

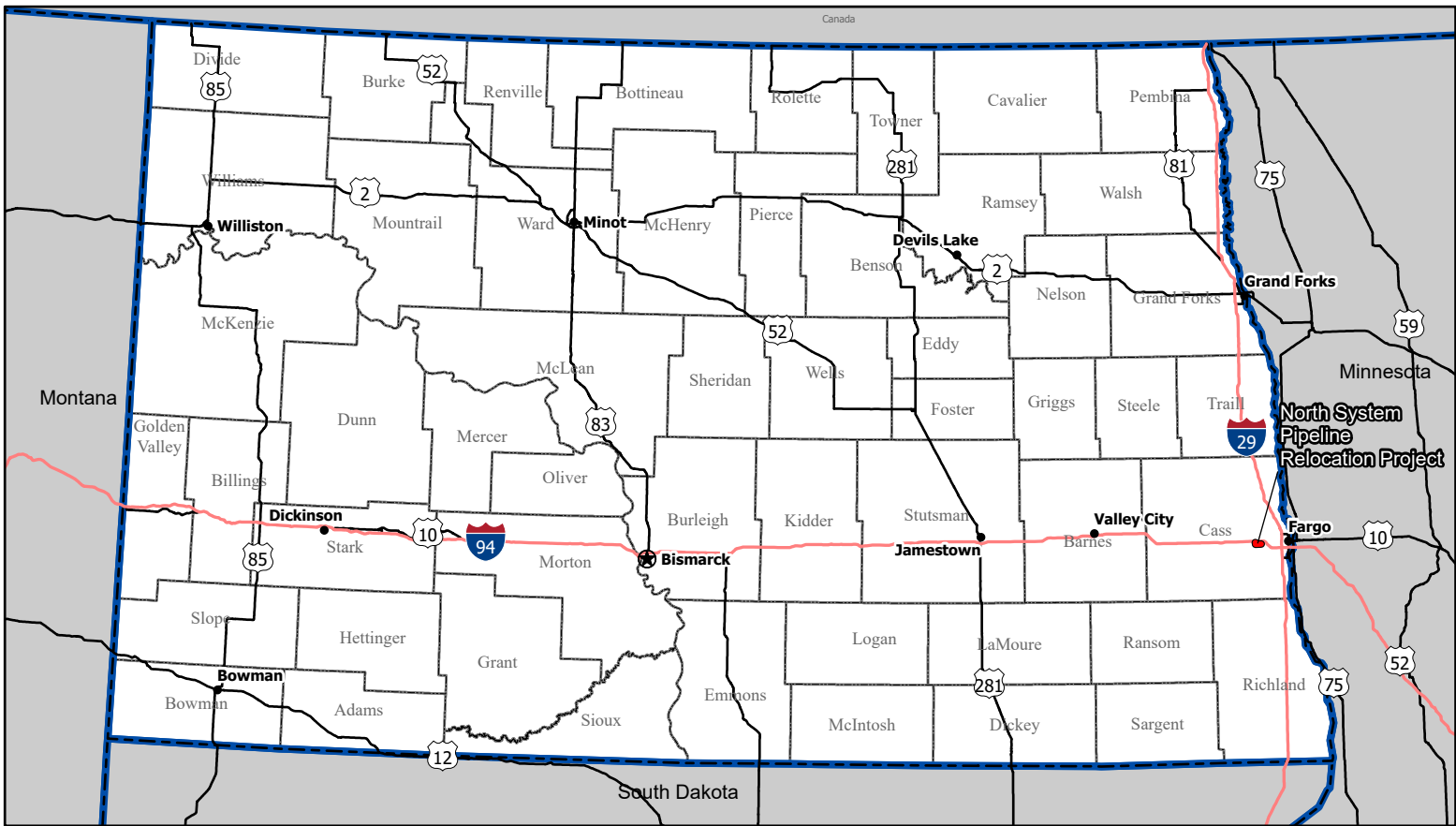
## **APPENDIX A**

**Project Overview Maps, Pipeline Schematics, ROW Detail,  
Corridor Exclusion and Avoidance Area Maps, and Engineering  
Drawings**

**PROJECT OVERVIEW MAPS**

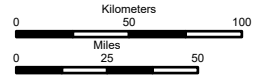
**Figure 1. Project Location**

**Figure 2. Project Study Area**



### North System Pipeline Relocation Project

- State Capital
- City
- Interstate Highway
- U.S. Highway
- Proposed NuStar FM Diversion Pipeline
- State Boundary

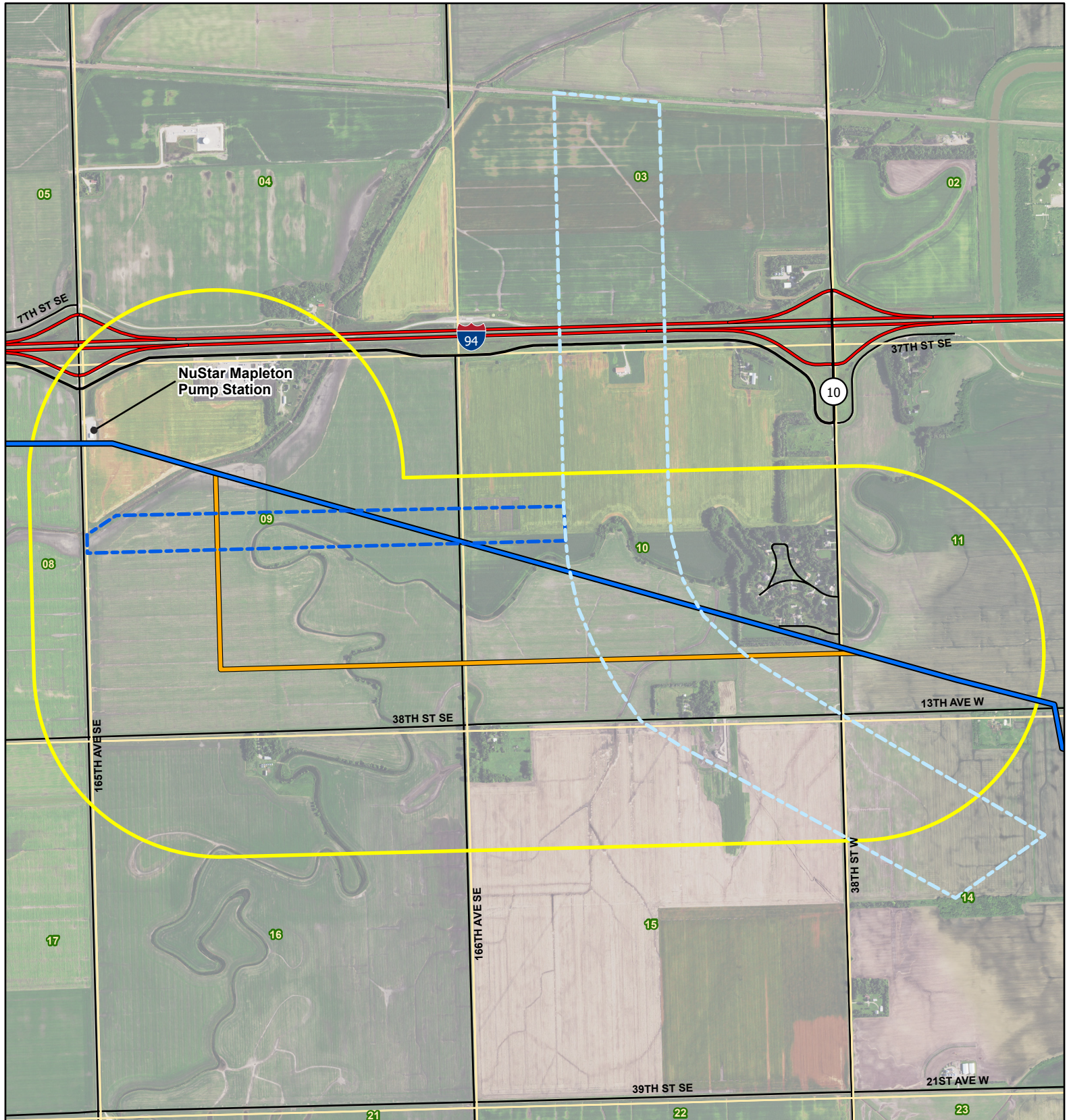


Quadrangle: West Fargo South (1976)  
 Casselton SE (1976)  
 Township/Range: T139N, R50W  
 Cass County, North Dakota

Projection: NAD 1983 UTM Zone 14N



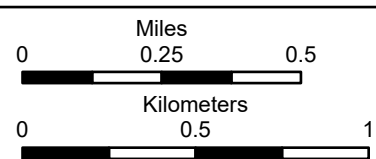
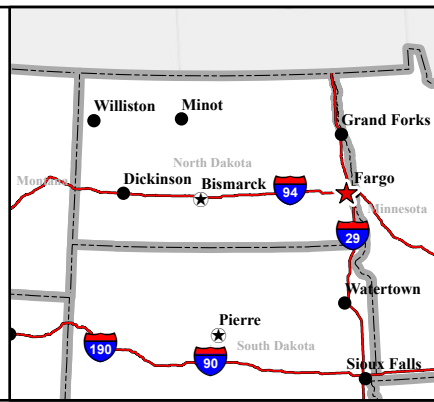
Figure 1. Project Location Map



**North System Pipeline Relocation Project**

- Proposed NuStar FM Diversion Pipeline
- NuStar's Existing North System Pipeline
- Interstate Highway
- State Highway
- Existing Road
- Drain 14
- Proposed Fargo-Moorhead Diversion Channel
- Study Area
- Section Boundary

**Figure 2. Project Study Area**



Base Map: 2019 Aerial Imagery  
 Source: USDA/FSA -  
 Aerial Photography Field Office  
 Quadrangle: West Fargo South (1976)  
 Casselton SE (1976)  
 Township/Range: T139N, R50W  
 Cass County, North Dakota  
 Projection: NAD 1983 UTM Zone 13N



## **PIPELINE SCHEMATICS AND DETAILS**

**Construction Sequence**

**Roadway HDD Bore**

**Water Crossing HDD Bore**

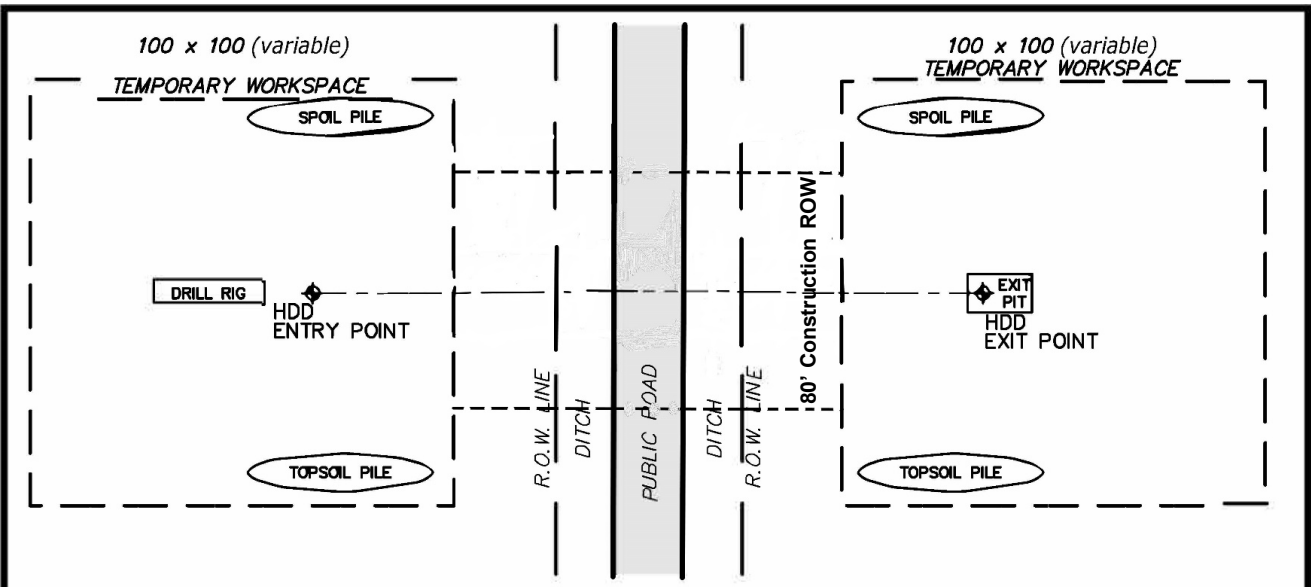
**Silt Fence Installation 1**

**Silt Fence Installation 2**

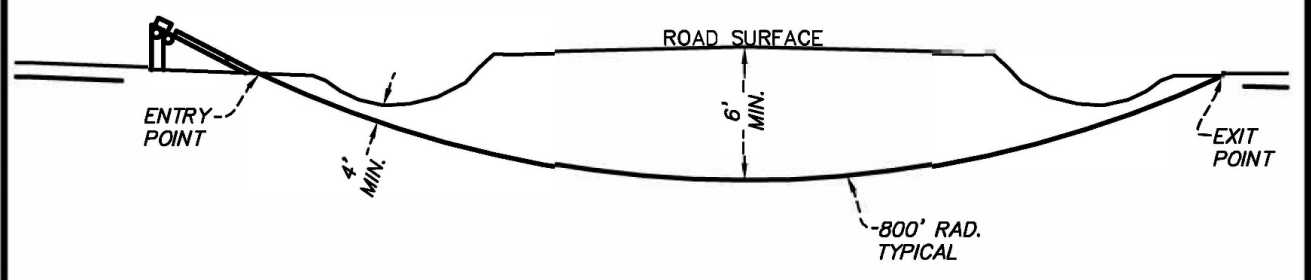
**Fiber Roll/Filter Sock Installation**

**Strawbale Installation**





**PLAN**



**PROFILE**

- NOTES:
1. PROTECTIVE LAYER SHALL BE USED ON PAVED ROAD SURFACES TO PREVENT DAMAGE FROM TRACKED EQUIPMENT.
  2. IF NECESSARY, INSTALL TEMPORARY CULVERT AND FILL IN BORROW PIT.
  3. MAINTAIN EXISTING VEGETATION IN BORROW PITS. STRIPPING SHOULD BE LIMITED TO THE AREA OF TEMPORARY CROSSING. PROVIDE SEDIMENT CONTROLS IN ACCORDANCE WITH STORM WATER MANAGEMENT PLAN.
  4. ELEVATION OF BORE PIT AND BELL HOLE FLOORS TO BE ADJUSTED TO PROVIDE MINIMUM COVER BELOW ROADWAY AND BORROW PITS.
  5. THIS DETAIL HAS BEEN PREPARED FOR ENVIRONMENTAL REVIEW PURPOSES ONLY.



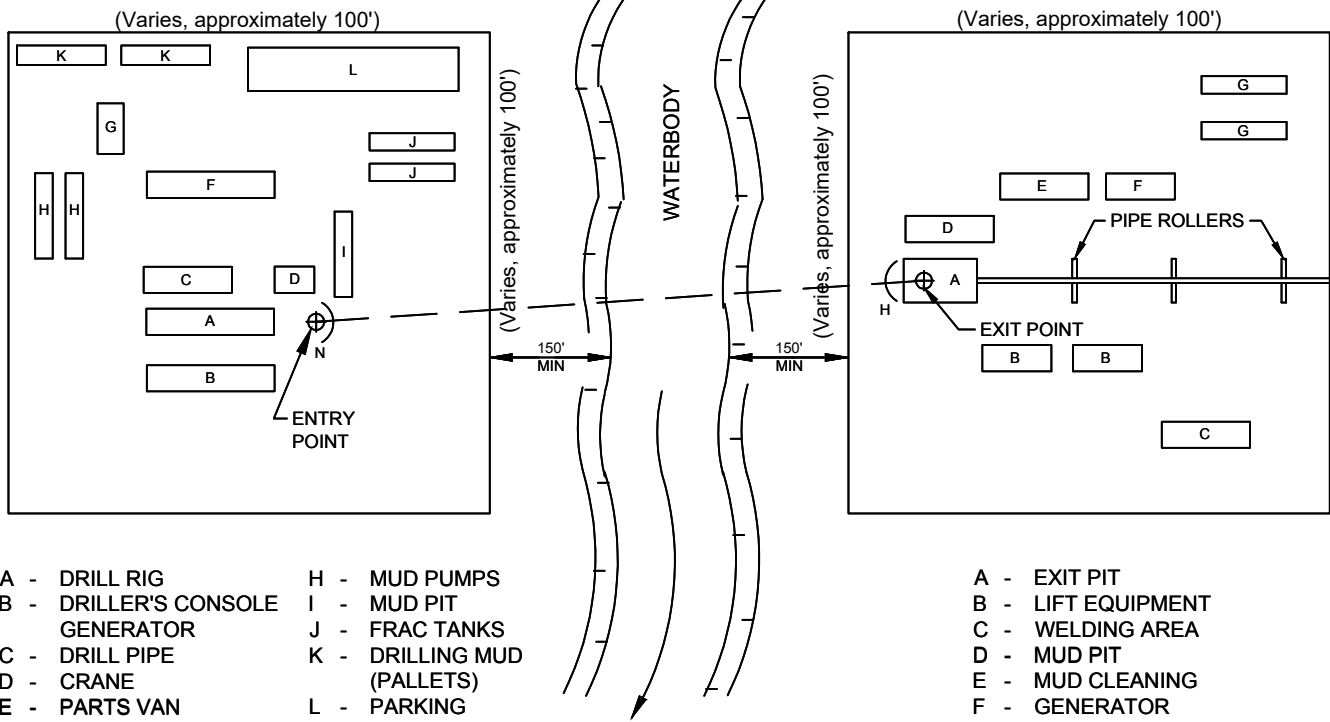
PIPELINE OPERATING PARTNERSHIP, L.P.

TYPICAL ROAD CROSSING  
NORTH SYSTEM PIPELINE RELOCATION PROJECT  
HORIZONTAL DIRECTIONAL DRILL

CASS COUNTY

NORTH DAKOTA

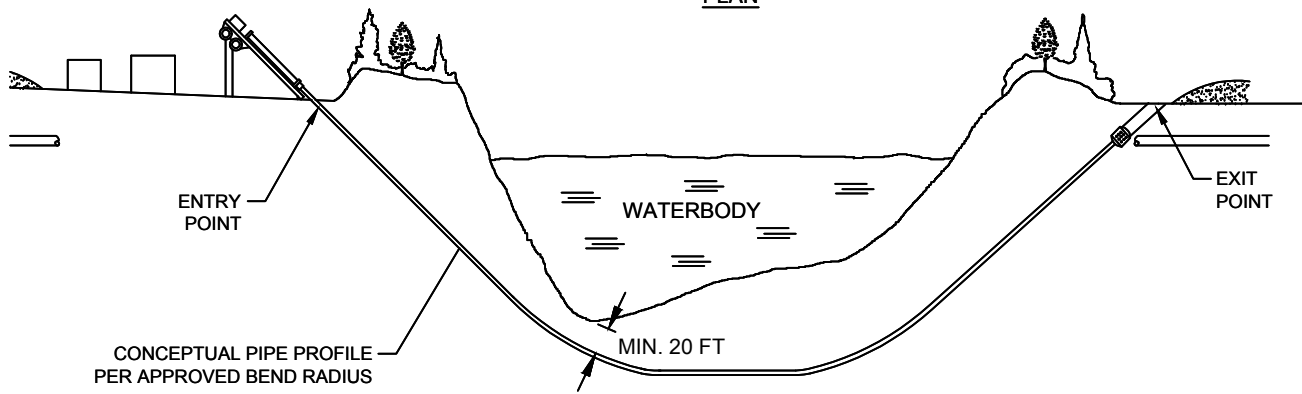
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SURVEY BY:	DRAWING DATE:	
DWG BY: EFN	APPROVED:	SCALE: 1" = 10'
CHECKED BY:		SHEET: 1 OF 1



- A - DRILL RIG
- B - DRILLER'S CONSOLE
- C - DRILL PIPE
- D - CRANE
- E - PARTS VAN
- F - MUD CLEANING UNIT
- G - MUD MIXING TANK
- H - MUD PUMPS
- I - MUD PIT
- J - FRAC TANKS
- K - DRILLING MUD (PALLETS)
- L - PARKING
- M - OFFICE TRAILER
- N - CONTAINMENT BERM

- A - EXIT PIT
- B - LIFT EQUIPMENT
- C - WELDING AREA
- D - MUD PIT
- E - MUD CLEANING
- F - GENERATOR
- G - FRAC TANKS
- H - CONTAINMENT BERM

**PLAN**




**PROFILE**

**NOTES:**

1. SET UP DRILLING EQUIPMENT A MINIMUM OF 150 FEET FROM THE EDGE OF THE WATERCOURSE. DO NOT CLEAR OR GRADE WITHIN THE 50-FOOT ZONE.
2. ENSURE THAT ONLY BENTONITE BASED DRILLING MUD IS USED. DO NOT ALLOW THE USE OF ANY ADDITIVES TO THE DRILLING MUD WITHOUT THE APPROVAL OF COMPANY'S INSPECTOR.
3. INSTALL SUITABLE DRILLING MUD TANKS OR SUMPS TO PREVENT CONTAMINATION OF WATERCOURSE.
4. INSTALL COMPACTED EARTHEN BERMS DOWNSLOPE FROM THE DRILL ENTRY AND ANTICIPATED EXIT POINTS TO CONTAIN ANY RELEASE OF DRILLING MUD.
5. DISPOSE OF DRILLING MUD IN ACCORDANCE WITH THE APPROPRIATE REGULATORY AUTHORITY REQUIREMENTS.

DRAWING DEPICTED IS SUPERSEDED BY WRITTEN STANDARD, SCOPE OF WORK OR LINE LIST.

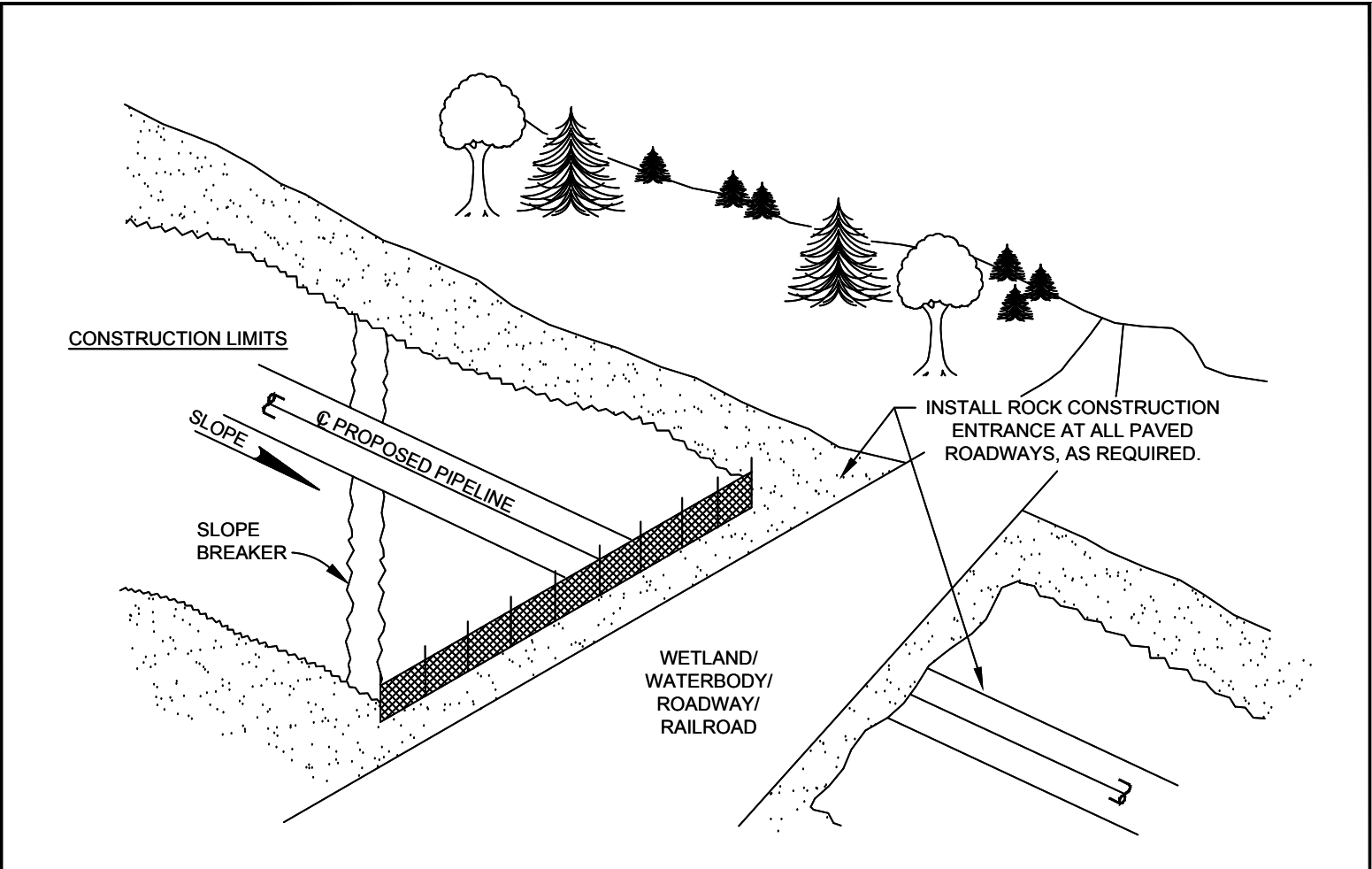
DESIGNED IN ACCORDANCE WITH TITLE 49 PART 192 OF MINIMUM FEDERAL SAFETY STANDARDS AND OPTIC GUIDE FOR GAS TRANSMISSION AND DISTRIBUTION PIPING SYSTEMS, LATEST EDITION.

PREPARED BY:  
  
 ENVIRONMENTAL CONSULTANTS  
 Sound Science. Creative Solutions.®

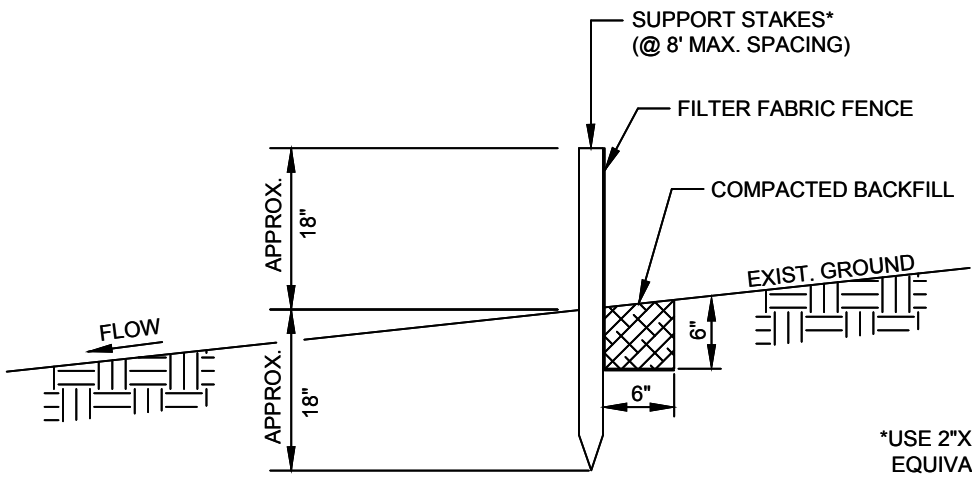
REV. LEVEL	DATE	BY	DESCRIPTION	CK.	APP.

**REVISIONS**

<b>TYPICAL WATERBODY CROSSING HORIZONTAL DIRECTIONAL DRILLING</b>					
DATE	REV. DATE	DRAWN BY	LOC. NO.	DRAWING NUMBER	SHEET NO.



**NOTES:**

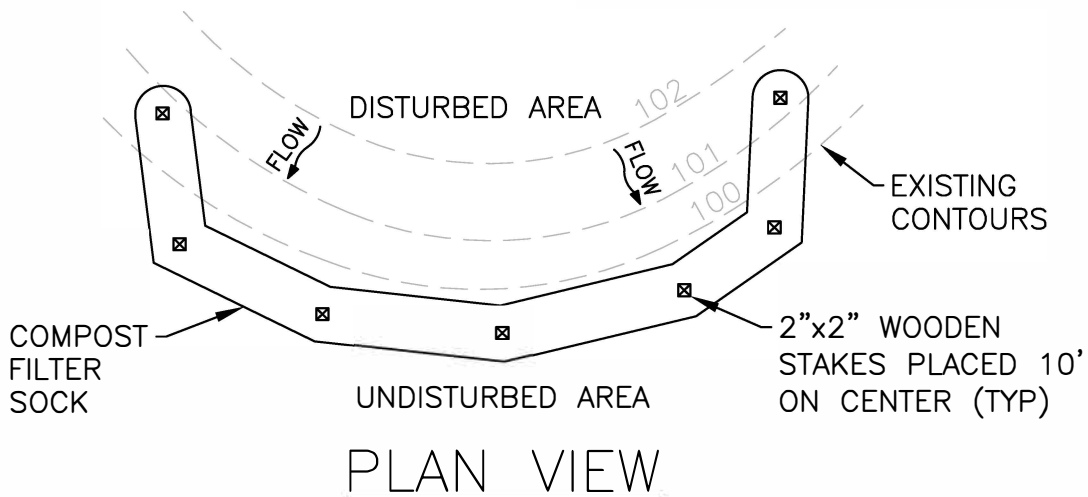
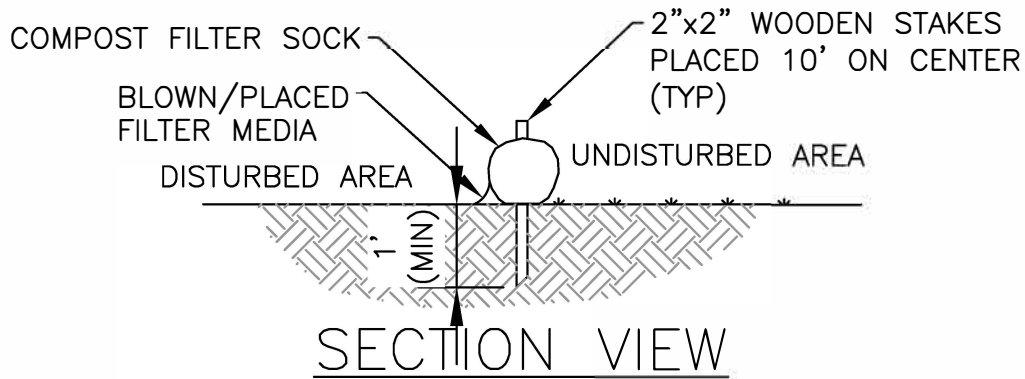


\*USE 2"X2" WOOD OR EQUIVALENT STEEL STAKES

PERMANENT STABILIZATION IS DEFINED AS MINIMUM, UNIFORM, PERENNIAL 70% VEGETATIVE COVER OR OTHER PERMANENT NON-VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED EROSION.

								TYPICAL STANDARD 18" SILT FENCE INSTALLATION (SHEET 1 OF 2)						
		REVISIONS												
REV. LEVEL	DATE	BY	DESCRIPTION			CK.	APP.	DATE	REV. DATE	DRAWN BY	LOC. NO.	DRAWING NUMBER	SHEET NO.	REV.





NOTES:

1. SOCK FABRIC AND COMPOST MATERIAL SHALL MEET ALL STATE STANDARDS.
2. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT. MAXIMUM SLOPE LENGTH ABOVE ANY BARRIER SHALL NOT EXCEED THAT SPECIFIED FOR THE SIZE OF THE SOCK AND THE SLOPE OF ITS TRIBUTARY AREA.
3. TRAFFIC SHALL NOT BE PERMITTED TO CROSS COMPOST FILTER SOCKS.
4. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE BARRIER AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.
5. COMPOST FILTER SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
6. BIO-DEGRADABLE COMPOST FILTER SOCKS SHALL BE REPLACED AFTER 6 MONTHS; PHOTO-DEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
7. UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS SOIL SUPPLEMENT.

COMPOST FILTER SOCK DETAIL

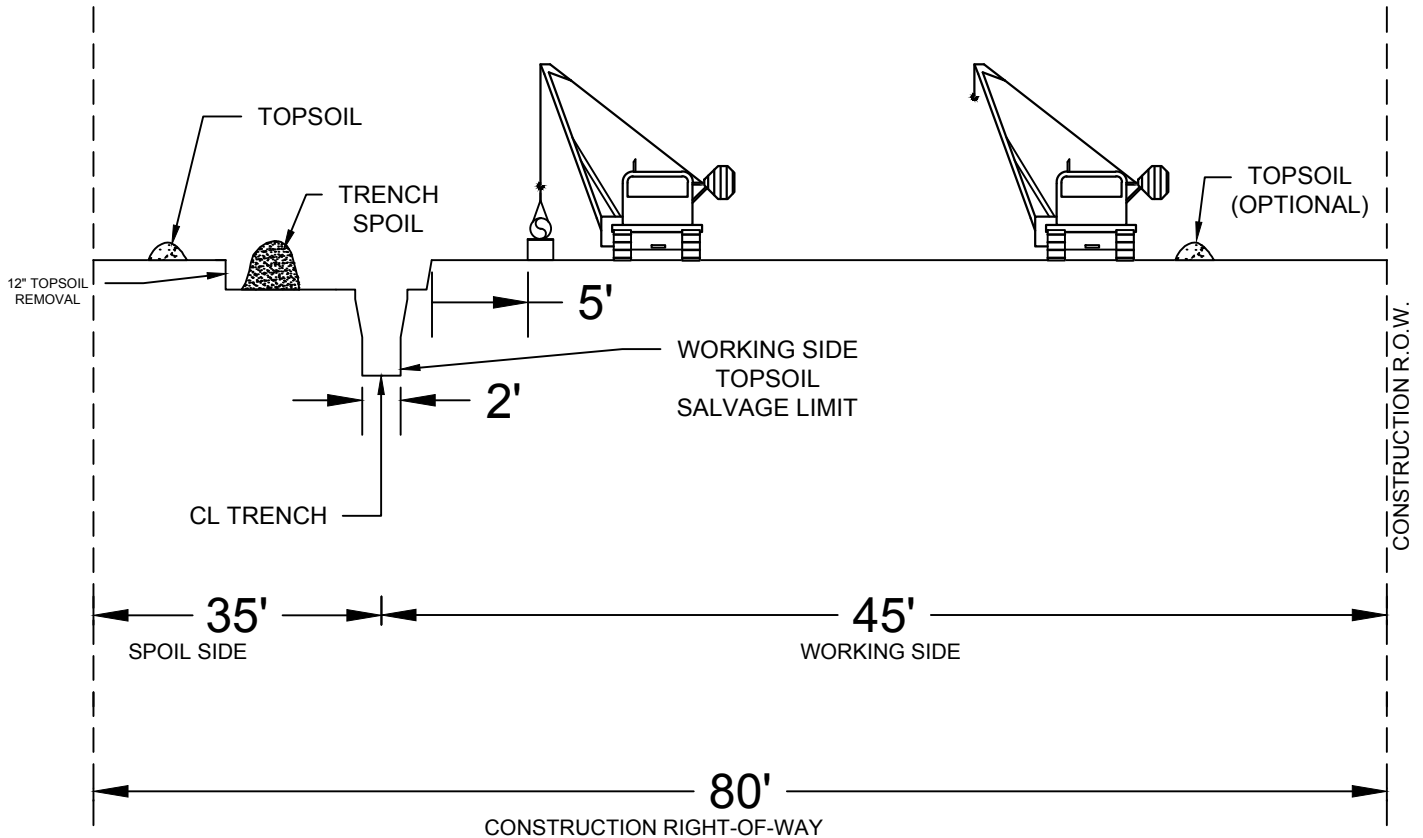
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REV. LEVEL	DATE	BY	DESCRIPTION	CHK.	APP.																																																														
REVISIONS																																																																			



## **RIGHT-OF-WAY (ROW) DETAIL**

## CONSTRUCTION RIGHT-OF-WAY DETAIL



PROFILE  
NOT TO SCALE

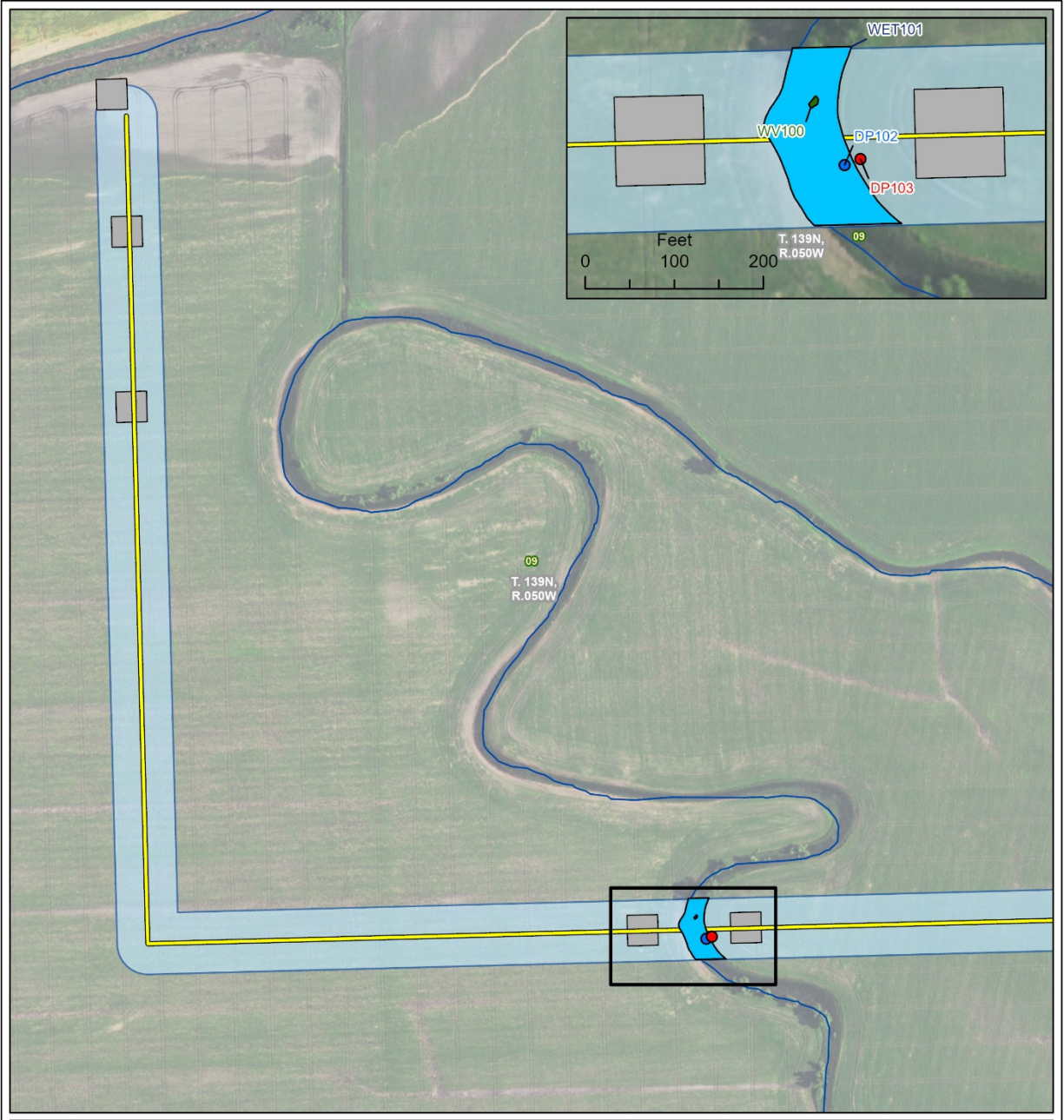
**NOTES:**

- CONSTRUCTION RIGHT-OF-WAY WILL TYPICALLY BE 80' WIDE OF TEMPORARY WORKSPACE. ADDITIONAL TEMPORARY WORKSPACE WILL BE NECESSARY AT MAJOR ROAD AND RIVER CROSSINGS AND OTHER SPECIAL CIRCUMSTANCES, AS REQUIRED. CERTAIN SITUATIONS MAY REQUIRE A NARROWER WIDTH.
- THIS DRAWING REFLECTS "TRENCH AND SPOIL SIDE" TOPSOIL STRIPPING PROCEDURE. SALVAGE TOPSOIL OVER TRENCH AND UNDER THE SPOIL PILE AT LOCATION IDENTIFIED ON THE CONSTRUCTION ALIGNMENT SHEETS, OR AS DIRECTED BY THE COMPANY INSPECTOR. DEPTH OF TOPSOIL STRIPPING IS THE DEPTH OF CULTIVATION OR 12," WHICHEVER IS GREATER.
- STOCKPILE TOPSOIL AS SHOW OR IN ANY CONFIGURATION APPROVED BY THE COMPANY INSPECTOR. KEEP TOPSOIL AND SPOIL PILES CLEAN OF ALL CONSTRUCTION DEBRIS. MAINTAIN A MINIMUM OF 12" OF SEPARATION BETWEEN TOPSOIL AND TRENCH SPOIL PILES. ENSURE THAT TOPSOIL AND TRENCH SPOIL DO NOT MIX.
- LEAVE GAPS IN TOPSOIL AND SPOIL PILES AT OBVIOUS DRAINAGES. DO NOT PUSH UPLAND SOILS INTO CREEKS OR WETLANDS. DO NOT USE TOPSOIL FOR PADDING. AVOID SCALPING VEGETATED GROUND SURFACE WHEN BACKFILLING TOPSOIL AND SPOILS PILES.
- THE OFFSET FROM AN EXISTING PIPELINE, WHERE APPLICABLE, WILL BE 25', BUT MAY BE INCREASED OR DECREASED DEPENDING ON THE SITE SPECIFIC CONSTRUCTION REQUIREMENTS.
- TEMPORARILY SUSPEND TOPSOIL HANDLING OPERATION DURING EXCESSIVELY WINDY CONDITIONS UNTIL MITIGATIVE MEASURES TO MINIMIZE WIND EROSION CAN BE IMPLEMENTED.
- BOTTOM OF TRENCH WIDTH WILL BE AN AVERAGE OF 2' (TYPICAL). HOWEVER, UNDER CERTAIN CIRCUMSTANCES, THE TRENCH MAY BE A MAXIMUM OF 10' WIDE.
- TOPSOIL AND TRENCH SPOIL RELATIVE POSITIONS CAN, AS DIRECTED BY THE COMPANY INSPECTOR, BE REVERSED.

SWCA ENVIRONMENTAL CONSULTANTS

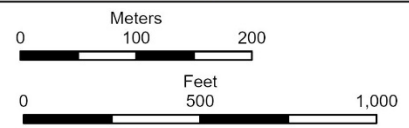
## **CORRIDOR EXCLUSION AND AVOIDANCE AREA MAPS**

- **Exclusion Areas: none identified**
- **Avoidance Areas: 2 wetlands**



**NuStar North System Pipeline**

- Wetland Data Point
- Upland Data Point
- Proposed Pipeline
- NHD Flowline
- Wetland Boundary
- Woody Vegetation
- Survey Area
- Horizontal Directional Drill Bore Pad
- Section Boundary



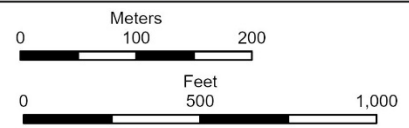
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 Source: USDA/FSA -  
 Aerial Photography Field Office  
 Quadrangle: West Fargo South (1976)  
 Casselton SE (1976)  
 Township/Range: T139N, R50W  
 Cass County, North Dakota  
 Projection: NAD 1983 UTM Zone 13N





**NuStar North System Pipeline**

- Wetland Data Point
- Upland Data Point
- Proposed Pipeline
- NHD Flowline
- Secondary Road
- Wetland Boundary
- Survey Area
- Horizontal Directional Drill Bore Pad
- Section Boundary



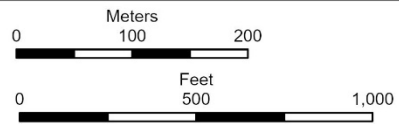
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 Source: USDA/FSA -  
 Aerial Photography Field Office  
 Quadrangle: West Fargo South (1976)  
 Casselton SE (1976)  
 Township/Range: T139N, R50W  
 Cass County, North Dakota  
 Projection: NAD 1983 UTM Zone 13N





**NuStar North System Pipeline**

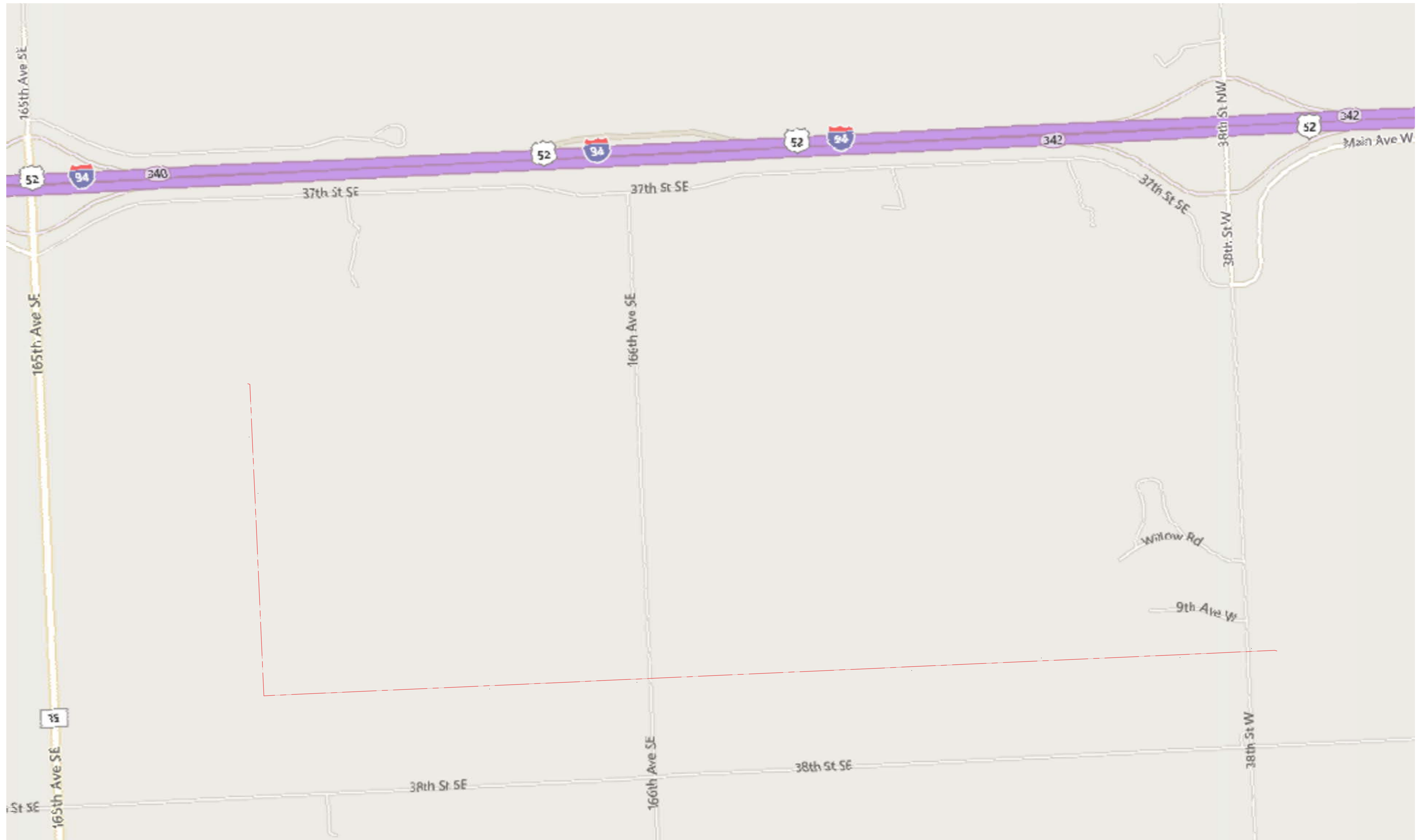
- Proposed Pipeline
- NHD Flowline
- Secondary Road
- Survey Area
- Horizontal Directional Drill Bore Pad
- Section Boundary



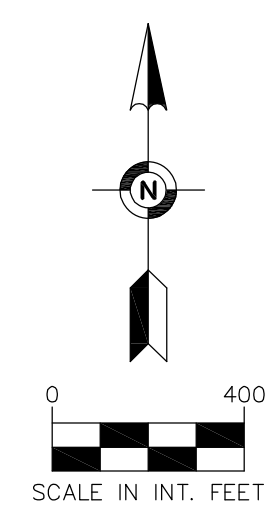
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 Source: USDA/FSA -  
 Aerial Photography Field Office  
 Quadrangle: West Fargo South (1976)  
 Casselton SE (1976)  
 Township/Range: T139N, R50W  
 Cass County, North Dakota  
 Projection: NAD 1983 UTM Zone 13N



**ENGINEERING DRAWINGS**  
**Alignment Sheets**  
**Crossing Plan and Profile Sheets**



**PRELIMINARY**



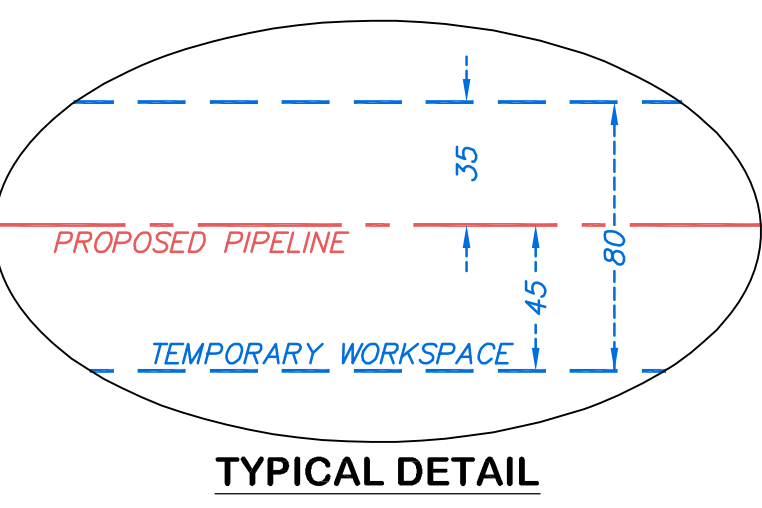
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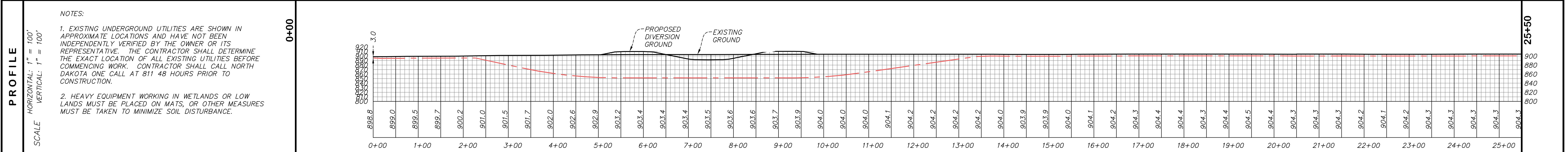
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						2	7/22/20	KTB	HDD & STATIONING				
						3	7/24/20	KTB	WORKSPACE				
						4	8/26/20	KTB	WETLANDS				

**NuStar**  
 PIPELINE OPERATING PARTNERSHIP, L.P.

**EFN**  
 Egan, Field & Nowak, Inc.  
 1229 Tyler Street NE, Suite 100  
 Minneapolis, Minnesota 55413  
 PHONE: (612) 466-3300  
 FAX: (612) 466-3363  
 WWW.EFNSURVEY.COM  
 LAND SURVEYORS SINCE 1872


ALIGNMENT SKETCH MAPLETON DIVERSION		
CASS COUNTY	NORTH DAKOTA	
IMAGERY DATE:	DRAWN BY: KTB	CLIENT PROJECT NO:
SURVEY BY: KB, DF	DRAWING DATE: 3/30/20	EFN PROJECT NO.: 39039
DWG BY: KTB	APPROVED:	SCALE: 1" = 400'
CHECKED BY: GKD		SHEET: 1 OF 6

OWNER	SURVEY/ABSTRACT	PARENT PIN 53000009053020 JANET WANZEK ETAL 61.76		10±19	PARENT PIN 53000009054000 JANET WANZEK ETAL 92.79		25±50	
	TRACT							
ENVIRONMENTAL	TIMING RESTRICTIONS							
	WETLAND / WATERBODY ID							
	WETLAND / WATERBODY TYPE							
	WATERBODY CLASSIFICATION							
PLAN	CONSTRUCTION METHOD	OPEN CUT	HDD		OPEN CUT			
	REGULATORY SPECIFICATION							
AC MITIGATION	 <p><b>TYPICAL DETAIL</b></p> <p>PROPOSED PIPELINE: 35' diameter</p> <p>TEMPORARY WORKSPACE: 45' x 90'</p>							




PIPE DATA	CLASSIFICATION		
	DESIGN PRESSURE	228'	1113'
	MAX ALLOWABLE OPERATING PRESSURE		
	NORMAL OPERATING PRESSURE		
DESIGN FACTOR	REFER TO HDR SHEET 1 FOR DRILL INFO		

NO.	DESCRIPTION	QUANTITY	NO.	DESCRIPTION	QUANTITY	REFERENCE DRAWINGS		DRAWING REVISION					
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1		1437'				1	4/13/20	KTB	ALIGNMENT & WORKSPACE				
2		1113'				2	7/22/20	KTB	HDD & STATIONING				
3	PIPELINE MARKERS	2				3	7/24/20	KTB	WORKSPACE WIDTH				



PIPELINE OPERATING PARTNERSHIP, L.P.



1229 Tyler Street NE, Suite 100  
Minneapolis, Minnesota 55413  
PHONE: (612) 466-3300  
FAX: (612) 466-3363  
WWW.EFNSURVEY.COM

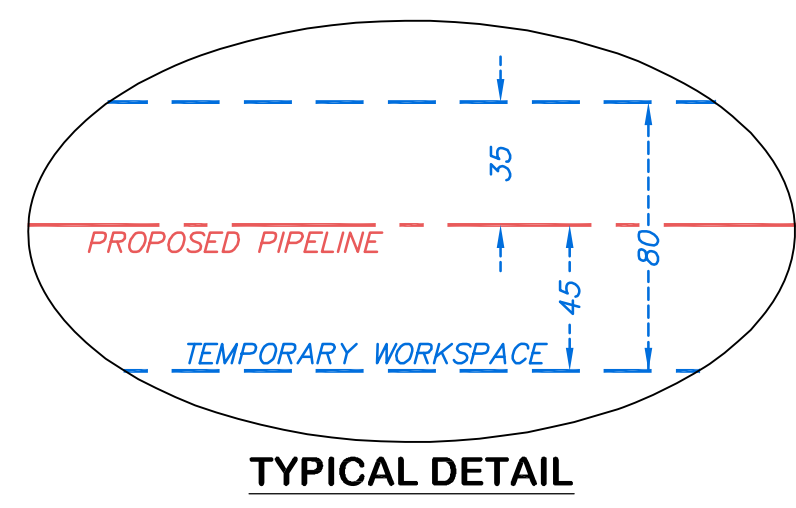
Egan, Field & Nowak, Inc.  
land surveyors since 1872

ALIGNMENT SKETCH  
MAPLETON DIVERSION

CASS COUNTY NORTH DAKOTA

IMAGERY DATE: DRAWN BY: KTB CLIENT PROJECT NO:  
SURVEY BY: KB, DF DRAWING DATE: 3/30/20 EFN PROJECT NO.: 39039  
DWG BY: KTB APPROVED: SCALE: 1" = 100'  
CHECKED BY: GKD SHEET: 2 OF 6

OWNER	SURVEY/ABSTRACT	PARENT PIN 53000009054000 JANET WANZEK ETAL 60.18		PARENT PIN 53000009055000 JANET WANZEK ETAL 103.45	
	TRACT	25+50	35+43	35+43	62+50
ENVIRONMENTAL	TIMING RESTRICTIONS				
	WETLAND / WATERBODY ID				
	WETLAND / WATERBODY TYPE				
	WATERBODY CLASSIFICATION				
PLAN	CONSTRUCTION METHOD	OPEN CUT		HDD	
	REGULATORY SPECIFICATION				
	AC MITIGATION				



**PRELIMINARY**

**LEGEND**

- PROPOSED 8-INCH PIPELINE
- PROPOSED WORKSPACE/EXIT
- PROPOSED DRILL ENTRY/EXIT
- SPOT ELEVATION
- EXISTING CONTOUR LINE
- TREE

SCALE IN INT. FEET  
Bearings based on NAD 83,  
North Dakota North, Int. Ft.  
grid system.

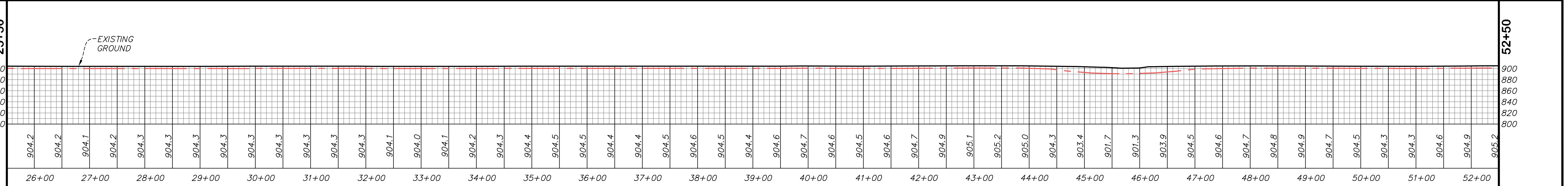


**PROFILE**

HORIZONTAL: 1" = 100'  
VERTICAL: 1" = 100'

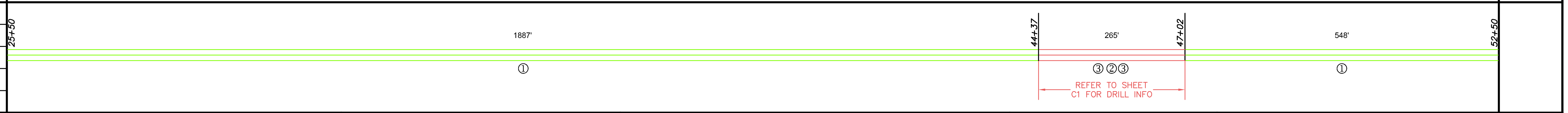
NOTES:

- EXISTING UNDERGROUND UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. CONTRACTOR SHALL CALL NORTH DAKOTA ONE CALL AT 811 48 HOURS PRIOR TO CONSTRUCTION.
- HEAVY EQUIPMENT WORKING IN WETLANDS OR LOW LANDS MUST BE PLACED ON MATS, OR OTHER MEASURES MUST BE TAKEN TO MINIMIZE SOIL DISTURBANCE.



**PIPE DATA**

CLASSIFICATION	
DESIGN PRESSURE	1887'
MAX ALLOWABLE OPERATING PRESSURE	
NORMAL OPERATING PRESSURE	
DESIGN FACTOR	



NO.	DESCRIPTION	QUANTITY	NO.	DESCRIPTION	QUANTITY	REFERENCE DRAWINGS		DRAWING REVISION				CHK	ENG	APP	QUNT
						DESCRIPTION	DWG FILE	NO.	DATE	BY	DESCRIPTION				
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2		265'				2	7/22/20	KTB	HDD & STATIONING						
3	PIPELINE MARKERS	2				3	7/24/20	KTB	WORKSPACE WIDTH & ADDITIONAL WORKSPACE						
4						4	8/26/20	KTB	WETLANDS						

**NuStar**  
PIPELINE OPERATING PARTNERSHIP, L.P.

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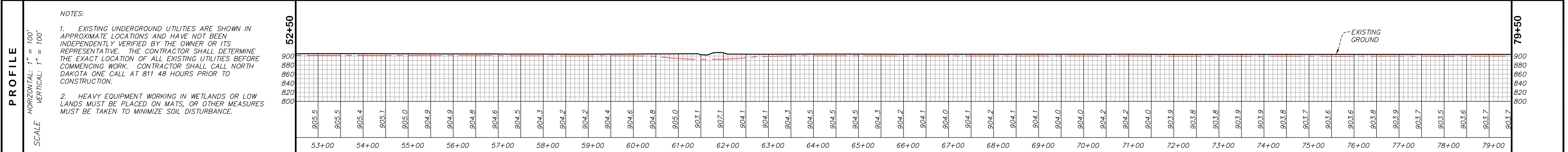
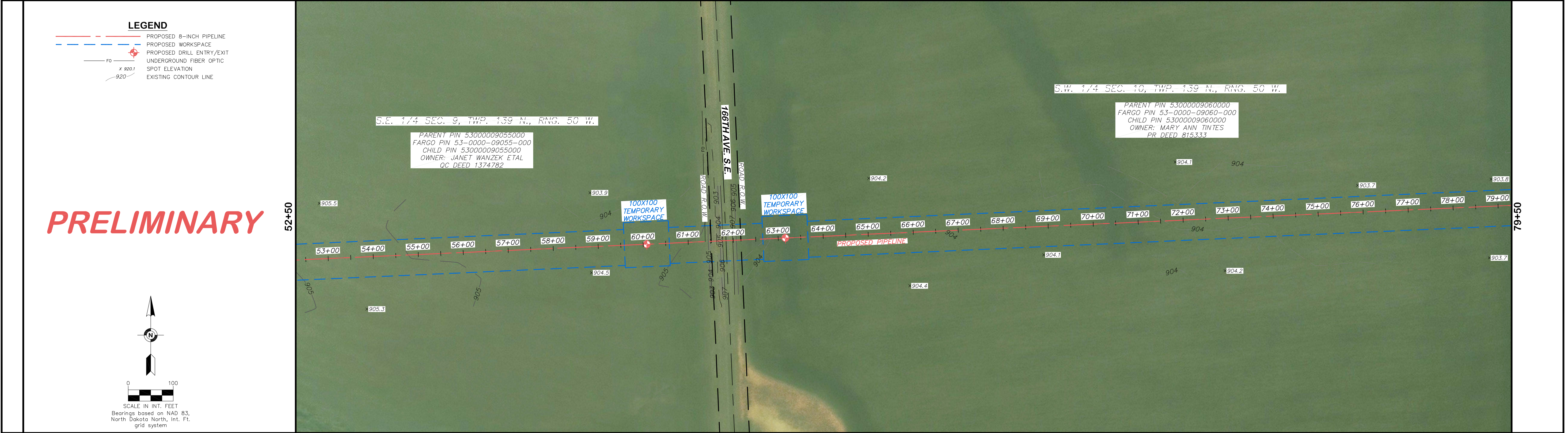
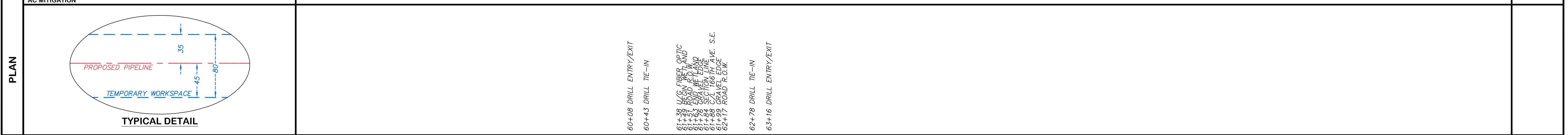
ALIGNMENT SKETCH  
MAPLETON DIVERSION

CASS COUNTY NORTH DAKOTA

IMAGERY DATE: DRAWN BY: KTB CLIENT PROJECT NO:  
SURVEY BY: KB, DF DRAWING DATE: 3/30/20 EFN PROJECT NO.: 39039  
DWG BY: KTB APPROVED DATE: SCALE: 1" = 100'  
CHECKED BY: GKD SHEET: 3 OF 6

OWNER	SURVEY/ABSTRACT		
	TRACT	52+50	79+50
	RODS	PARENT PIN 53000009055000 JANET WANZEK ETAL 56.61	PARENT PIN 53000009060000 MARY ANN TINTES 107.03

ENVIRONMENTAL	TIMING RESTRICTIONS		
	WETLAND / WATERBODY ID		
	WETLAND / WATERBODY TYPE		
	WATERBODY CLASSIFICATION		
	CONSTRUCTION METHOD	OPEN CUT	HDD
REGULATORY SPECIFICATION	← CASS CO.		



PIPE DATA

CLASSIFICATION	
DESIGN PRESSURE	793'
MAX ALLOWABLE OPERATING PRESSURE	
NORMAL OPERATING PRESSURE	①
DESIGN FACTOR	③ ② ③

REFER TO SHEET C2 FOR DRILL INFO

SUMMARY

BILL OF MATERIALS			REFERENCE DRAWINGS		DRAWING REVISION							
NO.	DESCRIPTION	QUANTITY	NO.	DESCRIPTION	NO.	DATE	BY	DESCRIPTION	CHK	ENG	APP	CLIENT
1		2465'			1	4/13/20	KTB	ALIGNMENT & WORKSPACE				
2		235'			2	7/22/20	KTB	HDD & STATIONING				
3	PIPELINE MARKERS	2			3	7/24/20	KTB	WORKSPACE WIDTH				
					4	8/26/20	KTB	WETLANDS				

PIPELINE OPERATING PARTNERSHIP, L.P.

Egan, Field & Nowak, Inc.  
land surveyors since 1872

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Minneapolis, Minnesota 55413  
PHONE: (612) 466-3300  
FAX: (612) 466-3363  
WWW.EFNSURVEY.COM

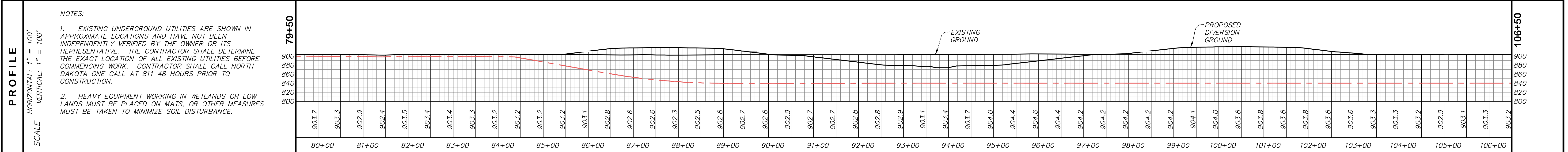
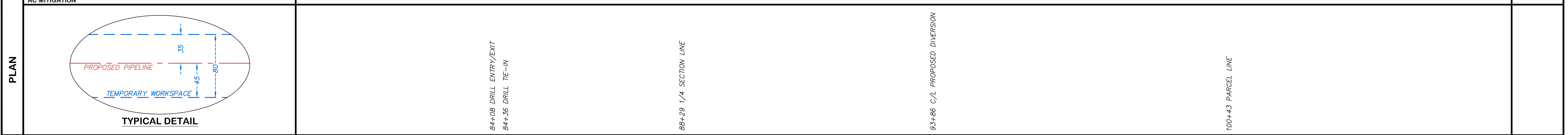
ALIGNMENT SKETCH  
MAPLETON DIVERSION

CASS COUNTY NORTH DAKOTA

IMAGERY DATE:	DRAWN BY: KTB	CLIENT PROJECT NO.:
SURVEY BY: KB, DF	DRAWING DATE: 3/30/20	EFN PROJECT NO.: 39039
DWG BY: KTB	APPROVED:	SCALE: 1" = 100'
	CHECKED BY: GKD	SHEET: 4 OF 6

OWNER	SURVEY/ABSTRACT			
	TRACT			
	RODS	79+50	88+29	106+50
		PARENT PIN 53000009060000 MARY ANN TINTES 53.27		PARENT PIN 53000009061005 MARY ANN TINTES 73.58
				PARENT PIN 53000009061007 JANET WANZEK ETAL 36.79

ENVIRONMENTAL	TIMING RESTRICTIONS			
	WETLAND / WATERBODY ID			
	WETLAND / WATERBODY TYPE			
	WATERBODY CLASSIFICATION			
	CONSTRUCTION METHOD	OPEN CUT	HDD	
	REGULATORY SPECIFICATION			



PIPE DATA

CLASSIFICATION	
DESIGN PRESSURE	486'
MAX ALLOWABLE OPERATING PRESSURE	2214'
NORMAL OPERATING PRESSURE	①
DESIGN FACTOR	③

REFER TO HDR SHEET 2 FOR DRILL INFO

SUMMARY	BILL OF MATERIALS			REFERENCE DRAWINGS		DRAWING REVISION				 PIPELINE OPERATING PARTNERSHIP, L.P.	ALIGNMENT SKETCH MAPLETON DIVERSION			
	NO.	DESCRIPTION	QUANTITY	NO.	DESCRIPTION	NO.	DATE	BY	DESCRIPTION		CHK	ENG	APP	CLIENT
	1		486'			1	4/13/20	KTB	ALIGNMENT & WORKSPACE		GKD			
		2214'				2	7/22/20	KTB	HDD & STATIONING					
	3	PIPELINE MARKERS	2			3	7/24/20	KTB	WORKSPACE WIDTH					

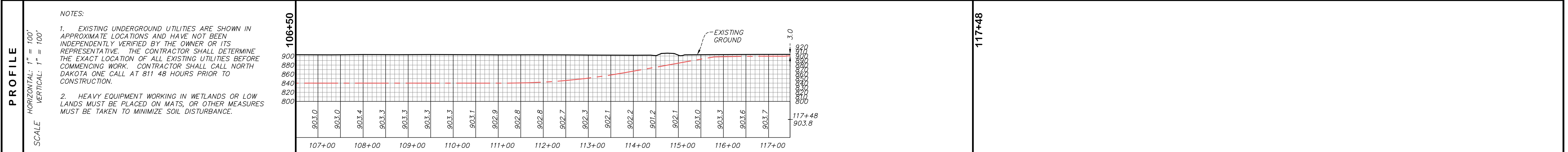
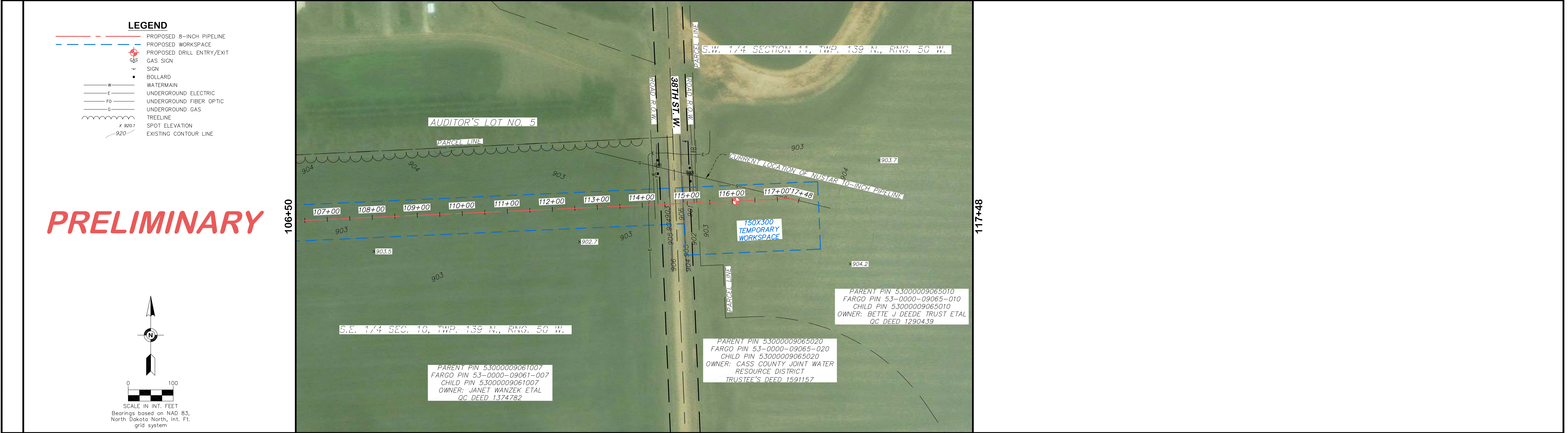
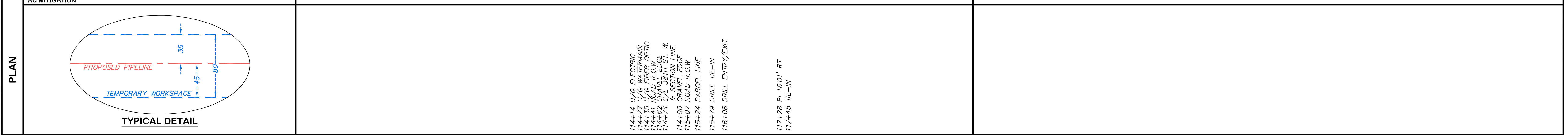
1229 Tyler Street NE, Suite 100  
Minneapolis, Minnesota 55413  
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FAX: (612) 466-3363  
WWW.EFNSURVEY.COM

Egan, Field & Nowak, Inc.  
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IMAGERY DATE: CASS COUNTY  
DRAWN BY: KTB  
CLIENT PROJECT NO.:  
SURVEY BY: KB, DF  
DRAWING DATE: 3/30/20  
EFN PROJECT NO.: 39039  
DWG BY: KTB  
APPROVED: SCALE: 1" = 100'  
CHECKED BY: GKD  
SHEET: 5 OF 6

SURVEY/ABSTRACT			
OWNER	TRACT	106+50	117+48
	RODS	49.94	3.03
		PARENT PIN 53000009061007 JANET WAZNEK ETAL PARENT PIN 53000009065020 CASS COUNTY JOINT WATER RESOURCE DISTRICT PARENT PIN 53000009065010 BETTE J DEEDE TRUST ETAL	

ENVIRONMENTAL	TIMING RESTRICTIONS	
	WETLAND / WATERBODY ID	
	WETLAND / WATERBODY TYPE	
	WATERBODY CLASSIFICATION	
	CONSTRUCTION METHOD	HDD
REGULATORY SPECIFICATION	CASS CO.	OPEN CUT



PIPE DATA

CLASSIFICATION	
DESIGN PRESSURE	92'
MAX ALLOWABLE OPERATING PRESSURE	
NORMAL OPERATING PRESSURE	
DESIGN FACTOR	REFER TO HDR SHEET 2 FOR DRILL INFO

SUMMARY	BILL OF MATERIALS				REFERENCE DRAWINGS		DRAWING REVISION						
	NO.	DESCRIPTION	QUANTITY	NO.	DESCRIPTION	NO.	DATE	BY	DESCRIPTION	CHK	ENG	APP	CLIENT
	1	PIPELINE MARKERS	2			1	4/13/20	KTB	ALIGNMENT & WORKSPACE				

**NuStar**  
PIPELINE OPERATING PARTNERSHIP, L.P.

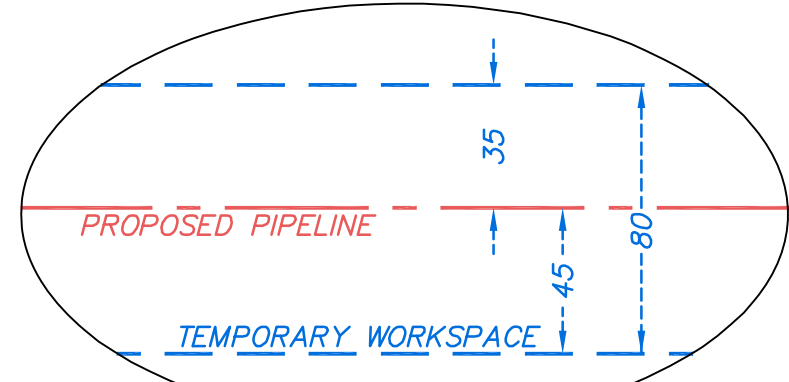
**EFN**  
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FAX: (612) 466-3363  
WWW.EFNSURVEY.COM

ALIGNMENT SKETCH  
MAPLETON DIVERSION  
NORTH DAKOTA

CASS COUNTY

IMAGERY DATE: DRAWN BY: KTB CLIENT PROJECT NO:  
SURVEY BY: KB, DF DRAWING DATE: 3/30/20 EFN PROJECT NO.: 39039  
DWG BY: KTB APPROVED: SCALE: 1" = 100'  
CHECKED BY: GKD SHEET: 6 OF 6

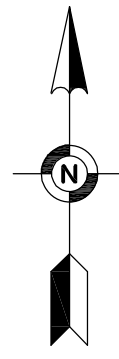
PLAN



TYPICAL DETAIL

LEGEND

- PROPOSED 8-INCH PIPELINE
- - - PROPOSED WORKSPACE
- ◆ PROPOSED DRILL ENTRY/EXIT
- SPOT ELEVATION
- - - EXISTING CONTOUR LINE
- ☼ OR ☼ TREE



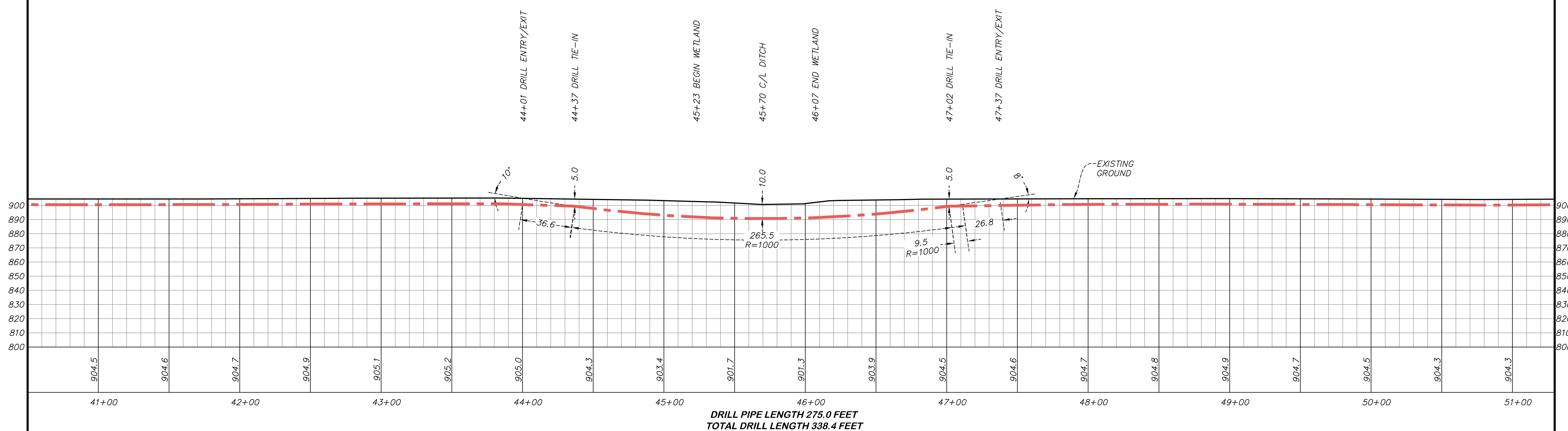
SCALE IN INT. FEET  
 Bearings based on NAD 83,  
 North Dakota North, Int. Ft.  
 grid system.



PROFILE

HORIZONTAL: 1" = 40'  
 VERTICAL: 1" = 40'  
 SCALE

- NOTES:
- EXISTING UNDERGROUND UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. CONTRACTOR SHALL CALL NORTH DAKOTA ONE CALL AT 811 48 HOURS PRIOR TO CONSTRUCTION.
  - HEAVY EQUIPMENT WORKING IN WETLANDS OR LOW LANDS MUST BE PLACED ON MATS, OR OTHER MEASURES MUST BE TAKEN TO MINIMIZE SOIL DISTURBANCE.



**PRELIMINARY**

DRILL PIPE LENGTH 275.0 FEET  
 TOTAL DRILL LENGTH 338.4 FEET

SUMMARY

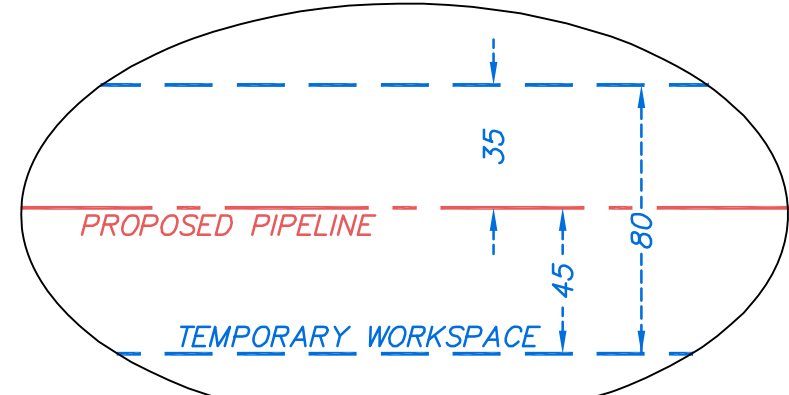
BILL OF MATERIALS			REFERENCE DRAWINGS		DRAWING REVISION								
NO.	DESCRIPTION	QUANTITY	NO.	DESCRIPTION	QUANTITY	NO.	DATE	BY	DESCRIPTION	CHK	ENG	APP	CLIENT
						1	4/13/20	KTB	ALIGNMENT & WORKSPACE				
						2	7/22/20	KTB	STATIONING				
						3	7/24/20	KTB	WORKSPACE WIDTH				
						4	8/26/20	KTB	WETLANDS				

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 WWW.EFNSURVEY.COM  
 land surveyors since 1872

DRILL PROFILE MAPLETON DIVERSION		
CASS COUNTY	NORTH DAKOTA	
IMAGERY DATE:	DRAWN BY: KTB	CLIENT PROJECT NO:
SURVEY BY: KB, DF	DRAWING DATE: 4/3/20	EFN PROJECT NO.: 39039
DWG BY: KTB	APPROVED:	SCALE: 1" = 40'
	CHECKED BY: GKD	SHEET: C1 OF C2

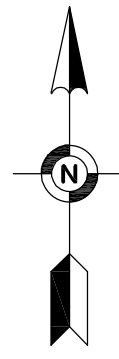
PLAN



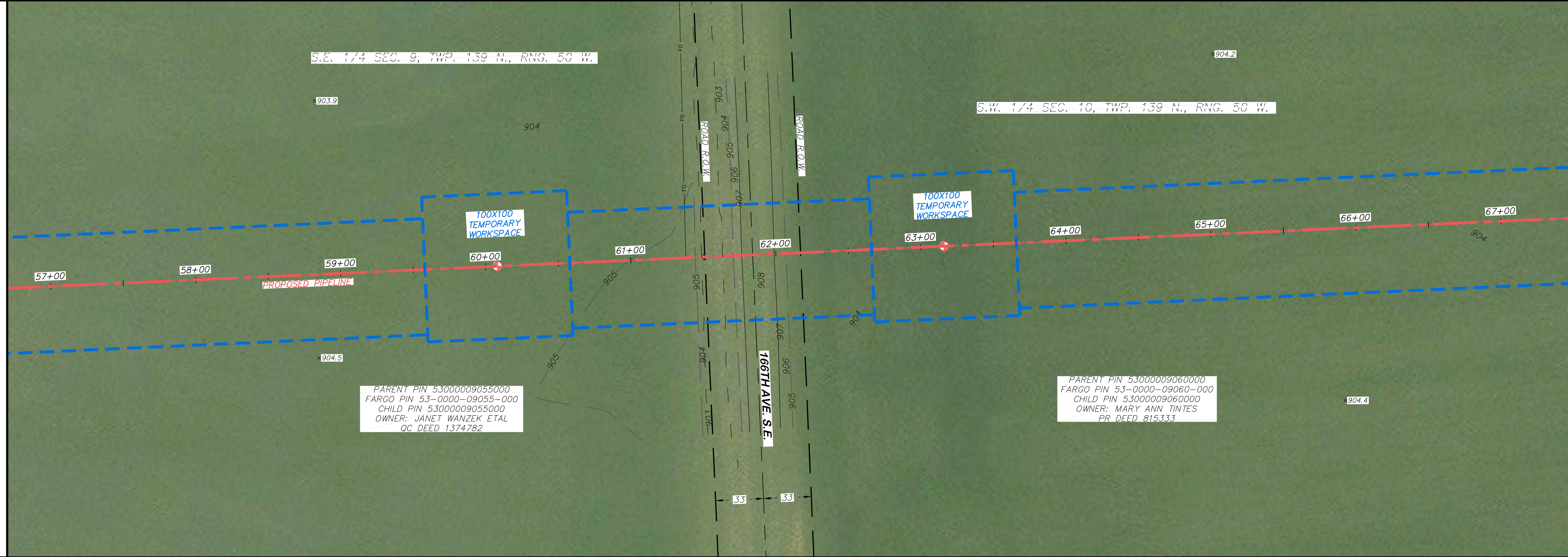
TYPICAL DETAIL

LEGEND

- PROPOSED 8-INCH PIPELINE
- PROPOSED WORKSPACE
- + PROPOSED DRILL ENTRY/EXIT
- UNDERGROUND FIBER OPTIC
- SPOT ELEVATION
- EXISTING CONTOUR LINE



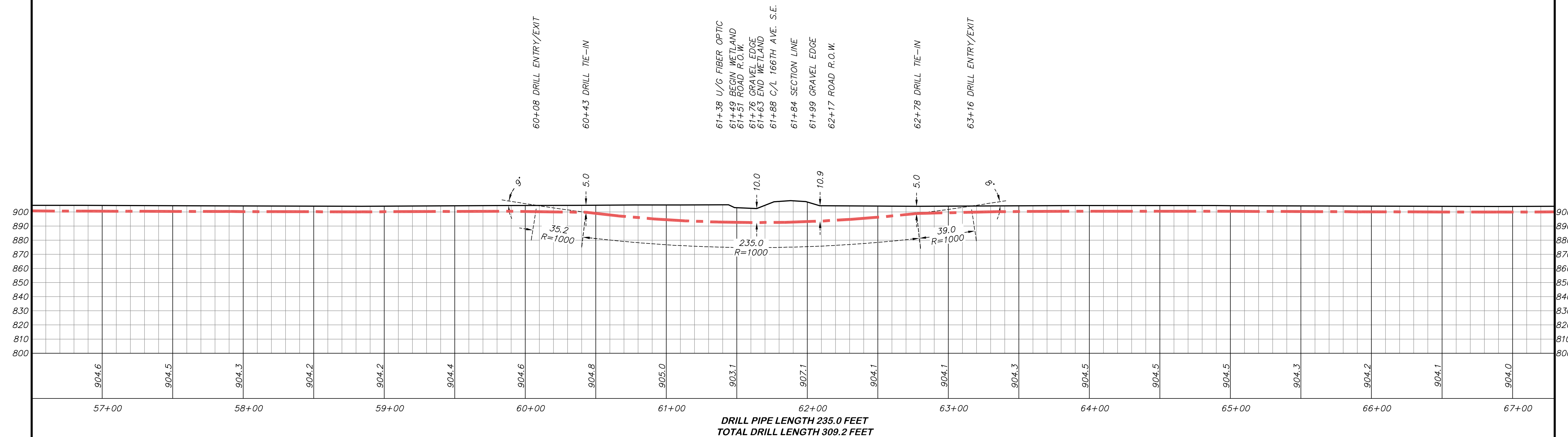
SCALE IN INT. FEET  
 Bearings based on NAD 83,  
 North Dakota North, Int. Ft.  
 grid system.



PROFILE

- NOTES:
- EXISTING UNDERGROUND UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS AND HAVE NOT BEEN INDEPENDENTLY VERIFIED BY THE OWNER OR ITS REPRESENTATIVE. THE CONTRACTOR SHALL DETERMINE THE EXACT LOCATION OF ALL EXISTING UTILITIES BEFORE COMMENCING WORK. CONTRACTOR SHALL CALL NORTH DAKOTA ONE CALL AT 811 48 HOURS PRIOR TO CONSTRUCTION.
  - HEAVY EQUIPMENT WORKING IN WETLANDS OR LOW LANDS MUST BE PLACED ON MATS, OR OTHER MEASURES MUST BE TAKEN TO MINIMIZE SOIL DISTURBANCE.

HORIZONTAL: 1" = 40'  
 VERTICAL: 1" = 40'  
 SCALE



**PRELIMINARY**

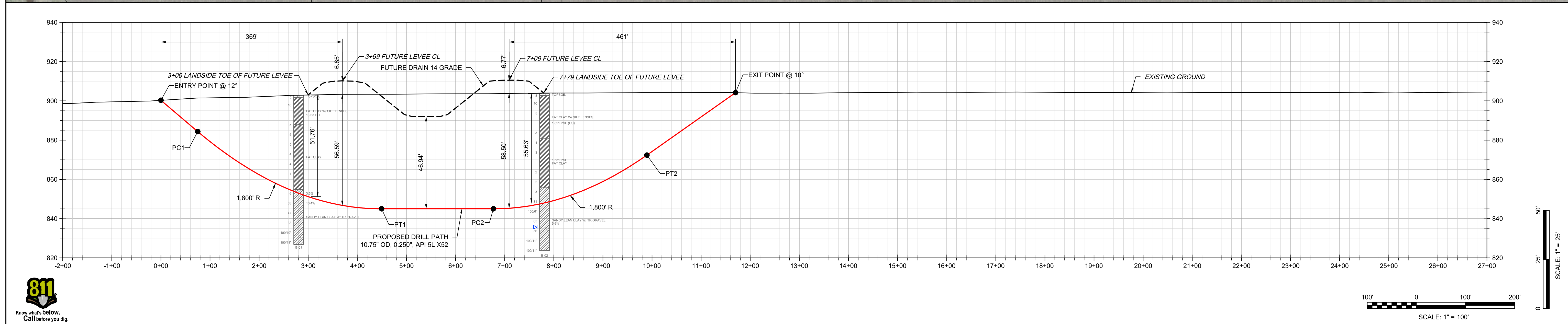
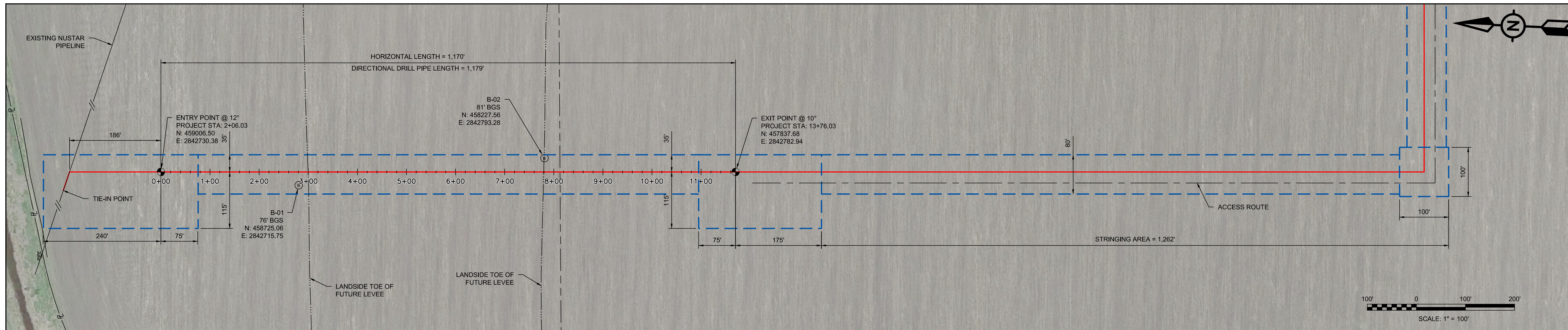
SUMMARY

BILL OF MATERIALS			REFERENCE DRAWINGS		DRAWING REVISION									
NO.	DESCRIPTION	QUANTITY	NO.	DESCRIPTION	DESCRIPTION	DWG FILE	NO.	DATE	BY	DESCRIPTION	CHK	ENG	APP	CLIENT
							1	4/13/20	KTB	ALIGNMENT & WORKSPACE				
							2	7/22/20	KTB	STATIONING				
							3	7/24/20	KTB	WORKSPACE WIDTH				
							4	8/26/20	KTB	WETLANDS				

**NuStar**  
 PIPELINE OPERATING PARTNERSHIP, L.P.

**EFN**  
 Egan, Field & Nowak, Inc.  
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 FAX: (612) 466-3363  
 WWW.EFNSURVEY.COM  
 land surveyors since 1872

DRILL PROFILE MAPLETON DIVERSION		
CASS COUNTY	NORTH DAKOTA	
IMAGERY DATE:	DRAWN BY: KTB	CLIENT PROJECT NO:
SURVEY BY: KB, DF	DRAWING DATE: 4/3/20	EFN PROJECT NO.: 39039
DWG BY: KTB	APPROVED:	SCALE: 1" = 40'
CHECKED BY: GKD	SHEET: C2 OF C2	



DIRECTIONAL DRILL DATA		
DESCRIPTION	STATION (ft)	ELEVATION (ft)
ENTRY POINT @ 12°	0+00.00	900.28
PC 1 (1,800' R)	0+75.02	884.33
PT 1	4+49.26	845.00
PC 2 (1,800' R)	6+76.89	845.00
PT 2	9+89.46	872.35
EXIT POINT @ 10°	11+70.00	904.18
HORIZONTAL DISTANCE (ft) = 1,170.00		
DIRECTIONAL DRILL PIPE LENGTH (ft) = 1,178.80		

- GENERAL NOTES**
- DRILL PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO THE CONTROL POSITION FOR THE CROSSING.
  - ALL COMPANY SPECIFICATIONS, PERMIT REQUIREMENTS AND CONTRACT DOCUMENTS SHALL BE ADHERED TO BY CONTRACTOR.
  - CONTRACTOR SHALL PLACE ONE CALL/811 NOTIFICATIONS AND ABIDE BY STATE REGULATIONS BEFORE DRILLING COMMENCES.
  - PRESENCE, LOCATION, AND ELEVATIONS (POTHOLE IF NEEDED) OF ALL UTILITIES/FACILITIES TO BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION AND CLEARLY MARKED AND EXPOSED (IF NECESSARY).
  - DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES SHALL BE MODIFIED TO PREVENT DAMAGE TO UNDERGROUND FACILITIES.
  - CONTRACTOR SHALL MONITOR TRENCHLESS OPERATIONS FOR AREA IMPACTS SUCH AS GROUND DISTURBANCE AND INADVERTENT RETURNS.
  - PILOT HOLE TOLERANCES AND MINIMUM THREE JOINT RADIUS SHALL BE MAINTAINED DURING PILOT HOLE OPERATIONS. TOLERANCES AND MINIMUM RADIUS SHALL BE REVIEWED BY COMPANY FOR APPROVAL.
  - CONTRACTOR HAS THE OPTION TO USE DJEL RIGS AND/OR RIG PLACEMENT IN REFERENCE TO ENTRY AND EXIT.
  - GEOTECHNICAL DATA AND INFORMATION IS PRESENTED FOR REFERENCE ONLY. REVIEW THE ASSOCIATED GEOTECHNICAL REPORT FOR ALL INTERPRETATIONS AND DETERMINATIONS REGARDING SUBSURFACE CONDITIONS.
  - ONE CONTINUOUS STRING OF PIPE SHALL BE UTILIZED DURING PULLBACK (NO MID-PULLBACK WELDS ALLOWED).
  - THE MINIMUM EXTENT OF THE GROUTING WILL BE TO COMPLETELY SEAL AND FILL THE UPPER 50 LINEAR FEET OF HOLE (IMMEDIATELY BELOW TIE-IN ELEVATION) ENTIRELY WITH GROUT AND A MINIMUM OF THE TOP 5 VERTICAL FEET FILLED WITH BACKFILL MATERIAL TO MATCH SURROUNDING SOIL CONDITIONS.

MATERIAL SPECIFICATIONS AND TOLERANCES	
ITEM	SPECIFICATIONS
PRODUCT PIPE	10.75" OD, 0.250", API 5L X52
EXTERNAL COATING	14-16 MILS FBE, 40-60 MILS ARO
OPERATING CONDITIONS	MAOP = 1480 PSIG ASSUMED MAXIMUM OPERATING TEMP = 80°F
ITEM	TOLERANCE
PILOT HOLE ENTRY ANGLE	INCREASE ANGLE UP TO 1° (STEEPER), NO DECREASE IN ANGLE ALLOWED.
PILOT HOLE ENTRY LOCATION	AS PER COORDINATES PROVIDED BY COMPANY. NO CHANGES WITHOUT COMPANY APPROVAL.
PILOT HOLE EXIT ANGLE	INCREASE ANGLE UP TO 1° (STEEPER) OR DECREASE UP TO 2° (FLATTER).
PILOT HOLE EXIT LOCATION	UP TO 20 FEET BEYOND OR 10 FEET SHORT OF THE EXIT STAKE. BETWEEN 5 FEET LEFT AND 5 FEET RIGHT OF CENTERLINE.
PILOT HOLE DEPTH	UP TO 2 FEET ABOVE THE DESIGN DRILL PROFILE OR 8 FEET BELOW THE DESIGN DRILL PROFILE.
PILOT HOLE ALIGNMENT	SHALL REMAIN WITHIN 5 FEET LEFT OR RIGHT OF THE HDD CENTERLINE.
MINIMUM RADIUS OF CURVATURE	MINIMUM COMBINED (HORIZONTAL AND VERTICAL) RADIUS OF CURVATURE = 1,300' OVER EACH 3 JOINT SEGMENT

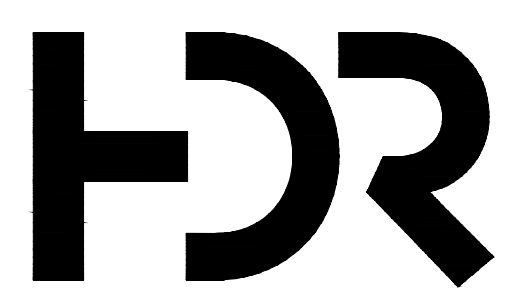
**LEGEND**

- PROPOSED PIPELINE
- PROPOSED TEMPORARY WORKSPACE
- PIPELINE
- ELECTRIC
- WATER LINE
- ROAD ROW
- PROPERTY LINE
- FIBER LINE
- SECTION LINE
- QUARTER SECTION LINE
- EDGE OF GRAVEL
- ACCESS ROUTE
- LANDSIDE TOE OF FUTURE LEVEE
- TREE LINE
- BOLLARD
- SIGN
- PIPE PIPELINE MARKER
- PROPOSED HDD ENTRY/EXIT POINT
- GEOTECHNICAL BORE
- COHESIVE SOILS, UCS, TONS/FT<sup>3</sup>
- N VALUES
- ROCK CORE RECOVERY, %
- MATERIAL GRAPHIC
- GRAVEL CONTENT
- UCS, PSF
- ROCK CORE RQD, %
- POSSIBLE ARTESIAN AQUIFER

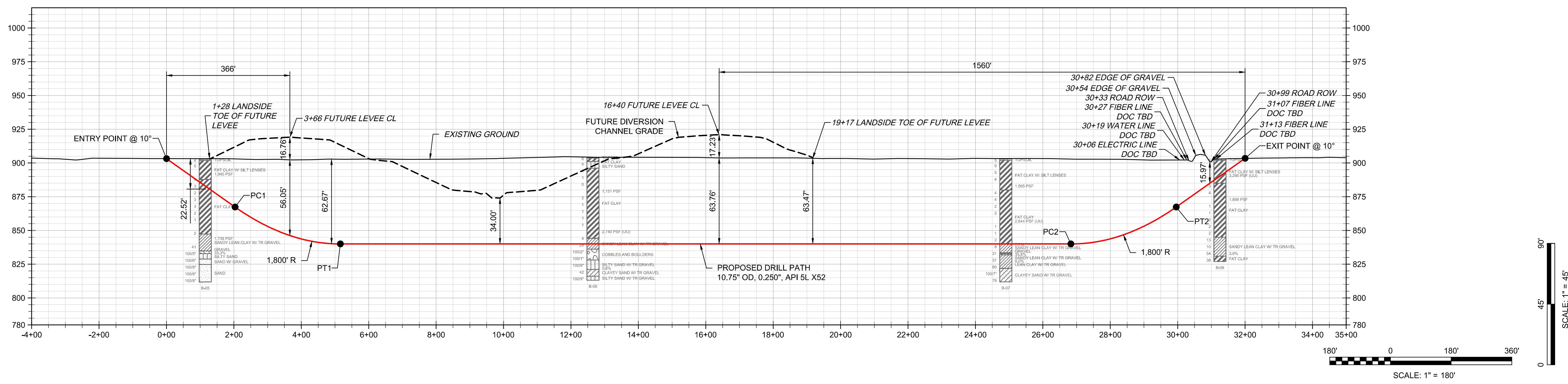
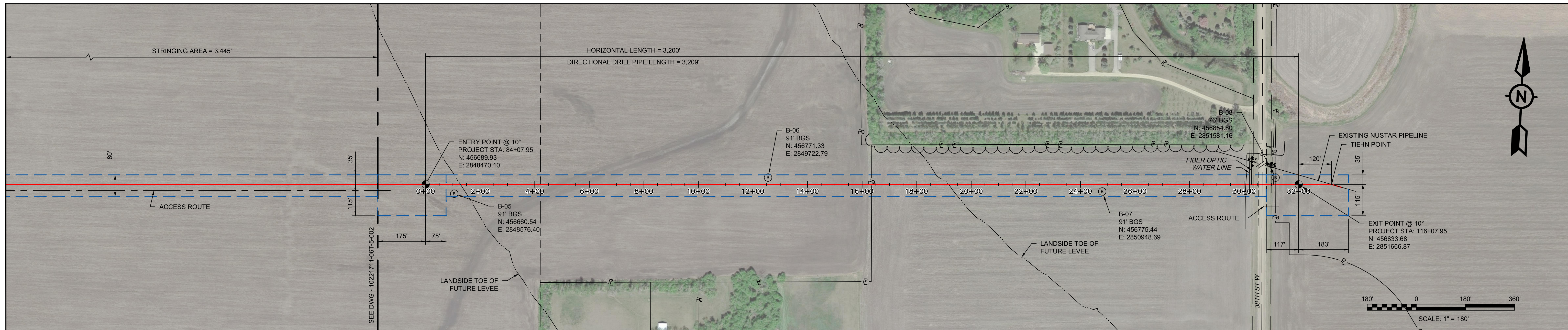
**NOTE:** (UJ) INDICATES UCS VALUE WAS CALCULATED FROM TRIAXIAL TESTING

**NOT FOR CONSTRUCTION**

REVISION			APPROVAL			PROJECT INFORMATION		DRAWING INFORMATION	
REV	DATE	DESCRIPTION	CAD	CHK	APP	NUSTAR ENERGY, L.P. 10-INCH PIPELINE RELOCATION CASS COUNTY, NORTH DAKOTA		10-INCH DIAMETER HORIZONTAL DIRECTIONAL DRILL DRAIN 14 INLET CROSSING PLAN AND PROFILE	
1	08/28/20	ISSUED FOR PERMIT	TSV	MAH	RJS	COORDINATE SYSTEM	NAD83 NORTH DAKOTA SOUTH US FEET	LOCATION	CASS COUNTY, NORTH DAKOTA
						VERTICAL DATUM	NAVD88	SCALE	SHEET 1 OF 1
						TOPOGRAPHIC DATA	EFN, INC	NOTED	10221711-01T-5-001
						AERIAL IMAGERY	GOOGLE EARTH		
						SURVEY COMPANY	EFN, INC		



SIZE - ANSIC (34x22)



DIRECTIONAL DRILL DATA		
DESCRIPTION	STATION (ft)	ELEVATION (ft)
ENTRY POINT @ 10°	0+00.00	903.21
PC 1 (1,800' R)	2+03.38	867.35
PT 1	5+15.94	840.00
PC 2 (1,800' R)	26+83.11	840.00
PT 2	29+95.68	867.35
EXIT POINT @ 10°	32+00.00	903.37
HORIZONTAL DISTANCE (ft) = 3,200.00		
DIRECTIONAL DRILL PIPE LENGTH (ft) = 3,209.48		

**GENERAL NOTES**

- DRILL PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO THE CONTROL POSITION FOR THE CROSSING.
- ALL COMPANY SPECIFICATIONS, PERMIT REQUIREMENTS AND CONTRACT DOCUMENTS SHALL BE ADHERED TO BY CONTRACTOR.
- CONTRACTOR SHALL PLACE ONE CALL/811 NOTIFICATIONS AND ABIDE BY STATE REGULATIONS BEFORE DRILLING COMMENCES.
- PRESENCE, LOCATION, AND ELEVATIONS (POTHOLE IF NEEDED) OF ALL UTILITIES/FACILITIES TO BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION AND CLEARLY MARKED AND EXPOSED (IF NECESSARY).
- DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES SHALL BE MODIFIED TO PREVENT DAMAGE TO UNDERGROUND FACILITIES.
- CONTRACTOR SHALL MONITOR TRENCHLESS OPERATIONS FOR AREA IMPACTS SUCH AS GROUND DISTURBANCE AND INADVERTENT RETURNS.
- PILOT HOLE TOLERANCES AND MINIMUM THREE JOINT RADIUS SHALL BE MAINTAINED DURING PILOT HOLE OPERATIONS. TOLERANCES AND MINIMUM RADIUS SHALL BE REVIEWED BY COMPANY FOR APPROVAL.
- CONTRACTOR MUST DRILL THE PILOT HOLE FROM WEST TO EAST, AND MOVE THE DRILL RIG TO THE EXIT SIDE LOCATION AFTER PILOT HOLE OPERATIONS, AND PRIOR TO PULLBACK. CONTRACTOR ALSO HAS THE OPTION TO USE DUEL RIGS.
- GEOTECHNICAL DATA AND INFORMATION IS PRESENTED FOR REFERENCE ONLY. REVIEW THE ASSOCIATED GEOTECHNICAL REPORT FOR ALL INTERPRETATIONS AND DETERMINATIONS REGARDING SUBSURFACE CONDITIONS.
- CONTRACTOR TO CLOSE 166TH AVE DURING PULLBACK TO ALLOW FOR ONE CONTINUOUS STRING OF PIPE TO BE UTILIZED (NO MID-PULLBACK WELDS ALLOWED).
- THE MINIMUM EXTENT OF THE GROUTING WILL BE TO COMPLETELY SEAL AND FILL THE UPPER 50 LINEAR FEET OF HOLE (IMMEDIATELY BELOW TIE-IN ELEVATION) ENTIRELY WITH GROUT AND A MINIMUM OF THE TOP 5 VERTICAL FEET FILLED WITH BACKFILL MATERIAL TO MATCH SURROUNDING SOIL CONDITIONS.

**MATERIAL SPECIFICATIONS AND TOLERANCES**

ITEM	SPECIFICATIONS
PRODUCT PIPE	10.75" OD, 0.250", API 5L X52
EXTERNAL COATING	14-16 MILS FBE, 40-60 MILS ARO
OPERATING CONDITIONS	MAOP = 1480 PSIG ASSUMED MAXIMUM OPERATING TEMP = 80°F
ITEM	TOLERANCE
PILOT HOLE ENTRY ANGLE	INCREASE ANGLE UP TO 1° (STEEPER), NO DECREASE IN ANGLE ALLOWED.
PILOT HOLE ENTRY LOCATION	AS PER COORDINATES PROVIDED BY COMPANY. NO CHANGES WITHOUT COMPANY APPROVAL.
PILOT HOLE EXIT ANGLE	INCREASE ANGLE UP TO 1° (STEEPER) OR DECREASE UP TO 2° (FLATTER).
PILOT HOLE EXIT LOCATION	UP TO 20 FEET BEYOND OR 10 FEET SHORT OF THE EXIT STAKE. BETWEEN 5 FEET LEFT AND 5 FEET RIGHT OF CENTERLINE.
PILOT HOLE DEPTH	UP TO 2 FEET ABOVE THE DESIGN DRILL PROFILE OR 4 FEET BELOW THE DESIGN DRILL PROFILE.
PILOT HOLE ALIGNMENT	SHALL REMAIN WITHIN 5 FEET LEFT OR RIGHT OF THE HDD CENTERLINE.
MINIMUM RADIUS OF CURVATURE	MINIMUM COMBINED (HORIZONTAL AND VERTICAL) RADIUS OF CURVATURE = 1,300' OVER EACH 3 JOINT SEGMENT

**LEGEND**

— PROPOSED PIPELINE  
--- PROPOSED TEMPORARY WORKSPACE  
--- PIPELINE  
--- ELECTRIC  
--- WATER LINE  
--- ROAD ROW  
--- PROPERTY LINE  
--- FIBER LINE  
--- SECTION LINE  
--- QUARTER SECTION LINE  
--- EDGE OF GRAVEL  
--- ACCESS ROUTE  
--- LANDSIDE TOE OF FUTURE LEVEE  
--- TREE LINE  
● BOLLARD  
+ SIGN  
- PIPE PIPELINE MARKER

● PROPOSED HDD ENTRY/EXIT POINT  
⊕ GEOTECHNICAL BORE

COHESIVE SOILS, UCS, TONS/FT<sup>3</sup>  
 N VALUES  
 ROCK CORE RECOVERY, %  
 MATERIAL GRAPHIC CONTENT  
 GRAVEL  
 UCS, PSF  
 MATERIAL DESCRIPTION (OPTION)  
 ROCK CORE RQD, %  
 POSSIBLE ARTESIAN AQUIFER

NOTE: (UJ) INDICATES UCS VALUE WAS CALCULATED FROM TRIAXIAL TESTING

**NOT FOR CONSTRUCTION**

REVISION			APPROVAL		
REV	DATE	DESCRIPTION	CAD	CHK	APP
1	08/28/20	ISSUED FOR PERMIT	TSV	MAH	RJS

PROJECT INFORMATION

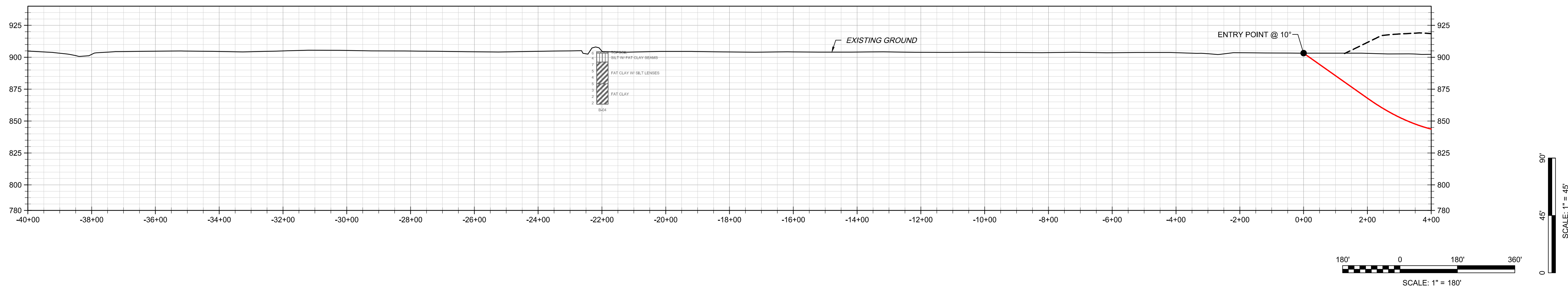
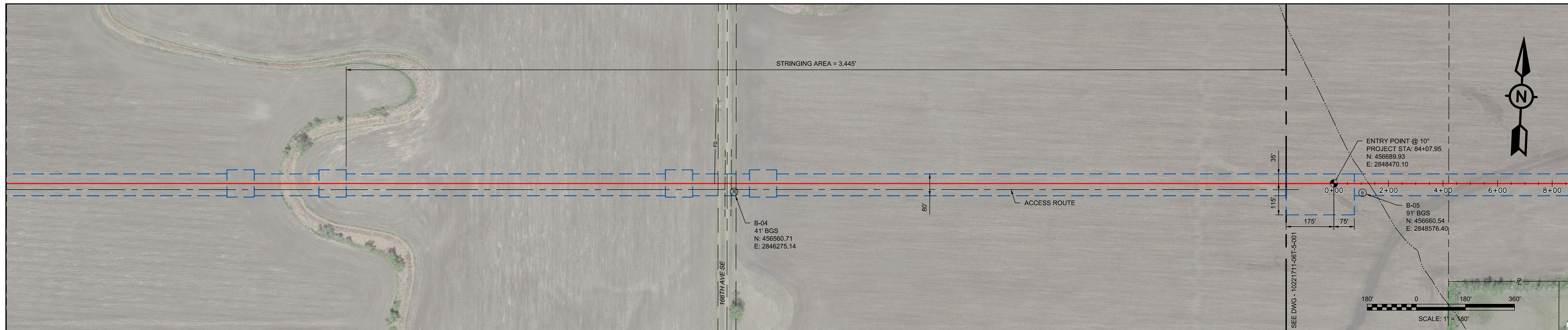
NUSTAR ENERGY, L.P.  
10-INCH PIPELINE RELOCATION  
CASS COUNTY, NORTH DAKOTA

DRAWING INFORMATION

10-INCH DIAMETER HORIZONTAL DIRECTIONAL DRILL  
DIVERSION CHANNEL CROSSING  
PLAN AND PROFILE

COORDINATE SYSTEM	NAD83 NORTH DAKOTA SOUTH US FEET	LOCATION	CASS COUNTY, NORTH DAKOTA	
VERTICAL DATUM	NAVD88	SCALE	NOTED	
TOPOGRAPHIC DATA	EFN, INC	SHEET	1 OF 2	
AERIAL IMAGERY	GOOGLE EARTH	PROJECT NO.	10221711-06T-5-001	
SURVEY COMPANY	EFN, INC	DATE	08/28/20	

SIZE - ANSI D (34x22)



**LEGEND**

	PROPOSED PIPELINE		PROPOSED HDD ENTRY/EXIT POINT
	PROPOSED TEMPORARY WORKSPACE		GEOTECHNICAL BORE
	PIPELINE		
	ELECTRIC		
	WATER LINE		
	ROAD ROW		
	PROPERTY LINE		
	FIBER LINE		
	SECTION LINE		
	QUARTER SECTION LINE		
	EDGE OF GRAVEL		
	ACCESS ROUTE		
	LANDSIDE TOE OF FUTURE LEVEE		
	TREE LINE		
	BOLLARD		
	SIGN		
	PIPELINE MARKER		

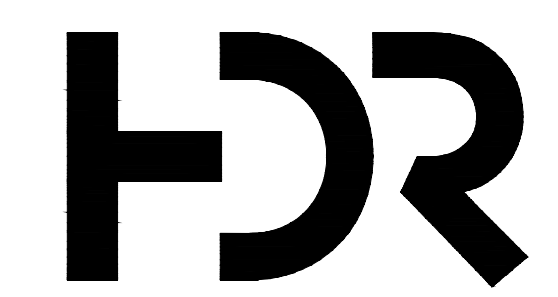
  

	COHESIVE SOILS, UCS, TONS/FT <sup>2</sup>		MATERIAL GRAPHIC
	N VALUES		GRAVEL CONTENT
	ROCK CORE RECOVERY, %		UCS, PSF
	ROCK CORE RQD, %		ROCK CORE RQD, %

**NOTE:**  
 (UJ) INDICATES UCS VALUE WAS CALCULATED FROM TRIAXIAL TESTING  
 POSSIBLE ARTESIAN AQUIFER

**NOT FOR CONSTRUCTION**

REVISION			APPROVAL		
REV	DATE	DESCRIPTION	CAD	CHK	APP
1	08/28/20	ISSUED FOR PERMIT	TSV	MAH	RJS



PROJECT INFORMATION	
NUSTAR ENERGY, L.P. 10-INCH PIPELINE RELOCATION CASS COUNTY, NORTH DAKOTA	
COORDINATE SYSTEM	NAD83 NORTH DAKOTA SOUTH US FEET
VERTICAL DATUM	NAVD88
TOPOGRAPHIC DATA	EFN, INC
AERIAL IMAGERY	GOOGLE EARTH
SURVEY COMPANY	EFN, INC

DRAWING INFORMATION		
10-INCH DIAMETER HORIZONTAL DIRECTIONAL DRILL DIVERSION CHANNEL CROSSING PLAN AND PROFILE		
LOCATION	CASS COUNTY, NORTH DAKOTA	
SCALE	SHEET	10221711-06T-5-002
NOTED	2 OF 2	

SIZE - ANSI D (34x22)