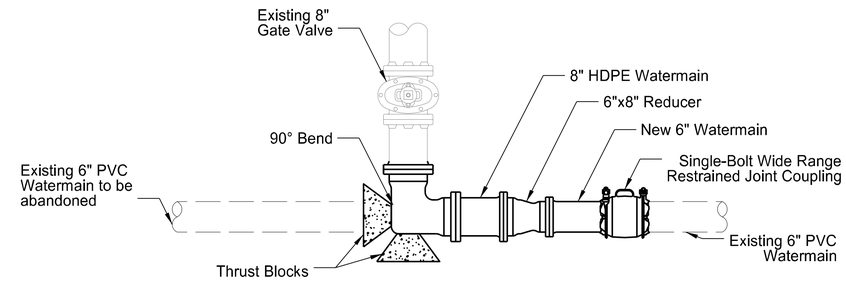
County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-22066
DATE:
NORTH DAKOTA
8/21/2024

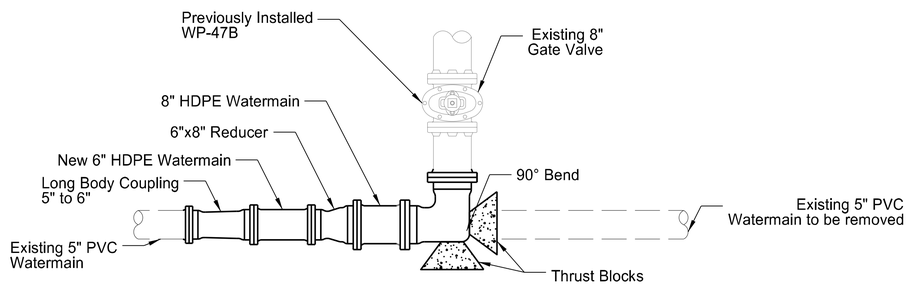
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	20	14



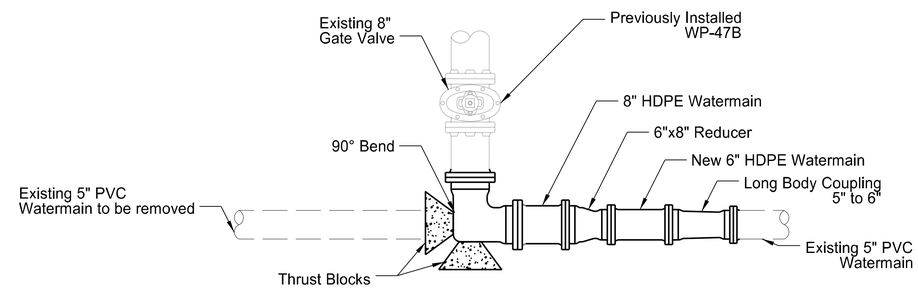
6 INCH EXISTING CONNECTION (SOUTH)



6 INCH EXISTING CONNECTION (NORTH)



5 INCH EXISTING CONNECTION (SOUTH)



5 INCH EXISTING CONNECTION (NORTH)

NOTES:
1. Wrap fittings and gate valves in 10 mil polyethylene.
2. All valves and fittings to be fully tied restrained.

Water Main - Connect To Existing

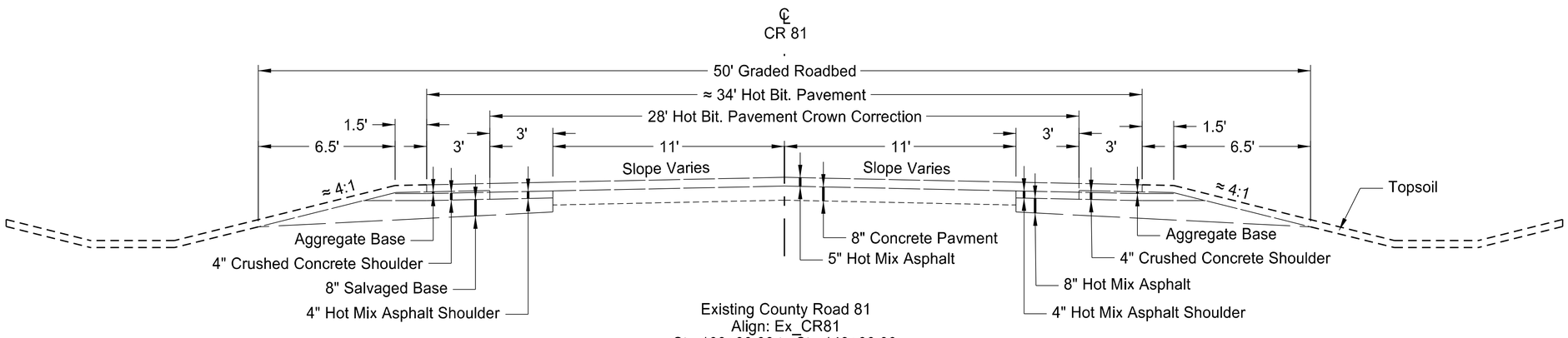
No Scale

General Details
Connections to Existing Watermain

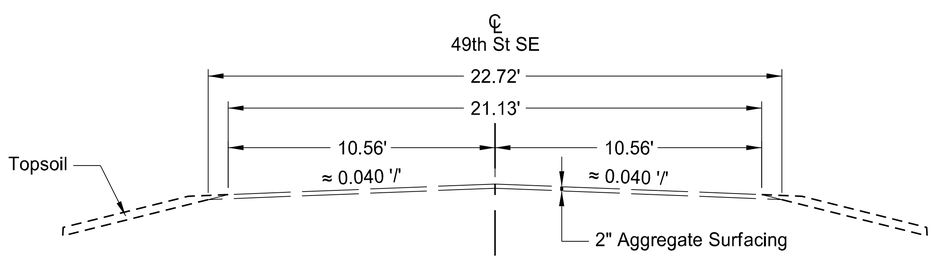
County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-23066
DATE:
NORTH DAKOTA
8/21/2024

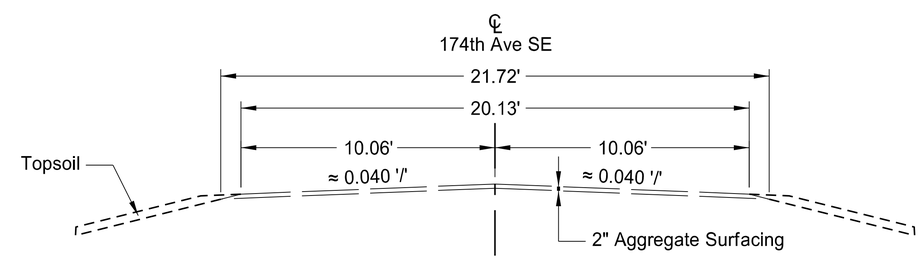
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	30	1



Existing County Road 81
Align: Ex_CR81
Sta 103+00.00 to Sta 143+00.00



Existing 49th St SE
Align: Ex_49THSTSE
Sta 201+00.00 to Sta 254+06.14



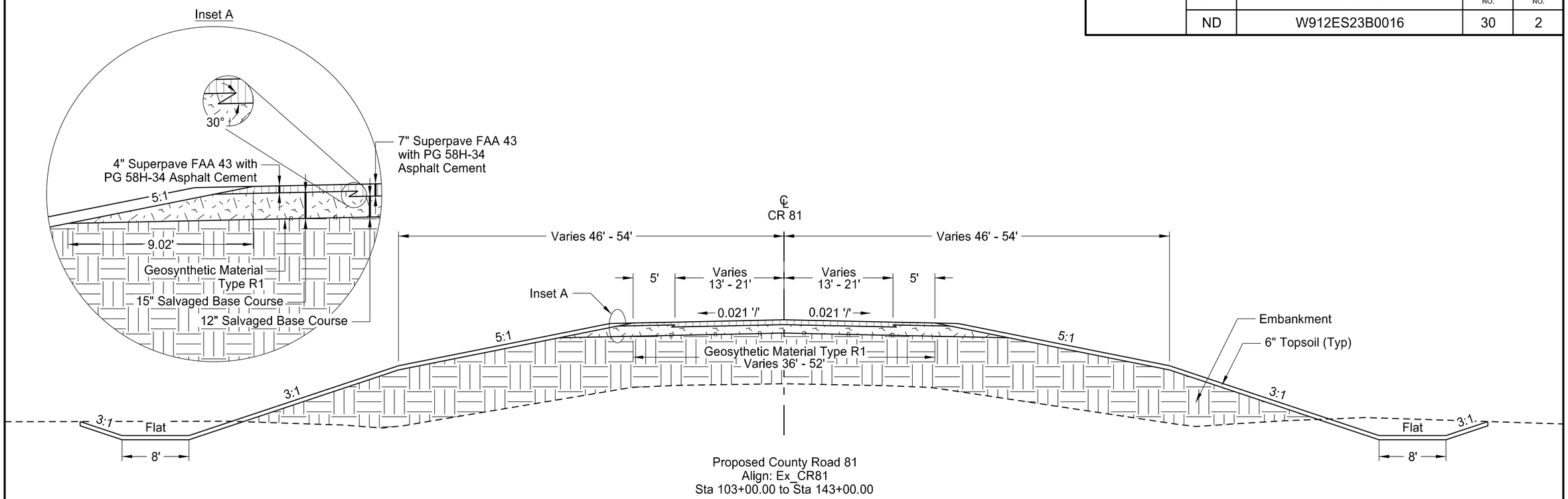
Existing 174th Ave SE
Align: Ex_174THAVESE
Sta 301+00.00 to Sta 337+63.81

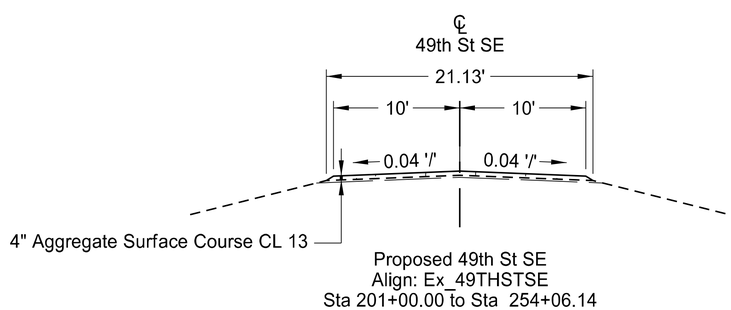
Existing Typical Sections

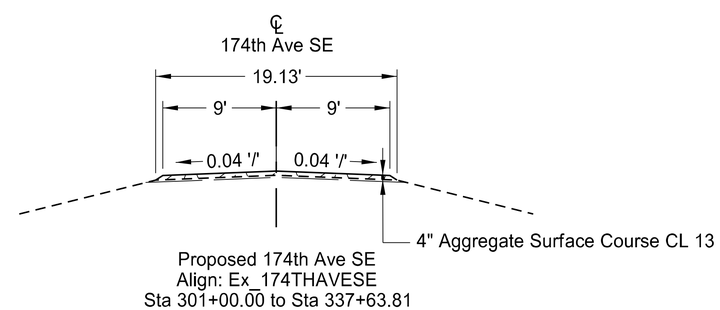
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	30	2





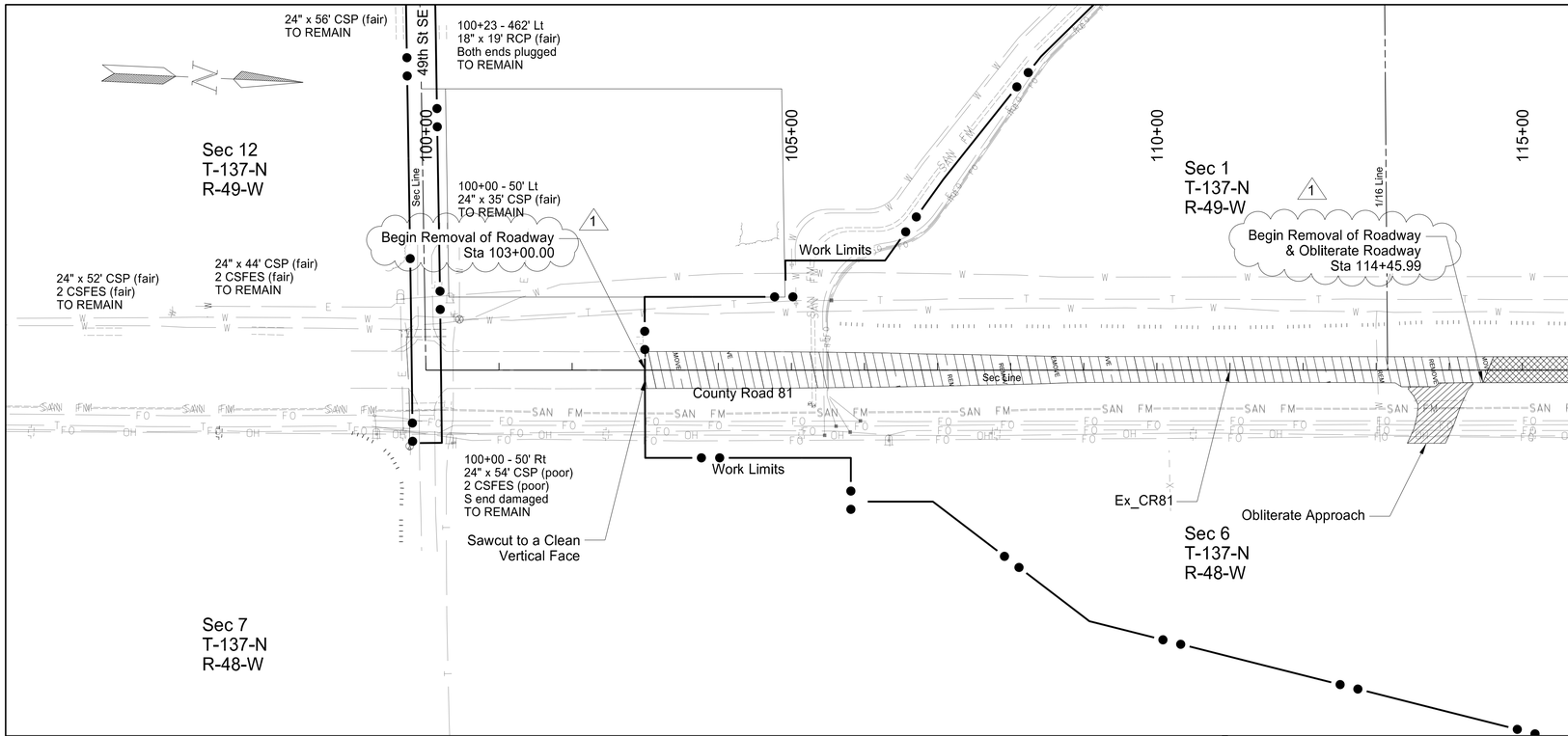


Proposed Typical Sections

Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

Amendment 003	STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
	ND	W912ES23B0016	40	1

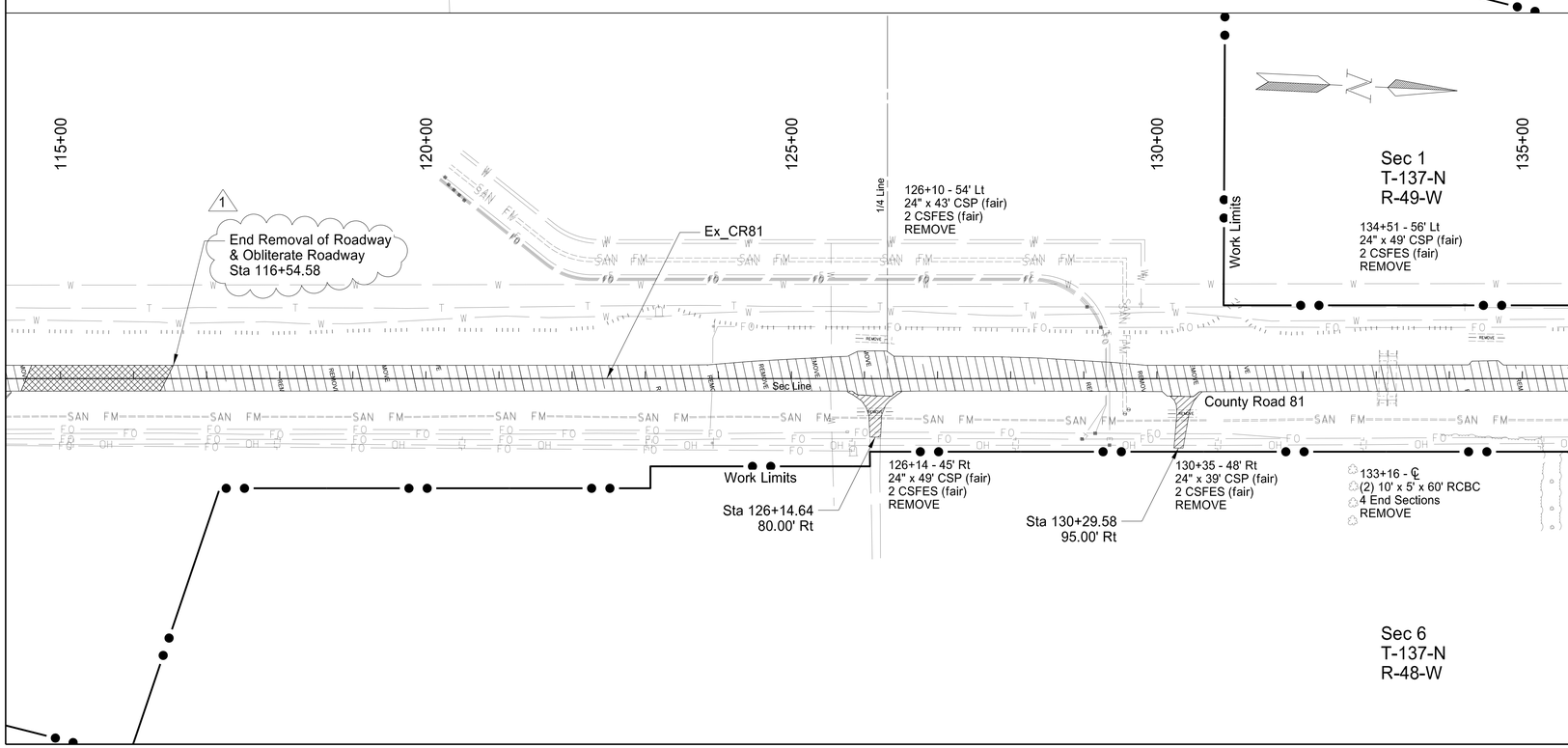


Legend

- Removal of Roadway
- Removal of Roadway & Obliterate Roadway
- Removal of Roadway - Aggregate Surface
- Removal of Pipe All Types and Sizes

1

0 100' 200' 400'

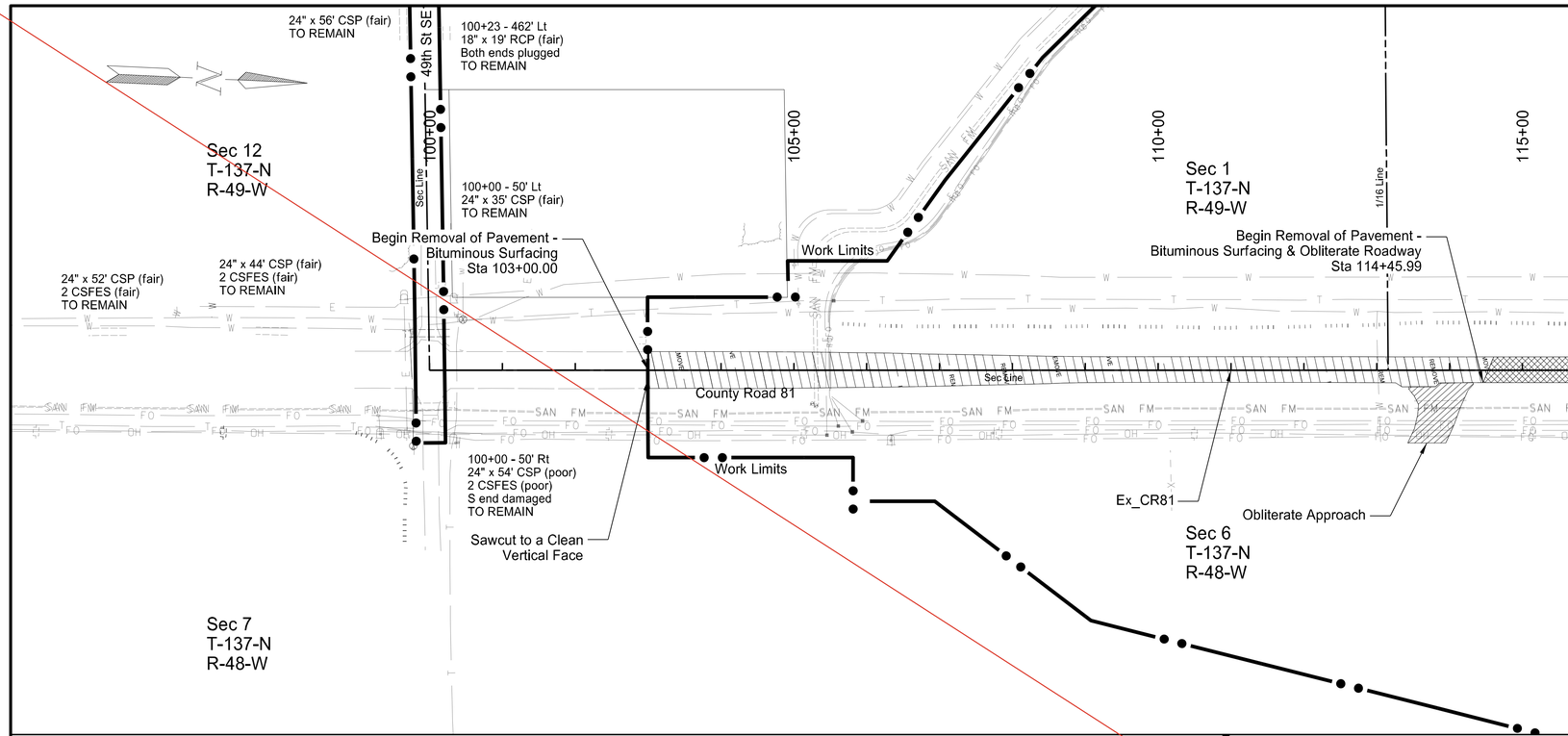


Removals

County Road 81
Reach SE-3 Roadway Improvements
Sta 103+00 to Sta 135+00

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUUD
PE-10407
DATE
NORTH DAKOTA
11/6/2024

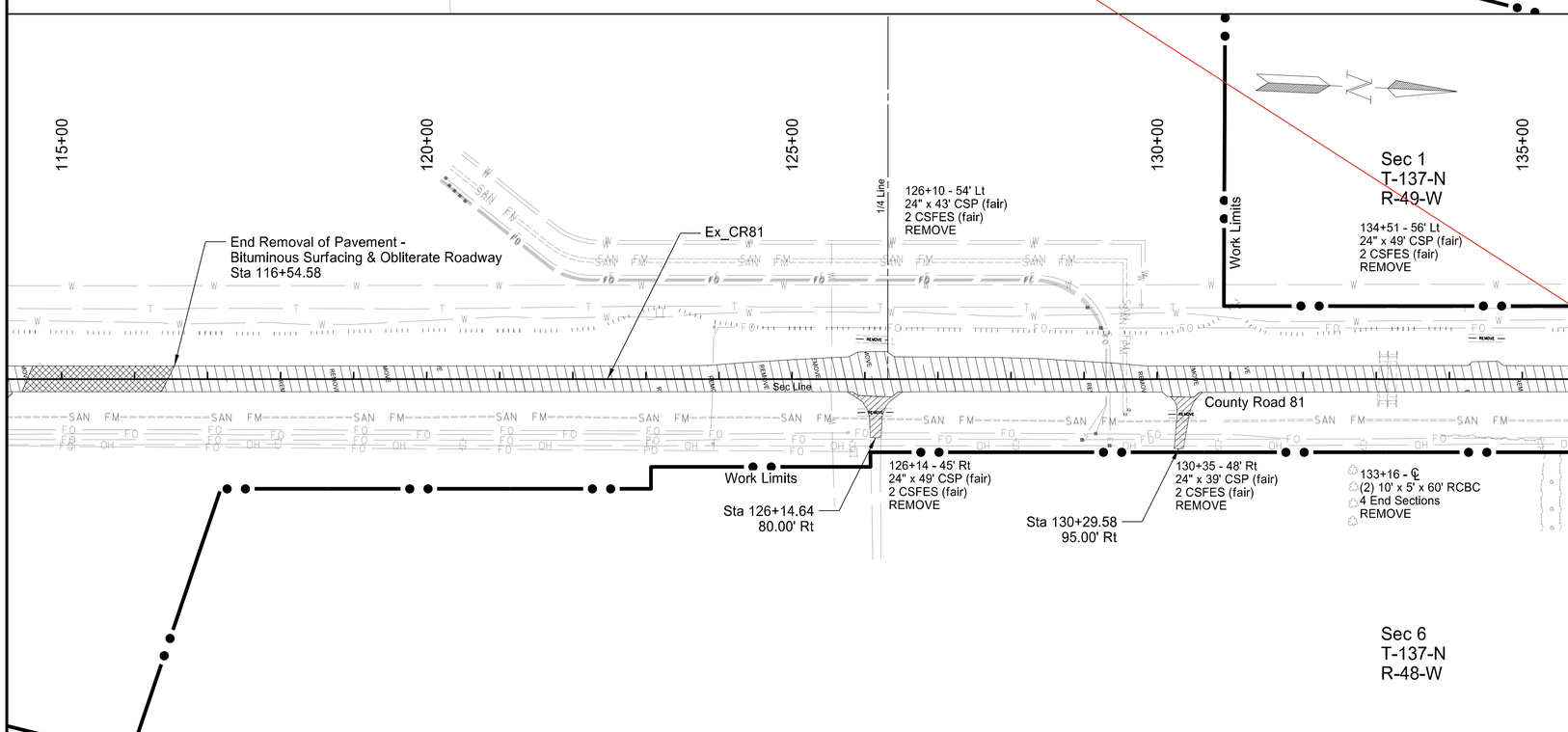
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	40	1



Legend

- Removal of Pavement - Bituminous Surfacing
- Removal of Pavement - Bituminous Surfacing & Obliterate Roadway
- Removal of Pavement - Aggregate Surfacing
- Removal of Pipe All Types and Sizes

0 100' 200' 400'

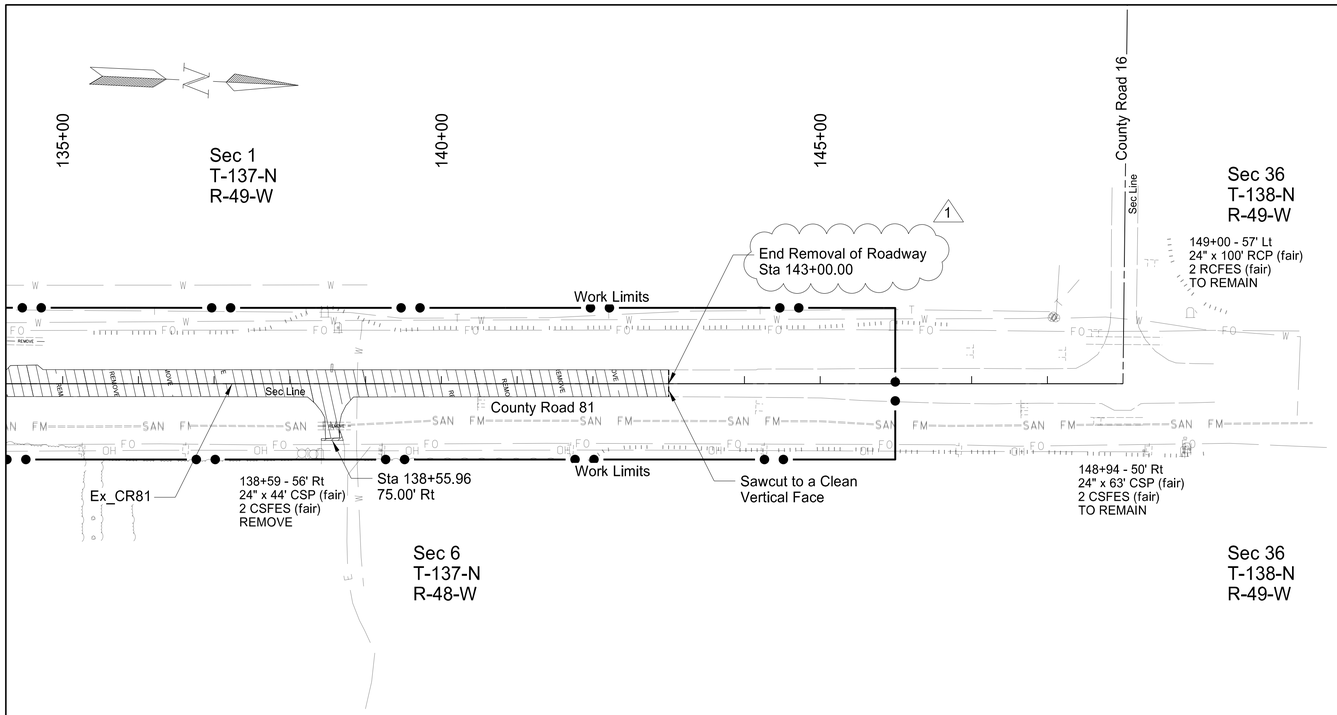


Removals

County Road 81
Reach SE-3 Roadway Improvements
Sta 103+00 to Sta 135+00

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

Amendment 003	STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
	ND	W912ES23B0016	40	2



Legend

- Removal of Roadway
- Removal of Roadway & Obliterate Roadway
- Removal of Roadway - Aggregate Surfacing
- Removal of Pipe All Types and Sizes

1

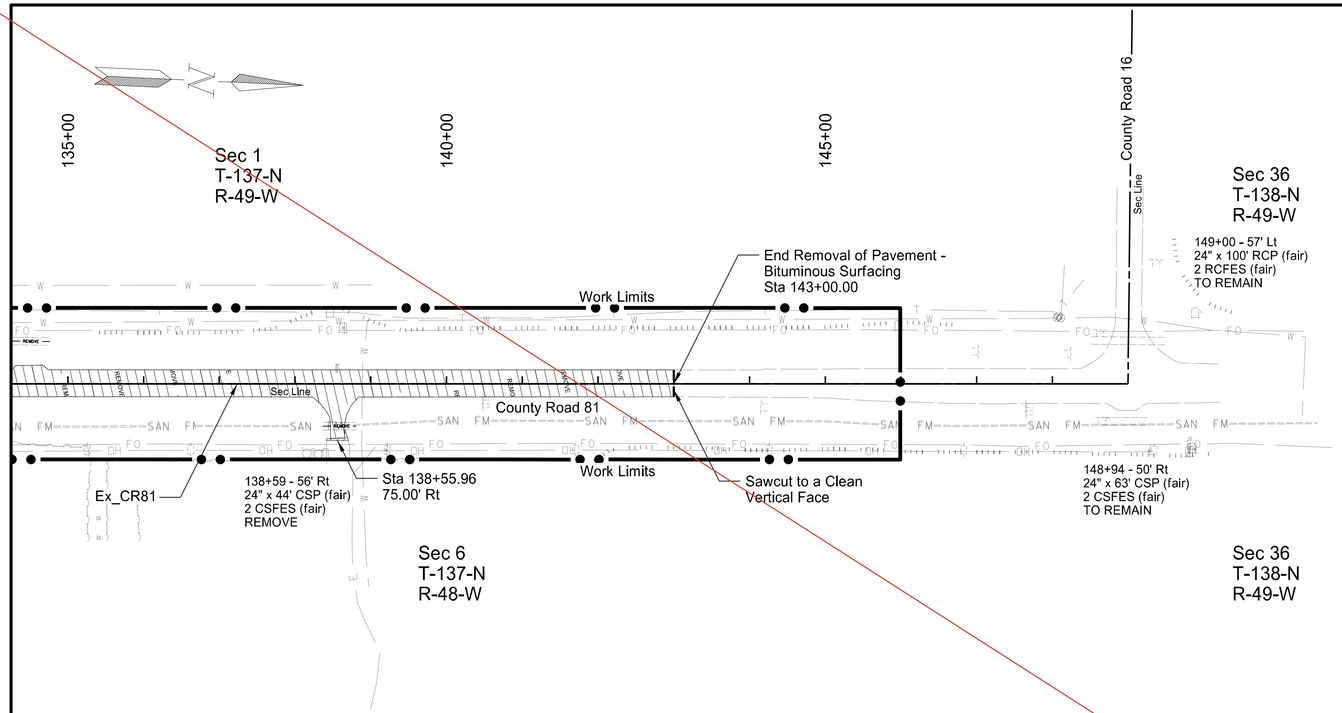
0 100' 200' 400'

Removals

County Road 81
Reach SE-3 Roadway Improvements
Sta 135+00 to Sta 143+00

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUUD
PE-10407
DATE
NORTH DAKOTA
11/6/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	40	2



Legend

- Removal of Pavement - Bituminous Surfacing
- Removal of Pavement - Bituminous Surfacing & Obliterate Roadway
- Removal of Pavement - Aggregate Surfacing
- Removal of Pipe All Types and Sizes

0 100' 200' 400'

Removals

County Road 81
Reach SE-3 Roadway Improvements
Sta 135+00 to Sta 143+00

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE-10407
DATE
NORTH DAKOTA
8/21/2024

Begin Station / Location	Begin Offset	End Station / Location	End Offset	Pipe Installation	Allowable Material	Required Diameter	Steel Pipe Coatings	Steel Pipe Corrugations or Spiral Ribs	Steel Pipe Minimum Thickness	(*) End Sections		Applicable Backfill
										Begin	End	
				In		In	Type		In	EA	EA	
125+87	56' Lt	126+33	56' Lt	30	Corrugated Steel Pipe	30	Z, A, P	2	0.064	FES	FES	NDDOT Spec 714.04 A
125+95	56' Rt	126+39	56' Rt	24	Corrugated Steel Pipe	24	Z, A, P	2	0.064	FES	FES	NDDOT Spec 714.04 A
130+07	54' Rt	130+53	56' Rt	24	Corrugated Steel Pipe	24	Z, A, P	2	0.064	FES	FES	NDDOT Spec 714.04 A
134+22	60' Lt	134+74	59' Lt	36	Corrugated Steel Pipe	36	Z, A, P	2	0.064	FES	FES	NDDOT Spec 714.04 A
138+33	55' Rt	138+79	54' Rt	30	Corrugated Steel Pipe	30	Z, A, P	2	0.064	FES	FES	NDDOT Spec 714.04 A

Corrugations: **2** = 2-2/3"x1/2"
3 = 3"x1"
5 = 5"x1"

Coatings: **Z** = Zinc
A = Aluminum
P = Polymeric (over Zinc or Aluminum)

Spiral Ribs: **3/4** = 3/4"x3/4"@7-1/2"
1 = 3/4"x1"@11-1/2"

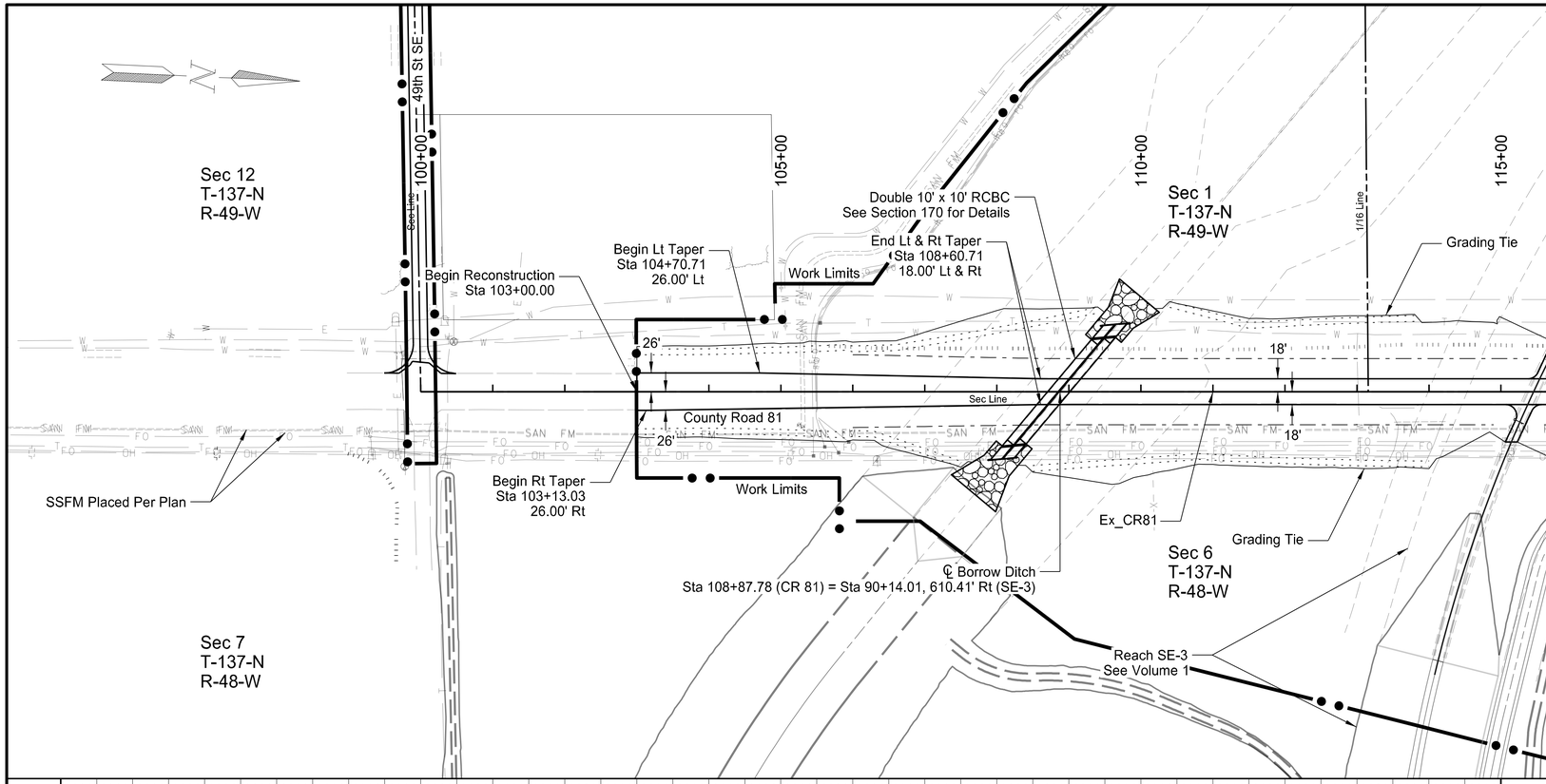
FES = Flared End Section
TES = Traversable End Section

Allowable Pipe List

Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	60	1

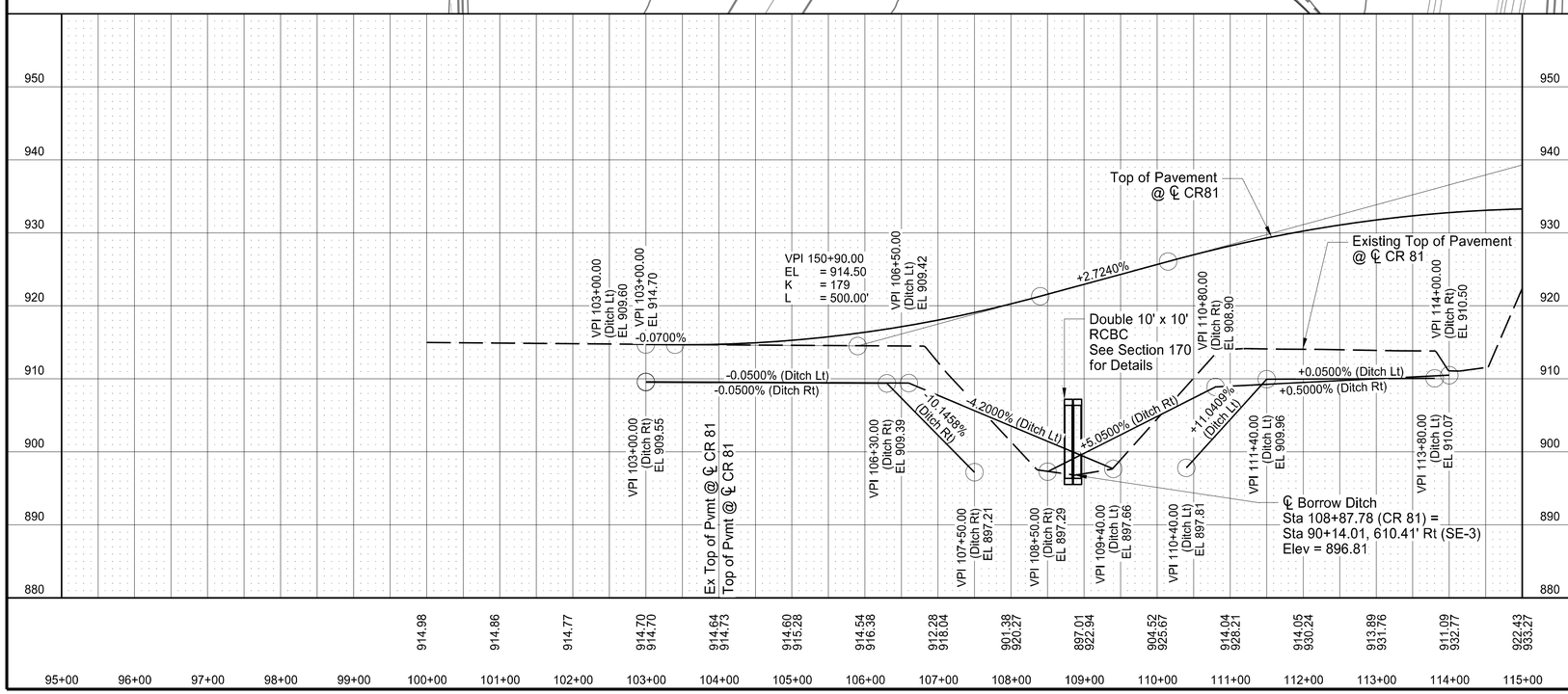


Legend

Proposed Ditch Bottom Location

Proposed Inslope Grade Break at Clear Zone

0 100' 200' 400'



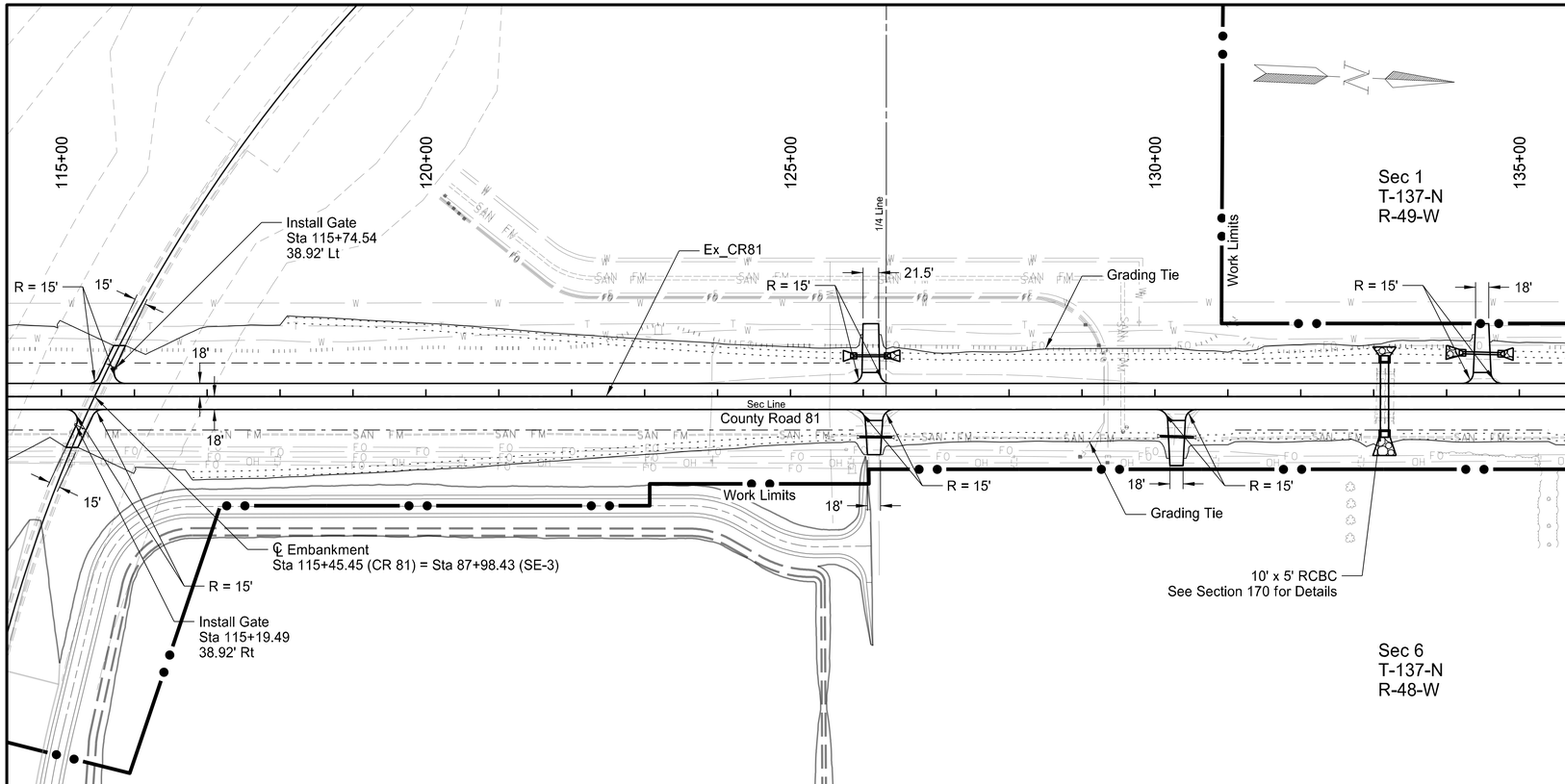
Plan & Profile

County Road 81
Reach SE-3 Roadway Improvements
Sta 103+00 to Sta 115+00

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA

8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	60	2

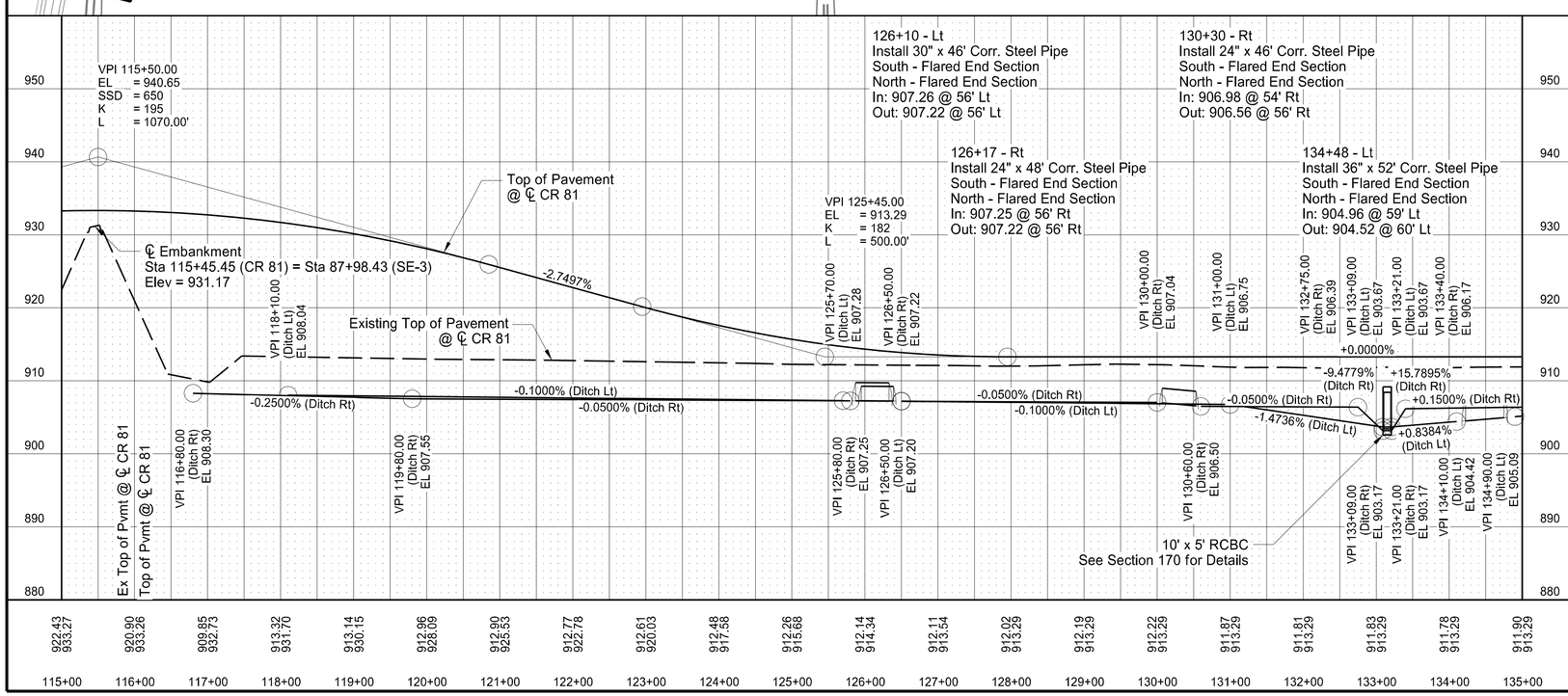


Legend

Proposed Ditch Bottom Location

Proposed Inslope Grade Break at Clear Zone

0 100' 200' 400'

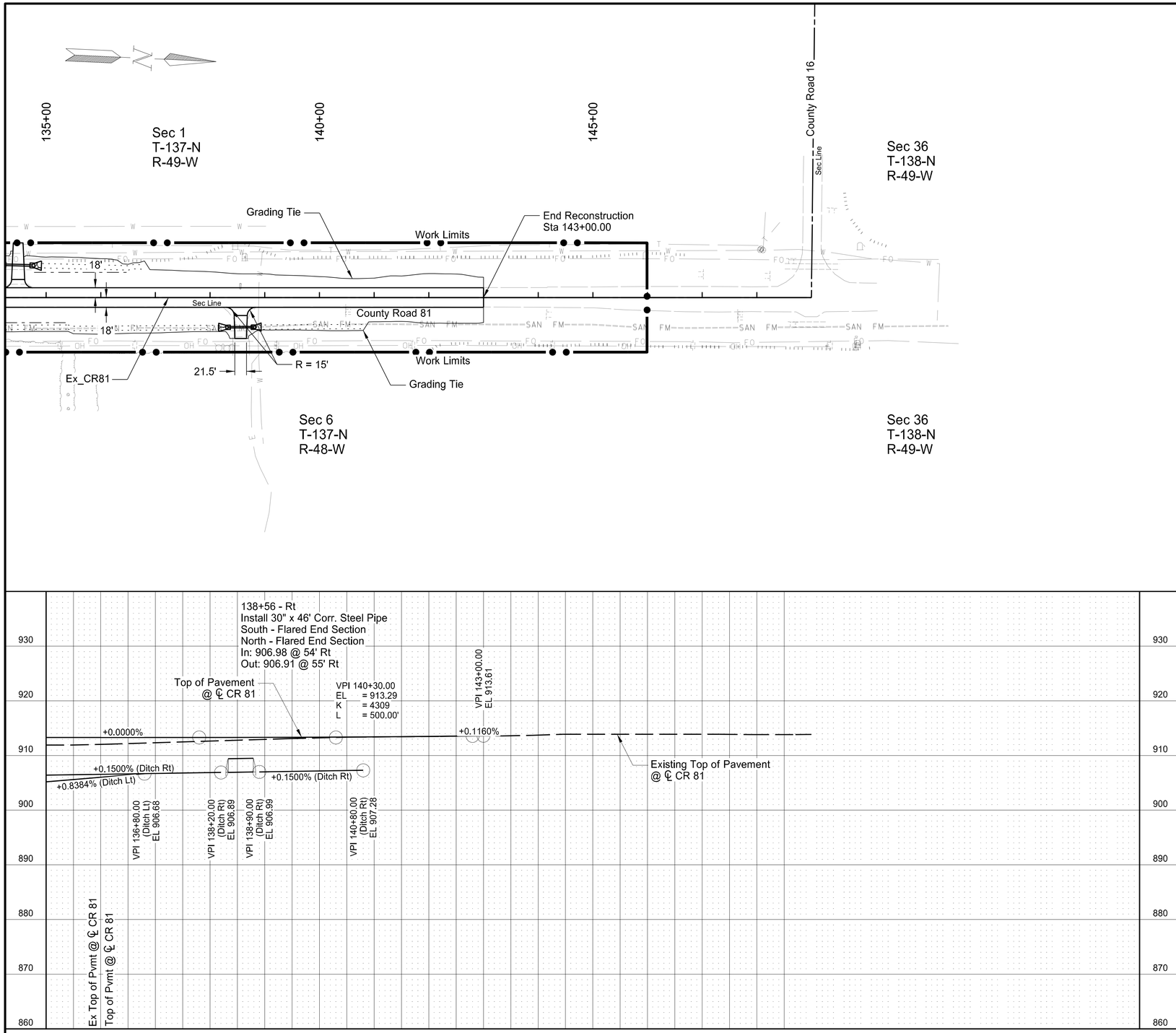


Plan & Profile

County Road 81
Reach SE-3 Roadway Improvements
Sta 115+00 to Sta 135+00

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	60	3



Legend

- Proposed Ditch Bottom Location
- Proposed Inslope Grade Break at Clear Zone

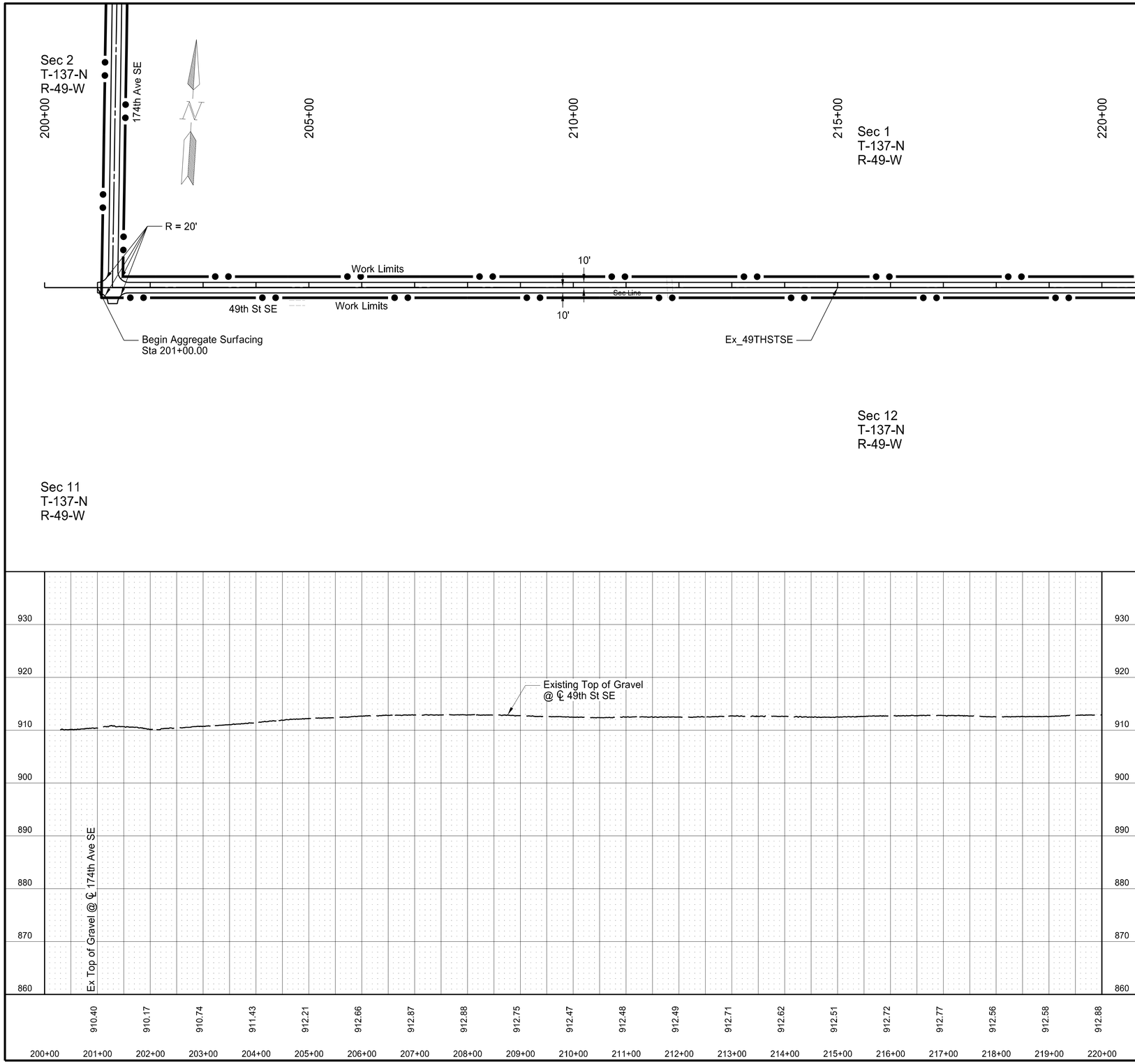
0 100' 200' 400'

Plan & Profile

County Road 81
Reach SE-3 Roadway Improvements
Sta 135+00 to Sta 143+00

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	60	4



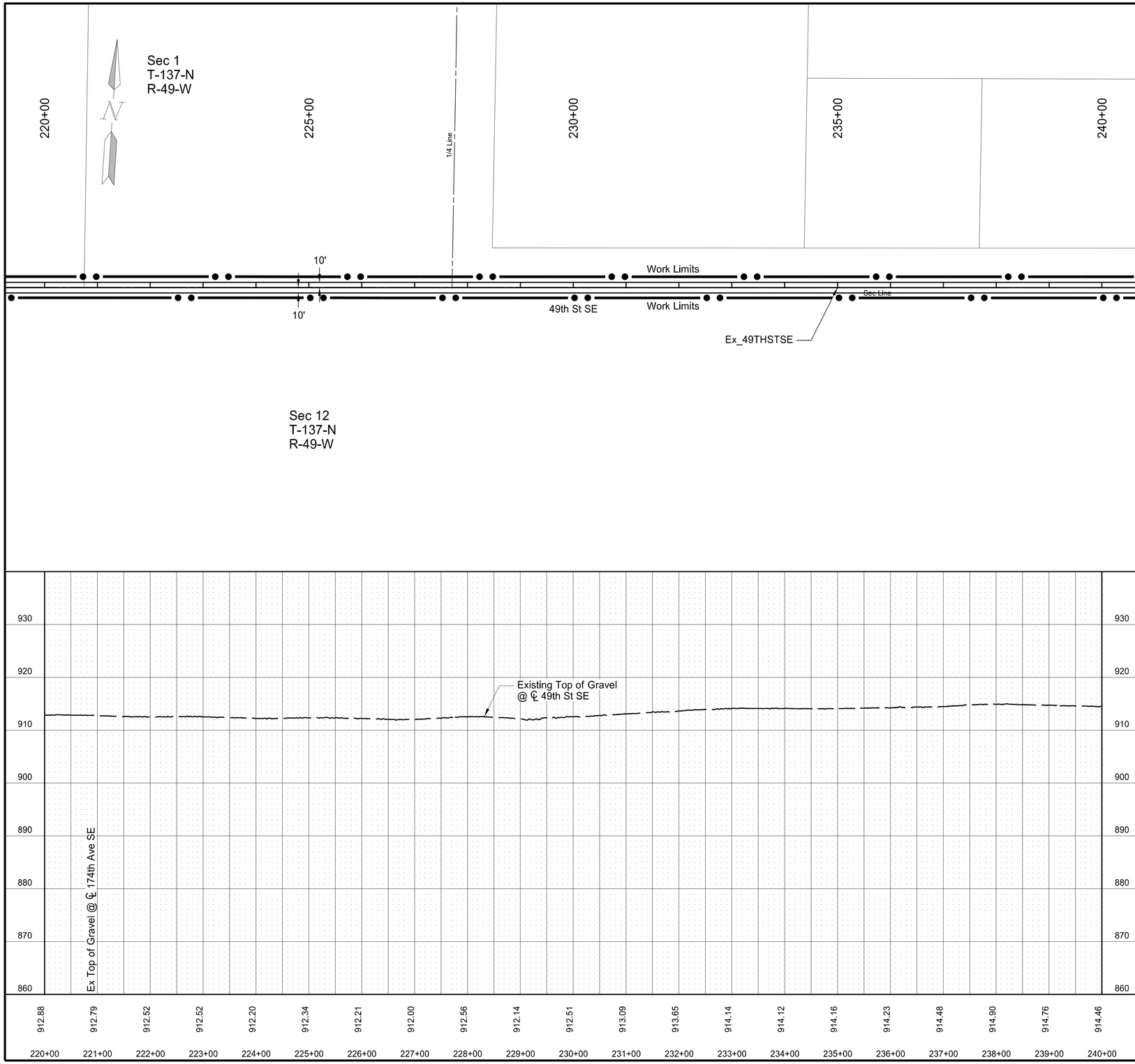
0 100' 200' 400'

Plan & Profile

49th St SE
Reach SE-3 Roadway Improvements
Sta 201+00 to Sta 220+00

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	60	5



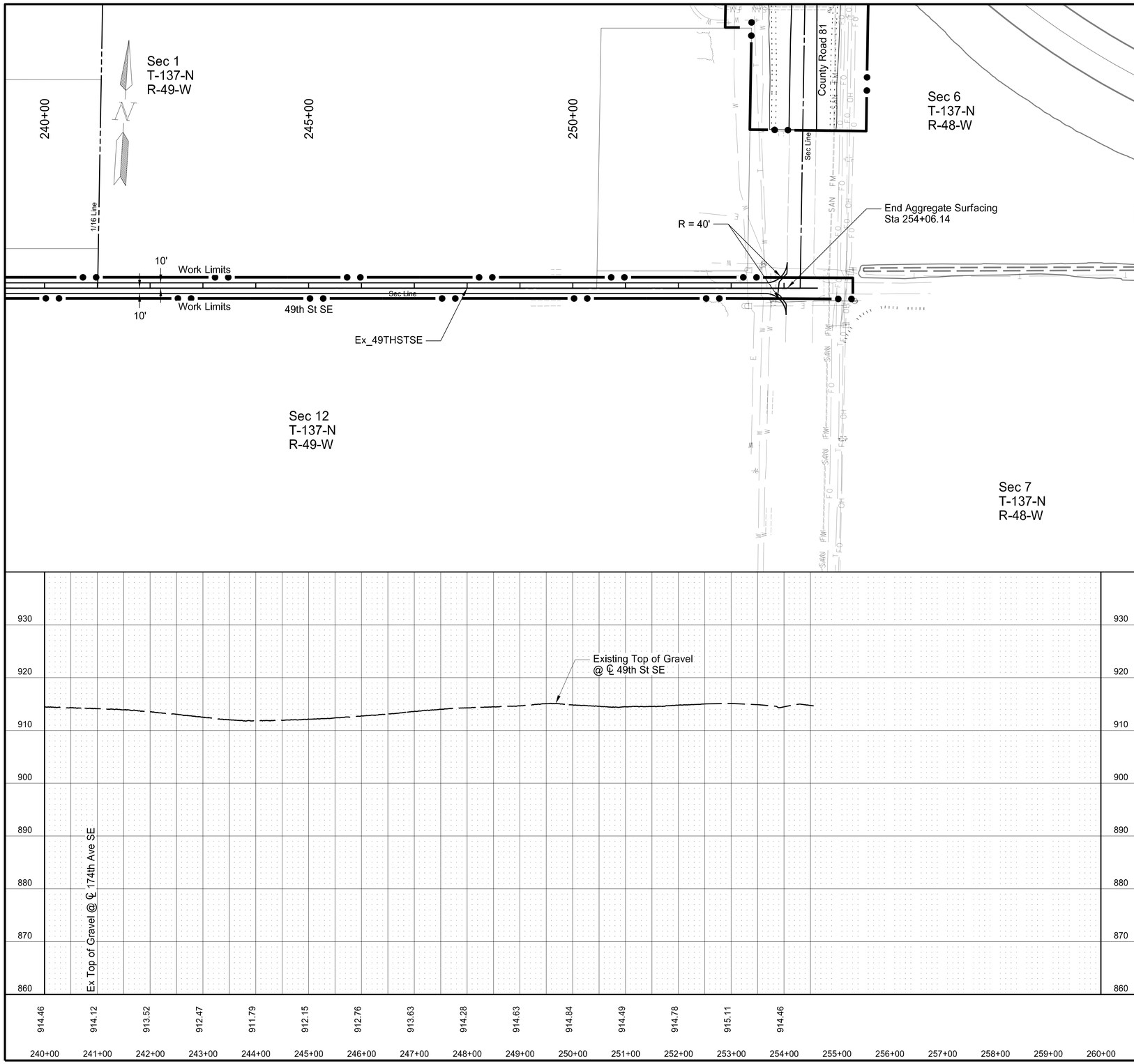
0 100' 200' 400'

Plan & Profile

49th St SE
Reach SE-3 Roadway Improvements
Sta 220+00 to Sta 240+00

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	60	6



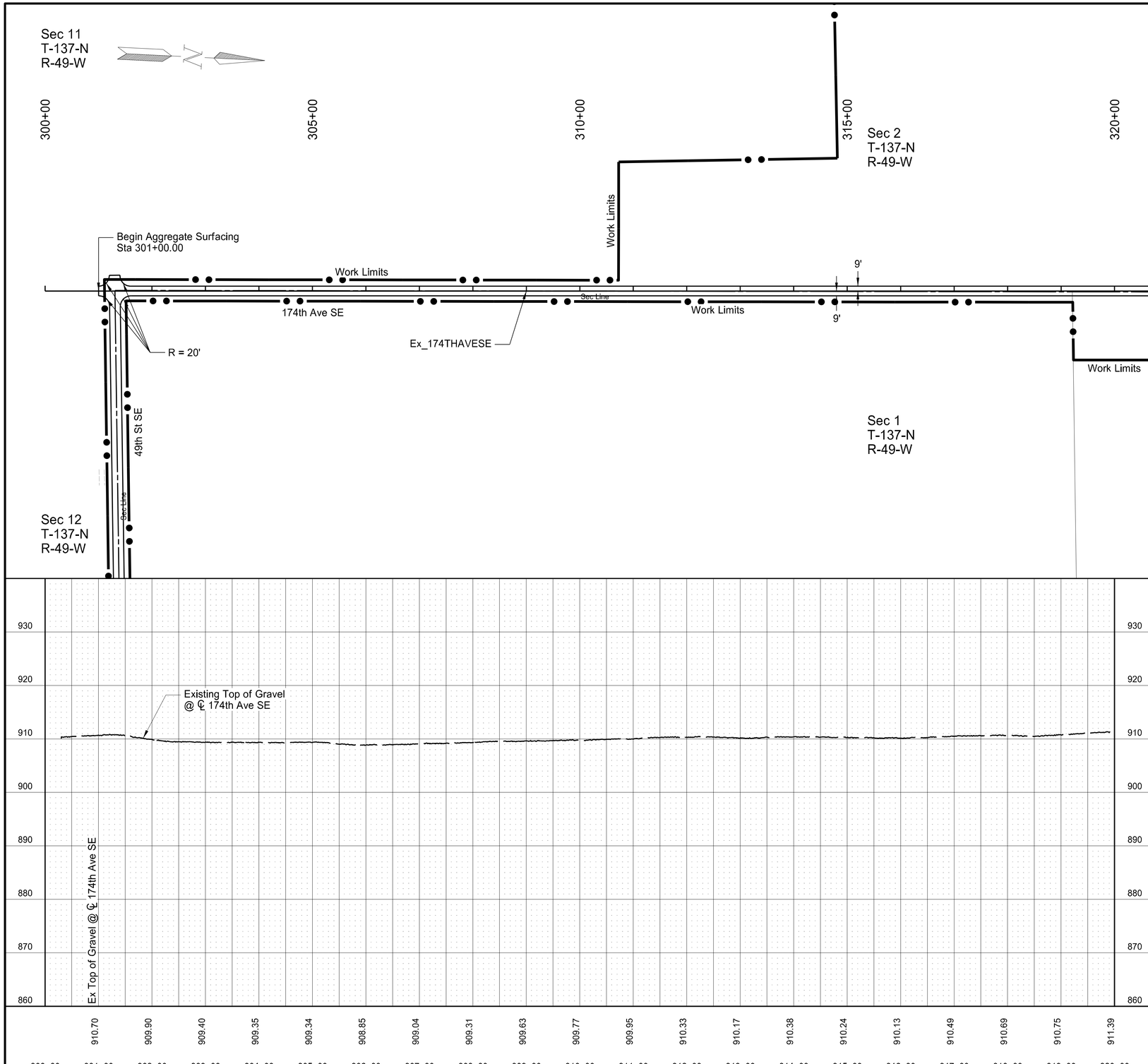
Plan & Profile

49th St SE
Reach SE-3 Roadway Improvements
Sta 240+00 to Sta 254+06

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA

8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	60	7



0 100' 200' 400'

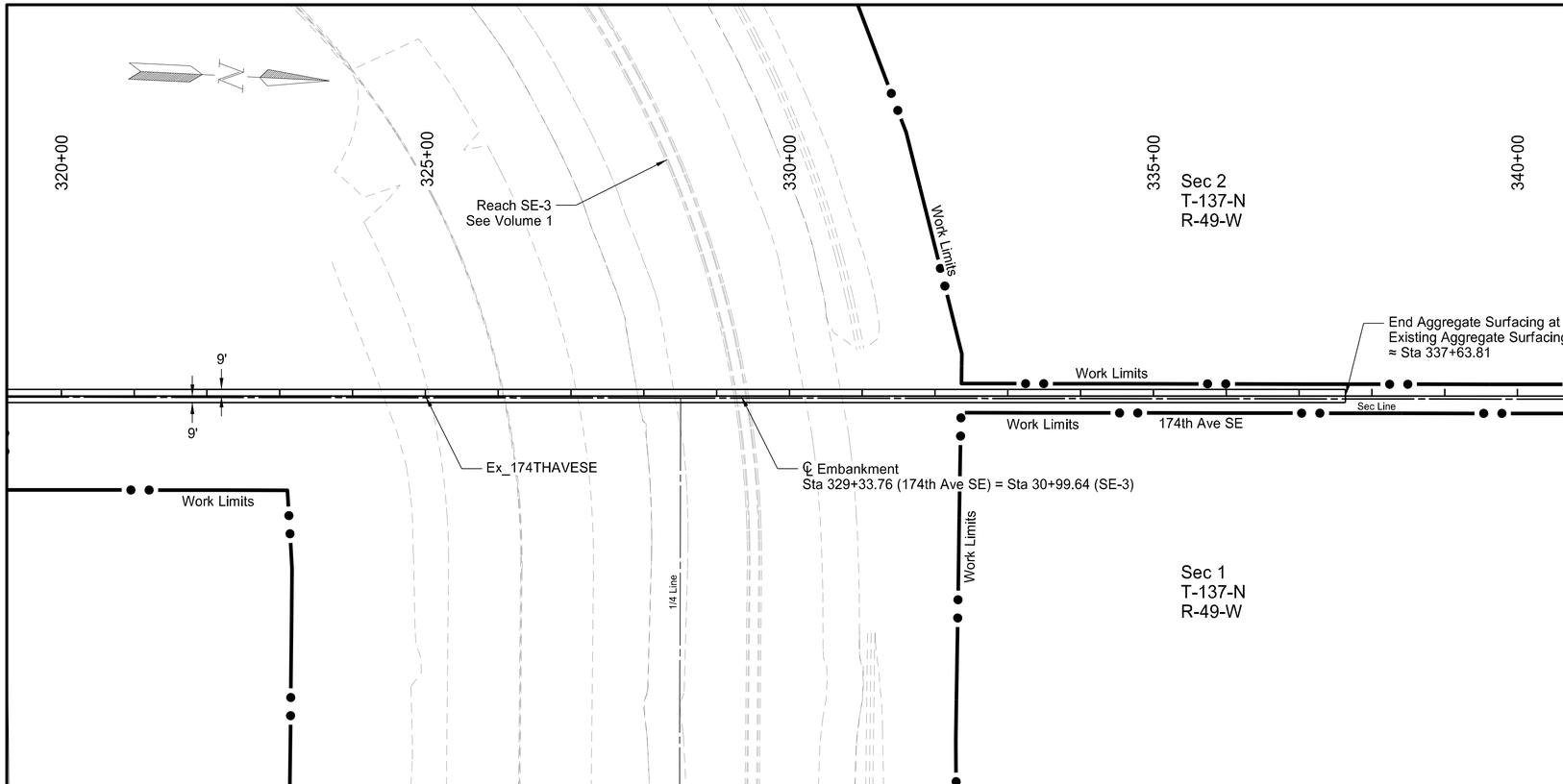
Plan & Profile

174th Ave SE
Reach SE-3 Roadway Improvements
Sta 301+00 to Sta 320+00

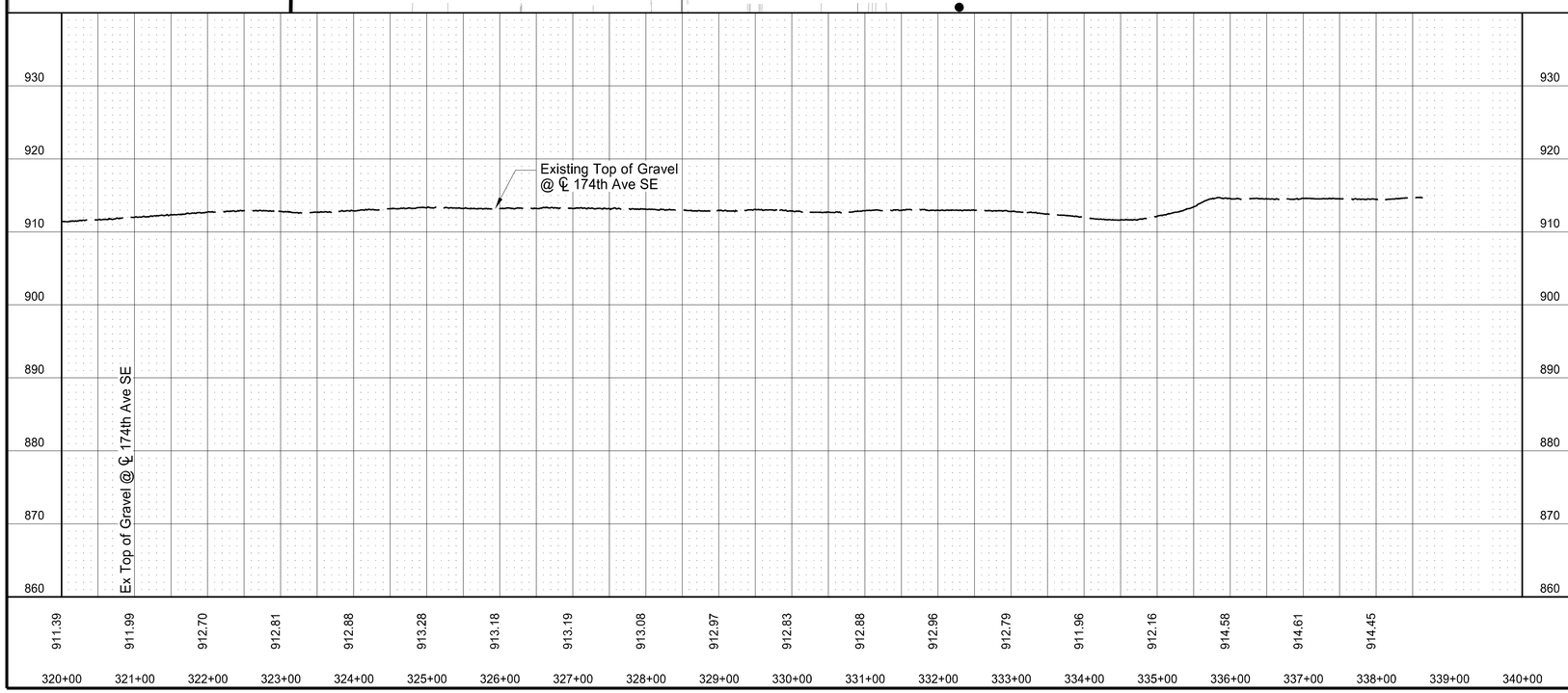
REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE-10407
DATE
NORTH DAKOTA

8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	60	8



0 100' 200' 400'

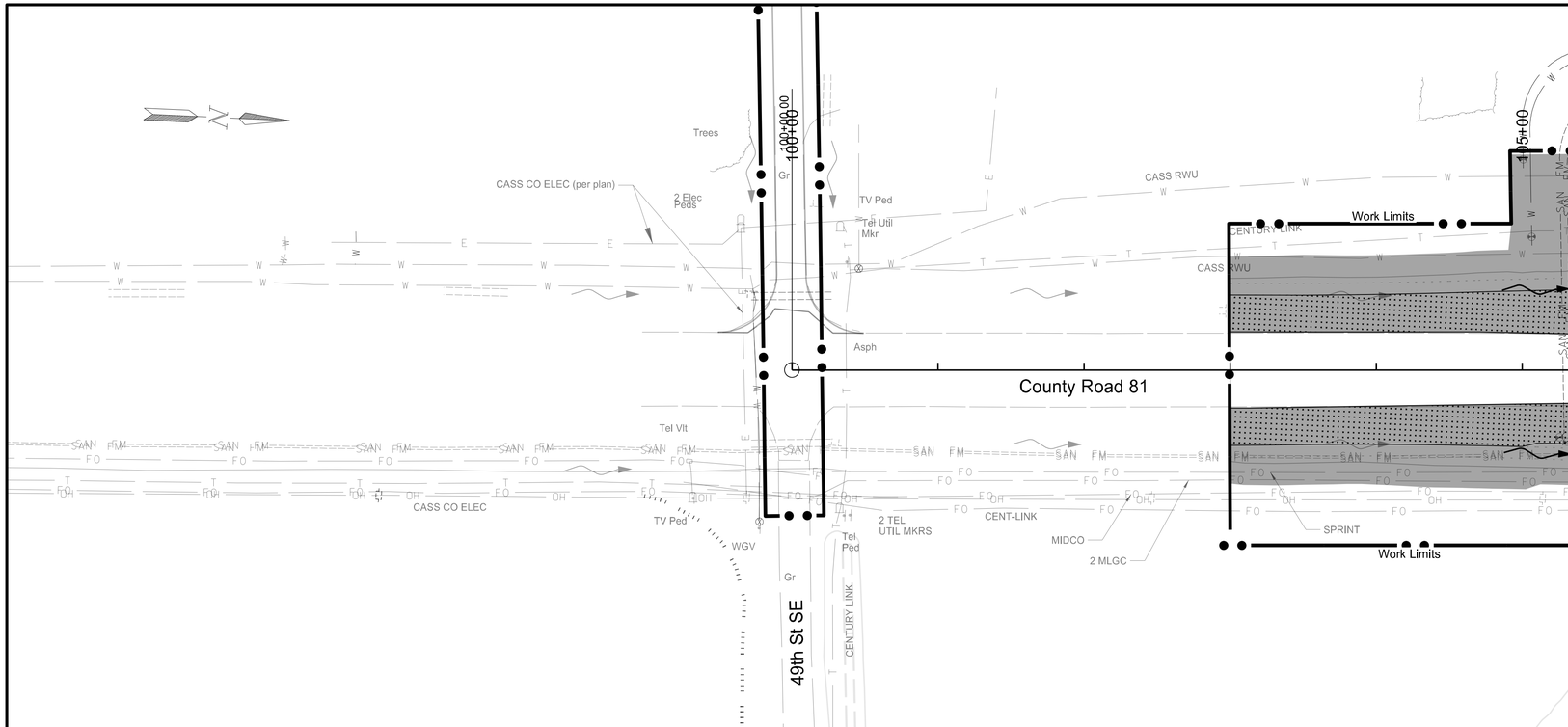


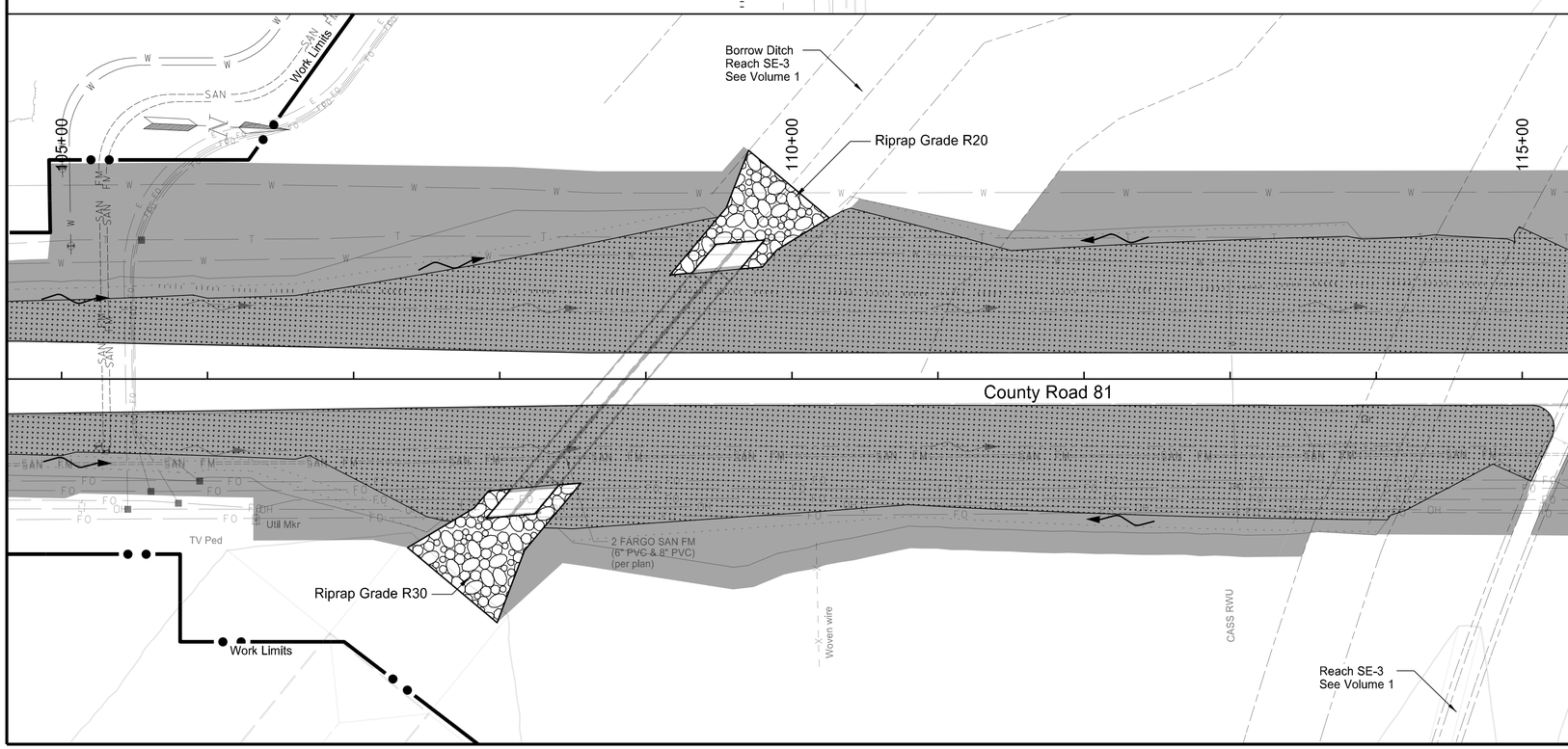
Plan & Profile

174th Ave SE
Reach SE-3 Roadway Improvements
Sta 320+00 to Sta 337+64

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	77	1





Notes:
See Volume 1 and specifications for permanent turf establishment measures to be applied along the Southern Embankment.

Adjacent to the Southern Embankment, Borrow Ditch, and Drainage Ditch, blend Seeding Class II with the seeding shown in Volume 1 for 15' beyond the CR 81 grading tie line.

0' 100' 200'

LEGEND

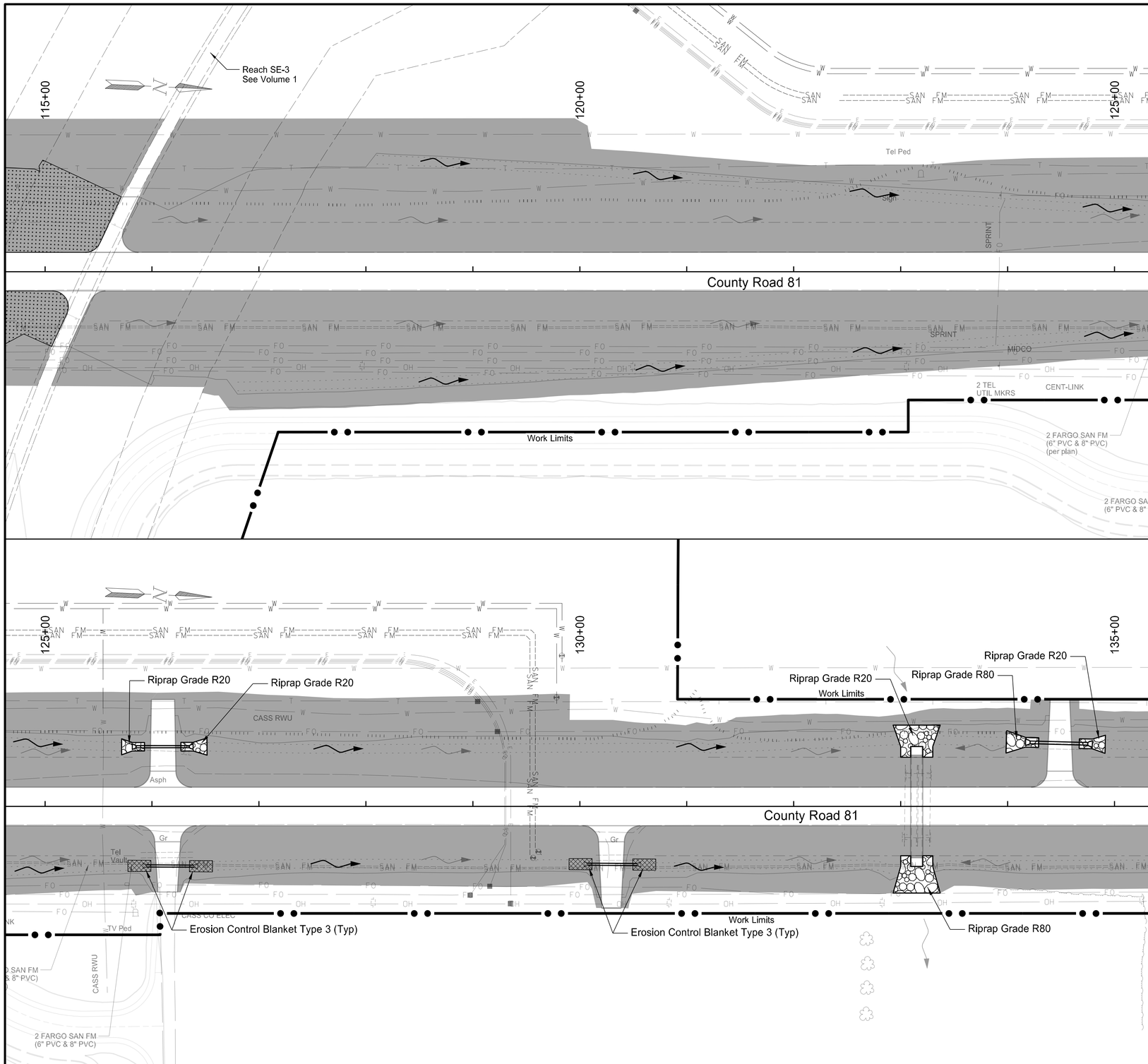
- Final Drainage Direction
- Existing Wetland
- Seeding Class II & Straw Mulch
- Erosion Control Blanket Type 3 (at Pipe Ends)
- TRM
- Riprap

Permanent Erosion Control

County Road 81
Reach SE-3 Roadway Improvements
Sta 103+00.00 to Sta 115+00.00

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-29066
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	77	2



Notes:
See Volume 1 and specifications for permanent turf establishment measures to be applied along the Southern Embankment.

Adjacent to the Southern Embankment, Borrow Ditch, and Drainage Ditch, blend Seeding Class II with the seeding shown in Volume 1 for 15' beyond the CR 81 grading tie line.

0' 100' 200'

LEGEND

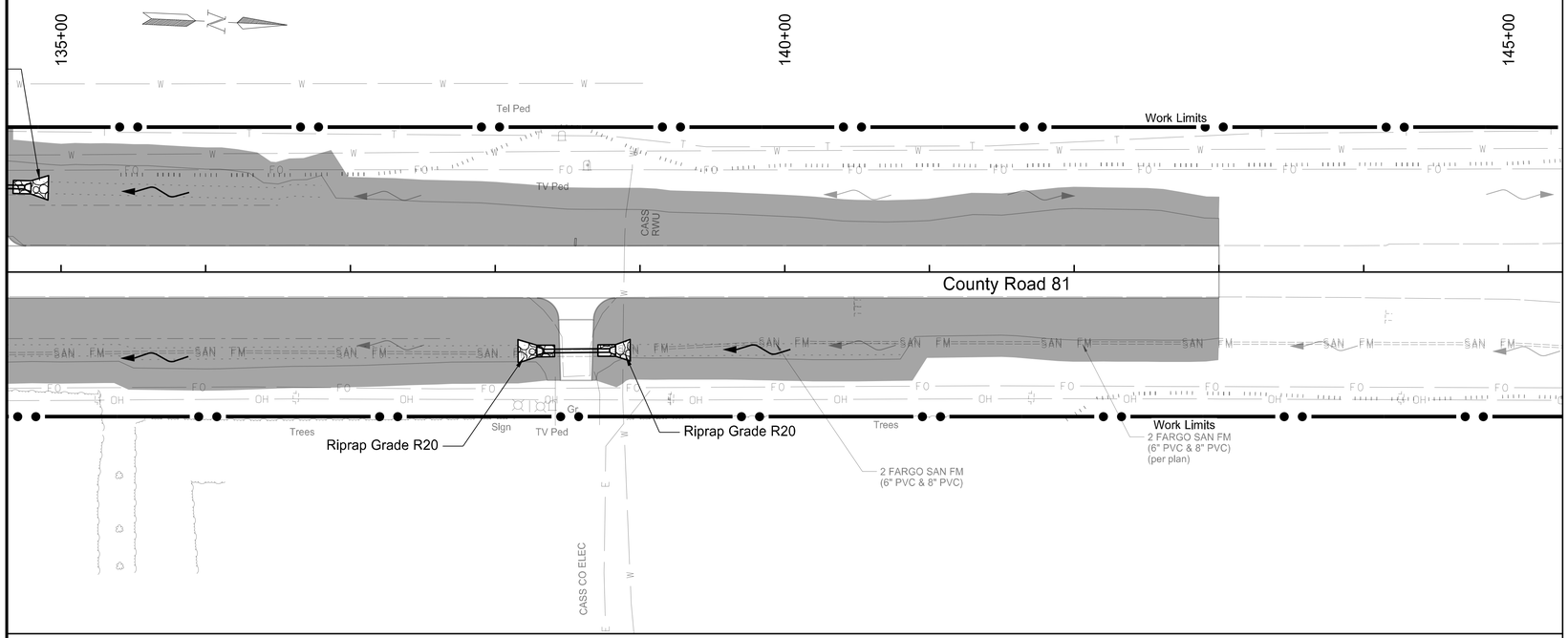
- Final Drainage Direction
- Existing Wetland
- Seeding Class II & Straw Mulch
- Erosion Control Blanket Type 3 (at Pipe Ends)
- TRM
- Riprap

Permanent Erosion Control

County Road 81
Reach SE-3 Roadway Improvements
Sta 115+00.00 to Sta 135+00.00

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-29066
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	77	3



Notes:
See Volume 1 and specifications for permanent turf establishment measures to be applied along the Southern Embankment.

Adjacent to the Southern Embankment, Borrow Ditch, and Drainage Ditch, blend Seeding Class II with the seeding shown in Volume 1 for 15' beyond the CR 81 grading tie line.

0' 100' 200'

LEGEND

- Final Drainage Direction
- Existing Wetland
- Seeding Class II & Straw Mulch
- Erosion Control Blanket Type 3 (at Pipe Ends)
- TRM
- Riprap

Permanent Erosion Control

County Road 81
Reach SE-3 Roadway Improvements
Sta 135+00.00 to Sta 143+00.00

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-20066
DATE:
NORTH DAKOTA
8/21/2024

PRELIMINARY SURVEY COORDINATE AND CURVE DATA - REACH SE-3

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	81	1

HORIZONTAL ALIGNMENT

PNT	STATION	NORTHING	EASTING
CR 81 (Chain: Ex_CR81)			
BEG	100+00.00	399819.79	2896712.14
END	148+99.69	404714.16	2896483.93
49th St SE (Chain: Ex_49THSTSE)			
BEG	200+00.00	399477.55	2891292.46
END	254+63.79	399822.62	2896745.35
174th Ave SE (Chain: Ex_174THAVESE)			
BEG	300+00.00	399355.47	2891428.04
PC	350+16.71	404366.12	2891181.58
PI C1	350+69.25	404418.60	2891178.99
PT	351+16.18	404457.16	2891214.67
END	353+00.00	404592.08	2891339.51

CURVE DATA

ARC DEFINITION

C1

PI STA	=	350+69.25
Delta	=	350° 35' 34" RT
D_a	=	150° 22' 56"
R	=	125.00'
T	=	52.54'
L	=	99.47'

US PUBLIC LAND SURVEY DATA

CORNER	IRN	NORTHING	EASTING

SURVEY CONTROL POINTS

PNT	NORTHING	EASTING	ELEV	DESCRIPTION
		MONUMENT DESCRIPTION		
PRIMARY CONTROL				
135	410048.70	2896161	909.64	CP J 506 H AND V
137	402484.50	2896687	909.01	CP K 506 H AND V
140	394566.40	2897031	912.90	CP L 506 H AND V
142	383672.40	2892148	916.46	CP N 506 H AND V
SECONDARY CONTROL				
10	399878.657	2896739.573	913.78	CP 2X2PKNAIL
11	400532.598	2896649.840	913.05	CP 2X2PKNAIL
12	401193.971	2896621.073	912.25	CP 2X2PKNAIL
13	401854.658	2896641.246	911.91	CP 2X2PKNAIL
14	402508.835	2896550.572	910.84	CP 2X2PKNAIL
15	403173.699	2896580.416	910.64	CP 2X2PKNAIL
16	403829.025	2896500.679	912.13	CP 2X2PKNAIL
17	404488.455	2896526.370	912.13	CP 2X2PKNAIL
18	405084.753	2896438.774	911.97	CP 2X2PKNAIL
19	399259.532	2896705.761	913.75	CP 2X2PKNAIL

NOTES: Sheet 1 of 1

Date Survey Completed 9/16/22

☐ Assumed Coordinates

☒ All coordinates on this sheet are NAD83(2011) North Dakota State Plane, South Zone grid coordinates.

All coordinates and measurements on this document derived from the US Survey Foot definition.

INITIALIZING BENCH MARK

☒ NAVD-88

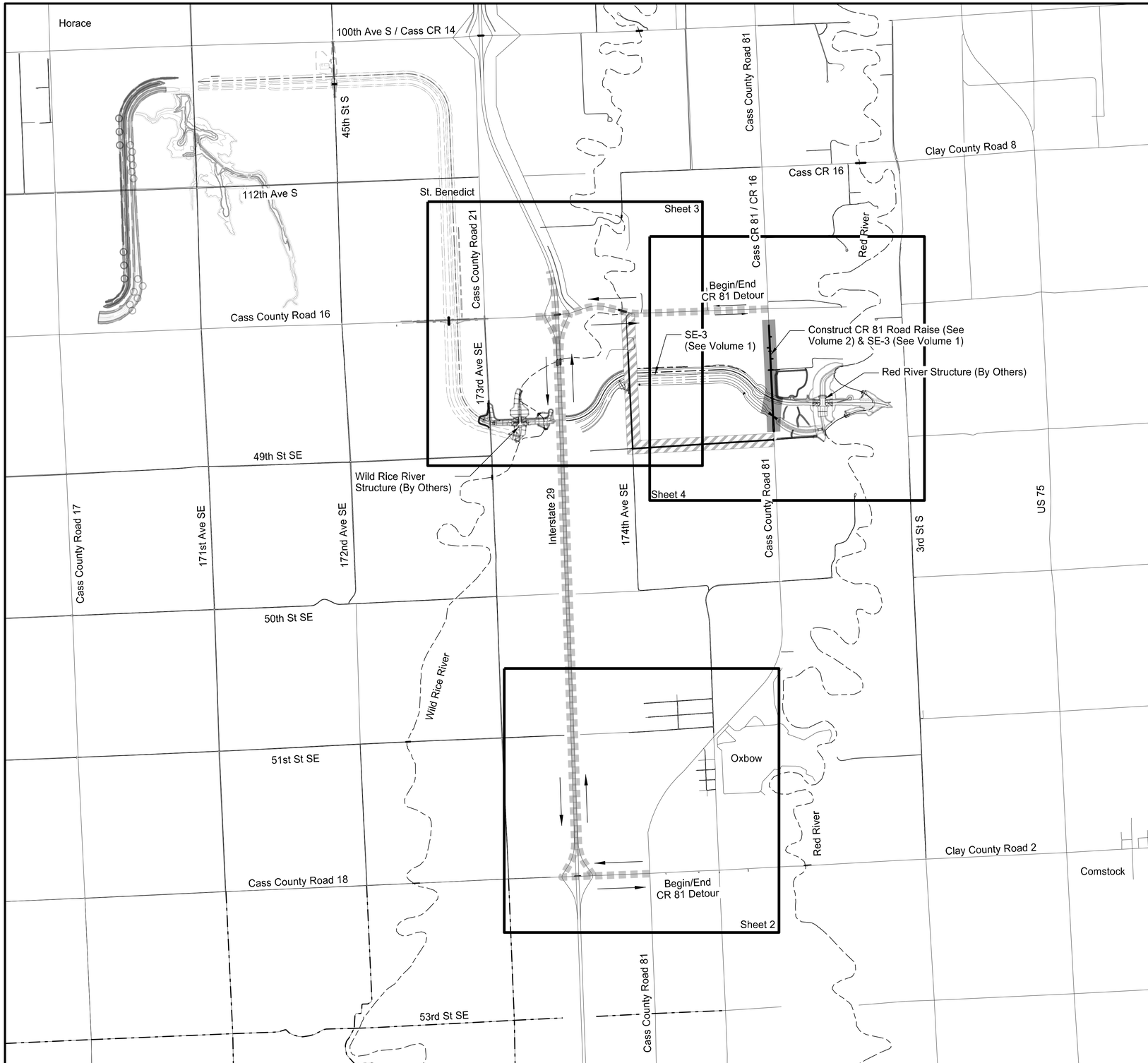
☐ _____

☐ GEOID12B ☐ _____

☒ GEOID18

REGISTERED LAND SURVEYOR
JAMES A. SCHLIEMAN
LS-4185
NORTH DAKOTA
8/22/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	100	1



Potential Detour Route for County Road 81 Road Raise

1. Close County Road 81 and implement detours.
2. Keep 174th Ave SE between 49th St SE & County Road 16 open for local traffic when County Road 81 is closed.
3. Detour routes County Road 16, I-29, & County Road 18.

Notes:
All signs shall be post mounted unless stated otherwise.

See NDDOT standard drawing D-704-21 for sign spacing.

All sign locations are approximate. Exact locations to be determined in the field.

If required, existing signing conflicting with the detour route shown shall be covered or removed at the discretion of the Contracting Officer.

LEGEND

- Work Area
- Detour Route
- Sign
- Dust Palliative

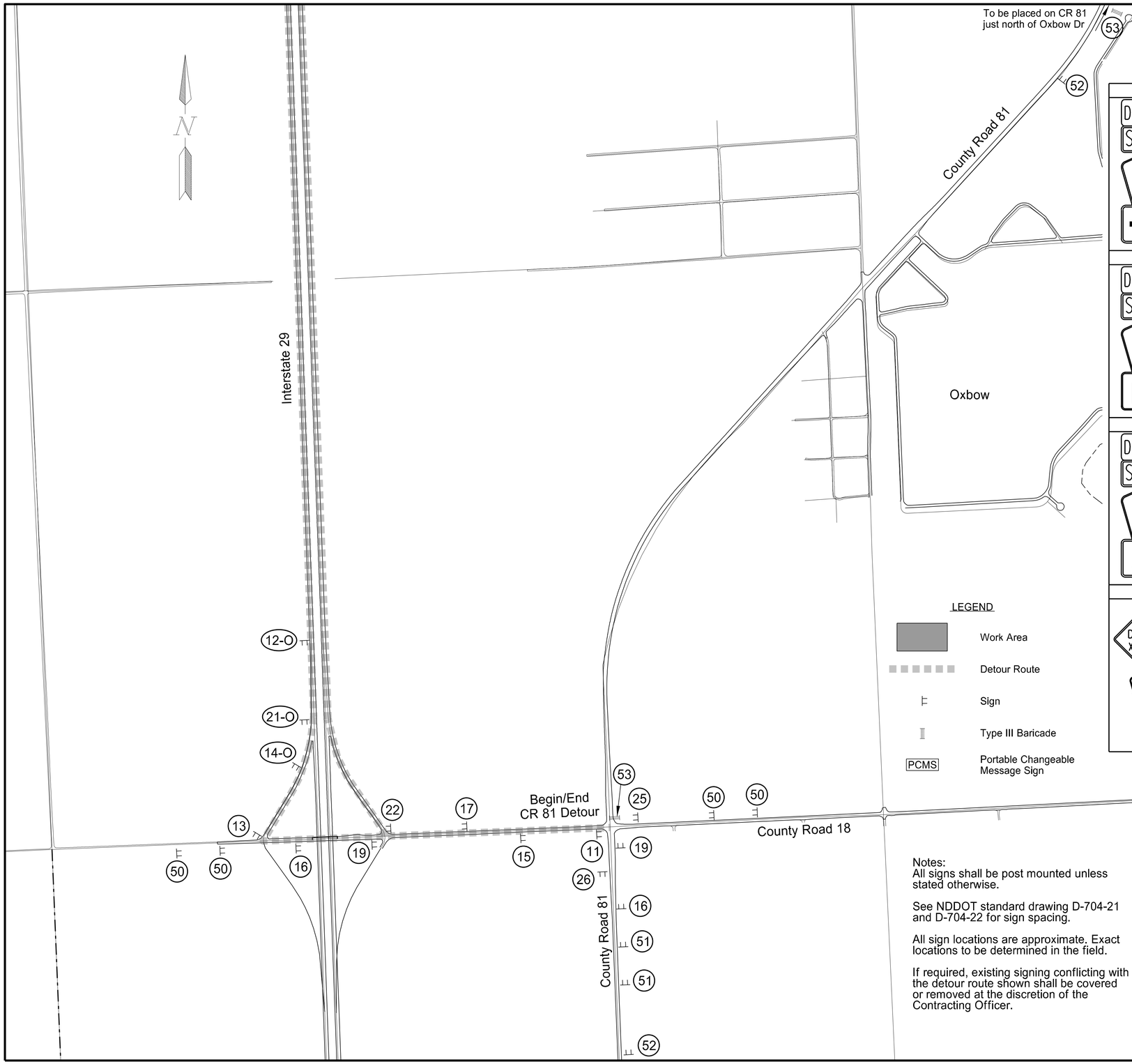
N

Work Zone Traffic Control
Potential CR 81 Detour Layout

County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-29066
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	100	2



11	12-O	13	14-O
DETOUR M4-8-24 SOUTH M3-3-24 CASS 81 COUNTY M1-6-24 M6-1R-21	DETOUR M4-8-30 SOUTH M3-3-30 CASS 81 COUNTY M1-6-30 M5-2R-30	DETOUR M4-8-24 SOUTH M3-3-24 CASS 81 COUNTY M1-6-24 M6-1L-21	DETOUR M4-8-30 SOUTH M3-3-30 CASS 81 COUNTY M1-6-30 M5-1L-30
15	**16**	**17**	**19**
DETOUR M4-8-24 SOUTH M3-3-24 CASS 81 COUNTY M1-6-24 M5-1R-21	DETOUR M4-8-24 NORTH M3-1-24 CASS 81 COUNTY M1-6-24 M5-1L-21	DETOUR M4-8-24 NORTH M3-1-24 CASS 81 COUNTY M1-6-24 M5-1R-21	DETOUR M4-8-24 NORTH M3-1-24 CASS 81 COUNTY M1-6-24 M6-1L-21
21-O	**22**	**25**	**26**
DETOUR M4-8-30 SOUTH M3-3-30 CASS 81 COUNTY M1-6-30 M6-2R-30	DETOUR M4-8-24 NORTH M3-1-24 CASS 81 COUNTY M1-6-24 M6-1R-21	DETOUR M4-8-24 NORTH M3-1-24 CASS 81 COUNTY M1-6-24 M6-3-21	DETOUR M4-8-24 END M4-6-24 CASS 81 COUNTY M1-6-24
50	**51**	**52**	**53**
DETOUR XXXX FT W20-2-48 CASS 81 COUNTY M1-6-30	DETOUR XXXX FT W20-2-48	ROAD CLOSED AHEAD W20-3-48	ROAD CLOSED XX MILES AHEAD LOCAL TRAFFIC ONLY R11-3A-60 Barricade Mounted

LEGEND

- Work Area
- Detour Route
- Sign
- Type III Baricade
- PCMS — Portable Changeable Message Sign

Notes:
All signs shall be post mounted unless stated otherwise.

See NDDOT standard drawing D-704-21 and D-704-22 for sign spacing.

All sign locations are approximate. Exact locations to be determined in the field.

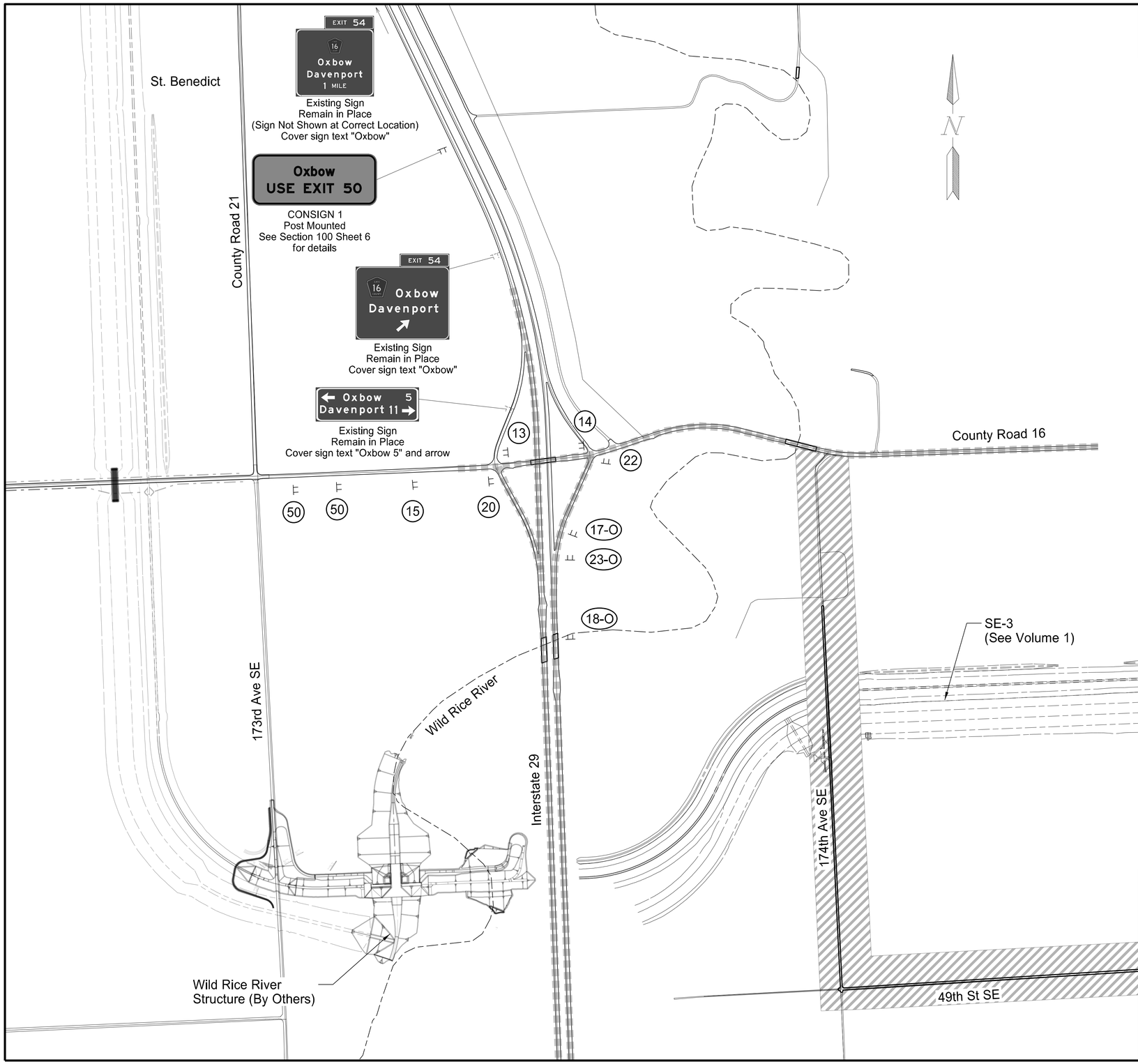
If required, existing signing conflicting with the detour route shown shall be covered or removed at the discretion of the Contracting Officer.

Work Zone Traffic Control
Potential CR 81 Detour Layout

County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-20066
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	100	3



13	14	15
DETOUR M4-8-24	DETOUR M4-8-24	DETOUR M4-8-24
SOUTH M3-3-24	SOUTH M3-3-24	SOUTH M3-3-24
CASS 81 COUNTY M1-6-24	CASS 81 COUNTY M1-6-24	CASS 81 COUNTY M1-6-24
M6-1L-21	M5-1L-21	M5-1R-21
17-O	**18-O**	**20**
DETOUR M4-8-30	DETOUR M4-8-30	DETOUR M4-8-24
NORTH M3-1-30	NORTH M3-1-30	SOUTH M3-3-24
CASS 81 COUNTY M1-6-30	CASS 81 COUNTY M1-6-30	CASS 81 COUNTY M1-6-24
M5-1R-30	M5-2R-30	M6-1R-21
22	**23-O**	**50**
DETOUR M4-8-24	DETOUR M4-8-30	DETOUR XXXX FT W20-2-48
NORTH M3-1-24	NORTH M3-1-30	CASS 81 COUNTY M1-6-30
CASS 81 COUNTY M1-6-24	CASS 81 COUNTY M1-6-30	
M6-1R-21	M6-2R-30	

LEGEND

- Work Area
- Detour Route
- Dust Palliative
- Sign
- Type III Baricade
- PCMS — Portable Changeable Message Sign

Notes:
All signs shall be post mounted unless stated otherwise.

See NDDOT standard drawing D-704-21 for sign spacing.

All sign locations are approximate. Exact locations to be determined in the field.

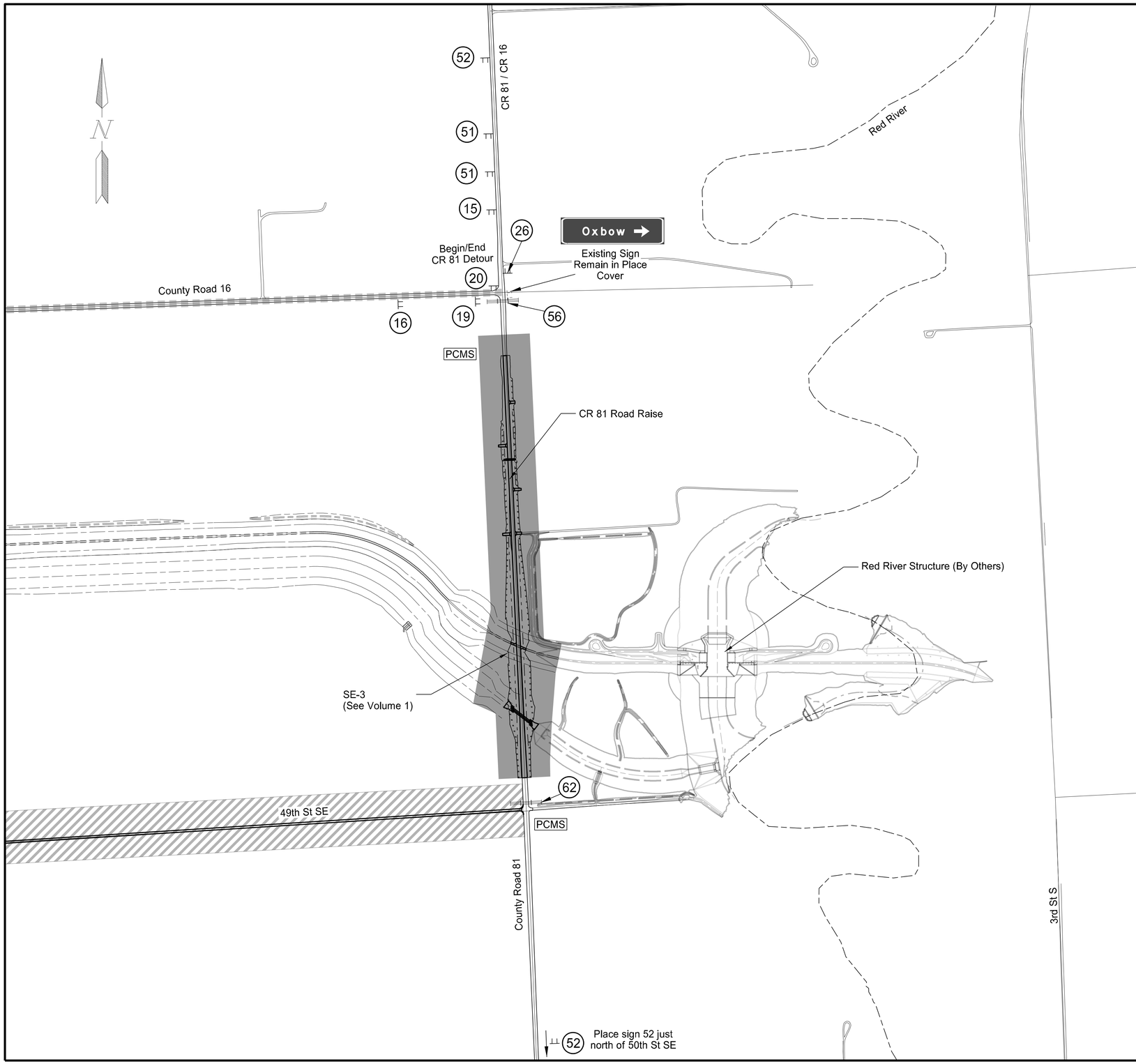
If required, existing signing conflicting with the detour route shown shall be covered or removed at the discretion of the Contracting Officer.

Work Zone Traffic Control
Potential CR 81 Detour Layout

County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-20066
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	100	4



15	16	19
DETOUR M4-8-24 SOUTH M3-3-24 CASS 81 COUNTY M1-6-24 M5-1R-21	DETOUR M4-8-24 NORTH M3-1-24 CASS 81 COUNTY M1-6-24 M5-1L-21	DETOUR M4-8-24 NORTH M3-1-24 CASS 81 COUNTY M1-6-24 M6-1L-21
20	**26**	**51**
DETOUR M4-8-24 SOUTH M3-3-24 CASS 81 COUNTY M1-6-24 M6-1R-21	DETOUR M4-8-24 END M4-6-24 CASS 81 COUNTY M1-6-24	DETOUR XXXX FT W20-2-48
52	**56**	**62**
ROAD CLOSED AHEAD W20-3-48	ROAD CLOSED R11-2-48 DETOUR M4-10R-48 Barricade Mounted	ROAD CLOSED R11-2-48 Barricade Mounted

LEGEND

- Work Area
- Detour Route
- Dust Palliative
- Sign
- Type III Baricade
- PCMS — Portable Changeable Message Sign

Notes:
All signs shall be post mounted unless stated otherwise.

See NDDOT standard drawing D-704-21 for sign spacing.

All sign locations are approximate. Exact locations to be determined in the field.

If required, existing signing conflicting with the detour route shown shall be covered or removed at the discretion of the Contracting Officer.

Work Zone Traffic Control
Potential CR 81 Detour Layout

County Road 81
Reach SE-3 Roadway Improvements

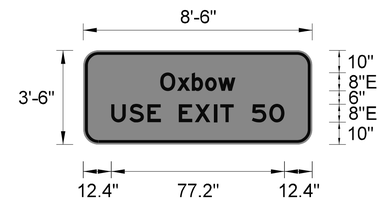
REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-19066
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	100	5

SIGN NUMBER	CONSIGN 1
WIDTH X HEIGHT	8'-6" x 3'-6"
BORDER WIDTH	1.25" (inset 0.75")
CORNER RADIUS	6"
MOUNTING	Ground
BACKGROUND	TYPE: IV Reflective
	COLOR: Orange
LEGEND/BORDER	TYPE: IV Reflective
	COLOR: Black

SYMBOL	X	Y	WID	HT	ANGLE

STATION(S): AREA: 29.8 Sq.Ft.



Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

PANEL STYLE: ND_Const_Special.ssi

LETTER POSITION (X)																			LENGTH	SIZE	SERIES
O	x	b	o	w															33.4	8/6	E 2000
34.3	41.8	48.4	54.3	60																	
U	S	E		E	X	I	T		5	0									77.2	8	E 2000
12.4	20.5	28.6	34.6	42.6	49.7	58.2	61	67	75	82.9											

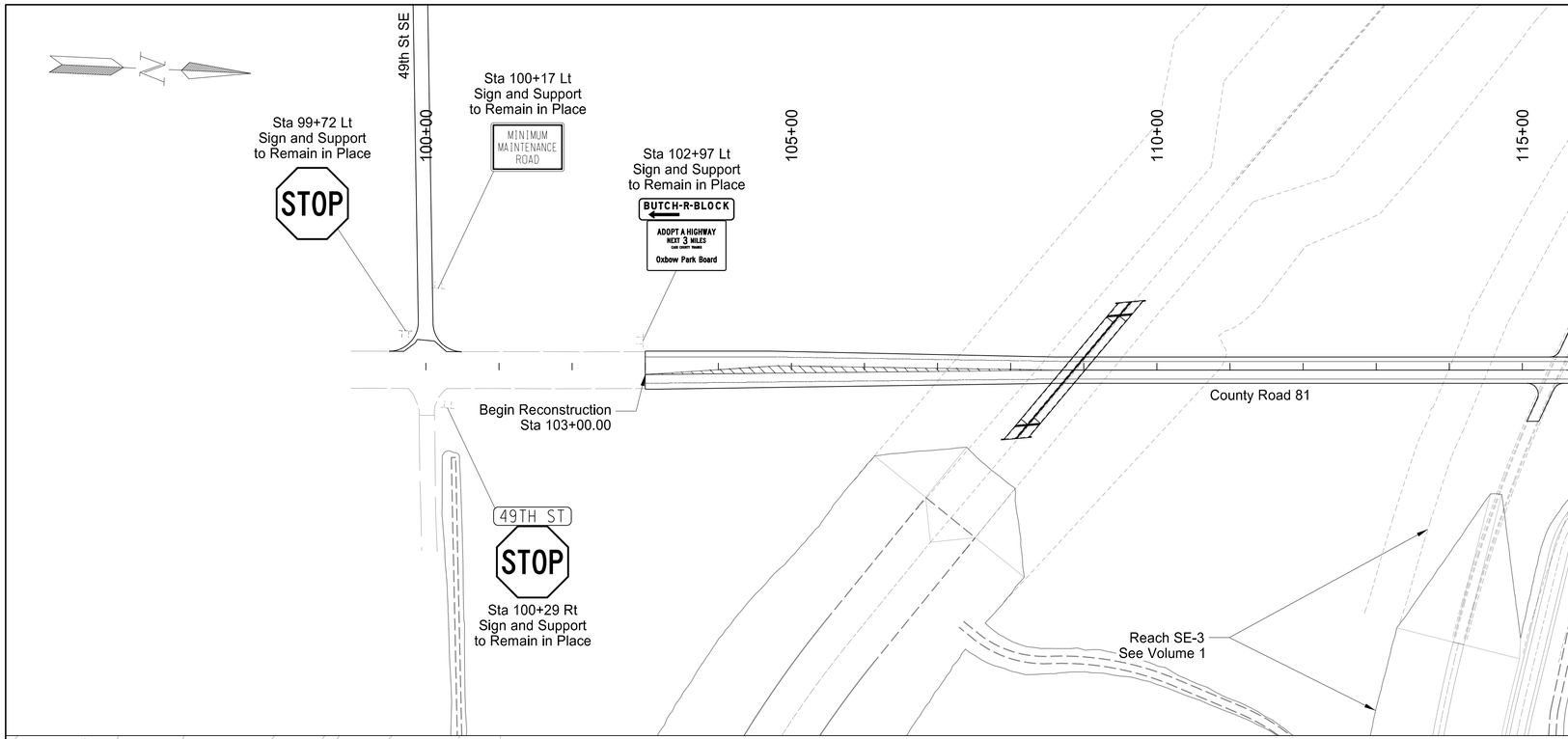
Work Zone Traffic Control
Sign Details

County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-19086
DATE:
NORTH DAKOTA

8/21/2024

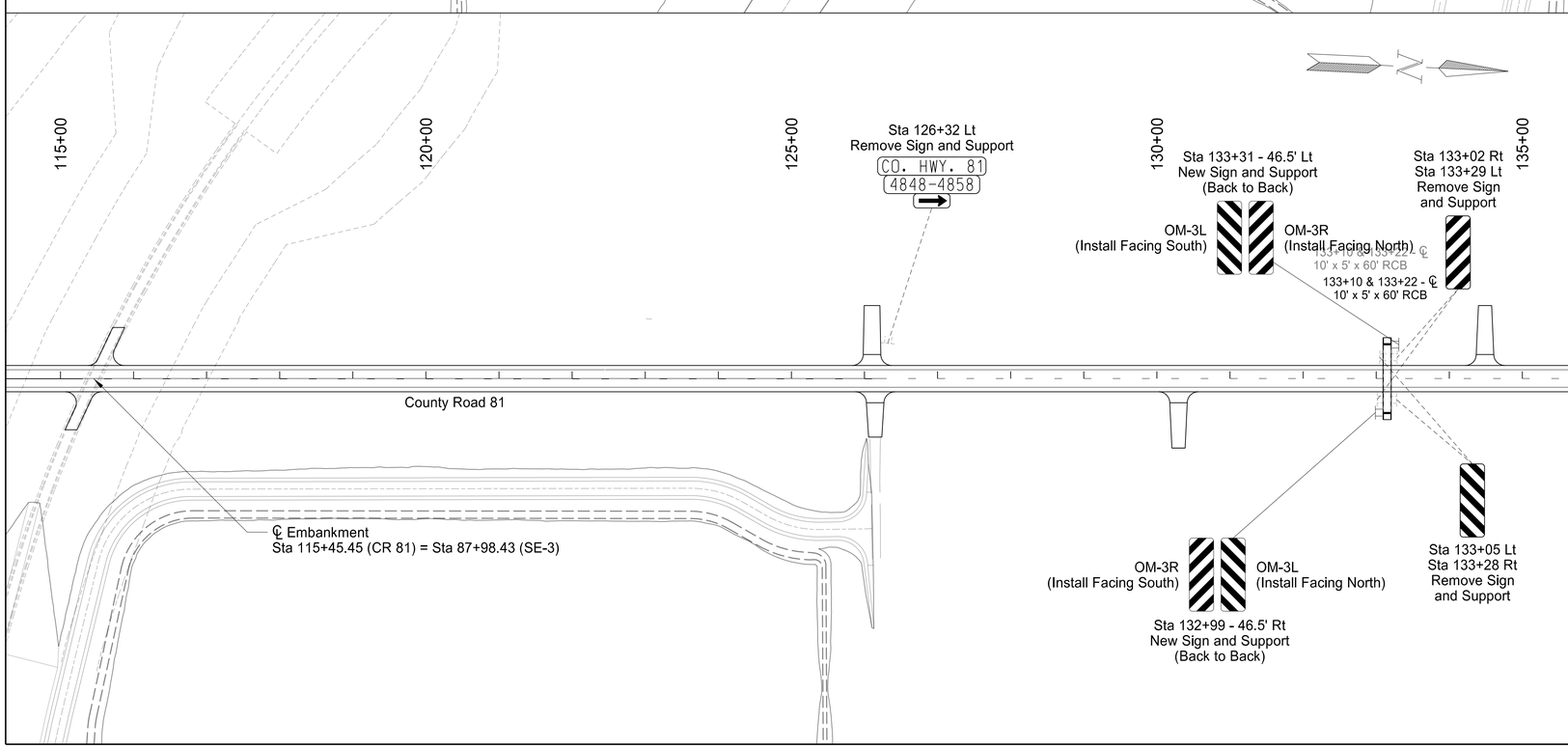
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	110	1



Legend

- Existing Sign
- Proposed Sign
- Proposed Type III Barricade

0 100' 200' 400'

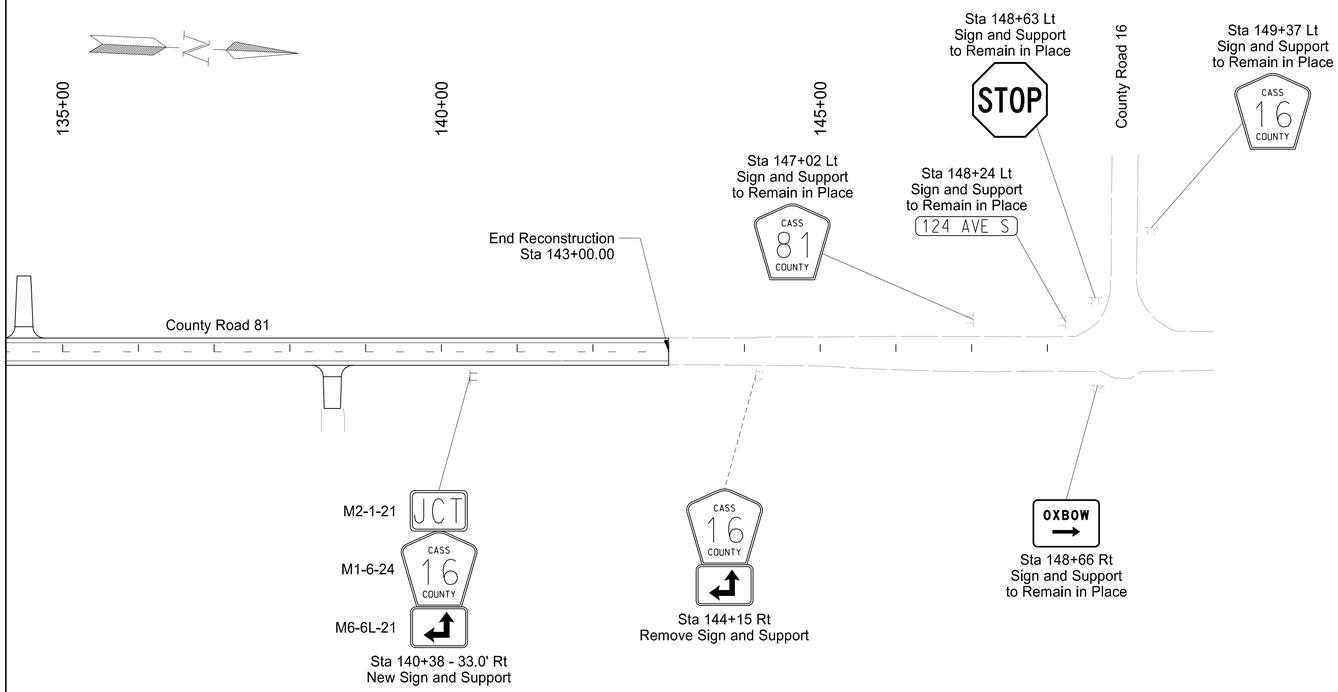


Signing

County Road 81
Reach SE-3 Roadway Improvements
Sta 103+00 to Sta 135+00

REGISTERED PROFESSIONAL ENGINEER
STEVEN L. STRACK
PE-10621
DATE
NORTH DAKOTA
8/22/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	110	2



Legend

- Existing Sign
- Proposed Sign
- Proposed Type III Barricade

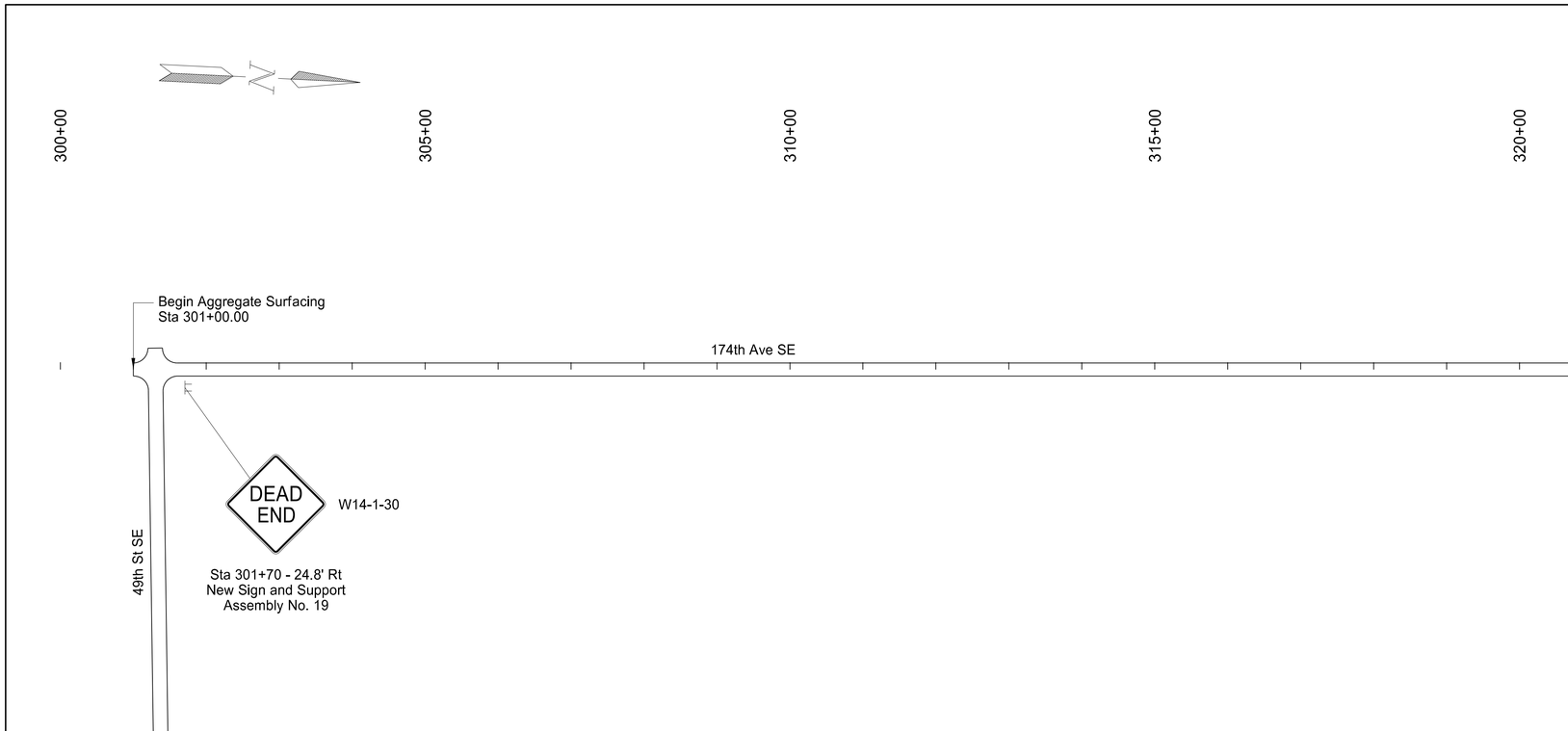
0 100' 200' 400'

Signing

County Road 81
Reach SE-3 Roadway Improvements
Sta 135+00 to Sta 143+00

REGISTERED PROFESSIONAL ENGINEER
STEVEN L. STRACK
PE-10621
DATE
NORTH DAKOTA
8/22/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	110	3



Legend

- Existing Sign
- Proposed Sign
- Proposed Type III Barricade

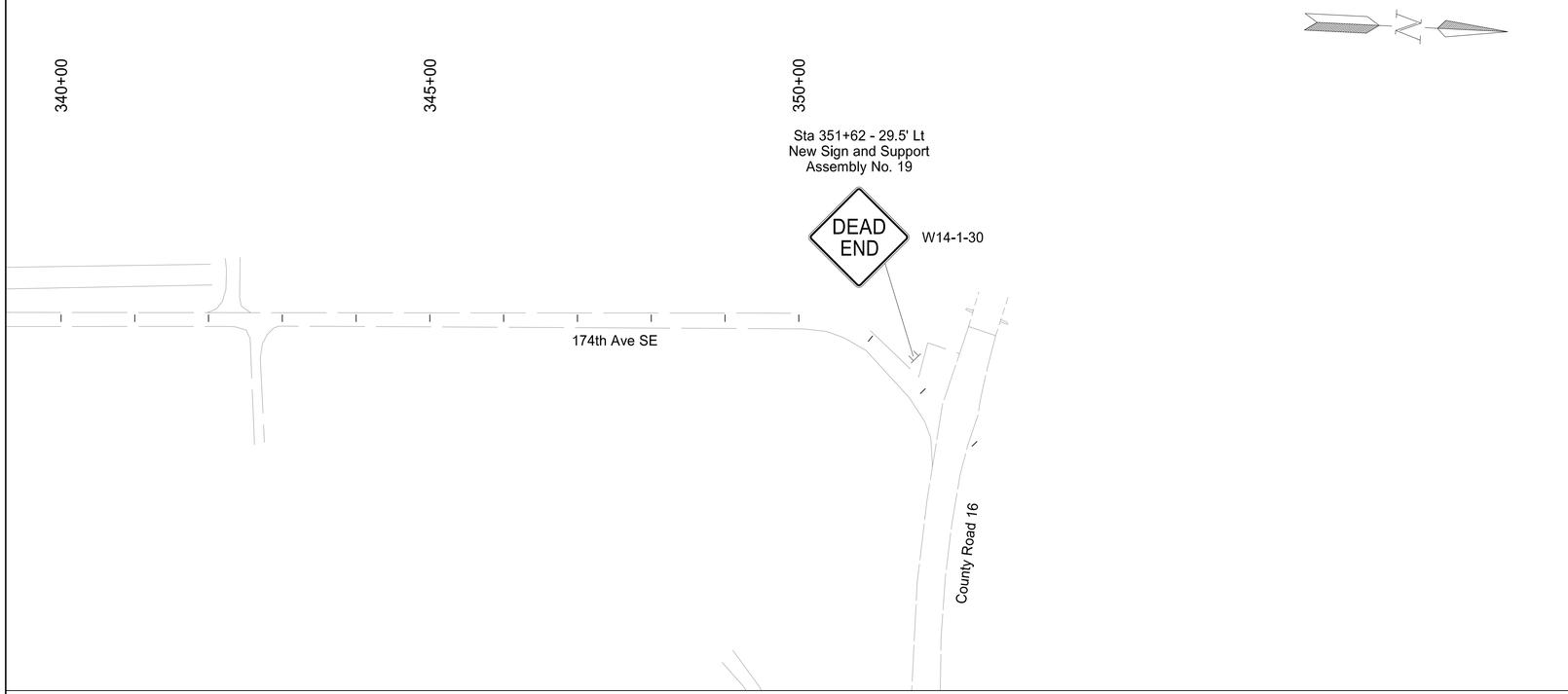
0 100' 200' 400'

Signing

174th Ave SE
Reach SE-3 Roadway Improvements
Sta 301+00 to Sta 340+00

REGISTERED PROFESSIONAL ENGINEER
STEVEN L. STRACK
PE-10621
DATE
NORTH DAKOTA
8/22/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	110	4



Legend

Existing Sign

Proposed Sign

Proposed Type III Barricade

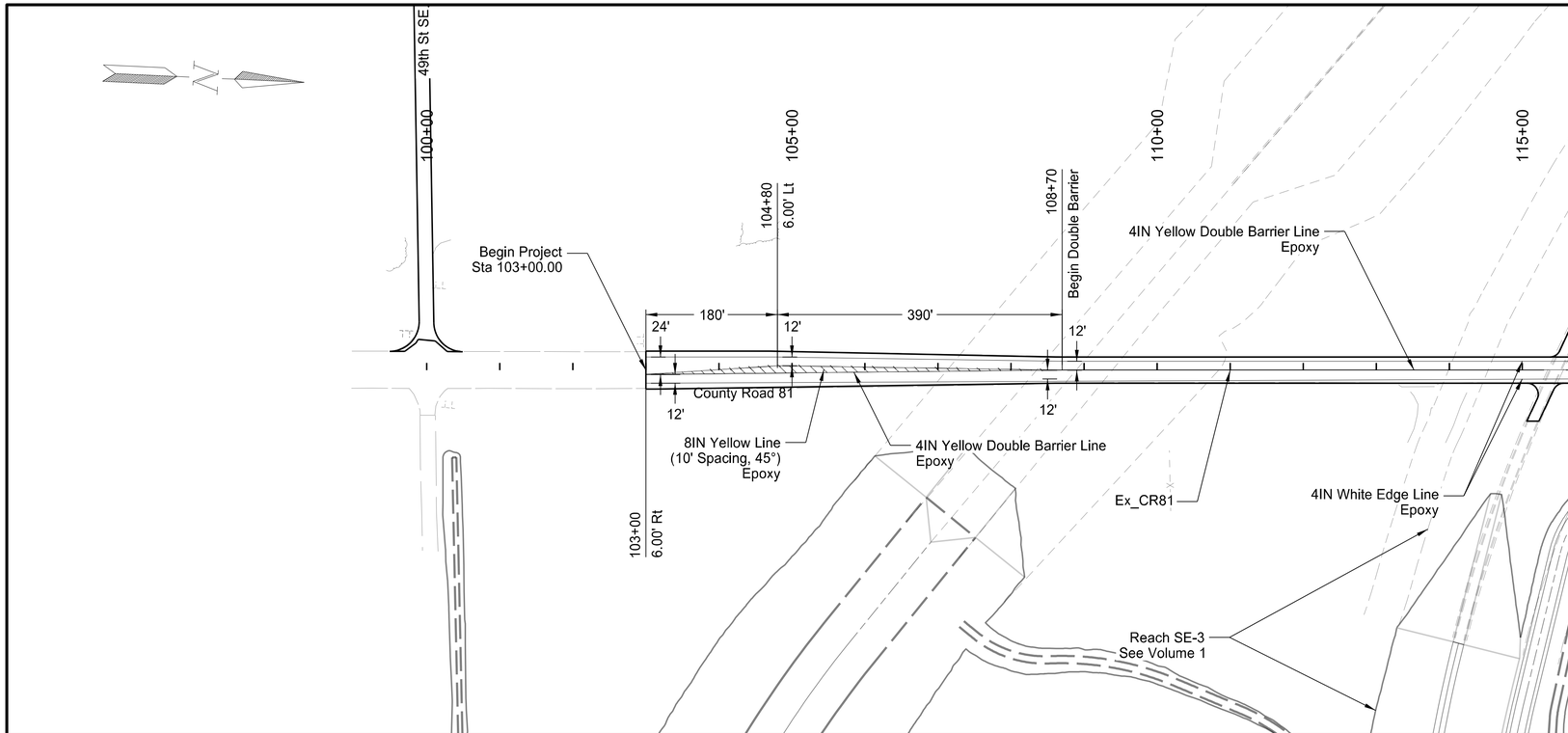
0 100' 200' 400'

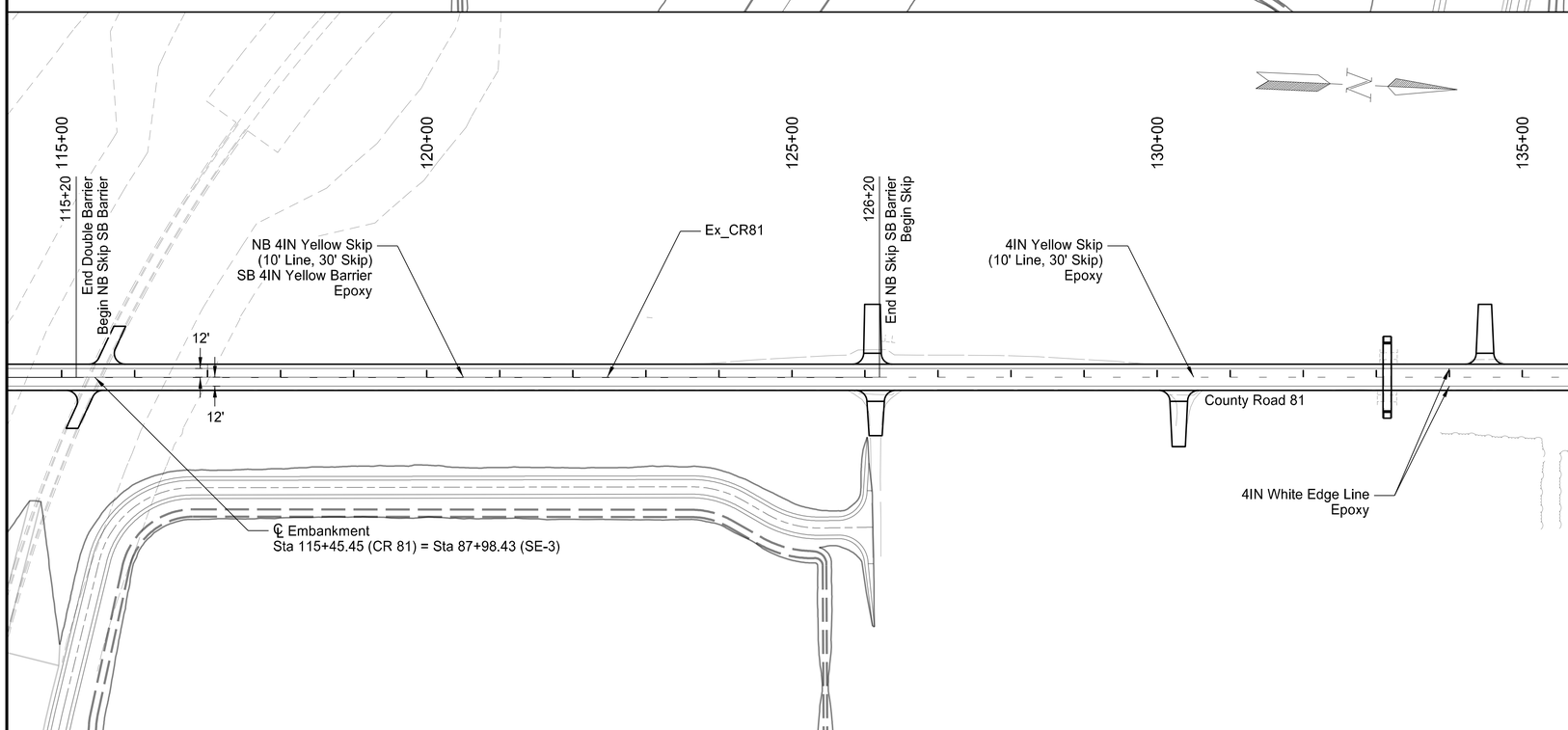
Signing

174th Ave SE
Reach SE-3 Roadway Improvements
Sta 340+00 to Sta 353+00

REGISTERED PROFESSIONAL ENGINEER
STEVEN L. STRACK
PE-10621
DATE
NORTH DAKOTA
8/22/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	120	1





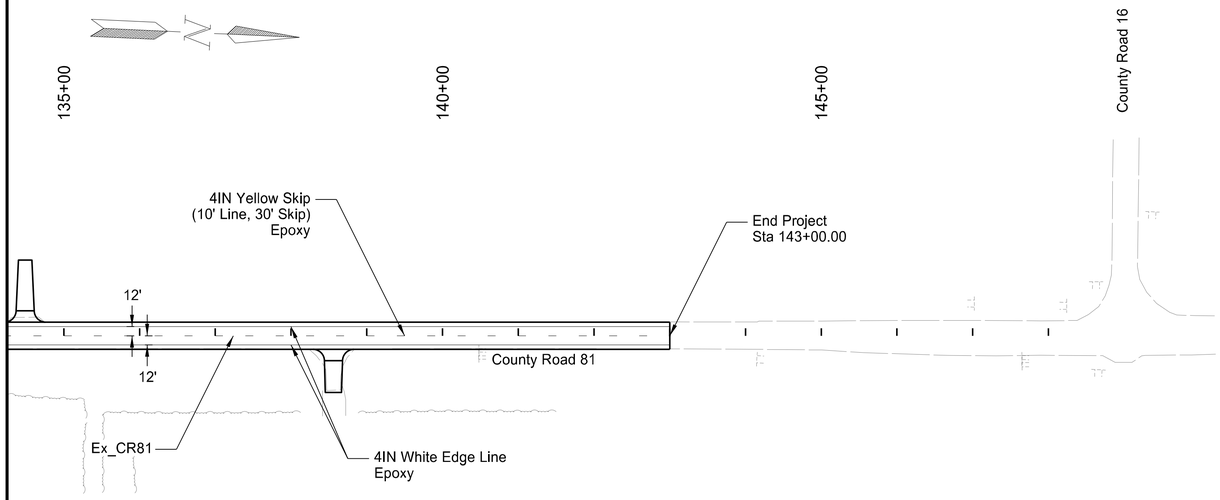
0 100' 200' 400'

Marking

County Road 81
Reach SE-3 Roadway Improvements
Sta 103+00 to Sta 135+00

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	120	2



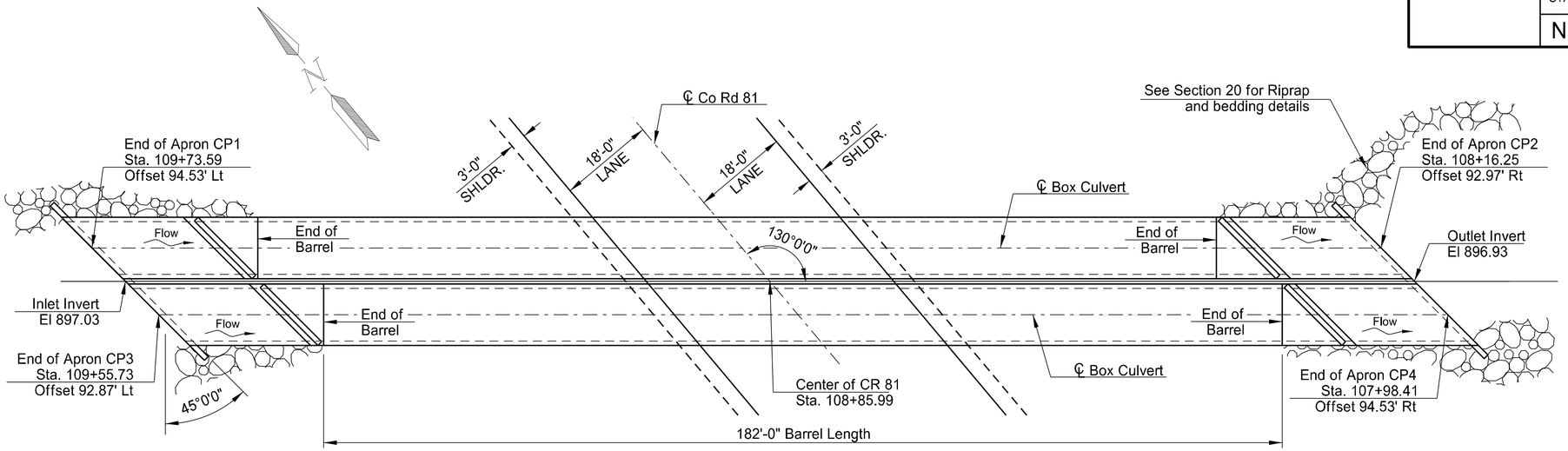
0 100' 200' 400'

Marking

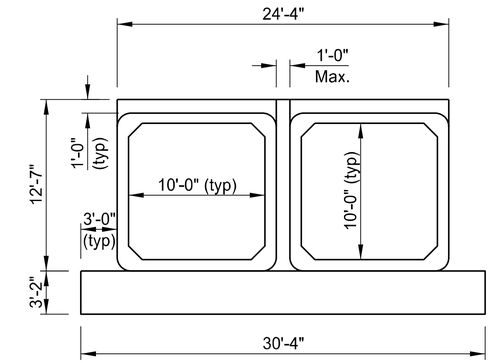
County Road 81
Reach SE-3 Roadway Improvements
Sta 135+00 to Sta 143+00

REGISTERED PROFESSIONAL ENGINEER
ADAM M. RUND
PE 10407
DATE
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	170	1



PLAN

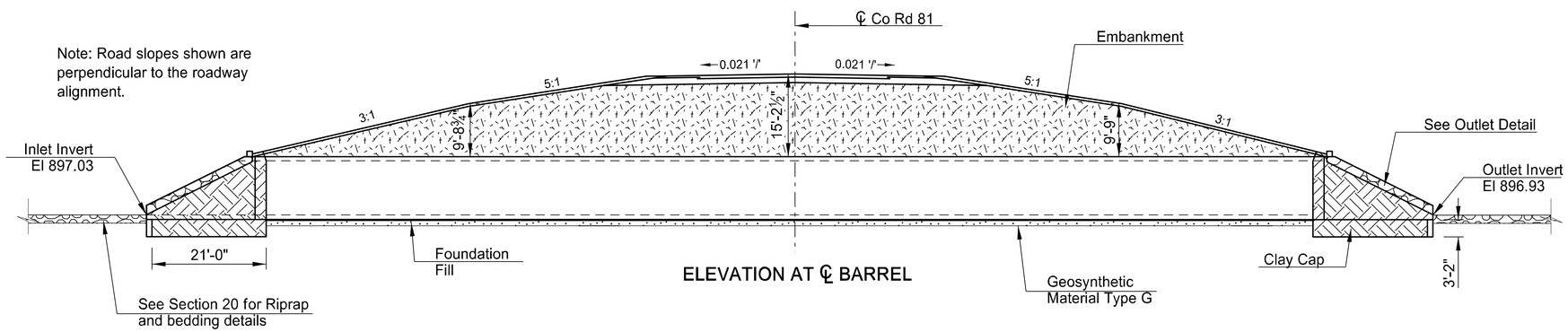


END VIEW

CO RD 81 BOX CULVERT INSTALLATION CAMBER PROFILE			
OFFSETS ALONG CL BOX CULVERT FROM THE INTERSECTION OF CL CO RD 81 ALIGNMENT AND CL BOX CULVERT			
OFSSET LT	ELEVATION	OFFSET RT	ELEVATION
-10.00	897.65	10.00	897.65
-20.00	897.63	20.00	897.62
-30.00	897.60	30.00	897.58
-40.00	897.56	40.00	897.54
-50.00	897.50	50.00	897.48
-60.00	897.44	60.00	897.41
-70.00	897.36	70.00	897.33
-80.00	897.30	80.00	897.25
-91.00	897.23	91.00	897.18
-122.38	897.03	122.38	896.93

Note: Offset locations based on anticipated box culvert joint locations. See settlement joint details on Sheet 3.

Note: Road slopes shown are perpendicular to the roadway alignment.



ELEVATION AT ℄ BARREL

For a single barrel box culvert with 11" thick roof, 11" floor and 10" walls, the following total factored moments and shears would result from the application of the required loads:

FACTORED DESIGN MOMENTS (SINGLE)	
WALL MOMENT	-18,550 ft-lbs
ROOF MOMENTS	
CORNER	-3,790 ft-lbs
BOTTOM	29,950 ft-lbs
FLOOR MOMENTS	
CORNER	-4,700 ft-lbs
TOP	31,830 ft-lbs

FACTORED DESIGN SHEARS (SINGLE)	
WALL SHEAR	6,240 lbs
ROOF SHEARS	
CORNER	14,160 lbs
FLOOR SHEARS	
CORNER	15,590 lbs

For a double barrel box culvert with 12" thick roof, 12" floor and 9" walls, the following total factored moments and shears would result from the application of the required loads:

FACTORED DESIGN MOMENTS (DOUBLE)	
WALL MOMENT	-10,790 ft-lbs
ROOF MOMENTS	
CORNER	-4,560 ft-lbs
BOTTOM	20,520 ft-lbs
TOP	-26,800 ft-lbs
FLOOR MOMENTS	
CORNER	-4,760 ft-lbs
TOP	21,330 ft-lbs
BOTTOM	-29,920 ft-lbs

FACTORED DESIGN SHEARS (DOUBLE)	
WALL SHEAR	6,770 lbs
ROOF SHEARS	
CORNER	12,150 lbs
WALL	18,860 lbs
FLOOR SHEARS	
CORNER	12,660 lbs
WALL	20,260 lbs

Concrete member thickness was determined without shear reinforcment. Alternative designs incorporating shear reinforcment to be submitted to and approved by the Contracting Officer.

REGISTERED PROFESSIONAL ENGINEER
WESLEY J. KELLER
PE-27400
DATE
NORTH DAKOTA
8/21/2024

STANDARD DRAWINGS

D-714-22

HL-93 DESIGN LOADING

COUNTY ROAD 81

PRECAST CONCRETE
DOUBLE BOX CULVERT LAYOUT

CLEAR SPAN 10' CLEAR HEIGHT 10'
MAXIMUM FILL 18'

STATION: 108+85.99
CASS COUNTY

NOTES – COUNTY ROAD 81

100 SCOPE OF WORK: Work at this site consists of building a new double barrel 10' x 10' x 182'-0" precast concrete box culvert as part of the Volume 2 work.

105 WORK DRAWINGS: Submit work drawings for the following items to the Contracting Officer for review and approval.

1. 10Ft x 10Ft Precast RCB Culvert

606 JOINTS: Provide joints in accordance with plan joint details and Section 606.04.E.3 of the NDDOT Standard Specification for Road and Bridge Construction, with the exception that 36" width of geotextile joint wrap is required around the exterior surfaces of the base, walls and roof, backer rods required around joint, as detailed, and polyurethane joint sealant required on inside face of the entire joint. Polyurethane joint sealant material to meet ASTM C920 and backer rod material to meet ASTM D5249.

Provide geotextile joint wrap around the exterior surfaces of the box culvert base, walls and roof centered on the joints. Geotextile to be geosynthetic material – type 2.

606 PRECAST SECTION: Tie the barrel sections together with 1"ϕ tie bolts as shown on standard drawing D-714-22. Place two ties per exterior wall joint, located at third points of the wall clear height.

Attach the apron to the last barrel section, the wingwalls and the cutoff wall. Attach the wingwalls to the last barrel section. Provide a welded tie type system for the connections of the apron to the box and wingwalls. Connect the wingwalls to the last barrel section by the use of tie bolts, steel-bolted plates or other approved method so the inside corner surface is smooth.

Use ASTM A36 steel for bolts, plates, angles, and studs. Use heavy hex nuts meeting the requirements of ASTM A563 and washers meeting ASTM F436, Type 1. Provide welded pipe sleeves meeting the requirements of ASTM A53, Grade B. Galvanize hardware and structural steel according to Section 854 of the NDDOT Standard Specification for Road and Bridge Construction.

Welders are to meet the requirements of Section 105.06 D of the NDDOT Standard Specification for Road and Bridge Construction. Galvanize field welds according to Section 854.02 of the NDDOT Standard Specification for Road and Bridge Construction.

Cast holes at 3'-0" centers through the apron and into the cutoff wall to receive ¾" diameter reinforcing bars. Cast holes in the last barrel section at 1'-0" centers for ½" diameter reinforcing bars to attach the parapet. Cast parapet against the section. Install the bars according to the manufacturer's recommendations, with a high strength adhesive specifically intended for concrete anchorage, in accordance with Section 806.02 of the NDDOT Standard Specification for Road and Bridge Construction.

Provide a distance of 1'-0" between separate precast units. Fill this gap with a controlled density backfill. Use a controlled density backfill consisting of cement, water, pozzolanic materials, and fillers. Use a material that is fluid on placement to flow around and fill voids in the backfill area. Use a material that is able to support normal loads after 6 hours and have a compressive strength in the range of 75 psi to 125 psi at 28 days. If the mix design shown is used, no further testing will be required. The mix design yields approximately one cubic yard of flowable mortar.

MIX DESIGNS

Mix Design 1		Mix Design 2 (No Fly Ash)	
Cement	100 lbs	Cement	165 lbs
Fly Ash	300 lbs	Fly Ash	NA
Fine Aggregate	2600 lbs	Fine Aggregate	2600 lbs
Water	70 gals	Water	50 gals

For the 12" cap, use a weatherproof and freeze/thaw resistant, non-shrink cement grout material which complies with ASTM C1107.

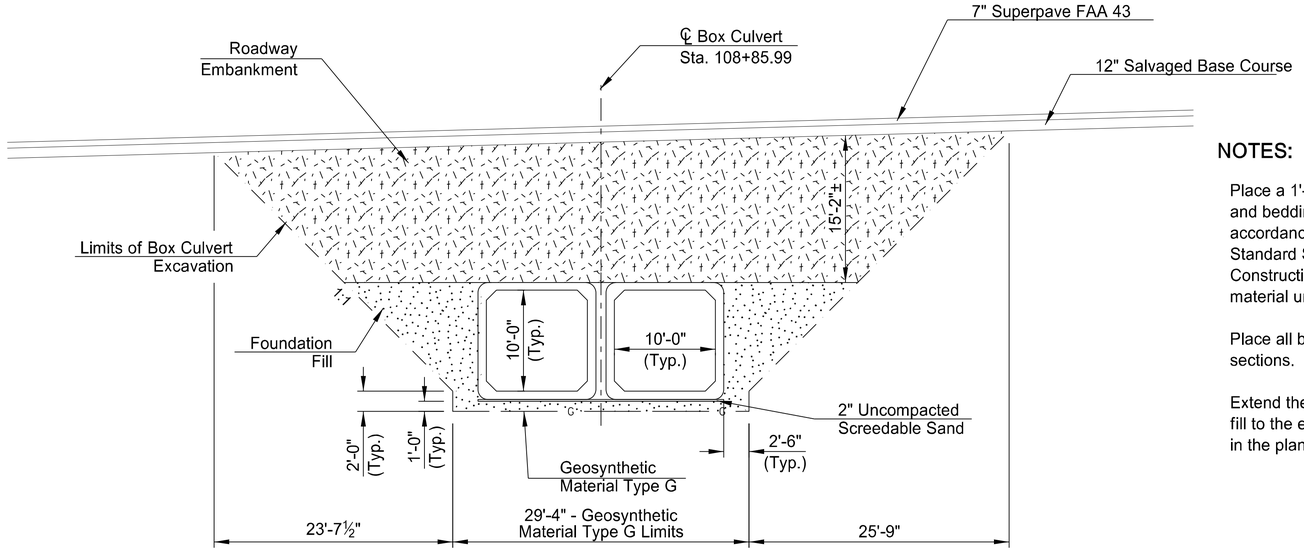
606 CONSTRUCTION REQUIREMENTS: The box culvert will be subject to long-term settlement due to high fill volumes. The box culverts should be fabricated and installed to accommodate the long-term settlement that is expected to occur. See Section 170 Sheet No. 1 for proposed installation and final profiles of the box culvert.

DESIGN LOADS

A. HL-93 Loading
B. Maximum Fill Height = 18'-0"

REGISTERED PROFESSIONAL ENGINEER
WESLEY J. MELVER
PE-27400
DATE
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	170	3



(SHOWING SECTION ALONG ℄ OF ROADWAY)

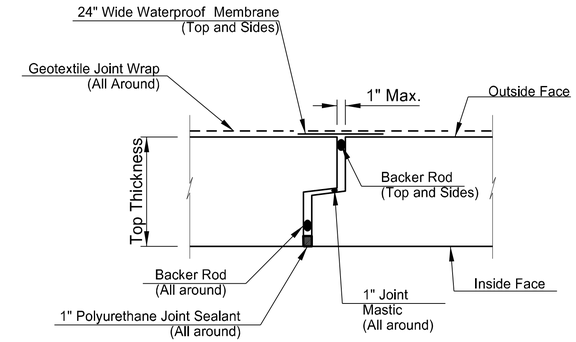
GEOSYNTHETIC GEOGRID PLACEMENT AND FOUNDATION FILL THROUGH EXISTING EMBANKMENT

NOTES:

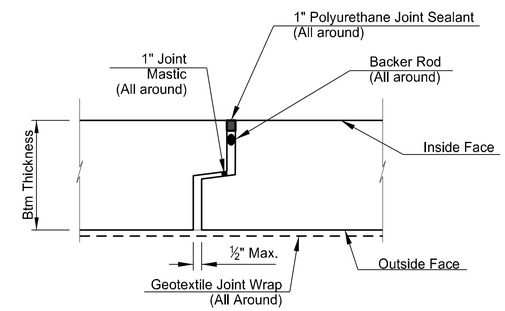
Place a 1'-0" minimum depth of foundation fill and bedding under the floor. Provide bedding in accordance with Section 606.04.E.1 of the NDDOT Standard Specifications for Road and Bridge Construction. Remove and replace all unsound material under the box with foundation fill.

Place all bedding prior to placing box culvert sections.

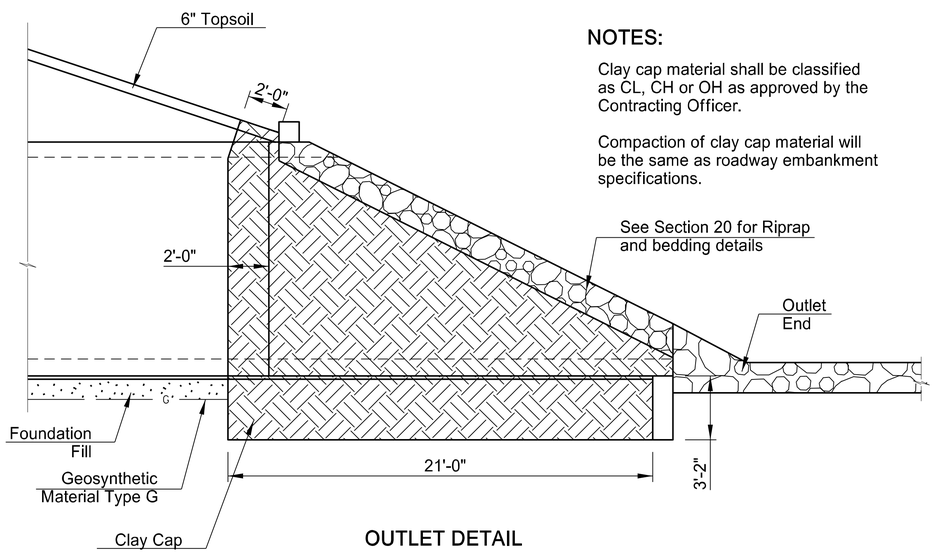
Extend the geosynthetic material and foundation fill to the end of the apron unless otherwise noted in the plans.



DIFFERENTIAL SETTLEMENT TOP JOINT DETAIL



DIFFERENTIAL SETTLEMENT BOTTOM JOINT DETAIL

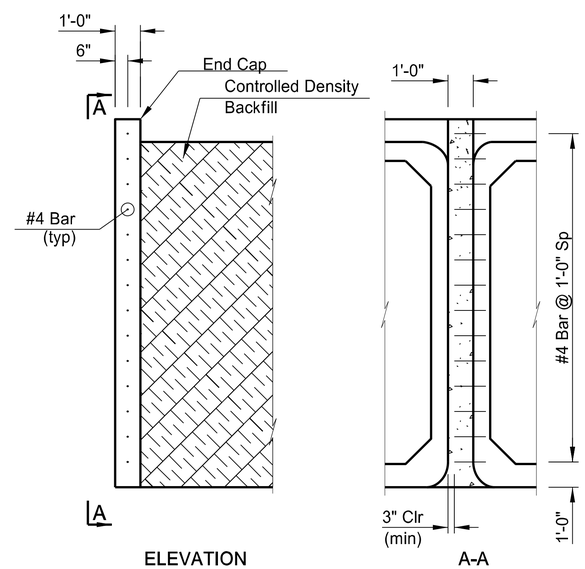


OUTLET DETAIL

NOTES:

Clay cap material shall be classified as CL, CH or OH as approved by the Contracting Officer.

Compaction of clay cap material will be the same as roadway embankment specifications.



CONTROLLED DENSITY BACKFILL DETAIL

NOTES:

The intent of this detail is to show only the placement of the controlled density backfill between adjacent barrels. The representation of the size of barrels is arbitrary.

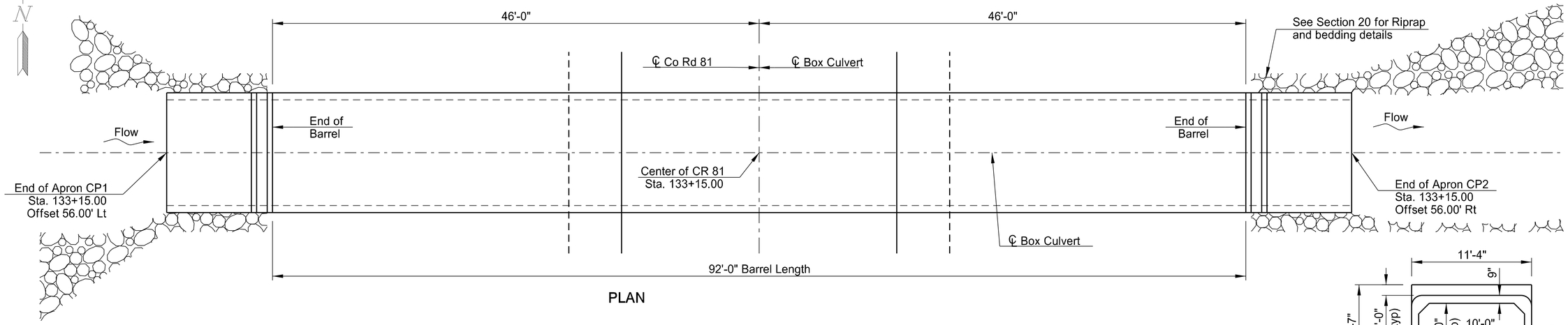
Embed the # 4 bar 6" into the side of one of the box culvert end sections maintaining a 3" minimum clearance from the other box culvert. Spacing measured 1'-0" from bottom of box and spaced at 1'-0" up the front face.

Install the # 4 bars according to the manufacturer's recommendations, with a high strength adhesive specifically intended for concrete anchorage and that meets the requirements of Section 806.02 of the NDDOT Standard Specifications for Road and Bridge Construction.

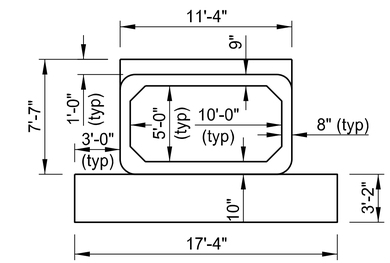
COUNTY ROAD 81

EXCAVATION & FOUNDATION FILL DETAIL

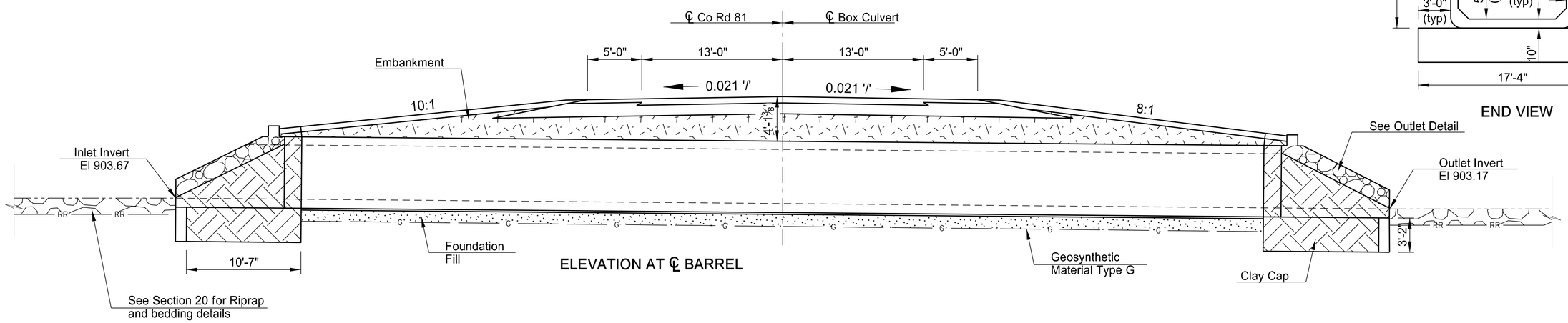
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	170	4



PLAN



END VIEW



ELEVATION AT ℄ BARREL

For a single barrel box culvert with 9" thick roof, 10" floor and 8" walls, the following total factored moments and shears would result from the application of the required loads:

FACTORED DESIGN MOMENTS (SINGLE)		FACTORED DESIGN SHEARS (SINGLE)	
WALL MOMENT	-14,200 ft-lbs	WALL SHEAR	-1,130 lbs
ROOF MOMENTS		ROOF SHEARS	
CORNER	-5,130 ft-lbs	CORNER	8,630 lbs
BOTTOM	15,170 ft-lbs	FLOOR SHEARS	
FLOOR MOMENTS		CORNER	6,790 lbs
CORNER	-2,350 ft-lbs		
TOP	16,650 ft-lbs		

Concrete member thickness was determined without shear reinforcment. Alternative designs incorporating shear reinforcment to be submitted to and approved by the Contracting Officer.

REGISTERED PROFESSIONAL ENGINEER
WESLEY J. KELVER
PE-27400
DATE
NORTH DAKOTA
8/21/2024

STANDARD DRAWINGS

D-714-22

HL-93 DESIGN LOADING

COUNTY ROAD 81

PRECAST CONCRETE
BOX CULVERT LAYOUT

CLEAR SPAN 10' CLEAR HEIGHT 5'
MAXIMUM FILL 8'

STATION: 133+15.00
CASS COUNTY

NOTES – COUNTY ROAD 81

100 SCOPE OF WORK: Work at this site consists of building a new single barrel 10' x 5' x 92'-0” precast concrete box culvert as part of the Volume 2 work.

105 WORK DRAWINGS: Submit work drawings for the following items to the Contracting Officer for review and approval.

1. 10Ft x 5Ft Precast RCB Culvert

606 JOINTS: Provide joints in accordance with plan joint details and Section 606.04.E.3 of the NDDOT Standard Specification for Road and Bridge Construction, with the exception that 36” width of geotextile joint wrap is required around the exterior surfaces of the walls and roof.

Provide geotextile joint wrap around the exterior surfaces of the box culvert walls and roof centered on the joints. Geotextile to be geosynthetic material – type 2.

606 PRECAST SECTION: Tie the barrel sections together with 1"ϕ tie bolts as shown on standard drawing D-714-22. Place two ties per exterior wall joint, located at third points of the wall clear height.

Attach the apron to the last barrel section, the wingwalls and the cutoff wall. Attach the wingwalls to the last barrel section. Provide a welded tie type system for the connections of the apron to the box and wingwalls. Connect the wingwalls to the last barrel section by the use of tie bolts, steel-bolted plates or other approved method so the inside corner surface is smooth.

Use ASTM A36 steel for bolts, plates, angles, and studs. Use heavy hex nuts meeting the requirements of ASTM A563 and washers meeting ASTM F436, Type 1. Provide welded pipe sleeves meeting the requirements of ASTM A53, Grade B. Galvanize hardware and structural steel according to Section 854 of the NDDOT Standard Specification for Road and Bridge Construction.

Welders are to meet the requirements of Section 105.06 D. of the NDDOT Standard Specifications for Road and Bridge Construction. Galvanize field welds according to Section 854.02 of the NDDOT Standard Specification for Road and Bridge Construction.

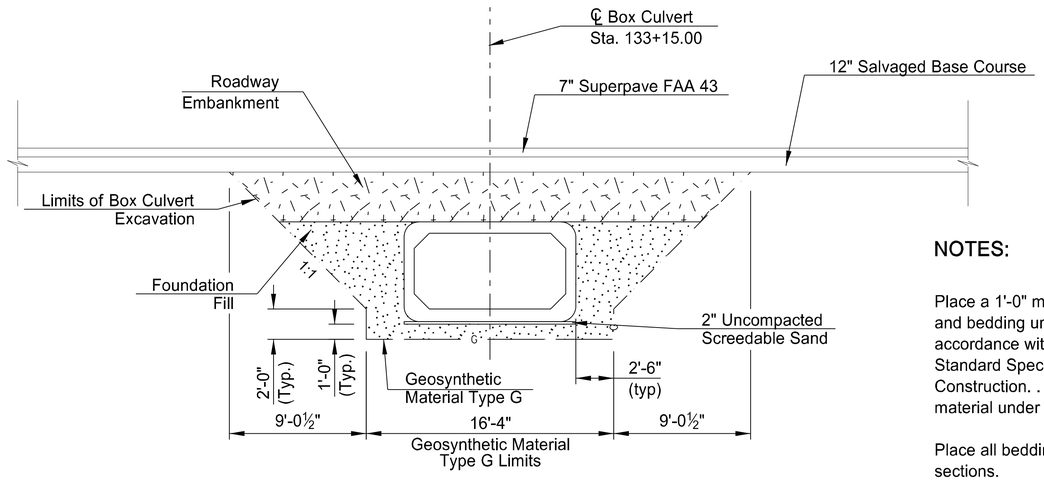
Cast holes at 3'-0" centers through the apron and into the cutoff wall to receive ¾" diameter reinforcing bars. Cast holes in the last barrel section at 1'-0" centers for ½" diameter reinforcing bars to attach the parapet. Cast parapet against the section. Install the bars according to the manufacturer's recommendations, with a high strength adhesive specifically intended for concrete anchorage, in accordance with Section 806.02 of the NDDOT Standard Specification for Road and Bridge Construction.

DESIGN LOADS

A. HL-93 Loading
B. Maximum Fill Height = 6’-0”

REGISTERED PROFESSIONAL ENGINEER
WESLEY J. KELLER
PE-27400
DATE
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	170	6



(SHOWING SECTION ALONG ℄ OF ROADWAY)

GEOSYNTHETIC GEOGRID PLACEMENT AND FOUNDATION FILL THROUGH EXISTING EMBANKMENT

NOTES:

Place a 1'-0" minimum depth of foundation fill and bedding under the floor. Provide bedding in accordance with Section 606.04.E.1 of the NDDOT Standard Specifications for Road and Bridge Construction. . Remove and replace all unsound material under the box with foundation fill.

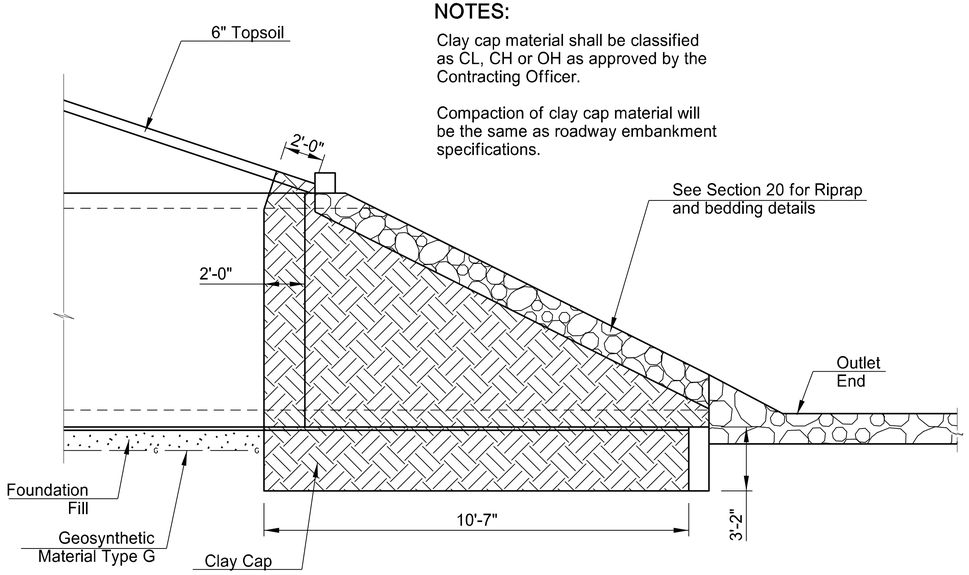
Place all bedding prior to placing box culvert sections.

Extend the geosynthetic material and foundation fill to the end of the apron unless otherwise noted in the plans.

NOTES:

Clay cap material shall be classified as CL, CH or OH as approved by the Contracting Officer.

Compaction of clay cap material will be the same as roadway embankment specifications.



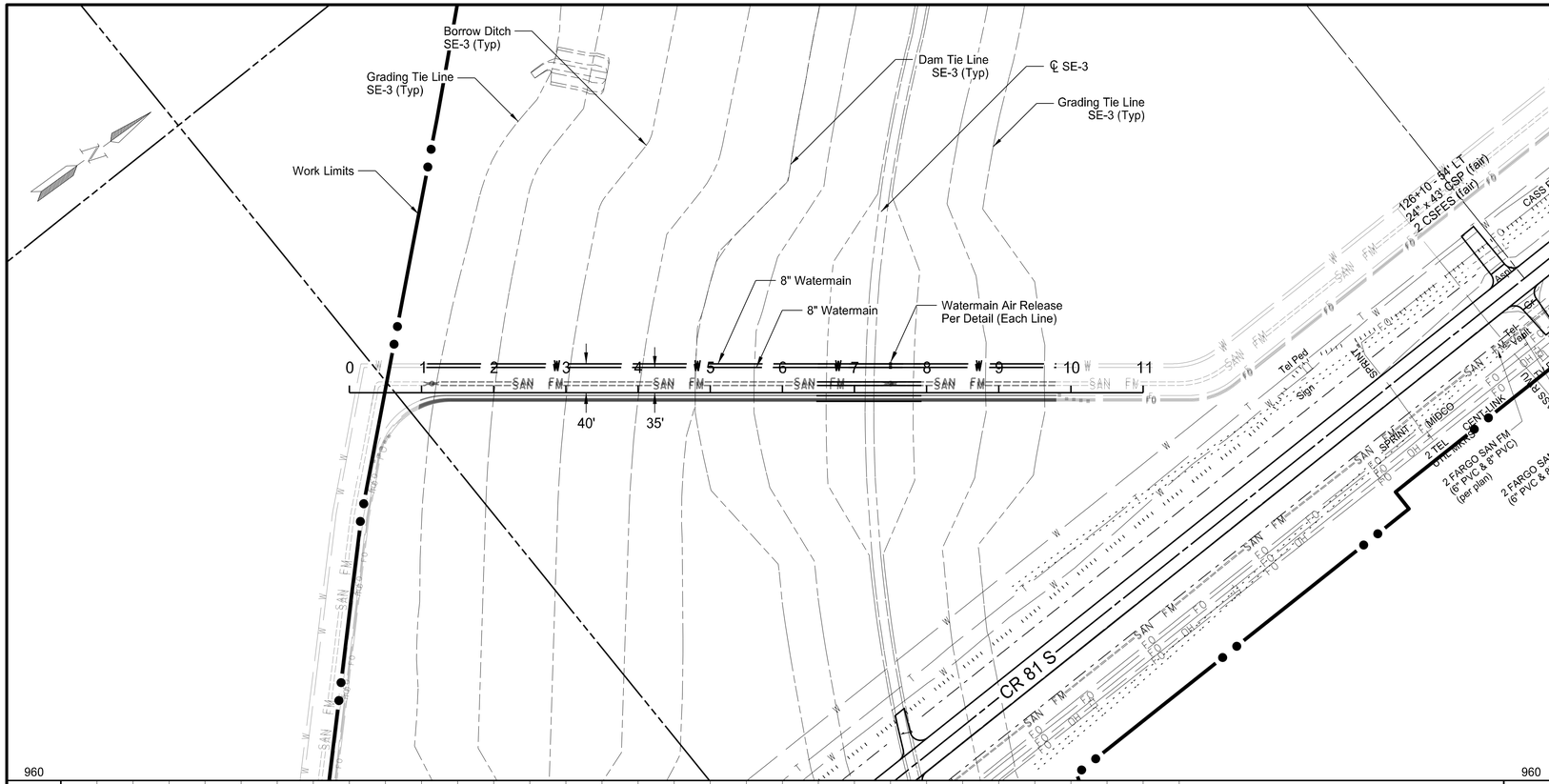
OUTLET DETAIL

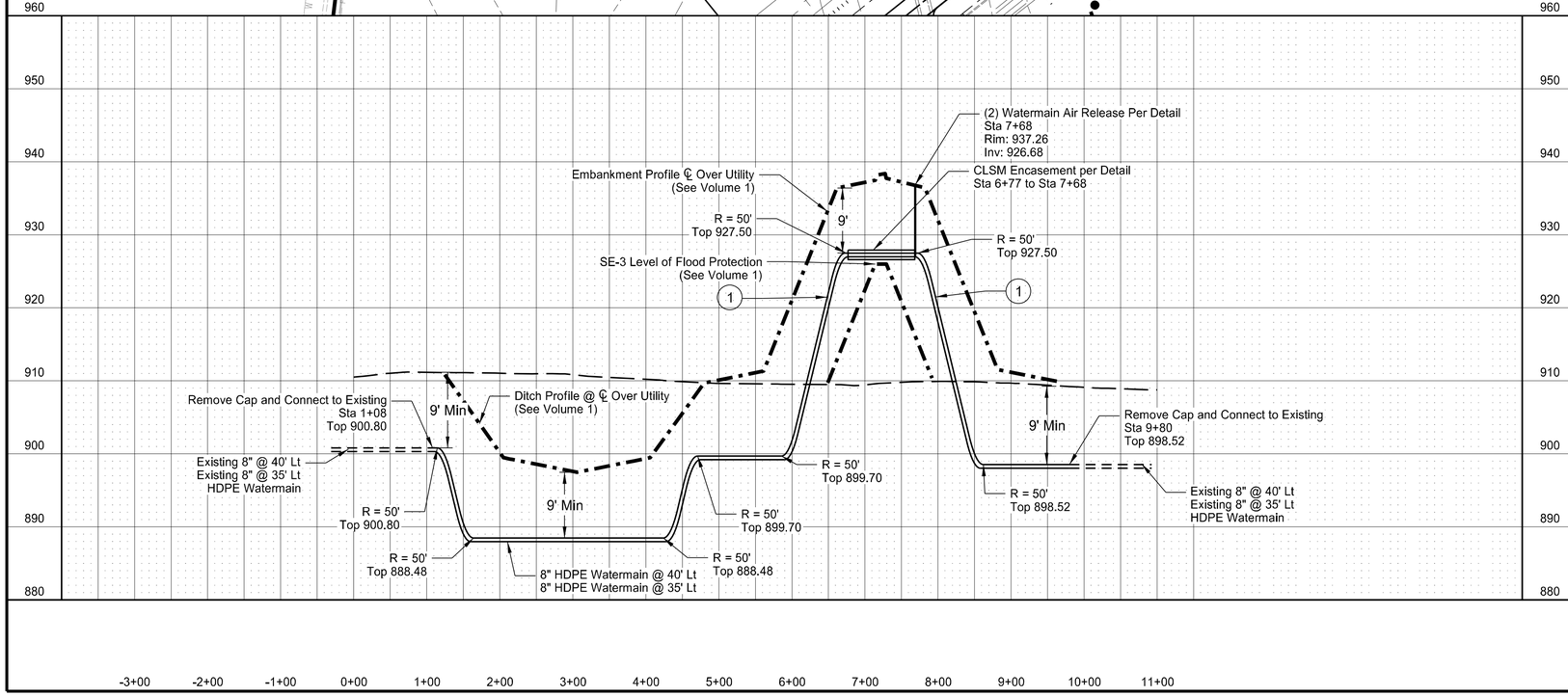
COUNTY ROAD 81 NORTH

STA. 133+15.00

EXCAVATION & FOUNDATION FILL DETAIL

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	199	1





1 EXPANSION/CONTRACTION JOINT FOR WATERMAIN (SEE DETAIL)
ELEV. 921.50 (WATERMAIN)

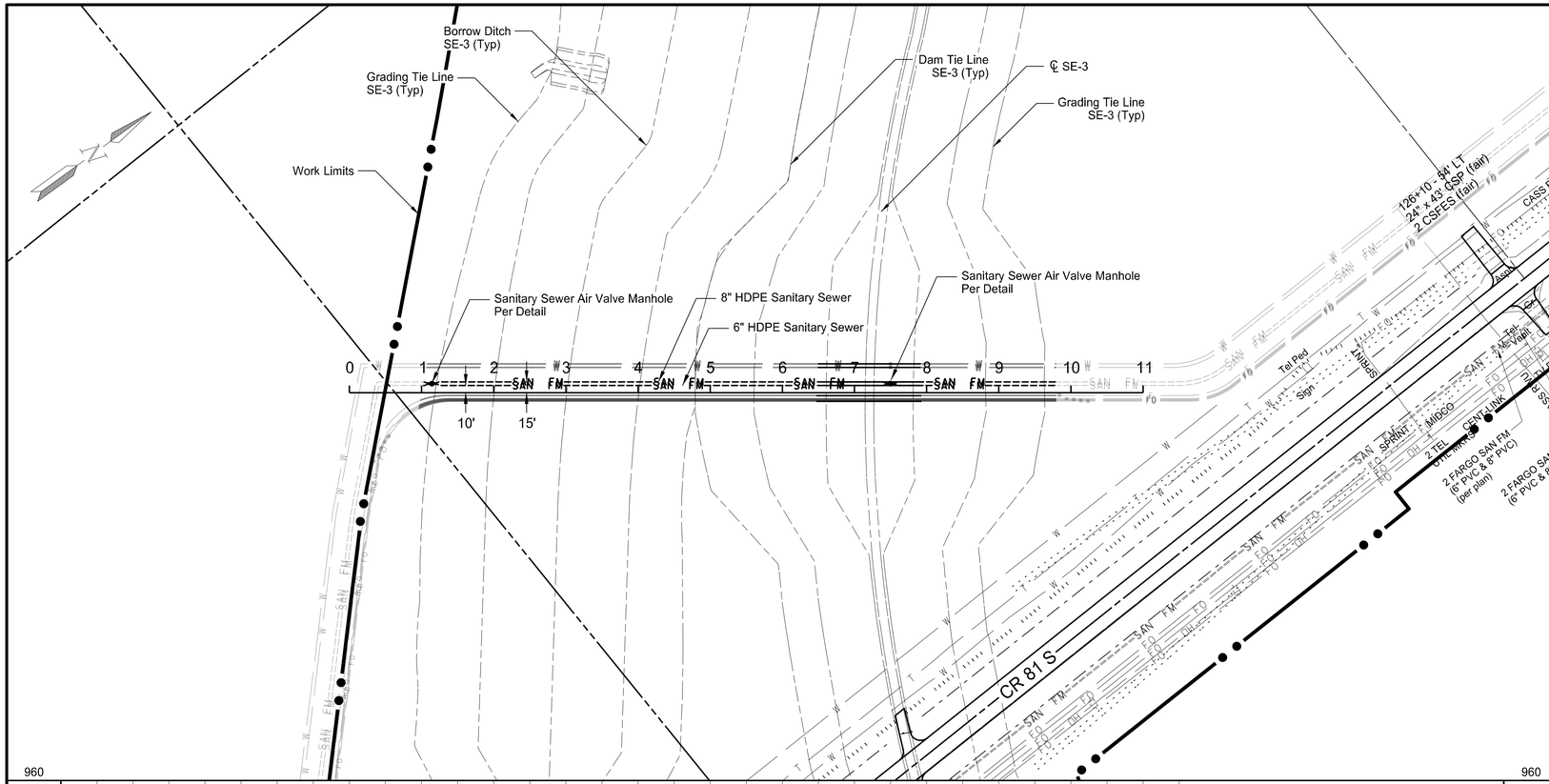
0 200
Scale in Feet

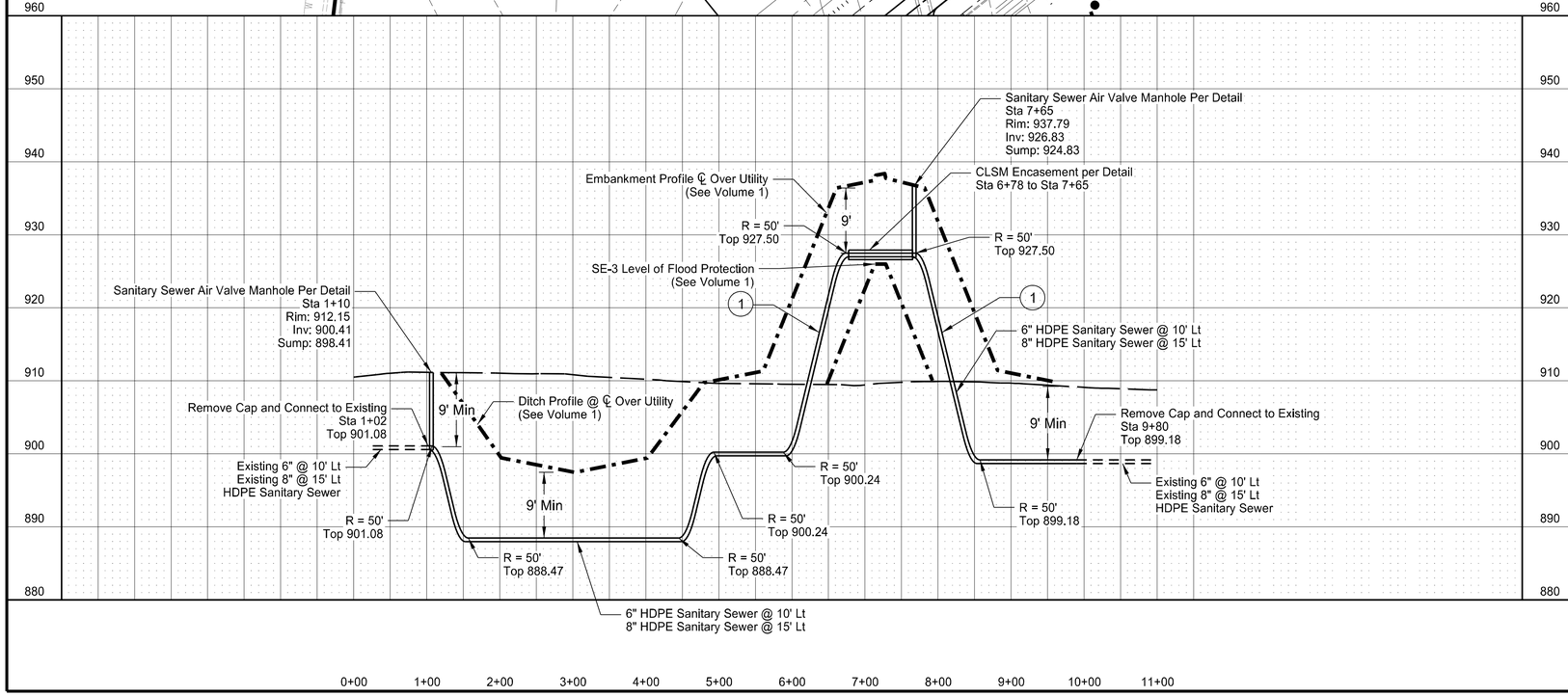
Plan & Profile
Utility Relocations
Watermain

County Road 81
Reach SE-3 Roadway Improvements
Sta 0+00 to Sta 11+00

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-10088
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	199	2





(1) EXPANSION/CONTRACTION JOINT FOR SANITARY FORCEMAIN (SEE DETAIL)
ELEV. 921.50 (FORCEMAIN)

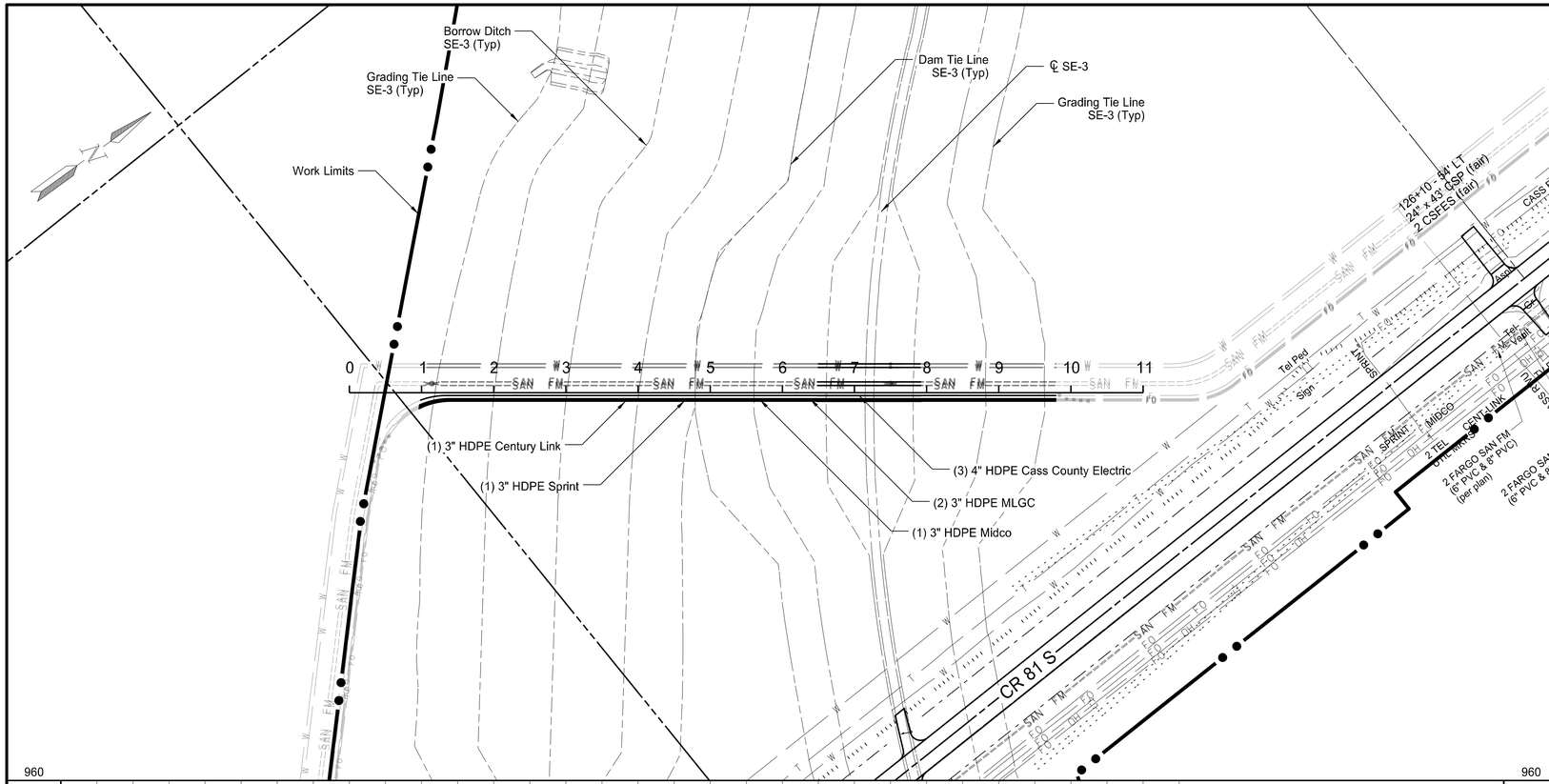
0 200
Scale in Feet

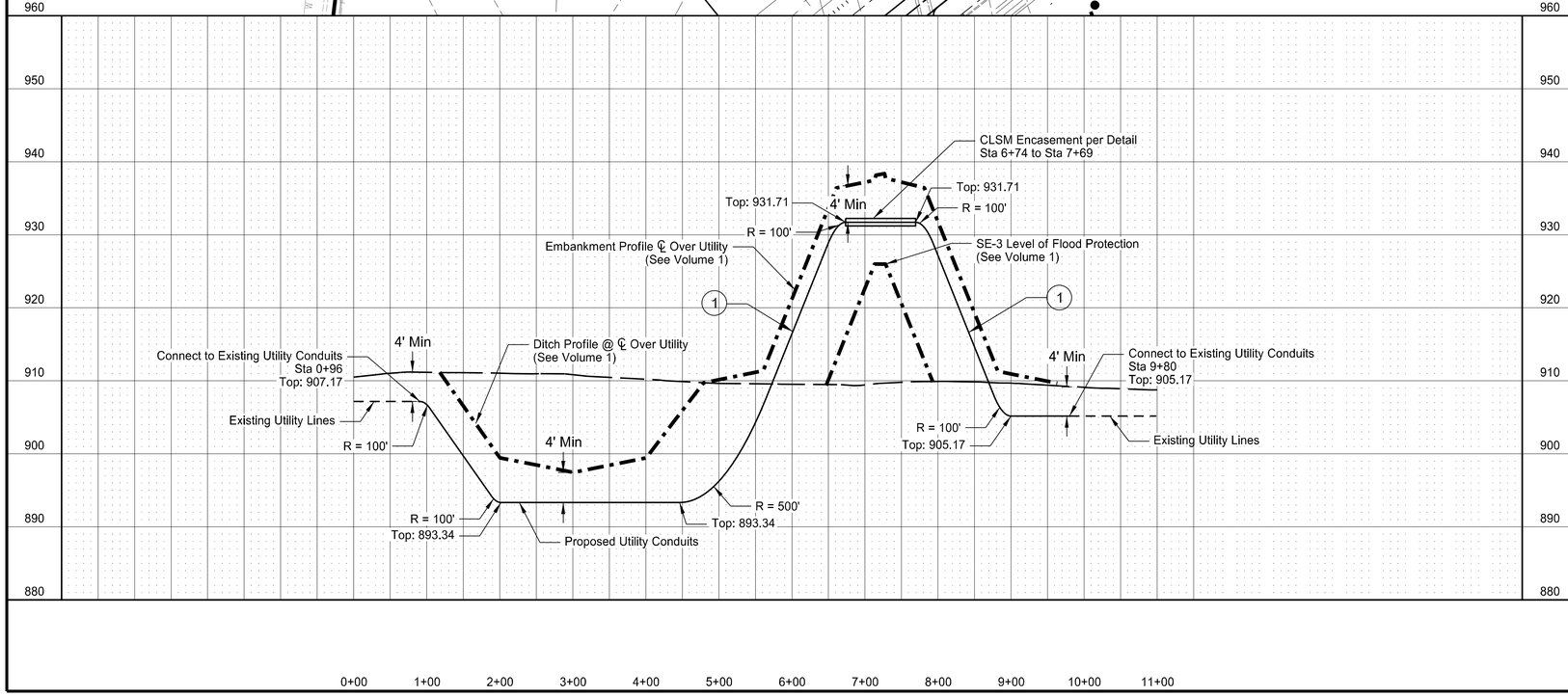
Plan & Profile
Utility Relocations
Sanitary Sewer

County Road 81
Reach SE-3 Roadway Improvements
Sta 0+00 to Sta 11+00

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-10295
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	199	3





(1) EXPANSION/CONTRACTION JOINT FOR DRY UTILITY (SEE DETAIL) ELEV. 921.50 (CONDUIT)

Note: See Section 20 for conduit layout details.

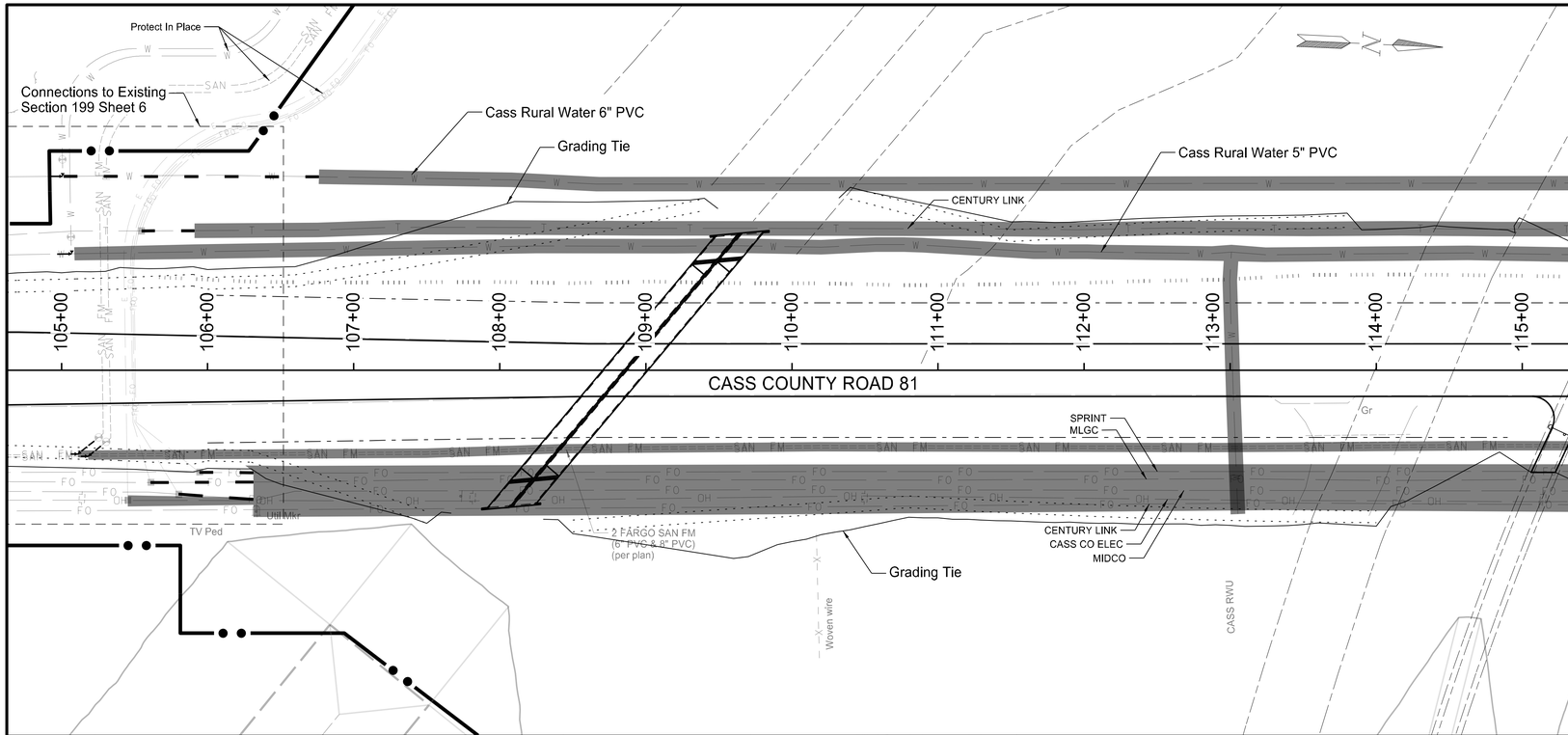
0 200
Scale in Feet

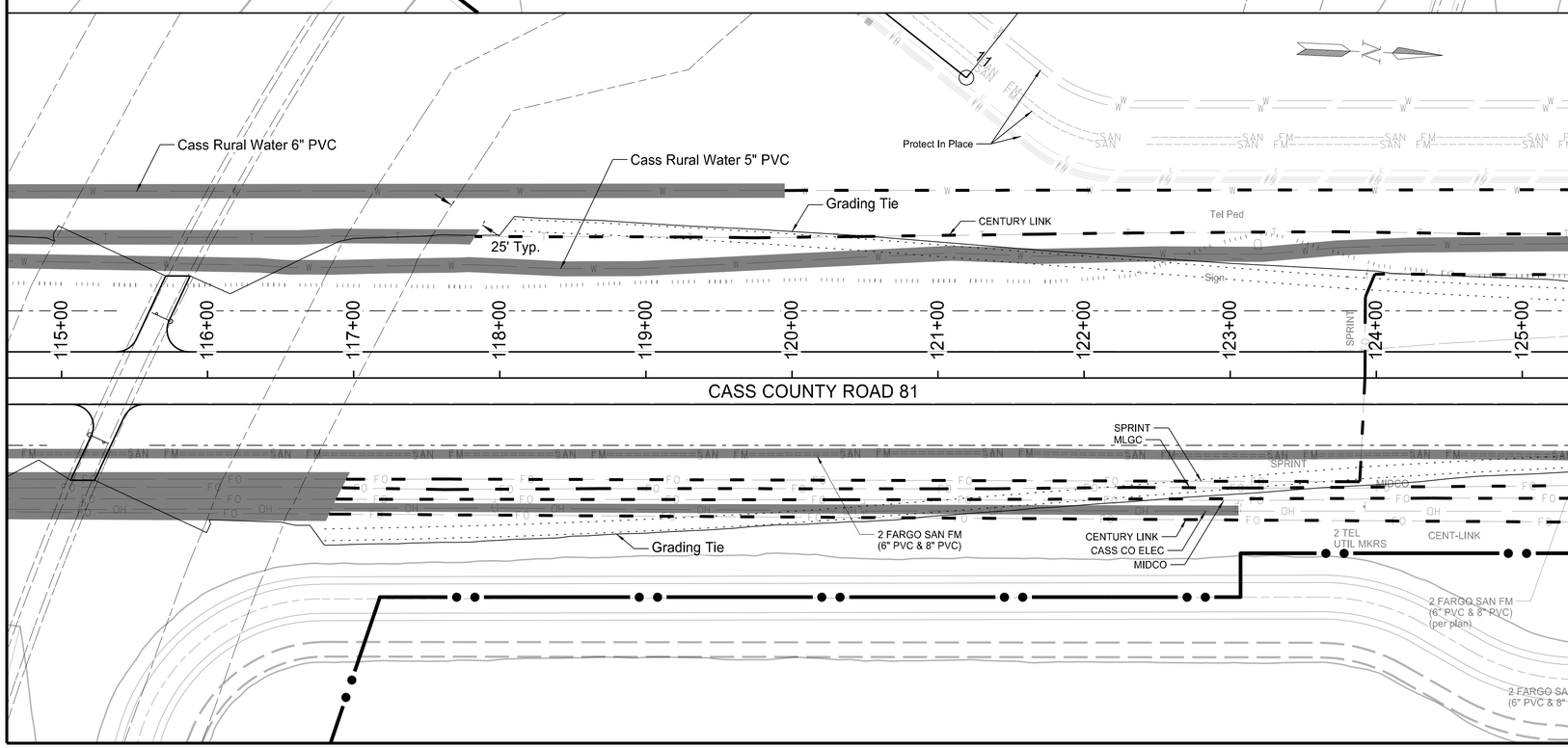
Plan & Profile
Utility Relocations
Dry Utilities

County Road 81
Reach SE-3 Roadway Improvements
Sta 0+00 to Sta 11+00

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-10088
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	199	4





Legend

- Proposed Ditch Bottom Location
- Proposed Inslope Grade Break at Clear Zone
- Remove Existing Utility
- Abandon Existing Utility
- Work Limits

NOTES:

1. Contractor shall coordinate each removal with Utility Owner.
2. Cass County Electric will remove their own overhead electric lines and power poles.

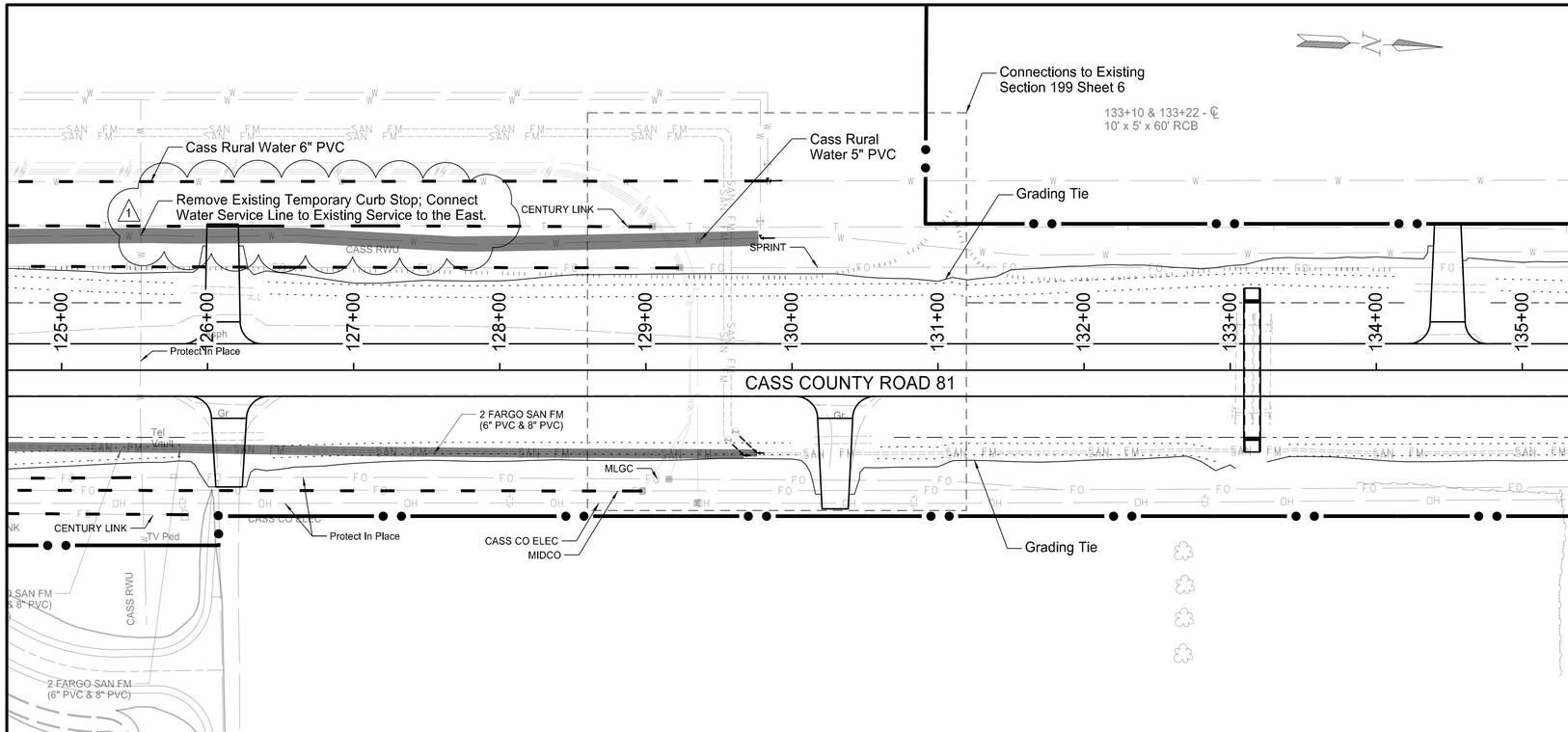
Utility Connection, Removal & Abandonment Plan

County Road 81
Reach SE-3 Roadway Improvements
Sta 105+00 to Sta 125+00

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-19066
DATE:
NORTH DAKOTA

8/21/2024

Docusign Envelope ID: 4DCF5CFC-5D48-4D62-9B7D-91E966BF59EA



Amendment 001	STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
	ND	W912ES23B0016	199	5

Legend

- Proposed Ditch Bottom Location
- Proposed Inslope Grade Break at Clear Zone
- Remove Existing Utility
- Abandon Existing Utility
- Work Limits

Notes:
1. Contractor shall coordinate each removal with Utility Owner. See Section 6 notes for utility contact information.
2. Cass County Electric Cooperative will remove their own overhead electric lines and power poles.

Utility Description	Start Location	End Location	Remove/Abandon
Cass Rural Water 6" PVC	105+01 Lt	106+76 Lt	Abandon
	106+76 Lt	119+95 Lt	Remove
	119+95 Lt	129+83 Lt	Abandon
Cass Rural Water 5" PVC	105+07 Lt	129+78 Lt	Remove
Cass Rural Water 1" Service	113+01 Lt	113+05 Rt	Remove
City of Fargo Sanitary Force Main 8" PVC	105+11 Rt	129+76 Rt	Remove
City of Fargo Sanitary Force Main 6" PVC	105+18 Rt	129+67 Rt	Remove
Cass County Electric Cooperative OH Electric	105+45 Rt	123+06 Rt	Remove By Others
CenturyLink FO Comm	105+55 Lt	105+91 Lt	Abandon
	105+91 Lt	117+83 Lt	Remove
	117+83 Lt	129+04 Lt	Abandon
CenturyLink FO Comm	106+31 Rt	116+83 Rt	Remove
	116+83 Rt	125+87 Rt	Abandon

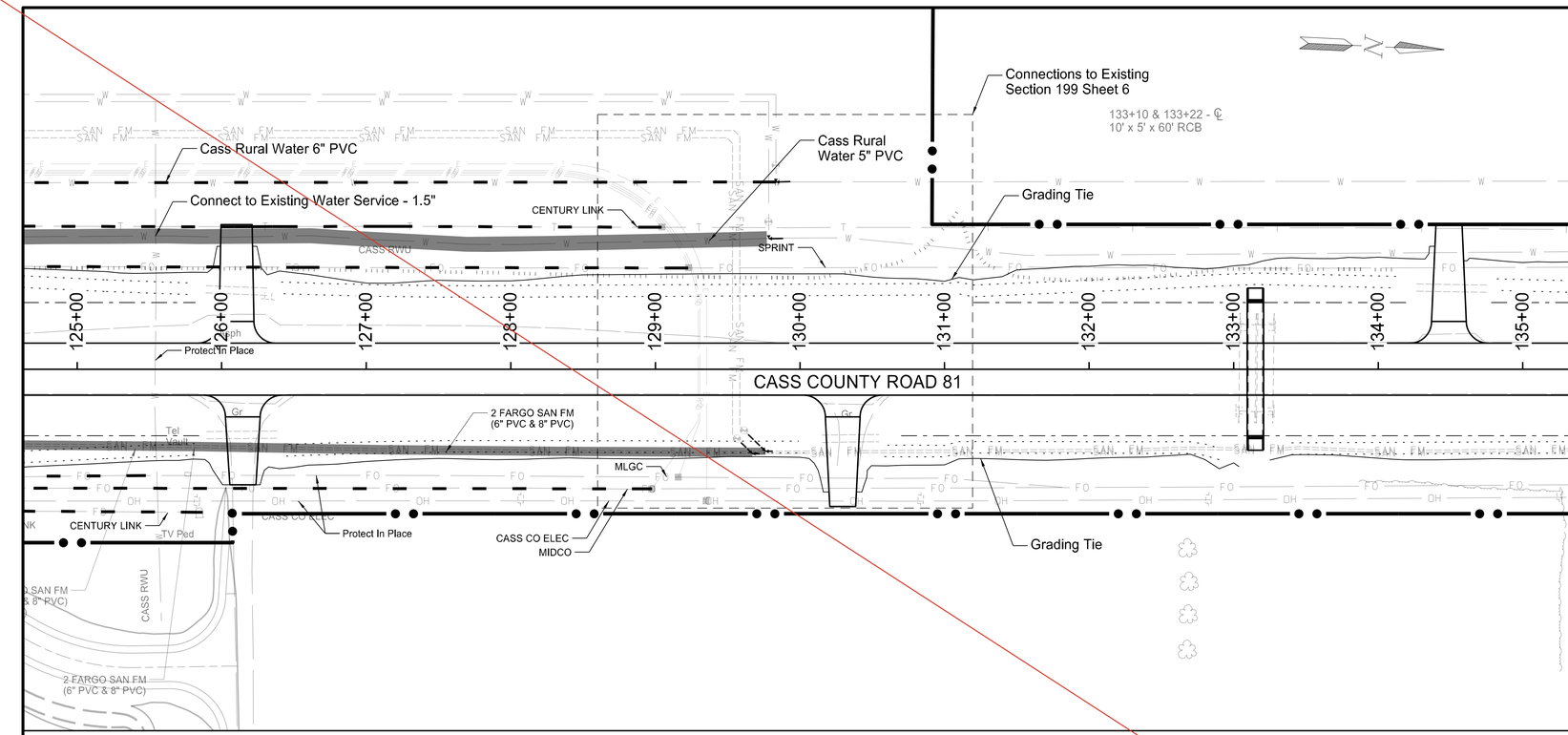
Utility Description	Start Location	End Location	Remove/Abandon
Midco FO Comm	105+80 Rt	106+31 Rt	Abandon
	106+31 Rt	116+88 Rt	Remove
	116+88 Rt	128+98 Rt	Abandon
MLGC FO Comm (2)	105+61 Rt	106+31 Rt	Abandon
	106+31 Rt	116+92 Rt	Remove
	116+92 Rt	125+48 Rt	Abandon
Sprint FO Comm	105+94 Rt	106+31 Rt	Abandon
	106+31 Rt	116+95 Rt	Remove
	116+95 Rt	123+89 Rt	Abandon
	123+89 Rt	123+99 Lt	Abandon
	123+99 Lt	129+23 Lt	Abandon

Utility Connection, Removal & Abandonment Plan

County Road 81
Reach SE-3 Roadway Improvements
Sta 125+00 to Sta 135+00

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-10066
DATE 10/24/24
NORTH DAKOTA

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	199	5



Legend

- Proposed Ditch Bottom Location
- Proposed Inslope Grade Break at Clear Zone
- Remove Existing Utility
- Abandon Existing Utility
- Work Limits

Notes:
1. Contractor shall coordinate each removal with Utility Owner. See Section 6 notes for utility contact information.
2. Cass County Electric Cooperative will remove their own overhead electric lines and power poles.

Utility Description	Start Location	End Location	Remove/Abandon
Cass Rural Water 6" PVC	105+01 Lt	106+76 Lt	Abandon
	106+76 Lt	119+95 Lt	Remove
	119+95 Lt	129+83 Lt	Abandon
Cass Rural Water 5" PVC	105+07 Lt	129+78 Lt	Remove
Cass Rural Water 1" Service	113+01 Lt	113+05 Rt	Remove
City of Fargo Sanitary Force Main 8" PVC	105+11 Rt	129+76 Rt	Remove
City of Fargo Sanitary Force Main 6" PVC	105+18 Rt	129+67 Rt	Remove
Cass County Electric Cooperative OH Electric	105+45 Rt	123+06 Rt	Remove By Others
CenturyLink FO Comm	105+55 Lt	105+91 Lt	Abandon
	105+91 Lt	117+83 Lt	Remove
	117+83 Lt	129+04 Lt	Abandon
CenturyLink FO Comm	106+31 Rt	116+83 Rt	Remove
	116+83 Rt	125+87 Rt	Abandon

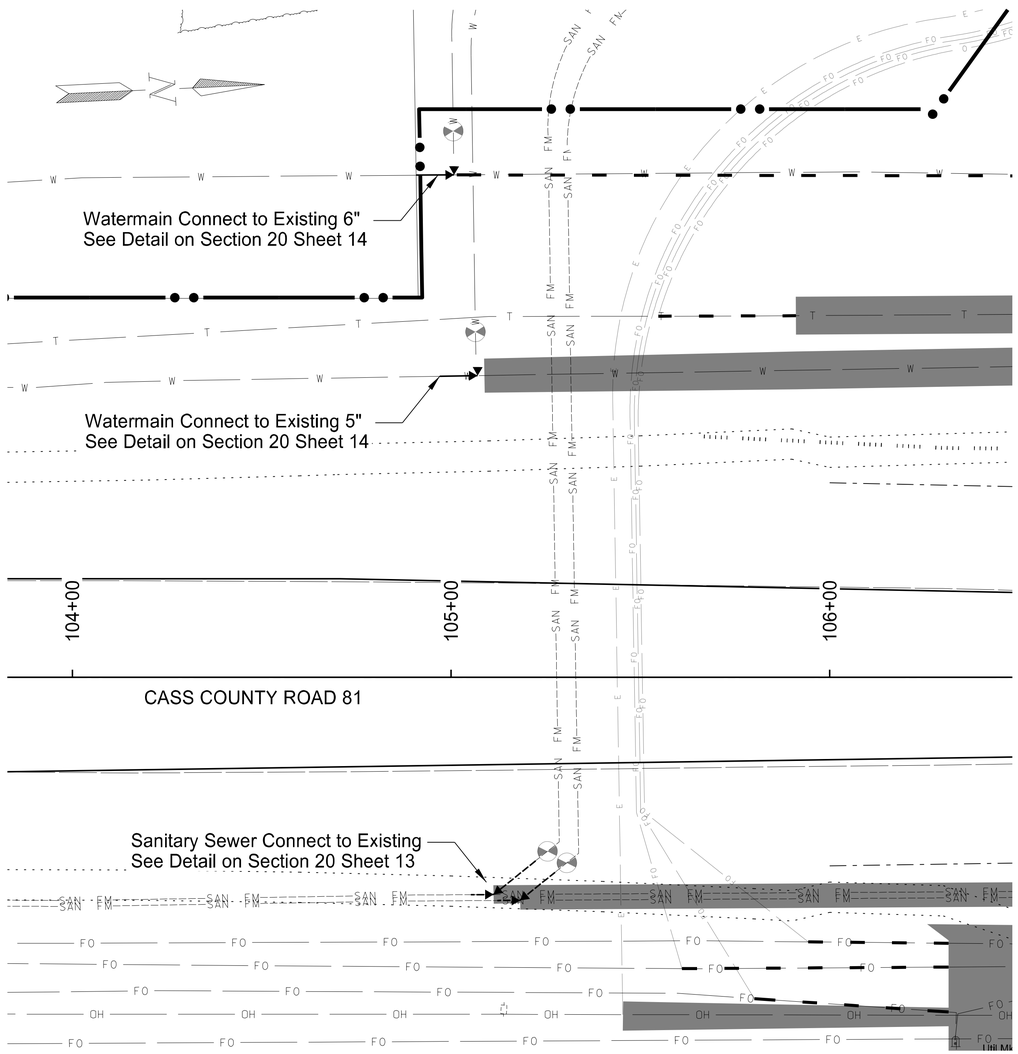
Utility Description	Start Location	End Location	Remove/Abandon
Midco FO Comm	105+80 Rt	106+31 Rt	Abandon
	106+31 Rt	116+88 Rt	Remove
	116+88 Rt	128+98 Rt	Abandon
MLGC FO Comm (2)	105+61 Rt	106+31 Rt	Abandon
	106+31 Rt	116+92 Rt	Remove
	116+92 Rt	125+48 Rt	Abandon
Sprint FO Comm	105+94 Rt	106+31 Rt	Abandon
	106+31 Rt	116+95 Rt	Remove
	116+95 Rt	123+89 Rt	Abandon
	123+89 Rt	123+99 Lt	Abandon
	123+99 Lt	129+23 Lt	Abandon

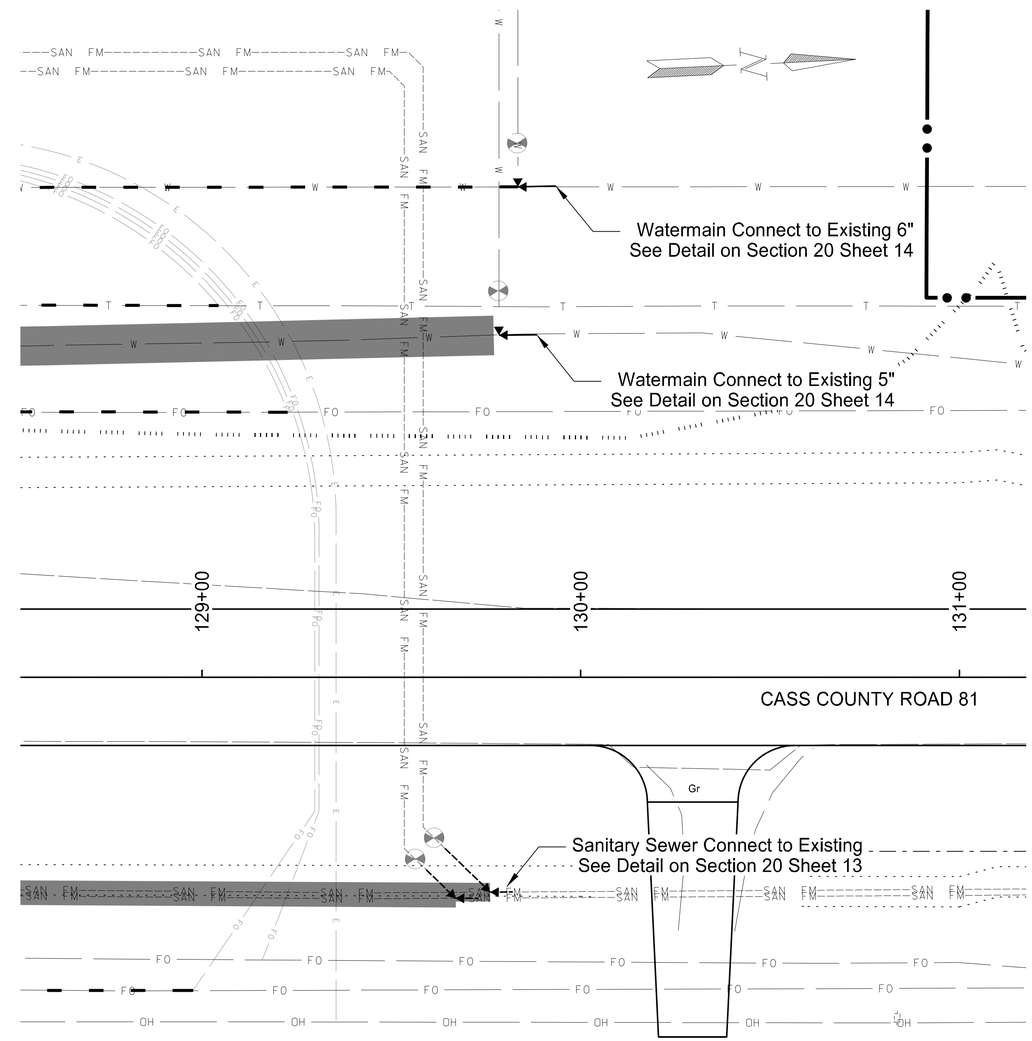
Utility Connection, Removal & Abandonment Plan

County Road 81
Reach SE-3 Roadway Improvements
Sta 125+00 to Sta 135+00

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-10088
DATE:
NORTH DAKOTA
8/21/2024

STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	199	6





Legend

- Proposed Ditch Bottom Location
- Proposed Inslope Grade Break at Clear Zone
- Remove Existing Utility
- Abandon Existing Utility
- Temporary Construction Limits
- Fee Title Limits

Utility Connection, Removal & Abandonment Plan

County Road 81
Reach SE-3 Roadway Improvements

REGISTERED PROFESSIONAL ENGINEER
DYLAN ENSRUDE
PE-19066
DATE:
NORTH DAKOTA
8/21/2024

Align: Ex_CR81

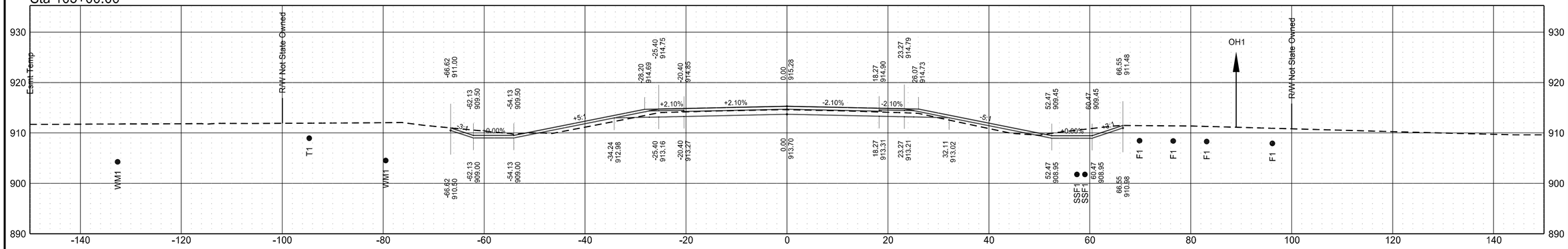
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	1

Legend

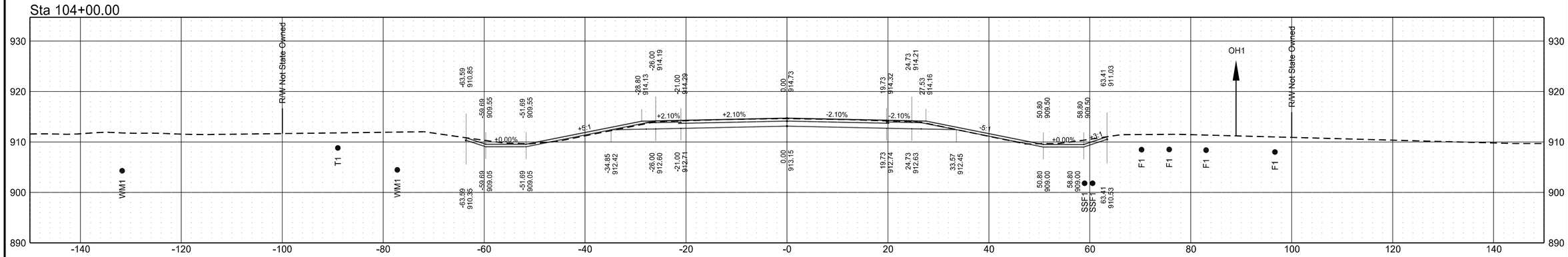
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

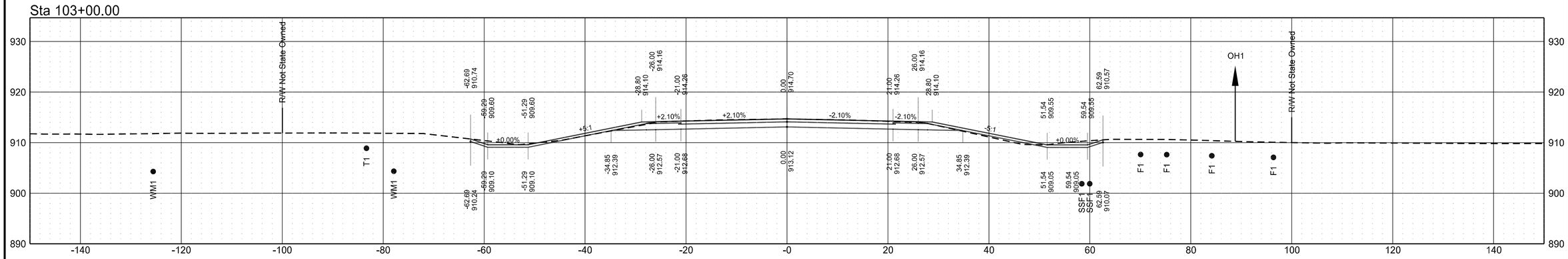
Sta 105+00.00



Sta 104+00.00



Sta 103+00.00



Align: Ex_CR81

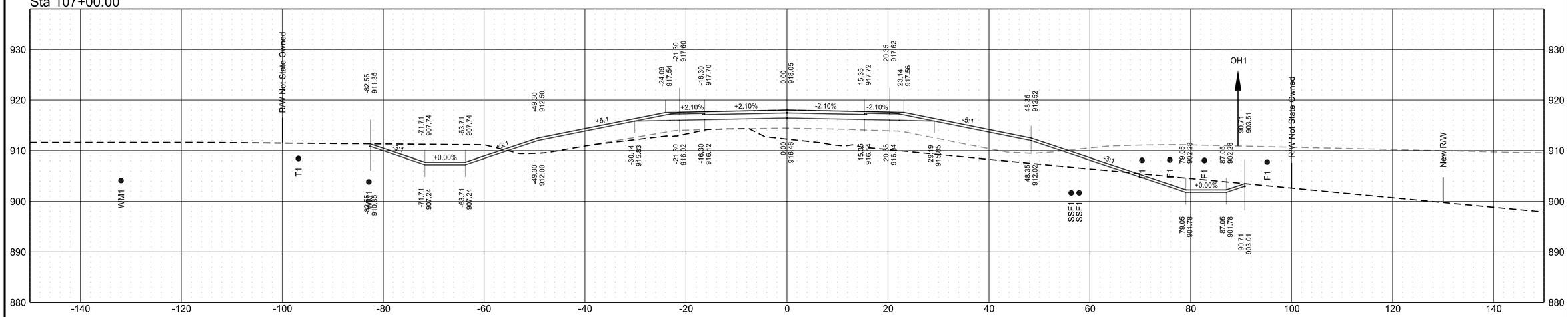
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	2

Legend

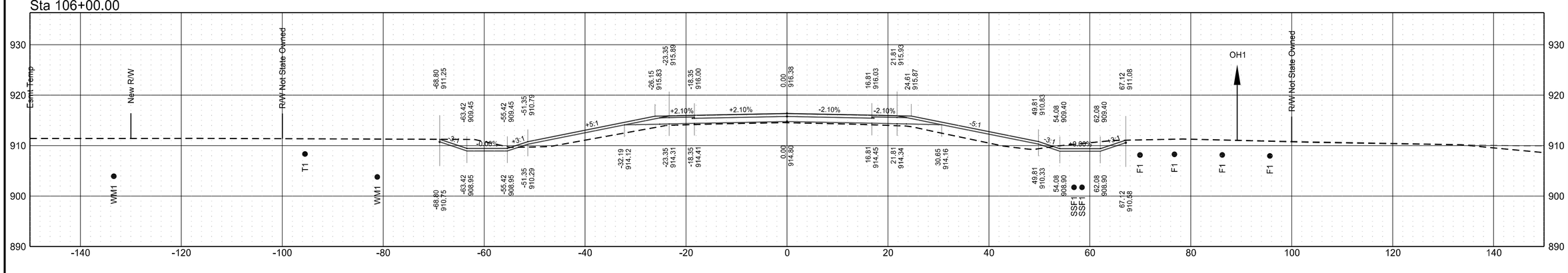
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

Sta 107+00.00



Sta 106+00.00



Align: Ex_CR81

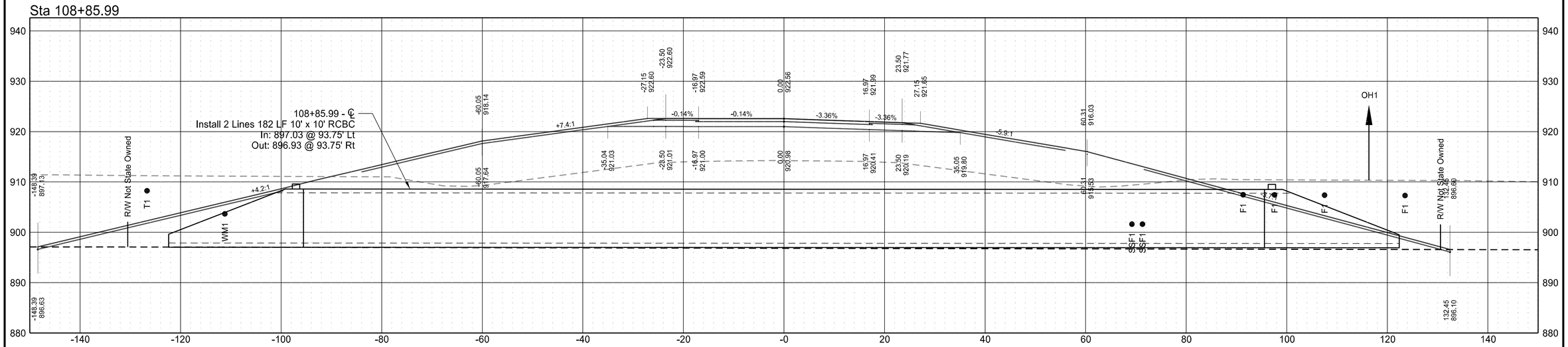
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	3

Legend

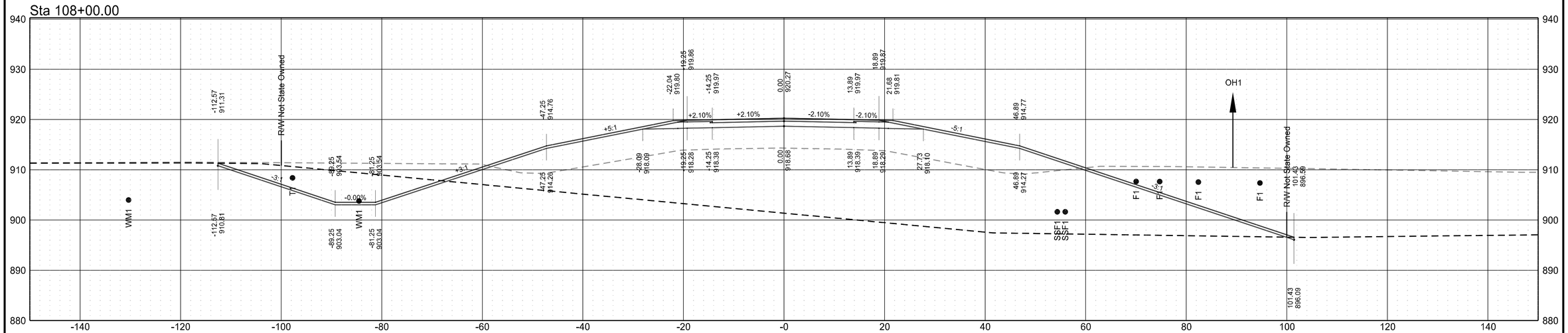
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

Sta 108+85.99



Sta 108+00.00



Align: Ex_CR81

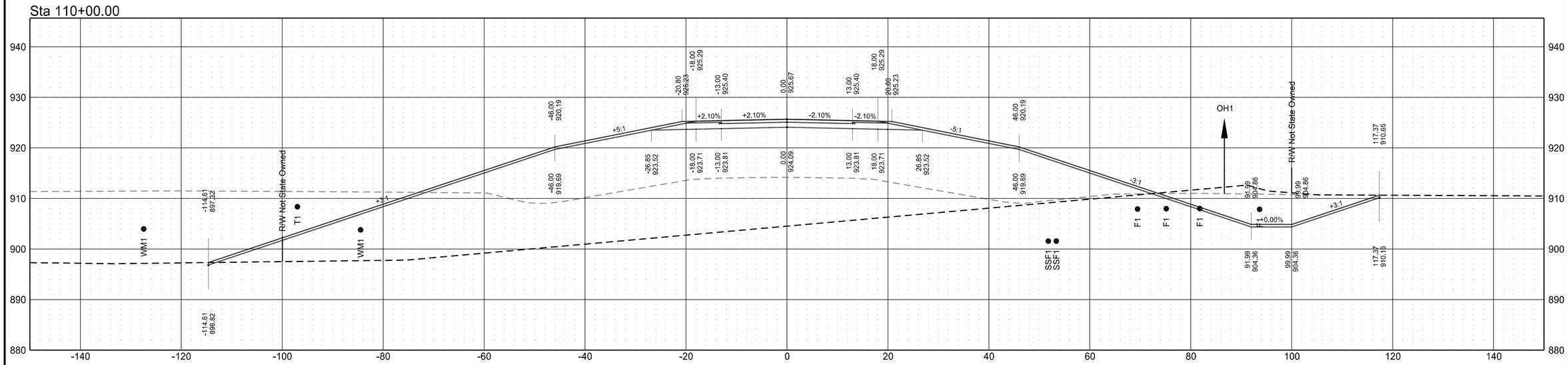
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	4

Legend

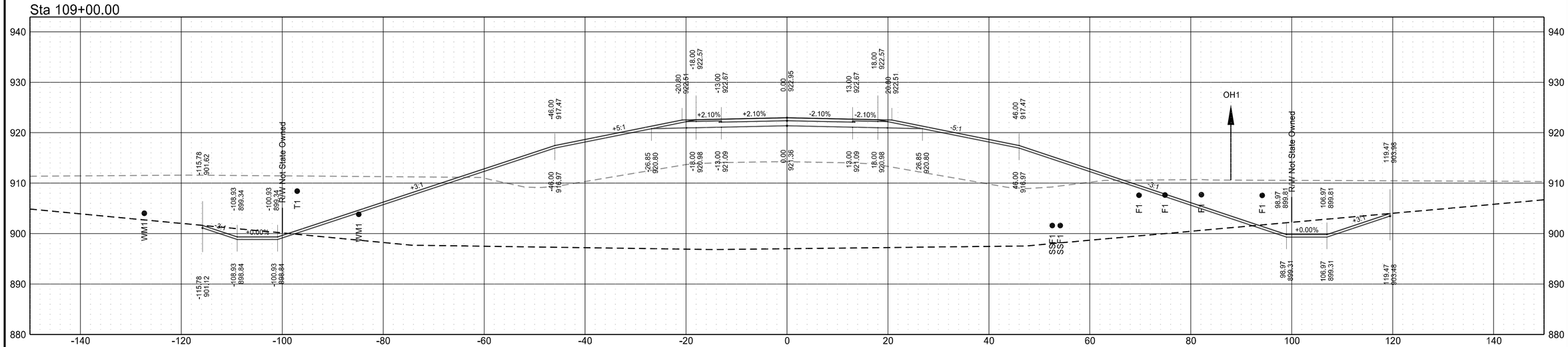
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

Sta 110+00.00



Sta 109+00.00



Align: Ex_CR81

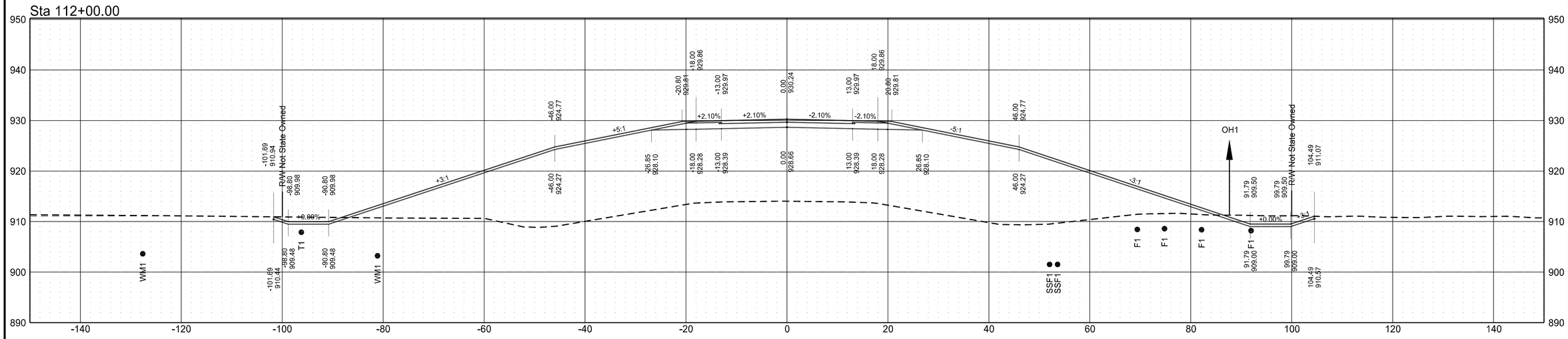
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	5

Legend

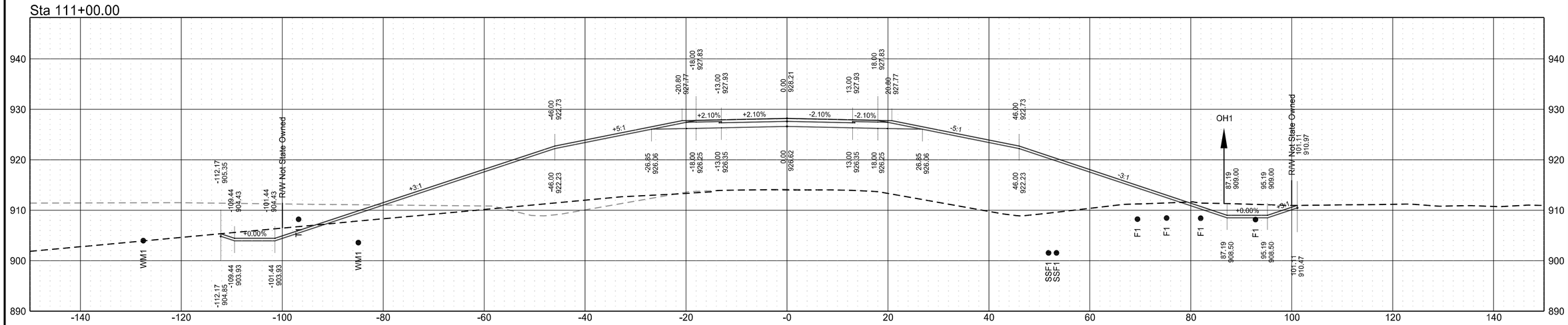
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

Sta 112+00.00



Sta 111+00.00



Align: Ex_CR81

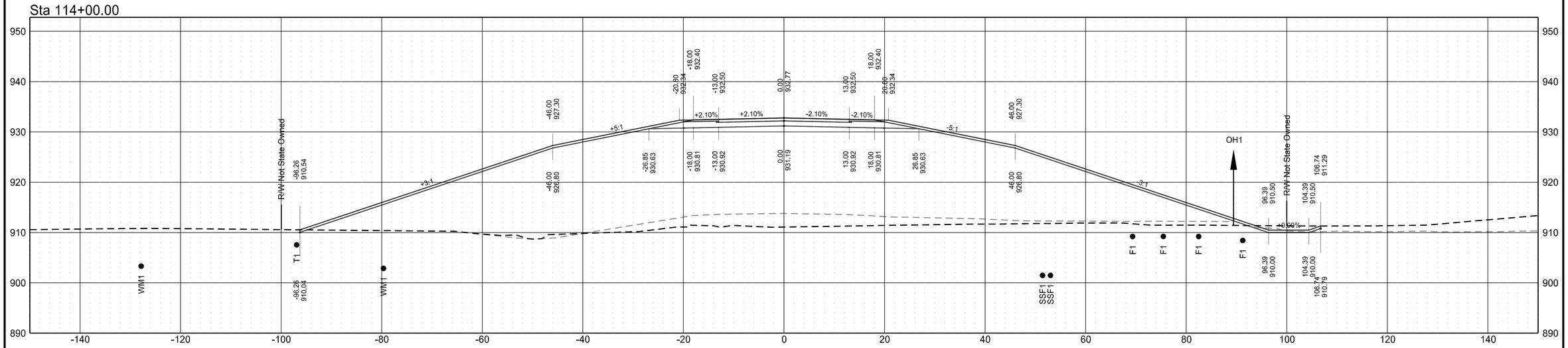
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	6

Legend

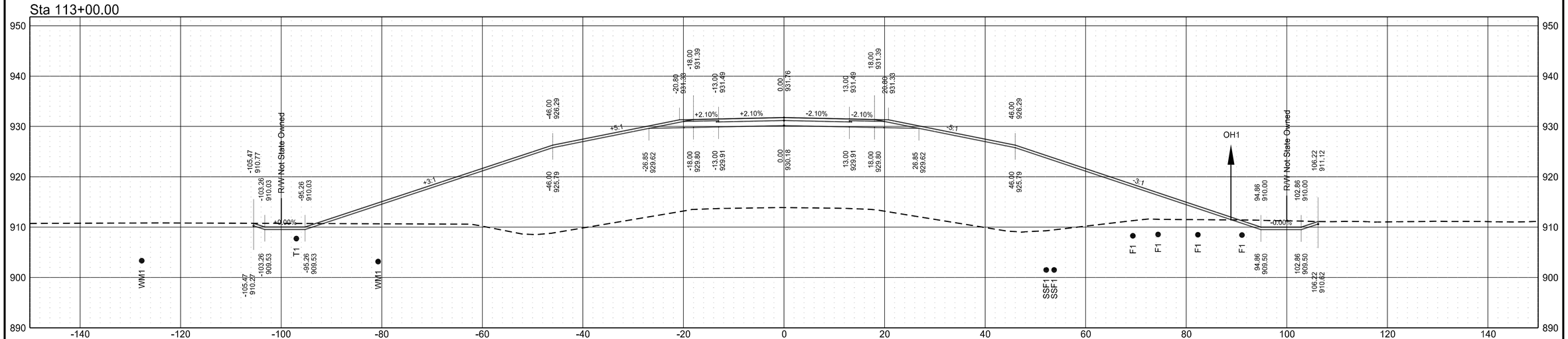
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

Sta 114+00.00



Sta 113+00.00



Align: Ex_CR81

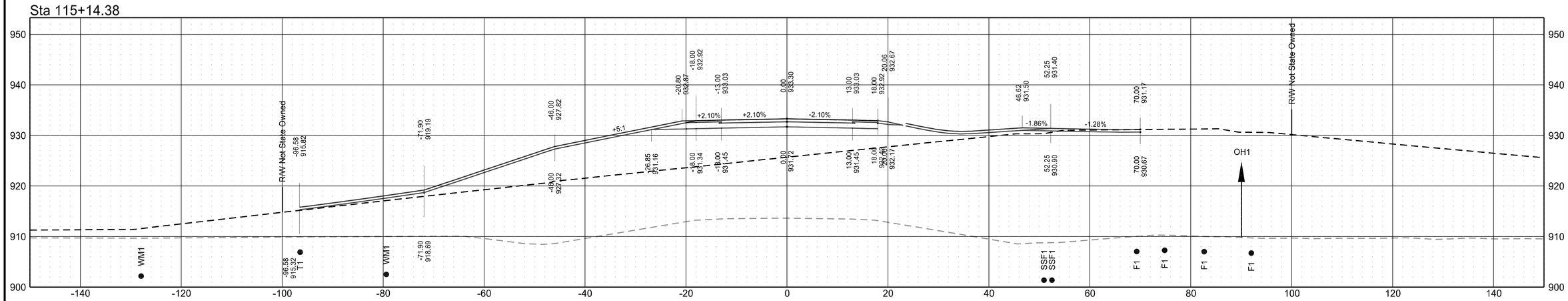
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	7

Legend

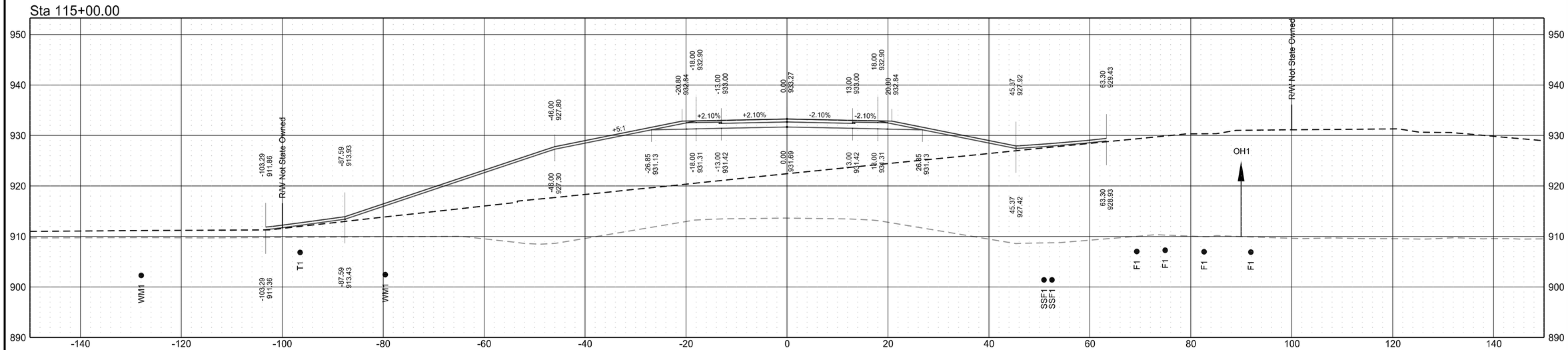
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

Sta 115+14.38



Sta 115+00.00



Align: Ex_CR81

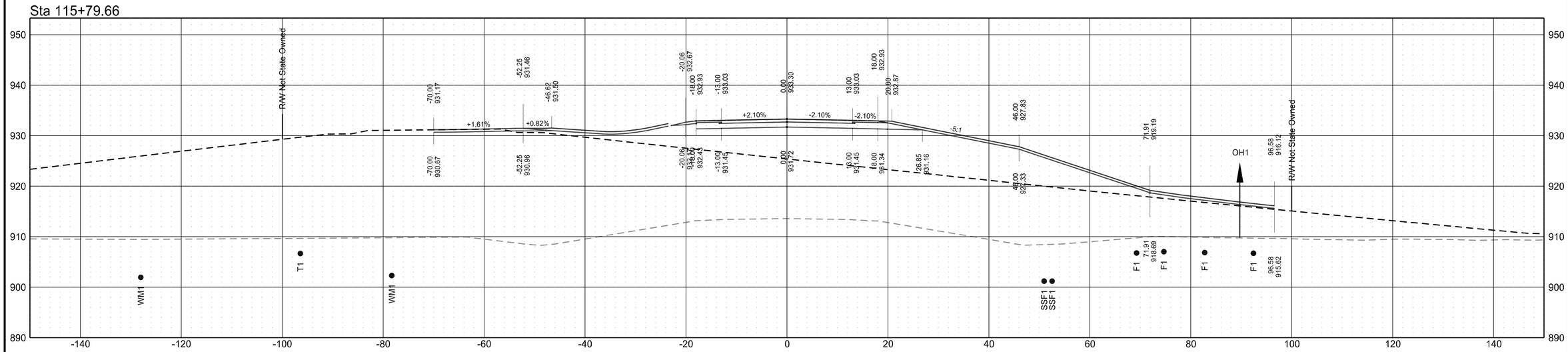
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	8

Legend

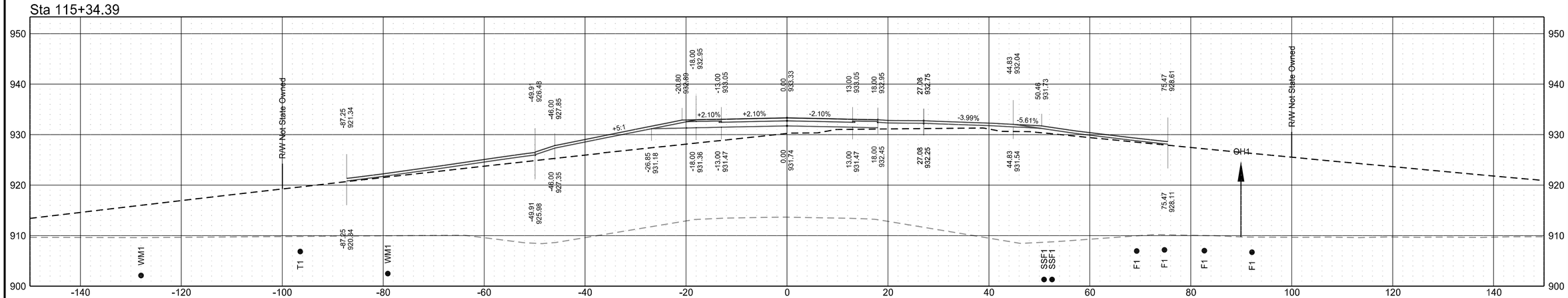
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

Sta 115+79.66



Sta 115+34.39



Align: Ex_CR81

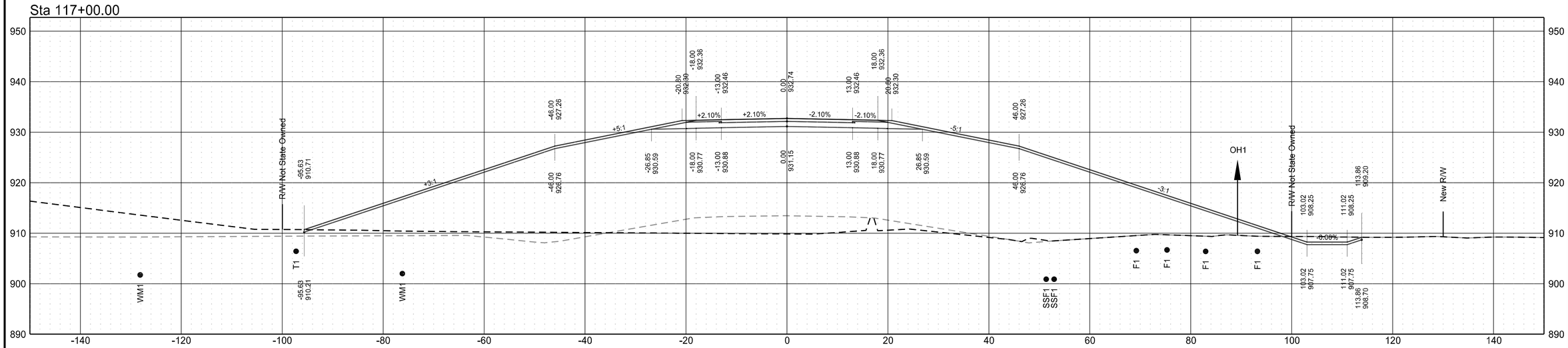
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	9

Legend

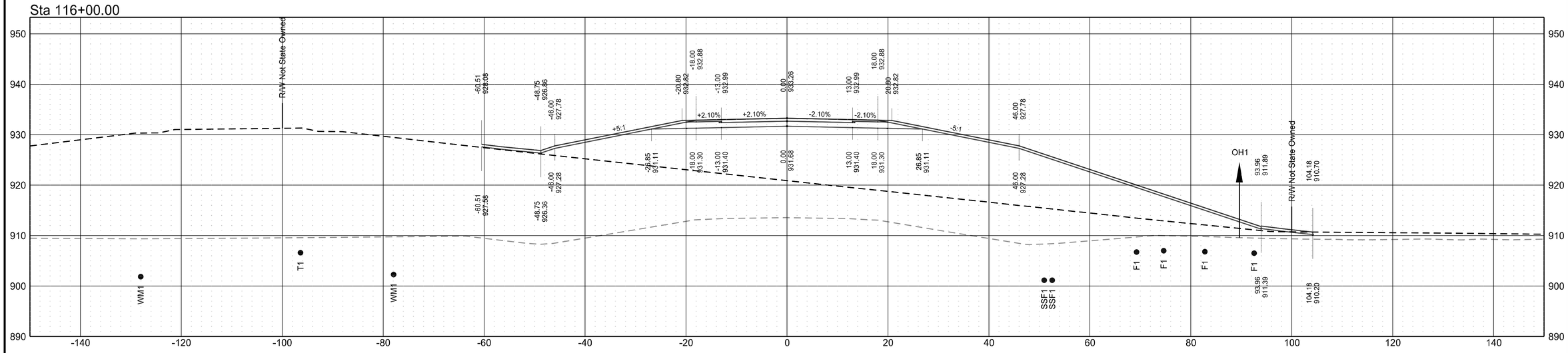
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

Sta 117+00.00



Sta 116+00.00



Align: Ex_CR81

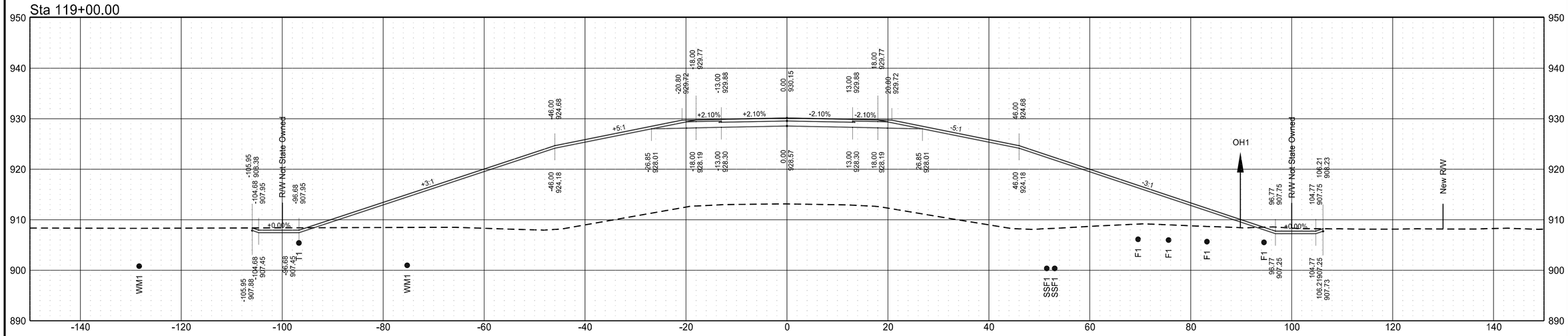
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	10

Legend

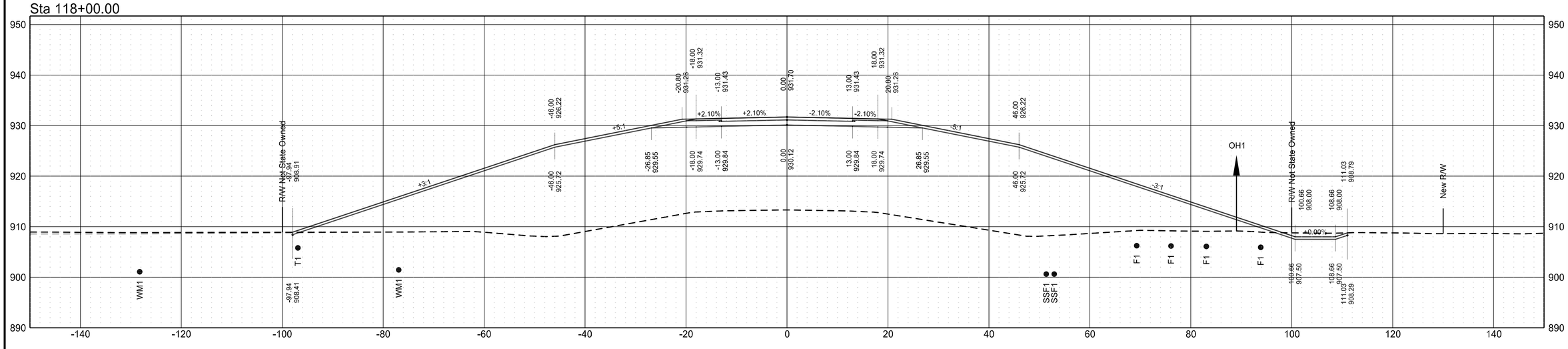
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

Sta 119+00.00



Sta 118+00.00



Align: Ex_CR81

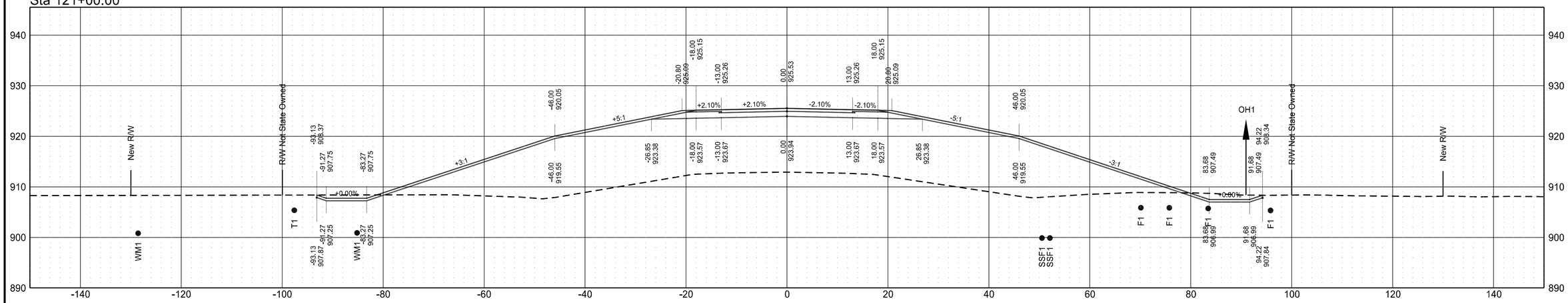
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	11

Legend

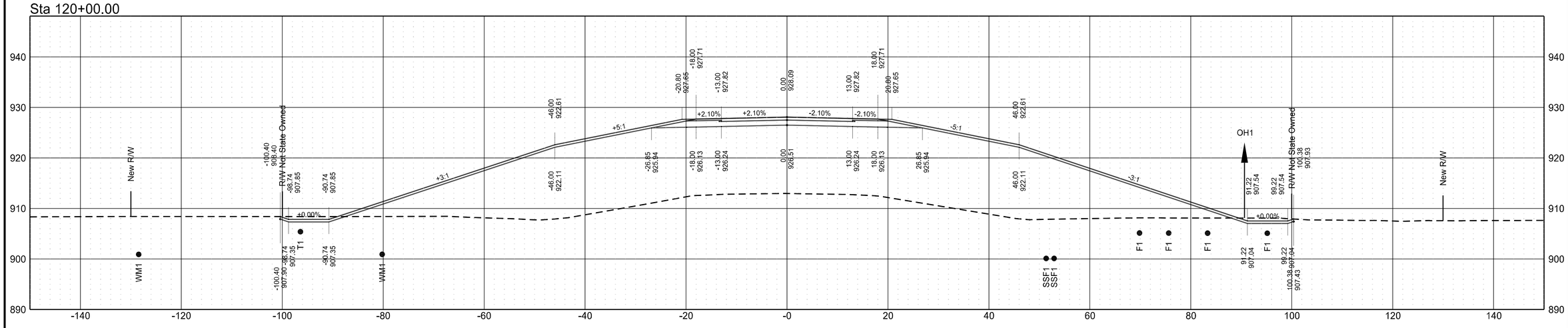
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

Sta 121+00.00



Sta 120+00.00



STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	12

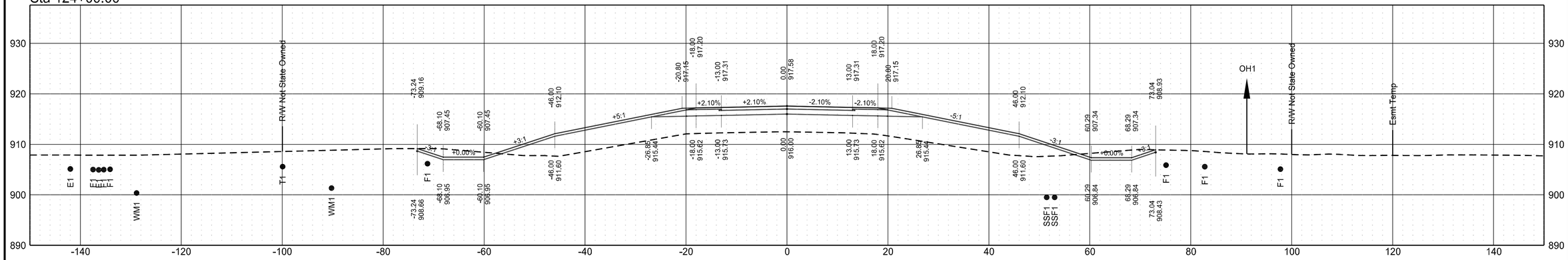
Legend

- - - - - Existing ground from preconstruction survey (for reference only)

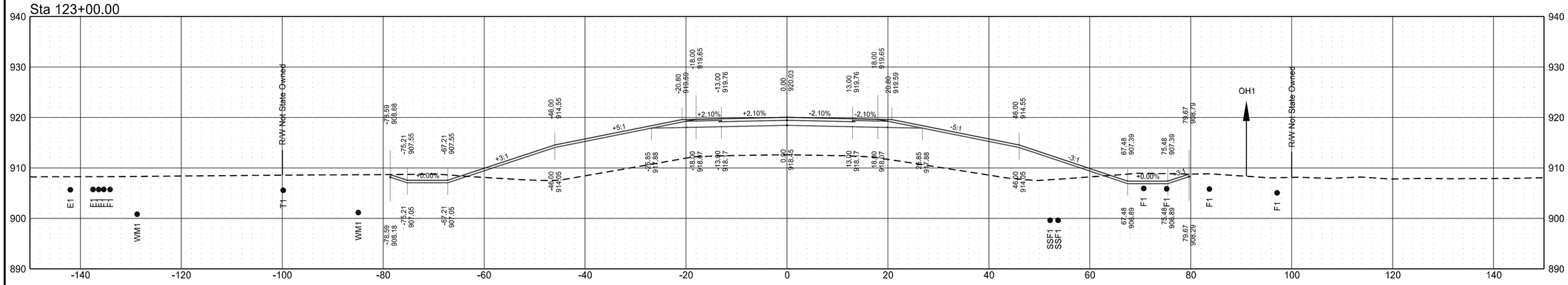
— — — — Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

Align: Ex_CR81

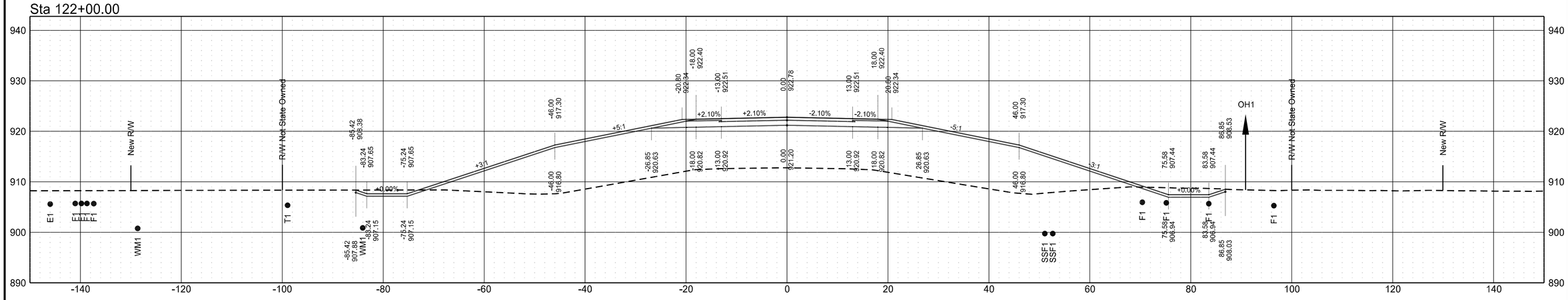
Sta 124+00.00



Sta 123+00.00



Sta 122+00.00



Align: Ex_CR81

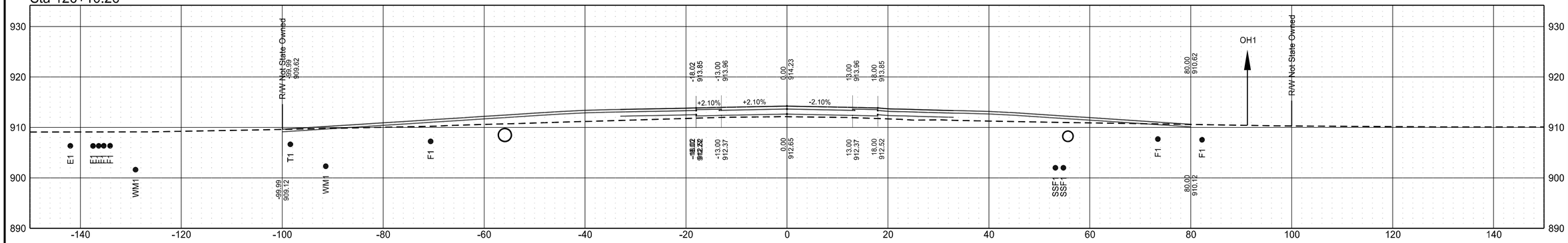
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	13

Legend

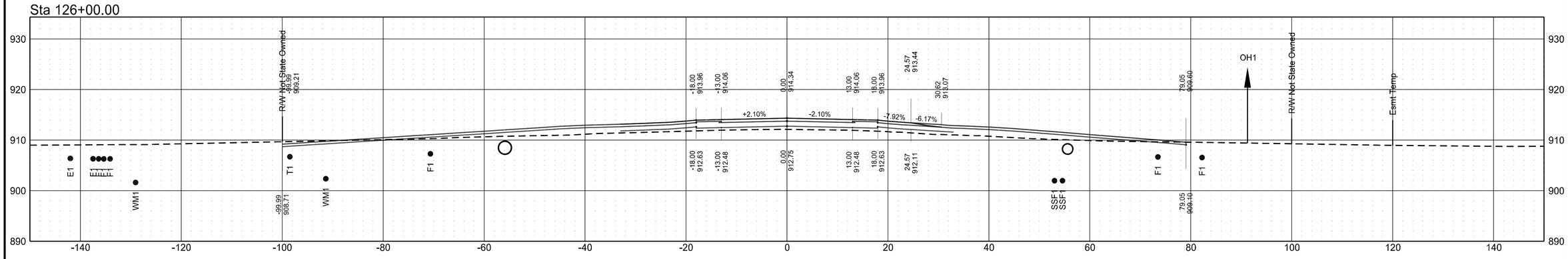
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

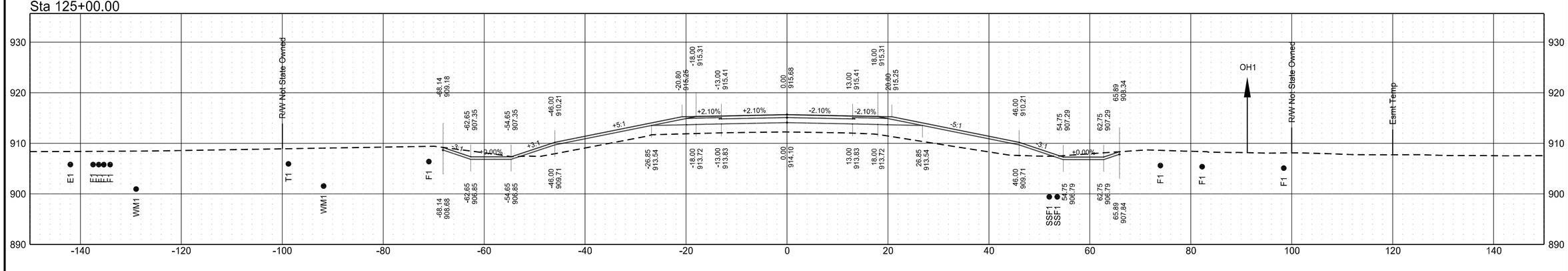
Sta 126+10.26



Sta 126+00.00



Sta 125+00.00



Align: Ex_CR81

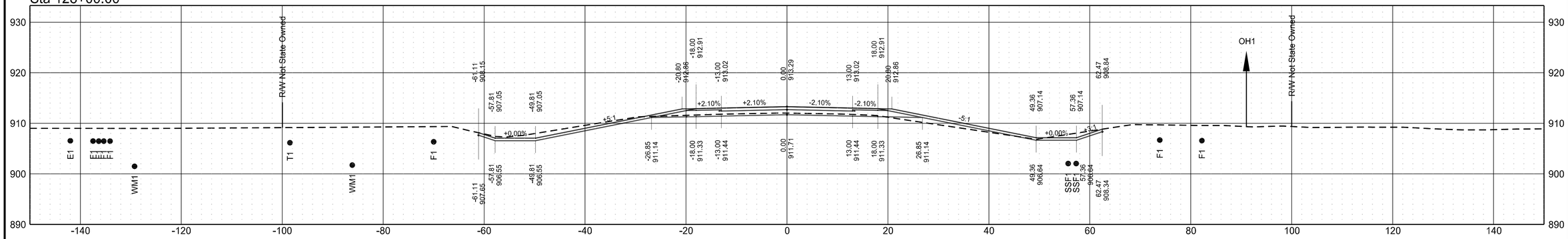
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	14

Legend

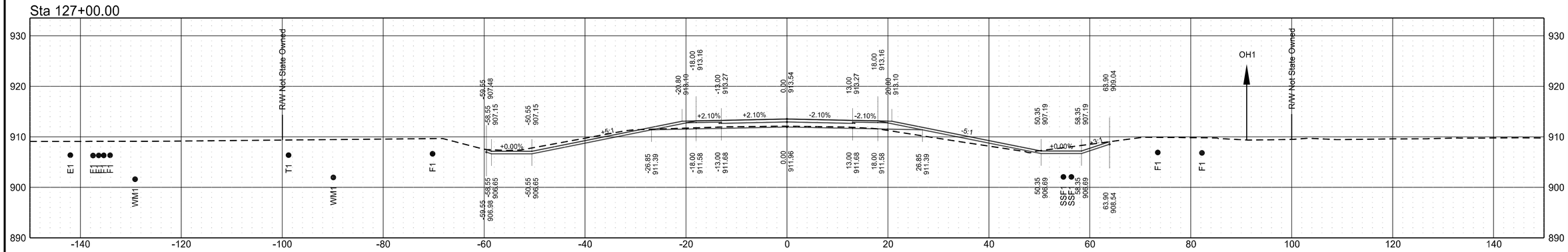
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

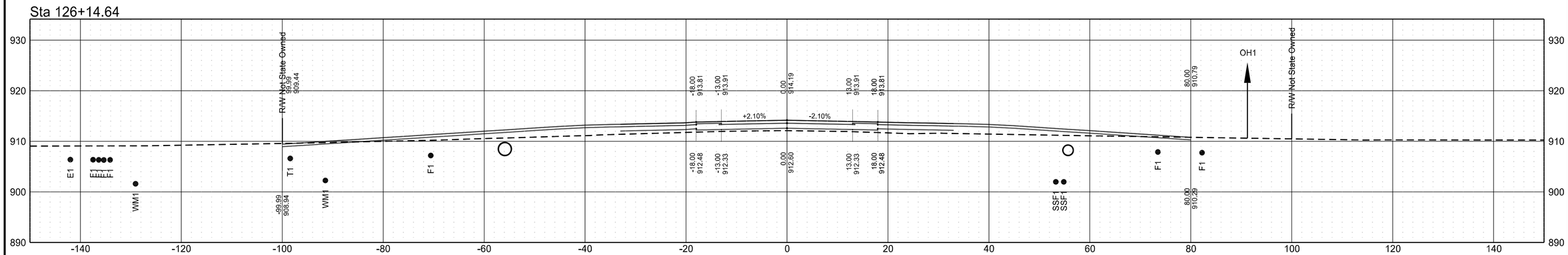
Sta 128+00.00



Sta 127+00.00



Sta 126+14.64



Align: Ex_CR81

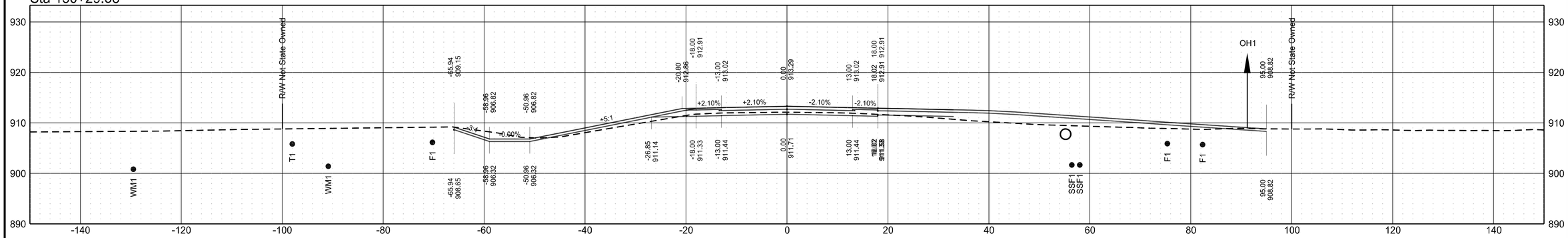
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	15

Legend

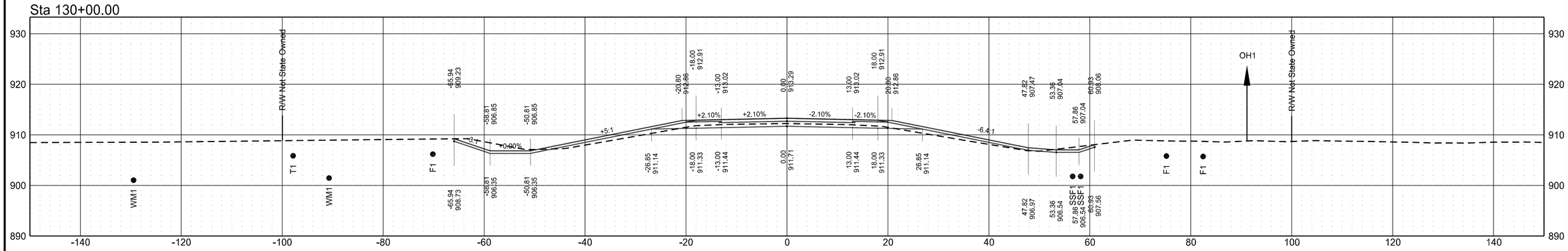
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

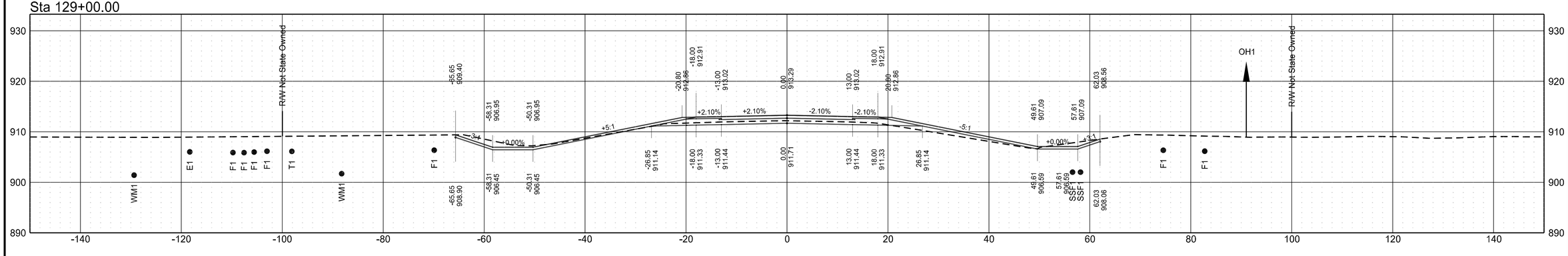
Sta 130+29.58



Sta 130+00.00



Sta 129+00.00



Align: Ex_CR81

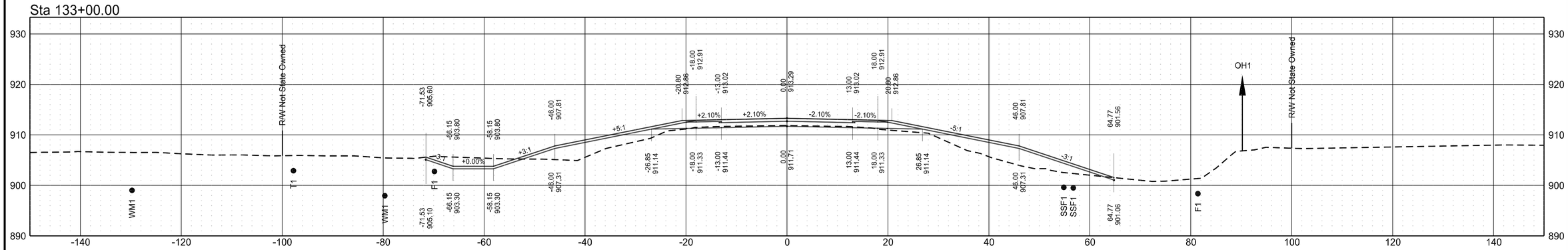
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	16

Legend

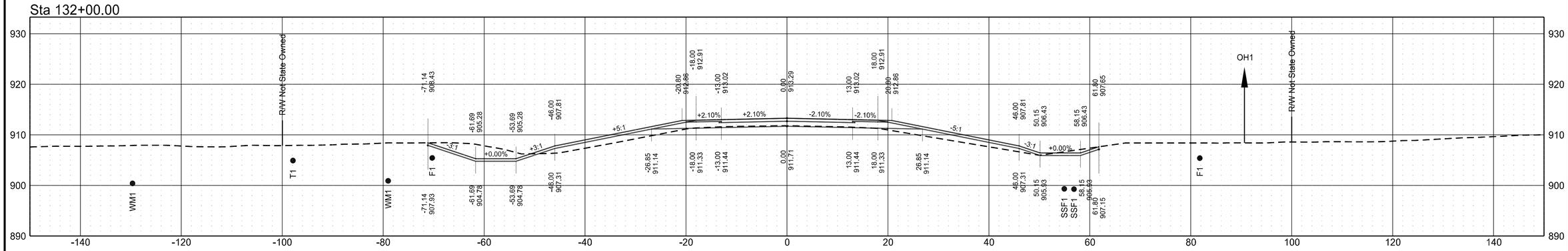
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

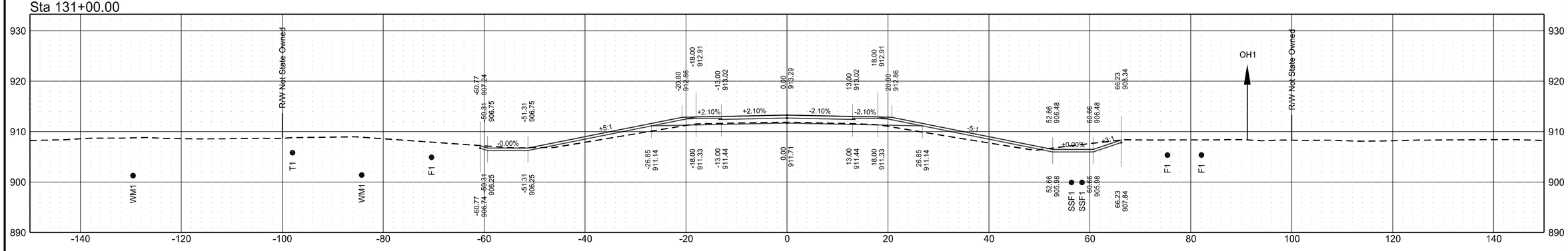
Sta 133+00.00



Sta 132+00.00



Sta 131+00.00



Align: Ex_CR81

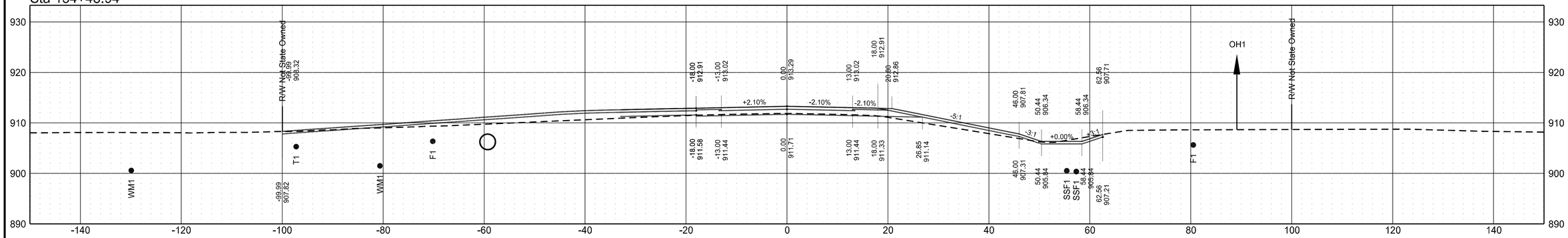
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	17

Legend

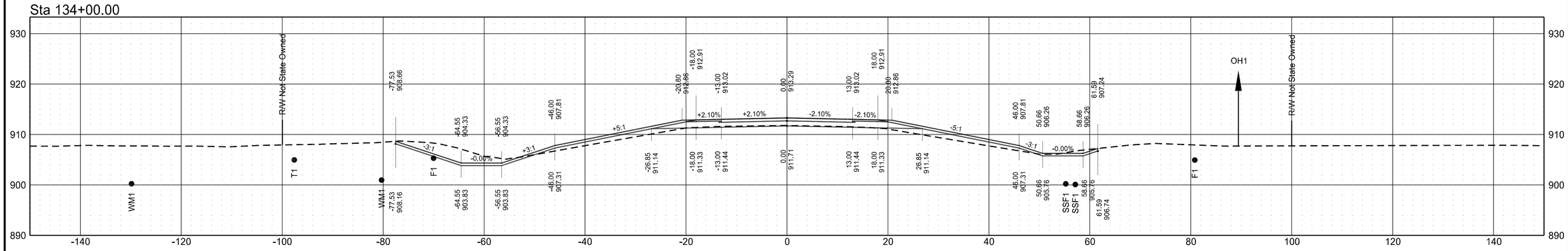
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

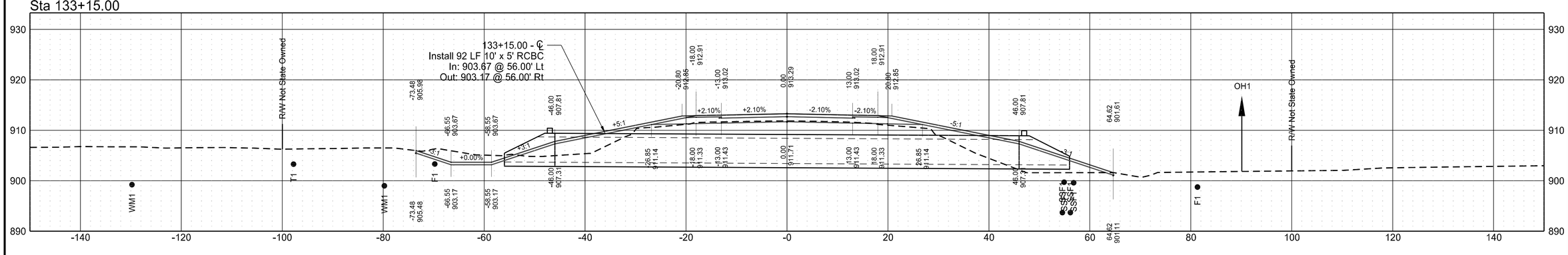
Sta 134+48.94



Sta 134+00.00



Sta 133+15.00



Align: Ex_CR81

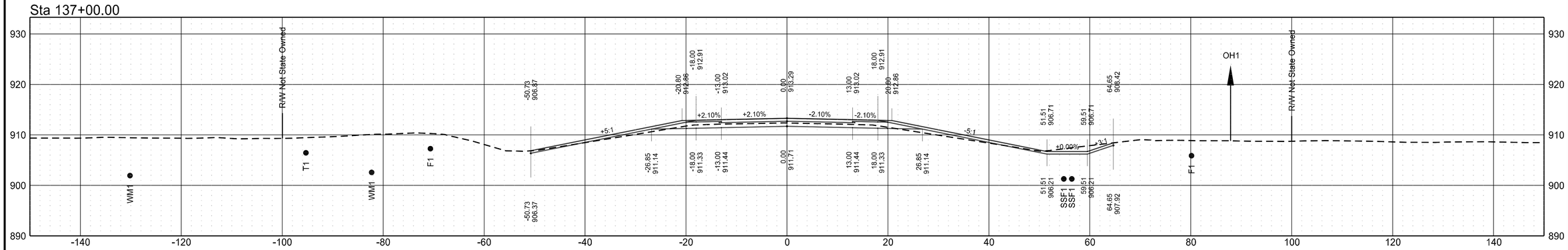
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	18

Legend

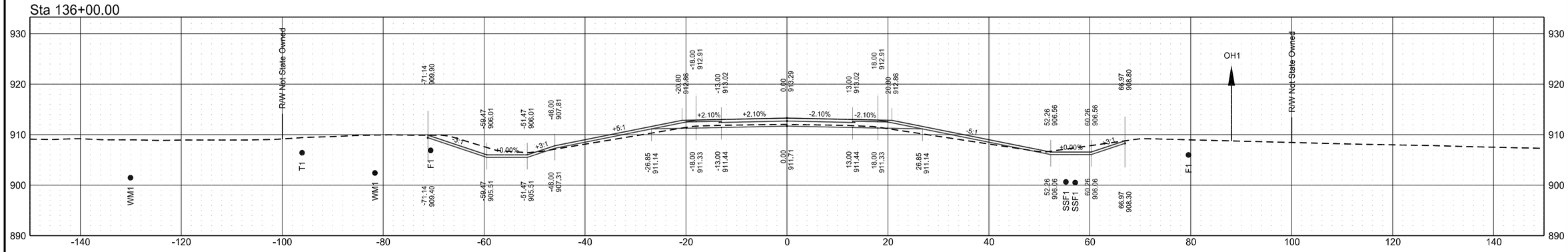
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

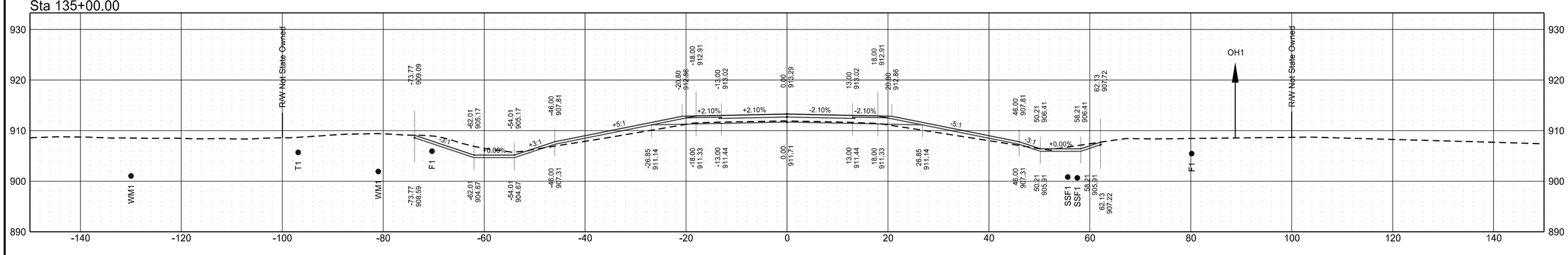
Sta 137+00.00



Sta 136+00.00



Sta 135+00.00



Align: Ex_CR81

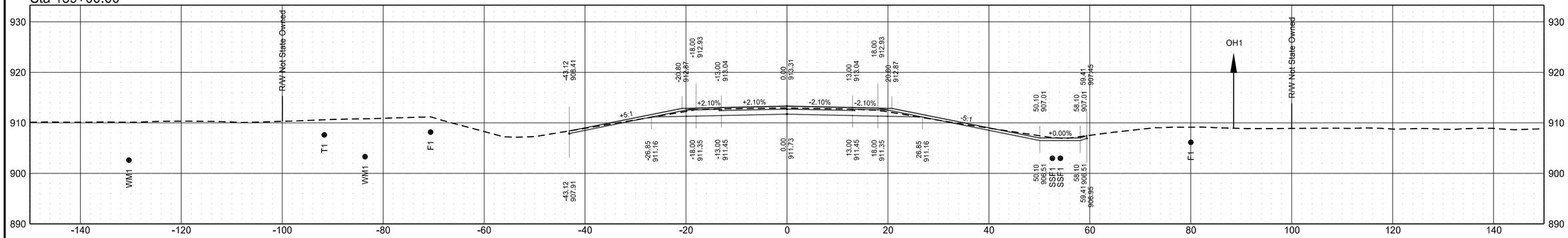
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	19

Legend

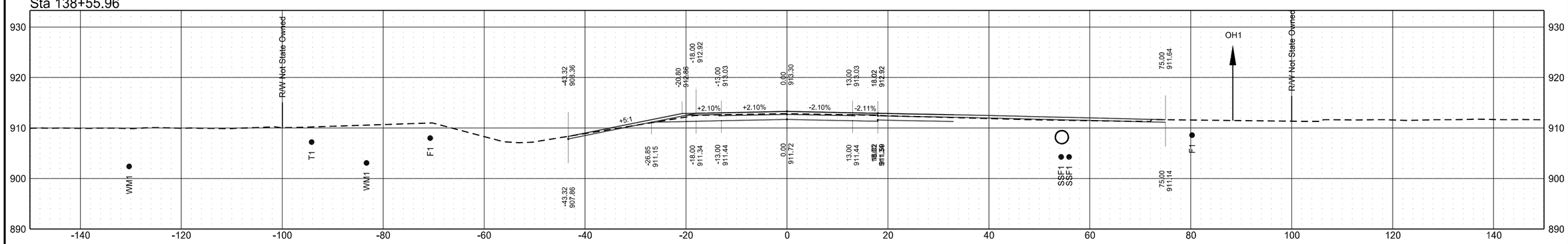
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

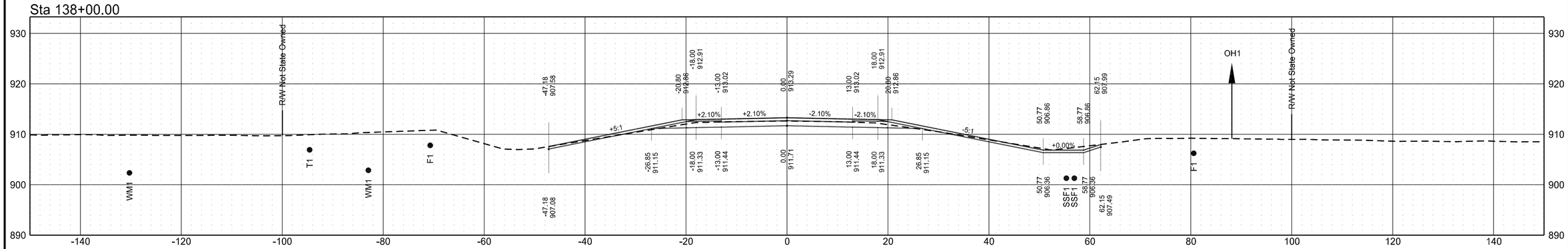
Sta 139+00.00



Sta 138+55.96



Sta 138+00.00



Align: Ex_CR81

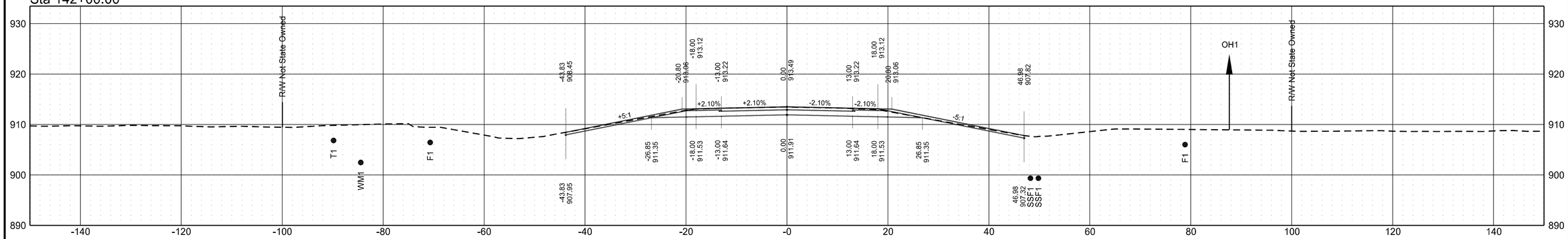
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	20

Legend

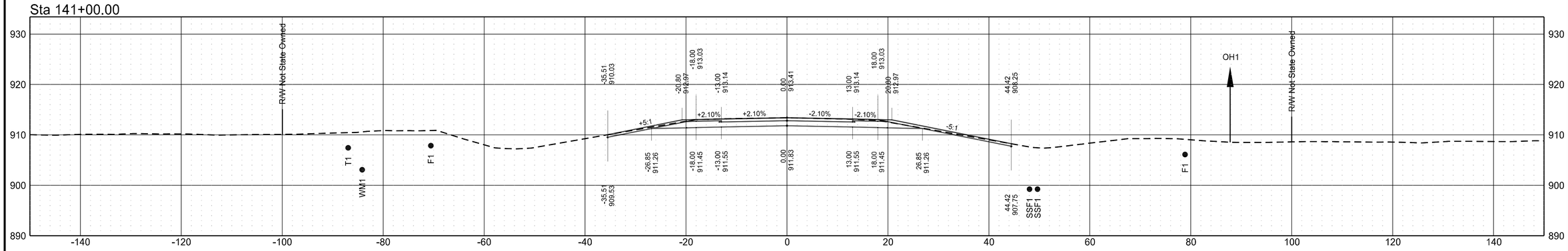
- - - - - Existing ground from preconstruction survey (for reference only)

– – – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

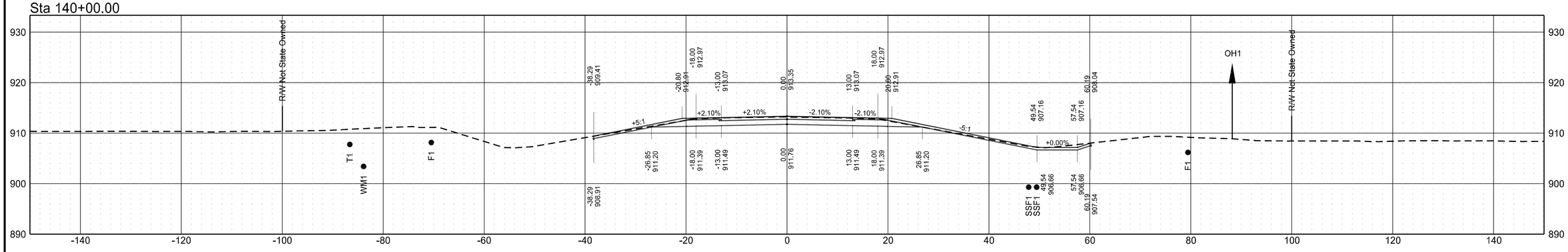
Sta 142+00.00



Sta 141+00.00



Sta 140+00.00



Align: Ex_CR81

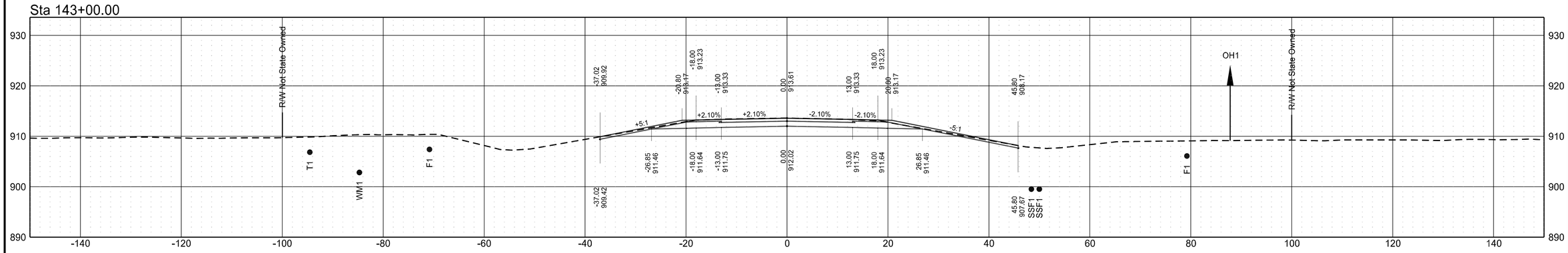
STATE	SOLICITATION NO.	SECTION NO.	SHEET NO.
ND	W912ES23B0016	200	21

Legend

– – – – – Existing ground from preconstruction survey (for reference only)

– – – – – Existing ground consisting of preconstruction survey and Reach SE-3 design as shown in Volume 1

Sta 143+00.00



NDDOT ABBREVIATIONS

D-101-1

?	This is a special text character used in the labeling of existing features. It indicates a feature that has an unknown characteristic, potentially based on: lack of description, location accuracy or purpose.
Abn	abandoned
Abut	abutment
Adj	adjusted
Aggr	aggregate
Ahd	ahead
ARV	air release valve
Align	alignment
Al	alley
Alt	alternate
Alum	aluminum
ADA	Americans with Disabilities Act
&	and
Appr	approach
Approx	approximate
ACP	asbestos cement pipe
Asph	asphalt
AC	asphalt cement
Assmd	assumed
@	at
Atten	attenuation
ATR	automatic traffic recorder
Ave	Avenue
Avg	average
ADT	average daily traffic
Bk	back
BF	back face
Balc	balcony
B Wire	barbed wire
Barr	barricade
Btry	battery
BI	beehive inlet
Beg	begin
BG	below grade
BM	bench mark
Bkwy	bikeway
Bit	bituminous
Blk	block
BH	bore hole
Bot	bottom
Blvd	Boulevard
Bndry	boundary
Brkwy	breakaway
Br	bridge
Bldg	building
Bus.	business
BV	butterfly valve
Byp	bypass
C Gdrl	cable guardrail
Calc	calculate
CIP	cast iron pipe
CB	catch basin
CRS	cationic rapid setting
C Gd	cattle guard
C To C	center to center
CL or ℄	centerline
Ch	chain
Chnlk	chain-link
Ch Blk	channel block
Ch Ch	channel change
Chk	check
Chsld	chiseled
Cir	circle
Cl	class
Clnt	clean-out
Clr	clear
Cl&gr	clearing & grubbing
Comb.	combination
Coml	commercial
Compr	compression
CADD	computer aided drafting & design
Conc	concrete
CECB	concrete erosion control blanket
Cond	conductor
Const	construction
Cont	continuous
CSB	continuous split barrel sample
Contr	contraction
Contr	contractor
CP	control point
Coord	coordinate
Cor	corner
Corr	corrected
CAES	corrugated aluminum end section
CAP	corrugated aluminum pipe
CMES	corrugated metal end section
CMP	corrugated metal pipe
CPVCP	corrugated poly-vinyl chloride pipe
CSES	corrugated steel end section
CSFES	corrugated steel flared end section
CSP	corrugated steel pipe
CSTES	corrugated steel traversable end section
Co	County
Crse	course
Ct	Court
Xarm	cross arm
Xbuck	cross buck
Xsec	cross sections
Xing	crossing
Xrd	crossroad
Crn	crown
Culv	culvert
C&G	curb & gutter
CI	curb inlet
CR	curb ramp
C	cut
Dd Ld	dead load
Defl	deflection
Defm	deformed
DInt	delineate
DIntr	delineator
Depr	depression
Desc	description
Det	detail
DWP	detectable warning panel
Dtr	detour
Dia or ø	diameter
Dir	direction
Dist	distance
DM	disturbed material
DB	ditch block
DG	ditch grade
Dbl	double
Dn	down
Dwg	drawing
Dr	drive
Drwy	driveway
DI	drop inlet
D	dry density
Ea	each
Esmt	easement
E	East
EB	Eastbound
Elast	elastomeric
EL	electric locker
E Mtr	electric meter
Elec	electric/al
EDM	electronic distance meter
Elev or El	elevation
Ellipt	elliptical
Emb	embankment
Emuls	emulsion/emulsified
ES	end section
Engr	engineer
ESS	environmental sensor station
Eq	equal
Evgr	evergreen
Exc	excavation
Exst	existing
Exp	expansion
Expy	Expressway
E	external of curve
Extru	extruded
FOS	factor of safety
Fed	Federal
FP	feed point
Fn	fence
Fn P	fence post
FO	fiber optic
FD	field drive
F	fill
FAA	fine aggregate angularity
FH	fire hydrant
Fl	flange
Flrd	flared
FES	flared end section
F Bcn	flashing beacon
FA	flight auger sample
FL	flow line
Ftg	footing
FM	force main
Fnd	found
Fdn	foundation
Frac	fractional
Frwy	freeway
Frt	front
FF	front face
F Disp	fuel dispenser
FFP	fuel filler pipes
FLS	fuel leak sensor
Furn	furnish/ed

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

07-01-14

REVISIONS

DATE	CHANGE
04-23-18	General Revisions
09-20-18	General Revisions
12-18-20	General Revisions
08-16-22	General Revisions

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

08/16/22

NDDOT ABBREVIATIONS

D-101-2

Galv	galvanized
Gar	garage
Gs L	gas line
G Reg	gas line regulator
GMV	gas main valve
G Mtr	gas meter
GSV	gas service valve
GVP	gas vent pipe
GV	gate valve
Ga	gauge
Gov	government
Grd	graded/grade
Grnd	ground
GWM	ground water monitor
Gdrl	guardrail
Gtr	gutter
H Plg	H piling
Hdwl	headwall
Ht	height
Hel	helical
HDPE	high density polyethylene
HM	high mast
HP	high pressure
HPS	high pressure sodium
HTCG	high tension cable guardrail
Hwy	highway
Hor	horizontal
HBP	hot bituminous pavement
HMA	hot mix asphalt
Hyd	hydrant
Ph	hydrogen ion content
Id	identification
Incl	inclinometer tube
IMH	inlet manhole
ID	inside diameter
Inst	instrument
Intchg	interchange
Intmdt	intermediate
Intscn	intersection
Inv	invert
IP	iron pipe
Jt	joint
Jct	junction

Ln	lane
Lg	large
Lat	latitude
Lt	left
Lens	lenses
Lvl	level
Lvlng	leveling
Lht	light
LP	light pole
Ltg	lighting
Liq	liquid
LL	liquid limit
Loc	location
Long.	longitude
Lp	loop
LD	loop detector
Lum	luminaire
Mb	mailbox
ML	main line
MH	manhole
Mkd	marked
Mkr	marker
Mkg	marking
MA	mast arm
Matl	material
Max	maximum
MC	meander corner
Meas	measure
Mdn	median
MD	median drain
MC	medium curing
MGS	Midwest Guardrail System
MM	mile marker
MP	mile post
Min	minimum
Misc	miscellaneous
Mon	monument
Mnd	mound
Mtbl	mountable
Mtd	mounted
Mtg	mounting
Mk	muck
Neop	neoprene
Ntwk	network
N	North
NE	North East
NW	North West
NB	Northbound
No. or #	number

Obsc	obscure(d)
Ocpd	occupied
Ocpy	occupy
O/s	offset
OC	on center
C	one dimensional consolidation
OC	organic content
Orig	original
O To O	out to out
OD	outside diameter
OH	overhead
PMT	pad mounted transformer
Pg	pages
Pntd	painted
Pr	pair
Pnl	panel
Pk	park
PSD	passing sight distance
Pvmt	pavement
Ped	pedestal
Ped	pedestrian
PPP	pedestrian pushbutton post
Pen.	penetration
Perf	perforated
Per.	perimeter
Perm	permanent
PL	pipeline
Pl	place
P&P	plan & profile
PL	plastic limit
Pl or ℙ	plate
Pt	point
PE	polyethylene
PVC	polyvinyl chloride
PCC	Portland Cement concrete
PP	power pole
Preempt	preemption
Prefab	prefabricated
Prfmd or Pref	preformed
Prep	preperation
Press.	pressure
PRV	pressure relief valve
Prestr	prestressed
Pvt	private
PD	private drive
Prod.	production/produce
Prog	programmed
Prop.	property
Prop Ln	property line
Ppsd	proposed
PB	pull box

Qty	quantity
Qtr	quarter
Rad or R	radius
RR	railroad
Rlwy	railway
Rsd	raised
RC	rapid curing
Rec	record
Rcy	recycle
RAP	recycled asphalt pavement
RPCC	recycled portland cement concrete
Ref	reference
R Mkr	reference marker
RM	reference monument
RP	reference point
Refl	reflectorized
RCB	reinforced concrete box
RCES	reinforced concrete end section
RCFES	reinforced concrete flared end section
RCP	reinforced concrete pipe
RCPS	reinforced concrete pipe sewer
RCTES	reinforced concrete traversable end section
Reinf	reinforcement
Res	reservation
Res	residence
Ret	retaining
Rev	reverse
Rt	right
R/W	right of way
Riv	river
Rd	road
Rdbd	road bed
Rdwy	roadway
RWIS	roadway weather information system
Rk	rock
Rt	route

NORTH DAKOTA
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REVISIONS

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NDDOT ABBREVIATIONS

D-101-3

Salv	salvage(d)
San	sanitary sewer line
Sec	section
SL	section line
Sep	separation
Seq	sequence
Serv	service
Sht	sheet
Shtng	sheeting
Shldr	shoulder
Sw or Sdwk	sidewalk
SD	sight distance
SN	sign number
Sig	signal
Sgl	single
SRCP	slotted reinforced concrete pipe
SC	slow curing
SS	slow setting
Sm	small
S	South
SE	South East
SW	South West
SB	Southbound
Sp	spaces
Spcl	special
SA	special assembly
SP	special provisions
G	specific gravity
Spk	spike
SB	split barrel sample
SH	sprinkler head
SV	sprinkler valve
Sq	square
Stk	stake
Std	standard
N	standard penetration test
Std Specs	standard specifications
Stm L	steam line
SEC	steel encased concrete
SMA	stone matrix asphalt
SSD	stopping sight distance
SD	storm drain
St	street
SPP	structural plate pipe
SPPA	structural plate pipe arch
Str	structure
Subd	subdivision
Sub	subgrade
Sub Prep	subgrade preperation
Ss	subsoil
SS	supplement specification
Supp	supplemental
Surf	surfacing
Surv	survey
Sym	symmetrical

Tel	telephone
Tel B	Telephone Booth
Tel P	telephone pole
Tv	television
Temp	temperature
Temp	temporary
TBM	temporary bench mark
T	thinwall tube sample
Ts	topsoil
Traf	traffic
TSCB	traffic signal control box
Tr	trail
Transf	transformer
Trans	transition
TT	transmission tower
TES	traversable end section
Trans	transverse
Trtd	treated
Trmt	treatment
Qc	triaxial compression
TERO	tribal employment rights ordinance
Tpl	triple
Typ	typical
Qu	unconfined compressive strength
Ugrnd	underground
Util	utility
VG	valley gutter
Vap	vapor
Vert	vertical
VCP	vitrified clay pipe
Vol	volume
VSFS	vehicle speed feedback sign
Wkwy	walkway
W	water content
WGV	water gate valve
WL	water line
WM	water main
WMV	water main valve
W Mtr	water meter
WSV	water service valve
WW	water well
Wrng	wearing
WIM	weigh in motion
W	west
WB	westbound
Wrng	wiring
W/	with
W/o	without
WC	witness corner

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NDDOT ABBREVIATIONS

MEASUREMENTS

ac	acres
A	ampere
Bd Ft	board feet
Cd	candela
cm	centimeter
C	coulomb
CF	cubic feet
m3	cubic meter
m3/s	cubic meters per second
CY	cubic yard
CY/mi	cubic yards per mile
D or Deg	degree
F	Fahrenheit
F	farad
ft	feet/foot
Gal	gallon
G	giga
Ha	hectare
H	henry
Hz	hertz
hr	hour(s)
in	inch
J	joule
K	kelvin
kN	kilo newton
kPa	kilo pascal
kg	kilogram
kg/m3	kilogram per cubic meter
km	kilometer
K	Kip(s)
LF	linear foot
L	litre
Lm	lumen
L sum	lump sum
Lx	lux
M Hr	man hour
M	mega
m	meter
m/s	meters per second
mi	mile
mL	milliliter
mm	millimeter
mm/hr	millimeters per hour
n	nano
N	newton
Pa	pascal
lb	pounds
sec	seconds
S	siemens
SF	square feet
km2	square kilometer
m2	square meter
SY	square yard
Sta Yd	station yards
SI	Systems International
T	tesla
T/mi	tons per mile
V	volt
W	watt
Wb	weber

SURVEY DESCRIPTIONS

Az	azimuth
Bs	backsight
Brg	bearing
BP Cap	blue plastic cap
BS	both sides
BC	brass cap
CS	curve to spiral
Eq	equation
E	external of curve
FS	far side
FB	field book
Fs	foresight
Geod	geodetic
GIS	Geographical Information System
GPS	Global Positioning System
HI	height of instrument
IM	iron monument
I Pn	iron pin
LS	Land Surveyor (licensed)
LSIT	Land Surveyor In Training
L	length of curve
LC	long chord
LB	level book
Mer	meridian
M	mid ordinate of curve
NGS	National Geodetic Survey
NS	near side
Obsn	observation
Off Loc	office location
OP Cap	orange plastic cap
PK	Parker-Kalon nail
P Cap	plastic cap
PP Cap	pink plastic cap
PCC	point of compound curve
PC	point of curve
PI	point of intersection
PRC	point of reverse curvature
PT	point of tangent
POC	point on curve
POT	point on tangent
RTP	random traverse point
Rge	range
RP Cap	red plastic cap
SC	spiral to curve
ST	spiral to tangent
Sta	station
SE	superelevation
Tan	tangent
T	tangent (semi)
TS	tangent to spiral
Twp	township
TB	transit book
TP	traverse point
TP	turning point
USC&G	US Coast & Geodetic Survey
USGS	US Geologic Survey
VC	vertical curve
WGS	World Geodetic System
YP Cap	yellow plastic cap
Z	zenith

SOIL TYPES

Cl	clay
Cl F	clay fill
Cl Hvy	clay heavy
Cl Lm	clay loam
Co S	coal slack
C Gr	coarse gravel
CS	coarse sand
FS	fine sand
Gr	gravel
Lig Co	lignite coal
Lig Sl	lignite slack
Lm	loam
Rk	rock
Sd	sand
Sdy Cl	sandy clay
Sdy Cl Lm	sandy clay loam
Sdy Fl	sandy fill
Sdy Lm	sandy loam
Sc	scoria
Sh	shale
Si Cl	silt clay
Si Cl Lm	silty clay loam
Si Lm	silty loam

NORTH DAKOTA
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NDDOT UTILITY COMPANY AND ORGANIZATION ABBREVIATIONS

D-101-10

702COM	702 Communications
ACCENT	Accent Communications
AGASSIZ WU	Agassiz Water Users Incorporated
AGC	Assiociated General Contractors of America
ALL PL	Alliance Pipeline
ALL SEAS WU	All Seasons Water Users Association
AMOCO PI	Amoco Pipeline Company
AMRDA HESS	Amerada Hess Corporation
AT&T	AT&T Corporation
B PAW	Bear Paw Energy Incorporated
BAKER ELEC	Baker Electric
BASIN ELEC	Basin Electric Cooperative Incorporated
BEK TEL	Bek Communications Cooperative
BELLE PL	Belle Fourche Pipeline Company
BLM	Bureau of Land Management
BNSF	Burlington Northern Santa Fe Railway
BOEING	Boeing
BRNS RWD	Barnes Rural Water District
BURK-DIV ELEC	Burke-Divide Electric Cooperative
BURL WU	Burleigh Water Users
CABLE ONE	Cable One
CABLE SERV	Cable Services
CAP ELEC	Capital Electric Cooperative Incorporat
CASS CO ELEC	Cass County Electric Cooperative
CASS RWU	Cass Rural Water Users Incorporated
CAV ELEC	Cavalier Rural Electric Cooperative
CBLCOM	Cablecom Of Fargo
CENEX PL	Cenex Pipeline
CENT PL WATER DIST	Central Pipe Line Water District
CENT PWR ELEC	Central Power Electric Cooperative
CENTURYLINK	CenturyLink
COE	Corps of Engineers
CONS TEL	Consolidated Telephone
CONT RES	Continental Resource Inc
CPR	Canadian Pacific Railway
D O E	Department Of Energy
DAK CARR	Dakota Carrier Network
DAK CENT TEL	Dakota Central Telephone
DAK RWD	Dakota Rural Water District
DGC	Dakota Gasification Company
DICKEY R NET	Dickey Rural Networks
DICKEY RWU	Dickey Rural Water Users Association
DICKEY TEL	Dickey Telephone
DNRR	Dakota Northern Railroad
DOME PL	Dome Pipeline Company
DVELEC	Dakota Valley Electric Cooperative
DVMW	Dakota, Missouri Valley & Western
ENBRDG	Enbridge Pipelines Incorporated
ENVENTIS	Enventis Telephone
EQUINOR	Equinor Pipeline
FALK MNG	Falkirk Mining Company
FHWA	Federal Highway Administration
G FKS-TRL WD	Grand Forks-traill Water District
GETTY TRD & TRAN	Getty Trading & Transportation
GLDN W ELEC	Golden West Electric Cooperative
GRGS CO TEL	Griggs County Telephone
GTR RAMSEY WD	Greater Ramsey Water District
GT PLNS NAT GAS	Great Plains Natural Gas Company
HALS TEL	Halstad Telephone Company
IDEA1	Idea1
INT-COMM TEL	Inter-Community Telephone Company
KANEB PL	Kaneb Pipeline Company
KEM ELEC	Kem Electric Cooperative Incorporated
KOCH GATH SYS	Koch Gathering Systems Incorporated
LKHD PL	Lakehead Pipeline Company
LNGDN RWU	Langdon Rural Water Users Incorporated
LWR YELL R ELEC	Lower Yellowstone Rural Electric
MCKNZ CON	McKenzie Consolidated Telcom
MCKNZ ELEC	McKenzie Electric Cooperative
MCKNZ WRD	McKenzie County Water Resource District
MCLEOD	McLeod USA
MCLN ELEC	McLean Electric Cooperative
MCLN-SHRDN R WAT	McLean-Sheridan Rural Water
MDU	Montana-dakota Utilities
MIDCO	MidContinent Communications
MIDSTATE TEL	Midstate Telephone Company
MINOT CABLE	Minot Cable Television
MINOT TEL	Minot Telephone Company
MISS VALL COMM	Missouri Valley Communications
MISS W W S	Missouri West Water System
MNKOTA PWR	Minnkota Power
MOR-GRAN-SOU ELEC	Mor-gran-sou Electric Cooperative
MOUNT-WILLI ELEC	Mountrail-williams Electric Cooperative
MRE LBTY TEL	Moore & Liberty Telephone
MUNICIPAL	City Water And Sewer
MUNICIPAL	City Of '.....'
N CENT ELEC	North Central Electric Cooperative
N VALL W DIST	North Valley Water District
ND PKS & REC	North Dakota Parks And Recreation
ND TEL	North Dakota Telephone Company
NDDOT	North Dakota Department of Transportation
NDSU SOIL SCI DEPT	NDSU Soil Science Department
NEMONT TEL	Nemont Telephone
NODAK R ELEC	Nodak Rural Electric Cooperative
NOON FRMS TEL	Noonan Farmers Telephone Company
NPR	Northern Plains Railroad
NSP	Northern States Power
NTH PRAIR RW	Northern Prairie Rural Water Association
NTHN BRDR PL	Northern Border Pipeline
NTHN PLNS ELEC	Northern Plains Electric Cooperative Incorporated
NTHWSTRN REF	Northwestern Refinery Company
NW COMM	Northwest Communication Cooperation
NWRWD	Northwest Rural Water District
ONEOK	Oneok gas
OSHA	Occupational Safety and Health Administration
OTTR TL PWR	Otter Tail Power Company
PAAP	Plains All American Pipeline
P L E M	Prairielands Energy Marketing
POLAR COM	Polar Communications
PVT ELEC	Private Electric
QWEST	Qwest Communications
R&T W SUPPLY	R & T Water Supply Association
RED RIV COMM	Red River Rural Communications
RESVTN TEL	Reservation Telephone
ROBRTS TEL	Roberts Company Telephone
R-RIDER ELEC	Roughrider Electric Cooperative
RRVW	Red River Valley & Western Railroad
S CENT REG WD	South Central Regional Water District
S E W U	South East Water Users Incorporated
SCOTT CABLE	Scott Cable Television Dickinson
SHERDN ELEC	Sheridan Electric Cooperative
SHEYN VLY ELEC	Sheyenne Valley Electric Cooperative
SKYTECH	Skyland Technologies Incorporated
SLOPE ELEC	Slope Electric Cooperative Incorporated
SOURIS RIV TELCOM	Souris River Telecommunications
ST WAT COMM	State Water Commission
STATE LN WATER	State Line Water Cooperative
STER ENG	Sterling Energy
STUT RWU	Stutsman Rural Water Users
SW PL PRJ	Southwest Pipeline Project
T M C	Turtle Mountain Communications
TCI	TCI of North Dakota
TESORO HGH PLNS PL	Tesoro High Plains Pipeline
TRI-CNTY WU	Tri-County Water Users Incorporated
TRL CO RWU	Traill County Rural Water Users
UNTD TEL	United Telephone
UPPR SOUR WUA	Upper Souris Water Users Association
US SPRINT	U.S. Sprint
USAF MSL CABLE	U.S.A.F. Missile Cable
USFWS	US Fish and Wildlife Service
USW COMM	U.S. West Communications
VRNDRY ELEC	Verendrye Electric Cooperative
W RIV TEL	West River Telephone Incorporated
WAPA	Western Area Power Administration
WAWSA	Western Area Water Supply Authority
WEB	W. E. B. Water Development Association
WILLI RWA	Williams Rural Water Association
WILSTN BAS PL	Williston Basin Interstate Pipeline Company
WLSH RWD	Walsh Water Rural Water District
WOLVRTN TEL	Wolverton Telephone
XLENER	Xcel Energy
YSVR	Yellowstone Valley Railroad

NORTH DAKOTA
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LINE STYLES

D-101-20

Existing Topography

- Existing Ground Void
- Existing Cemetary Boundary
- Existing Box Culvert Bridge
- Existing Concrete Surface
- Existing Drainage Structure
- Existing Gravel Surface
- Existing Riprap
- Existing Dirt Surface
- Existing Asphalt Surface
- Existing Tie Point Line
- Existing Railroad Centerline
- Existing Guardrail Cable
- Existing Guardrail Metal
- Existing Edge of Water
- Existing Fence
- Existing Railroad
- Existing Field Line
- Exst Flow
- Existing Curb
- Existing Valley Gutter
- Existing Driveway Gutter
- Existing Curb and Gutter
- Existing Mountable Curb and Gutter
- Existing 3-Cable w Posts
- Site Boundary
- Existing Berm, Dike, Pit, or Earth Dam
- Existing Ditch Block
- Existing Tree Boundary
- Existing Brush or Shrub Boundary
- Existing Retaining Wall
- Existing Planter or Wall
- Existing W-Beam Guardrail with Posts
- Existing Railroad Switch
- Gravel Pit - Borrow Area
- Existing Wet Area-Vegetation Break
- Existing High Tension Cable Guardrail
- Existing High Tension Cable Guardrail with Posts

Proposed Topography

- 3-Cable w Posts
- Flow
- Fence
- Remove Line
- Wall
- Retaining Wall (Plan View)
- W-Beam w Posts
- High Tension Cable Guardrail with Posts

Existing Utilities

- Existing Electrical
- Existing Fiber Optic Line
- Existing TV Fiber Optic
- Existing Gas Pipe
- Existing Overhead Utility Line
- Existing Power
- Existing Fuel Pipeline
- Existing Undefined Above Ground Pipe Line
- Existing Sanitary Sewer
- Existing Sanitary Force Main
- Existing Storm Drain
- Existing Storm Drain Force Main
- Existing Culvert
- Existing Telephone Line
- Existing TV Line
- Existing Water or Steam Line
- Existing Under Drain
- Existing Slotted Drain
- Existing Conduit
- Existing Conductor
- Existing Down Guy Wire Down Guy
- Existing Underground Vault or Lift Station

Proposed Utilities

- 24 Inch Pipe
- Reinforced Concrete Pipe
- Under Drain
- Edge Drain

Traffic Utilities

- Conductor
- Fiber Optic
- Existing Loop Detector
- Existing Double Micro Loop Detector
- Micro Loop Detector Double
- Existing Micro Loop Detector
- Micro Loop Detector
- Signal Head with Mast Arm
- Existing Signal Head with Mast Arm

Sign Structures

- Existing Overhead Sign Structure
- Existing Overhead Sign Structure Cantilever
- Overhead Sign Structure Cantilever

NORTH DAKOTA
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LINE STYLES

D-101-21

Right Of Way

- Easement
- Existing Easement
- Right of Way
- Existing Right of Way
- Existing Right of Way Railroad
- Existing Right of Way Not State Owned
- Existing Government Lot Line
- Existing Adjacent Block Lines
- Existing Adjacent Lot Lines
- Existing Adjacent Property Line
- Existing Adjacent Subdivision Lines
- Sight Distance Triangle Line
- Dimension Leader

Boundary Control

- Existing City Corporate Limits or Reservation Boundary
- Existing State or International Line
- Existing Township
- Existing County
- Existing Section Line
- Existing Quarter Section Line
- Existing Sixteenth Section Line
- Existing Centerline
- Tangent Line

Cross Sections and Typicals

- Existing Ground
- Existing Topsoil (Cross Section View)
- Void — Void — Void — V Existing Ground Void (Not Surveyed)
- Existing Concrete
- Existing Aggregate (Cross Section View)
- Existing Curb and Gutter (Cross Section View)
- Existing Asphalt (Cross Section View)
- Existing Reinforcement Rebar

Geotechnical

- D — D Geotextile Fabric Type D
- Geo — Geo Geogrid
- R — R Geotextile Fabric Type R
- R — R Geotextile Fabric Type R1
- RR — RR Geotextile Fabric Type RR
- S — S Geotextile Fabric Type S
- Subgrade Reinforcement
- Failure Line

Countours

- Depression Contours
- Supplemental Contour

Profile

- Subgrade, Subcut or Ditch Grade
- Topsoil Profile

Striping

- Centerline Pavement Marking
- Barrier with Centerline Pavement Marking
- Barrier Pavement Marking
- Stripe 4 IN Dotted Extension White
- Stripe 8 IN Dotted Extension White
- Stripe 8 IN Lane Drop

Pavement Joints

- Doweled Joint
- Tie Bar 30 Inch 4 Foot Center to Center
- Tie Bar 18 Inch 3 Foot Center to Center
- Tie Bar at Random Spacing

Bridge Details

- Small Hidden Object
- Large Hidden Object
- Phantom Object
- Existing Conditions Object
- Centerline Main
- Centerline Secondary
- Excavation Limits
- Proposed Ground
- Sheet Piling

Erosion Control

- Limits of Const Transition Line
- Bale Check
- Rock Check
- S — S Floating Silt Curtain
- SF — SF Silt Fence
- Excavation Limits
- Fiber Rolls

Environmental

- Wetland Mitigation
- Existing Wetland Easement USFWS
- Existing Wetland Jurisdictional
- Existing Wetland
- Tree Row

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SYMBOLS

D-101-30

- North Arrow (Half Scale)
- Alignment Data Point
- Alignment Monument
- Spot Elevation
- Existing Miscellaneous Spot
- Existing Access Control Arrow
- Existing Benchmark
- Reset USGS Marker
- Iron Monument Found
- Iron Pin R/W Monument
- Property Corner
- Iron Pin Reference Monument
- Right of Way Marker (Exst, Ppsd, Reset)
- Existing Federal Reference Corner
- Existing Section Corner (Full, Quarter, Sixteenth, Meander)
- Existing Witness Corner
- Existing Control Point (CP, GPS-RTK, TRI)
- Existing Traverse PI Aerial Panel
- Existing Reference Marker Point NGS
- Existing EFB Misc
- Existing Bush or Shrub
- Existing Large Evergreen Tree
- Existing Small Evergreen Tree
- Existing Large Tree
- Existing Small Tree
- Existing Tree Trunk
- Cairn or Stone Circle
- Existing Artifact
- Existing Satellite Dish
- Existing Weather Station
- Existing Windmill or Tower
- Reinforced Pavement
- CSB — Continuous Split Barrel Sample
- FA — Flight Auger Sample
- SB — Split Barrel Sample
- T — Thinwall Tube Sample
- N — Standard Penetration Test
- Inc T — Inclinometer Tube
- Excavation Unit
- Existing Ground Water Well Bore Hole

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SYMBOLS

D-101-31

Flexible Delineator

Flexible Delineator Type A (Exst, Ppsd)

Flexible Delineator Type B (Exst, Ppsd)

Flexible Delineator Type C (Exst, Ppsd)

Flexible Delineator Type D (Exst, Ppsd)

Flexible Delineator Type E (Exst, Ppsd)

Delineator Type A (Exst, Ppsd, Diamond Grade-Reset)

Delineator Type B (Exst, Ppsd, Diamond Grade-Reset)

Delineator Type C (Exst, Ppsd, Diamond Grade)

Delineator Type D (Exst, Ppsd, Diamond Grade)

Delineator Type E (Exst, Ppsd, Diamond Grade)

Barricade (Type I, Type II, Type III}

Arrow Panel (Caution Mode, Double Direction, Left Directional, Right Directional, Sequencing, Truck Mounted)

Attenuation Device

Truck Mounted Attenuator

Delineator Drums

Flagger

Tubular Marker

Traffic Cone

Back to Back Vertical Panel Sign

Highway Sign (Exst, Ppsd)

Mile Post Type A (Exst-Ppsd-Reset)

Mile Post Type B (Exst, Ppsd)

Mile Post Type C (Exst, Ppsd)

Object Marker Type I (Exst, Ppsd)

Object Marker Type II (Exst, Ppsd)

Object Marker Type III (Exst, Ppsd)

Existing Reference Marker

Road Closure Gate 18 Ft (Exst, Ppsd)

Road Closure Gate 28 Ft (Exst, Ppsd)

Road Closure Gate 40 Ft (Exst, Ppsd)

Existing Railroad Battery Box

Existing RR Profile Spot

Existing Railroad Crossbuck

Existing Railroad Frog

Existing Mailbox (Private, Federal)

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SYMBOLS

D-101-32

- Existing Luminaire
- Luminaire LED
- Existing Light Standard Luminaire
- Relocate Light Standard
- Light Standard Light LED Luminaire
- Light Standard 35 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 50 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 70 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 100 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 150 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 200 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 250 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 310 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 400 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 700 Watt High Pressure Sodium Vapor Luminaire
- Light Standard 1000 Watt High Pressure Sodium Vapor Luminaire
- Emergency Vehicle Detector
- Video Detection Camera

- High Mast Light Standard 3 Luminaire (Exst, Ppsd)
- High Mast Light Standard 4 Luminaire (Exst, Ppsd)
- High Mast Light Standard 5 Luminaire (Exst, Ppsd)
- High Mast Light Standard 6 Luminaire (Exst, Ppsd)
- High Mast Light Standard 7 Luminaire (Exst, Ppsd)
- High Mast Light Standard 8 Luminaire (Exst, Ppsd)
- High Mast Light Standard 9 Luminaire (Exst, Ppsd)
- High Mast Light Standard 10 Luminaire (Exst, Ppsd)
- Overhead Sign Structure Load Center (Exst, Ppsd)
- Traffic Signal Controller (Exst, Ppsd)
- Pad Mounted Traffic Signal Controller (Exst, Ppsd)
- Flashing Beacon (Exst, Ppsd)
- Concrete Foundation (Exst, Ppsd)
- Pipe Mounted Flasher (Exst, Ppsd)
- Pad Mounted Feed Point (Exst, Ppsd)
- Pipe Mounted Feed Point with Pad (Exst, Ppsd)
- Pole Mounted Feed Point (Exst, Ppsd)
- Junction Box (Exst, Ppsd)
- Existing Pedestrian Head with Number
- Existing Signal Head
- Pole Mounted Head
- Existing Lighting Standard Pole

- Existing Traffic Signal Standard
- Pull Box (Exst-Ppsd-Undefined)
- Intelligent Transportation Pull Box (Exst, Ppsd)
- Transformer (Exst, Ppsd)
- Power Pole (Exst-Ppsd-with Transformer)
- Wood Pole (Exst, Ppsd)
- Pedestrian Push Button Post (Exst, Ppsd)
- Existing Pole
- Existing Telephone Pole
- Existing Post
- Connection Conductor (Ground, Neutral, Phase 1, Phase 2)

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

07-01-14

REVISIONS

DATE	CHANGE
12-18-20	General Revisions

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

Kirk J Hoff

12 18 2020

SYMBOLS

D-101-33

Existing Manhole (Electrical, Gas, Telephone)

Water Manhole (Exst, Exst with Valve)

Sanitary Sewer Manhole (Exst, Ppsd, Exst with Valve)

Sanitary Force Main Manhole (Exst, Ppsd, Exst with Valve)

Storm Drain Manhole (Exst, Ppsd, Exst with Inlet, Ppsd with Inlet)

Force Main Storm Drain Manhole (Exst, Exst with Valve)

Manhole (Ppsd, Ppsd 48 Inch, Exst Undefined)

Existing Water Appurtenance

Sprinkler Head (Exst, Ppsd)

Fire Hydrant (Exst, Ppsd)

Cleanout (Exst Sanitary, Underdrain)

Existing Catch Basin Inlet (Round, Square)

Existing Curb Inlet (Round, Square)

Existing Slotted Reinforced Concrete Pipe

Catch Basin (Riser 30 Inch, Beehive, Type A)

Inlet Mountable Curb (Type A, Type B)

Inlet Saddle Base (Type 1, Type 2)

Inlet Special (Catch Basin, Type 1, Type A)

Inlet (Tee, Type 1, Type 2, Type 2 Double)

Median Drain

Headwall (Exst, Ppsd, Ppsd Single with Vegitation Barrier,
Ppsd Double with Vegitation Barrier)

Cap or Stub
Exst Gas, Exst Sanitary, Exst Storm Drain, Ppsd Storm Drain, Exst Water

Existing Pedestal
Electrical, Telephone, Fiber Optic Telephone, TV, Fiber Optic TV, Undefined

Existing Pipe Vent
Gas, Fuel, Sanitary, Storm Drain, Water, Undefined

Valve
Exst Gas, Exst Water, Ppsd Water, Exst Undefined

Pump
Sanitary, Storm Drain, Exst Water

Corrugated Metal End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)

Reinforced Concrete End Section (18, 24, 30, 36, 42, 48, 54, 60 Inch)

Existing Utility Marker

Existing Meter

Existing Fuel Dispensers

Existing Fuel Filler Pipes

Existing Fuel Leak Sensors

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

07-01-14

REVISIONS

DATE	CHANGE
12-18-20	General Revisions Sheet added - Continued from D-101-32

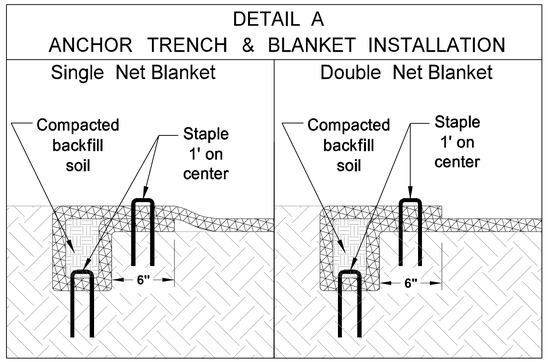
KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

Kirk J Hoff

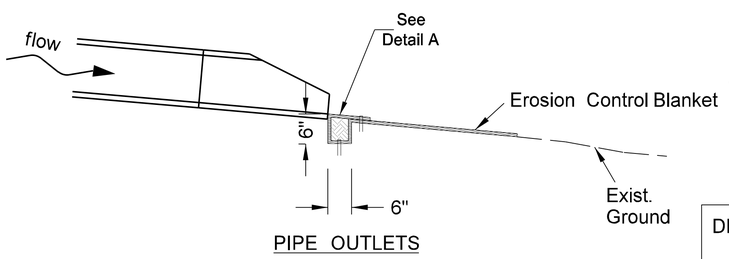
12 18 2020

D-255-2

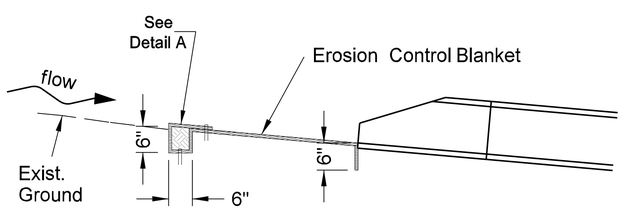
EROSION AND SILTATION CONTROL
EROSION CONTROL BLANKET INSTALLATION



NOTE:
If a Single Net Blanket is used the side with the netting should be on the top once the blanket is installed.

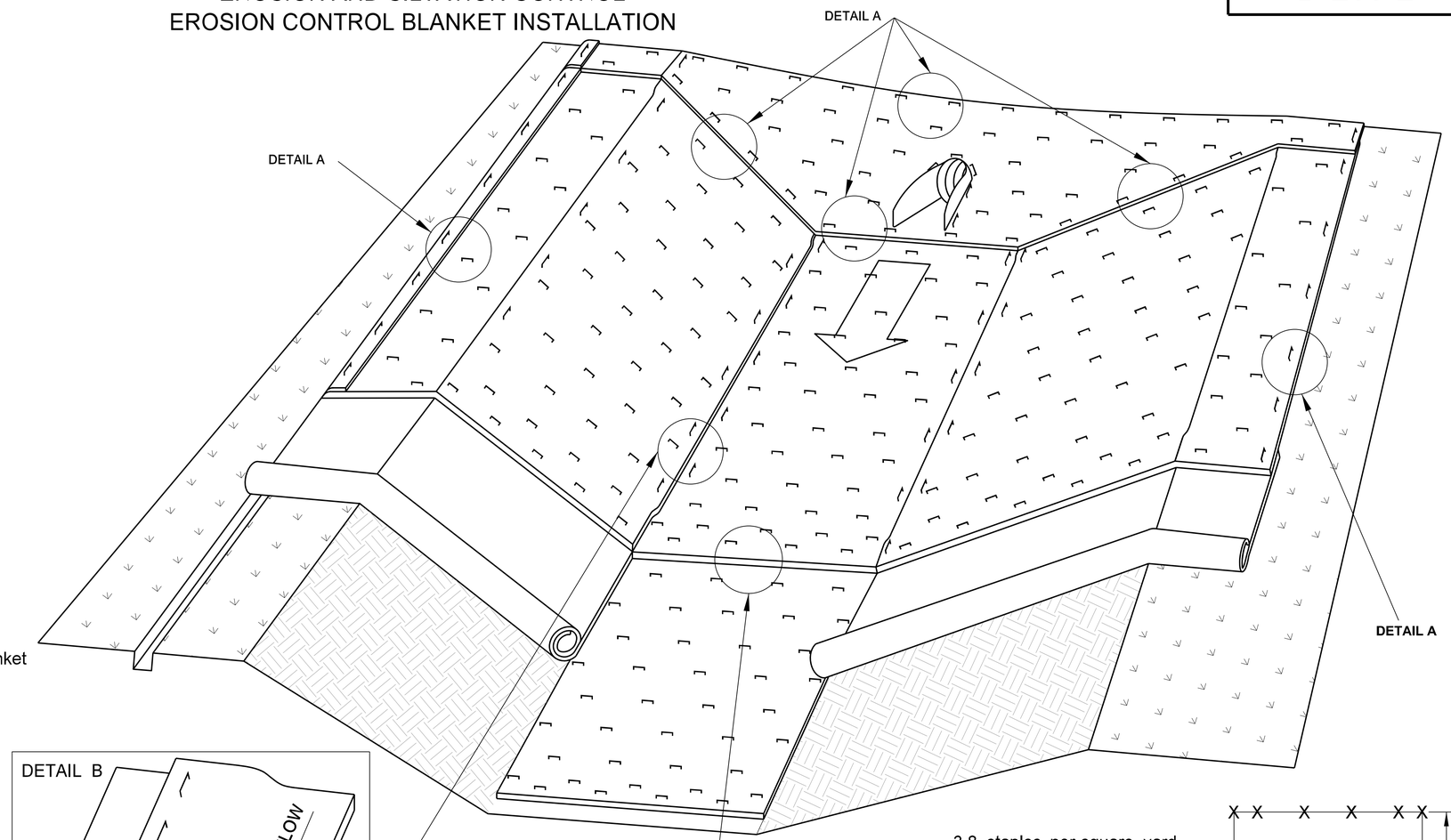


PIPE OUTLETS

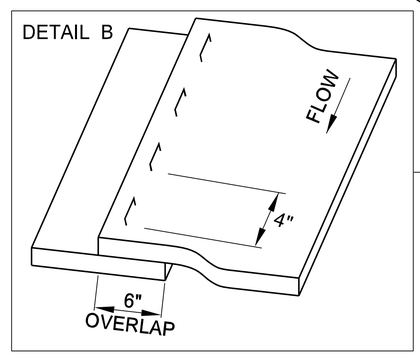


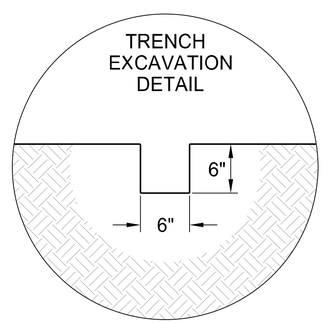
PIPE INLETS

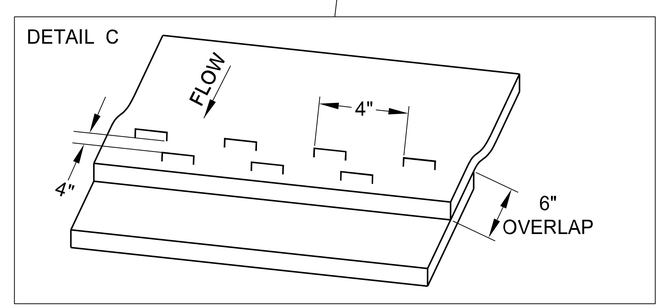
INSTALLATION AT PIPE ENDS



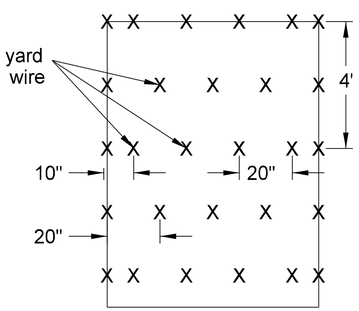
BLANKET LAYOUT
CHANNEL OR SLOPE INSTALLATION







3.8 staples per square yard using 8-inch 11 gauge wire "u" staples.



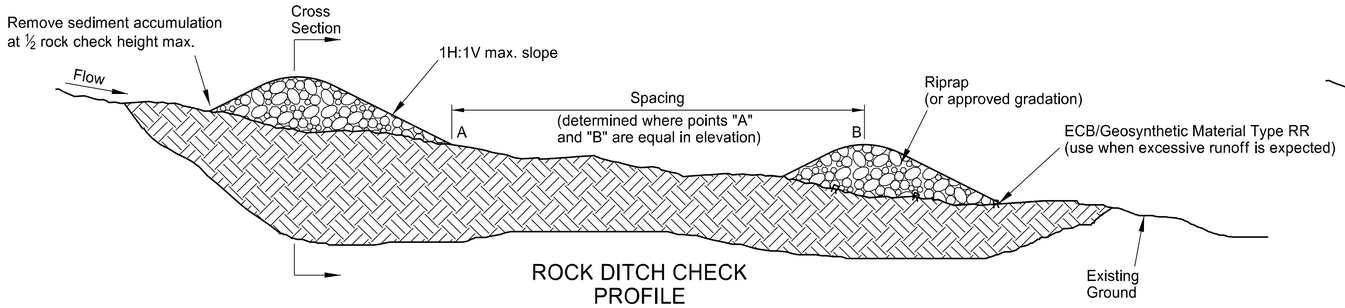
STAPLE PATTERN

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-5 to D-255-2.
07-27-15	Changed installation details such as trench depth and overlap dimensions.
08-27-19	New Design Engineer PE Stamp.

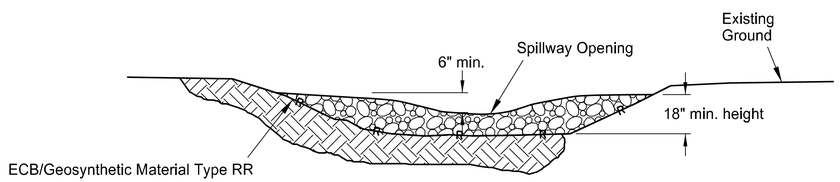
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 08/27/19 and the original document is stored at the North Dakota Department of Transportation

EROSION AND SILTATION CONTROLS

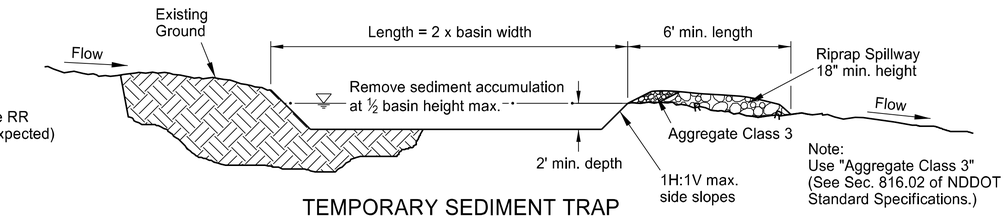
D-256-1



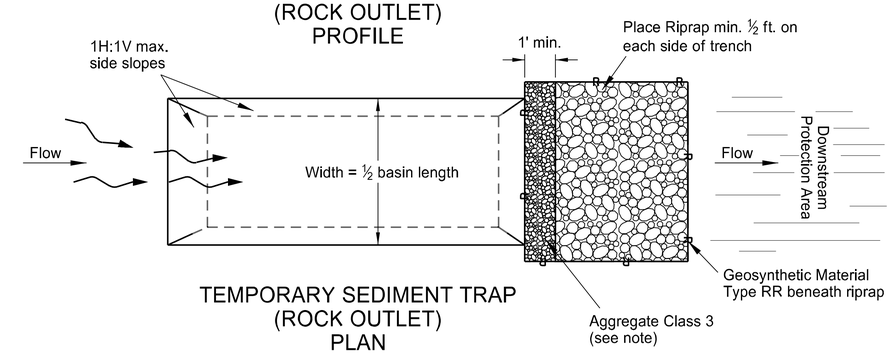
ROCK DITCH CHECK
PROFILE



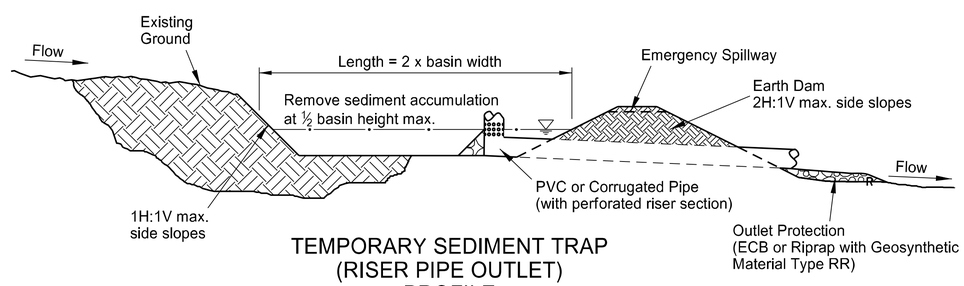
ROCK DITCH CHECK
CROSS SECTION



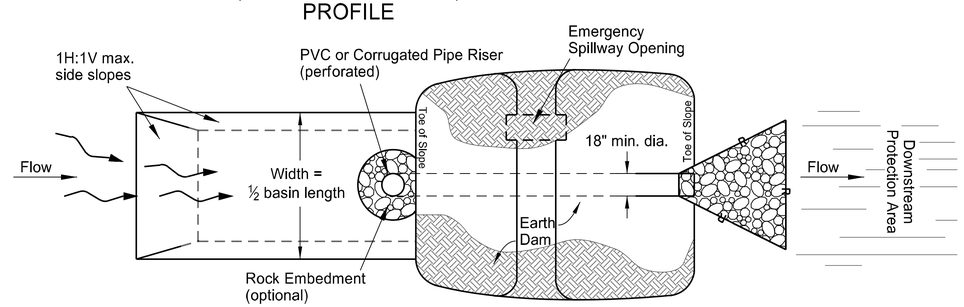
TEMPORARY SEDIMENT TRAP
(ROCK OUTLET)
PROFILE



TEMPORARY SEDIMENT TRAP
(ROCK OUTLET)
PLAN



TEMPORARY SEDIMENT TRAP
(RISER PIPE OUTLET)
PROFILE



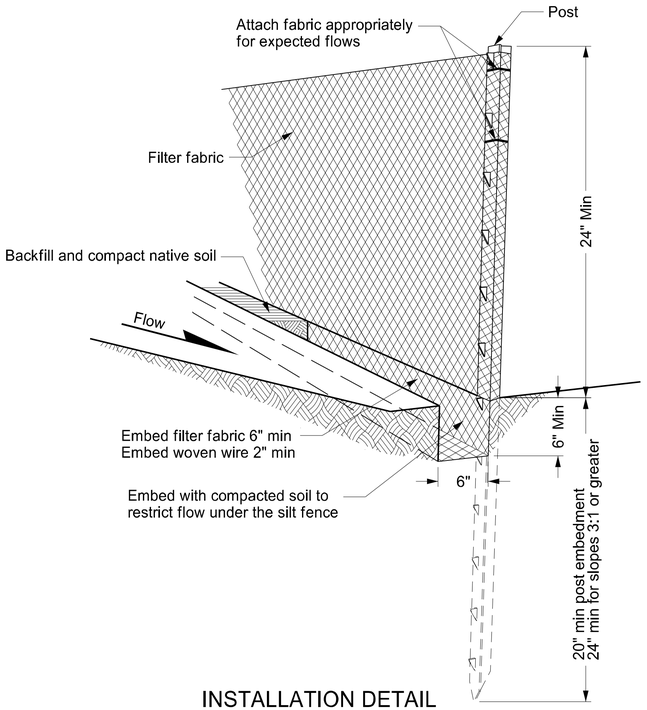
TEMPORARY SEDIMENT TRAP
(RISER PIPE OUTLET)
PLAN

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Changed standard drawing number from D-708-2 to D-256-1. Deleted silt fence details.
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 8-27-2019 and the original document is stored at the North Dakota Department of Transportation

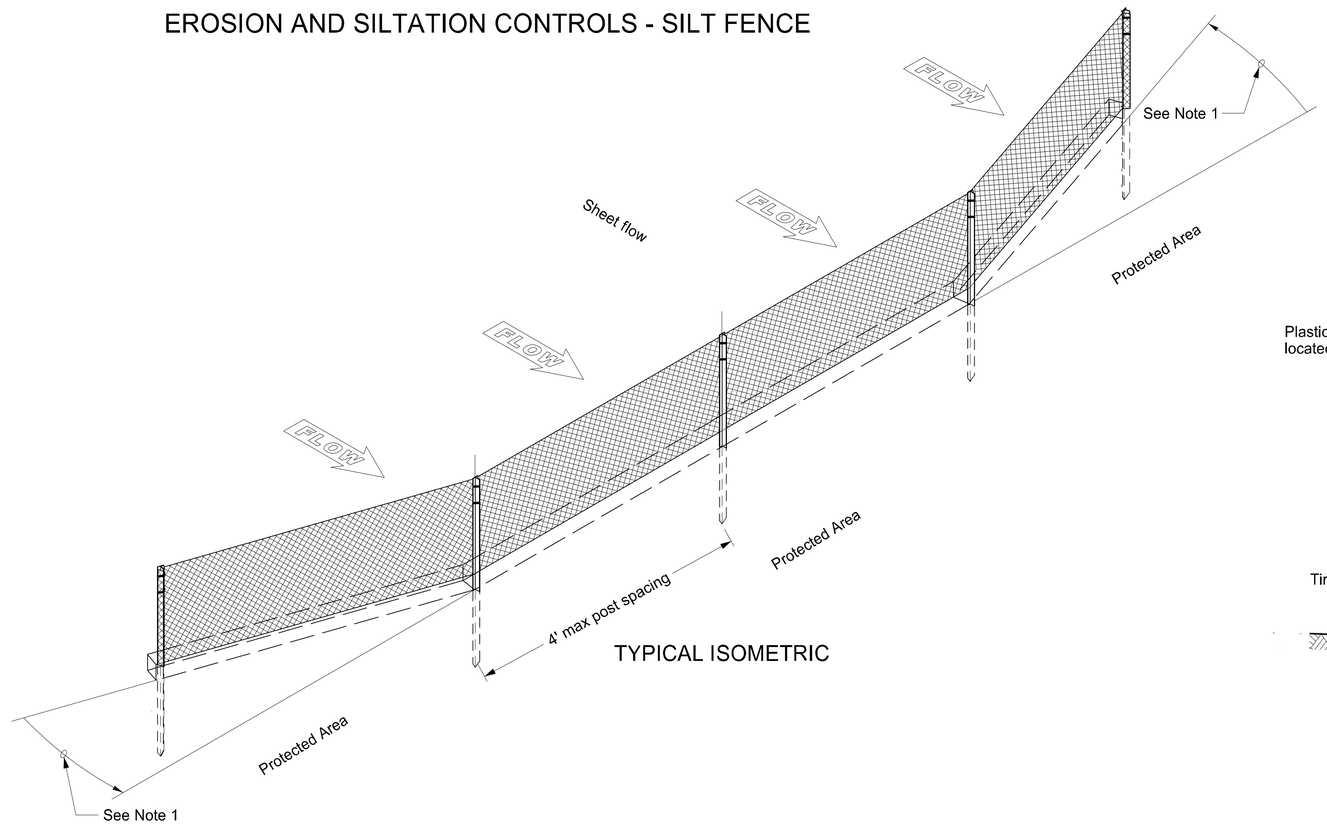
EROSION AND SILTATION CONTROLS - SILT FENCE

D-260-1

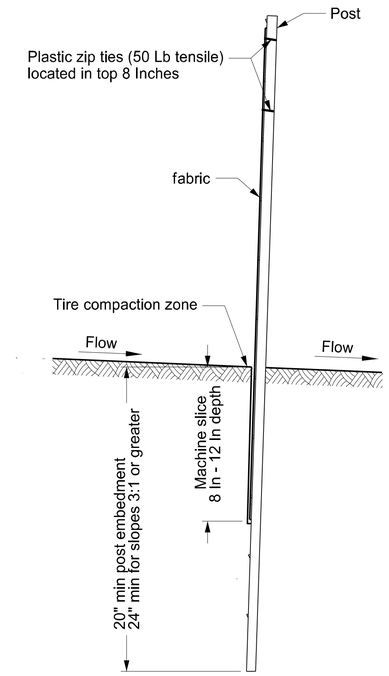


INSTALLATION DETAIL

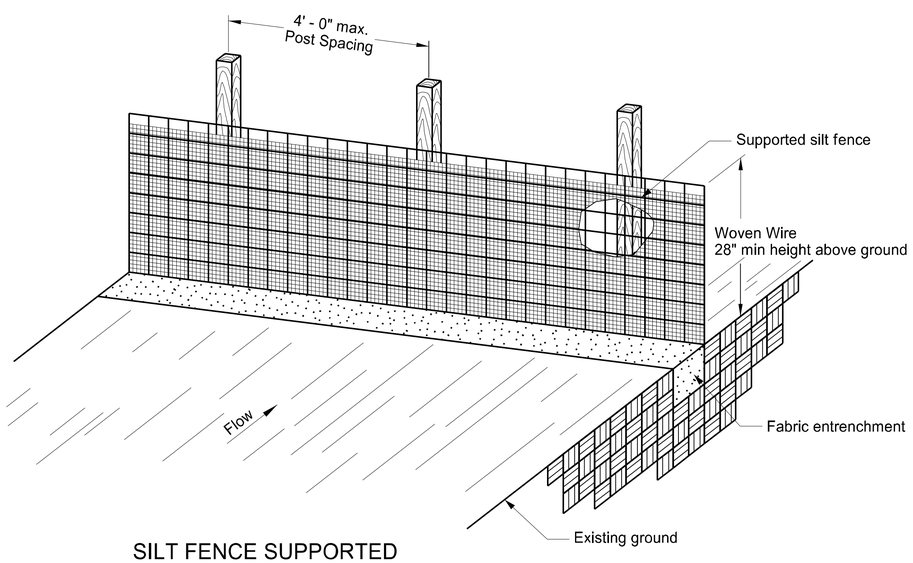
Minimize disturbance of ground around trench and smooth surface after excavation to avoid concentrating flows. Compact to prevent undercutting flows.



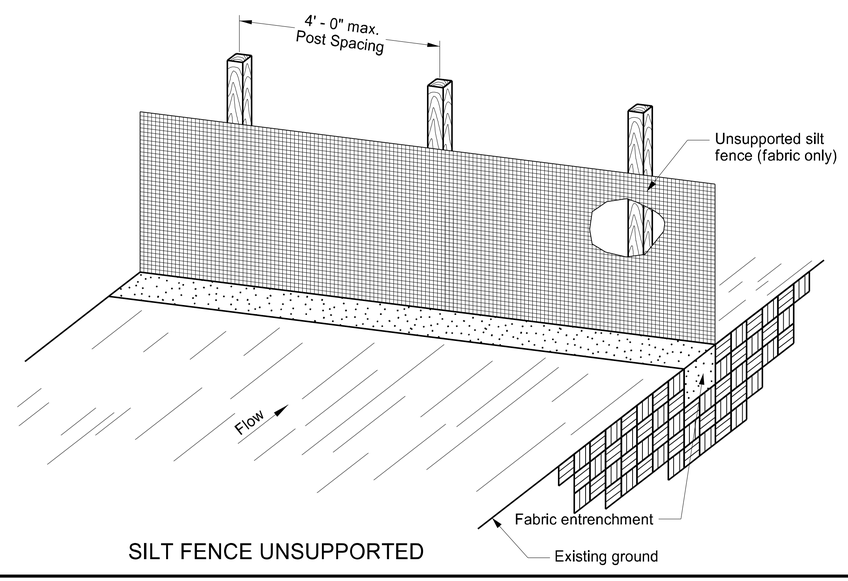
TYPICAL ISOMETRIC



MACHINE SLICED SILT FENCE



SILT FENCE SUPPORTED



SILT FENCE UNSUPPORTED

NOTES:
1. Install the ends of the silt fence to point slightly upslope to prevent sediment from flowing around the ends of the fence.
2. Place splices outside low spots.
3. Install silt fencing parallel to contour lines.
4. Do not embed silt fence when placed in standing water.
5. Silt fence material does not need to reach the top of woven wire support.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-03-13

REVISIONS

DATE	CHANGE
06-26-14	Standard drawing resulted from splitting standard D-708-2.
06-27-16	Revised details & added new ones.
08-27-19	New Design Engineer PE Stamp.

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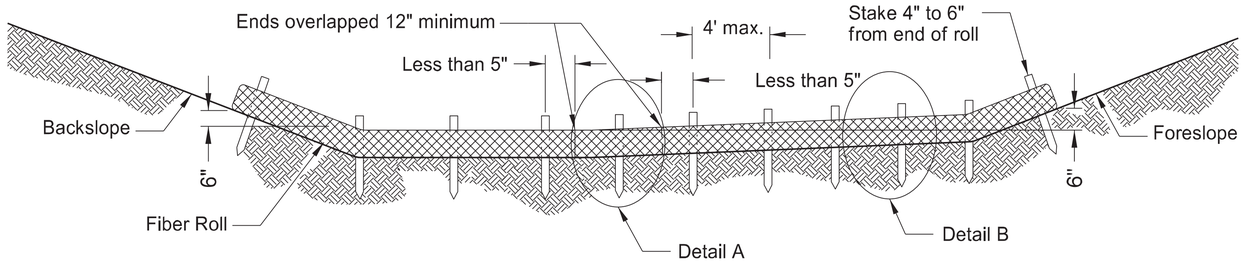
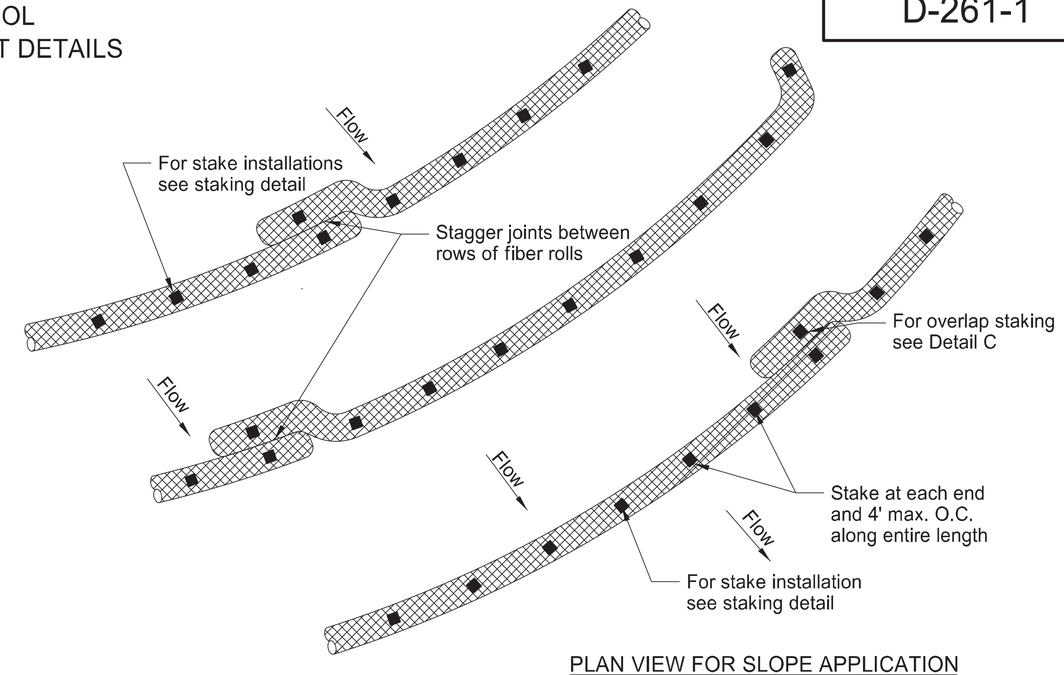
EROSION CONTROL
FIBER ROLL PLACEMENT DETAILS

D-261-1

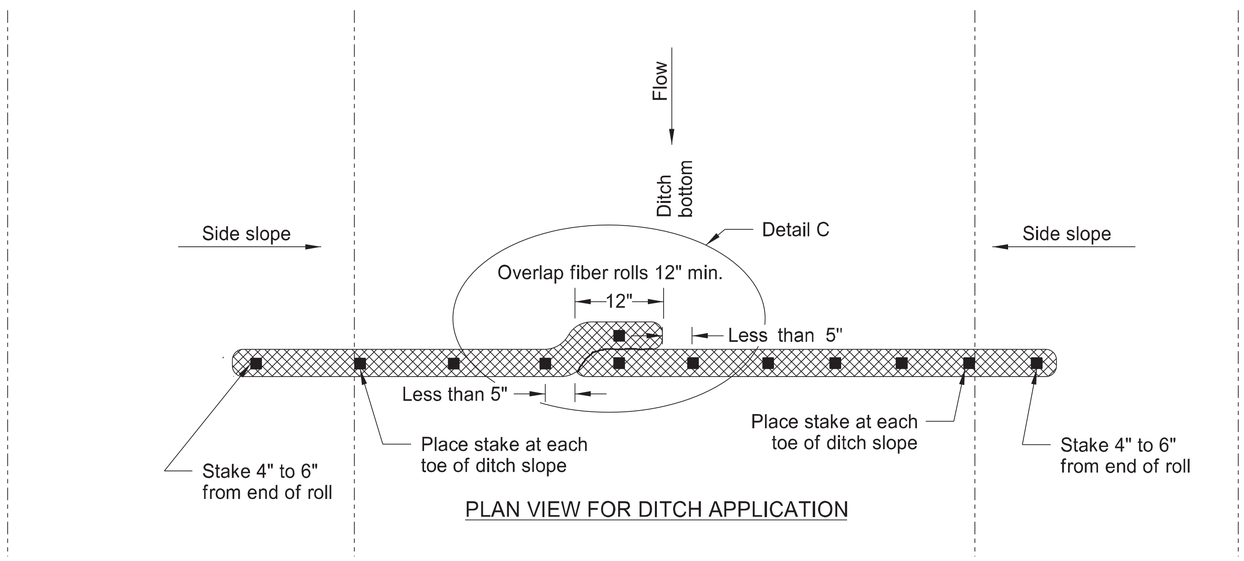


12 OR 20 INCH FIBER ROLL - DITCH BOTTOM

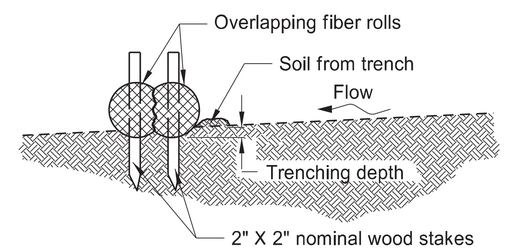


PLAN VIEW FOR SLOPE APPLICATION

Ensure fiber rolls are placed along the contours of the slope.

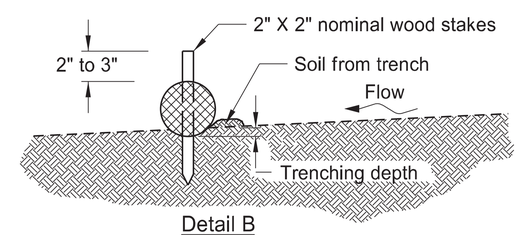


PLAN VIEW FOR DITCH APPLICATION



Detail A

Fiber Roll Overlapping Staking Detail



Detail B

Fiber Roll Staking Detail

FIBER ROLL DIAMETER	NOMINAL STAKE SIZE	MINIMUM STAKE LENGTH	MINIMUM TRENCH DEPTH	MAXIMUM TRENCH DEPTH
6"	2" x 2"	18"	2"	2"
12"	2" x 2"	24"	2"	3"
20"	2" x 2"	36"	3"	5"

NOTE: Runoff must not be allowed to run under or around roll.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

11-18-10

REVISIONS

DATE	CHANGE
06-10-13	Added plan view for ditch and slope application. Added table with values for stake and trench dimensions.
10-04-13	Revised fiber roll overlap detail.
06-26-14	Changed standard drawing number from D-708-7 to D-261-1.
08-27-19	New Design Engineer PE Stamp
04-22-24	Slope Plan View-Overlap Change.

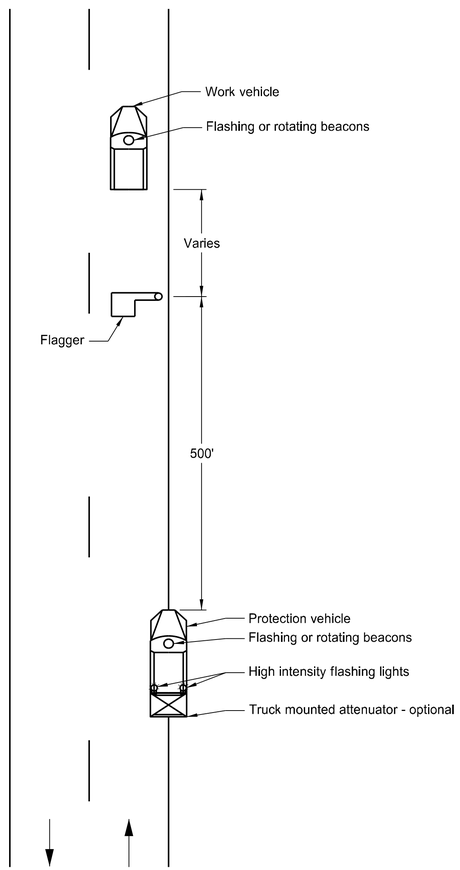
KIRK J. HOFF REGISTERED PROFESSIONAL ENGINEER PE-4683 NORTH DAKOTA

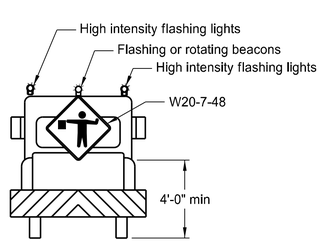
04/22/24

TRAFFIC CONTROL FOR CORING OF HOT BITUMINOUS PAVEMENT

D-704-2

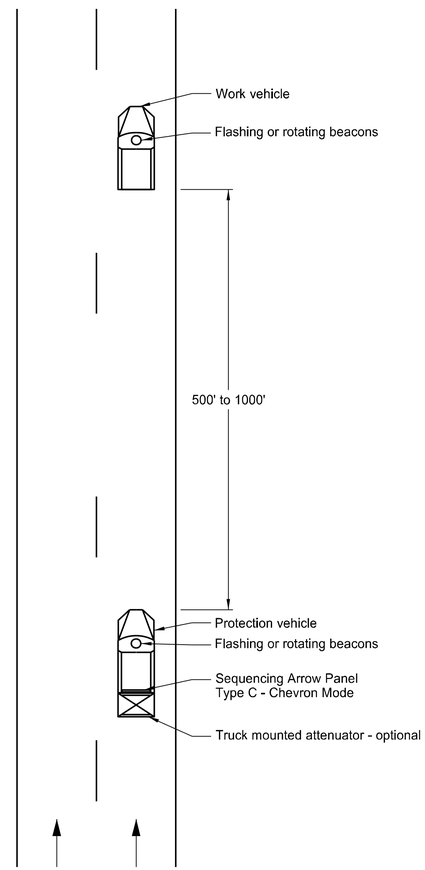
Two Lane, Two Way Roadways

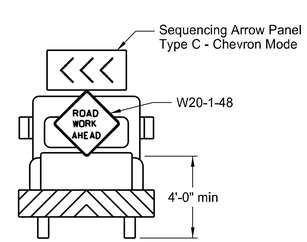




Typical Protection Vehicle

Multilane Roadways





Typical Protection Vehicle

Notes:

1. Display a 360 degree rotating, flashing, oscillating or strobe light on the working vehicle.

2. Display a 360 degree rotating, flashing, oscillating or strobe light on the shadow vehicle. Operate a sequencing arrow panel Type C in chevron mode on the shadow vehicle for Multilane Roadway.

3. Use these layouts during daylight hours and in areas of good visibility only.

4. Use flagger to protect the work area and warn oncoming traffic for two lane, two way roadway.

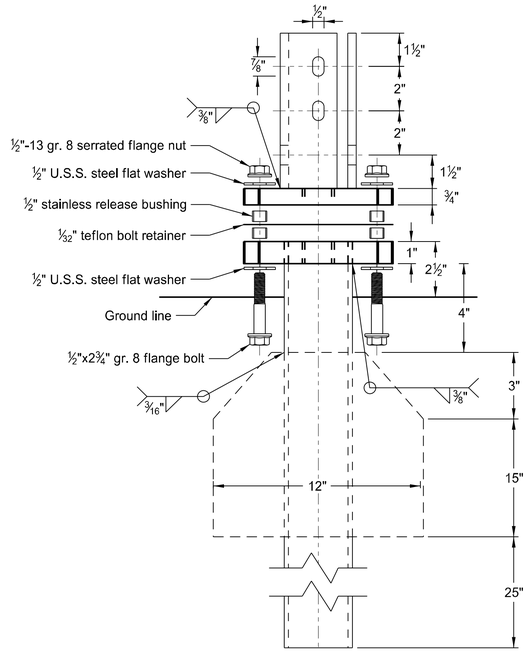
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 10/03/19 and the original document is stored at the North Dakota Department of Transportation

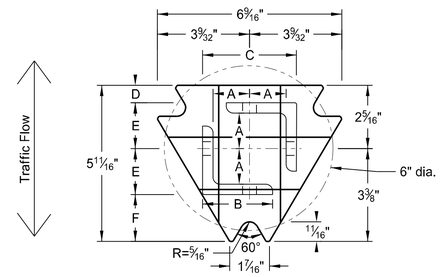
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-7

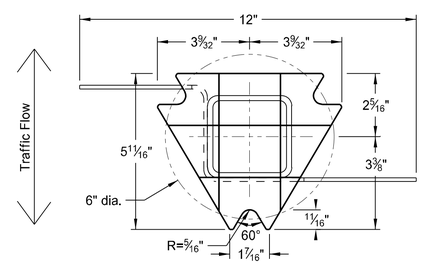
Perforated Tube



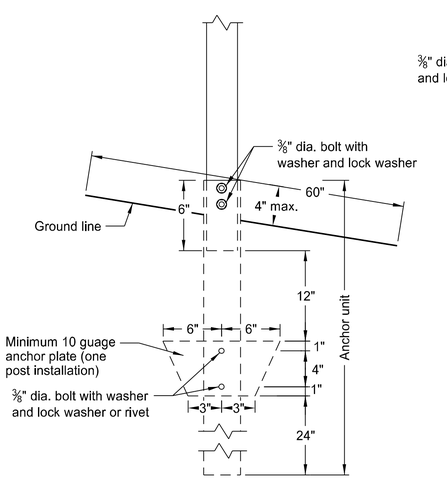
Multi-Directional
Slip Base Assembly



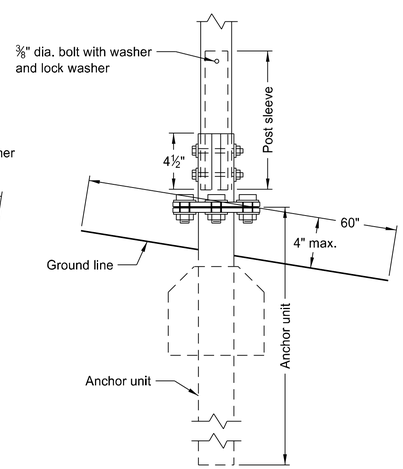
Top Post Receiver
Plate - ASTM A572 grade 50
Angle Receiver - 2½"x2½"x⅜" ASTM A36 structural angle



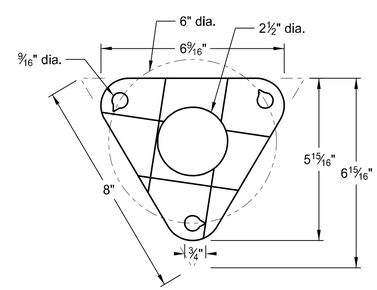
Bottom Soil Stub
Tube - 3"x3"x7 gauge ASTM A500 grade B tube
Stabilizing Wing - 7 gauge H.R.P.O. ASTM A1011
Plate - ASTM A572 grade 50



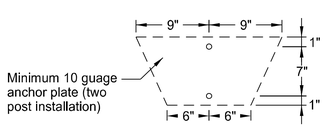
Anchor Unit and Post Assembly



Multi-Directional
Slip Base Anchor Unit
and Post Sleeve Assembly



Bolt Retainer for Base Connection
Bolt Retainer- 1/32" Reprocessed Teflon



Notes:

1. Torque slip base bolts as specified by manufacturer.
2. Use anchor with 43.9 KSI yield strength and 59.3 KSI tensile strength.
3. Provide 4" vertical clearance for anchor or breakaway base. Measure the 4"x60" measurement above and below post location and back and ahead of post.
4. In concrete sidewalk, use same anchor without wings.
5. Provide more than 7' between the first and fourth posts of a four post sign.

Telescoping Perforated Tube

Number of Posts	Post Size in.	Wall Thick-ness Gauge	Sleeve Size in.	Wall Thick-ness Gauge	Slip Base	Anchor Size without Slip Base in.
1	2	12			No	2¼
1	2¼	12			No	2½
1	2½	12			(A)	3
1	2½	10			Yes	
1	2¼	12	2	12	Yes	
1	2½	12	2¼	12	Yes	
2	2	12			No	2¼
2	2¼	12			No	2½
2	2½	12			Yes	
2	2½	12			Yes	
2	2¼	10	2	12	Yes	
2	2½	12	2¼	12	Yes	
3 & 4	2½	12			Yes	
3 & 4	2½	10			Yes	
3 & 4	2½	12	2¼	12	Yes	
3 & 4	2¼	12	2	12	Yes	
3 & 4	2½	10	2 3/16	10	Yes	

(A) Use breakaway base when support is placed in weak soils. Engineer determines if soils are weak.

(B) For additional wind load, insert the 2 3/16"x10 ga. into 2½"x10 ga.

Properties of Telescoping Perforated Tube

Tube Size in.	Wall Thickness in.	U.S. Standard Gauge	Weight per Foot lbs.	Moment of Inertia in.^{4}	Cross Sec. Area in.^{2}	Section Modulus in.^{3}
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.785

Top Post Receiver Data Table

Square Post Sizes (B)	A	B	C	D	E	F
2 3/16"x10 ga.	1 9/64"	2½"	3 1/32"	25/32"	1 33/64"	1⅞"
2½"x10 ga.	1 9/32"	2½"	3 9/16"	⅝"	1 21/32"	1¾"

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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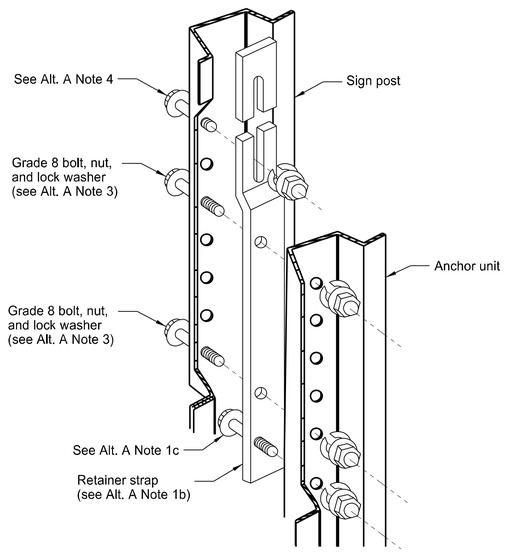
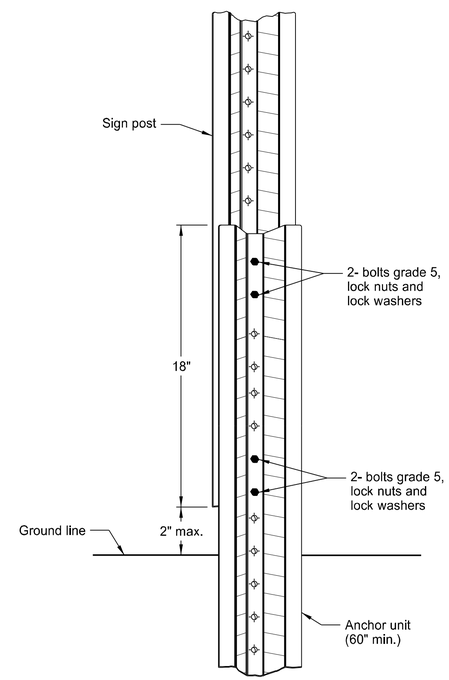
BREAKAWAY SYSTEMS FOR CONSTRUCTION ZONE SIGNS

D-704-8

U-Channel Post

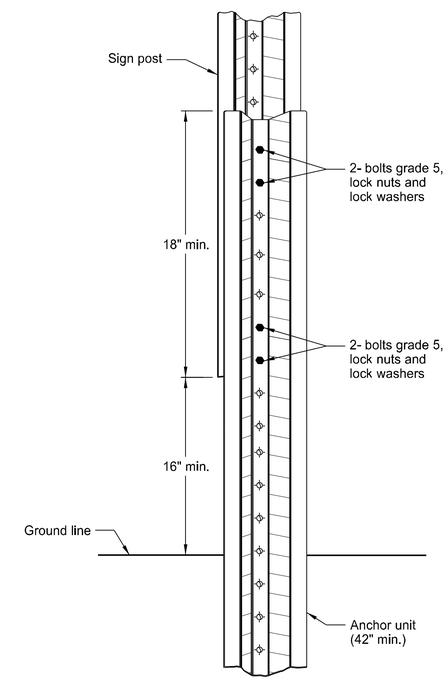


Detail A



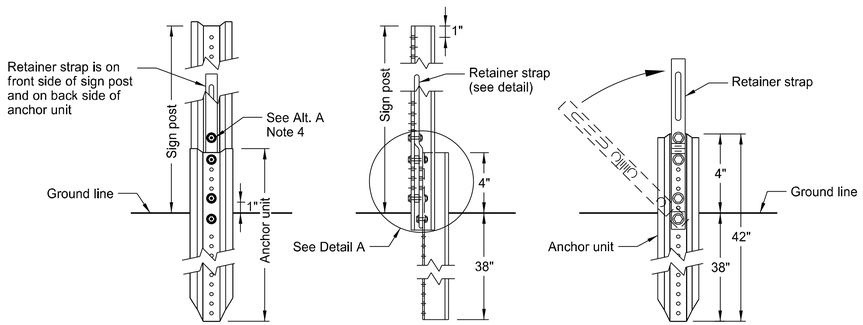
Breakaway U-Channel Splice Detail
Alternate B
(2.5 and 3 lb/ft)

Install a maximum of 3 posts within 7'.



Breakaway U-Channel Splice Detail
Alternate C
(2.5 and 3 lb/ft)

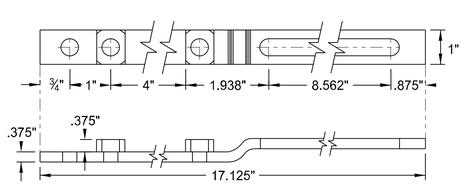
Install a maximum of 3 posts within 7'.



Front View | Side View | Back View

Breakaway U-Channel Detail
Alternate A

Install a maximum of 2 posts within 7'.



Retainer Strap Detail

Alternate A Steps of Installation:

1. a) Drive anchor unit to within 12" of ground level.
   b) Establish proper assembly by lining up bottom hole of retainer strap with 6th hole from the top of the anchor unit.
   c) Assemble strap to back of anchor unit using 5/16"x2" bolt, lock washer and nut.
   d) Rotate strap 90° to left.
2. a) Drive anchor unit to 4" above ground.
   b) Rotate strap to vertical position.
3. a) Place 5/16"x2" bolt, lock washer and nut in bottom of sign post to facilitate alignment of sign post with proper hole in anchor unit.
   b) Alternately tighten two connector bolts.
4. Complete assembly by tightening 5/16"x2" bolt (this fastens sign post to retainer strap).
5. Properly nest base post, strap, and sign post. Proper nesting occurs when all flat surfaces of the base post, strap, and sign post at the bolts have full contact across the entire width.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
2-28-14	
REVISIONS	
DATE	CHANGE
9-27-17	Updated to active voice
10-03-19	New Design Engr PE Stamp

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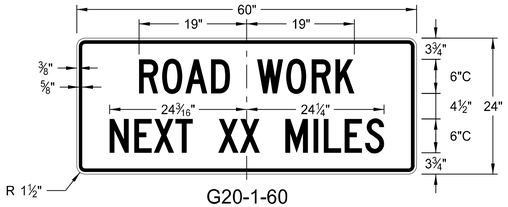
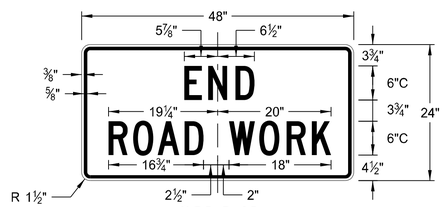
CONSTRUCTION SIGN DETAILS
TERMINAL AND GUIDE SIGNS

D-704-9

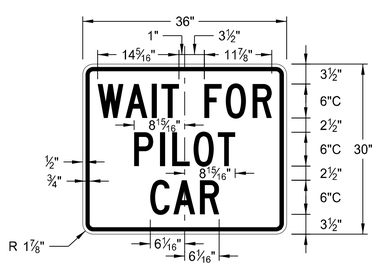


G20-1-60
Legend: black (non-refl)
Background: orange

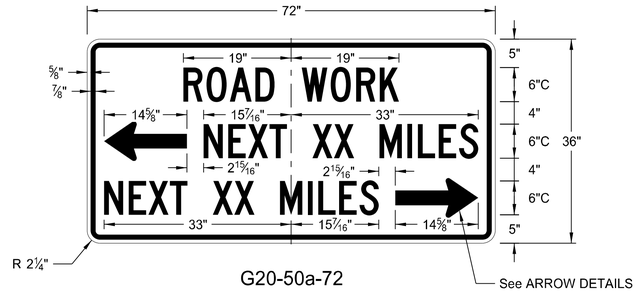
G20-1b-60
Legend: black (non-refl)
Background: orange



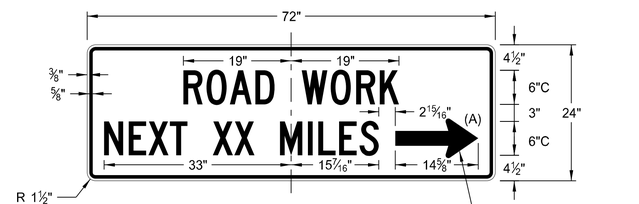
G20-2-48
Legend: black (non-refl)
Background: orange



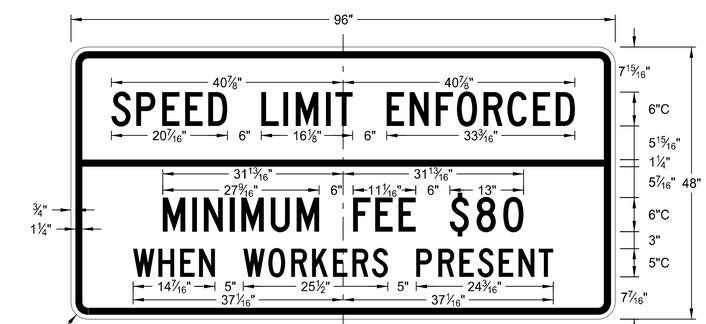
G20-4b-36
Legend: black (non-refl)
Background: orange



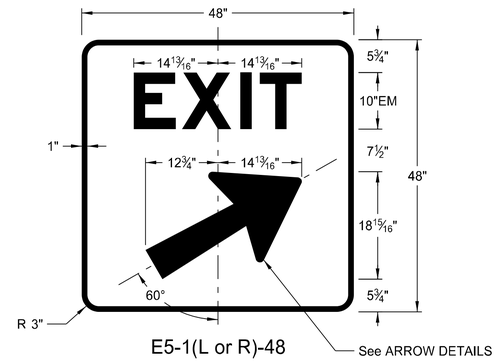
G20-50a-72
Legend: black (non-refl)
Background: orange



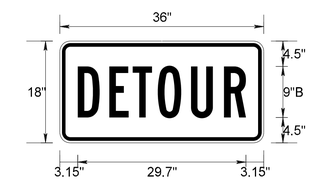
G20-52a-72
Legend: black (non-refl)
Background: orange



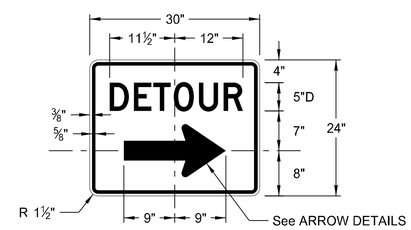
G20-55-96
Legend: black (non-refl)
Background: orange



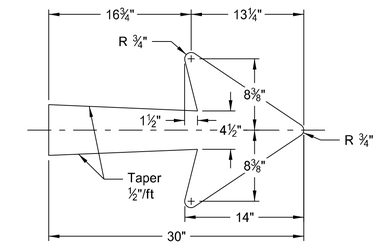
E5-1(L or R)-48
Legend: white
Background: green (orange optional)



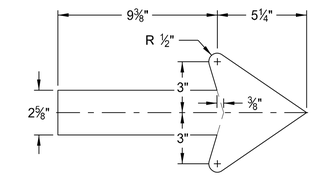
M4-8-36
Legend: black (non-refl)
Background: orange



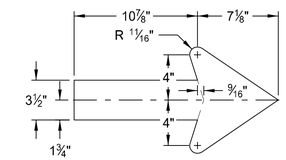
M4-9(L or R)-30 &
M4-9-30
Legend: black (non-refl)
Background: orange



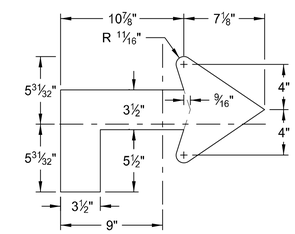
E5-1-48



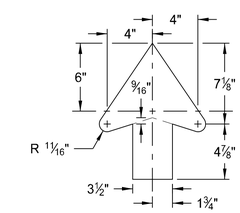
G20-50a-72
G20-52a-72



M4-9(L or R)-30
Right or Left



M4-9(L or R)-30
Advanced Right or Left



M4-9-30
Straight

ARROW DETAILS

NOTES:

(A) Arrow may be right or left of the legend to indicate construction to the right or left.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Added sign & background color
10-03-19	New Design Engineer PE Stamp

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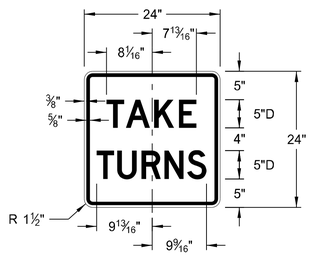
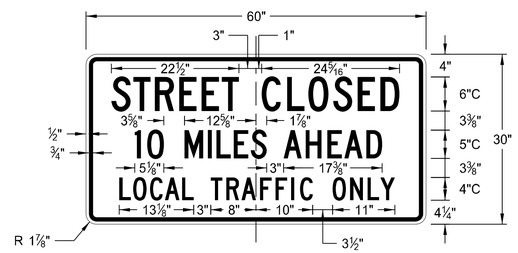
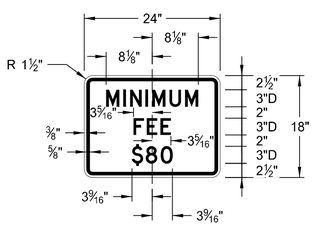
CONSTRUCTION SIGN DETAILS
REGULATORY SIGNS



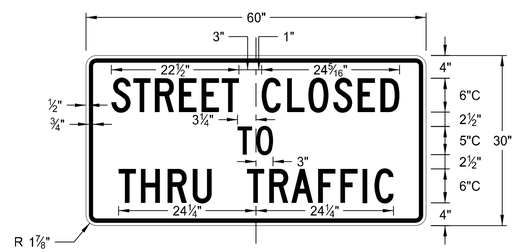
R1-50P-24
Legend: black (non-refl)
Background: white



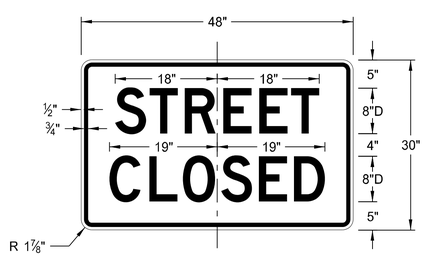
R11-3c-60
Legend: black (non-refl)
Background: white



R2-1aP-24
Legend: black (non-refl)
Background: white



R11-4a-60
Legend: black (non-refl)
Background: white



R11-2a-48
Legend: black (non-refl)
Background: white

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Revised sign number
10-03-19	New Design Engineer PE Stamp

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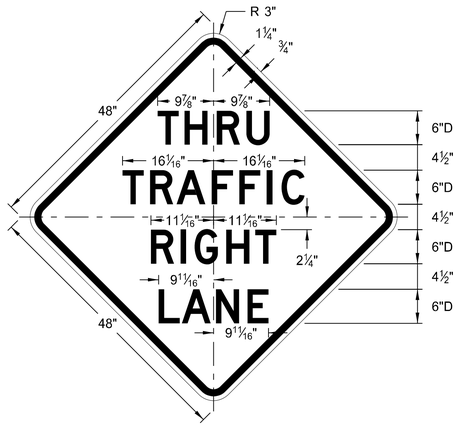
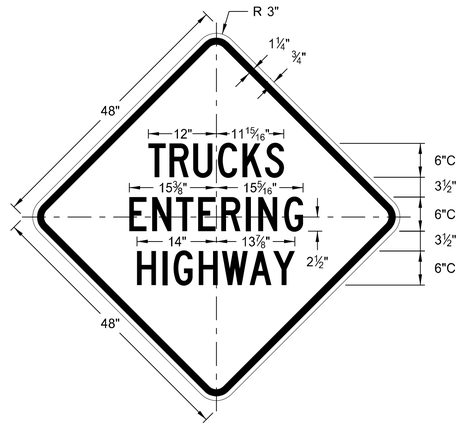
CONSTRUCTION SIGN DETAILS
WARNING SIGNS

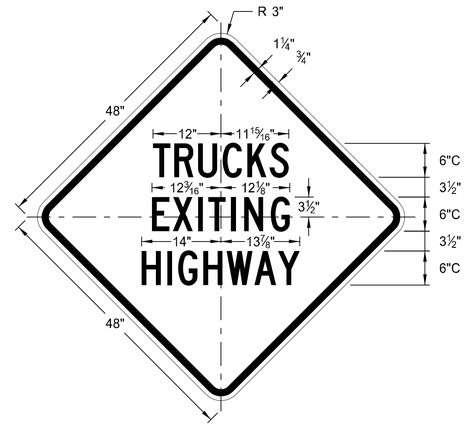
D-704-11



W5-8-48
Legend: black (non-refl)
Background: orange



W8-53-48
Legend: black (non-refl)
Background: orange



W8-56-48
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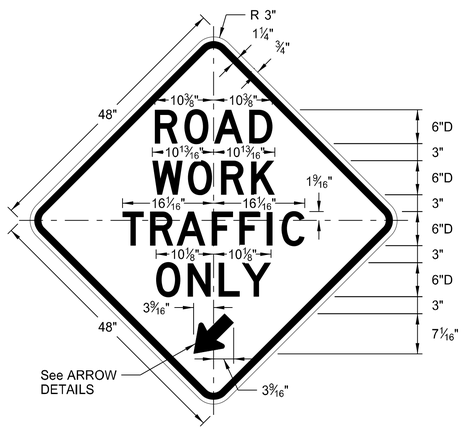
Background: orange



W5-9-48
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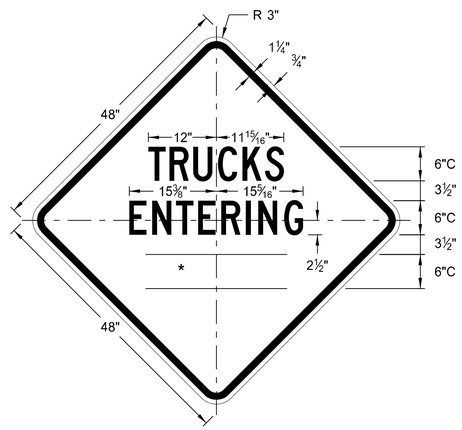
Background: orange



W8-54-48
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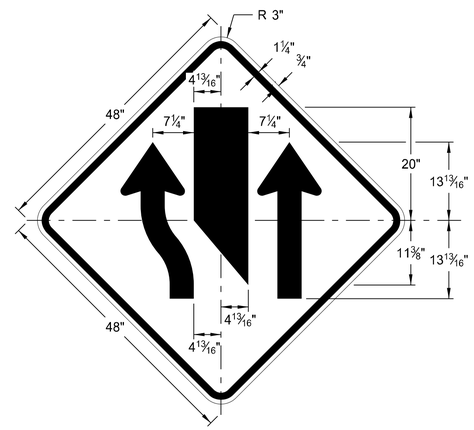
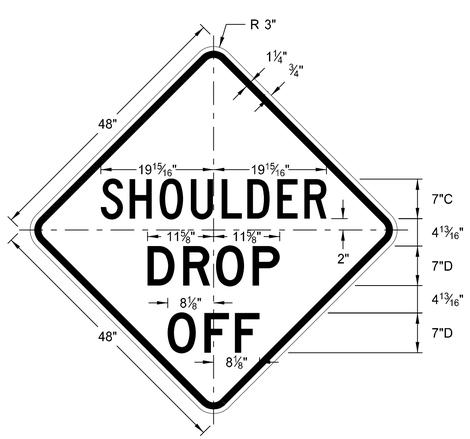
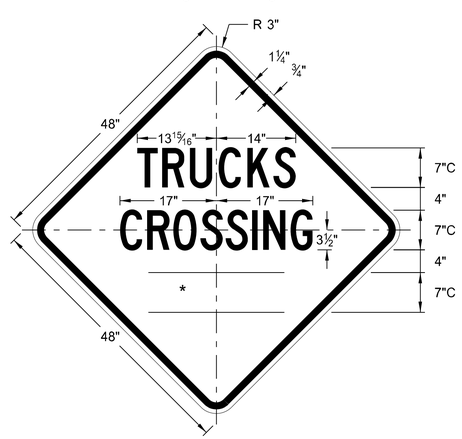
Background: orange



W9-3a-48
Legend: black (non-refl)
Background: orange



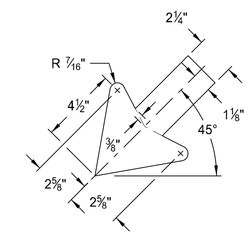
W8-9a-48
Legend: black (non-refl)
Background: orange



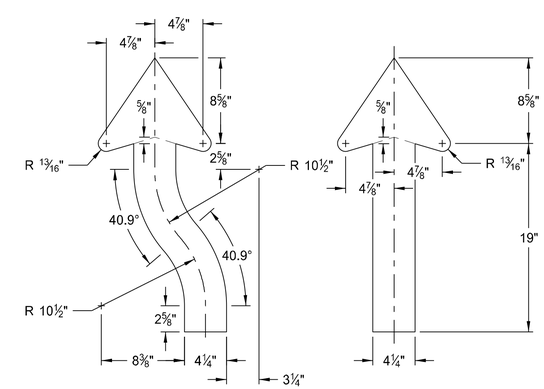
W8-55-48
Legend: black (non-refl)
Background: orange

WORD	LETTER SPACING
AHEAD	Standard
200 FT	Standard
350 FT	Standard
500 FT	Standard
1000 FT	Reduce 40%
1500 FT	Reduce 40%
½ MILE	Reduce 50%
1 MILE	Standard

* DISTANCE MESSAGES



W5-9-48



W9-3a-48

ARROW DETAILS

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-13-13	
REVISIONS	
DATE	CHANGE
8-17-17	Updated sign number
5-31-18	Revised sign and arrow details
10-03-19	New Design Engineer PE Stamp

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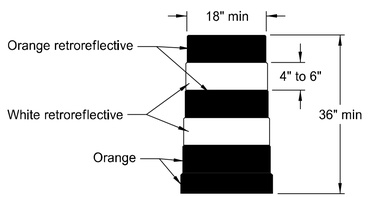
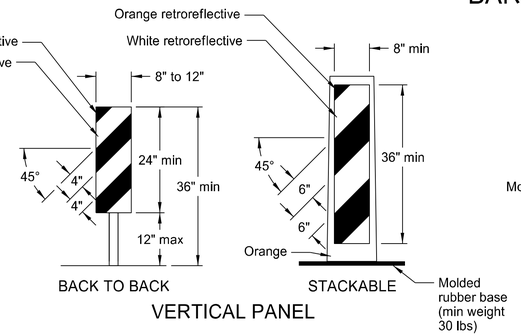
BARRICADE AND CHANNELIZING DEVICE DETAILS

D-704-13



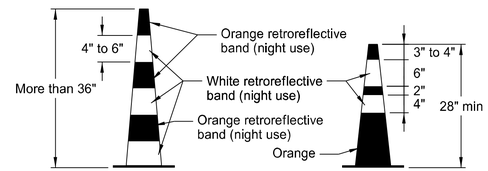
DELINEATOR DRUM

Provide horizontal, circumferential, alternating orange and white retroreflective stripes 4" to 6" wide for drum markings. Use a minimum of two orange and two white stripes with the top stripe being orange for each drum. Do not exceed 3" nonretroreflectorized spaces between the horizontal orange and white stripes. Avoid placement of stripes on drum ribs or indentations. Use closed top drums that will not allow collection of debris. Do not place ballast on the top of drum.



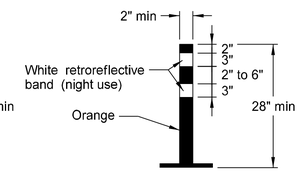
VERTICAL PANEL

Provide alternating orange and white retroreflective stripes, sloping downward in direction vehicular traffic is to pass. Place retroreflective sheeting on both sides of panel with a minimum of 270 square inches of retroreflective area facing vehicular traffic. Where the height of the retroreflective material on the vertical panel is 36 inches or more, use a stripe width of 6 inches.



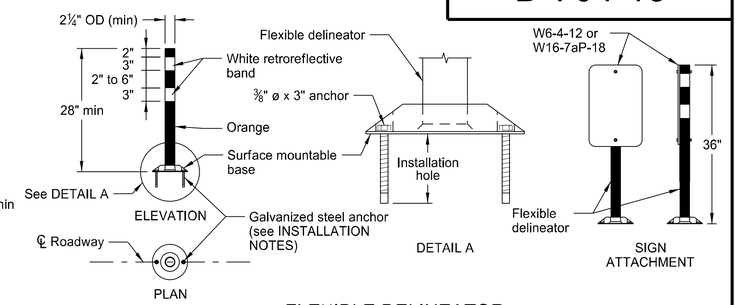
TRAFFIC CONE

Provide retroreflectorization of cones more than 36" in height by alternating orange and white retroreflective stripes. Use a minimum of two orange and two white stripes for each cone with the top stripe being orange. Use maximum 3" nonretroreflectorized space between the orange and white stripes.



TUBULAR MARKER

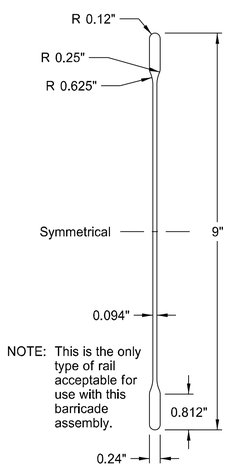
Provide retroreflectorization of tubular markers more than 42" in height by alternating four 4" to 6" wide orange and white stripes with the top stripe being orange.



FLEXIBLE DELINEATOR

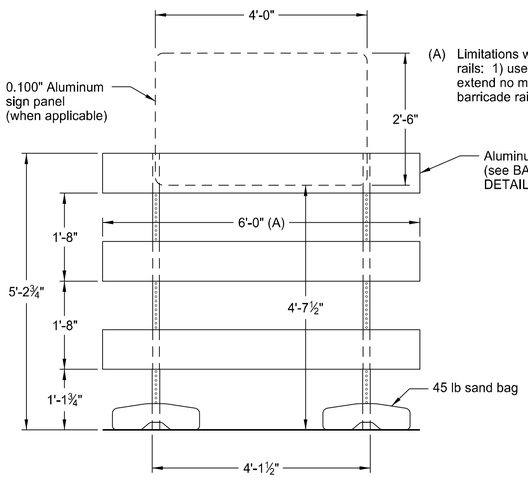
INSTALLATION NOTES:

1. Drill installation holes to diameter and depth required by manufacturer's specifications.
2. For removal, remove anchors and fill installation hole with an epoxy designed to bond to pavement surface.
3. In lieu of bolted down base, use an 8" x 8" butyl pad or hot melt butyl. Remove butyl as close as possible to pavement surface.



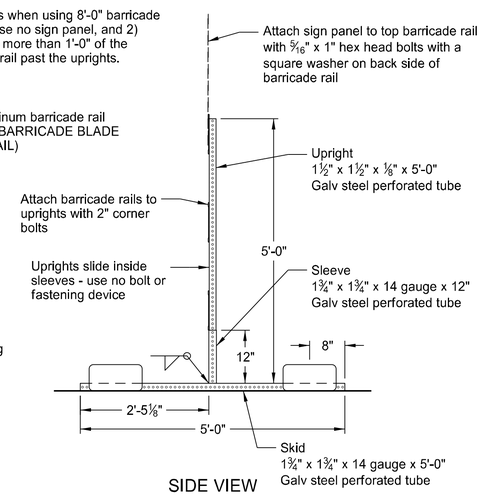
NOTE: This is the only type of rail acceptable for use with this barricade assembly.

BARRICADE BLADE DETAIL



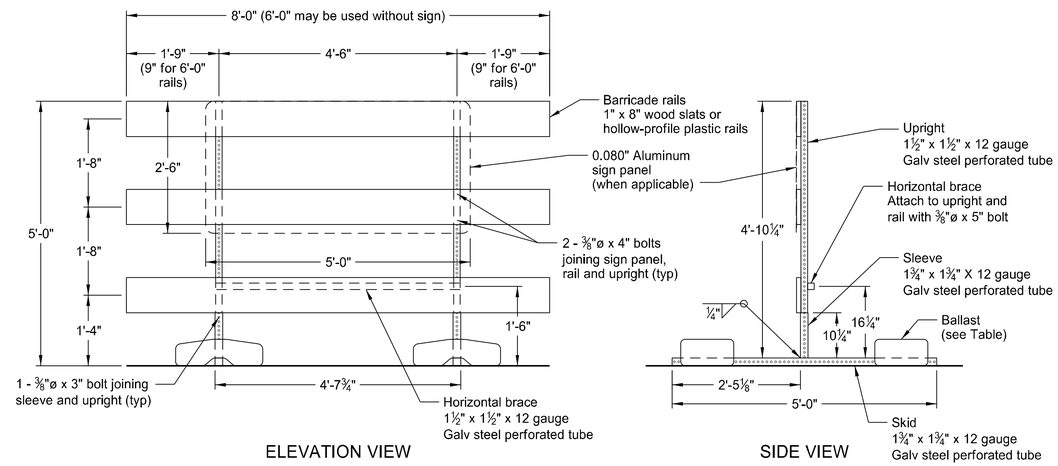
(A) Limitations when using 8'-0" barricade rails: 1) use no sign panel, and 2) extend no more than 1'-0" of the barricade rail past the uprights.

ELEVATION VIEW



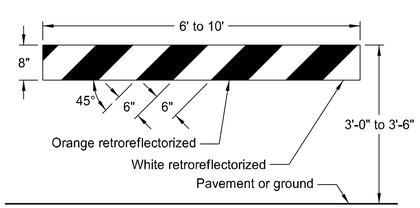
SIDE VIEW

BARRICADE ASSEMBLY DETAIL
(Aluminum Barricade Rails)

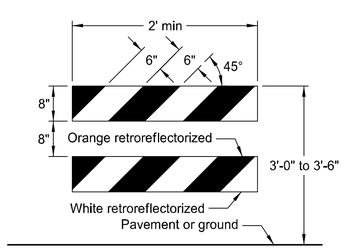


BARRICADE ASSEMBLY DETAIL
(Wood or Plastic Rails)

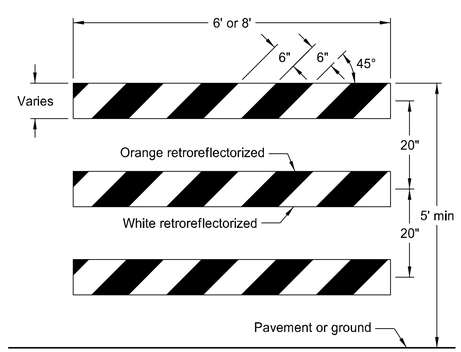
NOTE: For barricade markings use alternating orange and white retroreflective stripes, sloping downward in the direction traffic is to pass. Place retroreflective sheeting on both sides of the rails with a minimum of 270 square inches of visible retroreflective area facing vehicular traffic. When the barricade length is less than 36", use a rail stripe width of 4".



TYPE I BARRICADE

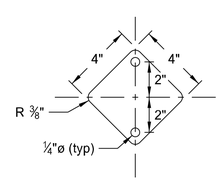


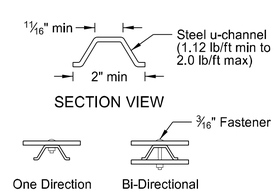
TYPE II BARRICADE

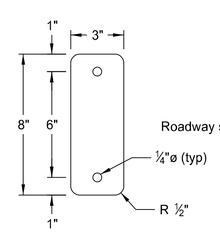


TYPE III BARRICADE

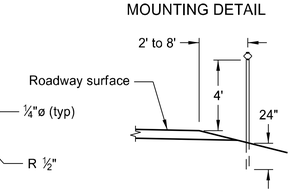
BARRICADE RAIL DETAILS







REFLECTOR DETAIL



ELEVATION

DELINEATORS

MINIMUM BALLAST
(For each side of barricade support)

Without Sign	4 - 25 lb sandbags
With Sign	6 - 25 lb sandbags

Note: Number of sandbags based on a wind speed of 55 MPH. Sandbags assumed to be placed at or near the ends of the skids.

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

10-3-13

REVISIONS

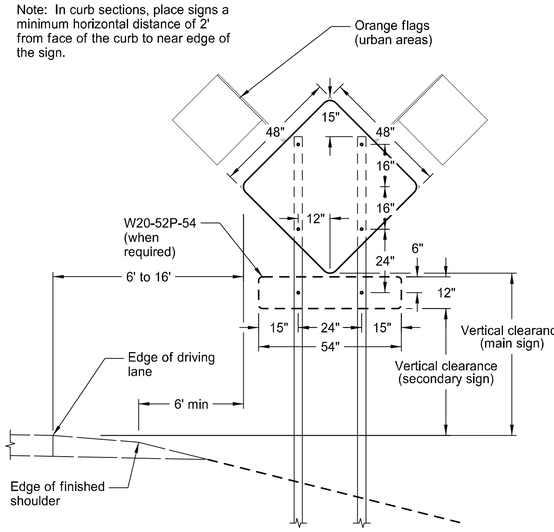
DATE	CHANGE
9-27-17	Updated to active voice
11-01-19	Revised details for Flexible Delineator

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

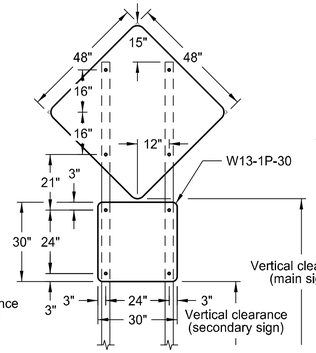
CONSTRUCTION SIGN PUNCHING AND MOUNTING DETAILS

D-704-14

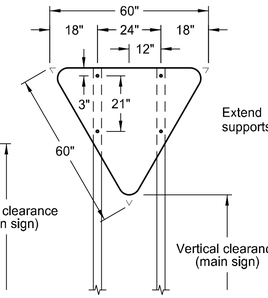
Note: In curb sections, place signs a minimum horizontal distance of 2' from face of the curb to near edge of the sign.



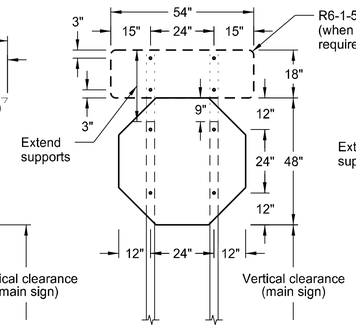
TYPICAL SECTION
(48" x 48" diamond warning sign shown)



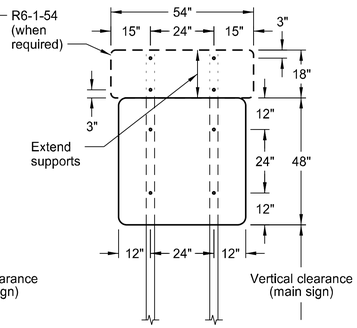
48" x 48" DIAMOND SIGN
(with 30" x 30" secondary sign)



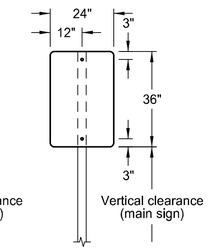
R1-2-60 - YIELD SIGN



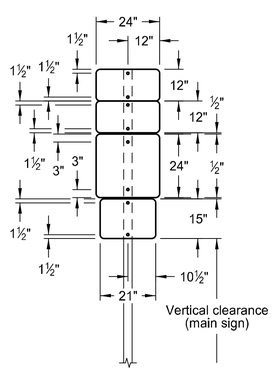
R1-1-48 - STOP SIGN
(with R6-1-54 sign as required)



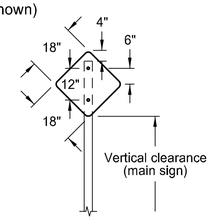
48" x 48" SIGN
(with R6-1-54 sign as required)



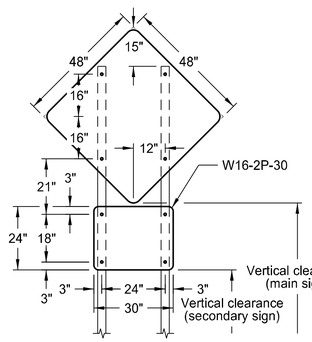
24" x 36" SIGN



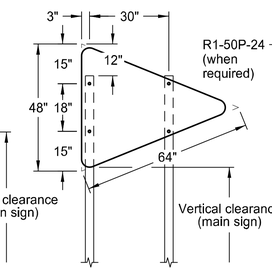
24" x 24"
ROUTE MARKER
ASSEMBLY



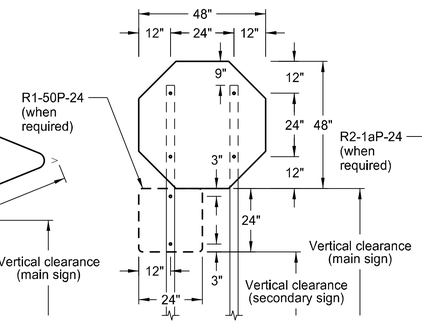
18" x 18"
DIAMOND SIGN



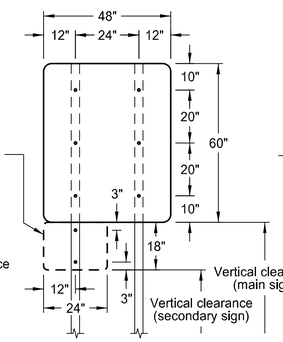
48" x 48" DIAMOND SIGN
(with 30" x 24" secondary sign)



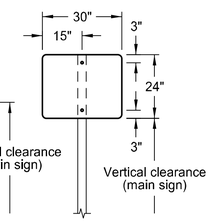
W14-3-64 - PENNANT SIGN



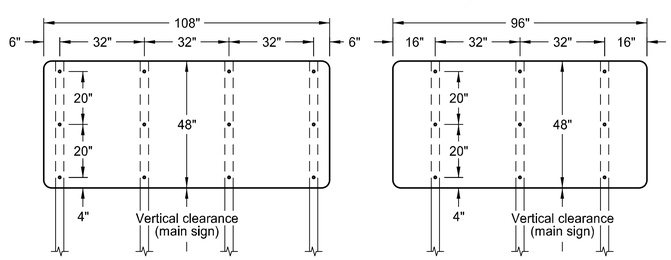
R1-1-48 - STOP SIGN
(with R1-50P-24 sign as required)



48" x 48" SIGN
(with R2-1aP-24 sign as required)

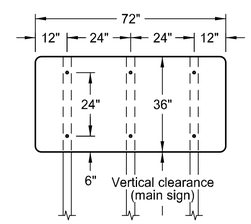


30" x 24" SIGN

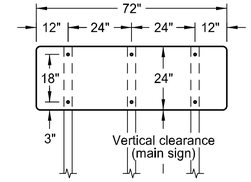


108" x 48" SIGN

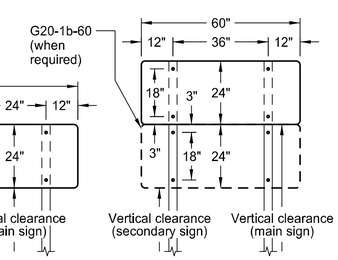
96" x 48" SIGN



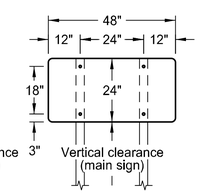
72" x 36" SIGN



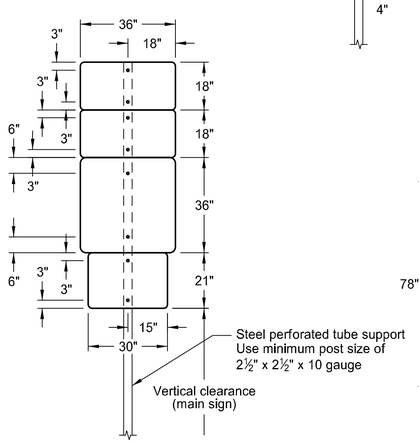
72" x 24" SIGN



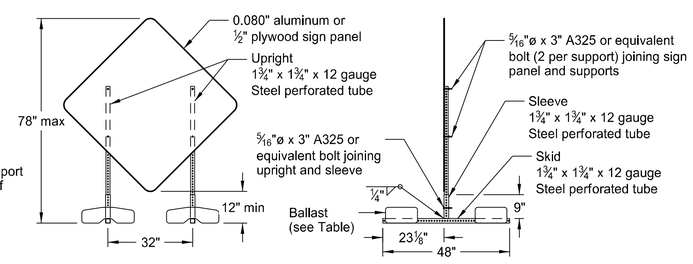
60" x 24" SIGN



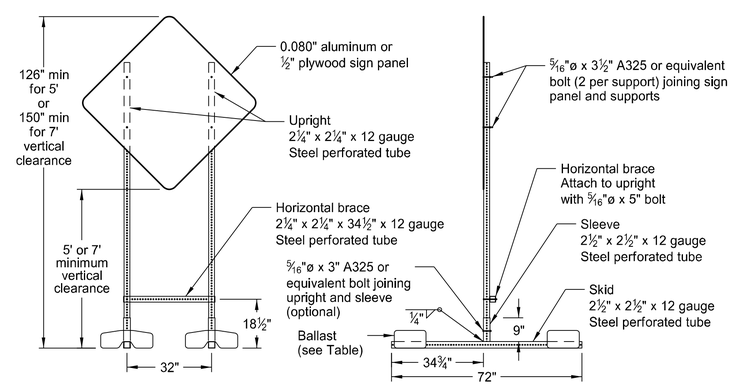
48" x 24" SIGN



36" x 36"
ROUTE MARKER
ASSEMBLY



PORTABLE SIGN SUPPORT
LOW-MOUNTING HEIGHT



PORTABLE SIGN SUPPORT
HIGH-MOUNTING HEIGHT

NOTES:

1. Sign Supports: Galvanize or paint supports. Minimum post sizes are 2.5 lb/ft u-channel or 2" x 2" x 12 gauge steel perforated tube, except where noted. When installing signs on u-channel, minimum post size for assemblies containing a secondary sign is 3.0 lb/ft. Post sizes based on a wind speed of 55 MPH.

   Place signs over 50 square feet on 2½" x 2½" perforated tube supports as a minimum.

   Do not attach guy wires to sign supports. Attach wind beams behind sign panels when used with u-posts.

2. Sign Panels: Provide sign panels made of 0.100" aluminum, ½" plywood, or other approved material, except where noted. Punch all holes round for ⅜" bolts.

3. Alternate Messages: Install and remove alternate message signs on reflectorized plate (without borders) as required. (i.e. "Left" and "Right" message on lane closure sign)

4. Route Marker Auxiliary Signs: Provide route marker auxiliary signs, such as the cardinal direction and directional arrows, with a background and legend that match the route marker they are used with:

   Interstate - white legend on blue background
   Interstate Business Loop - white legend on green background
   US and State - black legend on white background
   County - yellow legend on blue background

5. Vertical Clearance: Install signs with a vertical clearance of 5'-0" (see TYPICAL SECTION.) In areas where parking or pedestrian movements are likely or the view of the sign may be obstructed, install signs with a vertical clearance of 7'-0" from the top of the curb or from the near edge of the driving lane in absence of a curb.

   The vertical clearance to secondary signs is 1'-0" less than the vertical clearance stated above.

   Provide a minimum clearance of 7'-0" from the ground at the post for signs with an area exceeding 50 square feet.

6. Portable Signs: Provide portable signs that meet the vertical clearance stated above when it is necessary to place signs within the pavement surface.

   Use of low-mounting height (minimum 12" vertical clearance) portable signs for 5 days or less, is allowed as long as the view of the sign is not obstructed. Time delays caused by unforseen circumstances, such as equipment breakdown, rain, subgrade failures, etc., will not accrue towards the 5 day period. Use of R9-8 through R9-11a series, W1-6 through W1-8 series, M4-10, and E5-1 is allowed for longer than 5 days.

   Restrict signs mounted on portable sign supports shown in the LOW-MOUNTING HEIGHT and HIGH-MOUNTING HEIGHT details to a maximum surface area of 16 square feet.

MINIMUM BALLAST
(For each side of sign support base)

Sign Panel Mounting Height (ft)	Number of 25 lb sandbags for 4' x 4' sign panel
1'	6
5'	8
7'	10

Note: The number of sandbags are based on a wind speed of 55 MPH. Place sandbags at or near the ends of skids.

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

10-4-13

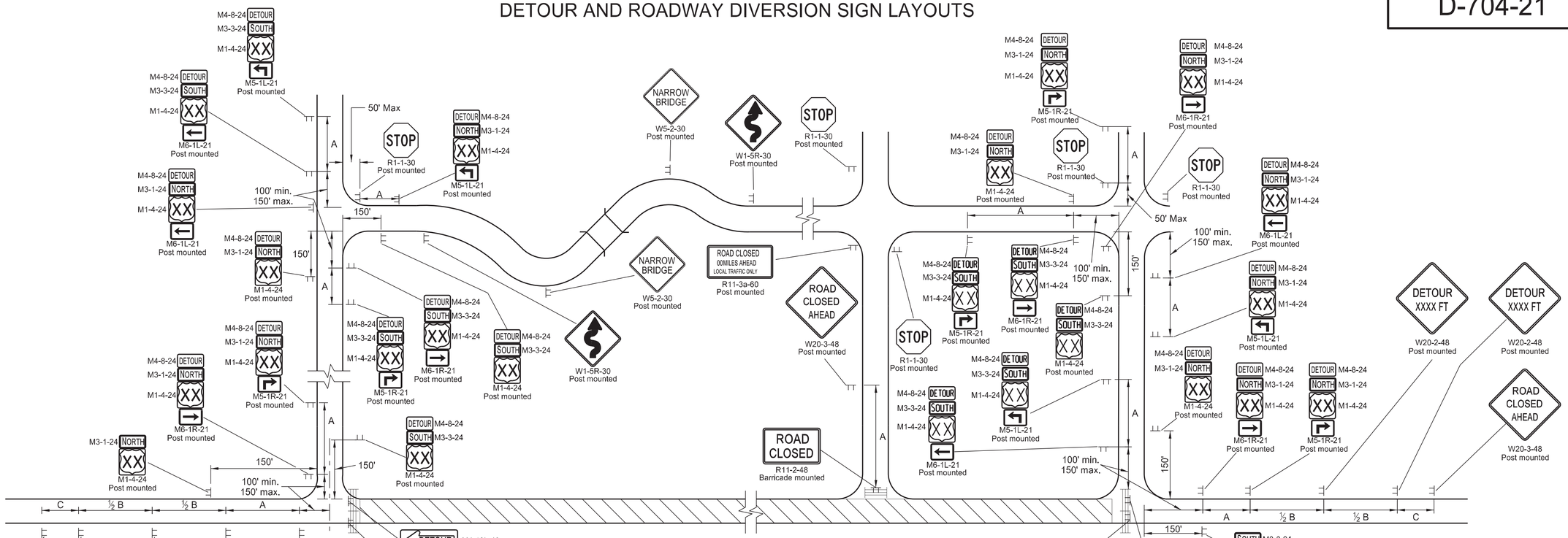
REVISIONS

DATE	CHANGE
11-14-13	Revised Note 6
9-27-17	Updated to active voice
11-01-19	Revised 60"x24" sign detail

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 11/1/19 and the original document is stored at the North Dakota Department of Transportation

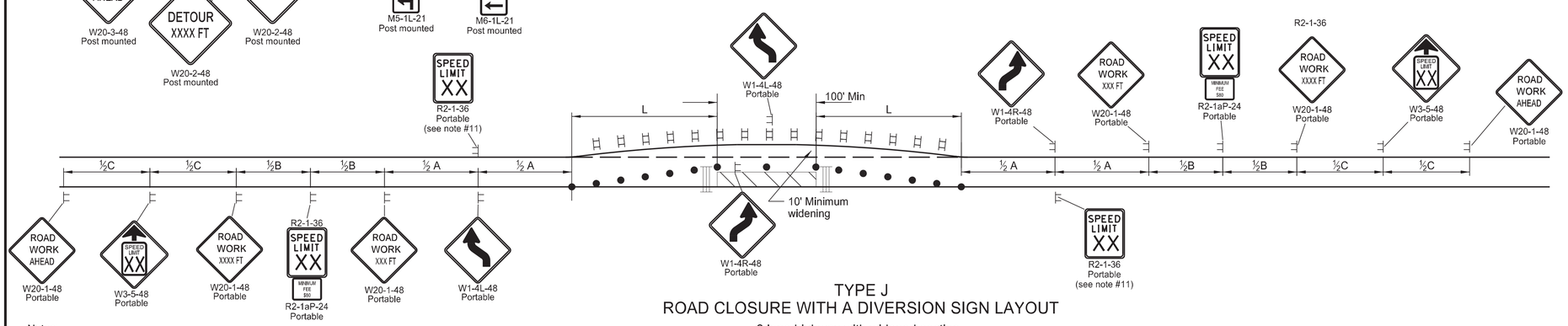
DETOUR AND ROADWAY DIVERSION SIGN LAYOUTS

D-704-21



TYPE I
DETOUR SIGN LAYOUT

2 lane highway when roadway
is closed and detour provided



TYPE J
ROAD CLOSURE WITH A DIVERSION SIGN LAYOUT

2 lane highway with widened section,
traffic maintained in both directions.

Use layout when work is less than 5 days or is within a project.

Notes:

1. Variables
   S=Numerical value of speed limit or 85th percentile. W=The width of taper.
   L=Minimum length of taper, or S x W for freeways, expressways, and all other roads with speeds of 45 mph or greater, or $W \times S^2 / 60$ for urban, residential, and other streets with speeds of 40 mph or less.
2. Place barricades on moveable assemblies and signs on portable assemblies when on roadway.
3. Space delineator drums and vertical panels at dimension "S" for tapering traffic. Space delineator drums, tubular markers and vertical panels at 2 times "S" for tangents.
4. Determine the reduced speed limit based on the in place speed limit before construction. Where speed limits exceed 30 MPH, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½ B.
5. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inches square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
6. Cover existing speed limit signs within a reduced speed limit zone.
7. Covered (when approved by engineer) or obliterated payment marking measured as Obliteration of Pavement Marking.
8. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
9. If the tangent between tapers is less than 600', as an option, use sign W24-1-48 in place of double reverse curve signs.
10. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.
11. Re-establish speed limit. Determine exact speed limit in the field, dependent on location and conditions.

ADVANCE WARNING SIGN SPACING

Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40 mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

KEY

- Type III barricade
- Work area
- Sign
- Vertical panels back to back
- Delineator drum

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

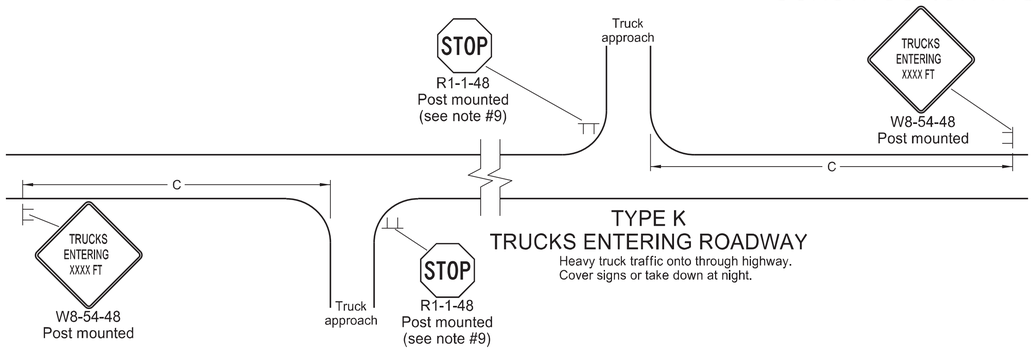
DATE	CHANGE
08-17-17	Updated notes & added spd limit
11-01-19	Revised sign #s and note 8
12-08-21	Added Dollars At Work sign
11-29-22	Removed Dollars At Work

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

11/29/22

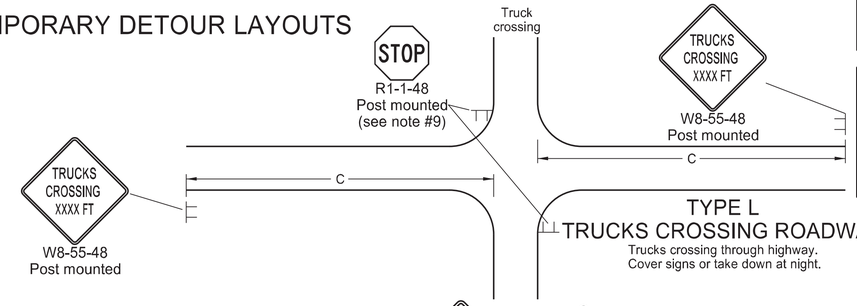
CONSTRUCTION TRUCK AND TEMPORARY DETOUR LAYOUTS

D-704-22



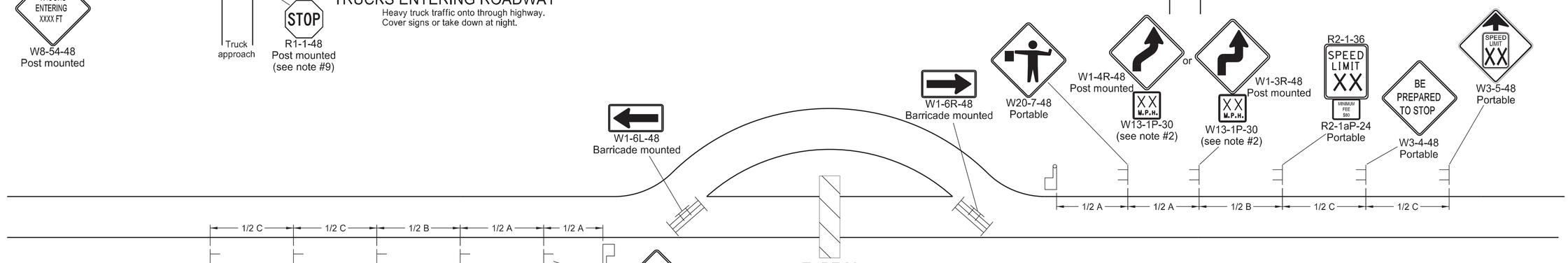
TYPE K
TRUCKS ENTERING ROADWAY

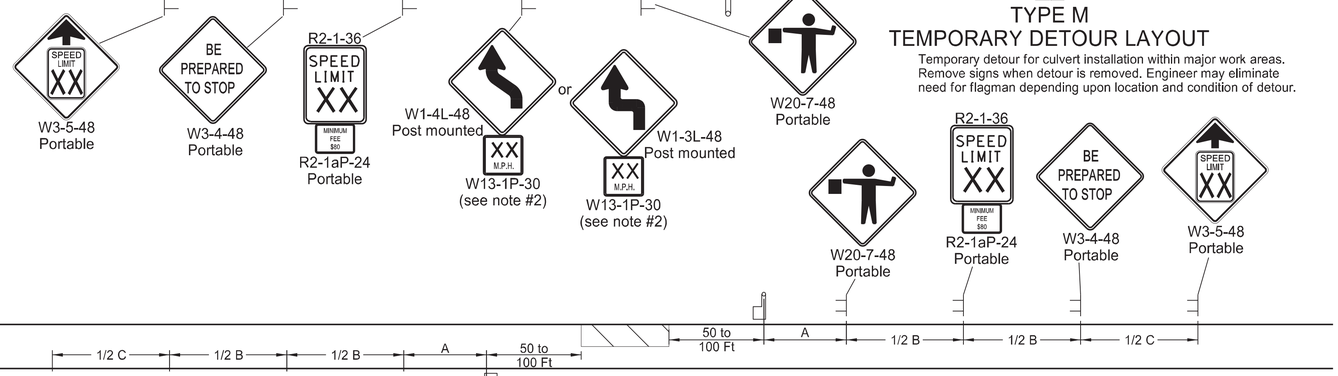
Heavy truck traffic onto through highway.
Cover signs or take down at night.



TYPE L
TRUCKS CROSSING ROADWAY

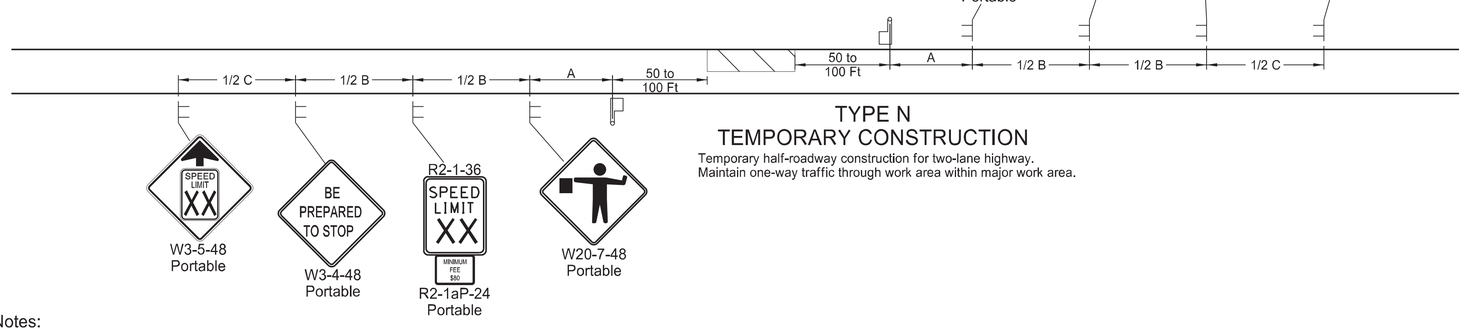
Trucks crossing through highway.
Cover signs or take down at night.





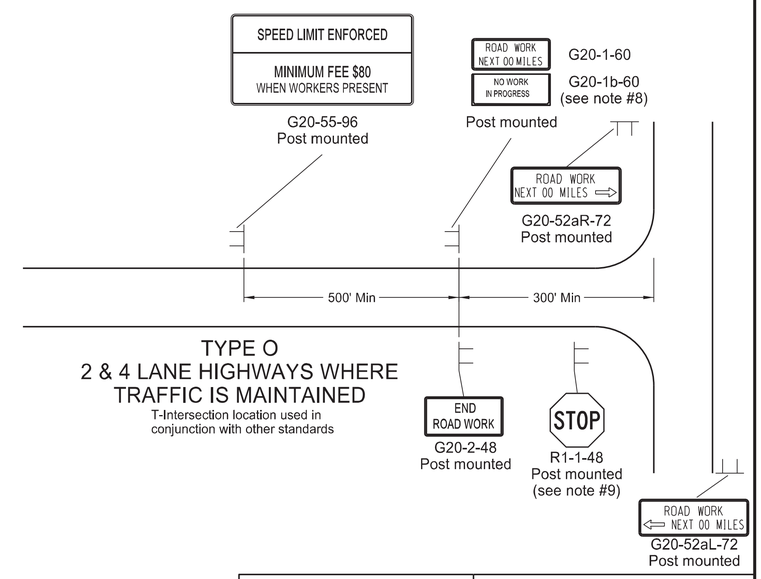
TYPE M
TEMPORARY DETOUR LAYOUT

Temporary detour for culvert installation within major work areas.
Remove signs when detour is removed. Engineer may eliminate need for flagman depending upon location and condition of detour.



TYPE N
TEMPORARY CONSTRUCTION

Temporary half-roadway construction for two-lane highway.
Maintain one-way traffic through work area within major work area.



TYPE O
2 & 4 LANE HIGHWAYS WHERE TRAFFIC IS MAINTAINED

T-Intersection location used in conjunction with other standards

KEY

- Type III barricade
- Work area
- Sign
- Flagger

Notes:

1. Place barricades on a moveable assemblies and signs on portable assemblies when located on roadway.
2. Where necessary, safe speed to be determined by the Engineer.
3. Determine the reduced speed limit based on the in-place speed limit before construction. Where speed reductions exceed 30 mph, install a second speed limit sign with the desired speed reduction (not to exceed 30 mph.) Place the second speed limit sign at ½ B.
4. Install flags on warning signs in urban areas when signs are not portable. Mount 24 inch square flags perpendicular to the edges of the sign, and at such a distance above the edge that the flag does not touch the sign when limp.
5. Cover existing speed limit signs within a reduced speed zone.
6. Covered (when approved by engineer) or obliterated pavement marking measured as Obliteration of Pavement Marking.
7. As an option, use portable sign supports in lieu of post mounted signs in accordance with NDDOT Standard Drawing D-704-14.
8. Install sign G20-1b-60 when work is suspended for winter.
9. If existing stop sign is in place, a 48" stop sign is not required.
10. Sign G20-55-96 is not required if layout is part of other traffic control that contains this sign, or if work is less than 15 days.
11. Recommend using 40 mph speed limit in vicinity of workers, unless location and conditions dictate otherwise.

ADVANCE WARNING SIGN SPACING

Road Type	Distance Between Signs Min. (ft)		
	A	B	C
Urban - Low Speed (30 mph or less)	150	150	150
Urban - Low Speed (over 30 to 40mph)	280	280	280
Urban - High Speed (over 40 mph to 50 mph)	360	360	360
Rural - High Speed (over 50 mph to 65 mph)	720	720	720
Urban Expressway and Freeway (55 mph to 60 mph)	850	1350	2200
Rural Expressway and Freeway (70 mph to 75 mph)	1000	1500	2640
Interstate/4-Lane Divided (Maintenance and Surveying)	750	1000	1500

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

9-27-13

REVISIONS

DATE	CHANGE
08-17-17	Update notes & sign numbers
11-01-19	Revised sign numbers & note 7
12-09-21	Added Speed Limit Enforced and Dollars At Work signs
11-29-22	Removed Dollars At Work

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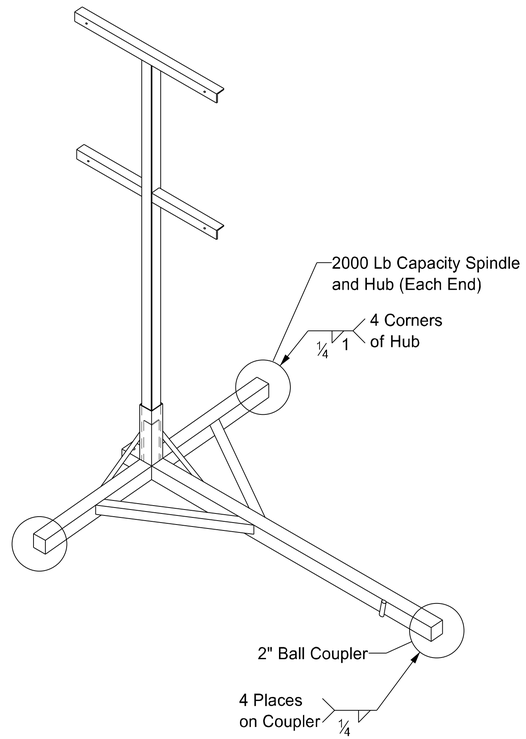
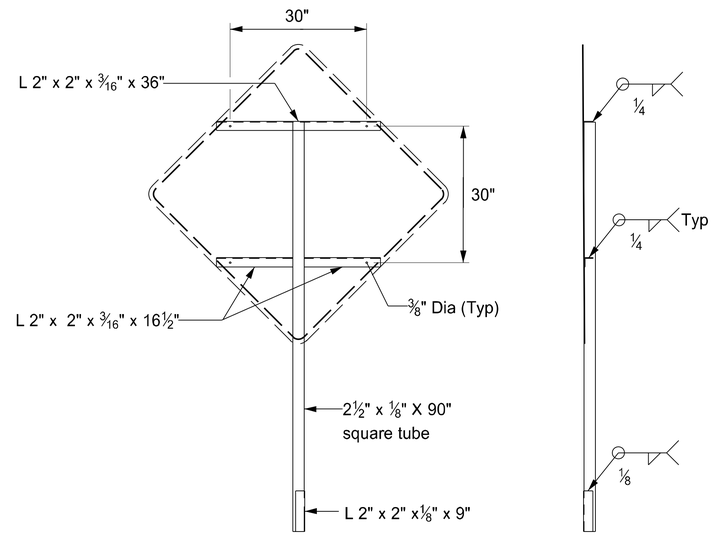
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

11/29/22

PORTABLE SIGN SUPPORT ASSEMBLY

D-704-50

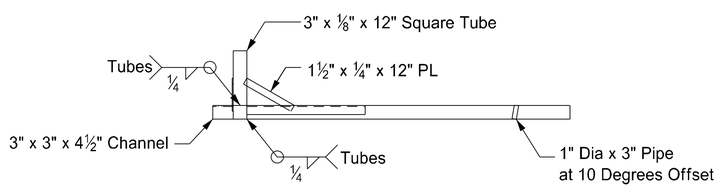


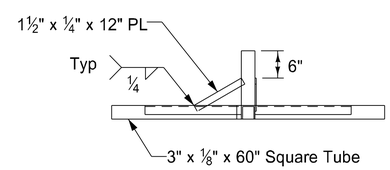


FRONT

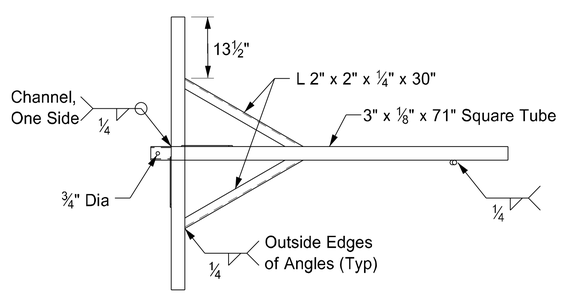
RIGHT

SIGN SUPPORT





RIGHT



TOP

TRAILER

Notes:

1. Maximum 250 pound weight of assembly.
2. Use a 14" wheel and tire.
3. Use no automotive and equipment axle assemblies for trailer-mounted sign supports.
4. Other NCHRP 350 or MASH crash tested assemblies are acceptable.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
11-23-10	
REVISIONS	
DATE	CHANGE
12/02/2020	Updated Note to active voice.

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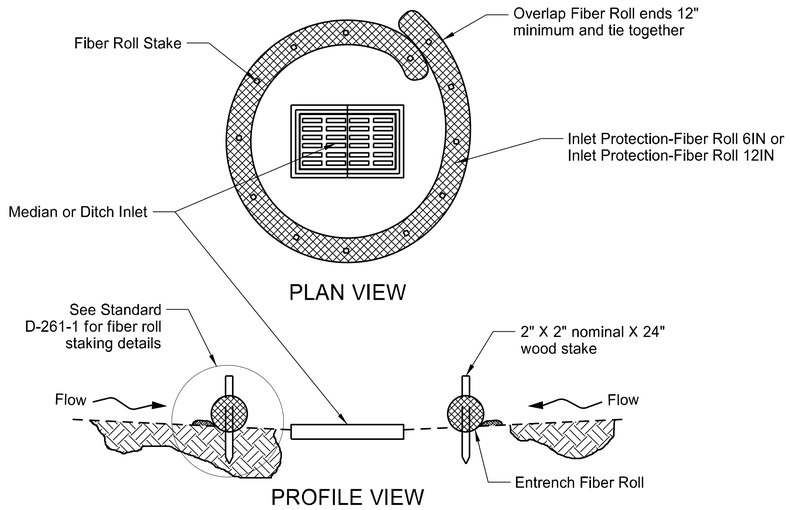
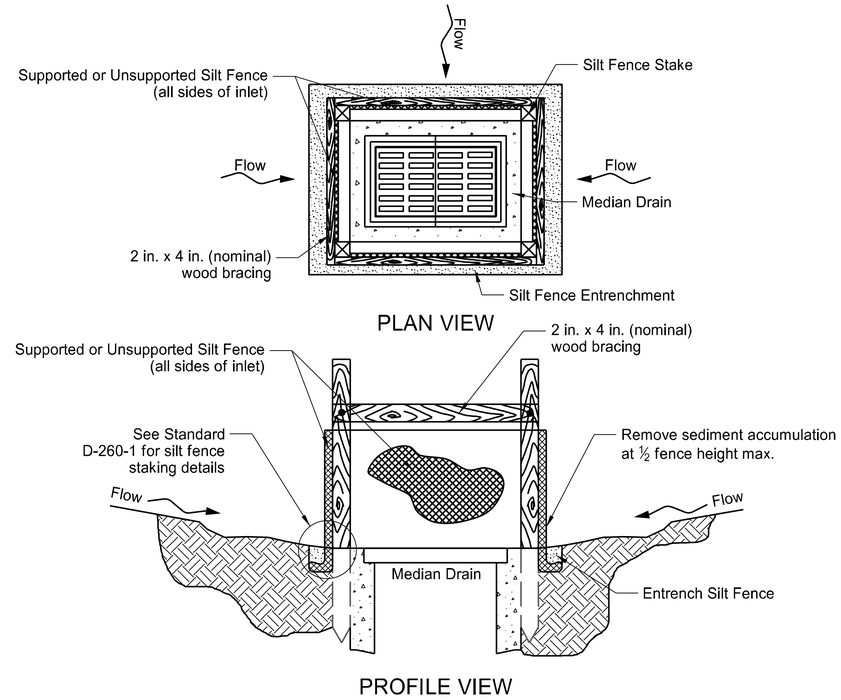
12 02 2020

EROSION AND SILTATION CONTROLS
MEDIAN OR DITCH INLET PROTECTION

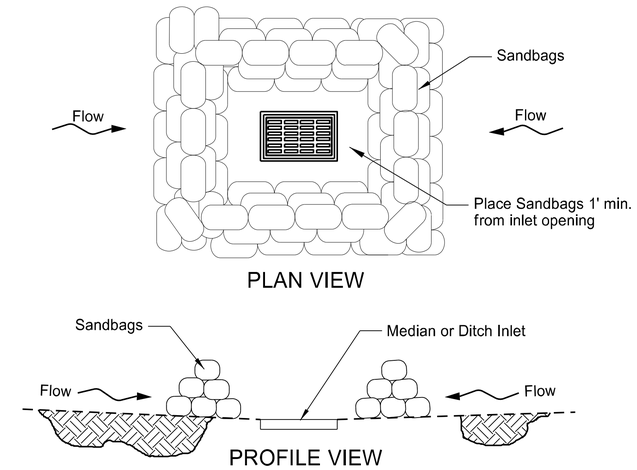
D-708-6



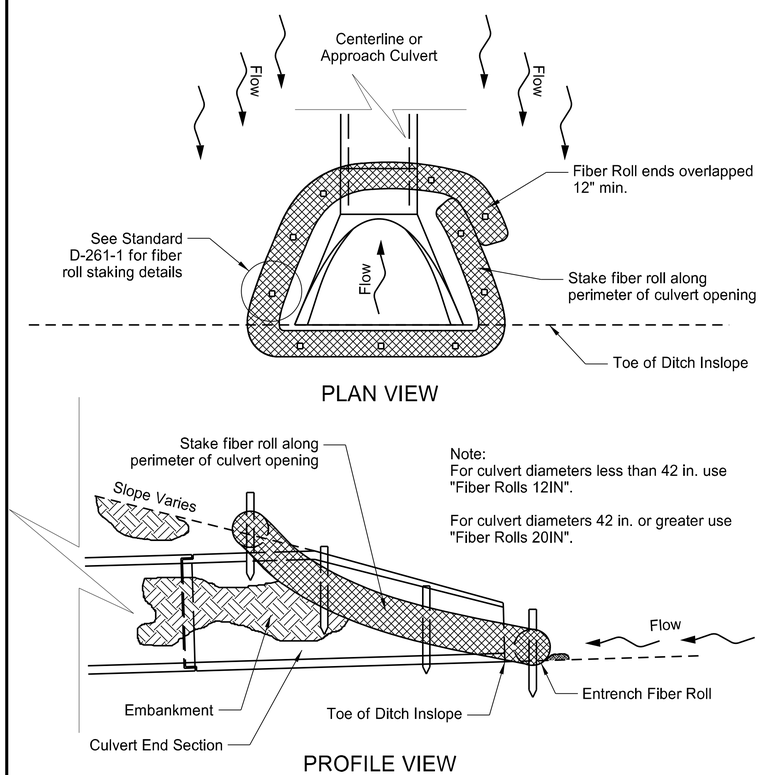
FIBER ROLL PROTECTION (MEDIAN OR DITCH INLET)



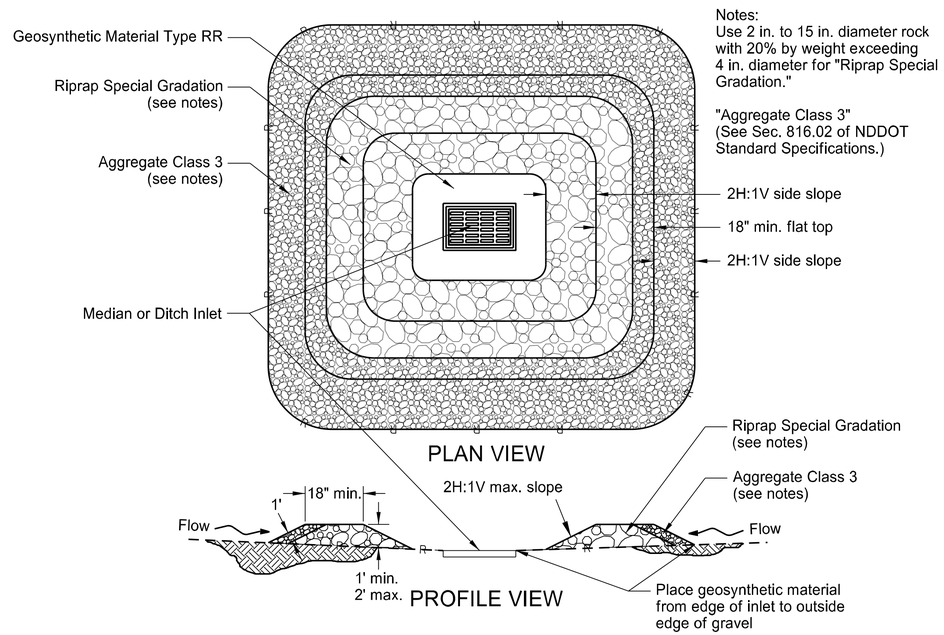
SILT FENCE PROTECTION (MEDIAN OR DITCH INLET)



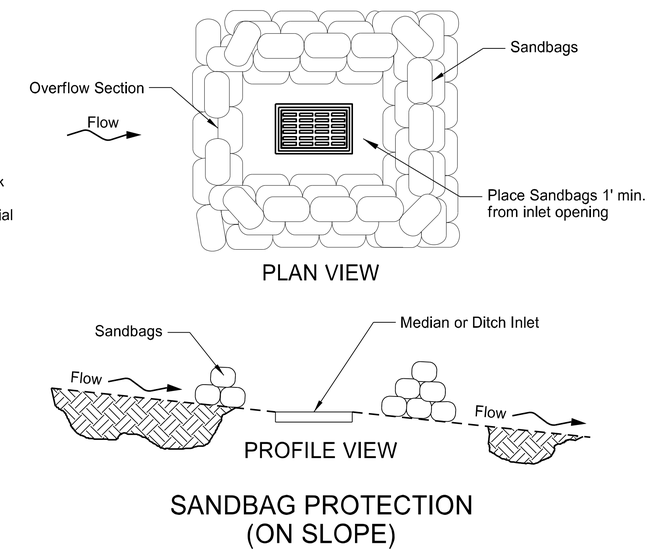
SANDBAG PROTECTION (LOW POINT)



FIBER ROLL PROTECTION (INLET OF CULVERT)



GRAVEL INLET PROTECTION (MEDIAN OR DITCH INLET)



SANDBAG PROTECTION (ON SLOPE)

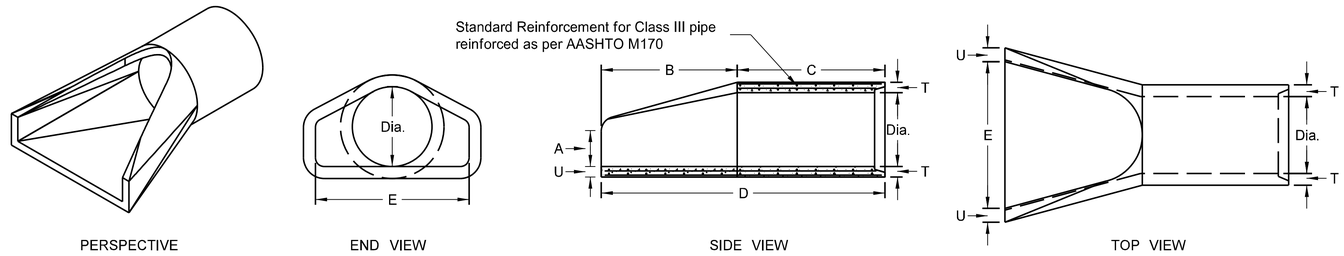
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-03-13	
REVISIONS	
DATE	CHANGE
06-26-14	Updated reference to standard drawing number for fiber roll staking details.
10-01-14	Updated reference to standard drawing number for silt fence.
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 8-27-19 and the original document is stored at the North Dakota Department of Transportation

REINFORCED CONCRETE PIPE CULVERTS AND END SECTIONS
(Round Pipe)

D-714-1

FLARED END SECTION						
TERMINAL DIMENSIONS						
DIA	A	B	C	D	E	U
12	0'-4"	2'-0"	4'-0⅞"	6'-0⅞"	2'-0"	2"
15	0'-6"	2'-3"	3'-10"	6'-1"	2'-6"	2¼"
18	0'-9"	2'-3"	3'-10"	6'-1"	3'-0"	2½"
21	0'-9"	3'-0"	3'-1"	6'-1"	3'-6"	2¾"
24	0'-9½"	3'-7½"	2'-6"	6'-1½"	4'-0"	3"
27	0'-10½"	4'-0"	2'-1½"	6'-1½"	4'-6"	3¼"
30	1'-0"	4'-6"	1'-7¾"	6'-1¾"	5'-0"	3½"
36	1'-3"	5'-3"	2'-9"	8'-0"	6'-0"	4"
42	1'-9"	5'-3"	2'-9"	8'-0"	6'-6"	4½"
48	2'-0"	6'-0"	2'-0"	8'-0"	7'-0"	5"
54	2'-3"	5'-5"	2'-9¼"	8'-2¼"	7'-6"	5½"
60	2'-11"	5'-0"	3'-3"	8'-3"	8'-0"	5"
66	2'-6"	6'-0"	2'-3"	8'-3"	8'-6"	5½"
72	3'-0"	6'-6"	1'-9"	8'-3"	9'-0"	6"
78	3'-0"	7'-6"	1'-9"	9'-3"	9'-6"	6½"
84	3'-0"	7'-6½"	1'-9"	9'-3½"	10'-0"	6½"
90	3'-5"	7'-3½"	2'-0"	9'-3½"	11'-0"	6½"



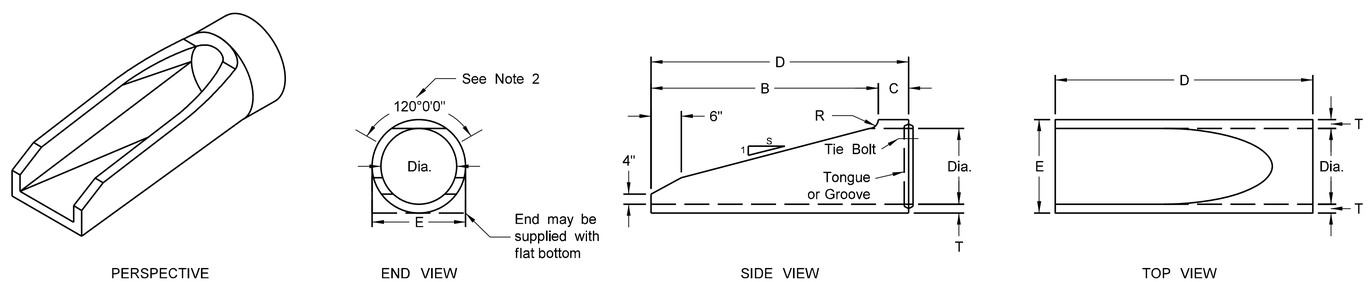
PERSPECTIVE | END VIEW | SIDE VIEW | TOP VIEW

REINFORCED CONCRETE PIPE - FLARED END SECTION
Reinforcement to be equivalent to Class III RCP

NOTES:

1. All reinforcing steel shall meet AASHTO M170 requirements.
2. All circular, longitudinal, and elliptical reinforcement shall be assembled and securely fastened in cage fashion so as to maintain reinforcement in exact shape and correct positions within the forms.
3. Laying length of pipe: 12" to 66" (incl.) = not less than 4 feet
   66" to 108" (incl.) = not less than 6 feet
4. Joints shall be sealed with rubber gaskets or with sealer approved by the engineer whenever pipe are specified for storm drain or sanitary sewers.
5. For Class IV and Class V reinforced concrete pipe and end section sizes which do not have reinforcement specified by AASHTO M170, shop drawings and design calculations shall be prepared and sealed by a Professional Engineer and submitted for the Engineer's review.

TRAVERSABLE END SECTION						
DIA	B	C	D	E	R	S
15"	4'	9"	4'-9"	1'-7½"	3"	6
18"	5'-9"	9"	6'-6"	1'-11"	3"	6
24"	6'	1'	7'	2'-6"	3"	4
30"	7'-6"	1'	8'-6"	3'-1"	3½"	4
36"	7'-3"	15"	8'-6"	3'-8"	3"	4



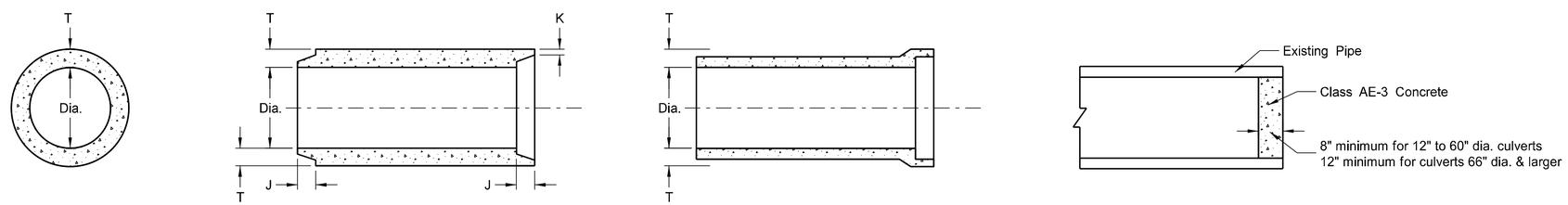
PERSPECTIVE | END VIEW | SIDE VIEW | TOP VIEW

REINFORCED CONCRETE PIPE - TRAVERSABLE END SECTION
Reinforcement to be equivalent to Class III RCP

NOTES (Traversable End Section):

1. Manufactured in accordance with applicable portions of ASTM C76/AASHTO M170.
2. Reinforcement per Class III RCP with double reinforcement in the upper 120° of the full barrel portion.

All Classifications of Round Concrete Pipe					
Internal Dia. of pipe in inches	Cross-Sectional Water Area	Weight per lin. foot of pipe Std. Wall	Joint L Groove End Min./Max.	Joint K Tongue End Min.	Minimum Wall Thickness (T)
Dia	Sq. ft.	Lbs.	In.	In.	In.
12	0.79	92	1⅝-2⅝	¾	2
15	1.23	127	1¾-2¾	⅞	2¼
18	1.77	168	1⅞-2⅞	1	2½
21	2.40	214	1⅞-3⅛	1⅛	2¾
24	3.14	265	2¼-3¼	1⅛	3
27	3.98	322	2¾-4	1¼	3¼
30	4.91	384	3¼-4¼	1¼	3½
33	5.94	452	3¼-4¼	1½	3¾
36	7.07	524	3¼-4¼	1½	4
42	9.62	685	3¾-4¾	1¾	4½
48	12.57	685	3⅝-4¾	1⅞	5
54	15.90	1070	4⅛-5¼	2	5½
60	19.63	1296	4½-5½	2¼	6
66	23.76	1542	5-6	2⅝	6½
72	28.27	1810	5⅝-6¾	2⅞	7
78	33.18	2098	6¼-7¼	2⅞	7½
84	38.48	2410	5⅝-7¾	3⅜	8
90	44.18	2793	6¾-8½	3⅛	8½
96	50.27	3092	7-8¾	3½	9
102	56.75	3466	7-8¾	3½	9½
108	63.62	3864	7¼-8½	3¾	10



END VIEW — CIRCULAR PIPE | TONGUE & GROOVE JOINT | BELL & SPIGOT JOINT | CONCRETE PIPE PLUG

JOINTS FOR REINFORCED CONCRETE PIPE

SEE STANDARD DRAWING D-714-22 FOR DETAILS OF CONCRETE PIPE TIES (TIE BOLTS).

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

05-12-14

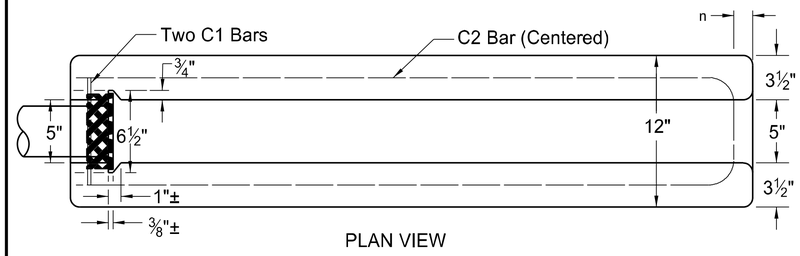
REVISIONS

DATE	CHANGE
01-21-15	Revised Note 5
11-21-16	Revised End Section Dimensions
09-18-19	Updated Perspective View Details

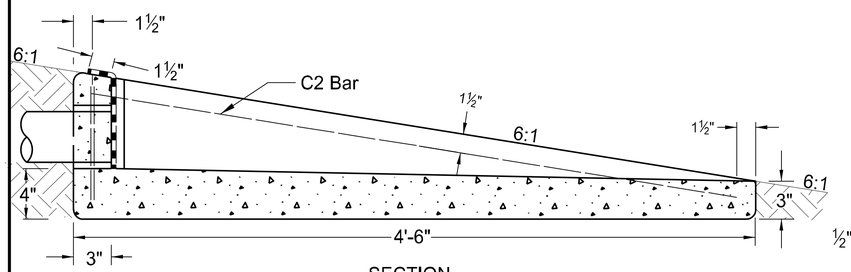
This document was originally issued and sealed by Jon Ketterling Registration Number PE- 4684, on 9/18/19 and the original document is stored at the North Dakota Department of Transportation

PRECAST CONCRETE HEADWALL DETAILS

D-714-18

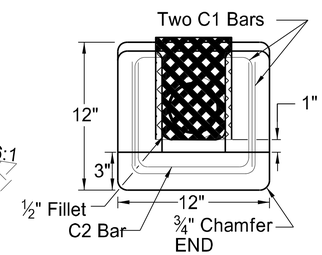


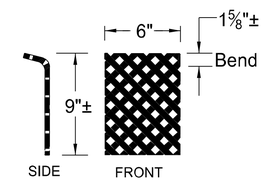
PLAN VIEW



SECTION

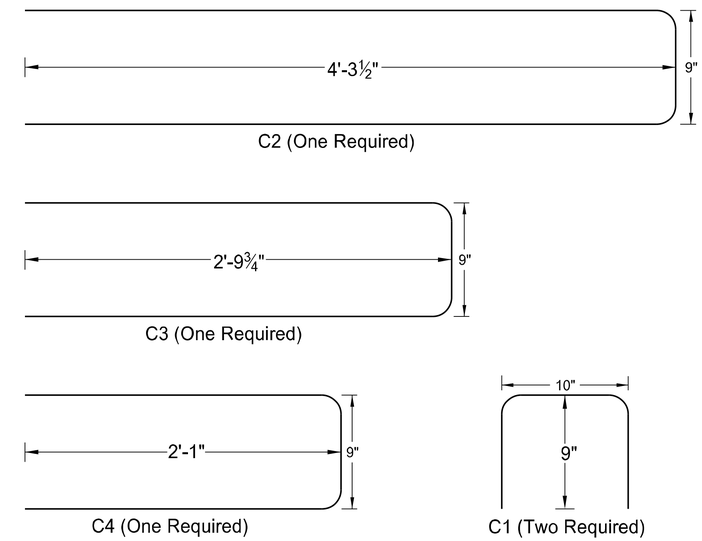
PRECAST CONCRETE HEADWALL (6:1 SLOPE)



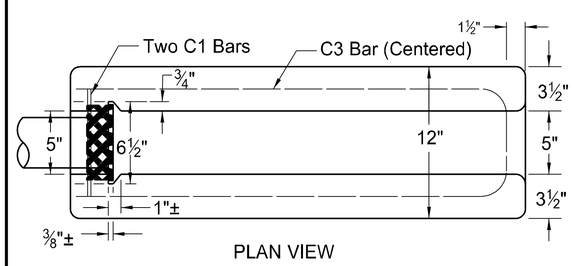


RODENT SCREEN

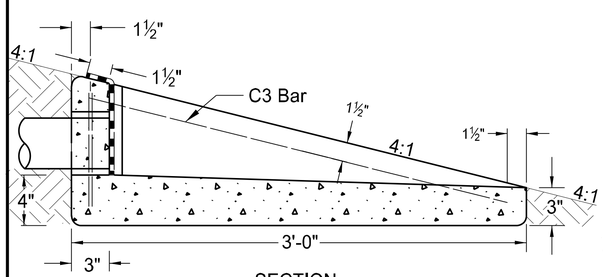
Dimensions are approximate to allow bend and a snug fit in headwall slot



BENT BAR DETAILS

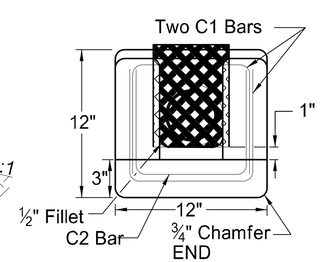


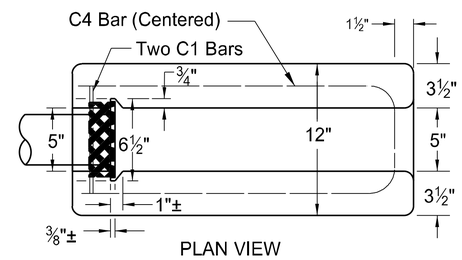
PLAN VIEW



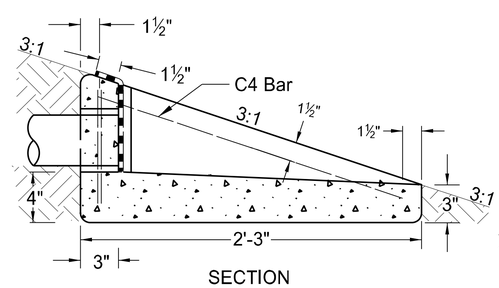
SECTION

PRECAST CONCRETE HEADWALL (4:1 SLOPE)



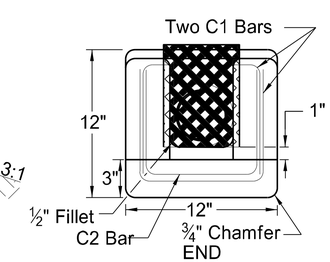


PLAN VIEW



SECTION

PRECAST CONCRETE HEADWALL (3:1 SLOPE)



NOTES:

RODENT SCREEN: Fabricate rodent screen from flattened expanded metal with screen openings of approximately 0.25 square inches. Use 16 ga metal, hot dip galvanized after fabrication, for the screen.

REINFORCING BARS: Use No. 4 deformed steel reinforcing bars.

BENT BARS: Bent bar dimensions given out to out.

SLOPE: Match headwall slope to foreslope.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-27-2010

REVISIONS

DATE	CHANGE
12/02/2020	Removed drainable base details Added 4:1 and 3:1 Headwalls

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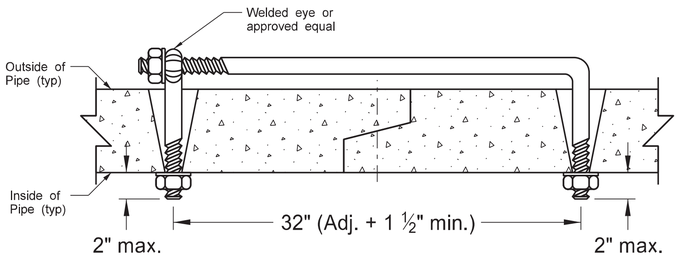
ENGINEER
NORTH DAKOTA

Kirk J Hoff

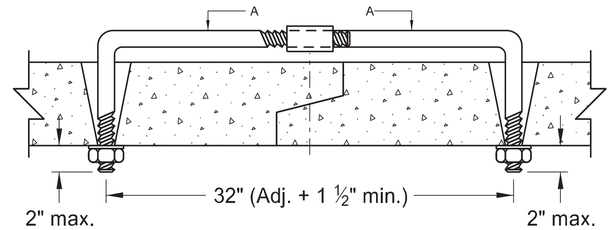
12 02 2020

CONCRETE PIPE, CATTLE PASS, OR PRECAST CONCRETE BOX CULVERT TIES

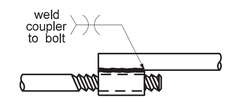
D-714-22



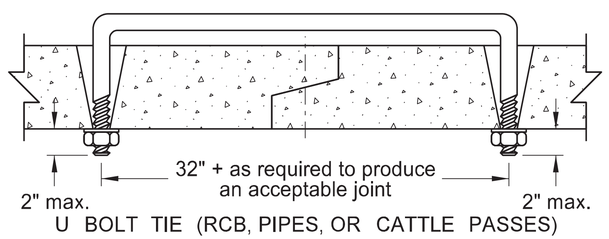
EYE BOLT TIE (PIPES ONLY)



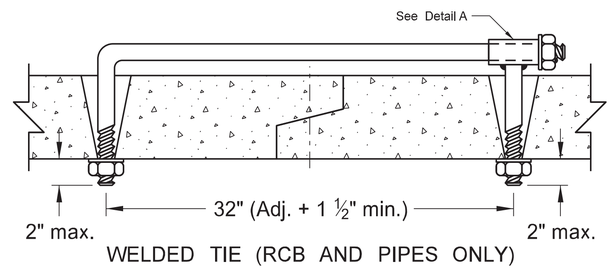
ADJUSTABLE TIE (RCB AND PIPES ONLY)



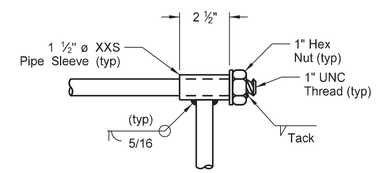
SECTION A-A



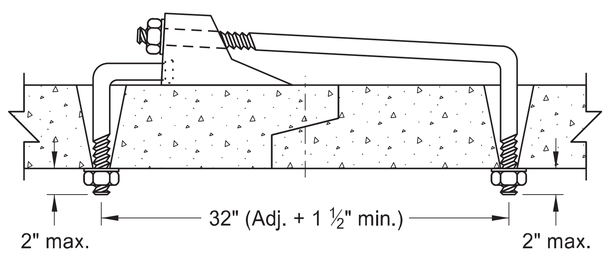
U BOLT TIE (RCB, PIPES, OR CATTLE PASSES)



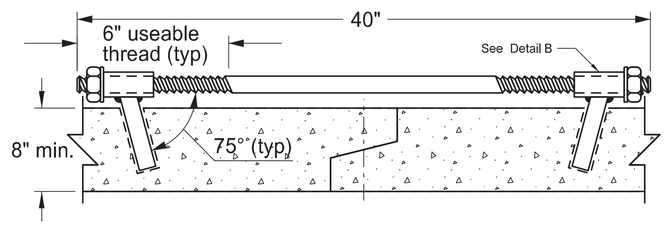
WELDED TIE (RCB AND PIPES ONLY)



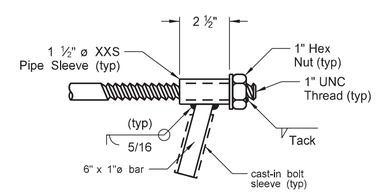
DETAIL A



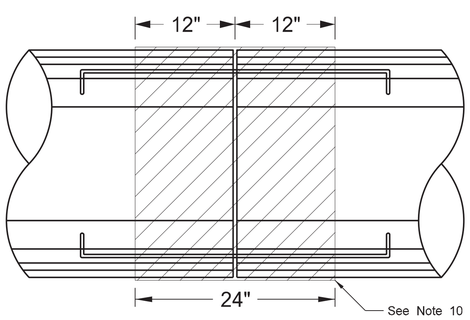
CANOPY TIE (PIPES ONLY)



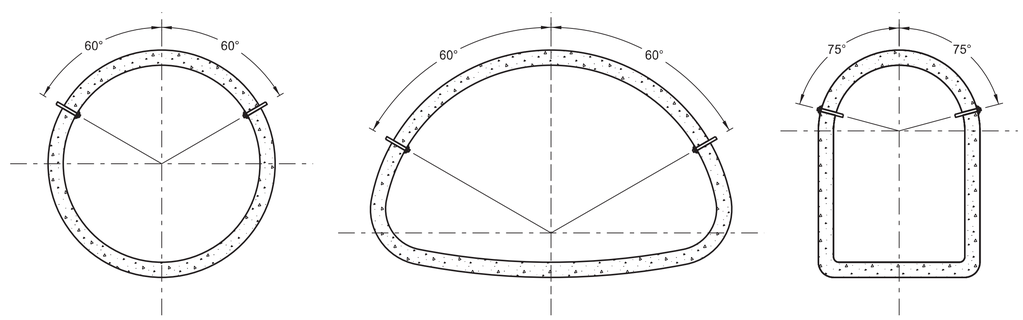
HIDDEN TIE (RCB ONLY)



DETAIL B



PLAN VIEW (PIPES ONLY)



END VIEW

REQUIRED SIZE OF TIE BOLTS		
Pipe Size	Thread ø	XXS Pipe Sleeve Inner ø
18" - 24"	⅝" See note 3	¾"
30" - 66"	¾"	1"
72" - 120"	1"	1 ¼"
RCB/Cattle Pass		

NOTES:

1. The pipe size listed is the inside diameter of round pipe or the equivalent diameter of pipe arch.
2. Insert pipe ties from the inside of the pipes and grout into place for Cattle Pass and Jacked and Bored pipes. Jacked and bored pipes with a diameter of 24" or less do not require pipe ties.
3. Nuts and washers are not required on Jacked and Bored pipes or pipes with a 24" diameter or less. Insert and grout tie bars into place where nuts and washers are not used.
4. Do not use pipe ties to pull the pipe or RCB sections tight. The ties are only for holding sections together.
5. Use only tie bolt assemblies that have been hot dip galvanized in accordance with ASTM A 153.
6. Holes in pipes to accommodate tie bolts can be precast or drilled. Tapered holes are permitted when precast. Use holes that have a diameter ¼" larger than the diameter of the thread. In precast RCB's, use holes that contain cast-in bolt sleeves with an inside diameter of 1 ¼".
7. Select the type of tie bolt used from those shown.
8. Include the cost of precasting or drilling the required holes and furnishing and installing the tie bolts in the price bid for the appropriate conduit or RCB pay item.
9. Tie all centerline and approach RCP culvert joints. Tie the first three joints including the end section of all free ends of storm drain systems. Free ends are defined as any storm drain end which does not terminate at an inlet or manhole. Outfall culverts with end sections which drain adjacent ditches are examples of free ends.
10. Place joint wrap prior to installing ties. Firmly secure the wrap around the full perimeter. For concrete pipes, overlap the joint by 12" in both directions. For box culverts, use a waterproof membrane that meets ASTM C877 (Type III). Provide a membrane that is a minimum of 12" wide and center it at the joint. Provide a minimum overlap of 2.5" at the seams.
11. Use tie bolts that conform to ASTM A 36. Use heavy hex nuts that conform to ASTM A 563. Use washers that conform to ASTM F 436, Type 1. Use welded pipe sleeves and cast-in bolt sleeves that conform to ASTM A 53, Grade B.
12. Tie RCB's at locations shown on the plans.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

3-18-14

REVISIONS

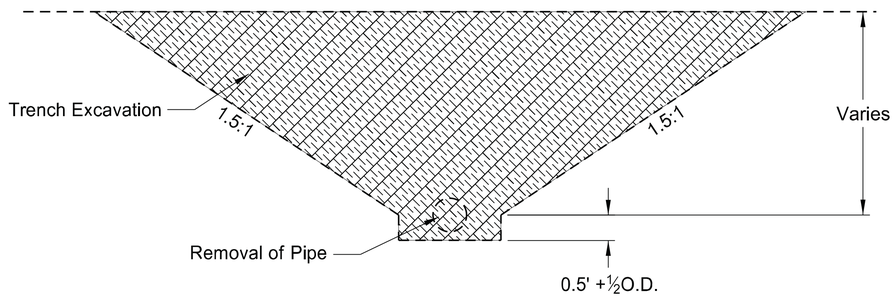
DATE	CHANGE
7-21-15	Note 8
6-6-17	Notes 2-11, Table, Title, Lables
8-11-21	Notes 2-12, Table, Lable

JONATHAN D KETTERING
REGISTERED
PROFESSIONAL
PE-4684
ENGINEER
NORTH DAKOTA
08/11/21

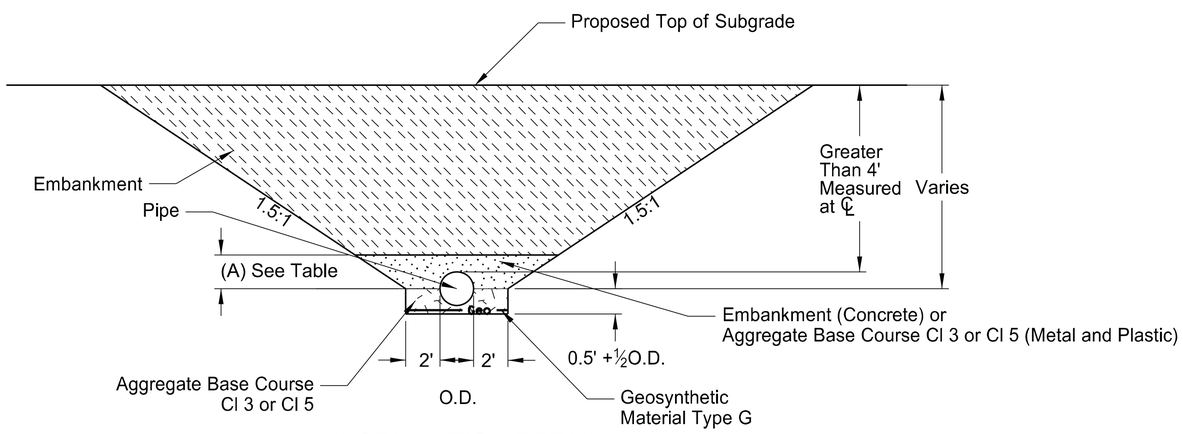
DocuSign

TRANSVERSE MAINLINE PIPE INSTALLATION DETAIL
PIPES MORE THAN 4 FEET BELOW TOP OF SUBGRADE

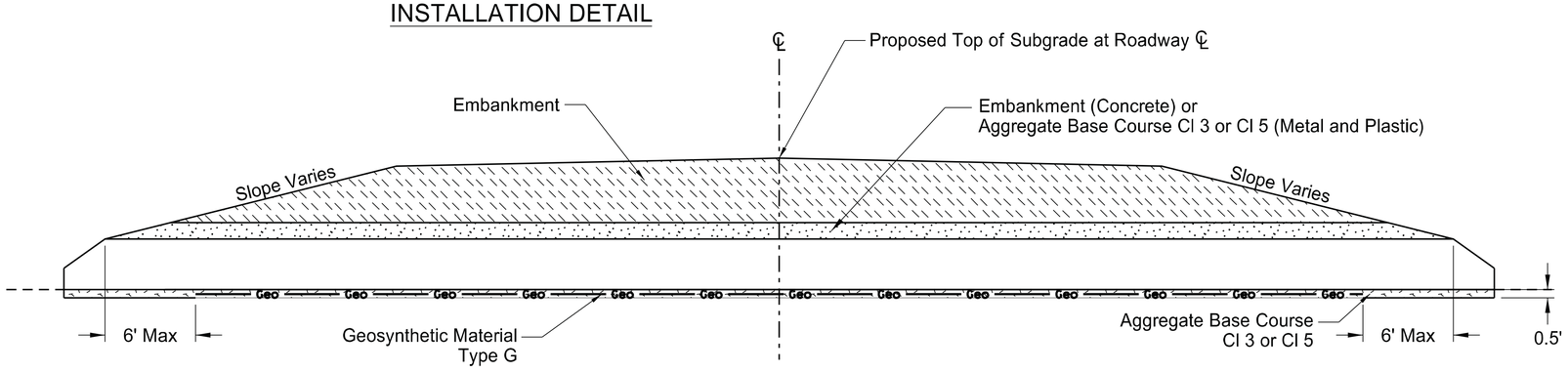
D-714-25



EXCAVATION DETAIL



INSTALLATION DETAIL



CROSS SECTION

Pay Items
1) Pipe*
2) Geosynthetic Material Type G
3) Removal of Pipe (if required)

*Included in Pipe Pay Item
1) Pipe
2) Trench excavation
3) Aggregate Base Course Cl 3 or Cl 5
4) Embankment

NOTES:

1) This drawing applies to new/replaced mainline and paved intersection roadways (including ramps). It does not include pipes in approaches.

2) Embankment may be either Borrow Excavation or Common Excavation - Type A.

Backfill Dimensions	
Pipe Materials	Dimension (A)
Concrete	0.5 O.D.
Metal and Plastic	0.5 O.D. + 1 Foot

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

7-26-13

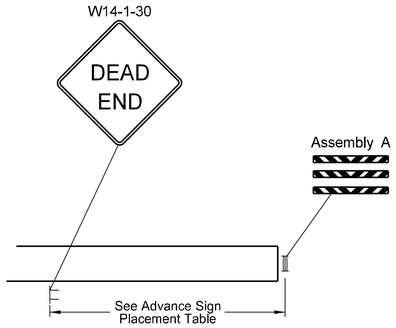
REVISIONS

DATE	CHANGE
10-15-13	Label Formatting
1-21-14	Nomenclature
9-18-15	Title Rewording
12-10-15	Added Plastic Pipe
5-27-20	Replaced R1 Fabric with Geogrid Changed bedding depth

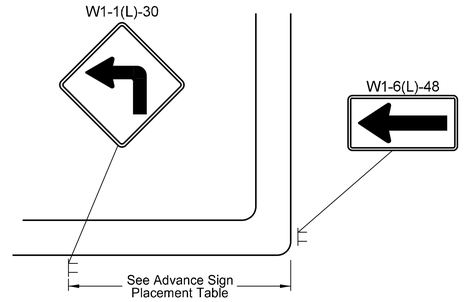
REGISTERED PROFESSIONAL ENGINEER
MATTHEW C KURLE
PE-8777
DATE
05/27/20
NORTH DAKOTA
DocuSign

BARRICADE AND ADVANCE SIGNS FOR FORWARD ROADWAY TERMINATION

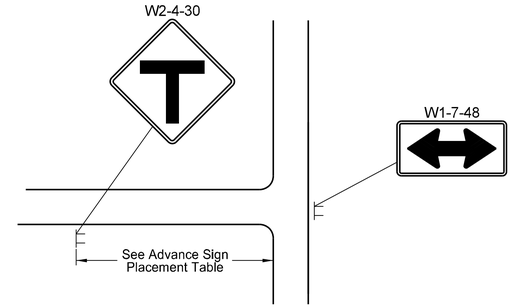
D-754-18



Roadway Termination with Dead End Type A



Roadway Termination with Right or Left Turn Type B



Roadway Termination with T-Intersection Type C

Notes:

Barricade Rails: Fabricate 8" or 9" x 120" rails from anodized aluminum and attach to perforated tube posts with two ⅜" diameter bolts per post placed between the reinforcing ribs.

Barricade Supports: Use material specified for sign supports.

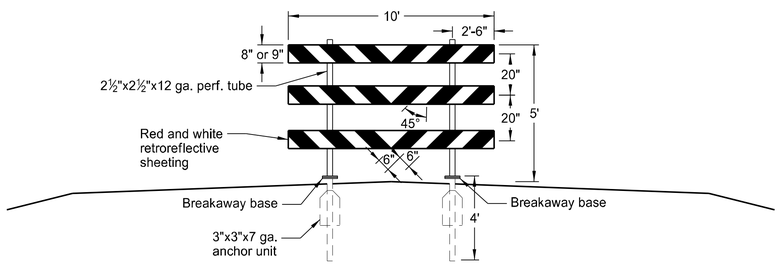
Method of Measurement: The number of each location completed, in place, and accepted by the Engineer.

Basis of Payment: Include all cost for furnishing, delivering, and installing all necessary signs and barricades at each location shown on the plans in the unit price bid for each location.

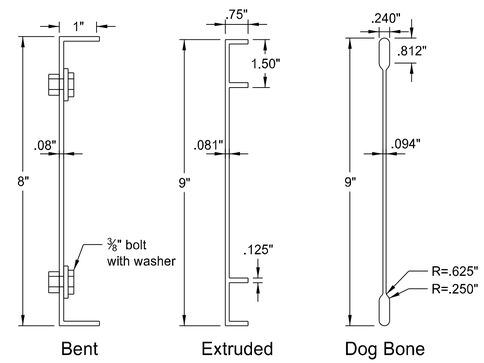
Vertical Clearance: 5' minimum, 7' residential and business districts where parking and/or pedestrian movements occur.

Place breakaway base and anchor unit as shown on D-754-24 or D-754-24A.

Use Type XI reflective sheeting.



Type III Barricade Assembly A



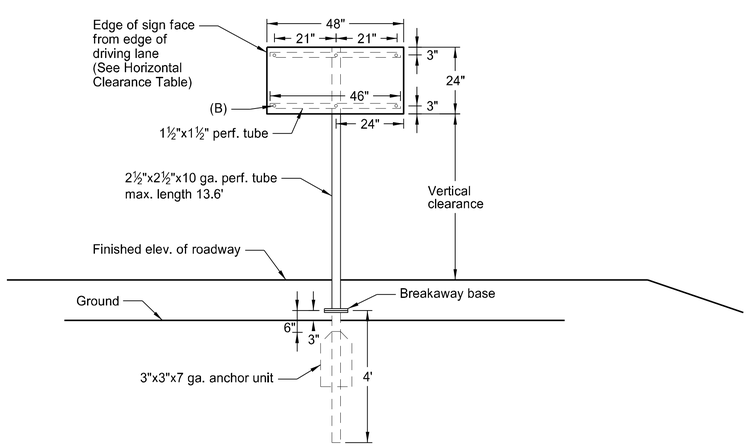
Barricade Bar Details

Horizontal Clearance Table	
Shoulder Width ft	Offset ft
0 to 2	16
>2 to 4	18
>4 to 6	20
>6 to 8	22
>8 to 10	24

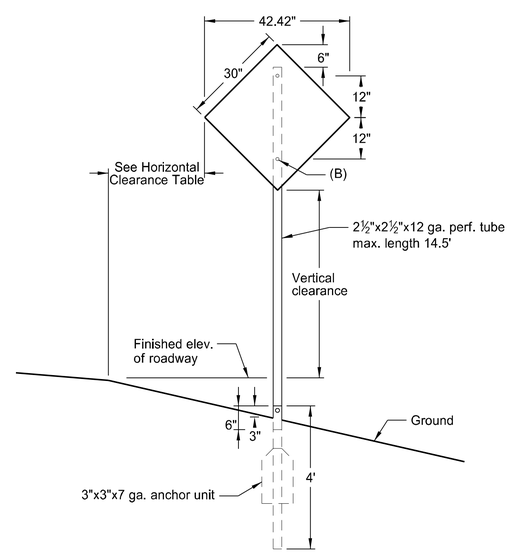
Advance Sign Placement Table (A)	
Posted or 85th Percentile Speed	Minimum Distance
0 to 40 mph	125 ft
45 mph	175 ft
50 mph	250 ft
55 mph	325 ft
60 mph	400 ft
65 mph	475 ft
70 mph	550 ft
75 mph	650 ft

(A) If roadway termination is ½ mile or less from a section line road, place the advanced warning sign just after the section line road.

(B) Punch round holes for ⅜" fasteners.



Assembly Detail for Directional Arrow Signs



Assembly Detail for 30" Signs

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
11-4-13	Non bkwy base for 30" signs
7-8-14	Note added for Refl. sheeting and revised Assembly detail for directional arrow signs.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 8/29/19 and the original document is stored at the North Dakota Department of Transportation

PERFORATED TUBE ASSEMBLY DETAILS

D-754-23

Notes:

1. Curbed Roadways: Use a 3' clearance from face of the curb except where right of way or sidewalk width is limited; Use a minimum 2' clearance. Increase the horizontal clearance if required to maintain a minimum sidewalk clear width of 4' from the sign support, not including any attached curb.

2. Minimum vertical clearance: Provide at least 5' measured from the bottom of the sign to the edge of the driving lane or auxiliary lane at the side of the road in rural districts. Provide at least 7' clearance to the bottom of the sign, where parking or pedestrian movements occur.

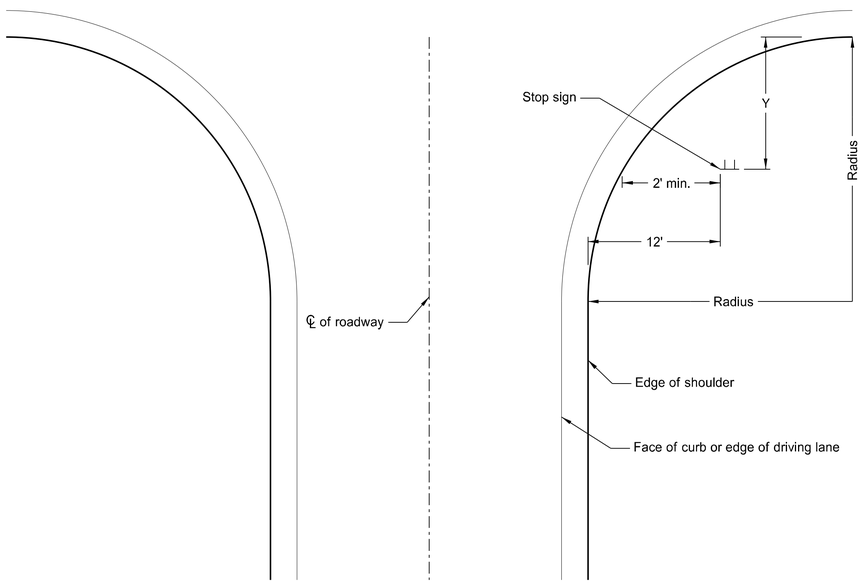
   Install signs on expressways a minimum height of 7'.

   Install adopt-a-highway signs on Freeways at least 7' above the edge of the driving lane.

   Maximum vertical clearance is 6" greater than the minimum vertical clearance.

3. Offset signs: Use a vertical clearance of 5' above the edge of the driving lane for signs placed 30 feet or more from the edge of the traveled way.

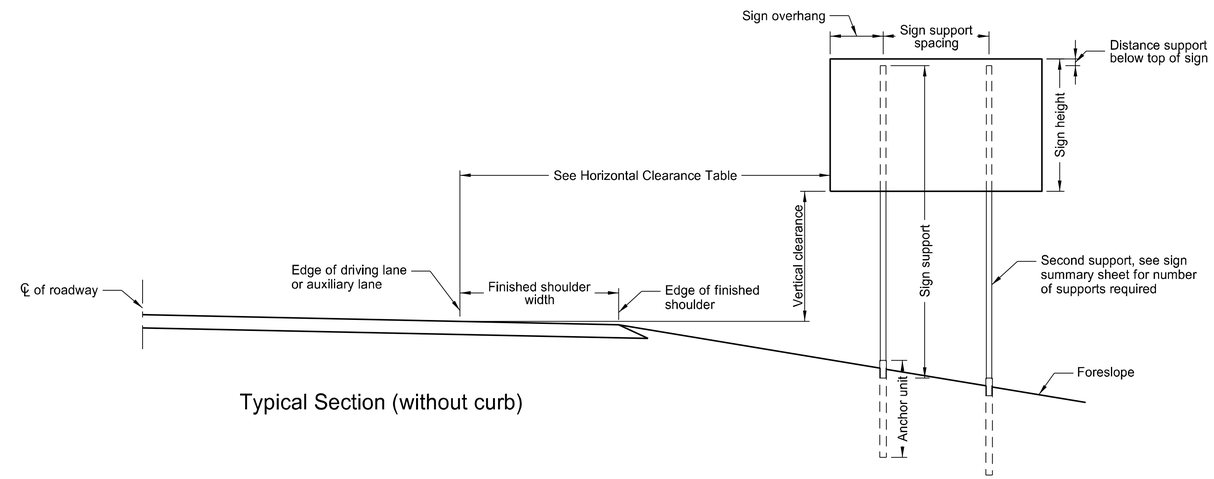
4. Provide a horizontal clearance from edge of shared use path to edge of sign of 3', except where width is limited. Provide a minimum clearance of 2'.



Stop Sign Location
Wide Throat Intersection

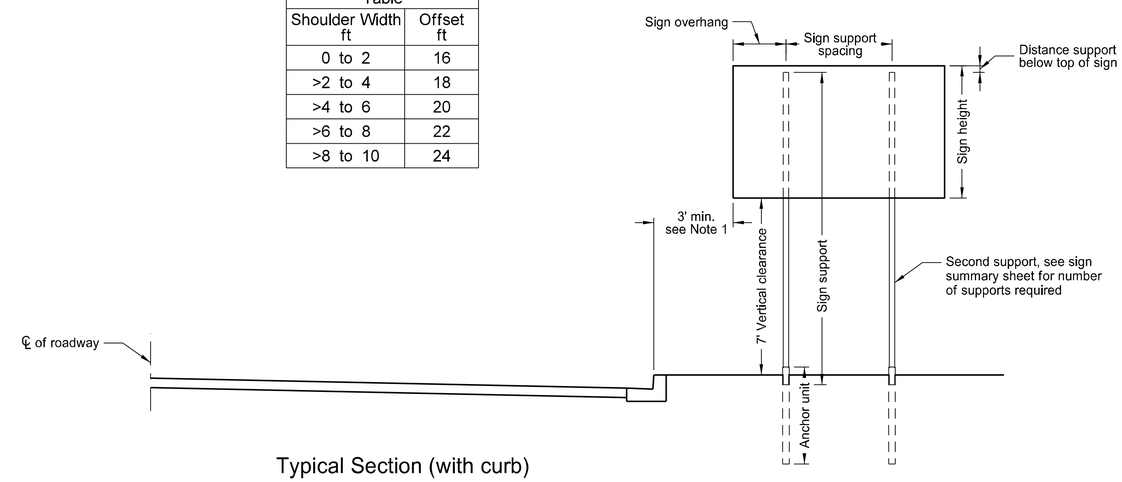
Use layout for the placement of "Stop" signs.

Radius ft.	Y-max. ft.	Y-min. ft.
40	50	15
45	50	18
50	50	21
55	50	25
60	50	28
65	50	32
70	50	35
75	50	39
80	50	43



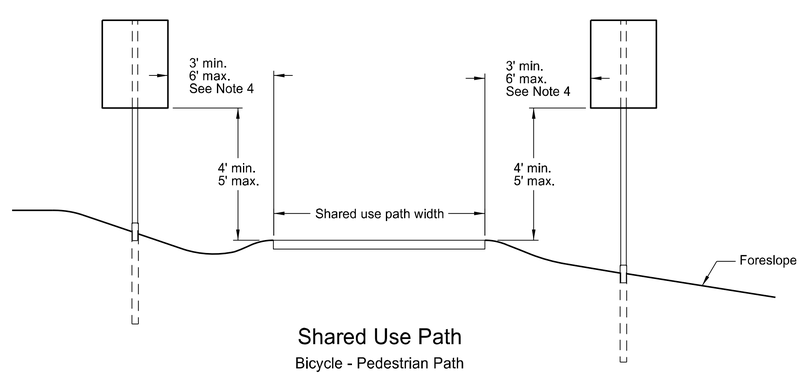
Typical Section (without curb)

Horizontal Clearance Table	
Shoulder Width ft	Offset ft
0 to 2	16
>2 to 4	18
>4 to 6	20
>6 to 8	22
>8 to 10	24



Typical Section (with curb)

Residential or Business District



Shared Use Path

Bicycle - Pedestrian Path

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
10-3-13	
REVISIONS	
DATE	CHANGE
7-8-14	Revised note 2, added note 4.
8-30-18	Updated notes to active voice.
8-29-19	New Design Engineer PE Stamp.

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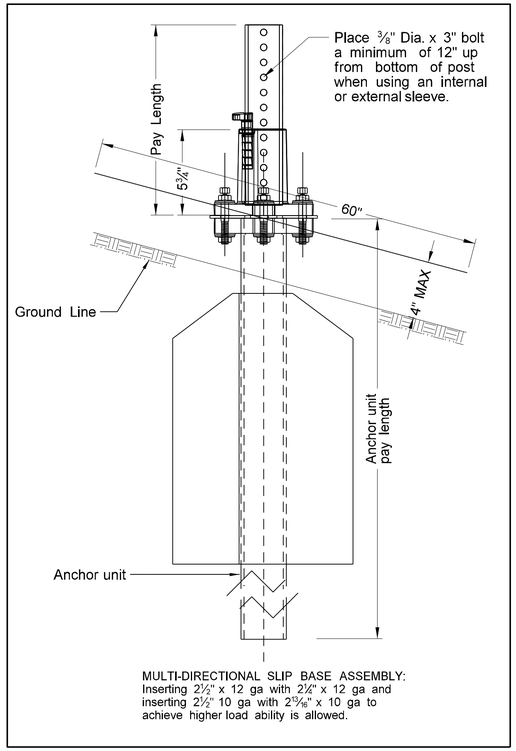
Mounting Details Perforated Tube

D-754-24

Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thick-ness Gauge
1	2	12			No	2¼	12
1	2¼	12			No	2½	12
1	2½	12			(B)	3(C)	7
1	2½	10			Yes		7
1	2¼	12	2½(D)	12	Yes		7
1	2½	12	2¼	12	Yes		7
2	2½	10			Yes		7
2	2¼	12	2½(D)	12	Yes		7
2	2½	12	2¼	12	Yes		7
3 & 4	2½	12			Yes		7
3 & 4	2½	10			Yes		7
3 & 4	2½	12	2¼	12	Yes		7
3 & 4	2¼	12	2½(D)	12	Yes		7
3 & 4	2½	10	2 3/16	10	Yes		7

(B) - Provide a shim as specified by the manufacturer when placing 2½", 12 gauge posts in standard soils without breakaway bases. Provide breakaway base when placing the support in weak soils. The Engineer will determine if the soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2½" x 12 ga. x 18" minimum length external sleeve required.



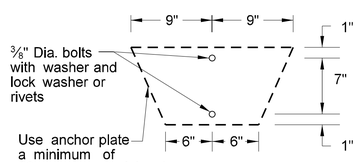
MULTI-DIRECTIONAL SLIP BASE ASSEMBLY: Inserting 2½" x 12 ga with 2¼" x 12 ga and inserting 2½" 10 ga with 2 13/16" x 10 ga to achieve higher load ability is allowed.

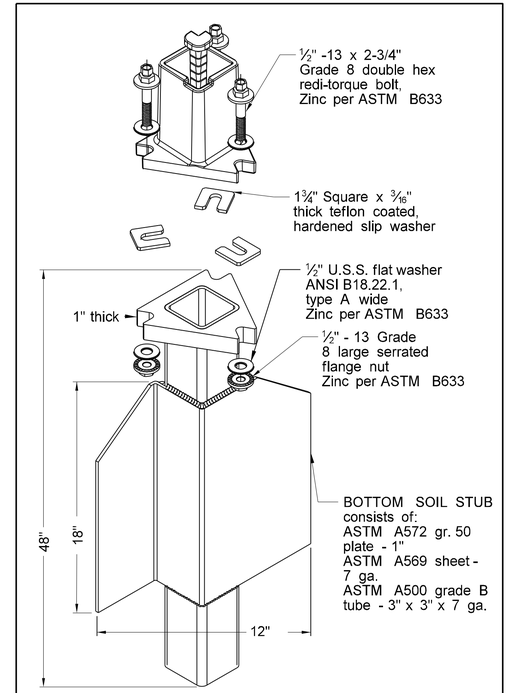
Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness in.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In.^{4}	Cross Sect. Area In.^{2}	Section Modulud In.^{3}
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.783

The 2 3/16" size 10 gauge is shown as 2.19" size on the plans; The 2½" size is shown as 2.51" size on the plans.

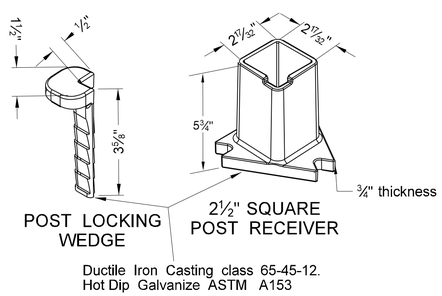
NOTE:

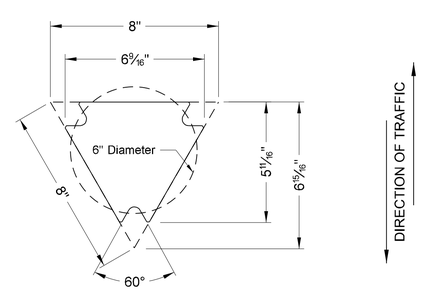
1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.
2. Provide 7 guage HRPO commmercial quality ASTM A569 and 3" x 3" x 7" guage ASTM A500 grade B anchor material with 43.9 KSI yield strength and 59.3 KSI tensile strength. Hot dip galvanize anchor per ASTM A123/153. Tolerances on anchor unit and slip base bottom assembly are +/- 0.005" unless ortherwise noted.
3. Eliminate wings when anchor is used in concrete sidewalk.
4. Provide a minimum 8' distance between the first and fourth post on four post signs.
5. Install in accordance with manufacturers recommendation.
6. Use a minimum ½" diameter x 4" grade 8 concrete fastener for surface mount breakaway base.



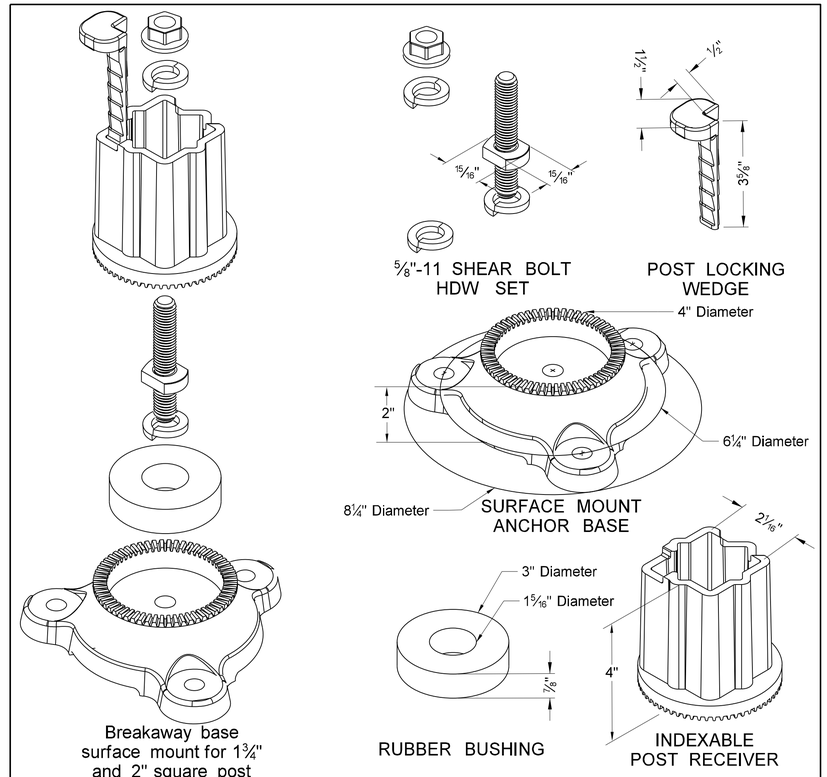


SLIP BASE FOR 2½" POST





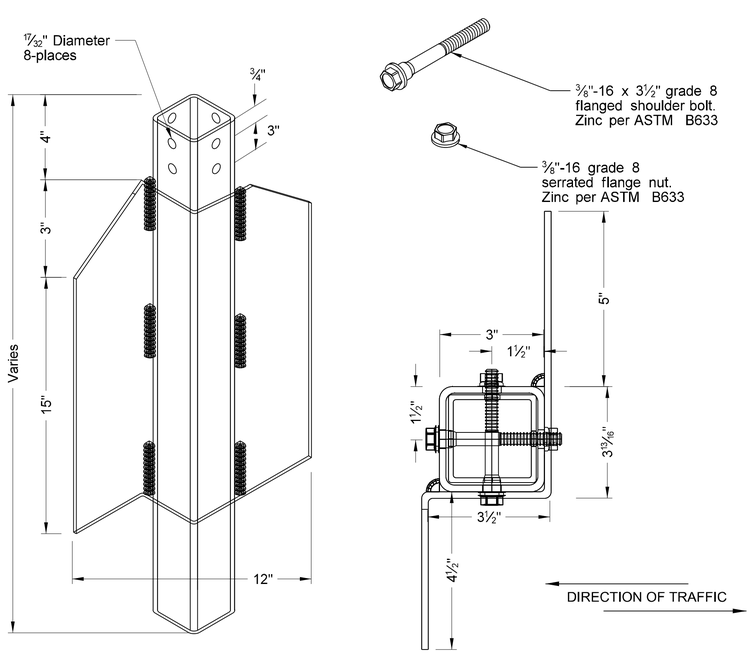
SLIP BASE DETAIL



SURFACE MOUNT ANCHOR BASE

SHOULDER BOLT

Shimming agent to reduce tolerance between 3" anchor unit and 2½" post.
(use standard ⅜" diameter grade 8 bolt with proper shim)



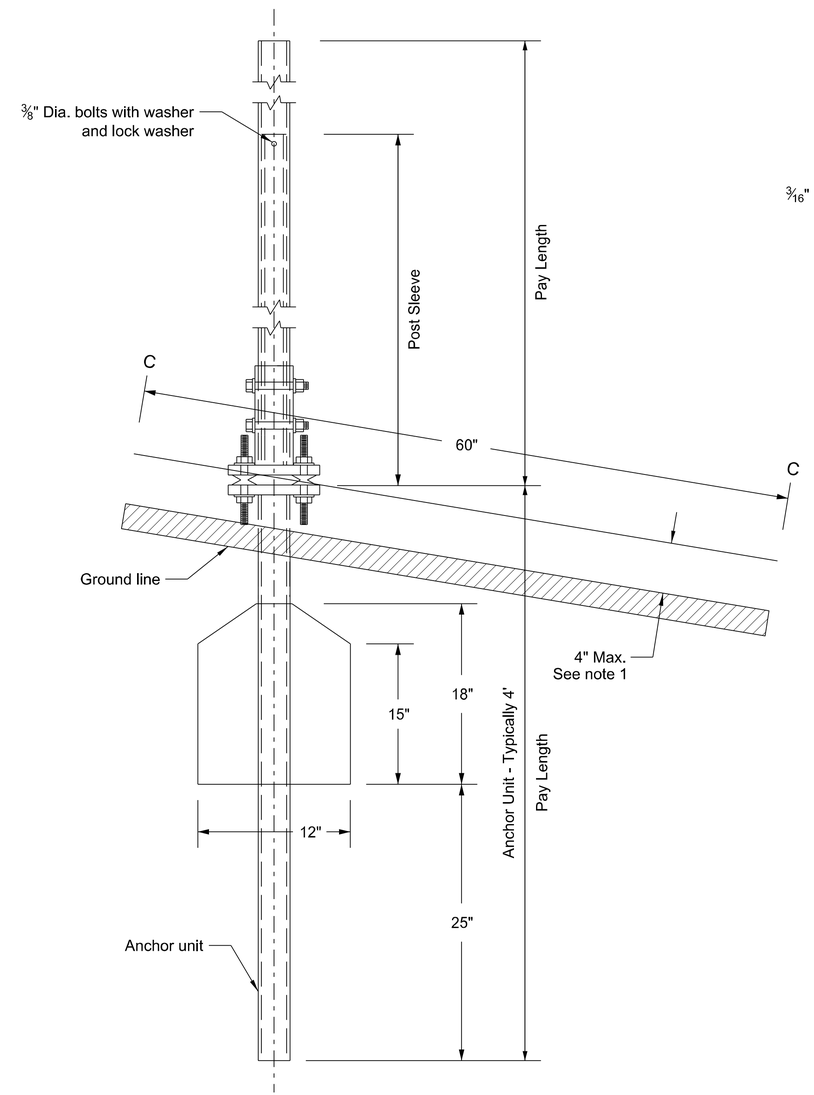
3" ANCHOR UNIT

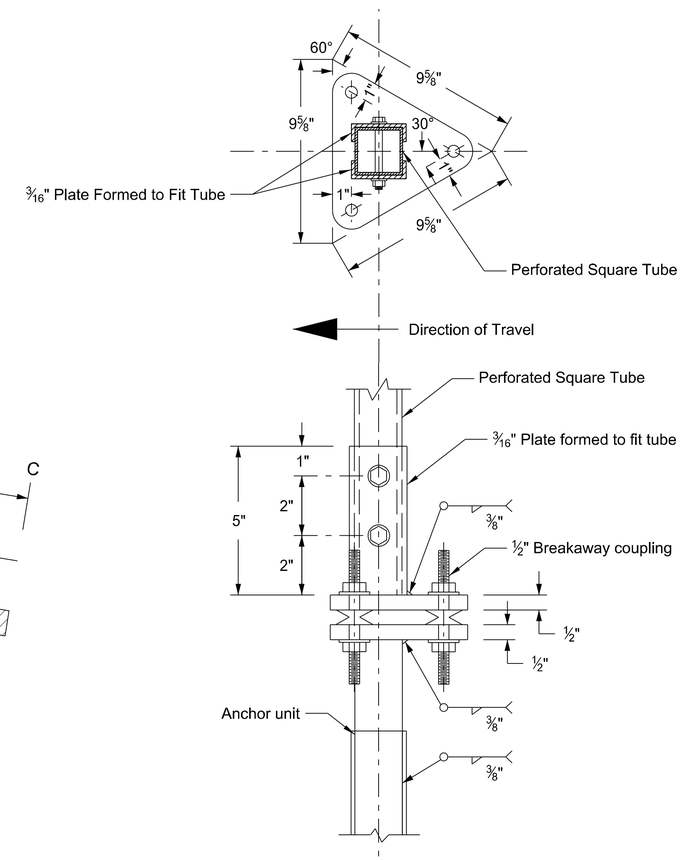
NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-6-09	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice & corrected max height of base.
8-29-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683 on 8/29/19 and the original document is stored at the North Dakota Department of Transportation

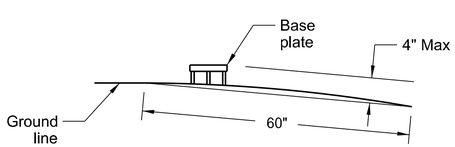
D-754-24A

Breakaway Coupler System for Perforated Tubes





Base Plate with Breakaway Coupler

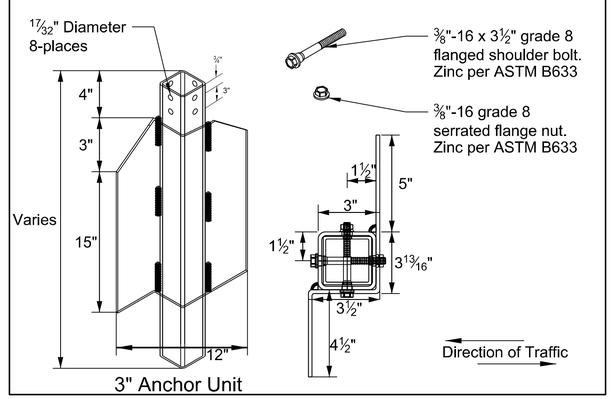


Section C-C

Max protection of the stub post is 4" above a 60" chord aligned radially to the center line of the highway and connecting any point, within the length of the chord, on the ground surface on one side of the support to a point in the ground surface on the other side.

Shoulder Bolt

Shimming agent to reduce tolerance between 3" anchor unit with 2½" post. (use of standard ⅜" diameter grade 8 bolt allowed with proper shim)



3" Anchor Unit

Notes:

1. 4" Vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.
2. Use anchor unit of the same size and specification as the post.
3. Provide a minimum 8' distance between the first and fourth post on four post signs.
4. Use the breakaway base system on standard D-754-24 or the breakaway coupling system manufactured from material meeting the requirements of ASTM A325 fasteners with the special requirements specified by DENT BREAKAWAY IND., INC. which meets the test requirements of NCHRP Report 350.

Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thickness Guage
1	2	12			No	2¼	12
1	2¼	12			No	2½	12
1	2½	12			(B)	3(C)	7
1	2½	10			Yes		7
1	2¼	12	2	12	Yes		7
1	2½	12	2¼	12	Yes		7
2	2½	10			Yes		7
2	2¼	12	2	12	Yes		7
2	2½	12	2¼	12	Yes		7
3 & 4	2½	12			Yes		7
3 & 4	2½	10			Yes		7
3 & 4	2½	12	2¼	12	Yes		7
3 & 4	2¼	12	2	12	Yes		7
3 & 4	2½	10	2 3/16	10	Yes		7

(B) - 2½" 12 gauge posts do not need breakaway bases unless support is placed in boggy, wet, or loose soil areas.

(C) - 3" anchor unit

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION

10-3-2013

REVISIONS

DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engr PE Stamp.

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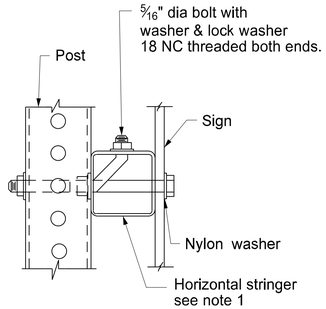
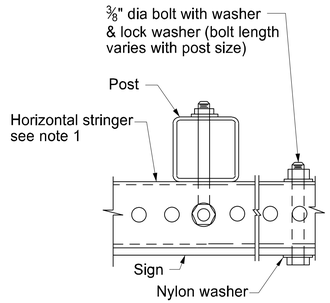
Mounting Details Perforated Tube

D-754-25

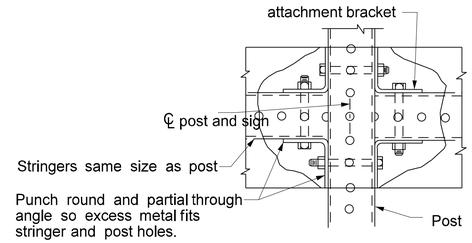


Side View



Top View

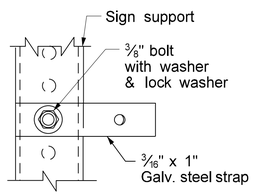
STRINGER MOUNTING
(WITH STRINGER IN FRONT OF POST)



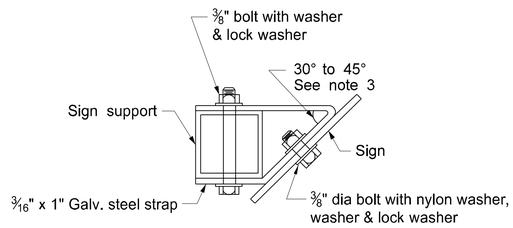
STREET NAME SIGNS AND ONE WAY SIGNS
SINGLE POST ASSEMBLY
ONE STRINGER OR BACK TO BACK MOUNTING

Note:

1. Horizontal stringers - Use perforated tubes or 1¾" x 3/16" thick, 1.08 lbs./ft aluminum or 3.16 lbs./ft steel z bar stringers.
2. Use minimum outside diameter 15/16" ±1/16" and 10 gauge thick metal washers on sign face.
3. Place No Parking signs with directional arrows at a 30 to 45 degree angle with the line of traffic flow. Turning the support to the correct angle for No Parking signs requiring the above angles is allowed. If the No Parking sign is placed with another sign that requires placement at a 90 degree angle with the line of traffic flow, use the detailed angle strap to mount the No Parking sign. Use flat washers and lock washers with all nylon washers.
4. Punching the sign backing and placing the bolt through the sign, the stringer and the post is allowed in lieu of using the bent bolt to attach the post to the stringer.
5. 4" vertical clearance of anchor or breakaway base. The 4" x 60" measurement is above and below post location and also back and ahead of post.

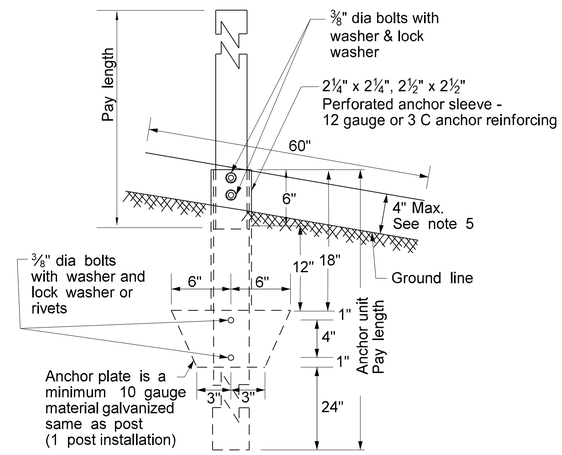


Side View



Top View

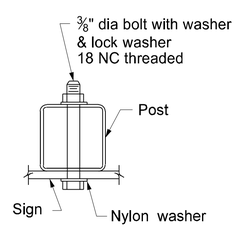
STRAP DETAIL



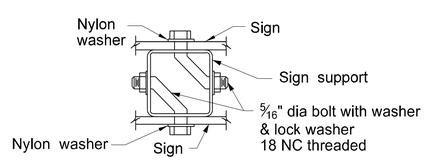
ANCHOR UNIT AND POST ASSEMBLY

Number of Posts	Telescoping Perforated Tube						
	Post Size In.	Wall Thick-ness Gauge	Sleeve Size In.	Wall Thick-ness Gauge	Slip Base	Anchor Size Without Slip Base In.	Anchor Wall Thick-ness Gauge
1	2	12			No	2¼	12
1	2¼	12			No	2½	12
1	2½	12			(B)	3(C)	7
1	2½	10			Yes		7
1	2¼	12	2½(D)	12	Yes		7
1	2½	12	2¼	12	Yes		7
2	2½	10			Yes		7
2	2¼	12	2½(D)	12	Yes		7
2	2½	12	2¼	12	Yes		7
3 & 4	2½	12			Yes		7
3 & 4	2½	10			Yes		7
3 & 4	2½	12	2¼	12	Yes		7
3 & 4	2¼	12	2½(D)	12	Yes		7
3 & 4	2½	10	2 3/16	10	Yes		7

(B) - When placing 2½", 12 gauge posts in standard soils without breakaway bases, provide a shim as specified by the manufacturer. Provide breakaway base when placing the support in weak soils. Engineer will determine if soils are weak. Weak soils are classified as boggy, wet, or loose soil areas.
(C) - 3" anchor unit
(D) - 2½" x 12 ga. x 18" minimum length external sleeve required.

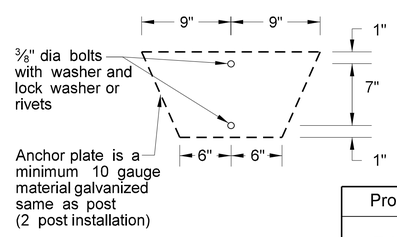


BOLT MOUNTING



Top View

BACK TO BACK MOUNTING



Properties of Telescoping Perforated Tubes						
Tube Size In.	Wall Thickness In.	U.S. Standard Gauge	Weight Per Foot Lbs.	Moment of Inertia In.^{4}	Cross Sect. area In.^{2}	Section Modulus In.^{3}
1½ x 1½	0.105	12	1.702	0.129	0.380	0.172
2 x 2	0.105	12	2.416	0.372	0.590	0.372
2¼ x 2¼	0.105	12	2.773	0.561	0.695	0.499
2 3/16 x 2 3/16	0.135	10	3.432	0.605	0.841	0.590
2½ x 2½	0.105	12	3.141	0.804	0.803	0.643
2½ x 2½	0.135	10	4.006	0.979	1.010	0.783

The 2 3/16" size 10 gauge is shown as 2.19" size on the plans.
The 2½" size is shown as 2.51" size on the plans.

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

8-6-09

REVISIONS

DATE	CHANGE
7-8-14	Revised Note 3.
8-30-18	Updated notes to active voice.
8-30-19	New Design Engr PE Stamp.

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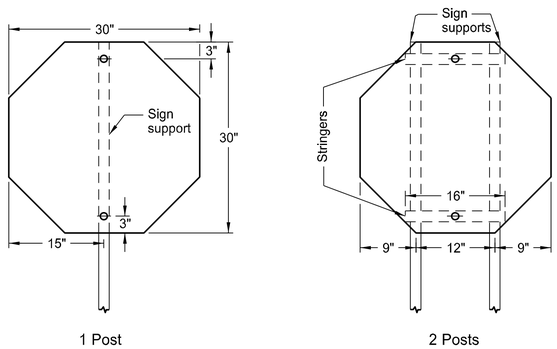
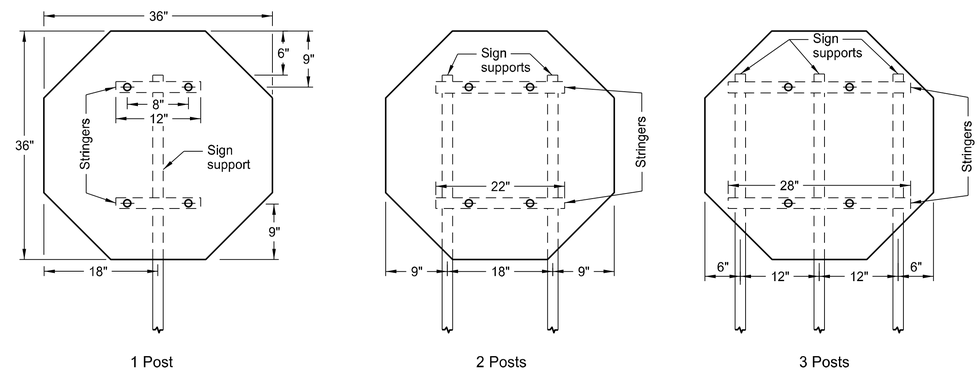
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS

D-754-26



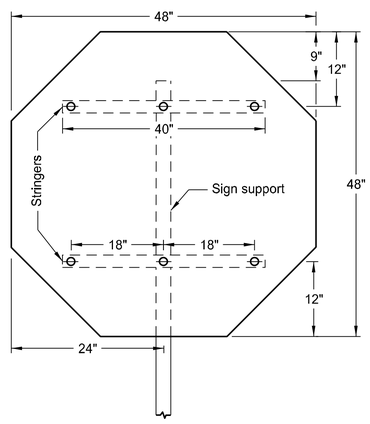
Assembly No. 1

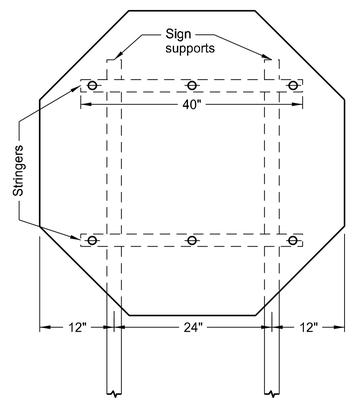


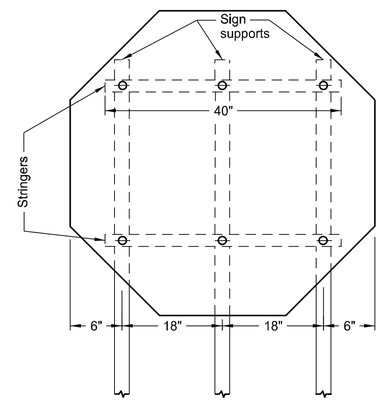
Assembly No. 2

Notes:

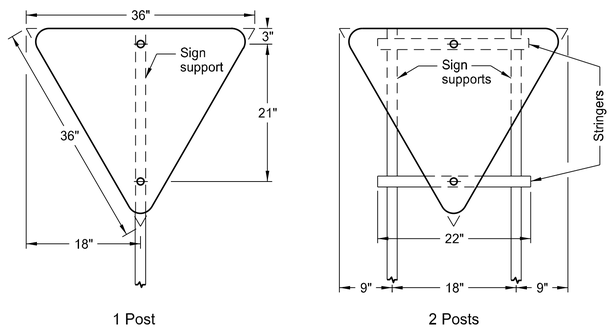
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.



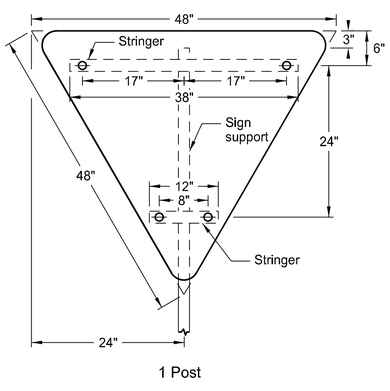


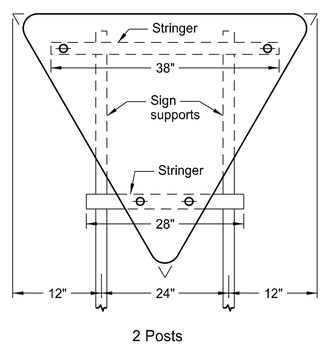


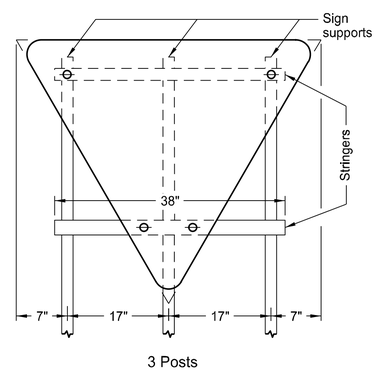
Assembly No. 3



Assembly No. 4







Assembly No. 5

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

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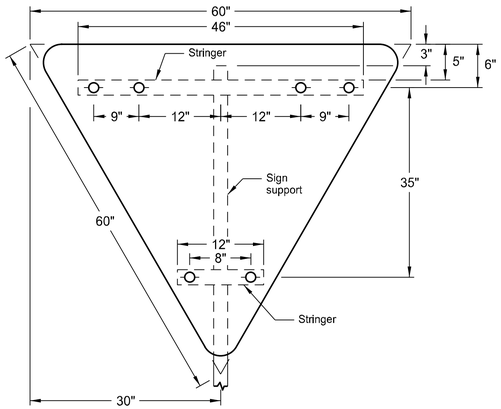
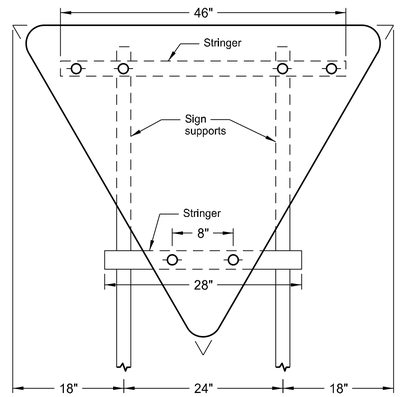
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS

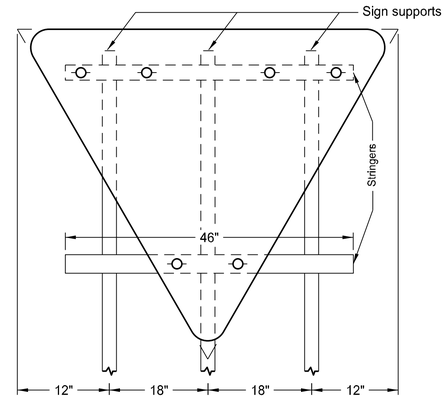
D-754-27



1 Post



2 Posts

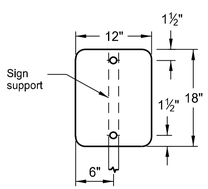


3 Posts

Assembly No. 6

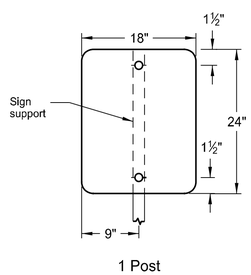
Notes:

1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.



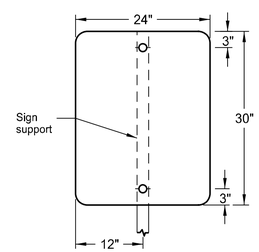
1 Post

Assembly No. 7



1 Post

Assembly No. 8



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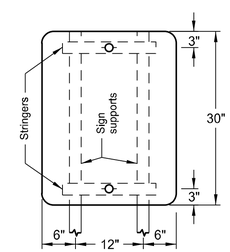
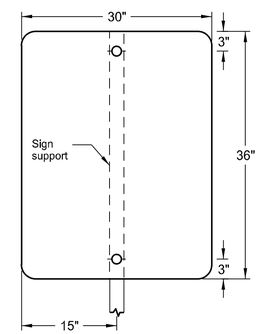


2 Posts

Assembly No. 9



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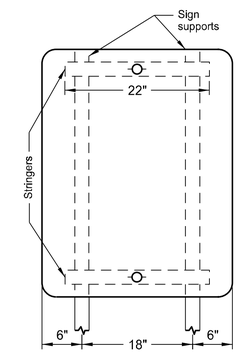
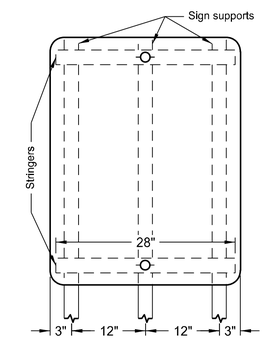
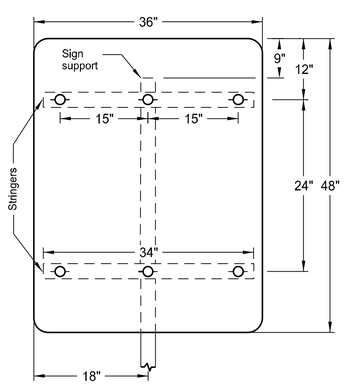


2 Posts

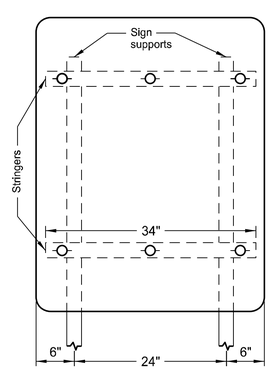


3 Posts

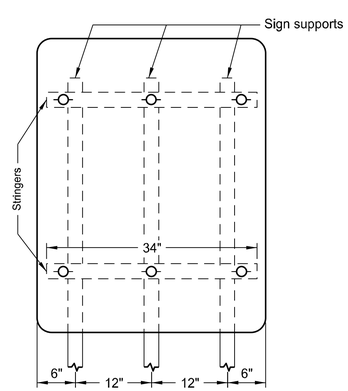
Assembly No. 10



1 Post



2 Posts



3 Posts

Assembly No. 11

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

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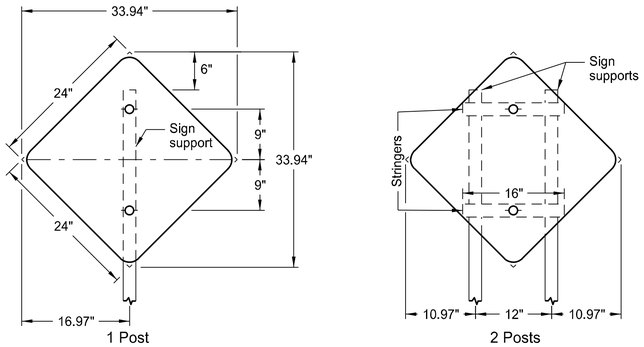
D-754-29

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS



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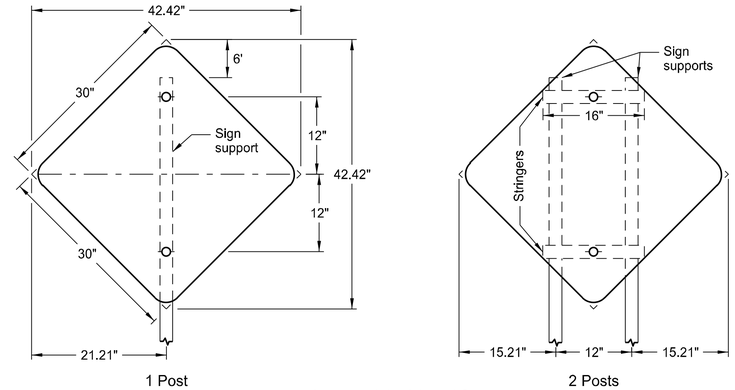

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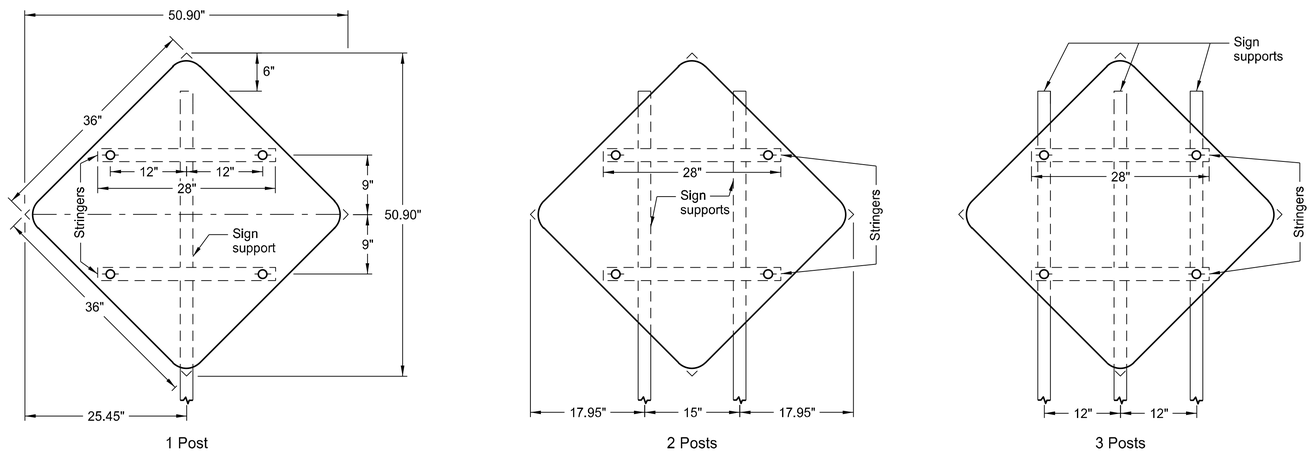

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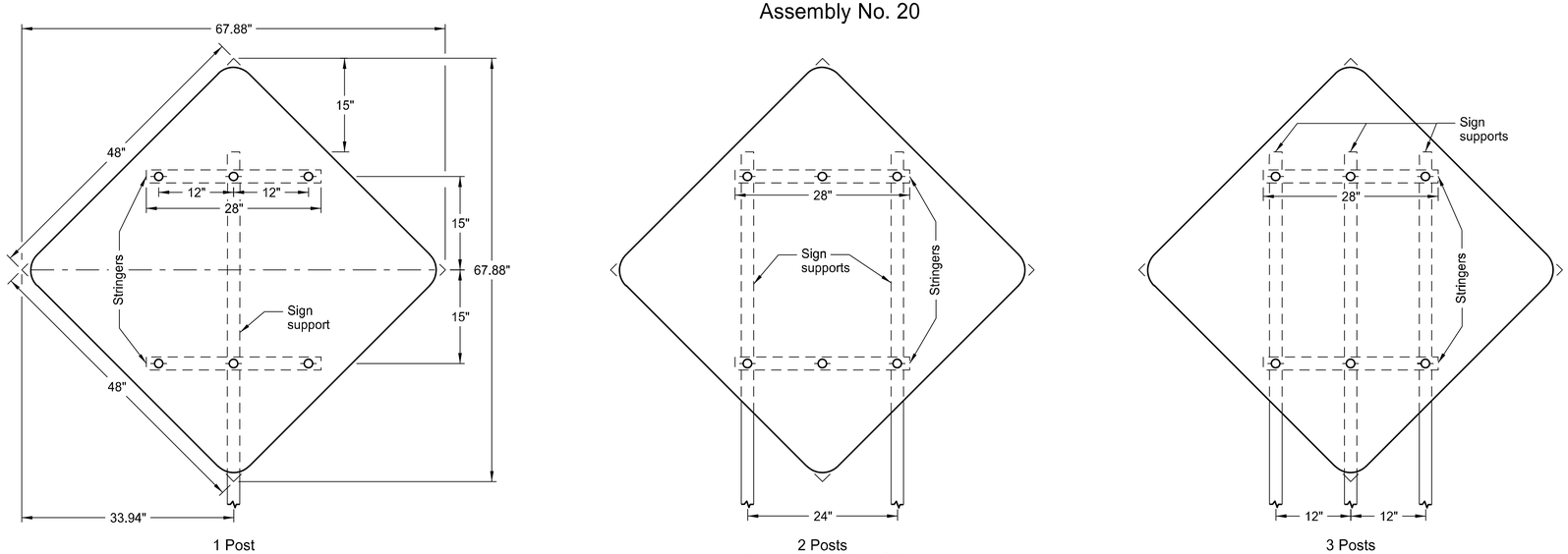

Assembly No. 21

Notes:

1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

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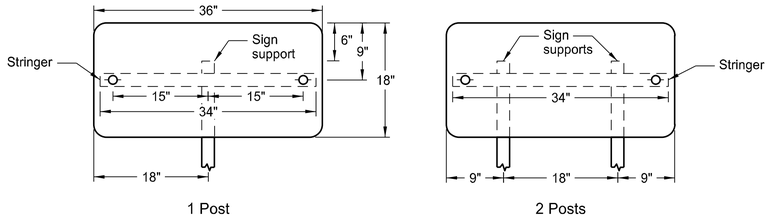
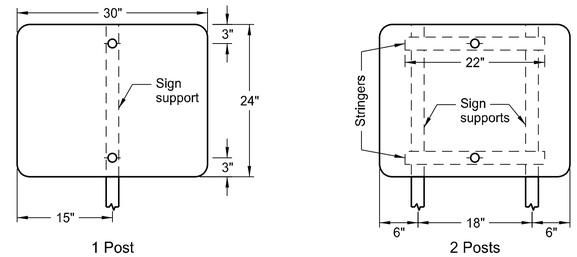
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS REGULATORY, WARNING AND GUIDE SIGNS

D-754-32



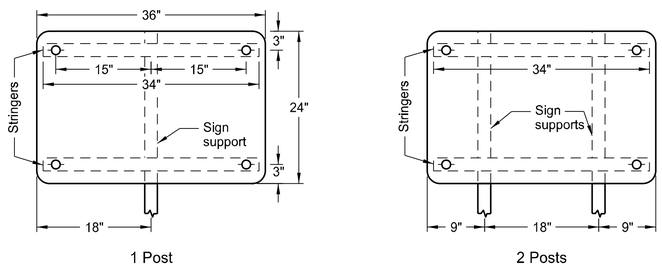
Assembly No. 31



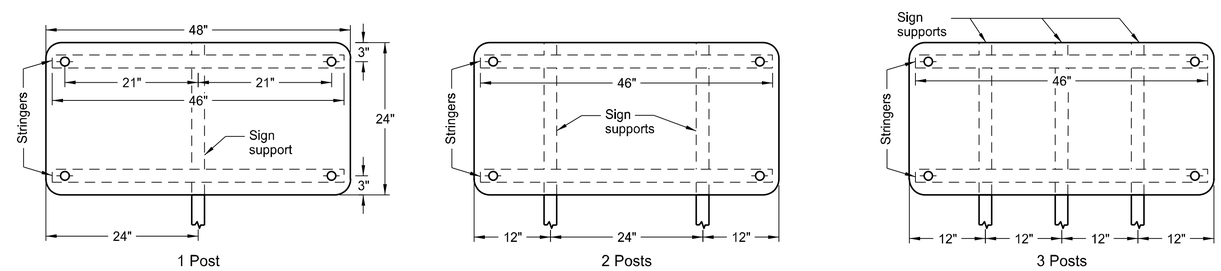
Assembly No. 32

Notes:

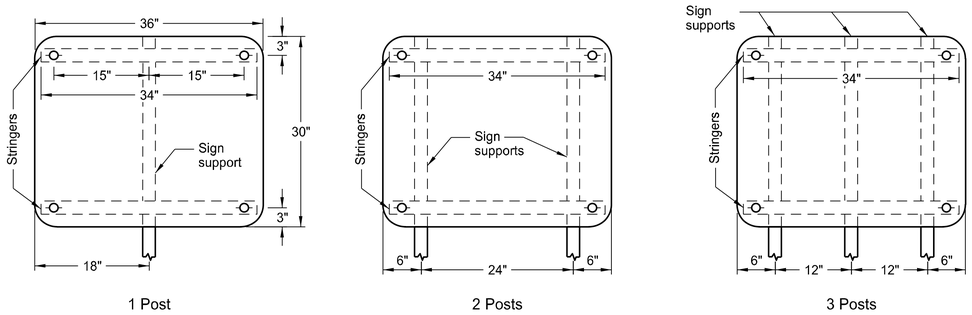
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½" x 1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.



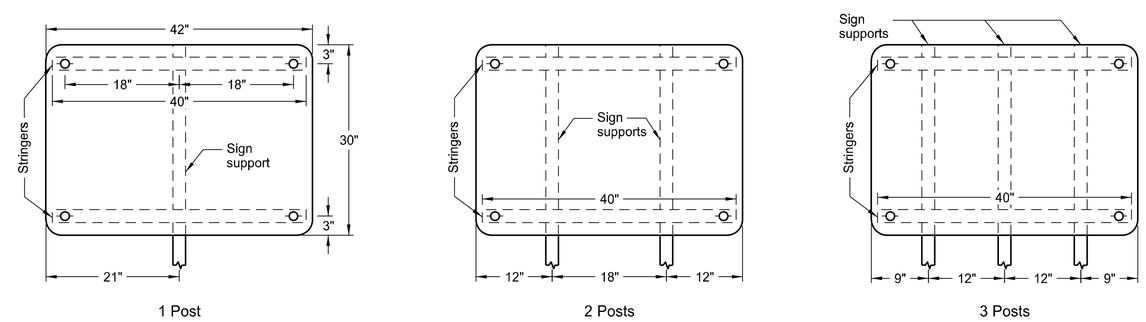
Assembly No. 33



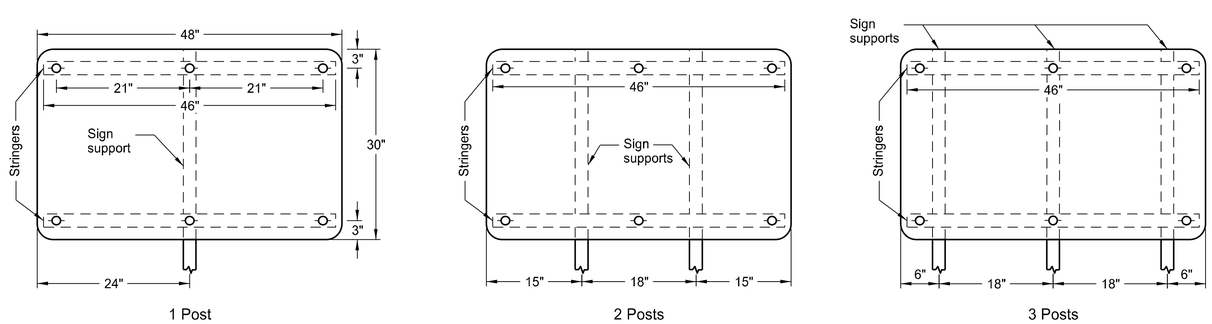
Assembly No. 34



Assembly No. 35



Assembly No. 36



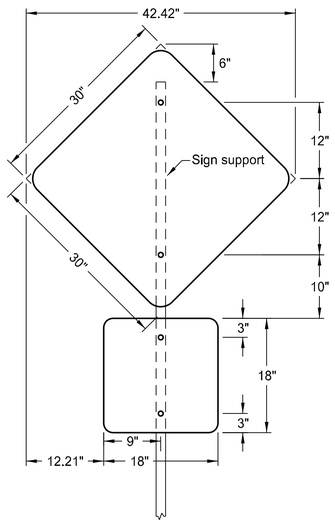
Assembly No. 37

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
8-30-19	New Design Engineer PE Stamp.

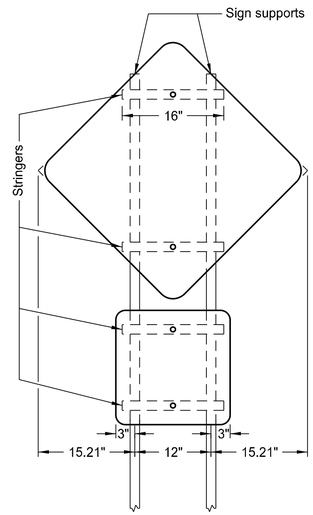
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS
REGULATORY, WARNING AND GUIDE SIGNS

D-754-37

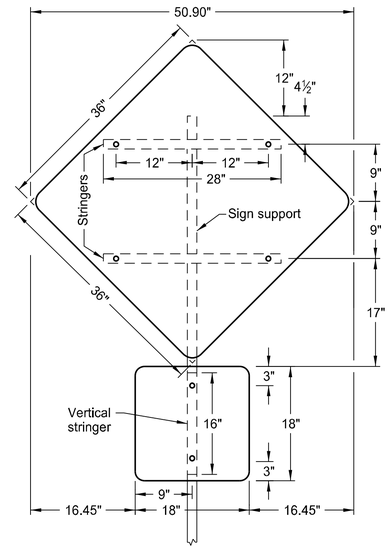


1 Post

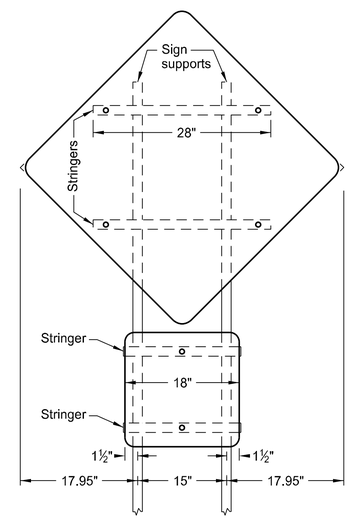


2 Posts

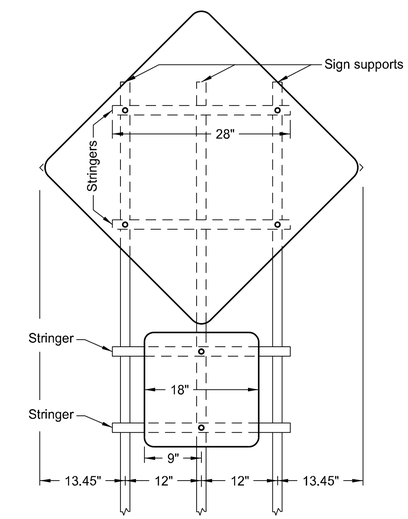
ASSEMBLY NO. 53



1 Post

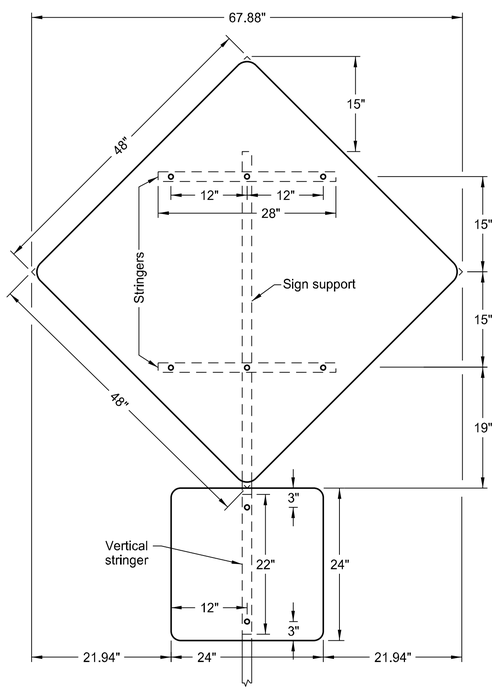


2 Posts

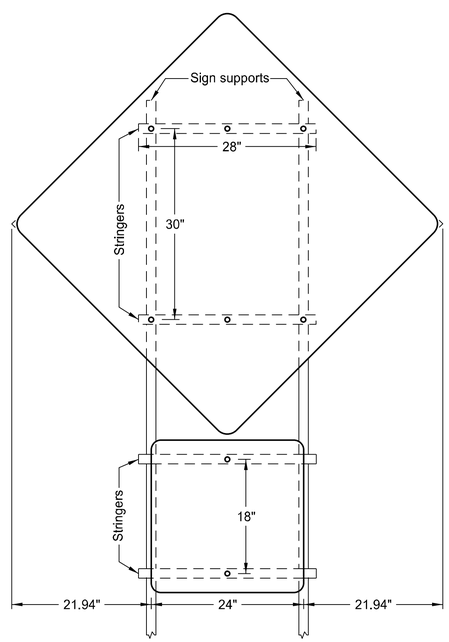


3 Posts

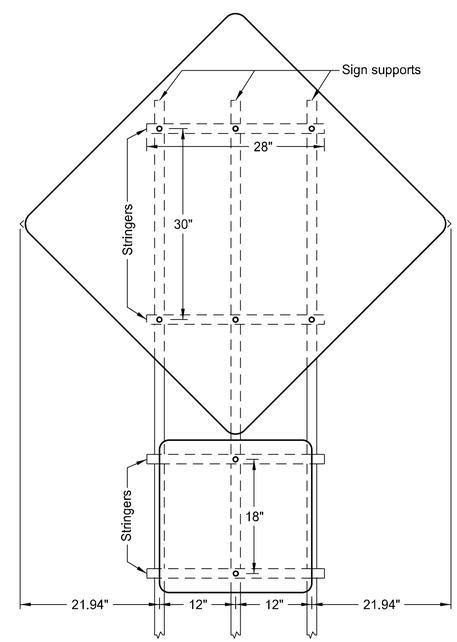
ASSEMBLY NO. 54



1 Post



2 Posts



3 Posts

ASSEMBLY NO. 55

Notes:

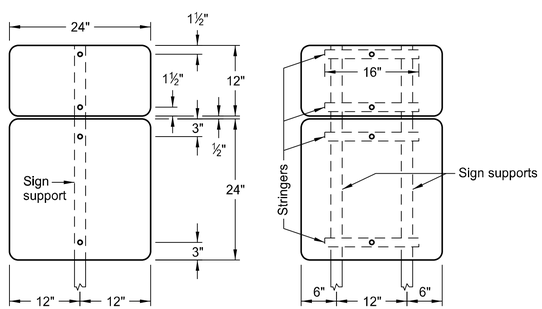
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½"x1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated to active voice & added Assembly 53, 54, & 55 dimension.
8-30-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 8/30/19 and the original document is stored at the North Dakota Department of Transportation

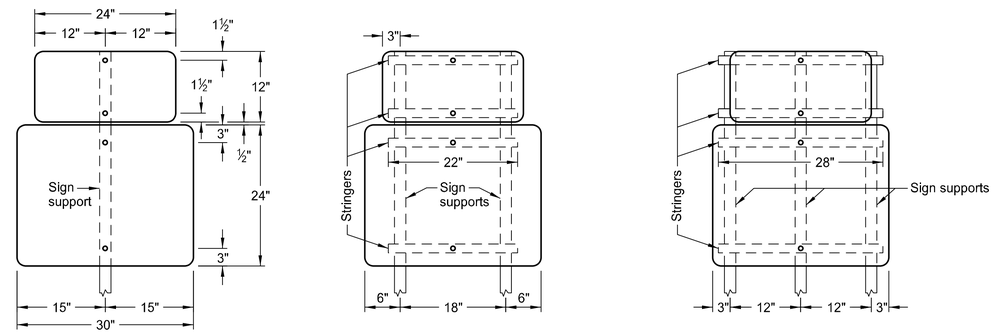
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

D-754-51



1 Post 2 Posts

ASSEMBLY NO. 371

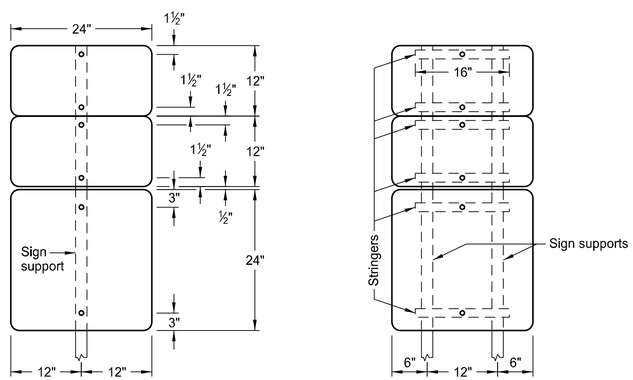


1 Post 2 Posts 3 Posts

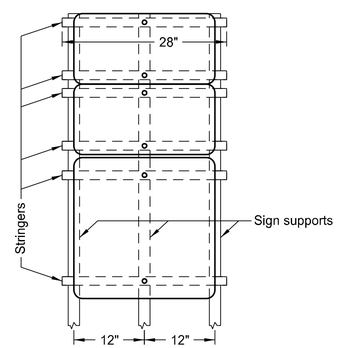
ASSEMBLY NO. 372

Notes:

1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½"x1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

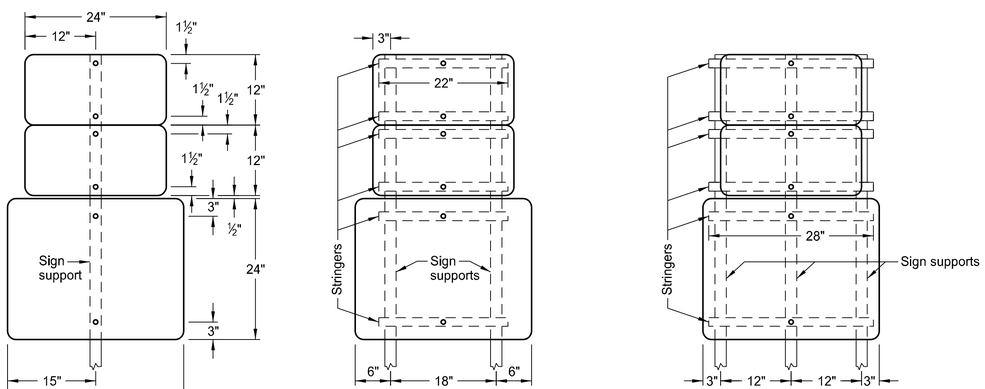


1 Post 2 Posts



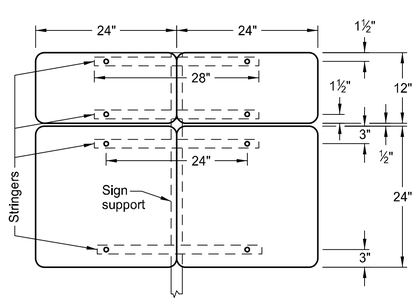
3 Posts

ASSEMBLY NO. 373

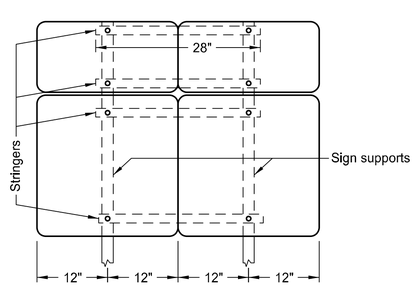


1 Post 2 Posts 3 Posts

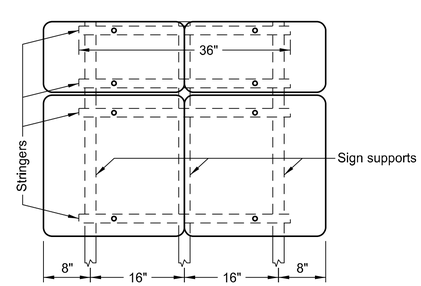
ASSEMBLY NO. 374



1 Post



2 Posts



3 Posts

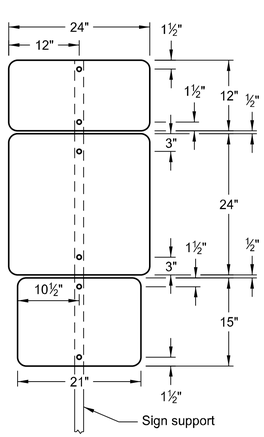
ASSEMBLY NO. 375

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
8-30-18 9-04-19	Updated notes to active voice. New Design Engineer PE Stamp.

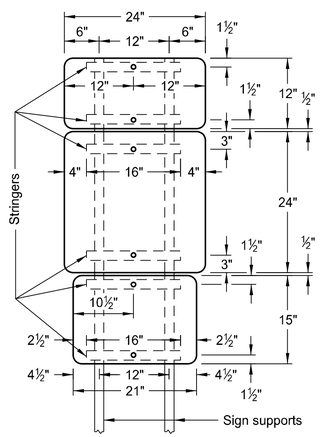
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 9/04/19 and the original document is stored at the North Dakota Department of Transportation

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

D-754-53

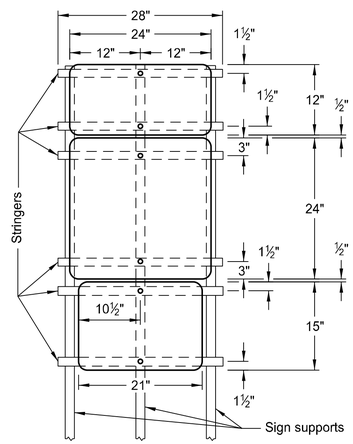


1 Post

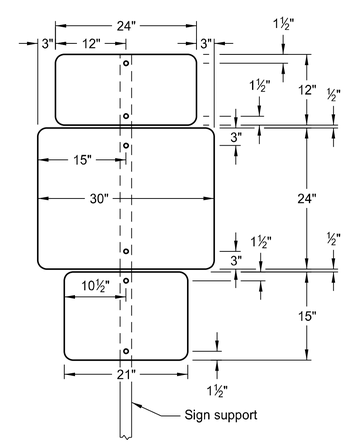


2 Posts

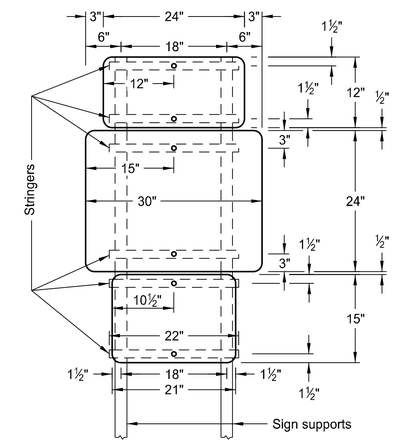
ASSEMBLY NO. 379



3 Posts

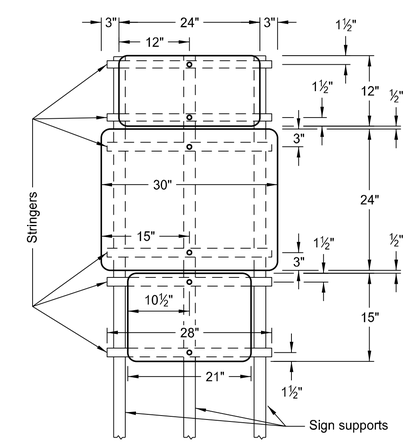


1 Post

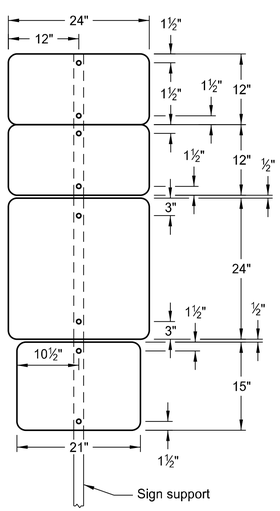


2 Posts

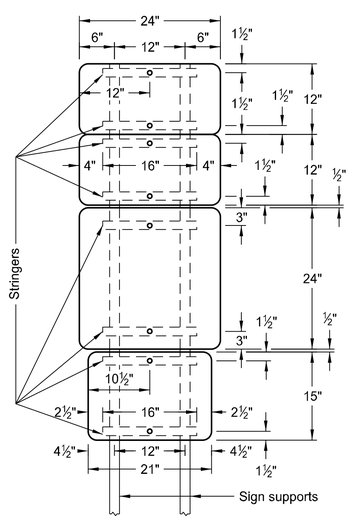
ASSEMBLY NO. 380



3 Posts

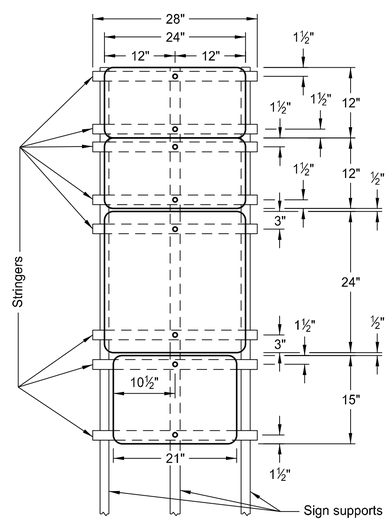


1 Post

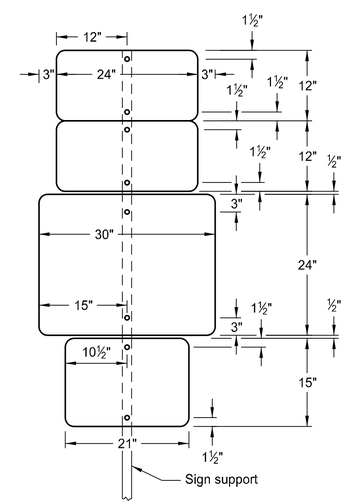


2 Posts

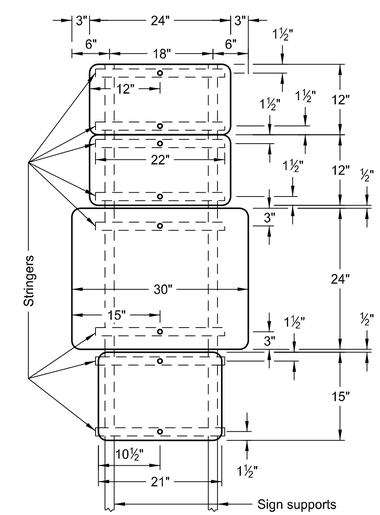
ASSEMBLY NO. 381



3 Posts

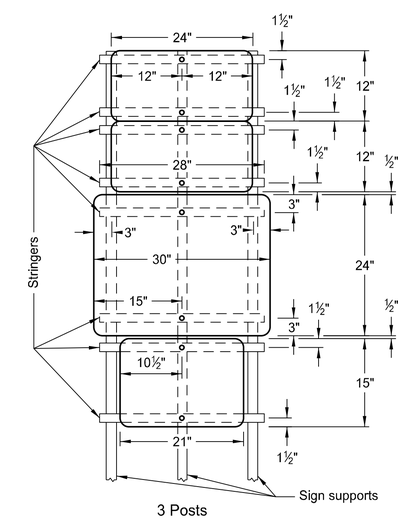


1 Post



2 Posts

ASSEMBLY NO. 382



3 Posts

Notes:

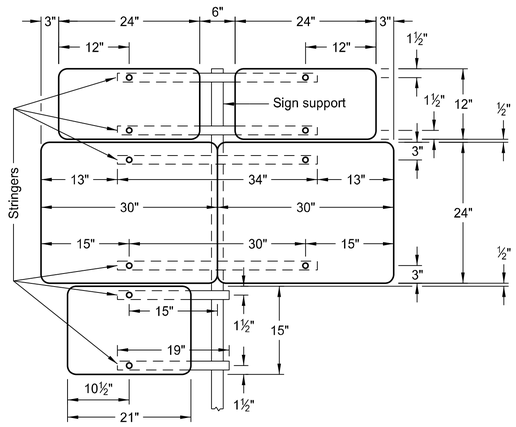
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½"x1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
9-04-19	New Design Engineer PE Stamp.

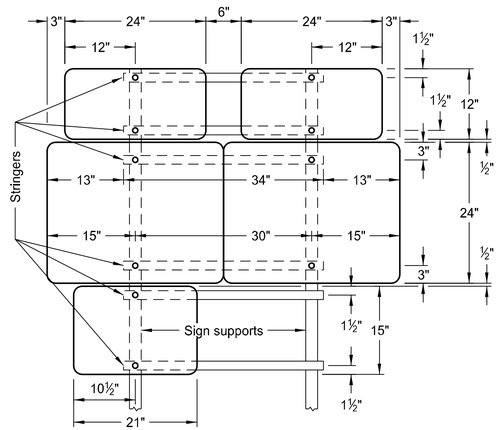
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 9/04/19 and the original document is stored at the North Dakota Department of Transportation

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

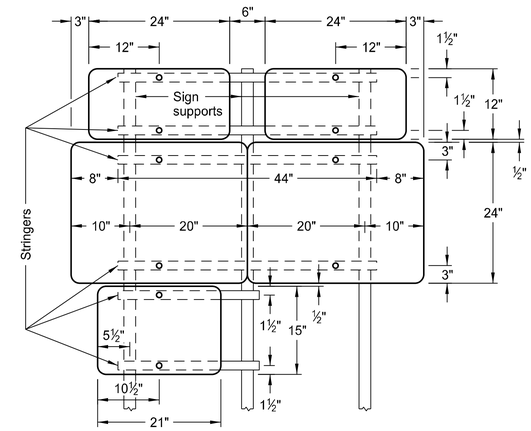
D-754-55



1 Post

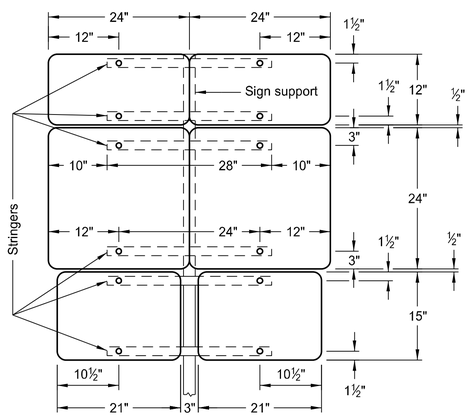


2 Posts

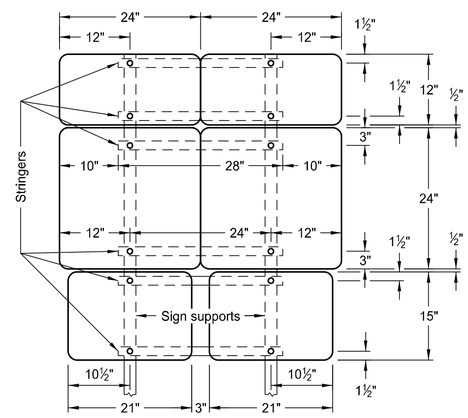


3 Posts

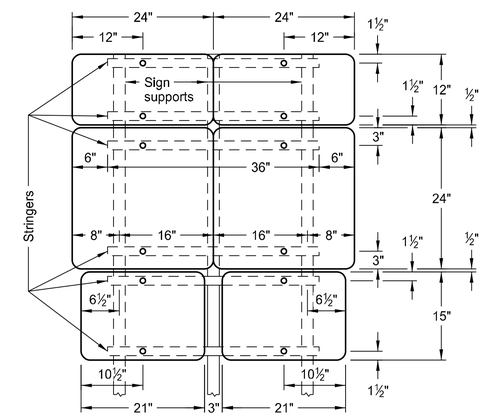
ASSEMBLY 386



1 Post

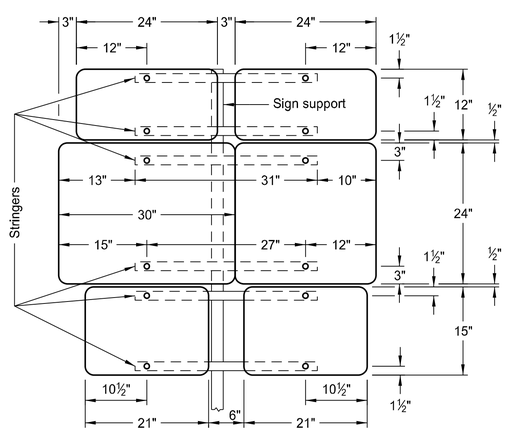


2 Posts

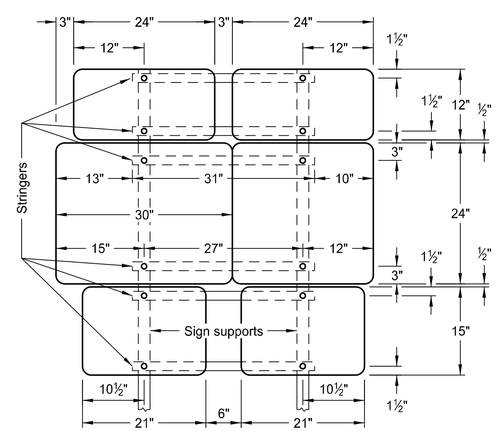


3 Posts

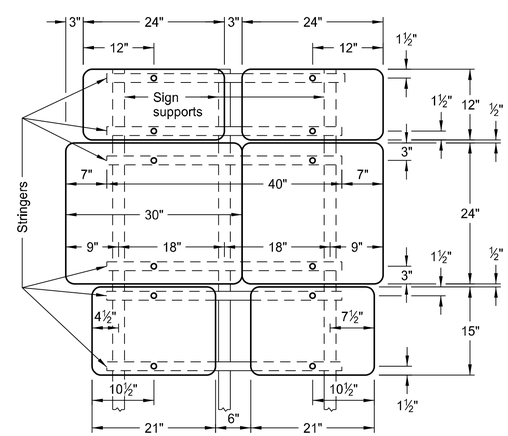
ASSEMBLY 387



1 Post



2 Posts



3 Posts

ASSEMBLY 388

Notes:

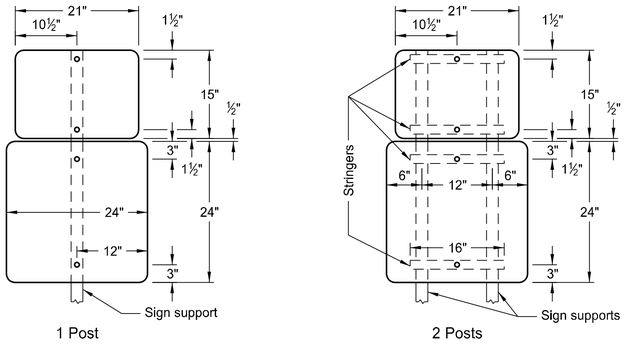
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½"x1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
9-04-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 9/04/19 and the original document is stored at the North Dakota Department of Transportation

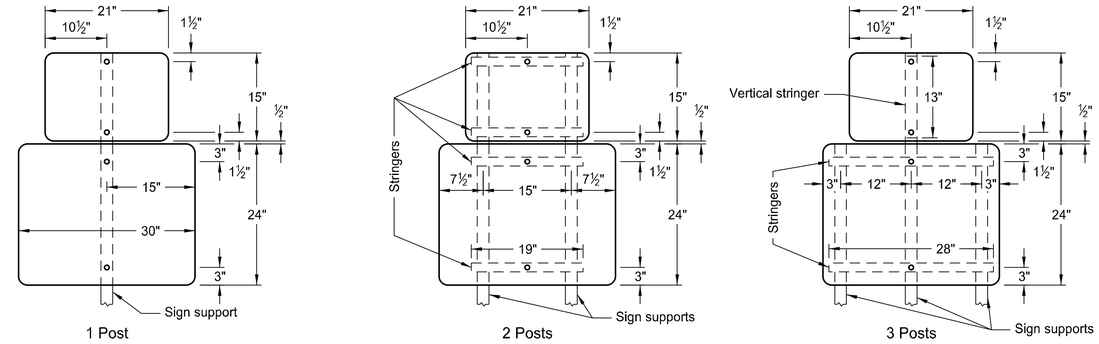
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

D-754-57



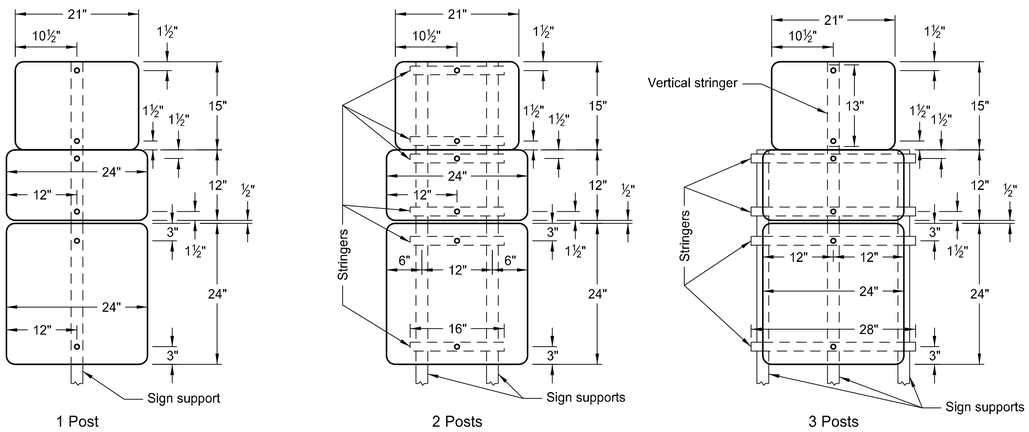
1 Post 2 Posts

ASSEMBLY 391



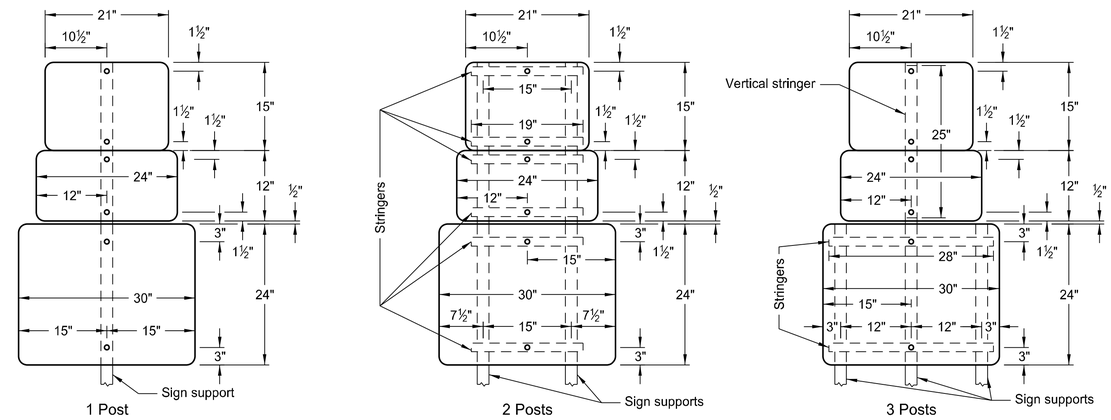
1 Post 2 Posts 3 Posts

ASSEMBLY 392



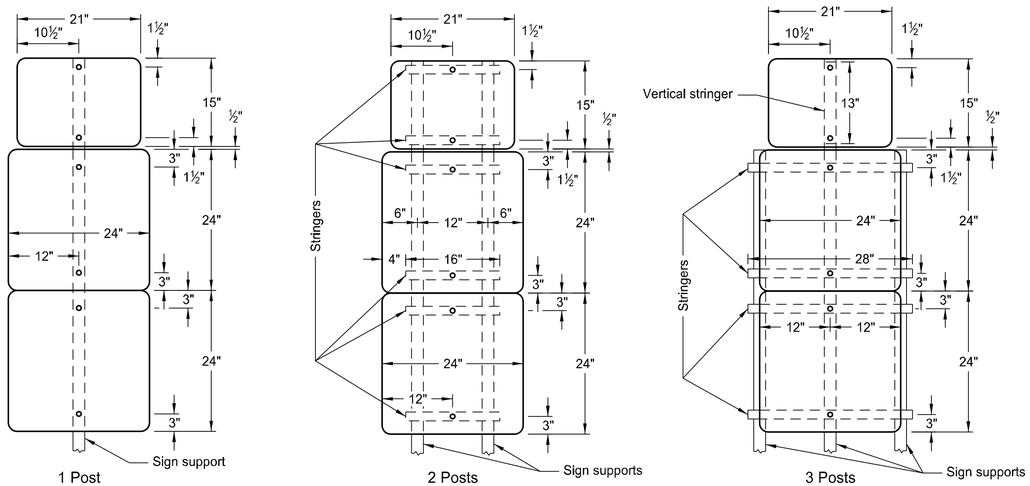
1 Post 2 Posts 3 Posts

ASSEMBLY 393



1 Post 2 Posts 3 Posts

ASSEMBLY 394



1 Post 2 Posts 3 Posts

ASSEMBLY 395

Notes:

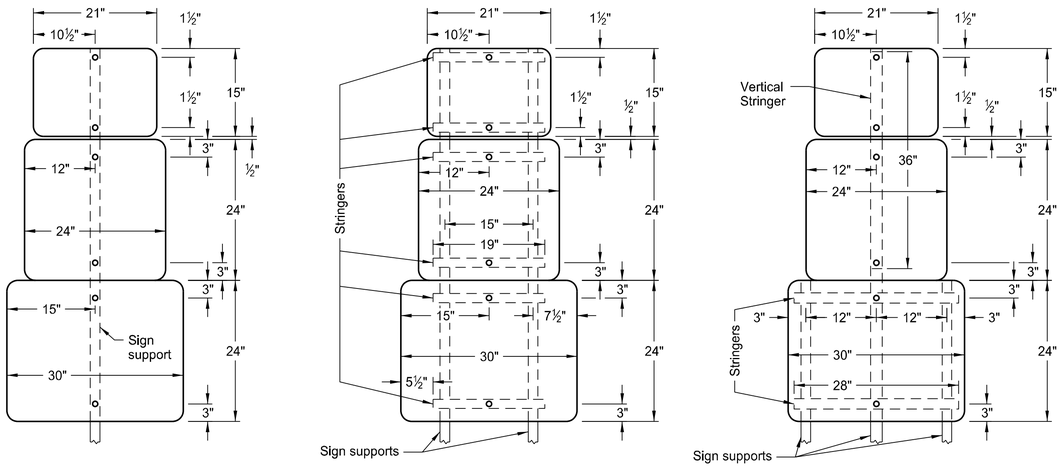
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½"x1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated to active voice & added dimension to Assembly 393 & 394.
9-04-19	New Design Engineer PE Stamp.

This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 9/04/19 and the original document is stored at the North Dakota Department of Transportation

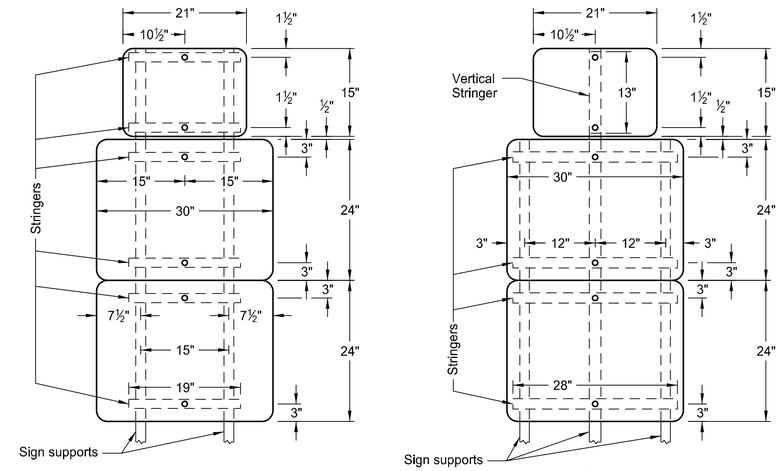
SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

D-754-58



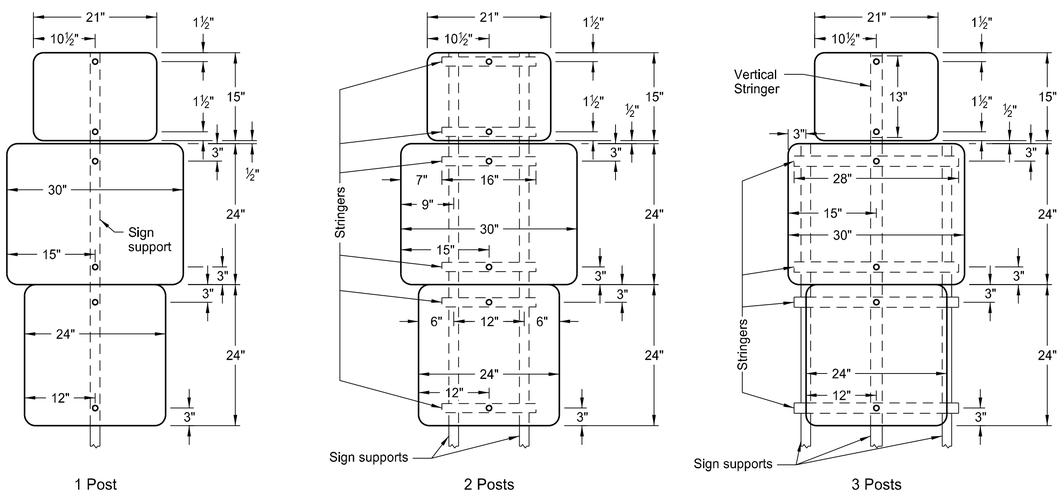
1 Post 2 Posts 3 Posts

ASSEMBLY 396



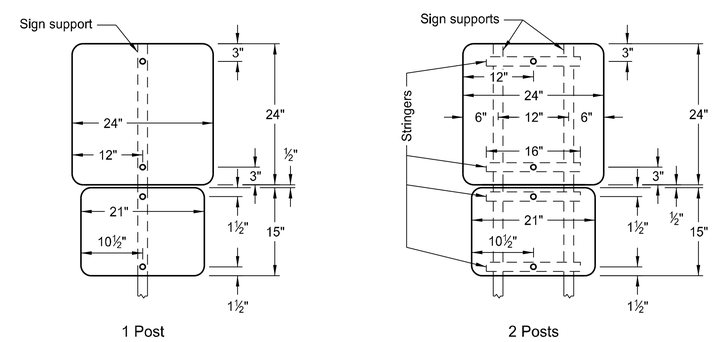
1 Post 2 Posts 3 Posts

ASSEMBLY 397



1 Post 2 Posts 3 Posts

ASSEMBLY 398



1 Post 2 Posts

ASSEMBLY 399

Notes:

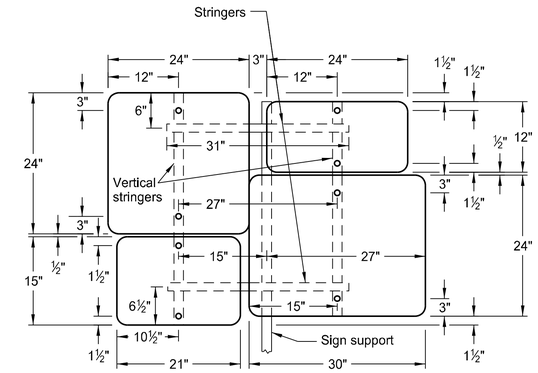
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½"x1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated to active voice & added Assembly 398 dimension.
9-04-19	New Design Engineer PE Stamp.

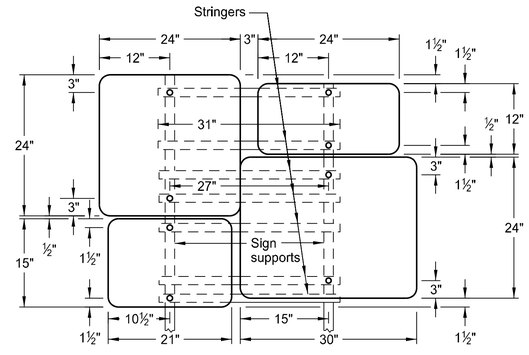
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 9/04/19 and the original document is stored at the North Dakota Department of Transportation

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

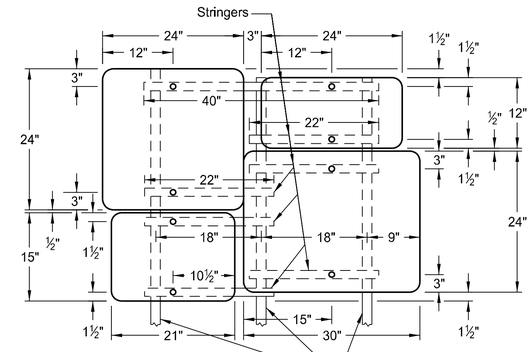
D-754-60



1 Post



2 Posts

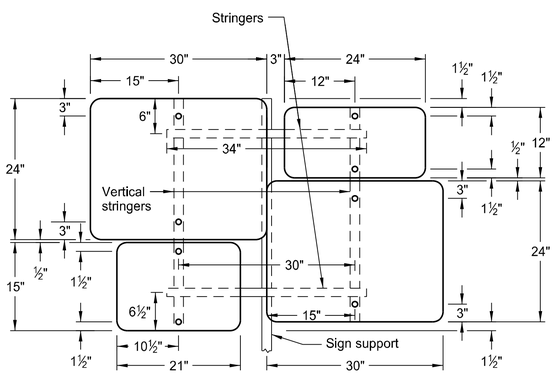


3 Posts

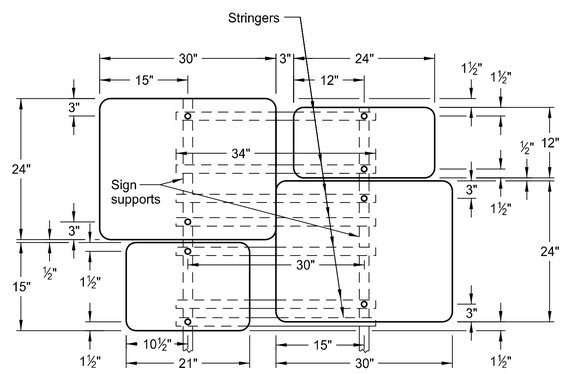
ASSEMBLY NO. 403

Notes:

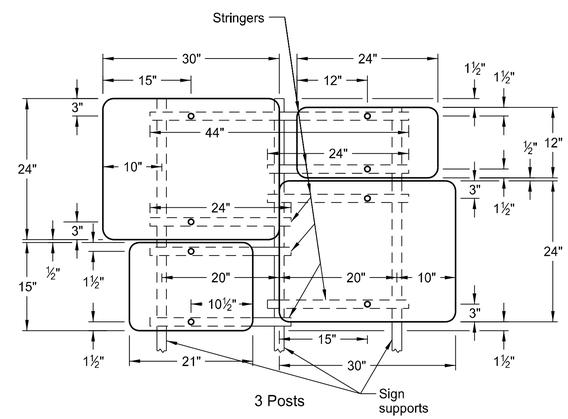
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½"x1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.



1 Post

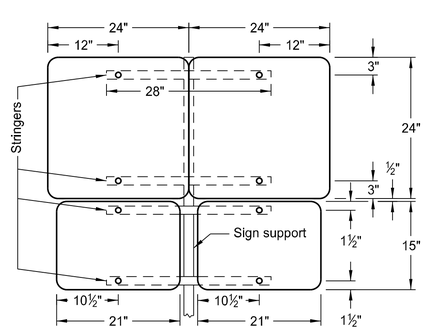


2 Posts

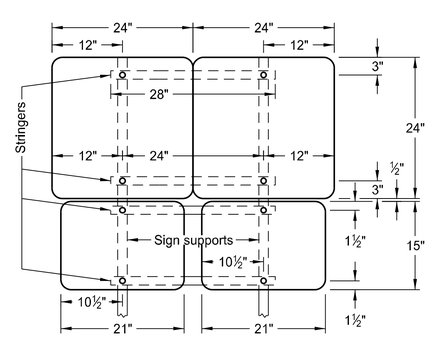


3 Posts

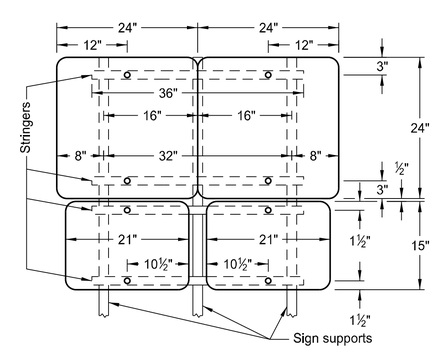
ASSEMBLY NO. 404



1 Post



2 Posts



3 Posts

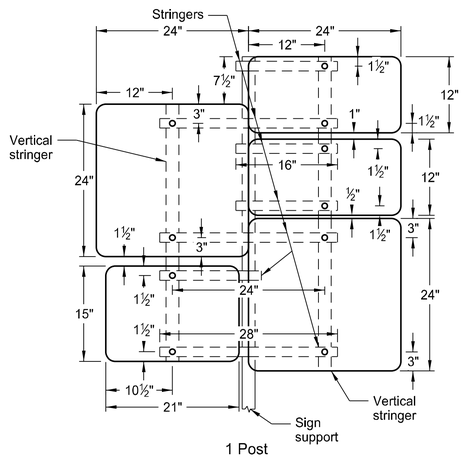
ASSEMBLY NO. 405

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-22-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
9-04-19	New Design Engineer PE Stamp.

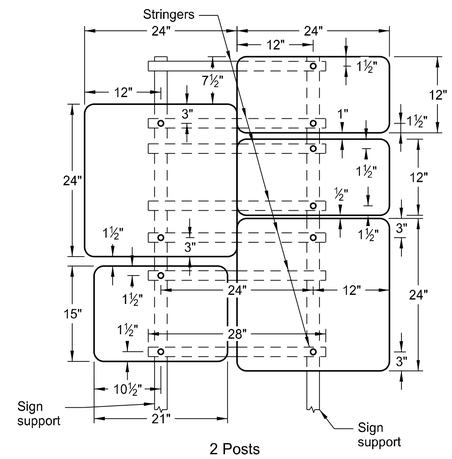
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 9/04/19 and the original document is stored at the North Dakota Department of Transportation

SIGN PUNCHING, STRINGER AND SUPPORT LOCATION DETAILS - ROUTE MARKER SIGNS

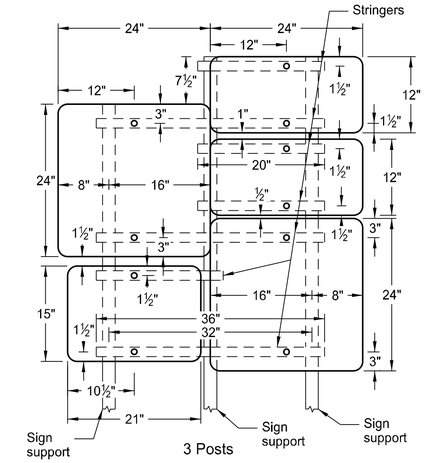
D-754-74



1 Post

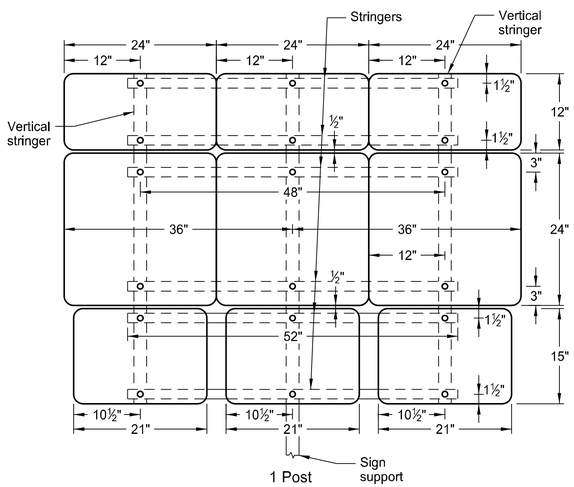


2 Posts

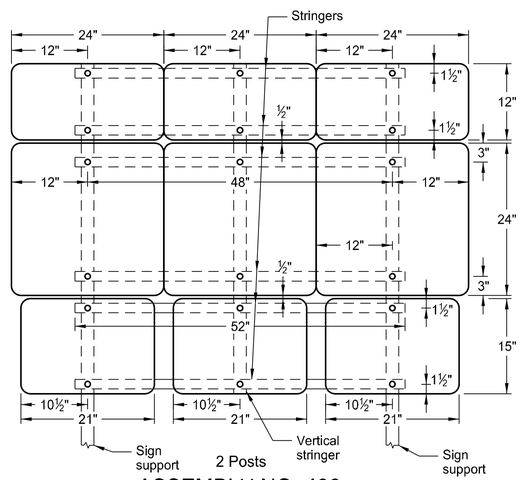


3 Posts

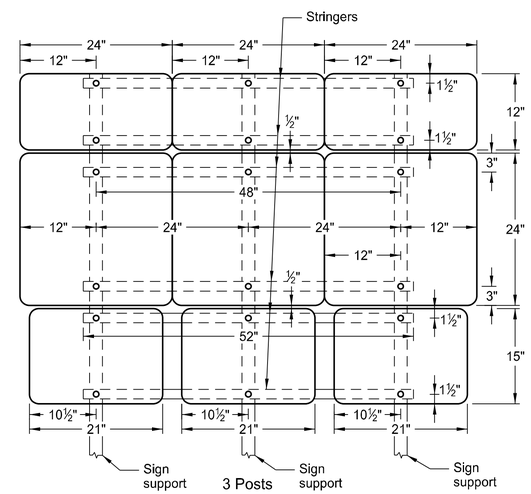
ASSEMBLY NO. 435



1 Post

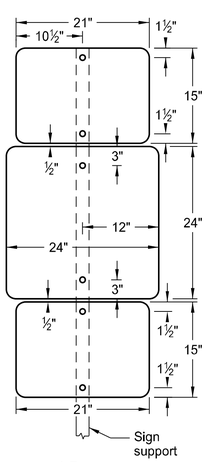


2 Posts

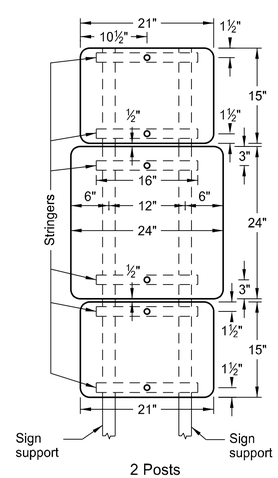


3 Posts

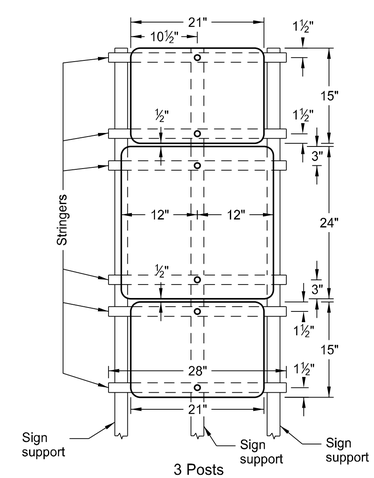
ASSEMBLY NO. 436



1 Post



2 Posts



3 Posts

ASSEMBLY NO. 437

Notes:

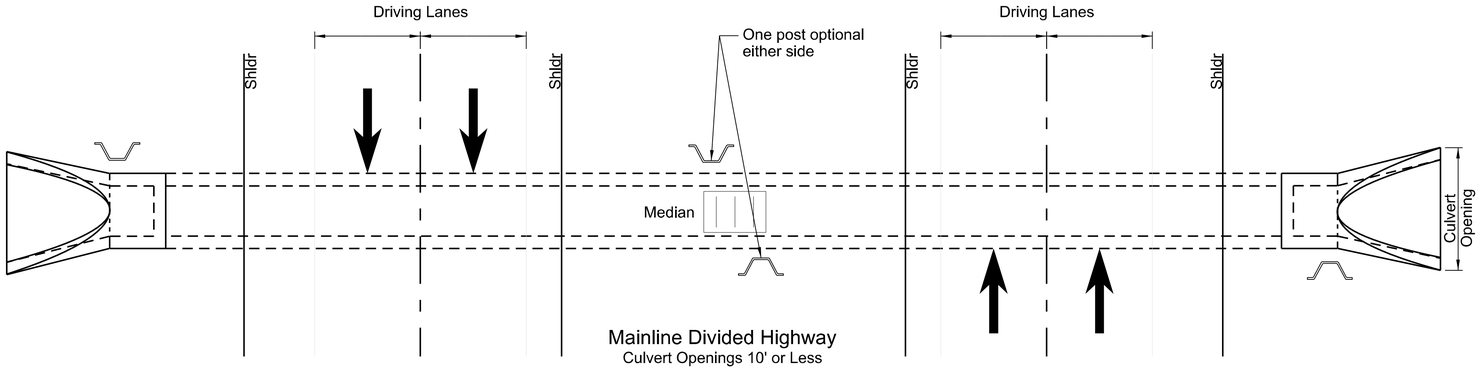
1. Use 0.100 inch minimum thickness sign backing material.
2. Use 1½"x1½" perforated square tube stringers.
3. Punch holes round for ⅜" bolt.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
9-25-12	
REVISIONS	
DATE	CHANGE
8-30-18	Updated notes to active voice.
9-05-19	New Design Engineer PE Stamp.

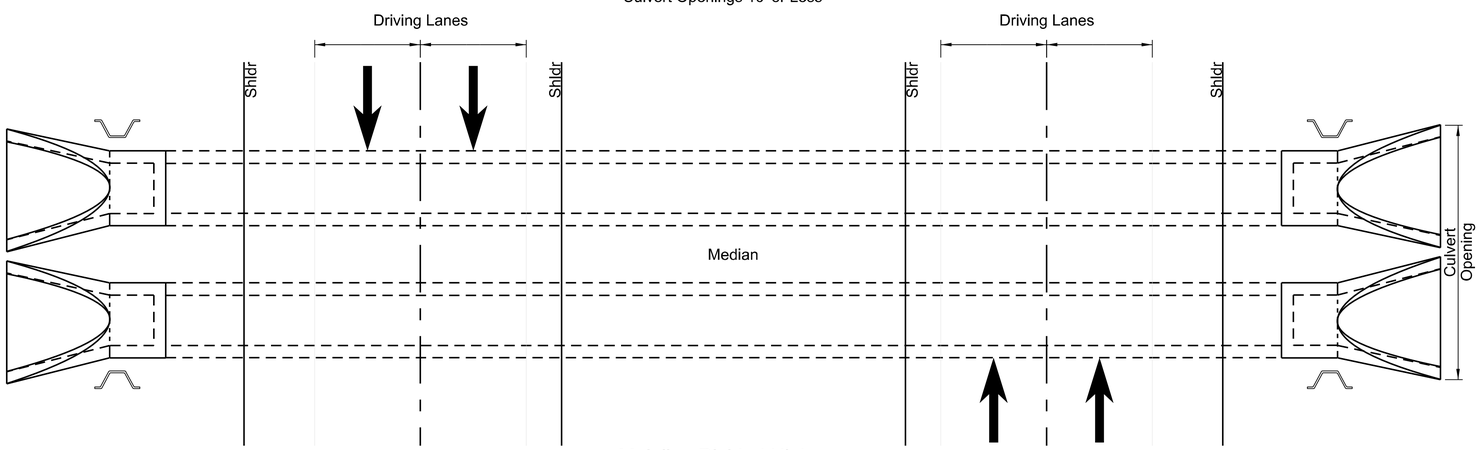
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 9/05/19 and the original document is stored at the North Dakota Department of Transportation

OBJECT MARKERS - CULVERTS

D-754-83

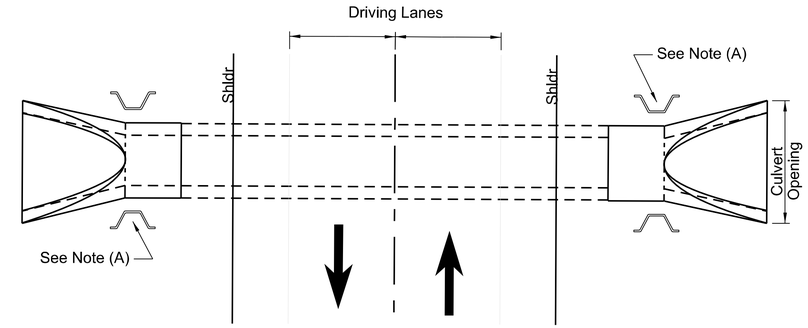


Mainline Divided Highway
Culvert Openings 10' or Less



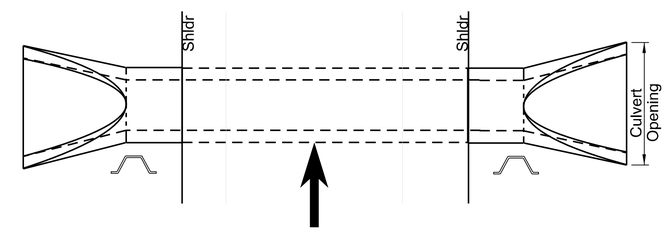
Mainline Divided Highway
Culvert Openings Greater than 10'
Multiple Installations

Post Location

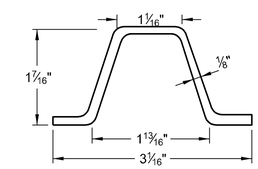


Two-Lane Highway

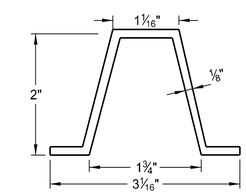
(A) Install additional marker where multiple pipe installations have a width of greater than 10'.



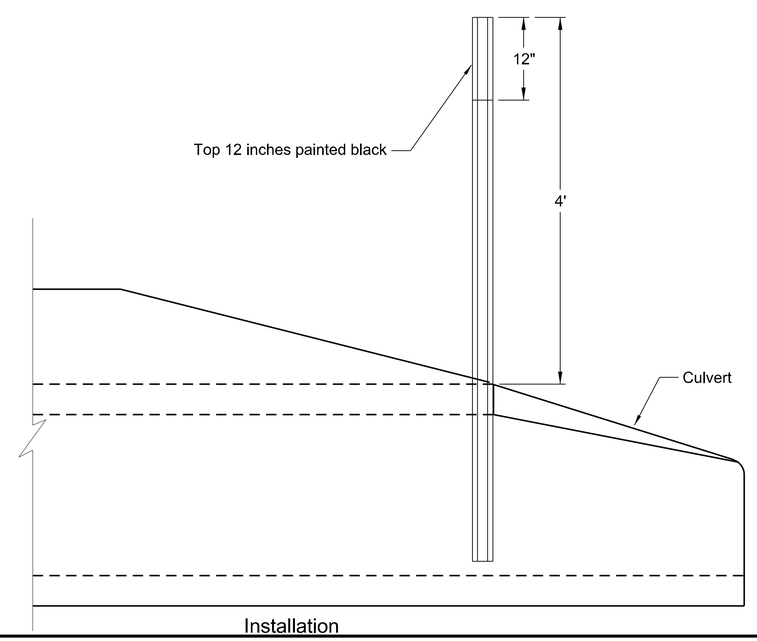
Ramp



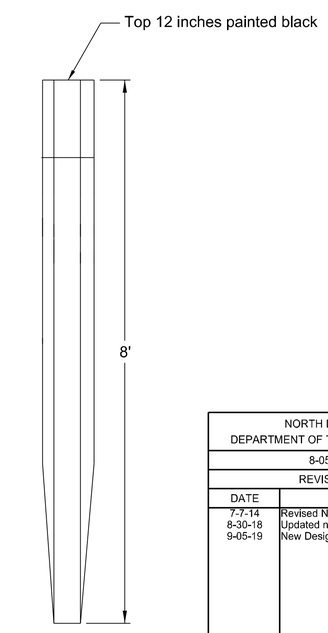
Steel Post Detail
Approx. 2.0 lbs/ft



Aluminum Post Detail
Approx. 0.88 lbs/ft



Installation



U-Type Post

Notes:

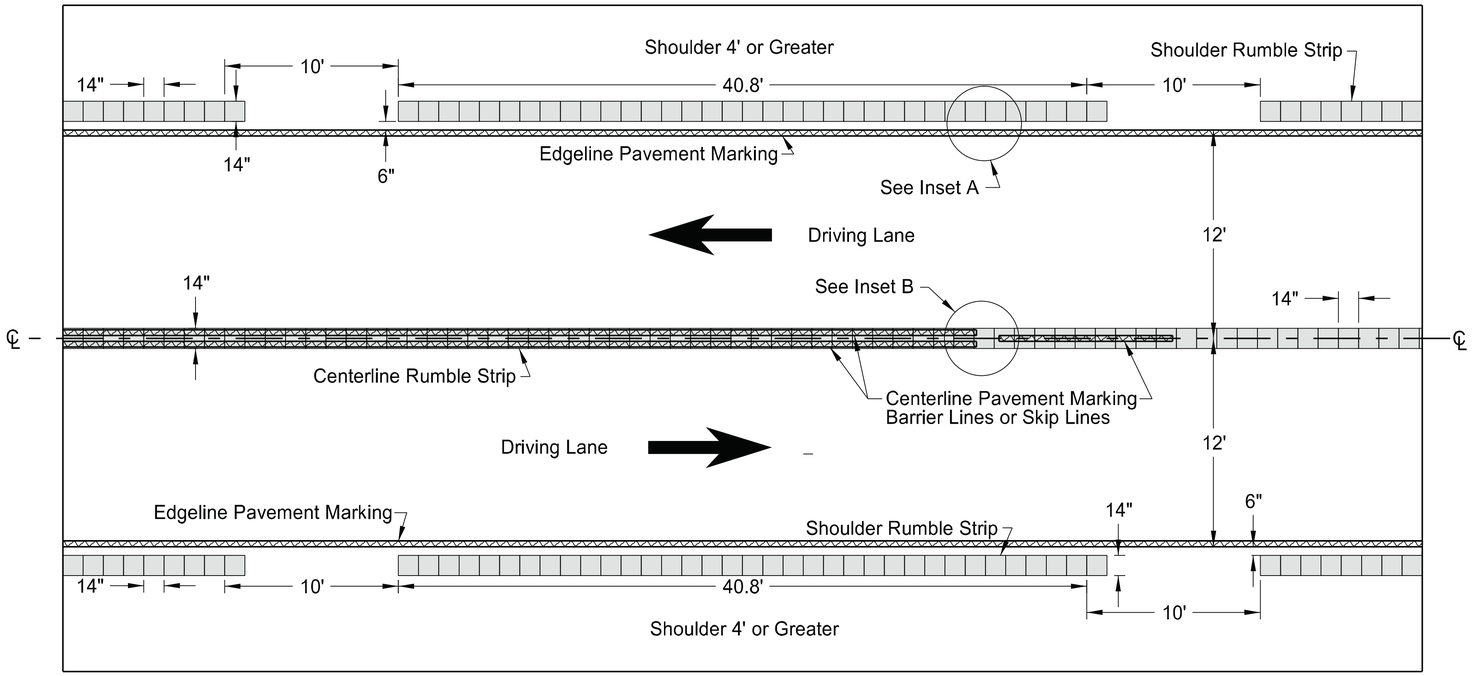
Mark each end of culverts crossing the roadway within the right-of-way with a post. Install posts in front of culvert in direction of travel along the side of culvert and one foot from culvert opening unless shown otherwise in plans.

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
8-05-13	
REVISIONS	
DATE	CHANGE
7-7-14	Revised Notes
8-30-18	Updated notes to active voice.
9-05-19	New Design Engineer PE Stamp.

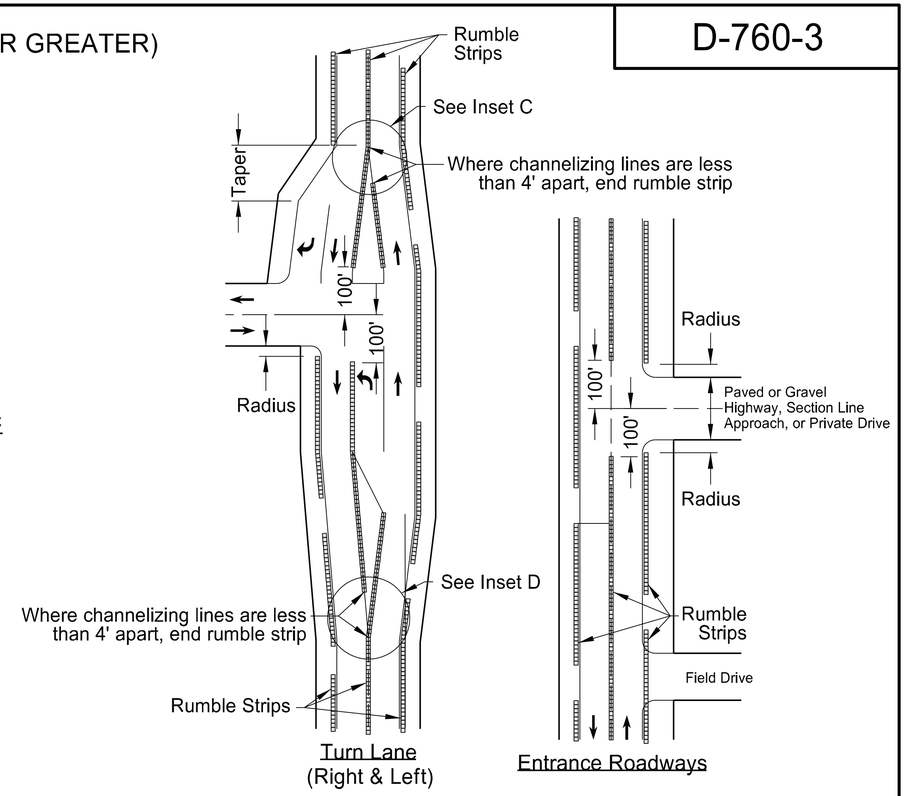
This document was originally issued and sealed by Kirk J Hoff, Registration Number PE- 4683, on 9/05/19 and the original document is stored at the North Dakota Department of Transportation

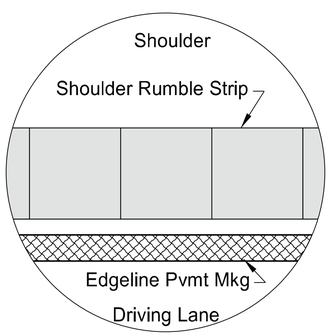
RUMBLE STRIPS UNDIVIDED HIGHWAYS (SHOULDERS 4' OR GREATER)

D-760-3

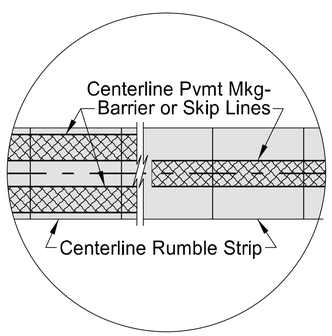


Undivided Highways (Shoulders 4' or Greater)

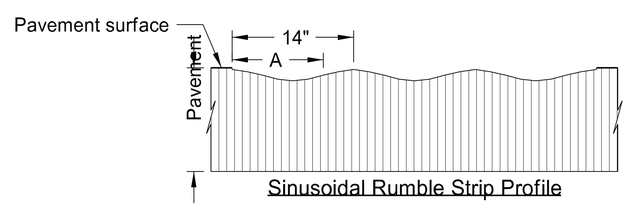




Inset A - Shoulder Rumble Strip
(Layout for opposite shoulder reversed)



Inset B - Centerline Rumble Strip



Sinusoidal Rumble Strip Profile

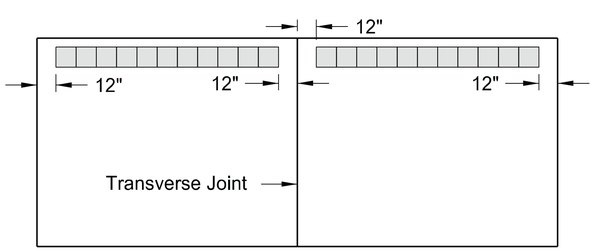
Milling Depths		
Location A (in)	Depth	
	MIL	in
0	62.5	1/16
1 3/4	156	5/32
3 1/2	281	9/32
5 1/4	438	7/16
7	500	1/2
8 3/4	438	7/16
10 1/2	281	9/32
12 1/4	156	5/32
14	62.5	1/16

NOTES:

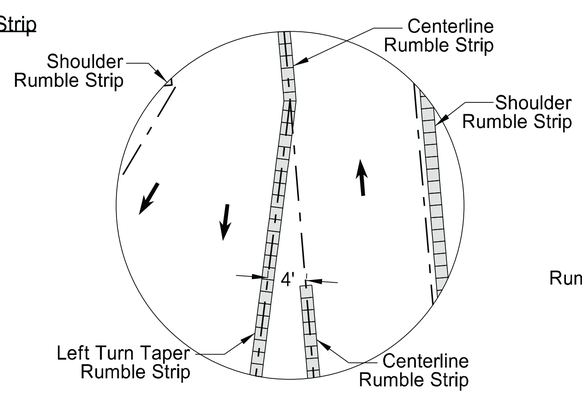
1) Discontinue shoulder rumble strips through the entire length of right turn lanes and tapers, and at the radius of paved or gravel highways, section line approaches, or private drives.

2) Discontinue centerline rumble strips 100' before and after paved or gravel highways, section line approaches, or private drives. Place rumble strips at left turn lanes as shown below.

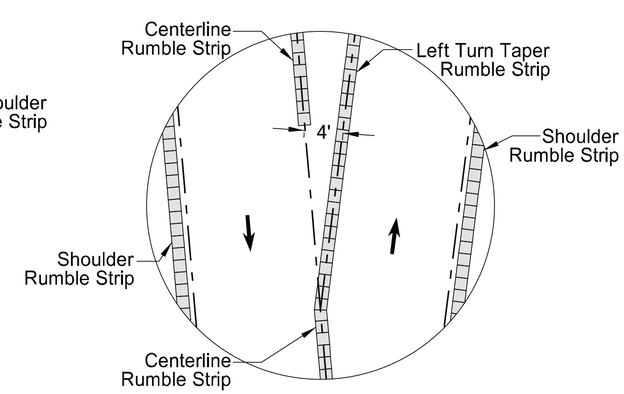
3) No additional quantity provided for centerline rumble strips on left turn tapers. Include all costs for centerline rumble strips on left turn tapers in the price bid for "Sinusoidal Rumble Strip - Asphalt Centerline" or "Sinusoidal Rumble Strip - Concrete Centerline".



Discontinue rumble strip approx. 12" on both sides of PCC transverse joint



Inset C



Inset D

NORTH DAKOTA
DEPARTMENT OF TRANSPORTATION

12-29-09

REVISIONS

DATE	CHANGE
2-25-10	Note 4 was added.
4-19-10	Revised Note 5, Note 6, and Turn Lane (Right & Left).
9-08-11	Revised Notes and D-760-3.
10-25-19	Added missing dimensions.
11-16-21	Changed turn lane rumble layouts.
3-07-23	Added Note 3.
5-26-23	Made rumble strips sinusoidal.

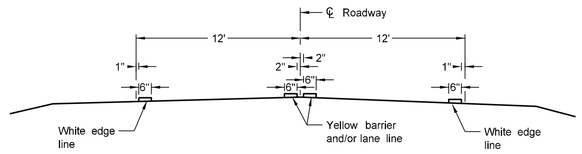
KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
ENGINEER
NORTH DAKOTA

05/26/23

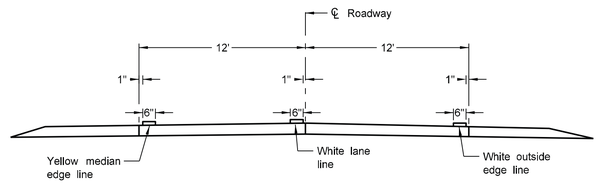
DocuSign Envelope ID: F823D7A4-83CC-4936-ABE1-378FF7682B3C

PAVEMENT MARKING

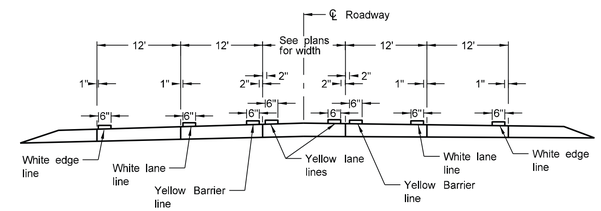
D-762-4



Two Lane Two Way
RURAL ROADWAY



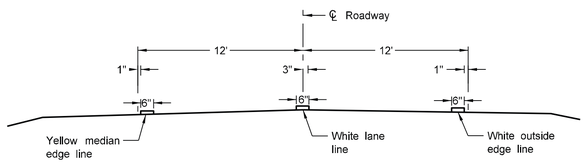
Two Lane Roadway
INTERSTATE HIGHWAY
Concrete Section



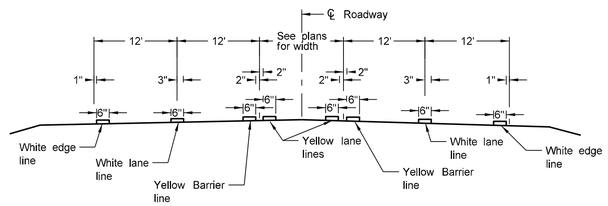
RURAL FIVE LANE ROADWAY
Concrete Section

NOTES:

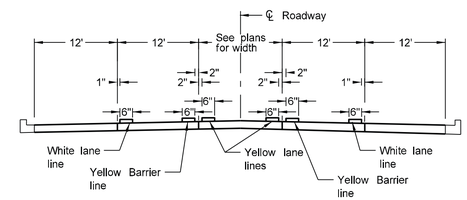
1. Continue edge lines through private drives and field drives. Break edge lines for intersections.
2. Normal width line - 6 inches wide for freeways, expressways, and ramps; 6 inches for all other roadways with speed limits > 40 mph,
3. Use 4 or 6 inch wide pavement marking for all other roadways with speed limits ≤ 40 mph.



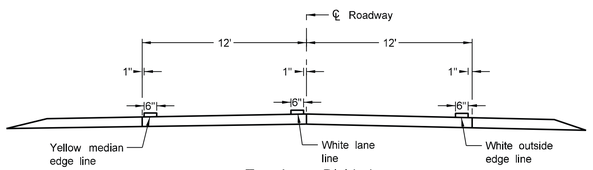
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Asphalt Section



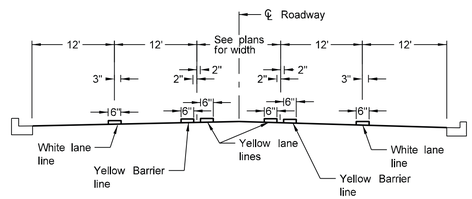
RURAL FIVE LANE ROADWAY
Asphalt Section



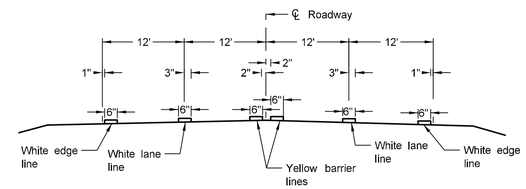
URBAN FIVE LANE SECTION
Concrete Section



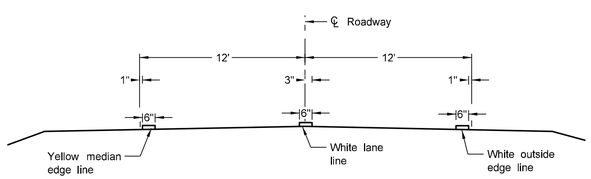
Two Lane Divided
Rural Roadway
PRIMARY HIGHWAY
Concrete Section



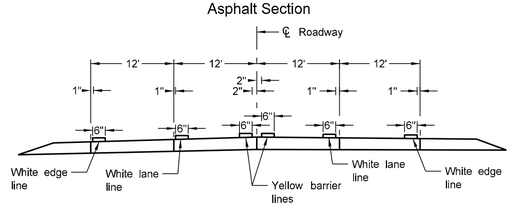
URBAN FIVE LANE SECTION
Asphalt Section



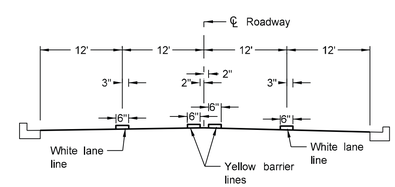
RURAL FOUR LANE ROADWAY
Asphalt Section



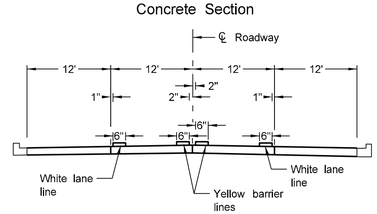
Two Lane Roadway
INTERSTATE HIGHWAY
Asphalt Section



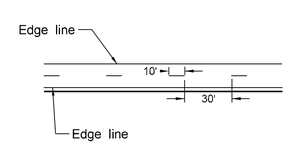
RURAL FOUR LANE ROADWAY
Concrete Section



URBAN FOUR LANE SECTION
Asphalt Section



URBAN FOUR LANE SECTION
Concrete Section



CENTERLINE PAVEMENT MARKING SKIP SPACING DETAIL

NORTH DAKOTA DEPARTMENT OF TRANSPORTATION	
12-1-10	
REVISIONS	
DATE	CHANGE
10-17-17	Updated to active voice.
08-27-19	New Design Engineer PE Stamp.
11-22-23	Revised pavement marking widths.

KIRK J. HOFF
REGISTERED
PROFESSIONAL
PE-4683
11/22/23
ENGINEER
NORTH DAKOTA