

Resource Report 8

Land Use, Recreation, and Aesthetics



Resource Report No. 8
Land Use, Recreation, and Aesthetics

**Ventura to Farmington A-Line Abandonment and Capacity Replacement Project and
Northern Lights 2027 Project**

FERC Docket No. CP26-___-000

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RESOURCE REPORT NO. 8 – LAND USE, RECREATION, AND AESTHETICS
SUMMARY OF FILING INFORMATION

MINIMUM REQUIREMENT	LOCATION ADDRESSED
Classify and quantify land use affected by: (§ 380.12(j)(1)) <ul style="list-style-type: none"> • Pipeline construction and permanent rights-of-way (§ 380.12(j)(1)); • Extra work/staging areas (§ 380.12(j)(1)); • Access roads (§ 380.12(j)(1)); • Pipe and contractor yards (§ 380.12(j)(1)); and • Aboveground facilities (§ 380.12(j)(1)). For aboveground facilities provide the acreage affected by construction and operation, acreage leased or purchased, and describe the use of the land not required for operation.	Section 8.1 and Tables 8.1-2, 8.1-6, Appendices 8A to 8D
Identify by milepost all locations where the pipeline right-of-way would at least partially coincide with existing right-of-way, where it would be adjacent to existing rights-of-way, and where it would be outside of existing right-of-way. (§ 380.12(j)(1)) <ul style="list-style-type: none"> • This may apply to the offshore as well. 	Section 8.1, tables 8.1-3 and 8.1-7
Provide detailed typical construction right-of-way cross-section diagrams showing information such as widths and relative locations of existing rights-of-way, new permanent right-of-way and temporary construction right-of-way. (§ 380.12(j)(1))	Figures 1-17 and 1-18, Resource Report 1
Summarize the total acreage of land affected by construction and operation of the project. (§ 380.12(j)(1)) <ul style="list-style-type: none"> • This applies to the offshore as well. 	Section 8.1 and Tables 8.1-2 and 8.1-6
Identify by milepost all planned residential or commercial/business development and the time frame for construction. (§ 380.12(j)(3)) <ul style="list-style-type: none"> • Identify all planned development crossed or within 0.25 mile of proposed facilities. 	Section 8.2
Identify by milepost special land uses (e.g., maple sugar stands, specialty crops, natural areas, national and state forests, conservation land, etc.). (§ 380.12(j)(4)) <ul style="list-style-type: none"> • This applies to the offshore as well, where it may include oyster and other shellfish beds, special anchoring or lightering areas, and shipping lanes. 	Section 8.3
Identify by beginning milepost and length of crossing all land administered by Federal, state, or local agencies, or private conservation organizations. (§ 380.12(j)(4)) <ul style="list-style-type: none"> • This applies to the offshore as well. 	Section 8.3
Identify by milepost all natural, recreational, or scenic areas and all registered natural landmarks crossed by the project. (§ 380.12(j) (4)&(6)) <ul style="list-style-type: none"> • This applies to the offshore as well. • Identify areas within 0.25 mile of any proposed facility. 	Not applicable
Identify all facilities that would be within designated coastal zone management areas. Provide a consistency determination or evidence that a request for a consistency determination has been filed with the appropriate state agency. (§ 380.12(j)(4) and (7))	Not applicable
Identify by milepost all residences and buildings that would be within 50 feet of the construction right-of-way or extra work area. (§ 380.12(j)(5))	Section 8.2 and Table 8.2-1
Identify all designated or proposed candidate National or State Wild and Scenic Rivers crossed by the project. (§ 380.12(j)(6))	Section 8.3.1
Describe any measures to visually screen aboveground facilities, such as compressor stations. (§ 380.12(j)(11))	Not applicable
Demonstrate that applications for rights-of-way or other proposed land use have been or soon will be filed with Federal land-managing agencies with jurisdiction over land that would be affected by the project. (§ 380.12(j)(12))	Not applicable

ADDITIONAL INFORMATION	
Identify all buildings within 50 feet of the construction right-of-way or extra work areas.	Section 8.2 and Table 8.2-1
Describe the management and use of all public lands that would be crossed.	Sections 8.3 and 8.5
Provide a list of landowners by milepost or tract number that corresponds to information on alignment sheets.	Appendix 1C, Resource Report 1 “CUI//PRIV – DO NOT RELEASE”
Provide a site-specific construction plan for residences within 25 feet of construction or as requested by Federal Energy Regulatory Commission staff.	Not applicable

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Abbreviations and Acronyms

A-line	Northern Natural Gas' 16-inch-diameter M500 A Mainline
D-line	Northern Natural Gas' 30-inch-diameter M500 D line
E-line	Northern Natural Gas' 30-inch-diameter M500 E line
ETWS	extra temporary workspace
FERC	Federal Energy Regulatory Commission
HDD	horizontal directional drill
MDNR	Minnesota Department of Natural Resources
MP	milepost
NL27 Project	Northern Lights 2027 Expansion Project
Northern	Northern Natural Gas
NRCS	Natural Resources Conservation Service
PAR	permanent access road
Plan	FERC's Upland Erosion Control, Revegetation, and Maintenance Plan
Procedures	FERC's Wetland and Waterbody Construction and Mitigation Procedures
Projects	Ventura to Farmington A-Line Abandonment and Capacity Replacement Project and Northern Lights 2027 Expansion Project
ROW	right of way
SHPO	State Historic Preservation Office
SPCC Plan	Spill Prevention, Control, and Countermeasure Plan
SWPPP	Stormwater Pollution Prevention Plan
TAR	temporary access road
TWS	temporary workspace
WMA	Wildlife Management Area
USDA-AMS	U.S. Department of Agriculture, Agricultural Marketing Service
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
V2F Project	Ventura to Farmington A-line Abandonment and Capacity Replacement Project

8.0 RESOURCE REPORT 8 – LAND USE, RECREATION, AND AESTHETICS

Northern’s application is composed of two discrete projects, the V2F Project and the NL27 Project (Projects). The two Projects will be built concurrently, and Northern has combined the two Projects into a single Section 7 application. Analysis and impacts are generally discussed separately for each Project throughout the application.

Resource Report 8 describes the potential Projects’ construction and operation impacts on existing and proposed land uses, as well as recreational and visual resources in the surrounding area. It summarizes the results of consultation with federal, state, municipal, and other local agencies, as appropriate. Resource Report 8 also discusses special construction techniques or other forms of mitigation that will be used to reduce impacts on land use, recreation and aesthetic resources during construction and operation of the proposed Project.

Northern owns and operates a natural gas transmission pipeline system, including pipeline and associated aboveground facilities in Minnesota and Iowa. Northern is filing an application with FERC pursuant to section 7 of the Natural Gas Act. The V2F Project involves isolation and abandonment in-place of approximately 105.76 miles of 16-inch-diameter pipeline on Northern’s M500 A and 25.35 miles of 16-inch-diameter M500 J pipeline systems (collectively referred to as the A-line) from Ventura, Iowa to Farmington, Minnesota. To replace the capacity, Northern will construct three new pipeline extensions consisting of approximately 17.88 miles of 36-inch or 30-inch-diameter pipelines and associated aboveground appurtenances in Freeborn, Steele and Dakota counties, Minnesota.

The NL27 Project consists of the installation of ten pipeline extensions totaling 28.43 miles, a compressor station uprate and associated aboveground appurtenances in Minnesota for firm transportation requirements associated with Northern’s customers. The NL27 Project is in Freeborn, Steele, Scott, Carver, Martin, Stearns, Jackson, Watonwan, Isanti, Morrison, and Washington counties, Minnesota.

Tables 8.0-1 and 8.0-2 provide a list of both Projects’ components along with their associated Minnesota or Iowa counties.

Table 8.0-1 V2F Project Facilities and Locations

Component	Project Facility	Facility Description	County, State
Lake Mills M500 E-line	8.29-mile pipeline	36-inch-diameter extension	Freeborn, MN
	Lake Mills compressor station	Temporary compression site	Worth, IA
Albert Lea M500 E-line	2.09-mile pipeline	36-inch-diameter extension	Steele, MN
	Owatonna compressor station	Temporary compression site	Steele, MN
Faribault M500 D-line	7.50-mile pipeline	30-inch-diameter extension	Dakota, MN
	Northfield #1	Temporary compression site	Dakota, MN
A-line Abandonment	Ventura compressor station	Pipeline disconnect site	Hancock, IA
	Farmington compressor station	Pipeline disconnect site	Dakota, MN

Component	Project Facility	Facility Description	County, State
	La Crosse BL MNB73201 launcher /ABA05	Temporary compression site	Freeborn, MN

Table 8.0-2 NL27 Project Facilities and Locations

Component	Project Facility	Facility Description	County, State
Lake Mills M500 E-line	2.32-mile pipeline	36-inch-diameter extension	Freeborn, MN
Albert Lea M500 E-line	3.42-mile pipeline	36-inch-diameter extension	Steele, MN
Willmar 3rd Branch Line Upstream	1.78-mile pipeline	24-inch-diameter extension	Scott, MN
Willmar 3rd Branch Line Downstream	4.78-mile pipeline	24-inch-diameter extension	Carver, MN
Welcome 2nd Line	1.24-mile pipeline	16-inch-diameter extension	Martin, MN
Paynesville 2nd Branch Line	2.45-mile pipeline	4-inch-diameter extension	Stearns, MN
Worthington 2nd Branch Line	2.17-mile pipeline	8-inch-diameter extension	Jackson, MN
Springfield 2nd Branch Line	7.40-mile pipeline	8-inch-diameter extension	Watonwan, MN
Minnesota Interconnect 2nd Branch Line	1.59-mile pipeline	12-inch-diameter extension	Isanti, MN
Alexandria 2nd Branch Line	1.28-mile pipeline	8-inch-diameter extension	Morrison, MN
Aboveground Facilities			
Hugo Compressor Station Uprate	Hugo compressor station	Turbine switch for newer model with increase of 700 horsepower	Washington, MN

8.1 LAND USE

For both Projects, land uses are characterized into seven classifications based on vegetative cover or predominant land use within the Project areas: agricultural, forest/woodland, wetlands, open land, residential, industrial/commercial, and open water. Land use classifications were assigned using field observations made in 2025 and interpretation of 2024 aerial imagery. Land use categories are defined below.

- Agricultural – active farmed cropland and specialty crop production
- Forested/woodland – upland mixed hardwood forests, mixed evergreen and hardwood forests
- Wetlands – emergent wetlands and scrub-shrub wetlands
- Open land – upland land including non-forested rangeland, scrub-shrub land, non-agricultural fields, prairie, and open land in the early stages of succession
- Residential – rural and developed residential property

- Industrial/commercial – manufacturing or industrial plants, mines, commercial facilities, roads, railroads, and electric or gas utility stations
- Open water – lakes, ponds and water crossings greater than 100 feet

For the V2F Project, the total acreage required for temporary construction activities is approximately 421.20 acres. Total permanent operational acreage for the pipelines combined with the aboveground appurtenant facilities is 92.35 acres. The land use type that will be predominantly disturbed during construction and operation of the V2F Project is classified as agricultural land use category.

For the NL27 Project, the total acreage required for temporary construction activities is approximately 567.36 acres. Total permanent operational acreage for the pipelines combined with the aboveground appurtenant facility is 162.01 acres. The land use type that will be predominantly disturbed during construction and operation of the NL27 Project is classified as agricultural land use.

8.1.1 V2F Project Pipeline Facilities

The V2F Project will consist of the following new and existing pipeline facilities:

- Lake Mills M500 E-line and a new block valve in Freeborn County, Minnesota
- Albert Lea M500 E-line in Steele County, Minnesota
- Faribault M500 D-line and a new block valve in Dakota County, Minnesota

As part of the V2F Project, Northern will replace approximately 0.32 mile of 24-inch-diameter with 30-inch-diameter pipeline on the Faribault M500 D-line and remove a three tie-over valve settings.

Table 8.1-1 lists miles and percent crossed by the proposed V2F pipelines for each land use category impacted. The disconnect sites and temporary compression sites are not included as they have no proposed pipeline. Table 8.1-2 is a summary of land use acreages affected by construction and operation of the proposed pipelines and appurtenances by land use category.

Table 8.1-1 Land Crossed by the V2F Project Pipelines

Project Component	Agriculture		Forest/Woodland		Industrial/Commercial		Open Land		Wetlands		Total Mile(s)	Total %
	Mile(s)	%	Mile(s)	%	Mile(s)	%	Mile(s)	%	Mile(s)	%		
Lake Mills M500 E-line	7.45	89.9	0.06	0.7	0.11	1.3	0.47	5.7	0.20	2.4	8.29	46.4
Albert Lea M500 E-line	1.65	78.9	0.03	1.4	0.01	0.5	0.15	7.2	0.25	12.0	2.09	11.7
Faribault M500 D-line	5.61	74.8	0.27	3.6	0.09	1.2	0.81	10.8	0.72	9.6	7.50	41.9
Totals	14.71	82.3	0.36	2.0	0.21	1.2	1.43	8.0	1.17	6.5	17.88	100.0

Table 8.1-2 Acreage Affected by Construction and Operation of the V2F Project

Facility	Agricultural		Forest/Woodland		Industrial/ Commercial		Open Land		Open Water		Residential		Wetlands		Total	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
Three Pipeline Extensions																
Lake Mills M500 E-line																
Pipeline ROW ^{1,2}	85.49	42.63	0.31	0.14	0.43	0.06	2.19	0.59	0.00	0.00	0.00	0.00	1.30	0.94	89.72	44.36
<i>Within Existing Easement</i>	19.27	13.53	0.08	0.04	0.03	0.02	0.20	0.15	0.00	0.00	0.00	0.00	0.28	0.19	19.86	13.93
<i>Outside of Existing Easement</i>	66.22	29.10	0.23	0.10	0.40	0.04	1.99	0.44	0.00	0.00	0.00	0.00	1.02	0.75	69.86	30.43
Extra Temporary Workspace (ETWS)	46.55	0.00	0.27	0.00	0.34	0.00	1.54	0.00	0.00	0.00	0.00	0.00	0.04	0.00	48.74	0.00
<i>Within Existing Easement</i>	8.79	0.00	0.03	0.00	0.04	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.98	0.00
<i>Outside of Existing Easement</i>	37.76	0.00	0.24	0.00	0.30	0.00	1.42	0.00	0.00	0.00	0.00	0.00	0.04	0.00	39.76	0.00
Staging Area	29.59	0.00	0.02	0.00	0.11	0.00	1.32	0.00	0.00	0.00	0.00	0.00	0.03	0.00	31.07	0.00
<i>Within Existing Easement</i>	0.16	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.00
<i>Outside of Existing Easement</i>	29.43	0.00	0.02	0.00	0.11	0.00	1.31	0.00	0.00	0.00	0.00	0.00	0.03	0.00	30.90	0.00
Temporary Access Roads	6.75	0.00	0.09	0.00	0.78	0.00	2.39	0.00	0.00	0.00	0.52	0.00	0.00	0.00	10.53	0.00
<i>Within Existing Easement</i>	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
<i>Outside of Existing Easement</i>	6.71	0.00	0.09	0.00	0.78	0.00	2.39	0.00	0.00	0.00	0.52	0.00	0.00	0.00	10.49	0.00
Existing Aboveground Appurtenance ⁴	0.15	0.00	0.00	0.00	0.64	0.64	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.64
<i>Within Existing Easement</i>	0.15	0.00	0.00	0.00	0.64	0.64	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.64
<i>Outside of Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Subtotal	168.53	42.63	0.69	0.14	2.30	0.70	7.45	0.59	0.00	0.00	0.52	0.00	1.37	0.94	180.86	45.00
Albert Lea M500 E-line																
Pipeline ROW ^{1,2}	19.36	9.76	0.22	0.15	0.01	0.00	0.32	0.12	0.00	0.00	0.00	0.00	0.20	0.01	20.11	10.04
<i>Within Existing Easement</i>	6.58	4.68	0.19	0.12	0.00	0.00	0.08	0.06	0.00	0.00	0.00	0.00	0.00	0.00	6.85	4.86
<i>Outside of Existing Easement</i>	12.78	5.08	0.03	0.03	0.01	0.00	0.24	0.06	0.00	0.00	0.00	0.00	0.20	0.01	13.26	5.18
ETWS	5.65	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.80	0.00
<i>Within Existing Easement</i>	1.03	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.05	0.00
<i>Outside of Existing Easement</i>	4.62	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.75	0.00
Staging Area ³	11.67	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.93	0.00
<i>Outside of Existing Easement</i>	11.67	0.00	0.00	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.93	0.00
Temporary Access Roads	5.30	0.00	0.00	0.00	0.20	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.04	0.00	5.65	0.00
<i>Within Existing Easement</i>	0.04	0.00	0.00	0.00	0.01	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00
<i>Outside of Existing Easement</i>	5.26	0.00	0.00	0.00	0.19	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.04	0.00	5.58	0.00
Subtotal	41.98	9.76	0.22	0.15	0.21	0.00	0.84	0.12	0.00	0.00	0.00	0.00	0.24	0.01	43.49	10.04
Faribault M500 D-line																
Pipeline ROW ^{1,2}	63.01	31.28	1.39	0.62	0.47	0.05	8.15	4.02	0.00	0.00	0.00	0.00	1.88	0.98	74.90	36.95
<i>Within Existing Easement</i>	15.77	11.31	0.31	0.24	0.02	0.01	1.54	1.04	0.00	0.00	0.00	0.00	0.54	0.39	18.18	12.99
<i>Outside of Existing Easement</i>	47.24	19.97	1.08	0.38	0.45	0.04	6.61	2.98	0.00	0.00	0.00	0.00	1.34	0.59	56.72	23.96

Facility	Agricultural		Forest/Woodland		Industrial/ Commercial		Open Land		Open Water		Residential		Wetlands		Total	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
ETWS	39.76	0.00	0.25	0.00	0.11	0.00	5.90	0.00	0.00	0.00	0.07	0.00	0.43	0.00	46.52	0.00
<i>Within Existing Easement</i>	<i>12.53</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.01</i>	<i>0.00</i>	<i>1.15</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.05</i>	<i>0.00</i>	<i>0.27</i>	<i>0.00</i>	<i>14.01</i>	<i>0.00</i>
<i>Outside of Existing Easement</i>	<i>27.23</i>	<i>0.00</i>	<i>0.25</i>	<i>0.00</i>	<i>0.10</i>	<i>0.00</i>	<i>4.75</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.02</i>	<i>0.00</i>	<i>0.16</i>	<i>0.00</i>	<i>32.51</i>	<i>0.00</i>
Staging Area	44.32	0.00	0.00	0.00	0.23	0.00	2.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.60	0.00
<i>Within Existing Easement</i>	<i>3.11</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.08</i>	<i>0.00</i>	<i>3.19</i>	<i>0.00</i>						
<i>Outside of Existing Easement</i>	<i>41.21</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.23</i>	<i>0.00</i>	<i>1.97</i>	<i>0.00</i>	<i>43.41</i>	<i>0.00</i>						
Temporary Access Roads	1.81	0.00	0.01	0.00	0.31	0.00	1.38	0.00	0.00	0.00	0.00	0.00	0.01	0.00	3.52	0.00
<i>Within Existing Easement</i>	<i>0.03</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.04</i>	<i>0.00</i>	<i>0.03</i>	<i>0.00</i>	<i>0.10</i>	<i>0.00</i>						
<i>Outside of Existing Easement</i>	<i>1.78</i>	<i>0.00</i>	<i>0.01</i>	<i>0.00</i>	<i>0.27</i>	<i>0.00</i>	<i>1.35</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.01</i>	<i>0.00</i>	<i>3.42</i>	<i>0.00</i>
Existing Aboveground Appurtenances ⁴	0.01	0.00	0.00	0.00	0.36	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.36
<i>Within Existing Easement</i>	<i>0.01</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.36</i>	<i>0.36</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.37</i>	<i>0.36</i>
<i>Outside of Existing Easement</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>
Subtotal	148.91	31.28	1.65	0.62	1.48	0.41	17.48	4.02	0.00	0.00	0.07	0.00	2.32	0.98	171.91	37.31
Two Disconnect Sites																
Ventura Compressor Station																
Disconnect Workspace ³ (ETWS/TAR)	0.76	0.00	0.00	0.00	3.94	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	4.73	0.00
Farmington Compressor Station																
Disconnect Workspace ³ (ETWS/TAR)	0.00	0.00	0.62	0.00	3.97	0.00	0.68	0.00	0.01	0.00	0.00	0.00	0.19	0.00	5.47	0.00
Subtotal	0.76	0.00	0.62	0.00	7.91	0.00	0.70	0.00	0.01	0.00	0.00	0.00	0.20	0.00	10.20	0.00
Temporary Compression Sites																
La Crosse BL MNB73201 Launcher/ABA 05																
Temporary Compression Workspace ³ (ETWS)	1.30	0.00	0.00	0.00	0.38	0.00	0.44	0.00	0.00	0.00	0.00	0.00	0.07	0.00	2.19	0.00
Lake Mills Compressor Station																
Temporary Compression Workspace ³ (ETWS)	0.00	0.00	0.00	0.00	4.97	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.29	0.00
Owatonna Compressor Station																
Temporary Compression Workspace ³ (ETWS/TAR)	0.00	0.00	0.00	0.00	4.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.33	0.00
Northfield MN #1																
Temporary Compression Workspace ³ (ETWS/TAR)	2.30	0.00	0.00	0.00	0.18	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.14	0.00	2.93	0.00
Subtotal	3.60	0.00	0.00	0.00	9.86	0.00	1.07	0.00	0.00	0.00	0.00	0.00	0.21	0.00	14.74	0.00
Project Within Existing Easement	<i>70.01</i>	<i>29.52</i>	<i>1.23</i>	<i>0.40</i>	<i>18.92</i>	<i>1.03</i>	<i>3.84</i>	<i>1.25</i>	<i>0.01</i>	<i>0.00</i>	<i>0.05</i>	<i>0.00</i>	<i>1.50</i>	<i>0.58</i>	<i>90.96</i>	<i>32.78</i>
Project Outside of Existing Easement	<i>293.77</i>	<i>54.15</i>	<i>1.95</i>	<i>0.51</i>	<i>2.84</i>	<i>0.08</i>	<i>23.71</i>	<i>3.48</i>	<i>0.00</i>	<i>0.00</i>	<i>0.54</i>	<i>0.00</i>	<i>2.84</i>	<i>1.35</i>	<i>330.24</i>	<i>59.57</i>
V2F PROJECT TOTAL	363.78	83.67	3.18	0.91	21.76	1.11	27.54	4.73	0.01	0.00	0.59	0.00	4.34	1.93	421.20	92.35

¹ Construction ROW is based on a 60- to 100-foot-wide temporary ROW in uplands and wetlands. Operational ROW is based on 50-foot-wide corridor in uplands and 10-foot-wide corridor in wetlands. Differing ROW widths are shown on the construction alignment sheets.

² Northern also included impacts for a single 6-foot-wide or two 3-foot-wide parallel travel lanes between HDD entry and exit points in the pipeline ROW calculations.

³ Outside existing easement

⁴ The existing aboveground appurtenance(s) will be removed.

V2F Land Use Summary

Construction and operation of the V2F Project will impact agricultural, forested/woodland (upland), industrial/commercial, open land, open water, residential, and wetland land use types. Total acreage for temporary construction activities of V2F Project components is approximately 421.20 acres. Approximately 78.4% (330.24 acres) of the construction footprint for the Project will require new TWS permits while approximately 21.6% (90.96 acres) of the construction footprint will overlap with existing pipeline ROW or existing Northern facilities. Total permanent operational acreage of the V2F Project components is approximately 92.35 acres. Approximately 64.5% (59.57 acres) of the operational footprint for the Project will occur outside of existing permanent ROW while 35.5% (32.78 acres) will overlap with existing operational footprints of other Northern facilities.

Agricultural Land

Agriculture is the dominant land use impacted by the V2F Project. Approximately 363.78 acres of agricultural land will be impacted by construction of the proposed Project, including TWS, ETWS, staging areas, access roads, and aboveground appurtenant facilities. Approximately 83.67 acres of agricultural land will be affected by operation and maintenance of the Project facilities.

The agricultural land crossed by the V2F Project is regularly cultivated and used to grow row crops, including corn and soybeans along with limited pasture, wheat and alfalfa fields. Temporary impacts on agricultural land are expected along the proposed construction corridor due to grading and trenching activities during pipeline installation. All construction workspaces with the exception of the aboveground facilities will be allowed to revert to agricultural land use after completion of construction.

The primary impacts on agricultural land during construction will include temporary reductions in agricultural production in areas of cultivated cropland and potentially reduced yields of future crops. Agricultural land in the construction area generally will be taken out of production for one growing season. Depending on construction progress and the specific crops being grown, potential impacts on cultivated cropland will occur only if construction occurs on those lands during the growing season, as defined by the NRCS Water and Climate Center Wetlands Determination Table.

Agricultural lands will be restored to their former use following construction; therefore, the pipelines' construction and operation will not result in a long-term impact on farmland. Approximately 0.16 acre of land will be returned to farmland with the removal of the Lake Mills tie-over valve setting and 0.01 acre of land on the Faribault tie-over valve setting. Impacts on prime farmland are discussed in more detail in Resource Report 7. Landowners will be compensated for crop loss resulting from construction, and crops may be planted on top of the new pipeline once land utilized for construction is restored. To avoid or minimize soil impacts, Northern will implement the erosion and sedimentation control and restoration procedures described in the Plan and its Procedures and the V2F Project SWPPPs. The procedures employed ensure that soil productivity is not diminished in agricultural lands by using topsoil segregation measures and alleviating compaction.

Specialty crops include fruits, vegetables, tree nuts, dried fruits, and nursery, floriculture, and horticulture crops (USDA-AMS 2025a). Based on a review of the Organic Integrity Database, aerial photography, field surveys, and Northern's landowner outreach efforts, no specialty crops or organic farms have been identified within the Project area (USDA-AMS 2025b). Northern will continue to work with individual landowners through the easement process to identify any specialty crops that may be impacted by the V2F Project. If any organic farms or specialty crops are identified, Northern

will work with landowners to determine measures to avoid and minimize impacts on these resources. Northern has confirmed that the land from MP 101.62 to MP 102.18 is currently enrolled in the Conservation Reserve Program. Northern is obtaining additional information from the landowner regarding this program. No other specialty crops, including nurseries, vineyards, orchards, citrus groves, dairies, aquaculture, or other tree farms were identified near V2F Project facilities.

Agricultural drain tile systems are used to improve drainage in agricultural areas where the water table is high and/or soil characteristics inhibit proper drainage for crop production. Drain tile systems in agricultural areas are designed to remove water from the top 3 to 4 feet of soil to improve soil productivity and crop yield. Construction activities such as trenching and heavy equipment traffic can damage existing drain tile systems. Damage to existing drain tile systems, if not repaired, can result in lower soil productivity and crop yields. Based on available online mapping, a county drainage district or private drain tile system may exist within the excavation depth of the Lake Mills M500 E-line between MP 40.70 and 40.95 (see Figure 8-1) Also depicted in Figure 8-1 are drain tile locations maintained on each county's GIS portal. Northern will confirm these locations during further landowner coordination. Four county drainage ditches will be crossed via HDD on the Lake Mills M500 E-line. As part of Northern's landowner outreach efforts, Northern will be collecting more detailed information for planning construction and restoration.

If drain tiles are encountered, Northern will communicate with landowners, perform preliminary assessments to identify existing drain tiles, repair damaged drain tiles, and monitor the Project area following the completion of construction. For drainage systems, Project-specific impacts on and proposed mitigation measures related to include, but are not limited to:

- Contacting affected landowners in advance of construction activities to identify known existing and planned drainage systems traversed by the proposed Project
- Providing locational information of any drain tiles discovered in preconstruction surveys or planning onto property maps to landowners requesting them
- Repairing drain tile damages that result from construction-related activities so that they are at least equivalent to their preconstruction condition, using materials comparable to those currently in place
- After the replacement of topsoil in the ROW, monitoring drainage systems repaired and replaced within the ROW until restoration is considered successful, to assess any drain tile settling, crop production, and drainage issues

Forest/Woodland Land

Approximately 3.18 acres of forested land will be impacted by construction of the proposed V2F Project, including TWS, ETWS, staging areas, and access roads. The forested land vegetation consists mostly of bur oak, red oak, green ash, American elm, quaking aspen, eastern cottonwood, black walnut, silver maple, box elder, and butternut. Trees will be cleared within the construction footprint to provide a safe work area; however, the woody vegetation will be allowed to regrow in areas only used as temporary workspace once construction is completed. Northern plans to complete tree clearing on the V2F pipeline extensions in early 2027 to minimize impacts on proposed, threatened, and endangered species.

Approximately 0.03 acre of forested land on the Lake Mills M500 E-line and 0.12 acre of forested land on the Faribault D-line will be crossed via HDD travel lanes that will be utilized by only foot traffic during HDD installation. There will be no ground disturbance and only minor hand-removal

of vegetation in the travel lanes. Approximately 0.62 acre of forested land also will not be cleared inside the ETWS at the Farmington compressor station. A total of 0.91 acre of forested/woodland land is shown in the operational footprint of the Project and will be subject to routine maintenance with the exception of HDD travel lanes.

Industrial/Commercial

Approximately 21.76 acres of industrial/commercial land will be impacted by construction of the proposed V2F Project, including TWS, ETWS, staging areas, access roads, and aboveground appurtenant facilities. Additionally, ETWS at the disconnect and temporary compression sites is primarily located inside existing Northern facilities and is therefore classified as industrial/commercial land. Temporary impacts on industrial/commercial land are expected along the proposed construction corridor due to grading and trenching activities during pipeline installation. The temporary construction corridor and ETWS will be allowed to revert to industrial/commercial land use after completion of construction.

Approximately 1.11 acres of industrial/commercial land will be affected by operation and maintenance of the V2F Project facilities. Where vegetation is present, dominant plant species include ragweed, smooth brome, yellow foxtail, common dandelion, and reed canary grass.

Open Land

Approximately 27.54 acres of open land will be impacted by construction of the proposed V2F Project, including TWS, ETWS, staging areas, access roads, and aboveground appurtenant facilities. Temporary impacts on open land are expected along the proposed construction corridor due to grading and trenching activities during pipeline installation. The temporary construction corridor and ETWS will be allowed to revert to open land use after completion of construction.

Approximately 4.73 acres of open land will be affected by operation and maintenance of the Project facilities. The open land consists of fallow land, or former cropland and/or other disturbed areas. Dominant plant species observed in open land include Kentucky bluegrass, buckwheat, reed canary grass, wild parsnip, alfalfa, giant ragweed, smooth brome, orchard grass, yellow foxtail, big bluestem, and red clover. In these open upland areas, routine vegetation maintenance will be conducted on a 50-foot-wide strip centered over the pipeline with a frequency of not more than once every three years. In addition, a 10-foot-wide strip over the pipeline may be maintained in an herbaceous state by mowing, cutting and trimming on an annual basis.

Northern has confirmed that the land on the Faribault M500 D-line between MP 101.62 to MP 102.18 is currently enrolled in the Conservation Reserve Program. The dominant land cover on the CRP land consisted of big bluestem and Indian grass. Northern will continue to work with landowners to determine restoration efforts required for these areas.

Open Water

No open water will be impacted by construction or operation of the V2F Project. Approximately 0.01 acre of open water is located within ETWS at the Farmington compressor station for the A-line disconnect. The open water area consists of a newly constructed stormwater pond and will not be avoided by the V2F Project.

Open water is discussed in further detail within Resource Report 2, Section 2.2. Methods outlined in the Plan and Northern’s Procedures will be implemented to minimize impacts on the open water during construction.

Residential

Approximately 0.59 acre of residential land will be impacted by construction of the proposed V2F Project, including ETWS and TARs. Residential land will not be affected by operation and maintenance of the V2F Project. The residential land that will be impacted by the V2F Project consists of privately owned and maintained yards and lawns that are dominated by Kentucky blue grass, smooth brome and orchard grass. The temporary construction corridor and ETWS will be allowed to revert to residential land use after completion of construction.

No residential land will be affected by operation and maintenance of the V2F Project facilities.

Wetlands

Approximately 4.34 acres of emergent wetlands will be impacted by construction of the proposed V2F Project, including ETWS and staging areas. Additional information on the wetland types and common vegetation is provided in Resource Report 2, Section 2.3. Thirty-nine wetlands will be crossed by the NL27 Project. Northern designed the V2F Project to avoid wetland areas where possible and reduced the width of the temporary construction workspace to between 50 and 75 feet to minimize the construction footprint where practicable. To minimize impacts, 13 wetlands will be crossed via HDD and 26 wetlands will be crossed via open-cut or will be temporarily impacted by ETWS, TAR or a staging area associated with the installation of the three pipeline extensions. An additional four wetlands are within the ETWS are needed for the disconnect sites or temporary compression sites. No wetlands will be impacted by construction or operation of the aboveground facilities associated with the V2F Project.

Approximately 0.18 acre of wetland on the Albert Lea M500 E-line and 0.39 acre of wetland on the Faribault D-line will be crossed via HDD travel lanes that will be utilized by only foot traffic during HDD installation. There will be no ground disturbance and only minor hand-removal of vegetation in the travel lanes. Approximately 0.14 acre of wetland at the Northfield #1 temporary compression site will be matted and used for parking compression trailers; approximately 0.19 acre of wetland will be used for dewatering at the Farmington compressor station. Neither of the wetlands in these locations will be impacted by ground disturbance.

For wetlands that will be crossed via open-cut trench, Northern will utilize a 75-foot-wide construction ROW through wetland areas with the exception of 13 emergent wetlands where Northern will utilize a 100-foot-wide construction corridor. ETWS and TARs will be located in upland areas a minimum of 50 feet from the wetland edge within the exception of five areas on the V2F Project where ETWS or TARs will be located within a wetland or a wetland buffer. Resource Report 1, Table 1.5-5 identifies these areas by MP and provides relevant information and justification to construct adjacent to the wetlands or its 50-foot buffer. No permanent wetland loss or conversion will occur as a result of the V2F Project.

Approximately 1.93 acres of wetland will be affected by operation and maintenance of the Project facilities. Permanent wetland loss will be avoided since no permanent wetland fill will result from the construction of Northern's proposed V2F Project. All forested/scrub-shrub wetlands or wetland

components containing forested and/or scrub-shrub areas crossed by the V2F Project will be completed via HDD and therefore not subject to ROW maintenance activities.

Wetlands are discussed in further detail in Resource Report 2, Section 2.3. Methods outlined in the Plan and Procedures, except as noted in Resource Report 1, Table 1.5-5, will be implemented to minimize impacts on wetlands during construction. Northern's SPCC Plan provides restrictions and mitigation measures to minimize potential impacts associated with the release of fuels, lubricants or other potentially toxic materials used during routine construction. Refueling and storage of hazardous materials will be prohibited within 100 feet of wetlands during construction except for the equipment that cannot be moved out of the buffer, such as the HDD rigs. The refueling buffers will be shown on the V2F Project SWPPP figures. The SPCC plan can be found in Resource Report 2, Appendix 2A.

Construction and Permanent ROW

The pipelines for the V2F Project will be installed within 50-foot-wide to 100-foot-wide nominal¹ construction corridors. In addition to the construction corridor, Northern will be utilizing ETWS, staging areas and new and/or to-be-improved temporary access roads during construction. Northern is negotiating with all landowners to acquire easements, where needed.

Northern will follow FERC Plan and their (Northern's) Procedures for post-construction maintenance activities found in Resource Report 1. As part of post-construction maintenance, a corridor approximately 50 feet wide will be maintained in upland areas. Some of the permanently maintained ROW would be allowed to revert to preconstruction conditions (primarily agricultural, industrial/commercial, open land, and residential) following construction. Maintenance clearing over the full width of the permanent ROW will not be performed more frequently than every three years; however, a corridor approximately ten feet in width and centered over the pipeline may be maintained annually in an herbaceous state. In wetlands, a 10-foot-wide corridor centered on the pipeline may be cleared at a frequency necessary to maintain an herbaceous state. In addition, trees within 15 feet of a corridor centered over the pipeline with roots that could compromise the integrity of pipeline coating will be selectively removed from the ROW. Northern will not conduct any routine vegetation mowing or clearing in between HDD entry and exit points in riparian or wetland environments.

Resource Report 1, Figure 1-17, provides cross-sectional diagrams of typical pipeline construction ROW and a ROW within a wetland; Figure 1-19 depicts an open-cut crossing of a wetland. Resource Report 1, Section 1.4, land requirements, contains additional information regarding the workspace requirements for the V2F Project.

Existing ROW

Northern has designed the V2F Project to utilize existing ROW where practicable. The three pipeline extensions were designed to parallel existing Northern mainlines; however, specific locations have offsets greater than 25 feet to minimize landowner and environmental impacts and to optimize HDD construction set-up. The offsets for the V2F Project are detailed below in Table 8.1-3.

ETWS of varying widths will be required adjacent to the TWS in certain locations for specialized construction methods such as HDDs; wetland crossings; at the beginning and end of each pipeline

¹ Nominal is an industry term that indicates the width of the construction ROW without additional construction workspaces.

segment; pipeline crossovers; and road crossings. Details of land use acreage impacts for ETWS and staging areas required for construction of the V2F Project are included in Appendix 8A.

Access Roads and Permanent Access Roads

Northern will build temporary construction entrances from existing public and private roads to gain access to construction workspaces for the V2F Project. In addition, Northern will construct or improve 29 TARs for the three V2F pipeline segments, which will result in 19.70 acres of temporary impact on primarily agricultural, industrial/commercial and open land. Five additional TARs will be required for the disconnect and temporary compression sites, which total another 1.00 acre of impact. The TARs and construction entrances (road approaches) will be underlain with a geotextile fabric, where applicable.

Following construction, Northern will remove gravel and geotextile from any TARs or construction entrances that required placement of new gravel. Soil will be decompacted in agricultural land and contours restored to preconstruction conditions.

There are no new permanent access roads planned for the V2F Project; Northern will utilize existing driveways at the aboveground appurtenances in addition to the existing facility entrances at Lake Mills compressor station, Northfield #1 and the La Crosse BL MNB73201 Launcher/ABA 05. These facility entrances are included as ETWS. Appendix 8B lists of the TARs planned for the V2F Project.

Staging Areas and ETWS

Northern has identified 17 staging areas, totaling 89.60 acres, that will be used for construction of the V2F Project. The staging areas will impact primarily agricultural, industrial/commercial and open land. The staging areas are generally adjacent to TWS and ETWS and will be utilized by the contractor(s) for pipe and equipment storage, staging of crews, equipment parking, welding, and fabricating. Staging areas will either undergo full ROW topsoil removal, be overlain by timber mats, or be covered with rock.

Northern has identified multiple ETWS areas, totaling 101.06 acres, along the pipeline routes. The ETWS areas will impact primarily agricultural, industrial/commercial and open land and are generally adjacent to the TWS. These areas will be used to facilitate construction at waterbody/wetland crossings, road and railroad crossings, tie-in locations, points of inflection, equipment storage, and pipe stringing on the ROW. The size and land use impacts for the staging and ETWS areas for the V2F Project are included in Appendix 8A.

8.1.2 V2F Project A-line Disconnect and Temporary Compression Sites

Land required for the disconnect activities includes ETWS at the V2F disconnect sites and the temporary compression site. In total, the disconnect of the A-line will affect approximately 10.20 acres of land (ETWS) at two compressor stations and 2.19 acres of land at the temporary compression site (La Crosse BL MNB73201 launcher /ABA05). Resource Report 1, Table 1.4-1 identifies the land requirements, including ETWS that will be disturbed at the disconnect sites and the temporary compression site.

Northern will utilize three additional temporary compression sites to complete the tie-ins for the Lake Mills and Albert Lea M500 E-lines and the Faribault M500 D-line. The three temporary compression sites will require 12.55 acres of ETWS; no ground disturbance will occur at these

locations as the temporary compression will be brought to site on trailers/skids and parked. Resource Report 1, Table 1.4-1 identifies the land requirements, including ETWS that will be disturbed at the three temporary compression sites.

The detailed topographic maps in Resource Report 1, Figure 1-2 and the aerial photo-based alignment sheets, Figures 1-6 and 1-7, depict the A-line abandonment temporary compression site - La Crosse BL MNB73201 launcher /ABA05 due to its proximity to the Albert Lea M500 E-line. The disconnect and temporary compression sites that are geographically separated from the pipeline extensions are included in Resource Report 1, Figures 1-10.

Because Northern is abandoning the A-line, no new land will be required on a long-term or permanent basis for the abandonment. Following disconnect of the A-line, disturbed portions of the ETWS will be restored to preconstruction land cover. The A-line to be abandoned is largely collocated with other Northern pipelines which Northern will continue to operate. After abandonment, Northern will continue to maintain its existing pipeline easements and does not plan to relinquish its existing easement agreements.

To gain access to the work area at the disconnect and temporary compression sites, Northern will primarily use existing public roads and the existing driveways into its facilities as described in Resource Report 1, Section 1.4 and Appendix 8A and Appendix 8B. Existing roads are in a condition that can accommodate construction traffic without modification or improvement. Upon completion of construction activities, any disturbed areas will be restored to preconstruction conditions.

8.1.3 V2F Project Pipeline Extensions

The land disturbed by construction of the three V2F pipeline extensions includes the construction ROW for installation of the pipelines. These ROW widths will accommodate large equipment movement, pipe stringing, welding, trenching, and the separate storage of topsoil and subsoil.

The pipeline extensions will be installed utilizing a 25-foot offset from existing pipelines, where practicable. The proposed pipelines will be offset greater than 25 feet from the existing lines at multiple locations to optimize the pipeline design and to reduce environmental and landowner impacts. The deviations are required to reduce the potential for night-time construction by reducing the number of pull-back sections on HDDs and avoid residences, wooded areas and wetlands. Table 8.1-3 below shows locations along the V2F Project where installation would be more than 25 feet from existing Northern pipelines.

Table 8.1-3 V2F Project Locations Where Installation Would be More than 25 Feet from Existing Pipelines

Project Component	MP	Max Deviation Distance (feet)	Named Pipeline	Justification
Lake Mills M500 E-line	34.37-34.68	490	M500D	To avoid wetland impact.
	35.04-35.13	175	M500D	To avoid waterway impact.
	35.88-36.66	53	M500D	To avoid aboveground piping present at the E-line to D-line regulator station

Project Component	MP	Max Deviation Distance (feet)	Named Pipeline	Justification
	36.23-36.65	205	M500D	To avoid tree clearing
	36.99-37.01	215	M500D	To avoid tree clearing.
	38.18-39.12	935	M500C	To avoid wetland impacts and address a landowner concern.
	39.43-39.91	125	M500D	To complete HDD in one pull-back section for the CPKC railroad crossing
	40.51-40.75	145	M500D	To cross I-90 at 90 degrees
	41.52-41.92	185	M500D	To cross 715th Avenue at 90 degrees
	42.04-42.23	84	M500D	Increased workspace needed for the HDD pullback
	42.24	135	M500D	To cross 240th street at 90 degrees
Albert Lea M500 E-line	1.55-1.54	115	M500D	Tie in to Northern’s existing pipeline
	3.55-3.64	145	M500D	Tie in to NL27 Albert Lea M500 E-line
Faribault M500 D-line	97.98-99.37	950	M500C/E	To avoid multiple wetland complexes and reduce environmental impacts
	100.43-100.94	215	M500C	To avoid pipeline installation through Northern’s existing Conger MN #1
	101.79-101.92	210	M500B	To cross CPKC railroad at 90 degrees
	102.03-102.22	250	M500B	Optimize an HDD set up to avoid tree clearing
	102.42-103.01	677	M500B	To avoid tree clearing

Temporary disturbances include the pipeline construction corridor (TWS), ETWS, travel lanes, TARs, and staging areas. Permanent disturbances include the 50-foot-wide permanently maintained ROW centered on the new pipelines, and the operational footprints of the new launcher

and valve settings and relocated receiver. Some of the permanently maintained ROW would be allowed to revert to preconstruction conditions (primarily agricultural use) following construction.

Pursuant to U.S. Department of Transportation requirements, the pipelines will have a minimum of 30 to 36 inches of cover from the top of the pipeline to the natural ground surface in normal soil conditions and a minimum of 36 inches of cover in agricultural land. The pipeline will have a minimum of 48 inches of cover from the top of the pipeline to the natural ground surface in irrigated agricultural lands. Northern will follow the specifications in section IV.A.2 of the Plan regarding the width of construction ROW; all planned workspaces are currently depicted on the V2F Project alignment sheets and aerial overview. Additional depth of cover to address landowner concerns (e.g., for agricultural lands) will be determined during the ROW negotiation process. At this time, Northern is not aware of any landowner concerns that would require extra construction ROW other than those workspaces depicted on the alignment sheets and aerials.

In total, construction of the three V2F pipeline extensions will affect approximately 396.26 acres of land. Approximately 92.35 acres will be required for permanent operational pipeline ROW. The temporary construction corridor, ETWS, staging areas, and TARs will be temporarily disturbed during construction of the three pipeline extensions but will be reclaimed and restored to preconstruction land cover after the completion of construction.

8.1.4 V2F Project Aboveground Appurtenant Facilities

The Project will require installation two new block valves within two existing facilities. No expansion or new gravel footprints will be required. Northern will remove three existing facilities as part of the Project. The affected acreage for each of the aboveground appurtenant facilities by existing land use type is detailed in Table 8.1-4 below.

Table 8.1-4 V2F Project Aboveground Appurtenant Facilities

Project Component	Proposed Activity	Existing Land Use	Total Construction Acres	Total Operational Acres ¹
Lake Mills M500 E-line				
Lake Mills E-line tie-over valve setting	Existing – to be removed	Industrial/Commercial	0.16	0.00
Conger MN #1 TBS ²	Block valve installation	Industrial/Commercial	0.64	0.64
Austin & Wells Branch Line Regulation Station ³	ETWS	Industrial/Commercial	0.27	0.27
Faribault M500 D-line				
Faribault tie-over valve setting	Existing – to be removed	Industrial/Commercial	0.01	0.00
E-line to D-line regulator station	Block valve installation	Industrial/Commercial	0.36	0.36
Valve setting	Existing – to be removed	Industrial/Commercial	<0.01	0.00
V2F Project Total			1.44	1.27

¹ Includes permanent driveway(s)

² Other than the installation of a new block valve, no other work is planned.

³ Austin and Wells branch line regulation station is counted in both Project footprints.

Additional details on the purpose for each aboveground appurtenant facility for the V2F Project are described in Resource Report 1, Table 1.3-4.

8.1.5 NL27 Project Pipeline Facilities

The NL27 Project will consist of ten new pipeline segments and one compressor station uprate. Table 8.1-5 lists miles and percentage crossed by the proposed NL27 pipelines for each land use category impacted. The Hugo compressor station uprate is not included in Table 8.1-5 as it is not a proposed pipeline. Table 8.1-6 is a summary of land use acreages affected by construction and operation of the proposed pipelines and pipeline appurtenances by land use category.

Table 8.1-5 Land Crossed by the NL27 Project Pipelines

Project Component	Agriculture		Forested/Woodland		Industrial/Commercial		Open Land		Open Water		Residential		Wetlands		Total Mile(s)	Total %
	Mile(s)	%	Mile(s)	%	Mile(s)	%	Mile(s)	%	Mile(s)	%	Mile(s)	%	Mile(s)	%		
Lake Mills M500 E-line	1.82	78.4	0.04	1.7	0.02	0.9	0.44	19.0	0.00	0.0	0.00	0.0	0.00	0.0	2.32	8.2
Albert Lea M500 E-line	2.83	82.7	0.04	1.2	0.01	0.3	0.42	12.3	0.00	0.0	0.00	0.0	0.12	3.5	3.42	12.0
Willmar 3rd Branch Line Upstream	0.21	11.8	0.21	11.8	0.05	2.8	0.56	31.5	0.03	1.7	0.56	31.5	0.16	8.99	1.78	6.3
Willmar 3rd Branch Line Downstream	3.53	73.8	0.22	4.6	0.06	1.3	0.80	16.7	0.00	0.0	0.00	0.0	0.17	3.6	4.78	16.8
Welcome 2nd Line	1.21	97.6	0.00	0.0	0.01	0.8	0.02	1.6	0.00	0.0	0.00	0.0	0.00	0.0	1.24	4.4
Paynesville 2nd Branch Line	0.67	27.3	0.30	12.3	0.15	6.1	0.82	33.5	0.00	0.0	0.03	1.2	0.48	19.7	2.45	8.6
Worthington 2nd Branch Line	1.95	89.9	0.07	3.2	0.01	0.5	0.14	6.5	0.00	0.0	0.00	0.0	0.00	0.0	2.17	7.6
Springfield 2nd Branch Line	6.16	83.2	0.07	0.9	0.08	1.1	0.83	11.2	0.00	0.0	0.01	0.1	0.25	3.4	7.40	26.0
Minnesota Interconnect 2nd Branch Line	0.91	57.2	0.15	9.4	0.03	1.9	0.42	26.4	0.00	0.0	0.00	0.0	0.08	5.0	1.59	5.6
Alexandria 2nd Branch Line	0.31	24.2	0.24	18.8	0.01	0.8	0.35	27.3	0.00	0.0	0.17	13.3	0.20	15.6	1.28	4.5
NL27 Totals	19.6	68.9	1.34	4.7	0.43	1.5	4.80	16.9	0.03	0.1	0.77	2.7	1.46	5.1	28.43	100

Table 8.1-6 Acreage Affected by Construction and Operation of the NL27 Project

Facility	Agricultural		Forested/Woodland		Industrial/ Commercial		Open Land		Open Water		Residential		Wetlands		Total	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
Lake Mills M500 E-line																
Pipeline ROW ^{1,2}	22.25	11.19	0.40	0.24	0.27	0.12	4.99	2.44	0.00	0.00	0.00	0.00	0.00	0.00	27.91	13.99
<i>Within Existing Easement</i>	5.56	3.72	0.11	0.08	0.04	0.02	1.40	0.94	0.00	0.00	0.00	0.00	0.00	0.00	7.13	4.76
<i>Outside of Existing Easement</i>	16.68	7.47	0.38	0.16	0.23	0.10	3.60	1.50	0.00	0.00	0.00	0.00	0.00	0.00	20.78	9.23
Extra Temporary Workspace (ETWS)	6.06	0.00	0.00	0.00	0.18	0.00	2.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.93	0.00
<i>Within Existing Easement</i>	0.99	0.00	0.00	0.00	0.02	0.00	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.55	0.00
<i>Outside of Existing Easement</i>	5.07	0.00	0.00	0.00	0.16	0.00	2.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.38	0.00
Staging Area	6.40	0.00	0.00	0.00	0.02	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.50	0.00
<i>Within Existing Easement</i>	0.49	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	0.00
<i>Outside of Existing Easement</i>	5.91	0.00	0.00	0.00	0.02	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0.00
Permanent Access Roads	0.08	0.08	0.00	0.00	0.00	0.00	1.21	1.21	0.00	0.00	0.27	0.27	0.00	0.00	1.56	1.56
<i>Within Existing Easement</i>	0.00	0.08	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
<i>Outside of Existing Easement</i>	0.08	0.10	0.00	0.00	0.00	0.00	1.19	1.19	0.00	0.00	0.27	0.27	0.00	0.00	1.54	1.54
Temporary Access Roads	1.96	0.00	0.00	0.00	0.06	0.00	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.37	0.00
<i>Within Existing Easement</i>	0.05	0.00	0.00	0.00	0.01	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00
<i>Outside of Existing Easement</i>	1.91	0.00	0.00	0.00	0.05	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.21	0.00
Existing Aboveground Appurtenances ⁴	0.00	0.00	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.25
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.25
Proposed Aboveground Appurtenance ⁴	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.05
<i>Outside of Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Subtotal	36.75	11.27	0.40	0.24	0.78	0.37	9.38	3.71	0.00	0.00	0.27	0.27	0.00	0.00	47.58	15.86
Albert Lea M500 E-line																
Pipeline ROW ^{1,2}	33.96	17.06	0.20	0.09	0.12	0.02	3.31	1.56	0.00	0.00	0.00	0.00	0.27	0.11	37.86	18.84

Facility	Agricultural		Forested/Woodland		Industrial/ Commercial		Open Land		Open Water		Residential		Wetlands		Total	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
<i>Within Existing Easement</i>	8.87	5.63	0.00	0.00	0.00	0.00	0.11	0.06	0.00	0.00	0.00	0.00	0.01	0.01	8.99	5.70
<i>Outside of Existing Easement</i>	25.09	11.43	0.20	0.09	0.12	0.02	3.20	1.50	0.00	0.00	0.00	0.00	0.26	0.10	28.87	13.14
ETWS	12.95	0.00	0.04	0.00	0.02	0.00	2.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.32	0.00
<i>Within Existing Easement</i>	1.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61	0.00
<i>Outside of Existing Easement</i>	11.34	0.00	0.04	0.00	0.02	0.00	2.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.71	0.00
Staging Area ³	7.15	0.00	0.00	0.00	0.01	0.00	4.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.99	0.00
<i>Outside of Existing Easement</i>	7.15	0.00	0.00	0.00	0.01	0.00	4.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.99	0.00
Permanent Access Roads	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
<i>Outside of Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
Temporary Access Roads	4.65	0.00	0.00	0.00	2.02	0.00	0.59	0.00	0.00	0.00	0.02	0.00	0.00	0.00	7.28	0.00
<i>Within Existing Easement</i>	0.02	0.00	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00
<i>Outside of Existing Easement</i>	4.63	0.00	0.00	0.00	1.99	0.00	0.58	0.00	0.00	0.00	0.02	0.00	0.00	0.00	7.22	0.00
Proposed Aboveground Appurtenance ⁴	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.16
<i>Outside of Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.16
Subtotal	58.71	17.06	0.24	0.09	2.17	0.02	11.22	1.74	0.00	0.00	0.02	0.00	0.27	0.11	72.63	19.02
Willmar 3rd Branch Line Upstream																
Pipeline ROW ^{1,2}	2.46	1.17	1.80	0.92	0.11	0.00	5.67	2.72	0.02	0.00	3.94	1.87	1.16	0.72	15.16	7.40
<i>Within Existing Easement</i>	0.84	0.61	0.29	0.19	0.00	0.00	1.53	1.00	0.00	0.00	0.99	0.49	0.58	0.38	4.23	2.67
<i>Outside of Existing Easement</i>	1.62	0.56	1.51	0.73	0.11	0.00	4.14	1.72	0.02	0.00	2.95	1.38	0.58	0.34	10.93	4.73
ETWS	1.50	0.00	0.42	0.00	0.09	0.00	3.93	0.00	0.00	0.00	2.38	0.00	0.03	0.00	8.35	0.00
<i>Within Existing Easement</i>	0.63	0.00	0.03	0.00	0.01	0.00	0.63	0.00	0.00	0.00	1.10	0.00	0.00	0.00	2.40	0.00
<i>Outside of Existing Easement</i>	0.87	0.00	0.39	0.00	0.08	0.00	3.30	0.00	0.00	0.00	1.28	0.00	0.03	0.00	5.95	0.00
Staging Area	1.56	0.00	0.00	0.00	0.00	0.00	2.51	0.00	0.00	0.00	0.29	0.00	0.00	0.00	4.36	0.00
<i>Outside of Existing Easement</i>	1.56	0.00	0.00	0.00	0.00	0.00	2.51	0.00	0.00	0.00	0.29	0.00	0.00	0.00	4.36	0.00
Temporary Access Roads	0.00	0.00	0.23	0.00	1.27	0.00	1.91	0.00	0.00	0.00	0.11	0.00	0.00	0.00	3.52	0.00

Facility	Agricultural		Forested/Woodland		Industrial/ Commercial		Open Land		Open Water		Residential		Wetlands		Total	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00
<i>Outside of Existing Easement</i>	0.00	0.00	0.23	0.00	1.27	0.00	1.88	0.00	0.00	0.00	0.11	0.00	0.00	0.00	3.49	0.00
Existing Aboveground Appurtenances ⁴	0.00	0.00	0.00	0.00	1.61	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61	0.98
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	1.61	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61	0.98
Subtotal	5.52	1.17	2.45	0.92	3.08	0.98	14.02	2.72	0.02	0.00	6.72	1.87	1.19	0.72	33.00	8.38
Willmar 3rd Branch Line Downstream																
Pipeline ROW ^{1,2}	41.80	20.96	0.75	0.33	0.18	0.01	8.65	4.07	0.00	0.00	0.03	0.00	1.31	0.90	52.72	26.27
<i>Within Existing Easement</i>	10.36	7.36	0.07	0.05	0.01	0.01	0.67	0.45	0.00	0.00	0.00	0.00	0.69	0.49	11.80	8.36
<i>Outside of Existing Easement</i>	31.44	13.60	0.68	0.28	0.17	0.00	7.98	3.62	0.00	0.00	0.03	0.00	0.62	0.41	40.92	17.91
ETWS	26.13	0.00	0.19	0.00	0.07	0.00	4.12	0.00	0.00	0.00	0.05	0.00	0.05	0.00	30.61	0.00
<i>Within Existing Easement</i>	2.11	0.00	0.00	0.00	0.00	0.00	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.67	0.00
<i>Outside of Existing Easement</i>	24.02	0.00	0.19	0.00	0.07	0.00	3.56	0.00	0.00	0.00	0.05	0.00	0.05	0.00	27.94	0.00
Staging Area	16.21	0.00	0.00	0.00	0.00	0.00	2.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.63	0.00
<i>Within Existing Easement</i>	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	0.00
<i>Outside of Existing Easement</i>	15.89	0.00	0.00	0.00	0.00	0.00	2.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.31	0.00
Permanent Access Roads	0.23	0.23	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.29
<i>Within Existing Easement</i>	0.01	0.01	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04
<i>Outside of Existing Easement</i>	0.22	0.22	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.25
Temporary Access Roads	4.94	0.00	0.00	0.00	0.08	0.00	1.52	0.00	0.00	0.00	0.86	0.00	0.08	0.00	7.48	0.00
<i>Within Existing Easement</i>	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00
<i>Outside of Existing Easement</i>	4.88	0.00	0.00	0.00	0.08	0.00	1.52	0.00	0.00	0.00	0.86	0.00	0.08	0.00	7.42	0.00
Existing Aboveground Appurtenances ⁴	0.00	0.00	0.00	0.00	0.30	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.30
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.30	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.30
Proposed Aboveground Appurtenance ⁴	0.15	0.15	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.16
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01

Facility	Agricultural		Forested/Woodland		Industrial/ Commercial		Open Land		Open Water		Residential		Wetlands		Total	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
<i>Outside of Existing Easement</i>	0.15	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.15
Subtotal	89.46	21.34	0.94	0.33	0.63	0.31	16.78	4.14	0.00	0.00	0.94	0.00	1.44	0.90	110.19	27.02
Welcome 2nd Line																
Pipeline ROW ^{1,2}	13.28	7.31	0.00	0.00	0.07	0.04	0.17	0.10	0.00	0.00	0.00	0.00	0.00	0.00	13.52	7.45
<i>Within Existing Easement</i>	4.43	3.66	0.00	0.00	0.02	0.02	0.05	0.05	0.00	0.00	0.00	0.00	0.00	0.00	4.50	3.73
<i>Outside of Existing Easement</i>	8.85	3.65	0.00	0.00	0.05	0.02	0.12	0.05	0.00	0.00	0.00	0.00	0.00	0.00	9.02	3.72
ETWS	0.82	0.00	0.00	0.00	0.03	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.03	0.00
<i>Within Existing Easement</i>	0.11	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00
<i>Outside of Existing Easement</i>	0.71	0.00	0.00	0.00	0.03	0.00	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.91	0.00
Staging Area	11.45	0.00	0.00	0.00	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.77	0.00
<i>Within Existing Easement</i>	0.58	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.59	0.00
<i>Outside of Existing Easement</i>	10.87	0.00	0.00	0.00	0.00	0.0	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.18	0.00
Permanent Access Roads	0.09	0.09	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.11
<i>Within Existing Easement</i>	0.02	0.02	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04
<i>Outside of Existing Easement</i>	0.07	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07
Temporary Access Roads	1.72	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.76	0.00
<i>Outside of Existing Easement</i>	1.72	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.76	0.00
Existing Aboveground Appurtenances ⁴	0.00	0.00	0.00	0.00	0.77	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.77
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.77	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.77
Proposed Aboveground Appurtenance ⁴	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
<i>Within Existing Easement</i>	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Subtotal	27.37	7.41	0.00	0.00	0.88	0.81	0.72	0.12	0.00	0.00	0.00	0.00	0.00	0.00	28.97	8.34
Paynesville 2nd Branch Line																
Pipeline ROW ^{1,2}	5.98	4.03	2.19	1.47	0.34	0.28	7.71	5.10	0.00	0.00	0.26	0.21	0.78	0.39	17.26	11.48
<i>Within Existing Easement</i>	0.87	0.86	0.60	0.60	0.04	0.03	2.53	2.30	0.00	0.00	0.00	0.00	0.00	0.00	4.04	3.79

Facility	Agricultural		Forested/Woodland		Industrial/ Commercial		Open Land		Open Water		Residential		Wetlands		Total	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
<i>Outside of Existing Easement</i>	5.11	3.17	1.59	0.87	0.30	0.25	5.18	2.80	0.00	0.00	0.26	0.21	0.78	0.39	13.22	7.69
ETWS	2.72	0.00	1.23	0.00	0.53	0.00	8.33	0.00	0.00	0.00	0.18	0.00	0.00	0.00	12.99	0.00
<i>Within Existing Easement</i>	0.12	0.00	0.07	0.00	0.05	0.00	1.80	0.00	0.00	0.00	0.11	0.00	0.00	0.00	2.15	0.00
<i>Outside of Existing Easement</i>	2.60	0.00	1.16	0.00	0.48	0.00	6.53	0.00	0.00	0.00	0.07	0.00	0.00	0.00	10.84	0.00
Staging Area	9.93	0.00	0.00	0.00	3.15	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.25	0.00
<i>Outside of Existing Easement</i>	9.93	0.00	0.00	0.00	3.15	0.00	1.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.25	0.00
Permanent Access Roads	0.00	0.00	0.00	0.00	0.07	0.07	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.13
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.04	0.04	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06
<i>Outside of Existing Easement</i>	0.00	0.00	0.00	0.00	0.03	0.03	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07
Temporary Access Roads	0.73	0.00	0.01	0.00	2.65	0.00	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.38	0.00
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00
<i>Outside of Existing Easement</i>	0.73	0.00	0.01	0.00	2.57	0.00	0.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.30	0.00
Existing Aboveground Appurtenances ⁴	0.00	0.00	0.00	0.00	0.29	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.29
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.23	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.23
<i>Outside Existing Easement</i>	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06
Proposed Aboveground Appurtenance ⁴	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Subtotal	19.36	4.03	3.43	1.47	7.03	0.64	18.27	5.17	0.00	0.00	0.44	0.21	0.78	0.39	49.31	11.91
Worthington 2nd Branch Line																
Pipeline ROW ^{1,2}	17.63	11.75	0.00	0.00	0.06	0.02	1.25	0.84	0.00	0.00	0.00	0.00	0.00	0.00	18.94	12.61
<i>Within Existing Easement</i>	4.86	4.85	0.00	0.00	0.01	0.01	0.39	0.39	0.00	0.00	0.00	0.00	0.00	0.00	5.26	5.25
<i>Outside of Existing Easement</i>	12.77	6.90	0.00	0.00	0.05	0.01	0.86	0.45	0.00	0.00	0.00	0.00	0.00	0.00	13.68	7.36
ETWS	7.26	0.00	0.00	0.00	0.03	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.44	0.00
<i>Within Existing Easement</i>	1.46	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.52	0.00
<i>Outside of Existing Easement</i>	5.80	0.00	0.00	0.00	0.03	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.92	0.00

Facility	Agricultural		Forested/Woodland		Industrial/ Commercial		Open Land		Open Water		Residential		Wetlands		Total	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
Staging Area	5.89	0.00	0.00	0.00	0.07	0.00	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.43	0.00
<i>Within Existing Easement</i>	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.00
<i>Outside of Existing Easement</i>	5.62	0.00	0.00	0.00	0.07	0.00	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.16	0.00
Permanent Access Roads	0.06	0.06	0.00	0.00	0.03	0.03	0.08	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.17
<i>Outside of Existing Easement</i>	0.06	0.06	0.00	0.00	0.03	0.03	0.08	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.17
Temporary Access Roads	1.71	0.00	0.08	0.00	0.04	0.00	0.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.74	0.00
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00
<i>Outside of Existing Easement</i>	1.71	0.00	0.08	0.00	0.04	0.00	0.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.72	0.00
Existing Aboveground Appurtenances ⁴	0.00	0.00	0.00	0.00	0.19	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.19
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.19	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.19
Proposed Aboveground Appurtenance ⁴	0.23	0.23	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.24
<i>Outside of Existing Easement</i>	0.23	0.23	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.24
Subtotal	32.78	12.04	0.08	0.00	0.42	0.24	2.87	0.93	0.00	0.00	0.00	0.00	0.00	0.00	36.15	13.21
Springfield 2nd Branch Line																
Pipeline ROW ^{1,2}	55.16	36.60	0.42	0.24	0.41	0.02	6.71	4.08	0.00	0.00	0.01	0.00	0.28	0.05	62.99	40.99
<i>Within Existing Easement</i>	15.13	15.13	0.12	0.12	0.00	0.00	1.40	1.40	0.00	0.00	0.00	0.00	0.02	0.02	16.67	16.67
<i>Outside of Existing Easement</i>	40.03	21.47	0.30	0.12	0.41	0.02	5.31	2.68	0.00	0.00	0.01	0.00	0.26	0.03	46.32	24.32
ETWS	24.01	0.00	0.26	0.00	0.44	0.00	3.58	0.00	0.00	0.00	0.08	0.00	0.00	0.00	28.37	0.00
<i>Within Existing Easement</i>	3.84	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.19	0.00
<i>Outside of Existing Easement</i>	20.17	0.00	0.26	0.00	0.44	0.00	3.23	0.00	0.00	0.00	0.08	0.00	0.00	0.00	24.18	0.00
Staging Area	15.88	0.00	0.03	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.24	0.00
<i>Within Existing Easement</i>	0.10	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00
<i>Outside of Existing Easement</i>	15.78	0.00	0.02	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.13	0.00
Permanent Access Roads	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04

Facility	Agricultural		Forested/Woodland		Industrial/ Commercial		Open Land		Open Water		Residential		Wetlands		Total	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
<i>Outside of Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
Temporary Access Roads	11.50	0.00	0.00	0.00	0.31	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.99	0.00
<i>Outside of Existing Easement</i>	11.50	0.00	0.00	0.00	0.31	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.99	0.00
Existing Aboveground Appurtenances ⁴	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
<i>Outside of Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Proposed Aboveground Appurtenance ⁴	0.22	0.22	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.23
<i>Within Existing Easement</i>	0.05	0.05	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.06
<i>Outside of Existing Easement</i>	0.17	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.17
Subtotal	106.77	36.82	0.71	0.24	1.17	0.02	10.87	4.15	0.00	0.00	0.09	0.00	0.28	0.05	119.89	41.28
Minnesota Interconnect 2nd Branch Line																
Pipeline ROW ^{1,2}	7.78	5.16	0.14	0.00	0.03	0.00	1.99	1.20	0.00	0.00	0.00	0.00	0.05	0.00	9.99	6.36
<i>Within Existing Easement</i>	1.32	1.32	0.00	0.00	0.00	0.00	0.60	0.60	0.00	0.00	0.00	0.00	0.00	0.00	1.92	1.98
<i>Outside of Existing Easement</i>	6.46	3.84	0.14	0.00	0.03	0.00	1.39	0.60	0.00	0.00	0.00	0.00	0.05	0.00	8.07	4.44
ETWS	9.84	0.00	0.03	0.00	0.03	0.00	2.91	0.00	0.00	0.00	0.02	0.00	0.00	0.00	12.83	0.00
<i>Within Existing Easement</i>	1.33	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.03	0.00
<i>Outside of Existing Easement</i>	8.51	0.00	0.03	0.00	0.03	0.00	2.21	0.00	0.00	0.00	0.02	0.00	0.00	0.00	10.80	0.00
Staging Area	7.36	0.00	0.00	0.00	0.00	0.00	2.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.85	0.00
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.00
<i>Outside of Existing Easement</i>	7.36	0.00	0.00	0.00	0.00	0.00	2.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.62	0.00
Permanent Access Roads	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07
<i>Outside of Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07
Temporary Access Roads	1.88	0.00	2.75	0.00	0.96	0.00	1.62	0.00	0.00	0.00	0.00	0.00	0.02	0.00	7.23	0.00
<i>Outside of Existing Easement</i>	1.88	0.00	2.75	0.00	0.96	0.00	1.62	0.00	0.00	0.00	0.00	0.00	0.02	0.00	7.23	0.00
Existing Aboveground Appurtenances ⁴	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01

Facility	Agricultural		Forested/Woodland		Industrial/ Commercial		Open Land		Open Water		Residential		Wetlands		Total	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Proposed Aboveground Appurtenance ⁴	0.05	0.05	0.00	0.00	0.00	0.00	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.09
<i>Within Existing Easement</i>	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
<i>Outside of Existing Easement</i>	0.04	0.04	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.07
Subtotal	26.91	5.21	2.92	0.00	1.03	0.01	9.12	1.31	0.00	0.00	0.02	0.00	0.07	0.00	40.07	6.53
Alexandria 2nd Branch Line																
Pipeline ROW ^{1,2}	2.72	1.82	0.63	0.29	0.07	0.00	3.11	2.02	0.00	0.00	1.17	0.76	1.27	0.78	8.97	5.67
<i>Within Existing Easement</i>	0.91	0.91	0.12	0.12	0.00	0.00	0.84	0.82	0.00	0.00	0.38	0.38	0.39	0.39	2.64	2.62
<i>Outside of Existing Easement</i>	1.81	0.91	0.51	0.17	0.07	0.00	2.27	1.20	0.00	0.00	0.79	0.38	0.88	0.39	6.33	3.05
ETWS	2.69	0.00	0.18	0.00	0.02	0.00	5.05	0.00	0.00	0.00	0.00	0.00	0.01	0.00	7.95	0.00
<i>Within Existing Easement</i>	0.59	0.00	0.04	0.00	0.01	0.00	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.48	0.00
<i>Outside of Existing Easement</i>	2.10	0.00	0.14	0.00	0.01	0.00	4.21	0.00	0.00	0.00	0.00	0.00	0.01	0.00	6.47	0.00
Staging Area	2.37	0.00	0.14	0.00	0.00	0.00	1.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.17	0.00
<i>Outside of Existing Easement</i>	2.37	0.00	0.14	0.00	0.00	0.00	1.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.17	0.00
Permanent Access Roads	0.18	0.18	0.00	0.00	0.05	0.05	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.25
<i>Within Existing Easement</i>	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.02
<i>Outside of Existing Easement</i>	0.16	0.16	0.00	0.00	0.05	0.05	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.23	0.23
Temporary Access Roads	2.88	0.00	0.08	0.00	0.24	0.00	0.18	0.00	0.00	0.00	0.27	0.00	0.00	0.00	3.65	0.00
<i>Within Existing Easement</i>	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00
<i>Outside of Existing Easement</i>	2.80	0.00	0.08	0.00	0.24	0.00	0.18	0.00	0.00	0.00	0.27	0.00	0.00	0.00	3.57	0.00
Existing Aboveground Appurtenances ⁴	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00
Proposed Aboveground Appurtenance ⁴	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
<i>Within Existing Easement</i>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<i>Outside of Existing Easement</i>	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01

Facility	Agricultural		Forested/Woodland		Industrial/ Commercial		Open Land		Open Water		Residential		Wetlands		Total	
	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper	Const	Oper
Subtotal	10.85	2.01	1.03	0.29	0.42	0.05	10.02	2.04	0.00	0.00	1.44	0.76	1.28	0.78	25.04	5.93
Aboveground Facility																
Hugo Compressor Station Uprate																
Project Within Existing Easement	0.00	0.00	0.00	0.00	4.53	4.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.53	4.53
Subtotal	0.00	0.00	0.00	0.00	4.53	4.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.53	4.53
Projects Within Existing Easement	68.05	44.17	1.46	1.16	8.31	7.39	15.64	8.23	0.00	0.00	2.58	0.87	1.69	1.29	97.73	63.11
Project Outside of Existing Easement	346.43	74.19	10.74	2.42	13.83	0.59	87.63	17.80	0.02	0.00	7.36	2.24	3.62	1.66	469.63	98.90
NL27 PROJECT TOTAL	414.48	118.36	12.20	3.58	22.14	7.98	103.27	26.03	0.02	0.00	9.94	3.11	5.31	2.95	567.36	162.01

¹ Construction ROW is based on a 60- to 100-foot-wide temporary ROW in uplands and wetlands. Operational ROW is based on 50-foot-wide corridor in uplands and 10-foot-wide corridor in wetlands. Differing widths are shown on the construction alignment sheets.

² Northern also included impacts for a single 6-foot-wide or two 3-foot-wide parallel travel lanes between HDD entry and exit points in the pipeline ROW calculations.

³ Outside existing easement

⁴ The existing aboveground appurtenance(s) will be removed.

NL27 Land Use Summary

Construction and operation of the NL27 Project will impact agricultural, forested/woodland (upland), industrial/commercial, open land, open water, residential, and wetland land use types. Total acreage for temporary construction activities of NL27 Project components is approximately 567.36 acres. Total permanent operational acreage of the NL27 Project components is approximately 162.01 acres. Approximately 82.8% (469.63 acres) of the construction footprint for the NL27 Project will require new temporary workspace permits while approximately 17.2% (97.73 acres) of the construction footprint will overlap with existing pipeline ROW or existing Northern facilities. Approximately 61.0% (98.90 acres) of the operational footprint for the NL27 Project will occur outside of existing permanent ROW while 40.0% (63.11 acres) will overlap with existing operational footprints of other Northern facilities.

Agricultural Land

Agriculture is the dominant land use impacted by the NL27 Project. Approximately 414.78 acres of agricultural land will be impacted by construction of the proposed NL27 Project, including TWS, ETWS, staging areas, access roads, and aboveground appurtenant facilities. Approximately 118.36 acres of agricultural land will be affected by operation and maintenance of the NL27 Project facilities.

The agricultural land crossed by the NL27 Project is regularly cultivated and used to grow row crops, including corn and soybeans along with limited pasture, wheat and alfalfa fields. Temporary impacts on agricultural land are expected along the proposed construction corridor due to grading and trenching activities during pipeline installation. All construction workspaces will be allowed to revert to agricultural land use after completion of construction with the exception of the 1.31 acres required for the proposed NL27 aboveground appurtenant facilities and PARs.

The primary impacts on agricultural land during construction will include temporary reductions in agricultural production in areas of cultivated cropland and potentially reduced yields of future crops. Agricultural land in the construction area generally will be taken out of production for one growing season. Depending on construction progress and the specific crop being grown, potential impacts on cultivated cropland will occur only if construction occurs on those lands during the growing season, as defined by the NRCS Water and Climate Center Wetlands Determination Table.

Agricultural lands will be restored to their former use following construction; therefore, the pipelines' construction and operation will not result in a long-term impact on farmland with the exception of the 1.31 acres of agricultural land required to construct and operate the proposed aboveground appurtenance facilities and driveways. Impacts on prime farmland are discussed in more detail in Resource Report 7. Landowners will be compensated for crop loss resulting from construction, and crops may be planted on top of the new pipeline once land utilized for construction is restored. To avoid or minimize soil impacts, Northern will implement the erosion and sedimentation control and restoration procedures described in the Plan and its Procedures and the NL27 Project SWPPPs. The procedures employed ensure that soil productivity is not diminished in agricultural lands by using topsoil segregation measures and alleviating compaction.

Specialty crops include fruits, vegetables, tree nuts, dried fruits, and nursery, floriculture, and horticulture crops (USDA-AMS 2025a). Based on a review of the Organic Integrity Database, aerial photography, field surveys, and Northern's landowner outreach efforts, no specialty crops or organic farms have been identified within the Project area (USDA-AMS 2025b). Northern will continue to

work with individual landowners through the easement process to identify any specialty crops that may be impacted by the Project. If any organic farms or specialty crops are identified, Northern will work with landowners to determine measures to avoid and minimize impacts on these resources. To date, Northern has no information regarding land that is enrolled in easement programs like the Conservation Reserve Program. Northern will continue coordination with landowners to obtain information regarding easement programs. No other specialty crops, including nurseries, vineyards, orchards, citrus groves, dairies, aquaculture, or other tree farms were identified near Project facilities. Specialty crops were reviewed through aerial images, field surveys, and landowner consultation.

Agricultural drain tile systems are used to improve drainage in agricultural areas where the water table is high and/or soil characteristics inhibit proper drainage for crop production. Drain tile systems in agricultural areas are designed to remove water from the top 3 to 4 feet of soil to improve soil productivity and crop yield. Construction activities such as trenching and heavy equipment traffic can damage existing drain tile systems. Damage to existing drain tile systems, if not repaired, can result in lower soil productivity and crop yields. Based on available online mapping, Northern is not aware of any county drainage districts or private drain tile system on the NL27 Project. As part of Northern's landowner outreach efforts, Northern will be collecting more detailed information for planning construction and restoration.

If drain tiles are encountered, Northern will communicate with landowners, perform preliminary assessments to identify existing drain tiles, repair damaged drain tiles, and monitor the NL27 Project area following the completion of construction. For drainage systems, Project-specific impacts on and proposed mitigation measures related to include, but are not limited to:

- Contacting affected landowners in advance of construction activities to identify known existing and planned drainage systems traversed by the proposed NL27 Project
- Providing locational information of any drain tiles discovered in preconstruction surveys or planning onto property maps to landowners requesting them
- Repairing drain tile damages that result from construction-related activities so that they are at least equivalent to their preconstruction condition, using materials comparable to those currently in place
- After the replacement of topsoil in the ROW, monitoring drainage systems repaired and replaced within the ROW until restoration is considered successful, to assess any drain tile settling, crop production, and drainage issues

Forested/Woodland Land

Approximately 12.20 acres of forested land will be impacted by construction of the proposed NL27 Project, including TWS, ETWS, staging areas, and access roads. The forested land vegetation consists mostly of bur oak, red oak, green ash, American elm, quaking aspen, eastern cottonwood, black walnut, silver maple, box elder, and butternut. Trees will be cleared within the construction footprint to provide a safe work area; however, the woody vegetation will be allowed to regrow in areas only used as TWS once construction is completed. Northern plans to complete tree clearing on the pipeline extensions early 2027 to minimize impacts on proposed, threatened and endangered species.

Approximately 0.01 acre of forested land on the Albert Lea M500 E-line, 0.06 acre of forested land on the Willmar 3rd branch line upstream, 0.11 acre of forested land on the Willmar 3rd branch line downstream, 0.05 acre of forested land on the Paynesville 2nd branch line, 0.05 acre of forested land

on the Worthington 2nd branch line, 0.02 acre of forested land on the Springfield 2nd branch line, 0.13 acre of forested land on the Minnesota Interconnect 2nd branch line, and 0.14 acre of forested land on the Alexandria 2nd branch line will be crossed via HDD travel lanes that will be utilized by only foot traffic during HDD installation. There will be no ground disturbance and only minor hand-removal of vegetation in the travel lanes.

A total of 3.58 acres of forested/woodland land is within the operational footprint; however, due to HDD travel lanes, only 2.98 acres will undergo routine vegetation maintenance within a 50-foot-wide corridor in uplands for the NL27 Project.

Industrial/Commercial

Approximately 22.14 acres of industrial/commercial land will be impacted by construction of the proposed NL27 Project, including TWS, ETWS, staging areas, access roads, and aboveground appurtenant facilities. Temporary impacts on industrial/commercial land are expected along the proposed construction corridor due to grading and trenching activities during pipeline installation. The temporary construction corridor and ETWS will be allowed to revert to industrial/commercial land use after completion of construction with the exception of the 0.30 acre required for the aboveground appurtenant facilities.

Approximately 7.98 acres of industrial/commercial land will be affected by operation and maintenance of the Project facilities. Where vegetation is present, dominant plant species include ragweed, smooth brome, yellow foxtail, common dandelion, and reed canary grass.

Open Land

Approximately 103.27 acres of open land will be impacted by construction of the proposed NL27 Project, including TWS, ETWS, staging areas, access roads, and aboveground appurtenant facilities. Temporary impacts on open land are expected along the proposed construction corridor due to grading and trenching activities during pipeline installation. The temporary construction corridor and ETWS will be allowed to revert to open land use after completion of construction with the exception of the 1.90 acres required for the proposed NL27 aboveground appurtenant facilities and driveways.

Approximately 26.03 acres of open land will be affected by operation and maintenance of the Project facilities. The open land consists of fallow land, or former cropland and/or other disturbed areas. Dominant plant species observed in open land include Kentucky bluegrass, buckwheat, reed canary grass, wild parsnip, alfalfa, giant ragweed, smooth brome, orchard grass, yellow foxtail, big bluestem, and red clover. In upland areas, routine vegetation maintenance will be conducted on a 50-foot-wide strip centered over the pipeline with a frequency of not more than once every three years. In addition, a 10-foot-wide strip over the pipeline may be maintained in an herbaceous state by mowing, cutting and trimming on an annual basis.

To date, Northern has no information regarding land that is enrolled in easement programs like the Conservation Reserve Program. Northern will continue coordination with landowners to obtain information regarding easement programs.

Open Water

Approximately 0.02 acre of open water occurs within the temporary construction corridor of the Willmar 3rd branch line upstream; however, the open water area will be avoided via HDD. No open water will be impacted by operation and maintenance of the NL 27 Project.

Open water is discussed in detail in Resource Report 2, Section 2.3. Methods outlined in the Plan and Northern’s Procedures will be implemented to minimize impacts on the open water during construction.

Residential

Approximately 9.94 acres of residential land will be impacted by construction of the proposed NL27 Project, including ETWS and TARs.

Approximately 3.11 acres of residential land will be affected by operation and maintenance of the Project facilities. The residential land that will be impacted by the NL27 Project consists of privately owned and maintained yards and lawns that are dominated by Kentucky blue grass, smooth brome and orchard grass. In these upland areas, routine vegetation maintenance will be conducted on a 50-foot-wide strip centered over the pipeline with a frequency of not more than once every three years. The temporary construction corridor and ETWS will be allowed to revert to residential land use after completion of construction.

Wetlands

Approximately 5.31 acres of wetland will be impacted by construction of the proposed NL27 Project, including ETWS and staging areas. Approximately 2.95 acres of wetland will be affected by operation and maintenance of the NL27 Project facilities. The NL27 Project will require permanent fill placement totaling 0.003 acre (145 square feet) within wetland WDC-W45 associated with the construction of the new tie-in valve setting at MP 11.15 on the Willmar 3rd branch line downstream. As part of the construction and operation impacts, the Willmar 3rd branch line upstream will require conversion of forested and scrub-shrub wetland types totaling 0.45 acre to install the pipeline via open-cut methods through wetlands WIL-W02, WIL-W05 and a portion of WIL-W09 and use TWS within a portion of WIL-W06. Of the total 0.45 acre of forested and scrub-shrub wetland conversion, a total of 0.17 acre of forested wetland and 0.02 acre of scrub-shrub wetland will be permanently maintained as emergent vegetation within the pipeline easement

Approximately 0.68 acre of wetland on the pipeline extensions will be crossed via HDD travel lanes that will be utilized by only foot traffic during HDD installation. There will be no ground disturbance and only minor hand-removal of vegetation in the travel lanes.

Thirty-nine wetlands will be crossed by the NL27 Project. Northern designed the Project to avoid wetland areas where practicable. Eleven wetlands will be crossed via HDD, a portion of four other wetlands will be partially crossed using HDD, and 24 wetlands will be crossed via open-cut trench methods or will be temporarily impacted by ETWS, TAR or staging areas. For wetlands that will be crossed via open-cut trench, Northern will utilize a 75-foot-wide construction ROW through wetland areas with the exception of two emergent wetlands where Northern will utilize a 100-foot-wide construction corridor. ETWS and staging areas will be located in upland areas a minimum of 50 feet from the wetland edge within the exception of 18 areas on the NL27 Project where ETWS, a staging area, or TARs will be located within a wetland or a wetland buffer. Resource Report 1, Table 1.5-6 identifies these areas by MP and provides relevant information and justification to construct adjacent to the wetlands or its 50-foot buffer. The NL27 Project will require permanent fill placement totaling 0.003 acre (145 square feet) and conversion of forested and scrub-shrub wetland types totaling 0.45 acre. Of the total 0.45 acre of forested and scrub-shrub wetland conversion, a total of 0.17 acre of forested wetland and 0.02 acre of scrub-shrub wetland will be permanently maintained as emergent

vegetation within the pipeline easement. Wetlands are discussed in detail in Resource Report 2, Section 2.3.

Except as noted in Resource Report 1, Table 1.5-6, methods outlined in the Plan and Northern's Procedures will be implemented to minimize impacts on wetlands during construction. Northern's SPCC Plan provides restrictions and mitigation measures to minimize potential impacts associated with the release of fuels, lubricants or other potentially toxic materials used during routine construction. Refueling and storage of hazardous materials will be prohibited within 100 feet of wetlands during construction except for the equipment that cannot be moved out of the buffer, such as the HDD rigs. The refueling buffers will be shown on the NL27 Project SWPPP figures. The SPCC plan can be found in Resource Report 2, Appendix 2A.

Construction and Permanent ROW

Northern proposes to utilize a 60- to a 100-foot-wide nominal construction ROW for installation of the NL27 pipeline extensions. There are several areas where different ROW widths are proposed due to site-specific conditions. These are discussed in Resource Report 1 and depicted on the construction alignment sheets, Resource Report 1. In addition to the construction corridor, Northern will be utilizing ETWS, staging areas, and new and/or to-be-improved TARs during construction. Northern is negotiating with all landowners to acquire easements, where needed.

Northern will follow the FERC Plan and their (Northern's) Procedures for post-construction maintenance activities. As part of post-construction maintenance, a corridor approximately 50 feet wide will be maintained in upland areas. Some of the permanently maintained ROW would be allowed to revert to preconstruction conditions (primarily agricultural, industrial/commercial, open land, and residential) following construction. Maintenance clearing over the full width of the permanent ROW will not be performed more frequently than every three years; however, a corridor approximately ten feet in width and centered over the pipeline may be maintained annually in an herbaceous state. In wetlands, a 10-foot-wide corridor centered on the pipeline may be cleared at a frequency necessary to maintain an herbaceous state. In addition, trees within 15 feet of a corridor centered over the pipeline with roots that could compromise the integrity of pipeline coating will be selectively removed from the ROW. Northern will not conduct any routine vegetation mowing or clearing in between HDD entry and exit points in riparian or wetland environments.

Resource Report 1, Figure 1-18, provides cross-sectional diagrams of typical pipeline construction ROW and a ROW within a wetland; Figure 1-19 depicts an open-cut crossing of a wetland. Resource Report 1, Section 1.4, land requirements, contains additional information regarding the workspace requirements for the NL27 Project.

Existing ROW

Northern has designed the NL27 Project to utilize existing ROW where practicable. The ten pipeline extensions were designed to parallel existing Northern mainlines; however, specific locations have offsets greater than 25 feet to minimize landowner and environmental impacts and to optimize HDD construction set-up. These areas are detailed below in Table 8.1-7.

ETWS of varying widths will be required adjacent to the TWS in certain locations for specialized construction methods such as HDDs; wetland crossings; at the beginning and end of each pipeline segment; pipeline crossovers; and road crossings. Details of land use acreage impacts for ETWS and staging areas required for construction of the NL27 Project are included in Appendix 8C.

Access Roads and Permanent Driveways

Northern will build temporary construction entrances from existing public and private roads to gain access to construction workspaces. In addition, Northern will construct and utilize, or improve existing, 55 TARs, which will result in 52.40 acres of temporary impact on primarily agricultural, industrial/commercial, and open land. The TARs and construction entrances (road approaches) will be underlain with a geotextile fabric, where applicable.

Following construction, Northern will remove gravel and geotextile from any TARs or construction entrances that required placement of new gravel. Soil will be decompacted in agricultural land and contours restored to preconstruction conditions.

Northern will construct or improve 11 PARs for the NL27 Project; Northern also will utilize 11 existing facility driveways at the Northern's existing facilities. These facility entrances are included as ETWS. Details of land use acreage impacts for TARs and PARs required for construction of the NL27 Project are included in Appendix 8D.

Staging Areas and ETWS

Northern has identified 30 staging areas, totaling 104.19 acres, that will be used for construction of the NL27 Project. The staging areas will impact primarily agricultural, industrial/commercial and open land. The staging areas are generally adjacent to TWS and ETWS and will be utilized by the contractor(s) for pipe and equipment storage, staging of crews, equipment parking, welding, and fabricating. Staging areas will either undergo full ROW topsoil removal, be overlain by timber mats, or be covered with rock underlain with geotextile fabric.

Northern has identified multiple ETWS areas along the pipeline routes, totaling 133.82 acres, that will be used for construction of the NL27 Project. The ETWS areas will impact primarily agricultural, industrial/commercial and open land and are generally adjacent to the TWS. These areas will be used to facilitate construction at waterbody/wetland crossings, road and railroad crossings, tie-in locations, points of inflection, equipment storage, and pipe stringing on the ROW. The size and land use impacts for the staging and ETWS areas for the NL27 Project are included in Appendix 8C.

8.1.6 NL27 Project Pipeline Extensions

The land disturbed by construction of the ten NL27 pipeline extensions includes a construction ROW for installation of the pipelines. These ROW widths will accommodate large equipment movement, pipe stringing, welding, trenching, and the separate storage of topsoil and subsoil.

The pipeline extensions will be installed utilizing a 25-foot offset from existing pipelines, where practicable. The proposed pipelines will be offset greater than 25 feet from the existing lines at multiple locations to optimize the pipeline design and to reduce environmental and landowner impacts. The deviations are required to reduce the potential for night-time construction by reducing the number of pull-back sections, reduce the potential for inadvertent returns during HDDs, and avoid residences, wooded areas, and wetlands. Table 8.1-7 summarizes the locations where the proposed pipelines will be more than 25 feet away from existing pipelines. Northern also provided the MP locations, length and minimum and maximum distance between the existing and proposed lines along with a justification for the offset. Table 8.1-7 below shows locations along the NL27 Project where installation would be more than 25 feet from the existing pipelines.

Table 8.1-7 NL27 Project Locations Where Installation Would be More than 25 Feet from the Existing Pipelines

Project Component	MP	Max Deviation Distance (feet)	Named Pipeline	Justification
Lake Mills M500 E-line	43.25-43.35	56	M500D	Pipeline takeoff and parallel a different line (M500J line)
	44.05-44.58	590	M500A	Avoidance of an environmentally sensitive area
Albert Lea M500 E-line	3.64- 4.12	775	M500C	Avoidance of the Chapa-kak-say-za WMA
	4.62-4.58	165	M500C	Deviation around environmental area
	5.05-5.59	165	M500C	Reduction of wetland impacts
	6.23-6.53	60	M500C	Avoid tree clearing
Willmar 3rd Branch Line Upstream	3.96-4.40	70	MNB75602	Avoid residential properties
	4.61-4.97	270	MNB75601	Avoid residential structures
Willmar 3rd Branch Line Downstream	8.24-8.41	205	MNB75601	Avoid tree clearing
	9.29-9.82	364	MNB75601	Avoid tree clearing
	9.94-11.15	1460	MNB75601	Avoid tree clearing and large wetland complexes
Welcome 2nd Line	NA	NA	Not applicable	Not applicable
Paynesville 2nd Branch Line	0.11-0.26	42	MNB59201	Reduce proximity to residential structures
	0.78-0.86	69	MNB59201	Cross Highway 23 closer to 90 degrees
	1.42-2.34	152	MNB59201	Avoid a gravel lot and to increase the HDD pull back
Worthington 2nd Branch Line	20.48-20.9	375	MNB7001	Avoid a cultural area
Springfield 2nd Branch Line	15.72-16.51	195	MNB83701	Improve HDD crossing angle for Butterfield Creek and crossing T74 at 90 degrees
	17.60-18.10	350	MNB83701	Avoid residential structure and cross Highway 27 at 90 degrees
	21.06-21.21	110	MNB83701	Tie into the proposed facility
Minnesota Interconnect 2nd Branch Line	18.13-18.45	300	MNB77501	To accommodate HDD to avoid tree clearing
	18.52-19.23	150	MNB77501	Avoidance of a new housing development
Alexandria 2nd Branch Line	17.48-18.08	360	MNB72901	To accommodate HDD to avoid tree clearing

Temporary disturbances include the pipeline construction corridor (TWS), ETWS, travel lanes, TAR, and staging areas. Permanent disturbances include the 50-foot-wide permanently maintained ROW centered on the new pipelines, and the operational footprints of the new launcher and valve settings and relocated receiver. Some of the permanently maintained ROW would be allowed to revert to preconstruction conditions (primarily agricultural use) following construction

Pursuant to U.S. Department of Transportation requirements, the pipelines will have a minimum of 30 to 36 inches of cover from the top of the pipeline to the natural ground surface in normal soil conditions and a minimum of 36 inches of cover in agricultural land. The pipeline will have a minimum of 48 inches of cover from the top of the pipeline to the natural ground surface in irrigated agricultural lands. Northern will follow the specifications in section IV.A.2 of the Plan regarding the width of construction ROW; all planned workspaces are currently depicted on the Project alignment sheets and aerial overview. Additional depth of cover to address landowner concerns (e.g., for agricultural lands) will be determined during the ROW negotiation process. At this time, Northern is not aware of any landowner concerns that would require extra construction ROW other than those workspaces depicted on the alignment sheets and aerials.

In total for the NL27 Project, construction of the ten pipeline extensions will affect approximately 562.83 acres of land. Approximately 157.48 acres will be required for permanent operational pipeline ROW. The temporary construction corridor, ETWS, staging areas, and TARs will be temporarily disturbed during construction of the three pipeline extensions but will be reclaimed and restored to preconstruction land cover after the completion of construction.

8.1.7 NL27 Project Aboveground Appurtenant Facilities and Hugo Compressor Station Uprate

The Project will require installation several new tie-in valve settings and receiver relocations along with a turbine uprate the Hugo compressor station. Northern will remove three existing facilities as part of the Project. The affected acreage for each of the aboveground appurtenant facilities and their associated PARs by existing land use type is detailed in Table 8.1-8 below. Facilities that are not being modified are not included in the table.

Table 8.1-8 NL27 Project Aboveground Appurtenant Facilities and Hugo Compressor Station

Facility Name	MP	Proposed Activity	Associated Project Component	Existing Land Use	Total Construction Acres ¹	Total Operational Acres ¹
Hugo compressor station (existing)	NA	Compressor uprate	Stand-alone component	Industrial/Commercial	4.53	4.53
Lake Mills tie-in valve setting	44.81	New valve setting ¹	Lake Mills M500 E-line	Agricultural 0.08	1.62 ²	1.62 ²
				Open Land 1.27		
				Residential 0.27		
Austin and Wells branch line regulation station ⁵	42.49	ETWS	Lake Mills M500 E-line	Industrial/Commercial	0.25	0.25
Albert Lea tie-in valve setting	7.06	New valve setting ¹	Albert Lea M500 E-line	Open Land	0.18	0.18

Facility Name	MP	Proposed Activity	Associated Project Component	Existing Land Use	Total Construction Acres ¹	Total Operational Acres ¹
Willmar 24-inch branch line-MNB75603-Receiver	N/A	Receiver will be relocated, facility will be removed	Willmar 3rd branch line upstream	Industrial/Commercial	0.40	0.00 ⁴
Willmar tie-in valve setting	3.35	To be removed	Willmar 3rd branch line upstream	Industrial/Commercial	0.23	0.00 ⁴
Credit River MN #1	5.13	Add relocated receiver to existing TBS	Willmar 3rd branch line upstream	Industrial/Commercial	0.98	0.98
MNB75603 Willmar D-line 24-inch extension receiver	6.38	Receiver will be relocated, no footprint mods	Willmar 3rd branch line downstream	Industrial/Commercial	0.30	0.30 ³
Willmar 3rd branch line downstream receiver	10.95	New facility, receiver ¹	Willmar 3rd branch line downstream	Agricultural 0.15	0.16	0.16
				Open Land 0.01		
Willmar 3rd branch line downstream tie-in valve setting	11.16	New valve setting ¹	Willmar 3rd branch line downstream	Agricultural 0.23	0.29	0.29
				Open Land 0.06		
Welcome south receiver and MAOP regulator	10.47	Belowground hot tap after the regulators (station piping)	Welcome 2nd line	Industrial/Commercial	0.77	0.00 ³
Welcome tie-valve setting	11.71	New valve setting ¹	Welcome 2nd line	Agricultural 0.10	0.12	0.12
				Open Land 0.02		
Dooley's #2	2.45	Existing TBS – tie-ins only	Paynesville 2nd branch line	Industrial/Commercial	0.29	0.00 ³
Paynesville tie-in valve setting	0.00	New valve setting ¹	Paynesville 2nd branch line	Industrial/Commercial 0.07	0.14	0.14
				Open Land 0.07		
Lakefield Tie-Over Regulating Station	19.34	Relocate receiver, no footprint mods	Worthington 2nd branch line	Industrial/Commercial	0.19	0.00 ³
Worthington 2nd line MNB87002 Receiver	21.51	New facility with relocated receiver ¹	Worthington 2nd branch line	Agricultural 0.29	0.41	0.41
				Industrial/Commercial 0.03		
				Open Land 0.09		

Facility Name	MP	Proposed Activity	Associated Project Component	Existing Land Use	Total Construction Acres ¹	Total Operational Acres ¹
Springfield 2nd branch line terminus valve setting	13.82	To be removed	Springfield 2nd branch line	Industrial/Commercial	0.01	0.00 ⁴
Springfield 2nd branch line downstream RMV	19.90	New facility with RMV ¹	Springfield 2nd branch line	Agricultural 0.12	0.15	0.15
				Open Land 0.03		
Springfield 2nd branch line tie-in valve setting	21.22	Expanded block valve setting -new tie-in valve setting	Springfield 2nd branch line ¹	Agricultural 0.10	0.14	0.14
				Open Land 0.04		
MIC block valve tie-in setting	17.64	Existing block valve setting – tie-in will be removed	Minnesota Interconnect 2nd branch line	Industrial/Commercial	0.01	0.00 ³
MIC tie-in valve setting	19.23	New valve setting ¹	Minnesota Interconnect 2nd branch line	Agricultural 0.05	0.16	0.16
				Open Land 0.11		
Alexandria 2nd branch line terminus valve setting	16.80	To be removed ⁴	Alexandria 2nd branch line	Industrial/Commercial	0.04	0.00
Alexandria 2nd branch line tie-in valve setting	18.08	New valve setting ¹	Alexandria 2nd branch line	Agricultural 0.19	0.26	0.26
				Industrial/Commercial 0.05		
				Open Land 0.02		
NL27 Project Total					11.63	9.14

¹ Includes permanent access roads(s)

² Includes 1.56 acres of existing residential driveway

³ Facility not needed for operation of NL27 Project

⁴ Facility will be removed as part of NL27 Project and facility easement released

⁵ Austin and Wells branch line regulation station is counted in both Project footprints.

Additional details on the purpose for each aboveground appurtenant facility for the Project are described in Resource Report 1, Table 1.3-4.

8.1.8 Land Use Impact Mitigation

Construction of both Projects will result in temporary and permanent impacts on the lands that it crosses. To reduce these impacts, Northern will restore lands affected by both Project construction and perform appropriate reclamation in accordance with the Plan and its Procedures. In doing so, impacts on existing land use caused by the construction, operation and maintenance of the Projects will either be temporary or confined to the permanent 50-foot-wide ROW. The majority of the permanent ROW will be allowed to revert to original land use (e.g., agricultural land). However, portions of the vegetated permanent ROW will be maintained following construction. In wetlands,

the permanent impact will be limited to a 10-foot-wide corridor centered over the pipelines. These facilities are sited in a way that is compatible, to the extent possible, with any existing regulations, plans and standards for the county where they are located.

Temporary impacts on land use include clearing new ROWs, expanding existing ROWs and short-term construction impacts on land uses. Impacts are considered short term if, after one to five growing seasons, the revegetated disturbed areas resemble adjacent undisturbed lands. Areas within both Project footprints with vegetation types that have the potential for revegetation within one to five growing seasons include agricultural, forested, wetland, open land, residential, and industrial/commercial.

8.2 RESIDENTIAL AREAS

8.2.1 Planned Residential and Commercial Areas

V2F Project

To determine reasonably foreseeable actions, Northern consulted with Dakota, Freeborn and Steele counties, Minnesota, and Hancock and Worth counties, Iowa, to identify planned developments within 0.25 mile of the Project. As part of Northern’s consultations with the above-referenced agencies, Northern requested information to identify other reasonably foreseeable actions within the Hydrologic Unit Code 12 watersheds and within a one-mile radius of the disconnect sites and pipeline. Furthermore, Northern reviewed past and reasonably foreseeable projects that have been or would be completed under its existing blanket certificates and that fall within the geographic scopes listed in Resource Report 1, Table 1.11-1. Outreach to local town and county planners and administrators identified no defined projects in the foreseeable future that would occur with the geographic scopes listed in Table 1.11-1 and that should be considered with respect to cumulative impacts. Resource Report 1, Table 1.11-2 quantifies the total acreage of overlap in each resource-specific geographic scope for the Project cumulative effects analysis. Copies of agency correspondence are included in Resource Report 1, Appendix 1E.

NL27 Project

To determine reasonably foreseeable actions, Northern consulted with Freeborn, Steele, Scott, Carver, Martin, Stearns, Jackson, Watonwan, Isanti, Morrison, and Washington counties, Minnesota to identify planned developments within 0.25-mile of the NL27 Project. As part of Northern’s consultations with the above-referenced agencies, Northern requested information to identify other reasonably foreseeable actions within the Hydrologic Unit Code 12 watersheds and within a 1-mile radius of the disconnect sites and pipeline. Furthermore, Northern reviewed past and reasonably foreseeable projects that have been or would be completed under its existing blanket certificates and that fall within the geographic scopes listed in Resource Report 1, Table 1.11-1. Copies of agency correspondence are included in Resource Report 1, Appendix 1E.

The Jackson County Land Management group identified one potential project referred to as the Three Waters Wind Energy Project which is located less than one mile from a portion of the Worthington 2nd branch line. The Freeborn County Highway Department also is planning to repave a highway crossed by the Lake Mills M500 E-line component in 2028, after construction is complete.

To date, outreach to local town and county planners and administrators identified no other defined projects in the foreseeable future that would occur with the geographic scopes listed in Table 1.11-1 and that should be considered with respect to cumulative impacts. Resource Report 1, Table 1.11-2 quantifies the total acreage of overlap in each resource-specific geographic scope for the Project cumulative effects analysis.

8.2.2 Existing Residences and Buildings

V2F Project

No residences or buildings are located within 25 feet of the proposed V2F Project pipeline, aboveground facilities or temporary construction workspaces.

NL27 Project

Northern reviewed each of the NL27 Project sites for potential existing buildings and residences located within 25 feet of the current proposed alignments. Details of these locations along with other structures within 25 feet of workspace for the Project are described in Table 8.2-1.

Table 8.2-1 Residential Buildings Within 25 Feet of NL27 Project Workspaces

Building Type	MP	Workspace Type	Distance from Workspace (feet)	Direction from Workspace
Willmar 3rd Branch Line Upstream				
Ag Building - Silo	3.40	WIL-ETWS-001	10	Edge
Outbuilding	4.00	WIL TWS	11	South
Outbuilding	4.30	WIL-ETWS-010	21	North
Outbuilding	4.85	WIL TWS/Travel Lane	8	North
Willmar 3rd Branch Line Downstream				
Home	10.20	WDC-TAR-009	18	Southeast
Paynesville 2nd Branch Line				
Ag building - Barn	0.18	PAY-TWS	25	North
Ag building	0.23	PAY TWS	21	North
Ag building	0.23	PAY TWS	7	North
Ag Building	0.64	PAY TWS	7	Southeast
Springfield 2nd Branch Line				
Outbuilding	17.20	SPR-TAR-003	1	North

No other residences, buildings or structures are located within 25 feet of the proposed NL27 Project workspaces. The site-specific residential construction plan for the home within 25 feet of construction workspaces is included in Figure 8-2.

Northern will minimize impacts on the above-described residential buildings by implementing the following measures.

- Notify landowners ten days in advance of construction by phone call and certified mailing
- Vehicle speeds will be restricted on the ROW to ten miles per hour in the vicinity of the residences.
- The edge of the construction workspace will be fenced with safety fencing extending a minimum of 100 feet either side of the residence. Fencing will remain in place until final cleanup is complete;
- The construction workspace will be regularly watered to control fugitive dust emissions;
- Residential access will not be impacted and will be unrestricted throughout construction;
- Residential utilities will be located prior to construction and all utility services will be maintained throughout construction;
- Topsoil will be segregated from areas to be excavated or graded and stockpiled for redistribution during restoration;
- No mature trees or landscaping will be removed from within the edge of the construction workspace unless necessary for the safe operation of construction equipment or as specified in landowner agreement.
- All lawn and landscape areas will be restored in the construction workspace immediately after cleanup operations, or as specified in landowner agreements, consistent with the requirements of the Plan.

8.3 PUBLIC LAND, RECREATION, AND OTHER DESIGNATED AREAS

Recreation and special land use generally include: federal, state or county/city parks and forests; conservation lands; WMA; hunting management areas; natural landmarks; scenic byways; designated trails; recreational rivers; and campgrounds. A search for these and other designated areas and sensitive receptors including churches, schools, cemeteries, and hospitals was conducted within 0.25 mile of the Projects.

8.3.1 Public, Recreation or Conservation Lands

V2F Project

The MDNR manages the approximate 20.62 acres of the Chapa-Kak-Say-Za WMA, which is located 0.14 mile north of the Albert Lea M500 E-line in Steele County. The WMA is outside the Project area and will not be impacted by construction activities.

No other special or unique scenic features were identified in the V2F Project areas, nor are there any designated scenic areas or viewsheds.

Construction activities will be relatively short term, and long-term changes will be relatively minor. Visual impacts with respect to cultural resources are discussed in more detail in Resource Report 4.

NL27 Project

The MDNR Chapa-Kak-Say-Za WMA in Steele County, is also located adjacent to the south end of the Albert Lea M500 E-line, however the WMA will not be impacted by construction or operational activities.

The Willmar 3rd branch line upstream crosses Credit River in Scott County and the Springfield 2nd branch line crosses the Watonwan River in Watonwan County. Both rivers are used for recreational activities; however, impacts to the rivers will be avoided using HDD.

Rice Lake is a recreational lake located approximately 0.16-mile north of the Willmar 3rd branch line downstream in Carver County; the lake is outside the Project area and will not be impacted by construction or operational activities.

Big Lake is a recreational lake located approximately 0.30-mile south of the Paynesville 2nd branch line in Stearns County. The lake is outside the Project area and will not be impacted by construction or operational activities.

The Husen State WMA is located approximately 0.30-mile south of the Worthington 2nd branch line in Jackson County. The WMA is outside the Project area and will not be impacted by construction or operational activities.

The Springvale County (Disc Golf) Park is located approximately 0.20-mile northwest of the Minnesota Interconnect 2nd branch line in Isanti County. The disc golf park is outside the Project area and will not be impacted by construction or operational activities.

No other special or unique scenic features occur within the NL27 Project areas, nor are there any designated scenic areas or viewsheds.

8.3.2 Other Designated Areas

On the V2F Project, the Farmington Lutheran Cemetery is located approximately 0.25-mile west of the Faribault M500 D-line in Dakota County; however, it will not be impacted by construction or operational activities.

No other churches, schools, cemeteries, or hospitals are located within 0.25-mile of the V2F Project or NL27 Projects. The Projects do not cross any areas used as landfills, hazardous waste sites or quarries.

8.3.3 Impacts and Mitigation

Construction of both Projects will alter visual aesthetics by removing existing vegetation and disturbing soils. Construction activities may temporarily disrupt recreational access and use of these areas primarily as a result of construction-related traffic. Construction also will generate dust and noise that may be a nuisance to recreational users. Noise and air impacts and mitigation for the Projects are discussed in more detail in Resource Report 9. Construction may also interfere with, or diminish, the quality of the recreational experience by affecting wildlife movements.

Resource Report 1 describes special construction techniques that will be implemented during construction of both Projects. In addition, implementation of the various Project-specific plans will assist in mitigating potential impacts. Impacts will be short term and limited to the period of active construction. Following construction, Northern will conduct post-construction reclamation of the ROW to preconstruction conditions.

8.4 VISUAL RESOURCES

Private lands crossed by both Projects are not subject to federal or state visual management standards. Visual resources on private lands are a function of geology, climate and historical processes, and are influenced by topographic relief, vegetation, water, wildlife, land use, human uses, and development. The topography of the areas affected by both Projects is generally flat with rural and residential developments, numerous roadways, and utility ROWs and facilities.

For both Projects, Northern either owns, holds easements, will obtain easements, or will have temporary agreements in-place with landowners for the use of Project workspaces and new aboveground facilities. The Project will affect private landowners except at road crossings, which are owned and managed by the state or county. No tribally owned or reservation land will be crossed or affected by the Project. Northern has confirmed that the land from MP 101.62 to MP 102.18 on the V2F Project is currently enrolled in the Conservation Reserve Program.

A list of affected landowners is provided in Resource Report 1, Appendix 1C and is labeled “**CUI//PRIV – DO NOT RELEASE.**”

8.4.1 Pipelines

Temporary visual impacts associated with the construction phase of both Projects will be primarily limited to areas requiring extra workspaces. Visual impacts associated with both Projects include the removal of existing vegetation and the exposure of bare soils within construction workspaces, as well as grading, trenching and equipment storage. Visual impacts due to construction are considered temporary for underground pipeline once the land has reverted to its original uses.

Northern proposes to use a standard construction ROW. Construction in flat, open terrains will temporarily disrupt and dominate the foreground and middle ground views with the introduction of equipment, materials, trenches, and spoil piles.

Construction and operation of the pipelines will cause temporary visual impacts; however, it will not result in any long-term impacts. To minimize impacts on visual resources, Northern aligned the proposed pipeline routes, where feasible, adjacent to existing pipeline and road ROW. Northern also attempted to align the pipeline to avoid aesthetic features to the extent possible.

8.4.2 Aboveground Appurtenant Facilities

V2F Project

Northern will install two new block valves inside two existing facilities, Conger MN #1 and the E-Line to D-Line regulator station. As none of the new equipment will be over eight feet in height and no new facilities or facility expansion is required, minimal permanent visual impacts will occur in the vicinity of the Project.

NL27 Project

All ten of the pipeline extensions consist largely of buried pipeline. Based on the location and height (less than eight feet) of the new aboveground appurtenant facilities and receivers to be relocated, minimal permanent visual impacts will occur in the vicinity of the pipeline extensions.

Northern will complete minor aboveground facility modifications within its existing Hugo compressor station facility; however, as Northern is replacing an existing turbine inside a building and visual screening is in place, no visual impacts will occur.

8.5 APPLICATION FOR RIGHTS OF WAY AND OTHER LAND USES

Neither of the Projects cross federal or state-owned or managed land. Therefore, no applications for ROWs or other proposed land use from federal land-managing agencies will be needed to complete the Projects.

8.6 REFERENCES

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Resource Report 8

Figures

Figure 8-1
County Drainage Systems on V2F Project

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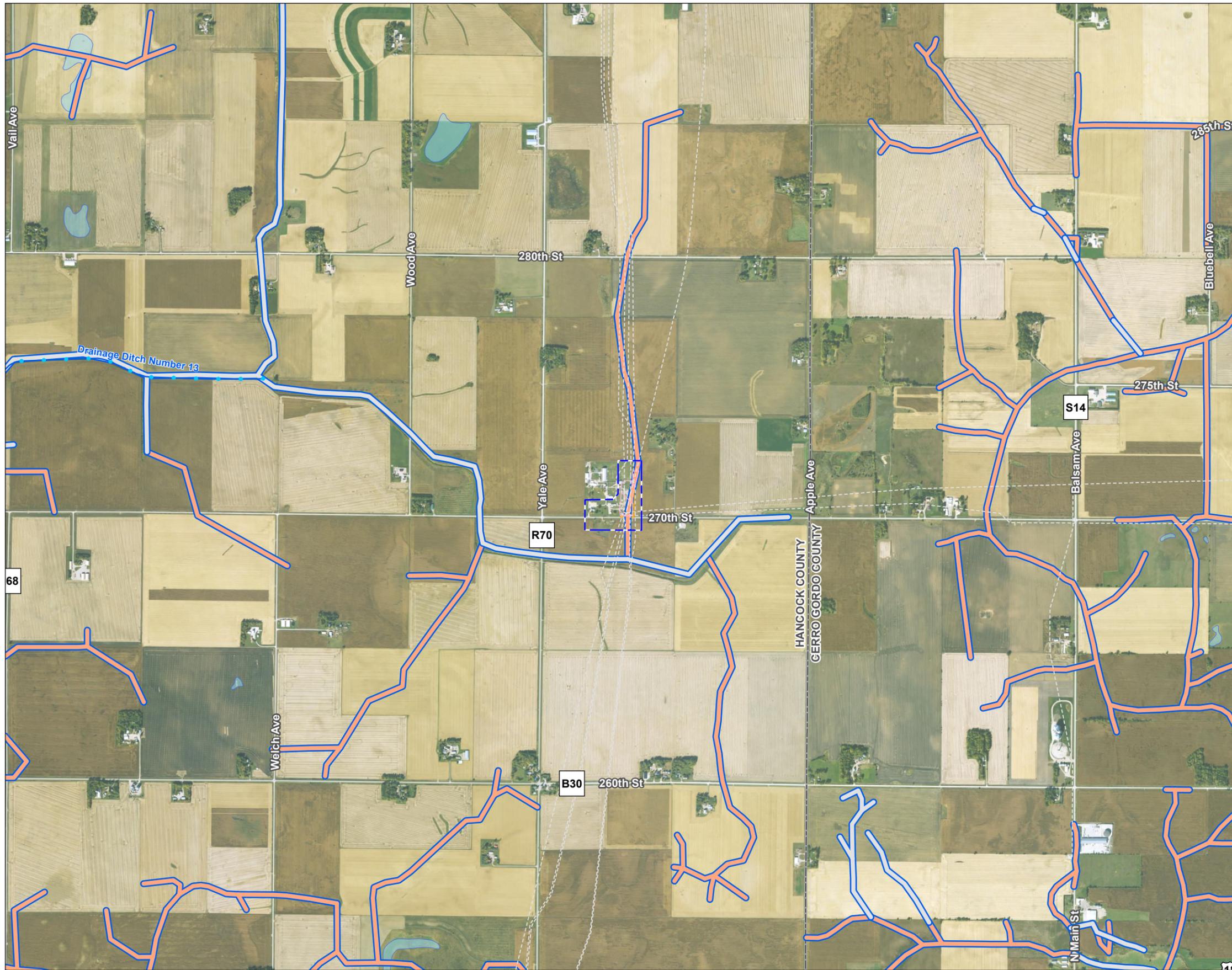


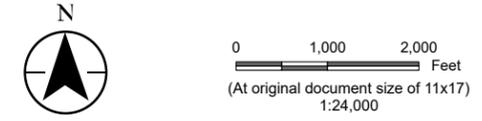
Figure No.
8-1

Title
**County Drainage Systems
V2F - Disconnect Site Ventura Compressor Station**

Client/Project
Northern Natural Gas
Ventura to Farmington A-Line Abandonment & Capacity Replacement Project

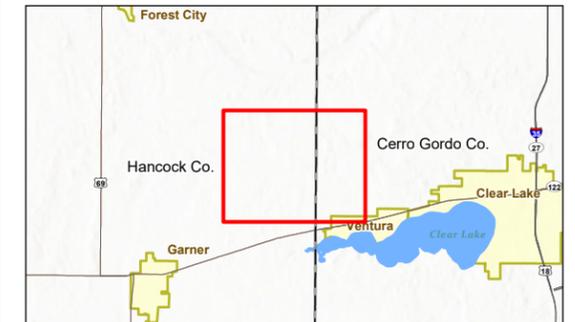
Project Location
Hancock County, Iowa

17260813
Prepared by JM on 2025-10-06
TR by JL on 2025-10-27
IR by SK on 2026-01-28



- Legend
- Environmental Survey Boundary
 - Extra Temporary Workspace
 - Temporary Access Road
 - Existing Pipeline
 - Drainage Centerline (Iowa WNDR)
 - Open/Other
 - Tile (Assumed)
 - Drainage Centerline (Minnesota DNR)
 - Open
 - Tile
 - National Hydrography Dataset
 - Canal/Ditch
 - Waterbody

Note: No digital drainage data available for Steele & Dakota Co. (MN)



- Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, NNG, Esri, USCB, USGS, IA DNR, MN DNR
 3. Background: 2023 NAIP

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

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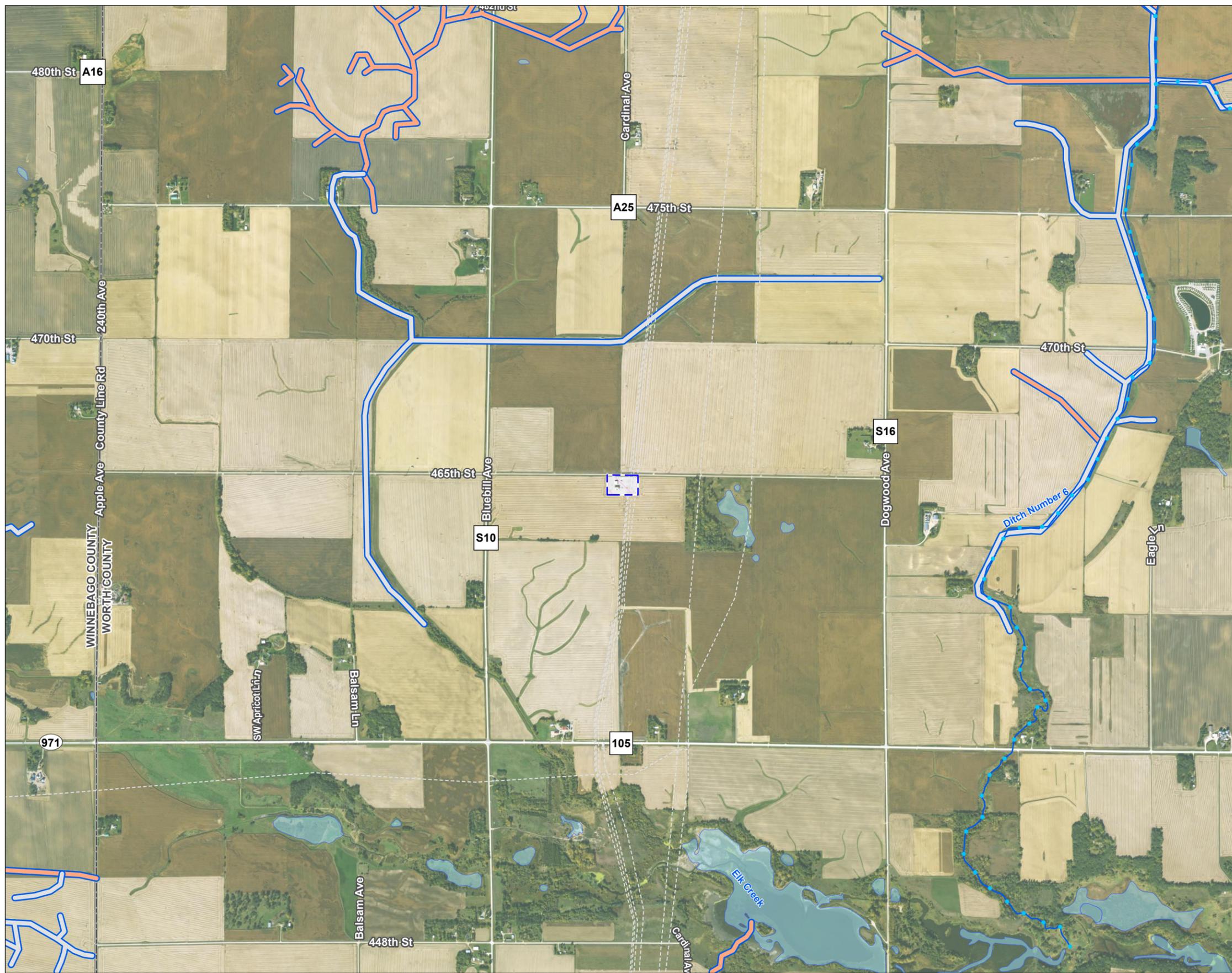


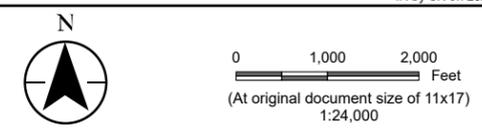
Figure No.
8-1

Title
**County Drainage Systems
V2F - Temporary Compression Site Lake Mills
Compressor Station**

Client/Project
Northern Natural Gas
Ventura to Farmington A-Line Abandonment & Capacity
Replacement Project

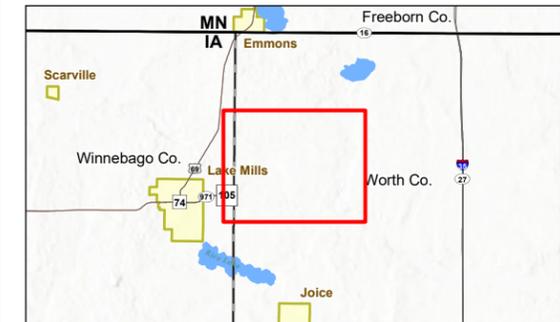
Project Location
Worth County, Iowa

Prepared by JM on 2025-10-06
TR by JL on 2025-10-27
IR by SK on 2026-01-28



- Legend
- Environmental Survey Boundary
 - Extra Temporary Workspace
 - Existing Pipeline
 - Drainage Centerline (Iowa WNRD)
 - Open/Other
 - Tile (Assumed)
 - Drainage Centerline (Minnesota DNR)
 - Open
 - Tile
 - National Hydrography Dataset
 - Canal/Ditch
 - Waterbody

Note: No digital drainage data available for Steele & Dakota Co. (MN)



- Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, NNG, Esri, USCB, USGS, IA DNR, MN DNR
 3. Background: 2023 NAIP

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Figure No.

8-1

Title
**County Drainage Systems
V2F - Lake Mills M500 E-Line**

Client/Project Northern Natural Gas 17260813
Ventura to Farmington A-Line Abandonment & Capacity Replacement Project

Project Location Freeborn County, Minnesota Prepared by JM on 2025-10-06
TR by JL on 2025-10-27
IR by SK on 2026-01-28



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Legend

- Environmental Survey Boundary
- Existing Lot
- Existing Access Road
- Temporary Workspace
- Extra Temporary Workspace
- Staging Area
- Temporary Access Road
- Proposed Pipeline
- Existing Pipeline
- Mile Post
- HDD
- Drainage Centerline (Iowa WNDR)
 - Open/Other
 - Tile (Assumed)
- Drainage Centerline (Minnesota DNR)
 - Open
 - Tile
- National Hydrography Dataset
 - Canal/Ditch
 - Waterbody

Note: No digital drainage data available for Steele & Dakota Co. (MN)



- Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, NNG, Esri, USCB, USGS, IA DNR, MN DNR
 3. Background: 2023 NAIP



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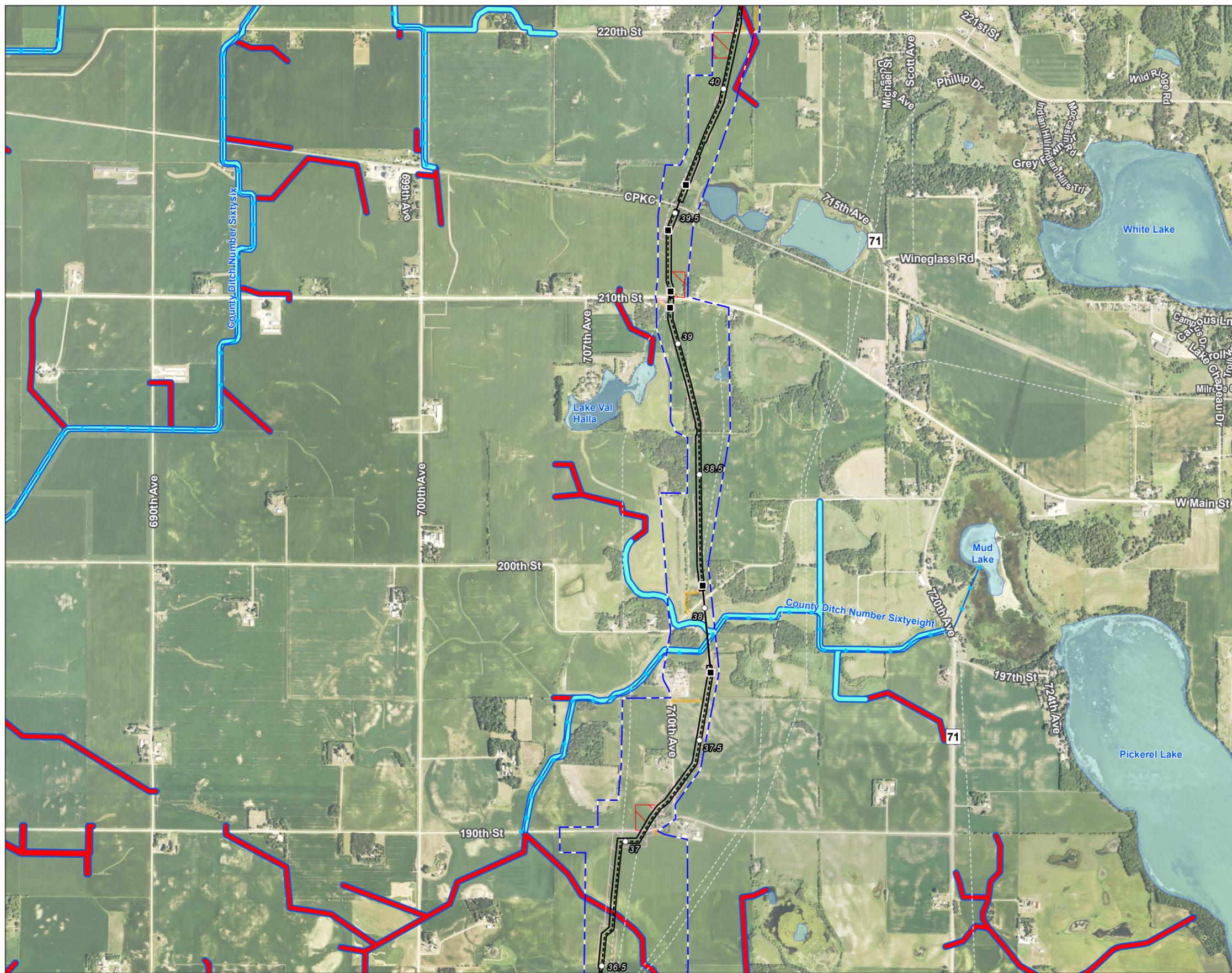


Figure No.

8-1

Title
County Drainage Systems
V2F - Lake Mills M500 E-Line

Client/Project
 Northern Natural Gas
 Ventura to Farmington A-Line Abandonment & Capacity
 Replacement Project

172608813

Project Location
 Freeborn County, Minnesota

Prepared by JM on 2025-10-06
 TR by JL on 2025-10-27
 IR by SK on 2026-01-28



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Legend

- Environmental Survey Boundary
- Temporary Workspace
- Extra Temporary Workspace
- Staging Area
- Temporary Access Road
- Proposed Pipeline
- Existing Pipeline
- Mile Post
- HDD
- Drainage Centerline (Iowa WNDR)**
- Open/Other
- Tile (Assumed)
- Drainage Centerline (Minnesota DNR)**
- Open
- Tile
- National Hydrography Dataset**
- Canal/Ditch
- Waterbody

Note: No digital drainage data available for Steele & Dakota Co. (MN)



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, NNG, Esri, USCB, USGS, IA DNR, MN DNR
 3. Background: 2023 NAIP



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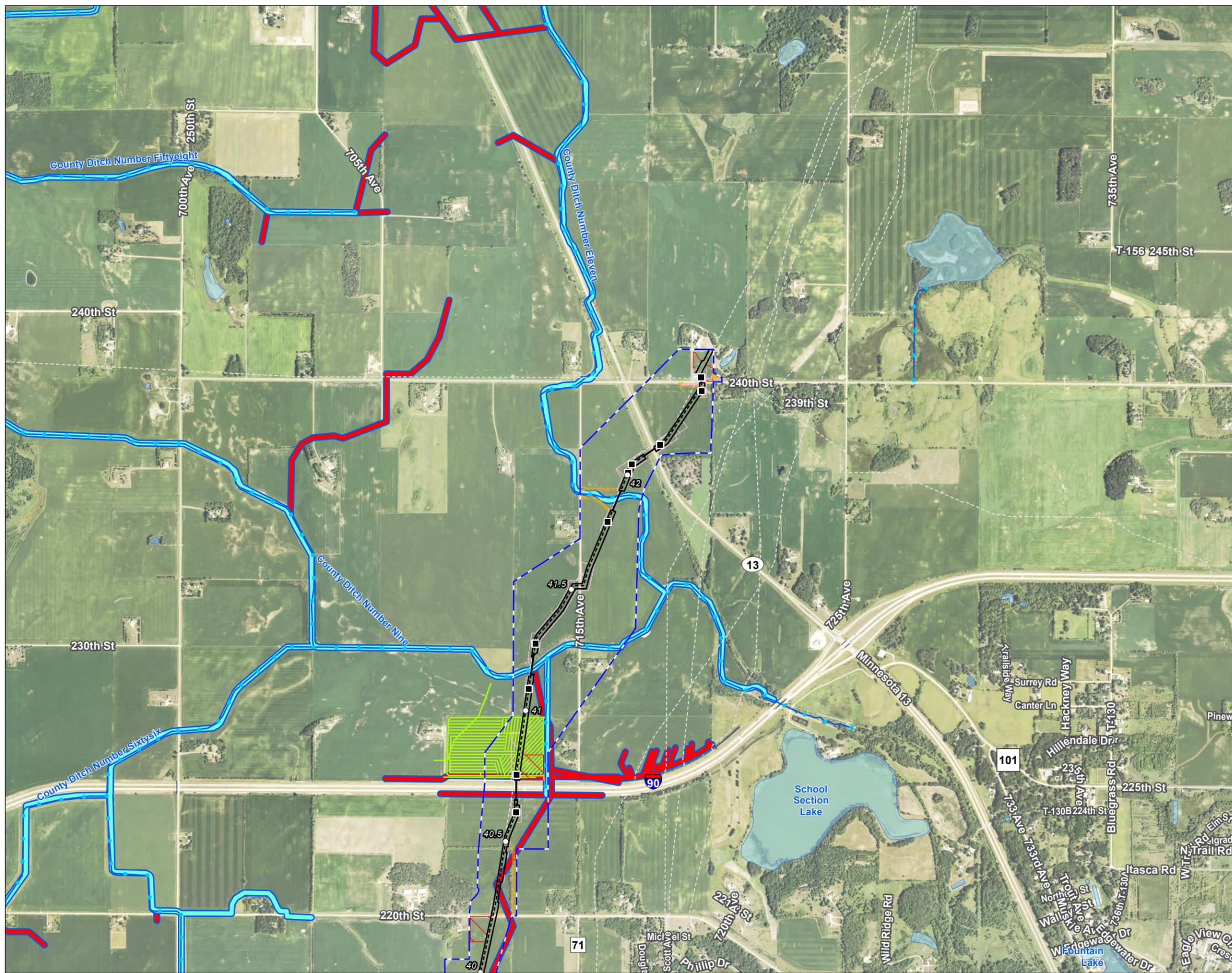


Figure No.

8-1

Title
County Drainage Systems
V2F - Lake Mills M500 E-Line

Client/Project
Northern Natural Gas
Ventura to Farmington A-Line Abandonment & Capacity
Replacement Project

17260813

Project Location
Freeborn County, Minnesota

Prepared by JM on 2025-10-06
TR by JL on 2025-10-27
IR by SK on 2026-01-28



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Legend

- Environmental Survey Boundary
- Existing Lot
- Temporary Workspace
- Extra Temporary Workspace
- Staging Area
- Temporary Access Road
- Proposed Pipeline
- Existing Pipeline
- Mile Post
- HDD
- Drain Tile
- Drainage Centerline (Iowa WNDR)**
- Open/Other
- Tile (Assumed)
- Drainage Centerline (Minnesota DNR)**
- Open
- Tile
- National Hydrography Dataset**
- Canal/Ditch
- Waterbody

Note: No digital drainage data available for Steele & Dakota Co. (MN)



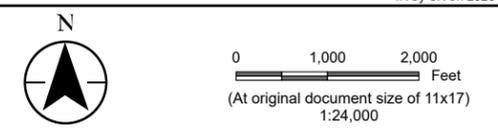
- Notes**
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, NNG, Esri, USCB, USGS, IA DNR, MN DNR
 3. Background: 2023 NAIP



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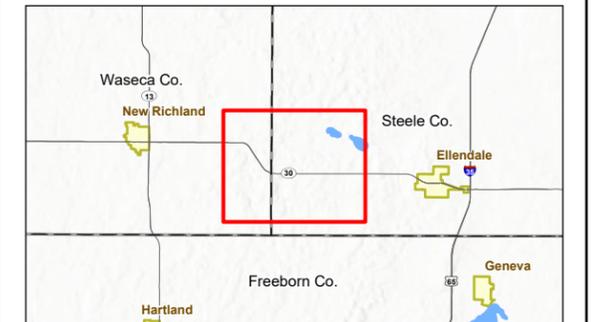


Figure No. **8-1**
 Title **County Drainage Systems V2F - Albert Lea M500 E-Line**
 Client/Project Northern Natural Gas 17260813
 Ventura to Farmington A-Line Abandonment & Capacity Replacement Project
 Project Location Steele County, Minnesota Prepared by JM on 2025-10-06
 TR by JL on 2025-10-27
 IR by SK on 2026-01-28



- Legend**
- Environmental Survey Boundary
 - Temporary Workspace
 - Extra Temporary Workspace
 - Staging Area
 - Temporary Access Road
 - Proposed Pipeline
 - Existing Pipeline
 - Mile Post
 - HDD
 - Drainage Centerline (Iowa WNDR)**
 - Open/Other
 - Tile (Assumed)
 - Drainage Centerline (Minnesota DNR)**
 - Open
 - Tile
 - National Hydrography Dataset**
 - Canal/Ditch
 - Waterbody

Note: No digital drainage data available for Steele & Dakota Co. (MN)



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, NNG, Esri, USCB, USGS, IA DNR, MN DNR
 3. Background: 2023 NAIP

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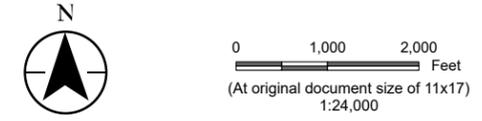


Figure No. 8-1

County Drainage Systems
V2F - Temporary Compression Site Owatonna
Compressor Station

Client/Project Northern Natural Gas
Ventura to Farmington A-Line Abandonment & Capacity Replacement Project

Project Location Steele County, Minnesota Prepared by JM on 2025-10-06
TR by JL on 2025-10-27
IR by SK on 2026-01-28



- Legend**
- Environmental Survey Boundary
 - Extra Temporary Workspace
 - Temporary Access Road
 - Existing Pipeline
 - Drainage Centerline (Iowa WNDR)**
 - Open/Other
 - Tile (Assumed)
 - Drainage Centerline (Minnesota DNR)**
 - Open
 - Tile
 - National Hydrography Dataset**
 - Canal/Ditch
 - Waterbody

Note: No digital drainage data available for Steele & Dakota Co. (MN)



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, NNG, Esri, USCB, USGS, IA DNR, MN DNR
 3. Background: 2023 NAIP

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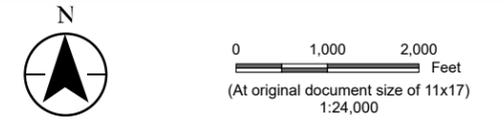


Figure No. 8-1

**County Drainage Systems
V2F - Temporary Compression Site Northfield #1**

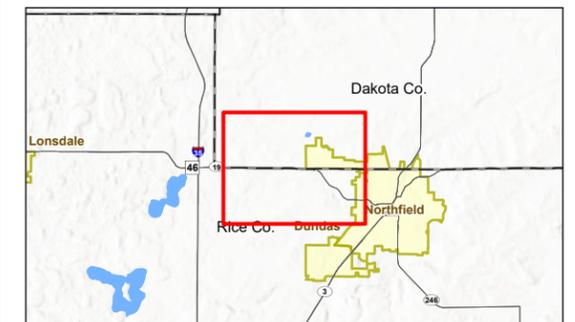
Client/Project Northern Natural Gas 172608813
Ventura to Farmington A-Line Abandonment & Capacity Replacement Project

Project Location Dakota County, Minnesota Prepared by JM on 2025-10-06
TR by JL on 2025-10-27
IR by SK on 2026-01-28



- Legend**
- Environmental Survey Boundary
 - Existing Lot
 - Existing Access Road
 - Extra Temporary Workspace
 - Temporary Access Road
 - Existing Pipeline
 - Drainage Centerline (Iowa WNDR)**
 - Open/Other
 - Tile (Assumed)
 - Drainage Centerline (Minnesota DNR)**
 - Open
 - Tile
 - National Hydrography Dataset**
 - Canal/Ditch
 - Waterbody

Note: No digital drainage data available for Steele & Dakota Co. (MN)



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, NNG, Esri, USCB, USGS, IA DNR, MN DNR
 3. Background: 2023 NAIP



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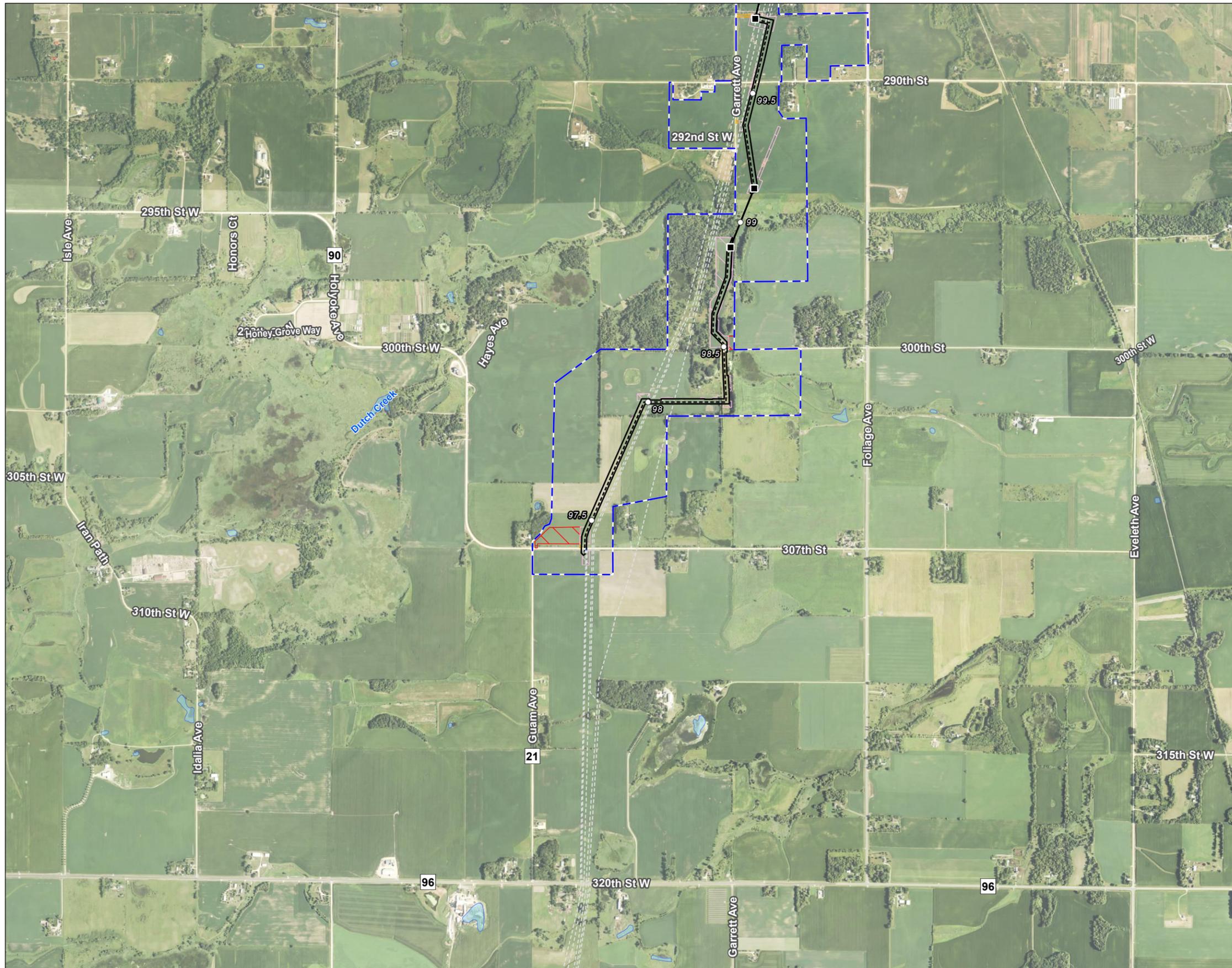
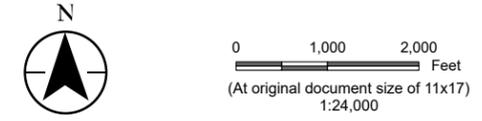


Figure No. **8-1**

**County Drainage Systems
V2F - Faribault M500 D-Line**

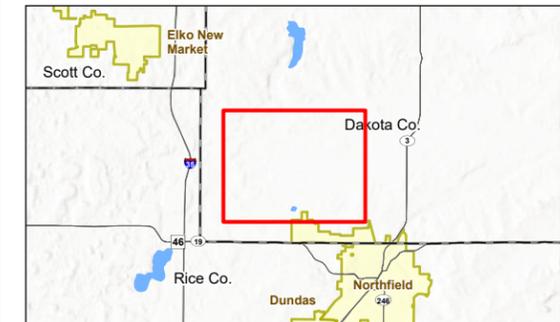
Client/Project: Northern Natural Gas
Ventura to Farmington A-Line Abandonment & Capacity Replacement Project

Project Location: Dakota County, Minnesota
Prepared by JM on 2025-10-06
TR by JL on 2025-10-27
IR by SK on 2026-01-28



- Legend**
- Environmental Survey Boundary
 - Existing Lot
 - Existing Access Road
 - Temporary Workspace
 - Extra Temporary Workspace
 - Staging Area
 - Temporary Access Road
 - Proposed Pipeline
 - Existing Pipeline
 - Mile Post
 - HDD
- Drainage Centerline (Iowa WNDR)**
- Open/Other
 - Tile (Assumed)
- Drainage Centerline (Minnesota DNR)**
- Open
 - Tile
- National Hydrography Dataset**
- Canal/Ditch
 - Waterbody

Note: No digital drainage data available for Steele & Dakota Co. (MN)



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, NNG, Esri, USCB, USGS, IA DNR, MN DNR
 3. Background: 2023 NAIP

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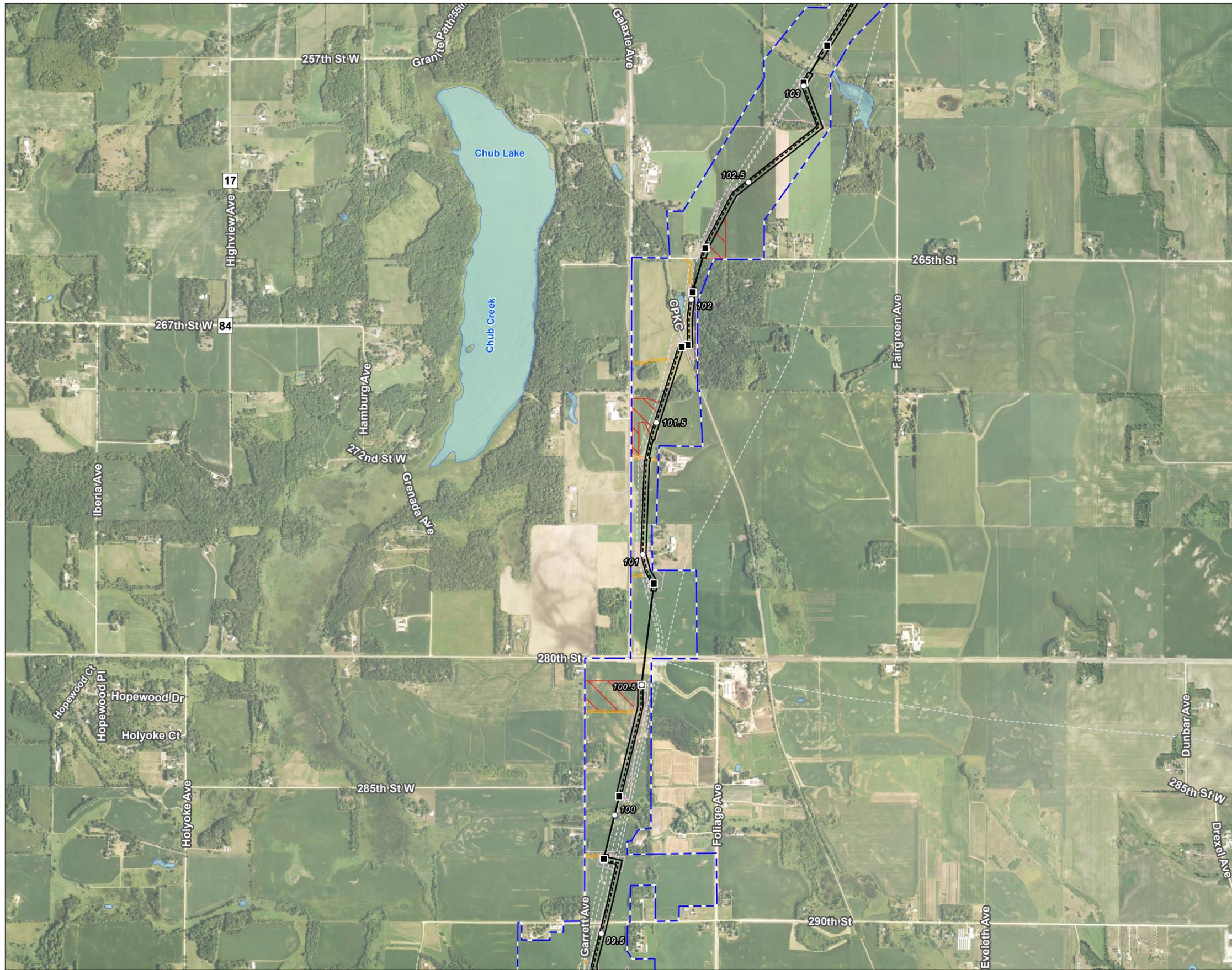
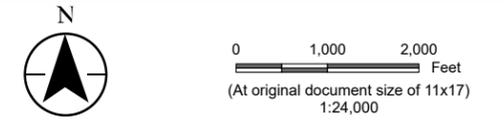


Figure No. 8-1

**County Drainage Systems
V2F - Faribault M500 D-Line**

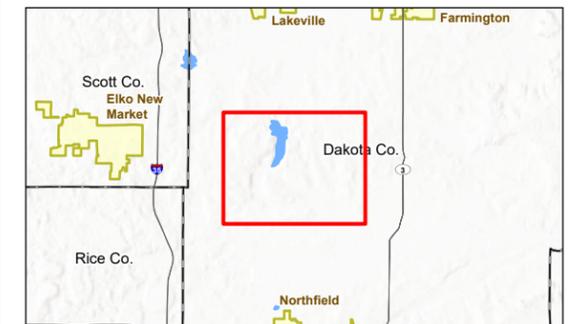
Client/Project Northern Natural Gas 17260813
Ventura to Farmington A-Line Abandonment & Capacity Replacement Project

Project Location Dakota County, Minnesota Prepared by JM on 2025-10-06
TR by JL on 2025-10-27
IR by SK on 2026-01-28



- Legend**
- Environmental Survey Boundary
 - Existing Lot
 - Temporary Workspace
 - Extra Temporary Workspace
 - Staging Area
 - Temporary Access Road
 - Proposed Pipeline
 - Existing Pipeline
 - Mile Post
 - HDD
- Drainage Centerline (Iowa WNRD)**
- Open/Other
 - Tile (Assumed)
- Drainage Centerline (Minnesota DNR)**
- Open
 - Tile
- National Hydrography Dataset**
- Canal/Ditch
 - Waterbody

Note: No digital drainage data available for Steele & Dakota Co. (MN)



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, NNG, Esri, USCB, USGS, IA DNR, MN DNR
 3. Background: 2023 NAIP

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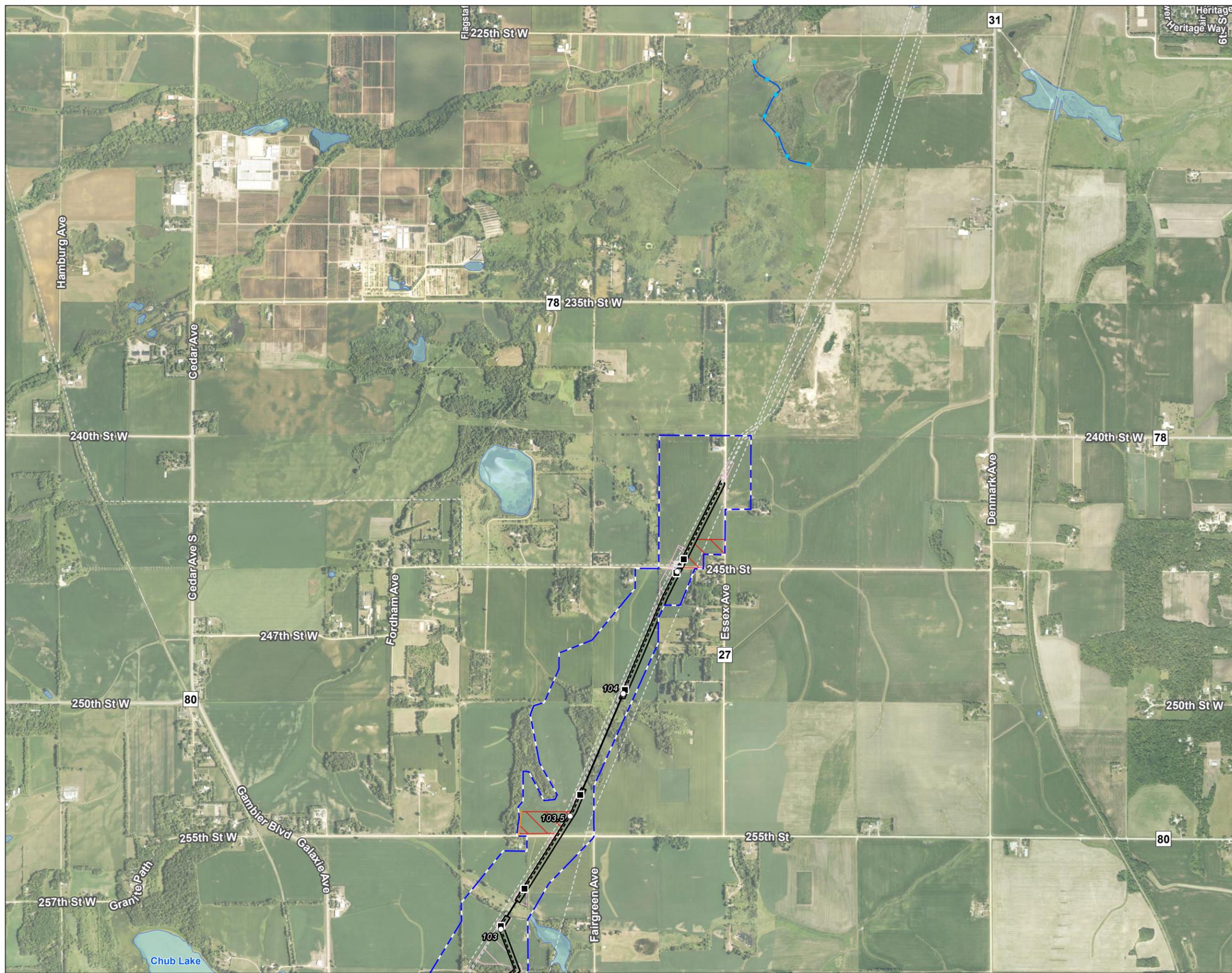
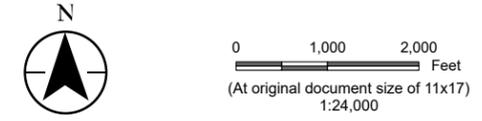


Figure No. **8-1**
Title
County Drainage Systems
V2F - Faribault M500 D-Line

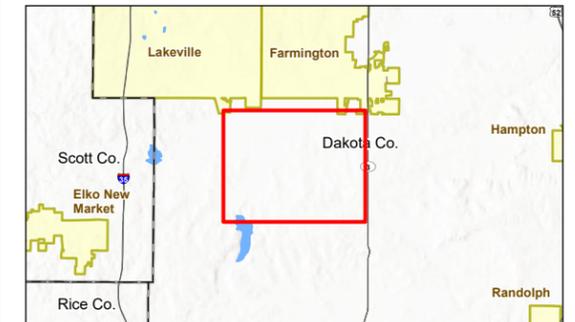
Client/Project Northern Natural Gas 172608813
 Ventura to Farmington A-Line Abandonment & Capacity Replacement Project

Project Location Dakota County, Minnesota Prepared by JM on 2025-10-06
 TR by JL on 2025-10-27
 IR by SK on 2026-01-28



- Legend**
- Environmental Survey Boundary
 - Existing Lot
 - Existing Access Road
 - Temporary Workspace
 - Extra Temporary Workspace
 - Staging Area
 - Temporary Access Road
 - Proposed Pipeline
 - Existing Pipeline
 - Mile Post
 - HDD
- Drainage Centerline (Iowa WNDR)**
- Open/Other
 - Tile (Assumed)
- Drainage Centerline (Minnesota DNR)**
- Open
 - Tile
- National Hydrography Dataset**
- Canal/Ditch
 - Waterbody

Note: No digital drainage data available for Steele & Dakota Co. (MN)



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, NNG, Esri, USCB, USGS, IA DNR, MN DNR
 3. Background: 2023 NAIP

Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

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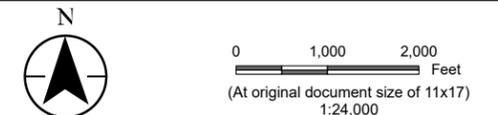
Figure No. **8-1**

Title
**County Drainage Systems
 V2F - Disconnect Site for A-Line Abandonment
 Farmington Compressor Station**

Client/Project
 Northern Natural Gas
 Ventura to Farmington A-Line Abandonment & Capacity
 Replacement Project

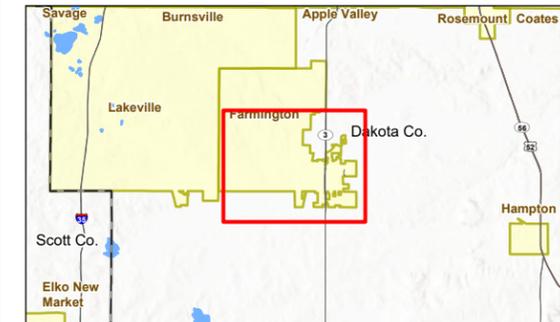
Project Location
 Dakota County, Minnesota

Prepared by JM on 2025-10-06
 TR by JL on 2025-10-27
 IR by SK on 2026-01-28



- Legend
- Environmental Survey Boundary
 - Extra Temporary Workspace
 - Temporary Access Road
 - Existing Pipeline
 - Drainage Centerline (Iowa WNDR)
 - Open/Other
 - Tile (Assumed)
 - Drainage Centerline (Minnesota DNR)
 - Open
 - Tile
 - National Hydrography Dataset
 - Canal/Ditch
 - Waterbody

Note: No digital drainage data available for Steele & Dakota Co. (MN)

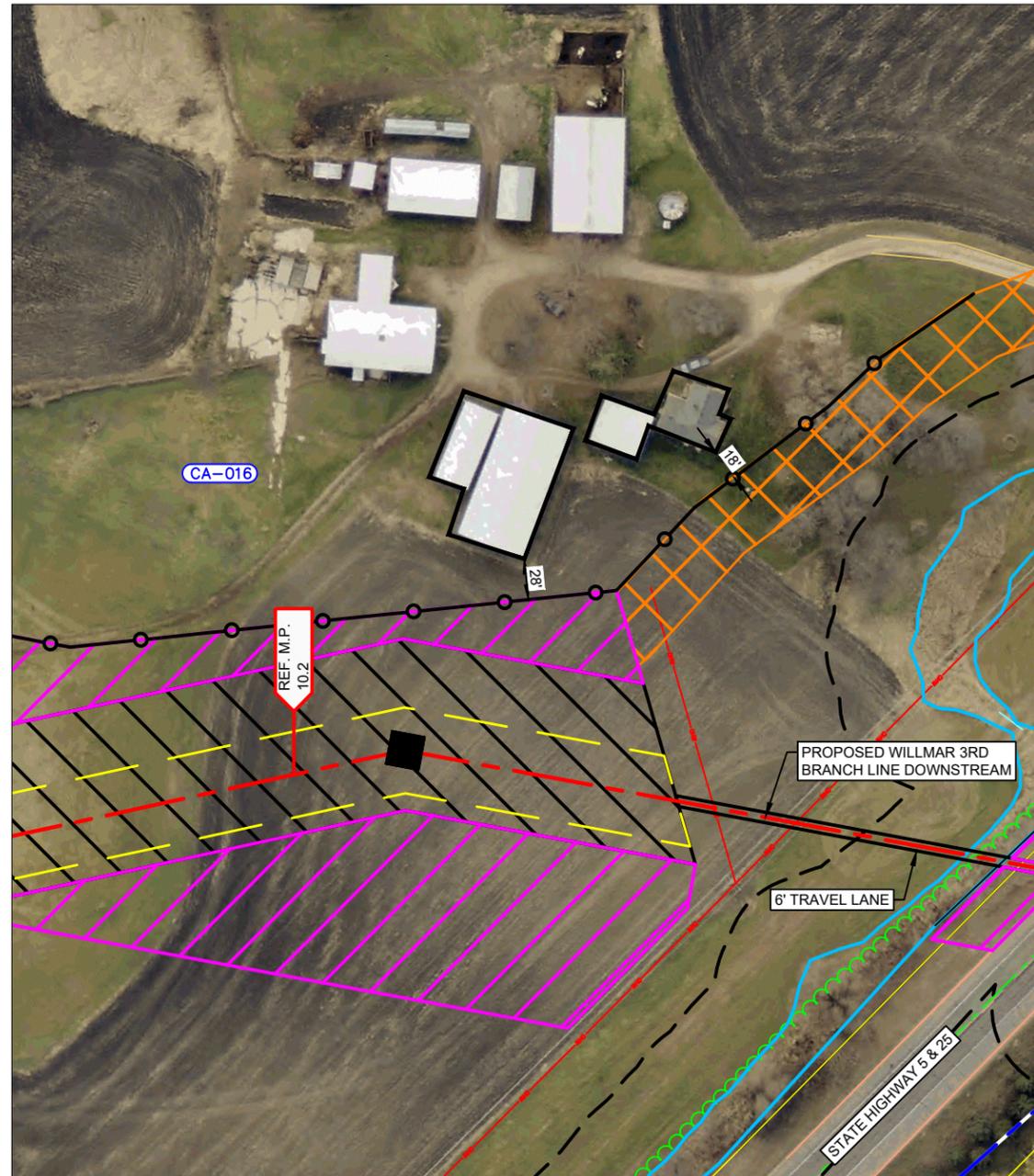


- Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, NNG, Esri, USCB, USGS, IA DNR, MN DNR
 3. Background: 2023 NAIP

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Figure 8-2
Site-Specific Residential Construction Plan for NL27 Project

SITE-SPECIFIC RESIDENTIAL CONSTRUCTION PLAN - CA-016



PLAN
SCALE: 1"=50'

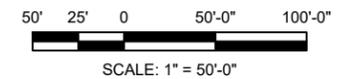
LEGEND	
	PROPOSED WILLMAR 3RD BRANCH LINE DOWNSTREAM
	PROPERTY LINE
	OVERHEAD POWERLINE
	SAFETY FENCE
	WETLAND BUFFER
	WETLAND
	HOUSE
	TEMP. WORKSPACE
	EXTRA TEMP. WORKSPACE
	TEMP. ACCESS ROAD
	PROJECT PERMANENT ROW
	ENVIRONMENTAL SURVEY BOUNDARY
	HDD ENTRY/EXIT

NOTES:

- NORTHERN WILL NOTIFY LANDOWNERS BY PHONE AND MAIL A MINIMUM OF 10 DAYS IN ADVANCE OF CONSTRUCTION.
- THE EDGE OF THE CONSTRUCTION WORKSPACE WILL BE FENCED WITH SAFETY FENCING EXTENDING A MINIMUM OF 100 FEET EITHER SIDE OF THE RESIDENCE. FENCING WILL REMAIN IN PLACE UNTIL FINAL CLEANUP IS COMPLETE.
- THE CONSTRUCTION WORKSPACE WILL BE REGULARLY WATERED TO CONTROL FUGITIVE DUST EMISSIONS.
- RESIDENTIAL ACCESS WILL NOT BE IMPACTED AND WILL BE UNRESTRICTED THROUGHOUT CONSTRUCTION.
- RESIDENTIAL UTILITIES WILL BE LOCATED PRIOR TO CONSTRUCTION AND ALL UTILITY SERVICES WILL BE MAINTAINED THROUGHOUT CONSTRUCTION.
- TOPSOIL WILL BE SEGREGATED FROM AREAS TO BE EXCAVATED OR GRADED AND STOCKPILED FOR REDISTRIBUTION DURING RESTORATION.
- NO MATURE TREES OR LANDSCAPING WILL BE REMOVED FROM WITHIN THE EDGE OF THE CONSTRUCTION WORKSPACE UNLESS NECESSARY FOR THE SAFE OPERATION OF CONSTRUCTION EQUIPMENT OR AS SPECIFIED IN LANDOWNER AGREEMENT.
- ALL LAWN AND LANDSCAPE AREAS WILL BE RESTORED IN THE CONSTRUCTION WORKSPACE IMMEDIATELY AFTER CLEANUP OPERATIONS, OR AS SPECIFIED IN LANDOWNER AGREEMENTS, CONSISTENT WITH THE REQUIREMENTS OF THE PLAN.

FUGITIVE DUST CONTROL MEASURES

- LIMIT VEHICLE AND EQUIPMENT SPEEDS TO 10 MILES PER HOUR.
- ALL TRACK-OUT PADS AND CONSTRUCTION ENTRANCES/EXITS WILL BE CLEANED AT THE END OF EACH WORKDAY.
- GRAVEL PADS WILL BE INSTALLED ADJACENT TO PAVED ROADWAYS TO LIMIT TRACK-OUT, AND CLEARLY ESTABLISHED AND ENFORCED TRAFFIC PATTERNS MAY BE USED TO ROUTE TRAFFIC OVER TRACK-OUT CONTROL DEVICES.
- THE CONSTRUCTION WORKSPACE WILL BE REGULARLY WATERED TO CONTROL FUGITIVE DUST EMISSIONS.
- IF WIND EROSION OR FUGITIVE DUST IS OBSERVED, NORTHERN WILL IMMEDIATELY REAPPLY OR IMPLEMENT ADDITIONAL WIND EROSION CONTROL BMPs FROM THE ABOVE LIST.
- FOR ADDITIONAL FUGITIVE DUST CONTROL MEASURES REFER TO THE FUGITIVE DUST MITIGATION PLAN.



Chan, Ginger 2/18/2026 4:48 PM M:\NNG 2027 NL2_ALIGNMENT_RESIDENTIAL PLAN\NL27 WDC RESIDENTIAL PLAN.DWG

INTERNAL INFORMATION
DISTRIBUTION/COPIES LIMITED TO
PROJECT NEEDS

FIGURE: 8-2

NO.	REVISION - DESCRIPTION	BY	DATE	CHK'D	APP'D
F	ISSUED FOR FERC	JM	1/13/26	ED	GC

FILED WITH FERC
ANY CHANGES FROM WHAT IS
SHOWN MUST BE IDENTIFIED
AND REVIEWED BY
REGULATORY BEFORE
IMPLEMENTATION

STATUS	CHECKED		APPROVED	
	BY	DATE	BY	DATE
PRELIM				
BID				
CONST.				

FAC. CODE: N/A	REL. W.O. N/A
PL# N/A	CONST. YR 2027
STA# N/A	PG# N/A
DESIGN BY ED	DATE 9/30/25
DRAWN BY JM	DATE 9/30/25
ASBUILT	
FILE NO.:	
SCALE: 1"=50'	

NORTHERN LIGHTS 2027 EXPANSION PROJECT
WILLMAR 3RD BRANCH LINE DOWNSTREAM
SITE-SPECIFIC RESIDENTIAL CONSTRUCTION PLAN - CA-016
SEC. 1, T115N. 26W
CARVER COUNTY, MINNESOTA

PROJECT NO.
DWG. NO.
CA-016

Appendix 8A
Extra Temporary Workspace and Staging Areas for V2F Project

Appendix 8A ETWS and Staging Areas for V2F Project

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
Lake Mills M500 E-line						
LMA ETWS-001	34.20	95'x250'x50'x240'x60'x200'x200'x200'	ETWS	Agricultural 0.78	0.93	pipeline and facility removal, pullback
				Industrial/Commercial 0.06		
				Open Land 0.09		
LMA SA-001	34.20	520'x420'x430'x55'x105'x290'	SA	Agricultural 4.23	4.33	Pipeline, pipe and equipment storage
				Open Land 0.10		
LMA ETWS-002	34.33	275'x35'x115'x80'x90'x70'	ETWS	Agricultural	0.32	HDD, bend
LMA ETWS-003	34.33	275'x70'x110'x85'x95'x105'	ETWS	Agricultural	0.52	HDD, bend
LMA ETWS-004	34.56	550'x560'x110'x255'x400'x125'x35'	ETWS	Agricultural 0.57	0.60	HDD, bend
				Open Land 0.03		
LMA ETWS-005	34.56	275'x40'x140'x40'x85'x115'x40'x175'x455'x210'x260'	ETWS	Agricultural 0.96	0.98	HDD, bend
				Open Land 0.02		
LMA ETWS-006	34.78	200'x35'x110'x95'x60'	ETWS	Agricultural	0.18	Bend
LMA ETWS-007	34.77	200'x45'x110'x100'x65'	ETWS	Agricultural	0.27	Bend
LMA ETWS-008	35.00	135'x200'x240'	ETWS	Agricultural	0.31	Bend
LMA ETWS-009	35.00	735'x185'x75'x215'x205'x215'x160'x185'	ETWS	Agricultural	1.90	Bend
LMA ETWS-010	35.04	270'x215'x75'	ETWS	Agricultural	0.13	Bend
LMA ETWS-011	35.08	185'x135'x95'x115'x65'	ETWS	Agricultural	0.32	Bend
LMA ETWS-012	35.51	140'x30'	ETWS	Agricultural	0.10	Soil storage for wetland crossing
LMA ETWS-013	35.57	140'x30'	ETWS	Agricultural	0.09	Soil storage for wetland crossing
LMA ETWS-014	35.62	225'x35'x95'x140'	ETWS	Agricultural	0.13	Bend
LMA SA-002	35.85	580'x470'x435'x145'x120'x255'x40'x195'x50'	SA	Agricultural 6.59	6.91	Pipe and equipment storage
				Industrial/Commercial 0.01		
				Open Land 0.31		

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
LMA ETWS-015	35.63	200'x90'x100'x105'x65'	ETWS	Agricultural	0.32	Bend
LMA ETWS-016	35.9	310'x75'x205'x65'x115'	ETWS	Agricultural 0.87	1.15	HDD, bend
				Industrial/Commercial 0.02		
				Open Land 0.26		
LMA ETWS-017	35.95	45'x55'x45'x55'	ETWS	Open Land	0.05	HDD, daylighting
LMA SA-003	35.98	695'x350'x325'x405'x210'	SA	Agricultural	4.87	Laydown
LMA ETWS-018	35.97	505'x80'x450'x100'x100'	ETWS	Agricultural 0.75	0.82	HDD, pullback, bend
				Open Land 0.07		
LMA ETWS-019	36.21	200'x65'x120'x250'x130'x65'x275'	ETWS	Agricultural	1.47	HDD, pullback, turn around, bend
LMA ETWS-020	36.12	310'x35'x180'x255'x545'x185'x590'x75'	ETWS	Agricultural	2.86	HDD, pullback, bend
LMA ETWS-021	36.6	240'x205'x85'x200'x15'x70'	ETWS	Agricultural	3.01	HDD, turn around, bend, soil storage for wetland crossing
LMA ETWS-022	36.6	285'x175'x25'x195'x130'x35'x540'x160'x380'x1460'x95'x1585'	ETWS	Agricultural	0.94	HDD, pullback, bend
	36.72					
LMA ETWS-023	36.6	285'x175'x25'x195'x130'x35'	ETWS	Agricultural 5.23	5.29	Bend, pullback, soil storage for wetland crossing, open cut pipeline crossing, open cut road, workspace for bore if needed
				Industrial/Commercial 0.06		
LMA SA-004	37.09	500'x400'x105'x35'x160'x145'x180'x110'	SA	Agricultural 2.86	2.96	Laydown, middle of pipeline
				Industrial/Commercial 0.01		
				Open Land 0.09		
LMA ETWS-024	36.96	495'x75'x345'x275'x80'x60'x95'x130'x210'	ETWS	Agricultural 1.50	1.52	Bend, open cut pipeline crossing, open cut road, workspace for bore if needed
				Industrial/Commercial 0.02		
LMA ETWS-025	37.1	290'x70'x65'x70'x255'x130'	ETWS	Agricultural 0.56	0.71	Bend, open cut road, workspace for bore if needed
				Industrial/Commercial 0.01		
				Open Land 0.14		
LMA ETWS-026	37.18	145'x110'x205'x170'x105'x310'	ETWS	Agricultural 0.70	0.78	Bend, open cut road, workspace for bore if needed
				Industrial/Commercial 0.01		
				Open Land 0.07		

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
LMA ETWS-027	37.18	350'x30'x125'x30'x165'x40'x90'x285'x205'x110'x35'	ETWS	Agricultural 0.83 Industrial/ Commercial 0.01 Open Land 0.07	0.91	Open cut road, workspace for bore if needed
LMA ETWS-028	37.3	150'x50'x210'x80'	ETWS	Agricultural 0.15 Industrial/ Commercial 0.01 Open Land 0.03	0.19	Open cut road, workspace for bore if needed
LMA ETWS-029	37.26	385'x65'x335'x40'	ETWS	Agricultural 0.29 Industrial/ Commercial 0.01 Open Land 0.03	0.33	Open cut road, workspace for bore if needed
LMA ETWS-030	37.39	225'x25'x85'x30'x30'x85'	ETWS	Agricultural	0.13	Bend
LMA ETWS-031	37.4	200'x90'x35'x50'x50'x80'x75'	ETWS	Agricultural	0.32	Bend
LMA ETWS-032	37.51	200'x35'	ETWS	Agricultural	0.16	Open cut pipeline crossing
LMA ETWS-033	37.51	200'x65'	ETWS	Agricultural	0.30	Open cut pipeline crossing
LMA ETWS-034	37.72	320'x35'x195'x135'	ETWS	Agricultural 0.11 Forested 0.03 Open Land 0.06	0.20	HDD, bend
LMA ETWS-035	37.72	305'x95'x100'x210'x65'	ETWS	Agricultural	0.48	HDD, bend
LMA ETWS-036	38.01	100'x60'	ETWS	Agricultural 0.08 Industrial/ Commercial 0.01 Open Land 0.02	0.11	Daylighting
LMA ETWS-037	38.03	100'x60'	ETWS	Forested	0.09	Daylighting
LMA ETWS-038	38.07	350'x50'	ETWS	Agricultural	0.40	HDD, pullback
LMA ETWS-039	38.27	850'x70'x845'	ETWS	Agricultural	0.68	HDD pullback
LMA ETWS-040	38.62	140'x35'	ETWS	Agricultural	0.11	Soil storage for tree line neckdown
LMA ETWS-041	38.67	230'x145'x95'x35'	ETWS	Agricultural	0.13	Soil storage for tree line neckdown, bend
LMA ETWS-042	38.67	200'x65'x105'x100'x90'	ETWS	Agricultural	0.32	Soil storage for tree line neckdown, bend

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
LMA SA-005	39.18	275'x510'x220'x110'x70'x70'x25'x20'x40'x20'x20'x155'	SA	Agricultural 2.55	2.80	Pipe and equipment storage, HDD exit, pullback
				Forested 0.02		
				Industrial/Commercial 0.02		
				Open Land 0.21		
LMA ETWS-043	38.77	140'x30'	ETWS	Agricultural 0.06	0.10	Soil storage for wetland crossing
				Forested 0.02		
				Open Land 0.02		
LMA ETWS-044	38.83	140'x30'	ETWS	Agricultural	0.10	Soil storage for wetland crossing
LMA ETWS-045	39.1	310'x140'x40'x190'x415'x65'	ETWS	Agricultural 0.63	0.84	HDD, bend, soil storage for wetland crossing, daylighting
				Industrial/Commercial 0.03		
				Open Land 0.18		
LMA ETWS-046	39.07	435'x115'x325'x35'	ETWS	Agricultural 0.25	0.29	HDD, bend, soil storage for wetland crossing, daylighting
				Wetland 0.04		
LMA ETWS-047	39.18	335'x30'x30'x45'x45'x50'x50'x105'x50'	ETWS	Agricultural 0.22	0.26	HDD, bends
				Open Land 0.04		
LMA ETWS-048	39.41	295'x100'x200'x35'	ETWS	Agricultural	0.19	HDD, bend
LMA ETWS-049	39.39	410'x70'x220'x210'x140'	ETWS	Agricultural	0.79	HDD, bend
LMA SA-006	40.12	300'x500'x415'x515'	SA	Agricultural 3.68	4.07	Pipe and equipment storage
				Wetland 0.03		
				Open Land 0.36		
LMA ETWS-050	39.51	185'x50'	ETWS	Agricultural 0.01	0.19	To monitor railroad HDD crossing
				Forested 0.14		
				Industrial/Commercial 0.04		
LMA ETWS-051	39.6	660'x25'	ETWS	Agricultural	0.37	HDD, pullback, soil storage for wetland neckdown
LMA ETWS-052	39.6	250'x40'	ETWS	Agricultural	0.23	HDD, pullback
LMA ETWS-053	39.79	225'x25'x175'x50'x25'	ETWS	Agricultural	0.12	Soil storage for wetland neckdown
LMA ETWS-054	39.93	200'x45'x90'x20'x20'x80'x70'	ETWS	Agricultural	0.28	Bend
LMA ETWS-055	39.93	200'x35'x80'x30'x30'x70'x55'	ETWS	Agricultural	0.18	Bend,
LMA ETWS-056	40.17	275'x10'x270'x10'	ETWS	Agricultural 0.05	0.06	Open cut road, workspace for bore if needed
				Open Land 0.01		

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
LMA ETWS-057	40.22	255'x10'x150'x110'x20'	ETWS	Agricultural 0.06	0.07	Open cut road, workspace for bore if needed, soil storage for wetland neckdown
				Open Land 0.01		
LMA ETWS-058	40.22	290'x35'x110'x170'x45'	ETWS	Agricultural 0.23	0.26	Open cut road and line crossing, workspace for bore if needed, daylighting
				Open Land 0.03		
LMA SA-007	40.74	500'x470'x110'x395'x415'	SA	Agricultural 4.81	5.13	Pipe and equipment storage
				Industrial/Commercial 0.07		
				Open Land 0.25		
LMA ETWS-059	40.35	140'x30'	ETWS	Agricultural	0.10	Soil storage for wetland neckdown
LMA ETWS-060	40.45	75'x25'	ETWS	Agricultural	0.04	Soil storage for tree line neckdown
LMA ETWS-061	40.49	75'x25'	ETWS	Agricultural	0.04	Soil storage for wetland neckdown
LMA ETWS-062	40.58	340'x110'x190'x165'x35'	ETWS	Agricultural	0.42	HDD, bend, soil storage for wetland neckdown
LMA ETWS-063	40.58	415'x65'x255'x175'	ETWS	Agricultural	0.49	HDD, bend, soil storage for wetland neckdown
LMA ETWS-064	40.73	50'x25'	ETWS	Open Land	0.02	Daylighting
LMA ETWS-065	40.74	950'x180'x830'x120'x65'	ETWS	Agricultural 2.46	2.50	HDD, pullback, bend
				Industrial/Commercial 0.01		
				Open Land 0.03		
LMA ETWS-066	41.05	380'x50'x405'x40'	ETWS	Agricultural	0.36	HDD, pullback
LMA ETWS-067	41.05	485'x10'x475'x15'	ETWS	Agricultural	0.11	HDD, pullback
LMA ETWS-068	41.22	230'x55'x220'x55'x55'x670'x505'x85'x35'x65'x490'x720'	ETWS	Agricultural	1.23	HDD, bends, turn around, open cut road, workspace for bore if needed
LMA ETWS-069	41.54	165'x35'x115'x385'x235'x635'	ETWS	Agricultural	0.65	Bends, turn around, open cut road, workspace for bore if needed
LMA ETWS-070	41.19	545'x70'x680'x445'x145'x220'x65'x140'x555'x670'x75'x75'x330'x95'	ETWS	Agricultural	2.08	HDD, bends, turn around, open cut road, workspace for bore if needed

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
LMA ETWS-071	41.54	350'x20'x140'x100'x315'x35'x65'x25'	ETWS	Agricultural 0.70	0.71	Bends, turn around, open cut road, workspace for bore if needed
				Industrial/Commercial 0.01		
LMA ETWS-072	41.77	250'x40'x250'x40'	ETWS	Agricultural	0.42	HDD, pullback
LMA ETWS-073	41.77	250'x10'x250'x10'	ETWS	Agricultural	0.10	HDD, pullback
LMA ETWS-074	41.94	295'x480'x10'x530'x265'x40'	ETWS	Agricultural	0.34	HDD, bend, turn around
LMA SA-008	42.46	130'x245'x60'x80'x100'x35'x50'x280'	SA	---	0.00 ¹	Pipe and equipment storage
LMA ETWS-075	41.93	640'x70'x315'x590'x45'x260'x215'	ETWS	Agricultural	1.86	HDD, bend, turn around
LMA ETWS-076	42.13	55'x55'	ETWS	Open Land	0.05	Daylighting
LMA ETWS-077	42.15	400'x180'x250'x70'	ETWS	Agricultural 0.40	0.48	HDD, pullback, bend
				Industrial/Commercial 0.01		
				Open Land 0.07		
LMA ETWS-078	42.14	495'x40'x290'x535'x160'x300'x75'	ETWS	Agricultural 1.19	1.24	HDD, pullback, bend
				Industrial/Commercial 0.01		
				Open Land 0.04		
LMA ETWS-079	42.4	285'x160'x220'x105'x35'	ETWS	Agricultural 0.45	0.48	HDD, pullback, bend
				Open Land 0.03		
LMA ETWS-080	42.45	365'x10'x300'x35'x65'x45'	ETWS	Agricultural 0.06	0.13	HDD, bend, daylighting
				Open Land 0.07		
LMA ETWS-081	42.47	50'x30'x100'x15'x85'x60'x205'x155'	ETWS	---	0.00 ¹	End of pipeline, facility, turn around
LMA ETWS-082	42.49	110'x95'x125'x40'	ETWS	---	0.00 ¹	End of pipeline, facility, turnaround, HDD, pullback
LMA SA-009	42.49	335'x40'x160'x70'x170'x95'	SA	---	0.00 ¹	Pipe and equipment storage
Subtotal Acreage for Lake Mills M500 E-line					79.81	
Albert Lea M500 E-line						
ALO ETWS-001	1.55	80'x505'x275'x315'x65'x110'x200'x100'x175'x90'x195'	ETWS	Agricultural 1.53	1.65	Start of pipeline, tie-in to ALO on V2F, bend
				Open Land 0.12		
ALO SA-001	1.55	465'x505'x465'x505'	ETWS	Agricultural 5.09	5.35	Start of pipeline, pipe and equipment storage HDD
				Open Land 0.26		

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
ALO ETWS-002	2.04	250'x40'x250'x40'	ETWS	Agricultura	0.23	HDD
ALO ETWS-003	2.04	240'x10'x240'x10'	ETWS	Agricultural	0.05	Laydown, middle of pipeline, near HDD exit
ALO ETWS-004	2.47	245'x40'x295'x65'	ETWS	Agricultural	0.25	Soil storage for wetland neckdown
ALO SA-002	2.47	190'x515'x190'x535'	SA	Agricultural	2.26	Pipe and equipment storage
ALO ETWS-005	2.67	280'x30'x280'x30'	ETWS	Agricultural	0.19	Start of pipeline, tie-in to ALO on V2F, bend
ALO SA-003	.57	355'x485'x405'x520'	SA	Agricultural	4.32	Laydown, middle of pipeline
ALO ETWS-006	2.77	140'x30'x140'x30'	ETWS	Agricultural	0.10	Soil storage for wetland neckdown
ALO ETWS-007	3.13	375'x95'x450'x180'x35'x315'x200'x100'	ETWS	Agricultural	1.02	Bends, open cut pipeline crossings
ALO ETWS-008	3.13	400'x250'x200'x135'x135'x180'x370'x100'x105'	ETWS	Agricultural	1.52	Bends, open cut pipeline crossings
ALO ETWS-009	3.42	140'x25'	ETWS	Agricultural	0.08	Soil storage for wetland neckdown
ALO ETWS-010	3.49	100'x25'x100'x25'	ETWS	Agricultural	0.03	Soil storage for wetland neckdown
ALO ETWS-011	3.55	180'x10'x150'x35'	ETWS	Agricultural	0.04	HDD, bend
ALO ETWS-012	3.52	250'x100'x185'x185'x125'x80'x110'	ETWS	Agricultural 0.61	0.64	HDD, bend
				Open Land 0.03		
ALO SA-004	3.61	600'x65'x100'x185'x55'x360'x105'x35'x305'x335'x135'x115'	SA	---	0.00 ¹	Laydown for project, near end of pipeline
ALO ETWS-013	3.61	515'x45'x120'x100'x135'x10'x360'x55'x185'x100'	SA	---	0.00 ¹	End of pipeline, facility, HDD, pullback, turn around
Subtotal Acreage for Albert Lea M500 E-line					17.73	
Faribault M500 D-line						
FAR ETWS-001	97.37	310'x140'x210'x30'x100'x25'x30'x65'	ETWS	Agricultural 0.39	0.82	Facility removal and start of pipeline tie in, open cut road crossing, bend, workspace for bore if needed
				Open Land 0.04		
				Wetland 0.39		
FAR SA-001	97.41	840'x85'x50'x135'x395'x610'x335'	SA	Agricultural 5.81	5.84	Start of pipeline, pipe and equipment storage
				Industrial/Commercial 0.03		

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
FAR ETWS-002	97.41	320'x65'x135'x110'x90'	ETWS	Agricultural	0.35	Open cut road crossing, bend, workspace for bore if needed
FAR ETWS-003	97.41	335'x100'x65'x130'x155'x35'	ETWS	Agricultural	0.39	Open cut road crossing, bend, workspace for bore if needed
FAR ETWS-004	97.89	160'x25'	ETWS	Agricultural	0.09	Soil storage for wetland crossing
FAR ETWS-005	97.95	245'x105'x160'x40'x75'x140'	ETWS	Agricultural	0.63	Bend, soil storage for wetland neckdown, open cut pipeline crossings
FAR ETWS-006	98.50	230'x25'	ETWS	Agricultural	0.13	Soil storage for wetland neckdown, open cut pipeline crossings
FAR ETWS-007	98.2	80'x25'	ETWS	Agricultural	0.05	Soil storage for wetland neckdown
FAR ETWS-008	98.24	80'x25'	ETWS	Agricultural 0.04	0.05	Soil storage for wetland neckdown
				Open Land 0.01		
FAR ETWS-009	98.28	170'x65'x125'x55'x50'x125'	ETWS	Open Land	0.31	Bend, Soil storage for wetland crossing
FAR SA-002	98.49	265'x110'x265'x100'	SA	Agricultural 0.61	0.63	Pipeline and equipment, storage
				Industrial/Commercial 0.02		
FAR ETWS-010	98.33	380'x190'x190'x45'x375'x380'x50'	ETWS	Open Land	0.33	Soil storage for wetland neckdown
FAR ETWS-011	98.49	220'x155'x85'x265'x35'x150'x300'x330'x310'x20'x325'x85'x30'	ETWS	Agricultural 0.86	0.88	HDD, bends, turn around
				Forested 0.01		
				Industrial/Commercial 0.01		
FAR ETWS-012	98.50	240'x905'x255'x90'x55'x955'x330'	ETWS	Agricultural 6.30	6.88	HDD, bends, turn around
				Forested 0.05		
				Open Land 0.53		
FAR ETWS-013	98.74	275'x30'x245'x515'x55'x545'	ETWS	Agricultural	0.51	HDD, bends, turn around
FAR ETWS-014	99.11	70'x255'x130'x120'	ETWS	Agricultural	0.28	HDD, bend, pullback
FAR ETWS-015	99.13	225'x45'x80'x200'x15'x1120'x50'x1120'x75'	ETWS	Agricultural	1.67	HDD, bend, pullback
FAR ETWS-016	99.36	200'x100'x100'x110'x70'	ETWS	Agricultural	0.34	Bend

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
FAR ETWS-017	99.36	185'x30'x95'x100'	ETWS	Agricultural	0.10	Bend
FAR ETWS-018	99.49	245'x45'x255'x40'	ETWS	Agricultural 0.19 Open Land 0.04	0.23	Open cut road, workspace for bore if needed
FAR ETWS-019	99.49	285'x10'x280'x10'	ETWS	Agricultural 0.06 Open Land 0.01	0.07	Open cut road, workspace for bore if needed
FAR ETWS-020	99.54	260'x15'x265'x10'	ETWS	Agricultural 0.05 Open Land.0.01	0.06	Open cut road, workspace for bore if needed
FAR ETWS-021	99.54	305'x40'x290'x45'	ETWS	Agricultural 0.24 Open Land 0.03	0.27	Open cut road, workspace for bore if needed
FAR ETWS-022	99.74	{50'x105'x25'x195'x350'x40'x265'x300'x50'	ETWS	Agricultural 0.55 Open Land 0.10	0.65	HDD, bends, open cut pipeline crossings, turn around
FAR ETWS-023	99.74	70'x125'x300'x120'x365'x225'	ETWS	Agricultural 1.12 Open Land 0.03	1.15	HDD, bends, open cut pipeline crossings, turn around
FAR ETWS-024	100.06	1425'x145'x40'x1460'	ETWS	Agricultural	2.96	HDD, pullback, turn around
FAR ETWS-025	100.06	330'x10'	ETWS	Agricultural	0.07	HDD, pullback, turn around
FAR ETWS-026	100.28	685'x345'x290'x445'x50'x380'	ETWS	Agricultural	1.13	HDD, bends, pullback
FAR ETWS-027	100.35	365'x475'x70'x60'x305'x340'x130'x90'	ETWS	Agricultural	1.52	HDD, bends, pullback
FAR SA-003	100.4	945'x25'x570'x1065'x165'x445'	SA	Agricultural 13.35 Open Land 0.29 Industrial/Commercial 0.08	13.72	Pipeline and equipment, storage
FAR ETWS-028	100.85	270'x15'x240'x405'x35'x90'x380'x260'x100'	ETWS	Agricultural	1.82	HDD, turn around, bends, open cut road, workspace for bore if needed,
FAR ETWS-029	100.85	355'x65'x280'x360'x70'x70'x300'x75'	ETWS	Agricultural	0.90	HDD, turn around, bends, open cut road, workspace for bore if needed
FAR ETWS-030	100.99	180'x45'x70'x110'	ETWS	Agricultural	0.11	Bend, open cut road, workspace for bore if needed
FAR ETWS-031	100.99	265'x140'x210'x80'x65'	ETWS	Agricultural 0.54 Open Land 0.02	0.56	Bend, open cut road, workspace for bore if needed

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
FAR ETWS-033	101.30	275'x200'x80'x35'	ETWS	Agricultural 0.14	0.14	Open cut road, workspace for bore if needed, bend, soil storage for wetland neckdown
FAR ETWS-032	101.33	200'x65'x105'x100'x85'	ETWS	Agricultural 0.28 Open Land 0.03	0.31	Open cut road, workspace for bore if needed, bend, soil storage for wetland neckdown
FAR SA-004	101.36	110'x35'x1095'x280'x295'x690'x290'x125'x660'	SA	Agricultural 6.51 Industrial/Commercial 0.10 Open Land 1.12	7.73	Pipeline and equipment, storage
FAR ETWS-034	101.43	185'x35'x80'x105'x30'	ETWS	Agricultural	0.14	Soil storage for wetland neckdown
FAR ETWS-036	101.73	210'x65'x85'x295'x115'x325'	ETWS	Open Land	1.18	Auger bore, pullback, bend
FAR ETWS-035	101.78	60'x45'x35'x35'	ETWS	Open Land	0.04	Auger bore, bend
FAR ETWS-036A	101.81	25'x20'	ETWS	Industrial/Commercial 0.03 Open Land 0.04	0.07	Railroad settlement monitoring
FAR ETWS-037	101.82	60'x70'x40'x65'	ETWS	Open Land	0.07	Auger bore, bend
FAR ETWS-038	101.82	245'x110'x545'x490'x50'x350'x530'x215'x225'x90'	ETWS	Forested 0.14 Open Land 2.21	2.35	Auger bore, HDD, pullback, bends
FAR ETWS-039	101.96	75'x155'x340'x325'x40'x30'x115'	ETWS	Open Land	0.37	HDD, bend
FAR ETWS-040	102.16	445'x770'x50'x620'x295'x290'x45'	ETWS	Agricultural 1.63 Industrial/Commercial 0.01 Residential 0.07	1.71	HDD, bend, pullback
FAR SA-005	102.16	385'x250'x665'x830'	SA	Agricultural 3.80 Industrial/Commercial 0.03 Open Land 0.21	4.04	Pipeline and equipment, storage
FAR ETWS-041	102.41	200'x110'x105'x110'x65'	ETWS	Agricultural	0.34	Bend
FAR ETWS-042	102.41	170'x35'x90'x90'	ETWS	Agricultural	0.10	Bend
FAR ETWS-043	102.82	200'x170'x145'x145'x40'	ETWS	Agricultural	0.28	Bend
FAR ETWS-044	102.82	160'x65'x150'x895'x70'x105'x190'x360'x160'x765'x45'	ETWS	Agricultural 6.91 Forested 0.05	6.96	HDD, bend, turn around

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
FAR ETWS-045	102.99	265'x45'x235'x40'	ETWS	Agricultural	0.20	HDD, bend
FAR ETWS-046	103.12	410'x40'x405'x40'	ETWS	Agricultural	0.37	HDD
FAR ETWS-047	103.12	150'x245'x270'	ETWS	Agricultural	0.41	HDD
FAR ETWS-048	103.36	300'x10'x295'x15'	ETWS	Agricultural	0.06	Open cut road, workspace for bore if needed
FAR ETWS-049	103.36	205'x50'x230'x40'	ETWS	Agricultural 0.17 Open Land 0.02	0.19	Open cut road, workspace for bore if needed
FAR ETWS-051	103.41	50'x50'	ETWS	Open Land	0.05	Open cut road, workspace for bore if needed
FAR SA-006	103.42	710'x440'x975'x255'x40'x280'	SA	Agricultural 8.44 Open Land 0.09	8.53	Pipeline and equipment, storage
FAR ETWS-050	103.42	235'x15'x240'x10'	ETWS	Agricultural 0.04 Open Land 0.01	0.05	Open cut road, workspace for bore if needed
FAR ETWS-052	103.55	335'x10'	ETWS	Agricultural	0.08	HDD, turn around
FAR ETWS-053	103.55	335'x40'	ETWS	Agricultural	0.31	HDD, turn around
FAR ETWS-054	103.99	330'x15'x335'x10'	ETWS	Agricultural	0.08	HDD, turn around, pullback
FAR ETWS-055	103.98	390'x40'x375'x45'	ETWS	Agricultural	0.35	HDD, turn around, pullback
FAR ETWS-056	104.29	310'x50'	ETWS	Agricultural	0.36	HDD
FAR ETWS-057	104.46	305'x10'x300'x10'	ETWS	Agricultural	0.06	HDD
FAR ETWS-058	104.37	185'x760'x420'x305'	ETWS	Agricultural 1.91 Open Land 0.09	2.00	Soil storage for treeline crossing
FAR SA-007	104.52	395'x625'x540'x290'x425'x280'	SA	Agricultural 5.80 Open Land 0.31	6.11	Pipeline and equipment, storage
FAR ETWS-059	104.53	290'x40'x270'x45'	ETWS	Agricultural 1.43 Industrial/ Commercial 0.03 Open Land 0.11	1.57	HDD, facility removal, same ditch installation
FAR ETWS-060	104.86	85'x35'x75'	ETWS	Open Land	0.03	End of pipeline tie in, facility removal, same ditch installation

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
FAR ETWS-061	104.86	170'x110'x125'x90'x100'x65'	ETWS	Agricultural 0.28	0.42	End of pipeline tie in, facility removal, same ditch installation
				Open Land 0.10		
				Wetland 0.04		
FAR ETWS-062	104.88	360'x240'x145'x100'	ETWS	Agricultural 0.44	0.56	Stopples workspace for existing pipeline
				Industrial/Commercial 0.03		
				Open Land 0.09		
Subtotal Acreage for Faribault M500 D-line					93.12	
A-line Disconnect Sites – Ventura and Farmington Compressor Stations						
VCS ETWS-001	N/A	170'x50'x55'x95'x380'x50'x30'x55'x60'x245'x415'x370'x120'x120'x195'	ETWS	Agricultural 0.54	4.37	A-line disconnect workspace at the Ventura compressor station
				Industrial/Commercial 3.82		
				Wetland 0.01		
FCS ETWS-001	N/A	100'x105'x120'x105'x60	ETWS	Open Land	0.35	A-line disconnect workspace at the Farmington compressor station
FCS ETWS-002	N/A	95'x35'x20'x80'x500'x220'x175'x50'x25'x45'x15'x30'x70'x30'x50'x500'x500'x75'x275'x325'x35'	ETWS	Forested 0.62	4.75	A-line disconnect workspace near the Farmington compressor station
				Industrial/Commercial 3.92		
				Open Land 0.01		
				Open Water 0.01		
				Wetland 0.19		
Subtotal Acreage for A-Line Disconnects					9.47	
Temporary Compression Sites						
LBL ETWS-001	N/A	90'x200'x485'x200'x385'	ETWS	Agricultural 1.30	2.19	Temporary compression site for the A-line abandonment (La Crosse BL MNB73201 launcher/ABA05)
				Industrial/Commercial 0.38		
				Open Land 0.44		
				Wetland 0.07		
LCS ETWS-001	N/A	610'x385'x595'x385'	ETWS	Industrial/Commercial 4.97	5.29	Temporary compression for Lake Mills M500 E-line tie-at the Lake Mills compressor station
				Open Land 0.32		
OCS ETWS-001	N/A	125'x60'x60'x25'x20'x35'x120'x75'x140'x25'x30'x25'x35'x30'x25'x40'x35'x35'x25'x25'x25'x415'x345'	ETWS	Industrial/Commercial	4.06	Temporary compression for the Albert Lea M500 E-line tie-in at the Owatonna compressor station
NOR ETWS-001	N/A	160'x450'x160'x450'	ETWS	Agricultural 1.84	2.40	Temporary compression for Faribault M500 D-line tie-at Northfield #1
				Industrial/Commercial 0.13		
				Open Land 0.29		
				Wetland 0.14		
Subtotal Acreage for Temporary Compression Sites					13.94	
Total Acreage					214.07	

¹ The workspace overlaps with the NL27 construction footprint; acres and impacts for this workspace are included and discussed in the NL27 tables.

Appendix 8B
TARs for V2F Project

Appendix 8B Temporary Access Roads for V2F Project

ID	MP	Type	Description	Length (feet)	Width (feet)	Existing Land Use (Subtotals)	Total Area (acres)
Lake Mills M500 E-line							
LMA TAR-001	34.20	Temporary	New TAR from 690th Avenue to LMA SA-001 and LMA ETWS-001	2070	30	Agricultural 0.82 Industrial/Commercial 0.66 Open Land 0.76	2.24
LMA TAR-002	34.57	Temporary	New TAR from 690th Avenue to LMA ETWS-004	2575	30	Agricultural 1.76 Open Land 0.03	1.79
LMA TAR-003	34.65	Temporary	New TAR from 705th Avenue to LMA ETWS-004	1963	30	Agricultural 0.24 Industrial/Commercial 0.01 Open Land 1.11	1.36
LMA TAR-004	35.97	Temporary	New TAR on existing private drive (from 180th Street) to LMA SA-003	790 207	30 50	Agricultural 0.39 Industrial/Commercial 0.01 Residential 0.37	0.77
LMA TAR-005	37.08	Temporary	New TAR from 190th Street to ETWS-024	80	90	Agricultural 0.15 Industrial/Commercial 0.02	0.17
LMA TAR-006	37.62	Temporary	New TAR from 710th ROW	625	130	Agricultural 0.41 Industrial/Commercial 0.02 Open Land 0.02	0.44
LMA TAR-007	38.06	Temporary	New TAR from 200th Street (partially including a private drive) to LMA ETWS-038	625	30	Agricultural 0.20 Forested 0.02 Industrial/Commercial 0.01 Open Land 0.29 Residential 0.15	0.67
LMA TAR-008	39.14	Temporary	New TAR from 210th Street to LMA ETWS-045	645	55	Agricultural 0.15 Industrial/Commercial 0.01 Open Land 0.05	0.21
LMA TAR-009	40.22	Temporary	New TAR from 220th Street to LMA ETWS-057	110	65	Agricultural 0.11 Industrial/Commercial 0.01 Open Land 0.05	0.17
LMA TAR-010	40.23	Temporary	New TAR from 220th Street to LMA ETWS-061	1475	30	Agricultural 0.90 Forested 0.07 Industrial/Commercial 0.01 Open Land 0.04	1.02
LMA TAR-011	40.74	Temporary	New TAR from 715th Avenue to ETWS-065	122	15	Agricultural 0.03 Open Land 0.01	0.04

ID	MP	Type	Description	Length (feet)	Width (feet)	Existing Land Use (Subtotals)	Total Area (acres)
LMA TAR-012	41.86	Temporary	New TAR from 715th Avenue to LMA ETWS-072	645	45	Agricultural 0.61 Industrial/Commercial 0.01	0.62
LMA TAR-013	41.93	Temporary	New TAR from 715th Avenue to LMA ETWS-075	730	45	Agricultural 0.69 Industrial/Commercial 0.01 Open Land 0.01	0.71
LMA TAR-014	42.44	Temporary	New TAR from 240th Street to ROW	205	35	Agricultural 0.28 Industrial/Commercial 0.01 Open Land 0.03	0.32
LMA TAR-015	42.46	Temporary	New TAR from 240th Street to LMA SA-008	470	30	N/A	0.00 ¹
Subtotal for Lake Mills M500 E-line							10.53
Albert Lea M500 E-line							
ALO TAR-001	2.03	Temporary	New TAR from Southwest 92nd Avenue to ALO ETWS-003 and ROW	2,455	50	Agricultural 2.70 Industrial/Commercial 0.01 Open 0.05 Wetland 0.04	2.80
ALO TAR-002	2.56	Temporary	New TAR from SW 92nd Avenue (partially including a private drive to ALO SA-002, ALO SA-003 and ROW	2,310	50	Agricultural 2.51 Industrial/Commercial 0.14	2.65
ALO TAR-003	3.59	Temporary	New TAR from West Highway 30 (partially including a private drive) to ROW and ALO ETWS-012	255	45	Agricultural 0.09 Industrial/Commercial 0.05 Open Land 0.06 Open Land 0.17	0.20
Subtotal for Albert Lea M500 E-line							5.65
Faribault M500 D-line							
FAR TAR-001	97.41	Temporary	New TAR From 307th Street West to FAR ETWS-003	79	25	Agricultural 0.03 Open Land 0.01 Wetland 0.01	0.05
FAR TAR-002	98.48	Temporary	New TAR from 307th Street to ROW	65	85	Industrial/Commercial 0.10	0.10
FAR TAR-003	99.39	Temporary	New TAR from Garrett Avenue to FAR ETWS-016	70	40	Agricultural 0.03 Industrial/Commercial 0.01 Open Land 0.03	0.07

ID	MP	Type	Description	Length (feet)	Width (feet)	Existing Land Use (Subtotals)	Total Area (acres)
FAR TAR-004	99.83	Temporary	New TAR from Galaxie Avenue to FAR ETWS-023	955	40	Agricultural 0.22 Industrial/Commercial 0.01 Open Land 0.10	0.33
FAR TAR-005	100.58	Temporary	New TAR from Galaxie Avenue to FAR ETWS-026	962	40	Agricultural 0.86 Industrial/Commercial 0.01 Open Land 0.02	0.89
FAR TAR-006	100.94	Temporary	New TAR from Galaxie Avenue to FAR ETWS-026	225	45	Agricultural 0.15 Industrial/Commercial 0.01 Open Land 0.08	0.24
FAR TAR-007	101.37	Temporary	New TAR from Galaxie Avenue (partially including a private drive) to FAR SA-004 and FAR ETWS-032	195	65	Agricultural 0.07 Industrial/Commercial 0.11 Open Land 0.08	0.30
FAR TAR-008	101.37	Temporary	New TAR from private drive to FAR ETWS-033	135	70	Agricultural 0.03 Industrial/Commercial 0.04 Open Land 0.05	0.12
FAR TAR-009	101.73	Temporary	New TAR from Galaxie Avenue to FAR ETWS-034	835	45	Agricultural 0.65 Forested 0.01 Industrial/Commercial 0.01	0.67
FAR TAR-010	102.07	Temporary	New TAR from 265th Street West to FAR ETWS-037	570	35	Agricultural 0.39	0.39
FAR TAR-011	103.36	Temporary	New TAR from 255th Street West to FAR SA-006	175	65	Agricultural 0.32 Industrial/Commercial 0.01 Open Land 0.03	0.36
Subtotal for Faribault M500 D-line							3.52
A-line Disconnect Sites – Ventura and Farmington Compressor Stations							
VCS TAR-001	N/A	Temporary	TAR on existing station road from 270th Street to VCS ETWS-001	555	30	Agricultural 0.22 Industrial/Commercial 0.12 Open Land 0.01	0.35
VCS-TAR-002	N/A	Temporary	TAR from 270th Street to VCS ETWS-001	30	20	Open Land	0.01
FCS TAR-001	N/A	Temporary	TAR from Knutsen Drive to FCS ETWS-001	465	30	Open land	0.32
FCS TAR-002	N/A	Temporary	TAR from Denmark Ave to FCS ETWS-002	75	25	Industrial/Commercial	0.05

ID	MP	Type	Description	Length (feet)	Width (feet)	Existing Land Use (Subtotals)	Total Area (acres)
Temporary Compression Sites – Owatonna and Northfield #1							
OCS TAR-001	N/A	Temporary	TAR from Cty Hwy 7 to OCS ETWS-001	750	15	Industrial/Commercial	0.27
NOR TAR-001	N/A	Temporary	TAR from 330 Street W to NOR ETWS-001	490	50	Agricultural 0.46	0.53
						Industrial/Commercial 0.05	
						Open land 0.02	
Subtotal for Temporary Disconnect and Compression Sites							1.53
V2F Project Total							21.23

¹ The workspace overlaps with the NL27 construction footprint; acres and impacts for this workspace are included and discussed in the NL27 tables. Access needed for the temporary disconnect site at the Lake Mills compressor station and for the temporary compression site at the Northfield #1 are included in the ETWS.

Appendix 8C
Extra Temporary Workspace and Staging Areas for NL27 Project

Appendix 8C ETWS and Staging Areas for NL27 Project

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
Lake Mills M500 E-line						
LMA-ETWS-001A	42.47	210'x95'x125'x70'x55'x30'x100'x15'x85'x60'x245'x255'x40'	ETWS	Agricultural 0.64	0.88	Start of pipeline, tie-in to LMA on V2F
				Industrial/Commercial 0.07		
				Open Land 0.17		
LMA SA-001	42.46	130'x245'x60'x80'x100'x35'x50'x280'	SA	Agricultural 0.84	0.94	Pipeline, pipe and equipment storage
				Industrial/Commercial 0.02		
				Open Land 0.08		
LMA-SA-002	42.49	335'x40'x160'x70'x170'x95'	SA	Agricultural	0.85	Pipeline, pipe and equipment storage
LMA-ETWS-003	42.59	105'x30'x140'x45'	ETWS	Open Land 0.08	0.08	Soil storage for neck down at wooded area
LMA-ETWS-003A	42.65	25'x100'	ETWS	Agricultural	0.06	Soil storage for neck down at wooded area
LMA-ETWS-004	43.61	200'x55'x100'x105'x35'	ETWS	Agricultural	0.18	Bend
LMA-ETWS-005	43.61	200'x65'x100'x105'x50'	ETWS	Agricultural	0.28	Bend
LMA-ETWS-006	43.67	390'x255'x85'x145'x255'	ETWS	Agricultural 1.28	1.29	Bend, HDD
				Industrial/Commercial 0.01		
LMA-ETWS-007	43.70	85'x100'x40'x110'	ETWS	Agricultural 0.11	0.12	Bend, HDD
				Industrial/Commercial 0.01		
LMA-ETWS-008	43.73	255'x130'x110'x200'x300'	ETWS	Agricultural 1.20	1.30	Bend, HDD
				Industrial/Commercial 0.03		
				Open Land 0.07		
LMA-ETWS-009	43.73	105'x100'x30'x65'	ETWS	Agricultural 0.04	0.07	Bend, HDD
				Industrial/Commercial 0.01		
				Open Land 0.02		
LMA-ETWS-010	43.81	135'x30'x85'x60'	ETWS	Agricultural	0.08	Bend
LMA-ETWS-011	43.81	200'x130'x110'x110'x75'	ETWS	Agricultural	0.37	Bend
LMA-ETWS-012	43.93	210'x130'x90'x45'	ETWS	Agricultural	0.13	Bend
LMA-ETWS-013	43.93	200'x60'x110'x100'x95'	ETWS	Agricultural	0.32	Bend

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
LMA-ETWS-014	44.02	265'x45'x270'	ETWS	Agricultural 0.14	0.14	Bend
LMA-ETWS-015	44.02	205'x145'x70'x115'x140'x25'	ETWS	Agricultural	0.29	Bend
LMA-ETWS-016	44.12	310'x10'x165'x145'x5'	ETWS	Agricultural 0.05	0.06	HDD
				Open Land 0.01		
LMA-ETWS-017	44.12	330'x50'x145'x180'x40'	ETWS	Agricultural 0.28	0.31	HDD
				Industrial/Commercial 0.01		
				Open Land 0.02		
LMA-ETWS-018	44.19	310'x10'x310'x10'	ETWS	Agricultural 0.05	0.07	HDD
				Open Land 0.02		
LMA-ETWS-019	44.19	290'x40'x295'x40'	ETWS	Agricultural 0.11	0.27	HDD
				Industrial/Commercial 0.04		
				Open Land 0.12		
LMA-SA-003	44.30	255'x55'x200'x390'x515'x55'x115'x410'	SA	Agricultural 4.71	4.71	Pipe and equipment storage
LMA-ETWS-020	44.33	200'x55'x95'x110'x35'	ETWS	Agricultural	0.17	Bend
LMA-ETWS-021	44.33	200'x65'x105'x100'x50'	ETWS	Agricultural	0.28	HDD
LMA-ETWS-022	44.44	690'x75'x650'x190'x215'x195'x95'x80'	ETWS	Open Land 1.13	1.13	Bends
LMA-ETWS-023	44.44	640'x50'x70'x90'x640'x100'x125'	ETWS	Open Land 0.62	0.62	Bends
LMA-ETWS-024	44.76	245'x100'x270'x90'	ETWS	Open Land	0.40	End of pipeline, facility, turn around
LMA-ETWS-025	44.76	130'x10'x155'x30'	ETWS	Open Land	0.03	Bend
Subtotal Acreage for Lake Mills M500 E-line					15.43	
Albert Lea M500 E-line						
ALO-ETWS-001	3.64	220'x200'x225'x35'x100'x100'x100'x65'	ETWS	Industrial/Commercial 0.01	0.78	Start of pipeline, tie-in to ALO on V2F, bend
				Open Land 0.77		
ALO-SA-001	3.64	565'x330'x350'x35'x225'x95'x35'x160'	SA	Open Land	4.04	Start of pipeline, pipe and equipment storage
ALO-ETWS-002	3.81	200'x140'x120'x140'x35'	ETWS	Open Land	0.24	Bend

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
ALO-ETWS-002A	3.73	215'x30'x230'x25'	ETWS	Open Land	0.13	Neck down for wetland crossing
ALO-ETWS-003	3.81	125'x65'x85'x80'	ETWS	Open Land	0.15	Bend
ALO-ETWS-004	3.90	670'x10'x665'x130'x40'x140'	ETWS	Agricultural	0.65	HDD, Bend
ALO-ETWS-005	3.90	700'x105'x630'x60'x15'	ETWS	Agricultural 0.95 Forested 0.04	0.99	HDD, Bend
ALO-ETWS-006	4.05	265'x55'x35'x35'x305'x10'	ETWS	Agricultural	0.25	HDD, Bend
ALO-ETWS-007	4.05	335'x45'x10'x35'x340'x165'x65'x225'	ETWS	Agricultural	0.95	HDD, Bend
ALO-ETWS-008	4.20	330'x25'x330'x25'	ETWS	Agricultural	0.19	Soil storage for wetland neckdown
ALO-ETWS-009	4.31	145'x65'x75'x40'	ETWS	Agricultural	0.09	Bend
ALO-ETWS-010	4.31	200'x65'x110'x110'x125'	ETWS	Agricultural	0.36	Bend
ALO-ETWS-011	4.43	200'x40'x110'x100'x55'	ETWS	Agricultural	0.18	Bend
ALO-ETWS-012	4.43	200'x45'x105'x100'x65'	ETWS	Agricultural	0.27	Bend
ALO-ETWS-013	4.49	185'x80'x95'x100'x35'	ETWS	Agricultural	0.19	Bend
ALO-ETWS-014	4.49	200'x70'x95'x125'x10'	ETWS	Agricultural	0.23	Bend
ALO-ETWS-015	4.56	150'x35'x85'x75'	ETWS	Agricultural	0.09	Bend
ALO-ETWS-016	4.56	200'x115'x105'x110'x70'	ETWS	Agricultural	0.35	Bend
ALO-ETWS-017	4.67	490'x10'x490'x10'	ETWS	Agricultural	0.11	HDD
ALO-ETWS-018	4.67	490'x150'x490'x150'	ETWS	Agricultural	1.66	HDD

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
ALO-ETWS-019	4.76	560'x10'x560'x10'	ETWS	Agricultural	0.13	HDD
ALO-ETWS-021	4.95	530'x90'x540'	ETWS	Agricultural	2.77	Pullback
ALO-ETWS-022	5.16	290'x10'	ETWS	Agricultural	0.07	HDD
ALO-ETWS-023	5.16	290'x40'	ETWS	Agricultural	0.27	HDD
ALO-ETWS-024	5.42	380'x30'x200'x50'x100'x150'x335'x10'	ETWS	Agricultural 0.27	0.28	HDD, Bend
				Open Land 0.01		
ALO-ETWS-025	5.42	285'x40'x335'x130'x105'x50'x270'	ETWS	Agricultural	0.61	HDD, Bend
ALO-ETWS-026	5.83	320'x10'x320'x10'	ETWS	Agricultural 0.06	0.07	HDD, Bend
				Open Land 0.01		
ALO-ETWS-027	5.83	345'x40'x335'x45'	ETWS	Agricultural 0.27	0.31	HDD, Bend
				Industrial/Commercial 0.01		
				Open Land 0.03		
ALO-SA-002	5.90	710'x315'x605'x55'x40'x245'	SA	Agricultural 4.04	4.79	Laydown for project, near middle of pipeline
				Industrial/Commercial 0.01		
				Open Land 0.74		
ALO-ETWS-028	5.90	315'x10'x310'x10'	ETWS	Agricultural 0.06	0.07	HDD
				Open Land 0.01		
ALO-ETWS-029	5.90	290'x45'x295'x40'	ETWS	Agricultural 0.24	0.27	HDD
				Open Land 0.03		
ALO-ETWS-030	6.28	200'x65'x100'x110'x35'	ETWS	Agricultural	0.19	Bend
ALO-ETWS-031	6.28	200'x65'x95'x110'x40'	ETWS	Agricultural	0.26	Bend
ALO-ETWS-032	6.47	200'x250'x35'x215'x165'x40'	ETWS	Agricultural	0.33	Bend
ALO-ETWS-033	6.47	200'x280'x65'x215'x135'x65'	ETWS	Agricultural	0.62	Bend
ALO-SA-003	6.89	385'x205'x15'x430'x110'x535'	SA	Agricultural 3.11	3.16	End of pipeline, pipe and equipment storage
				Open Land 0.05		

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
ALO-ETWS-034	6.97	205'x15'x210'x15'	ETWS	Agricultural	0.05	HDD
ALO-ETWS-035	6.97	275'x40'x255'x45'	ETWS	Agricultural 0.23	0.24	HDD
				Open Land 0.01		
ALO-ETWS-036	7.03	250'x75'x95'x100'x55'x45'x145'x100'x30'x145'	ETWS	Open Land	0.92	End of pipeline, HDD, facility, turn around
Subtotal Acreage for Albert Lea M500 E-line					27.31	
Willmar 3rd Branch Line Upstream						
WIL-ETWS-001	3.35	310'x50'x100'x145'x30'x110'x45'x65'x55'x145'x75'x10'x70'x130'x35'x115'x40'x10'x25'x130'x30'x15'x80'x70'x100'x45'x110'x105'	ETWS	Agricultural 1.16	1.28	Start of pipeline, HDD
				Industrial/Commercial 0.01		
				Open Land 0.06		
				Residential 0.05		
WIL-ETWS-001A	3.35	310'x50'x100'x145'x30'x110'x45'x65'x55'x145'x75'x10'x70'x130'x35'x115'x40'x10'x25'x130'x30'x15'x80'x70'x100'x45'x110'x105'	ETWS	Open Land	0.04	Extra width for TAR to make sharp turn off Vernon Avenue
WIL-SA-001	3.39	370'x175'x35'x140'x45'x185'	SA	Open Land	0.82	Start of pipeline, pipe and equipment storage
WIL-SA-002	3.39	325'x500'x265'x75'x200'x215'	SA	Agricultural 1.56	2.89	Start of pipeline, pipe and equipment storage
				Open Land 1.04		
				Residential 0.29		
WIL-ETWS-002	3.45	200'x140'x35'x105'x165'x35'	ETWS	Open Land	0.24	HDD, bend
WIL-ETWS-003	3.39	35'x200'x75'x265'x110'x115'x45'x235'x105'x135'	ETWS	Agricultural 0.09	0.81	Bend
				Industrial/Commercial 0.01		
				Open Land 0.71		
WIL-SA-003	4.97	35'x35'x10'x45'x15'x50'x50'x105'x80'x30'x195'	SA	Open Land 0.52	0.52	Pipeline and equipment, storage
WIL-ETWS-004	3.62	200'x25'	ETWS	Open Land	0.11	Soil storage for wetland neckdown
WIL-ETWS-005	3.74	200'x25'	ETWS	Forested 0.04	0.11	Soil storage for wetland neckdown
				Residential 0.07		
WIL-ETWS-006	3.82	100'x100'x65'x20'	ETWS	Agricultural 0.01	0.08	Bend
				Residential 0.07		
WIL-ETWS-007	3.82	200'x25'x165'x105'x35'x130'	ETWS	Agricultural 0.18	0.19	Bend
				Residential 0.01		

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
WIL-ETWS-008	3.94	195'x50'x125'x95'x125'	ETWS	Agricultural 0.05	0.22	Bend, open cut road, workspace for bore if needed
				Industrial/Commercial 0.03		
				Open Land 0.08		
				Residential 0.06		
WIL-ETWS-009	3.94	125'x140'x40'x125'x115'x30'	ETWS	Agricultural 0.01	0.14	Bend, open cut road, workspace for bore if needed
				Forested 0.02		
				Residential 0.11		
WIL-ETWS-010	4.12	340'x190'x380'x145'x25'x140'x365'x275'x165'	ETWS	Forested 0.29	0.77	Soil storage for wetland neckdown, HDD, bend, turn around
				Open Land 0.48		
WIL-ETWS-010A	4.40	50'x35'x20'x35'x50'x20'	ETWS	Open Land	0.03	Daylight utilities at public road
WIL-ETWS-011	4.25	235'x80'x150'x115'	ETWS	Open Land 0.31	0.35	HDD, bends, turn around
				Residential 0.01		
				Wetland 0.03		
WIL-ETWS-012A	4.31	25'x50'	ETWS	Residential	0.02	Daylight utilities at public road
WIL-ETWS-013	4.62	250'x10'x250'x20'	ETWS	Forested 0.07	1.24	HDD
				Open Land 0.82		
				Residential 0.35		
WIL-ETWS-014	4.74	80'x425'x385'x25'x20'x190'x215'x40'x390'x85'x20'	ETWS	Residential	0.45	HDD
WIL-ETWS-015	4.68	420'x45'x260'x255'x215'x200'x135'	ETWS	Industrial/Commercial 0.02	1.18	Bends, HDD, pullback
				Residential 1.16		
WIL-ETWS-015A	4.31	25'x50'	ETWS	Residential	0.02	Daylight utilities at public road
WIL-ETWS-016	4.98	60'x50'x45'x205'x120'x25'x120'x60'x65'x80'	ETWS	Open Land	0.39	HDD, bends
WIL-SA-003A	5.03	275'x25'x25'x65'x45'x35'x80'x55'x25'	SA	Open Land	0.13	Tie-ins, work inside facility
WIL-ETWS-16A	5.13	235'X210'	ETWS	Industrial/Commercial	0.00 ²	Tie-ins, work inside facility
WIL-ETWS-017	N/A	80'x5'x20'x5'x15'x40'x10'x25'x105'x50'x180'x140'x155'x130'x75'x25'	ETWS	Industrial/Commercial 0.02	0.68	Relocation of receiver and end of pipeline tie-in
				Open Land 0.66		
Subtotal Acreage for Willmar 3rd Branch Line Upstream					12.71	
Willmar 3rd Branch Line Downstream						
WDC-ETWS-001	6.38	540'x225'x125'x45'x100'x70'x195'x15'x355'x200'x355'	ETWS	Agricultural 2.88	3.03	Facility removal and start of pipeline tie in, HDD
				Industrial/Commercial 0.02		
				Open Land 0.13		

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
WDC-SA-001	6.38	290'x200'x355'x145'x520'	SA	Agricultural 2.78	2.91	Start of pipeline, pipe and equipment storage
				Open Land 0.13		
WDC-ETWS-002	6.41	335'x40'x240'x50'x35'x25'x45'	ETWS	Agricultural 0.30	0.33	HDD
				Open Land 0.03		
WDC-ETWS-003	6.41	285'x20'x40'x50'x210'x40'	ETWS	Agricultural 0.05	0.23	HDD
				Open Land 0.18		
WDC-ETWS-004	6.78	200'x90'x100'x105'x65'	ETWS	Agricultural	0.33	Bend
WDC-ETWS-005	6.78	230'x35'x95'x140'	ETWS	Agricultural 0.11	0.13	Bend
				Open Land 0.02		
WDC-ETWS-006	6.86	195'x25'	ETWS	Agricultural	0.11	Soil storage for wetland neckdown
WDC-ETWS-007	6.97	510'x25'x545'x40'	ETWS	Agricultural 0.25	0.30	HDD, soil storage for wetland neckdown
				Industrial/Commercial 0.01		
				Open Land 0.04		
WDC-ETWS-008	7.03	300'x100'x145'x20'x210'x360'x40'	ETWS	Agricultural 0.42	0.57	HDD, road
				Industrial/Commercial 0.03		
				Open Land 0.12		
WDC-ETWS-009	7.11	255'x40'x305'x65'	ETWS	Agricultural 0.22	0.25	HDD
				Open Land 0.03		
WDC-ETWS-010	7.08	440'x20'x425'x10'	ETWS	Agricultural 0.09	0.10	HDD
				Open Land 0.01		
WDC-ETWS-011	7.34	200'x25'	ETWS	Agricultural	0.11	Soil storage for wetland neckdown
WDC-ETWS-012	7.42	200'x25'	ETWS	Agricultural	0.11	Soil storage for wetland neckdown
WDC-ETWS-013	7.54	290'x55'x325'x40'	ETWS	Agricultural 0.25	0.28	HDD
				Open Land 0.03		
WDC-ETWS-014	7.54	130'x50'x155'x55'	ETWS	Agricultural	0.16	HDD
WDC-ETWS-015	7.63	330'x40'x300'x50'	ETWS	Agricultural	0.29	HDD
WDC-ETWS-016	7.65	250'x50'	ETWS	Agricultural	0.29	HDD

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
WDC-ETWS-017	7.79	120'x65'x100'x25'x65'	ETWS	Agricultural	0.18	Bend
WDC-ETWS-018	7.77	200'x50'x100'x105'x35'	ETWS	Agricultural	0.17	Bend
WDC-ETWS-019	8.22	200'x105'x105'x110'x65'	ETWS	Agricultural	0.34	Bend
WDC-ETWS-020	8.22	180'x35'x95'x95'	ETWS	Agricultural	0.11	Bend
WDC-SA-002	8.28	570'x285'x155'x150'x415'x415'	SA	Agricultural	4.97	Middle of pipeline, pipe and equipment storage
WDC-ETWS-022	8.34	865'x155'x110'x415'x385865'x155'x110'x415'x385'	ETWS	Agricultural	1.22	Bends
WDC-ETWS-022A	8.55	25'x125'	ETWS	Agricultural	0.07	Soil storage for wetland neckdown
WDC-ETWS-022B	8.62	25'x125'	ETWS	Agricultural	0.07	Soil storage for wetland neckdown
WDC-ETWS-023	8.86	530'x90'x375'x100'x85'	ETWS	Agricultural	0.76	HDD, bend
WDC-ETWS-024	8.84	285'x165'x200'x240'x125'x80'	ETWS	Agricultural 1.31 Open Land 0.01	1.32	HDD, bend
WDC-ETWS-025	9.07	380'x40'x360'x50'	ETWS	Agricultural	0.33	HDD
WDC-ETWS-026	9.08	235'x180'x315'x300'	ETWS	Agricultural	1.44	HDD
WDC-ETWS-027	9.27	200'x65'x135'x160'x210'	ETWS	Agricultural	0.41	Bend
WDC-ETWS-028	9.28	85'x40'x70'x35'	ETWS	Agricultural	0.06	Bend
WDC-ETWS-029	9.36	65'x65'	ETWS	Forested 0.07 Open Land 0.03	0.10	Bend
WDC-ETWS-030	9.37	130'x45'x150'x35'	ETWS	Open Land	0.11	Bend
WDC-ETWS-031	9.73	515'x105'x45'x395'x100'x195'	ETWS	Open Land	1.76	HDD, bends

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
WDC-ETWS-031A	9.85	25'x55'x25'x55'	ETWS	Industrial/Commercial 0.01	0.03	Daylight utilities at public road
				Open Land 0.02		
WDC-ETWS-031B	9.86	25'x55'x25'x55'	ETWS	Open Land	0.02	Daylight utilities at public road
WDC-ETWS-032	9.73	520'x35'x110'x380'x45'x120'	ETWS	Open Land	0.88	HDD, bends
WDC-SA-003	9.87	525'x655'x165'x30'x30'x55'x25'x20'x45'x125'x30'x30'x35'x130'x660'	SA	Agricultural 5.62	7.91	Pipe and equipment storage
				Open Land 2.29		
WDC-ETWS-032A	9.95	25'x55'	ETWS	Open Land	0.03	Daylight utilities at public road
WDC-ETWS-032B	9.96	25'x55'	ETWS	Open Land	0.02	Daylight utilities at public road
WDC-ETWS-033	9.90	330'x60'x145'x1325'x175'x150'x80'x535'x365'x925'	ETWS	Agricultural 4.98	5.41	HDD, bends, pullback
				Open Land 0.43		
WDC-ETWS-033A	10.28	40'x60'x40'x60'	ETWS	Open Land	0.04	Daylight utilities at public road
WDC-ETWS-033B	10.30	65'x60'x65'x60'	ETWS	Forested 0.03	0.07	Daylight utilities at public road
				Open Land 0.02		
				Wetland 0.02		
WDC-ETWS-034	9.90	265'x425'x65'x205'x195'x115'	ETWS	Agricultural 1.19	1.27	HDD, bends
				Open Land 0.08		
WDC-ETWS-035	10.16	380'x285'x175'x30'x105'	ETWS	Agricultural	0.71	HDD, bends
WDC-ETWS-035A	10.28	40'x60'x40'x60'	ETWS	Open Land	0.04	Daylight utilities at public road
WDC-ETWS-035B	10.30	65'x60'x65'x60'	ETWS	Forested 0.02	0.07	Daylight utilities at public road
				Open Land 0.02		
				Wetland 0.03		
WDC-ETWS-036	10.38	90'x115'x145'x165'x70'	ETWS	Agricultural 0.30	0.32	HDD, bends
				Forested 0.02		
WDC-ETWS-037	10.39	355'x70'x360'x585'x20'x855'	ETWS	Agricultural	1.73	HDD, bends
WDC-ETWS-038	10.46	130'x20'x85'x70'	ETWS	Agricultural 0.06	0.08	HDD, bends
				Forested 0.02		
WDC-ETWS-039	10.61	105'x60'x10'x85'x100'x110'x125'	ETWS	Agricultural 0.23	0.30	HDD, bends
				Forested 0.02		
				Residential 0.05		

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
WDC-ETWS-040	10.62	125'x25'x100'x35'	ETWS	Agricultural 0.03	0.06	HDD, bends
				Forested 0.03		
WDC-ETWS-040A	10.69	50'x100'x45'x100'	ETWS	Agricultural	0.10	HDD
WDC-ETWS-041	10.70	275'x550'x75'x260'x75'x140'x645'x95'x90'	ETWS	Agricultural	3.03	HDD, bends, pullback
WDC-ETWS-042	10.70	340'x140'x65'x80'x380'	ETWS	Agricultural	0.86	HDD, bends
WDC-ETWS-043	10.82	155'x85'x90'x40'	ETWS	Agricultural	0.10	HDD, bends
WDC-ETWS-044	10.95	195'x10'x130'x100'x130'x40'x185'x150'	ETWS	Agricultural 0.35	0.37	Facility removal and end of pipeline tie in, HDD
				Open Land 0.02		
WDC-SA-004	10.95	70'x120'x155'x105'x10'x480'x135'x110'x60'x575'	SA	Agricultural	2.84	Pipe and equipment storage
Subtotal Acreage for Willmar 3rd Branch Line Downstream					49.24	
Welcome 2nd Line						
WBL-SA-001	10.47	460'x525'x235'x95'x335'x15'x165'x150'x310'	SA	Agricultural 5.32	5.63	Start of pipeline, pipe and equipment storage
				Open Land 0.31		
WBL-SA-002	10.47	250'x205'x90'x265'	SA	Agricultural	0.78	Start of pipeline, pipe and equipment storage
WBL-ETWS-001	11.71	290'x200'x235'x90'x135'x155'x200'x105'	ETWS	Agricultural 0.82	0.92	Facility removal and end of pipeline tie in, bend
				Open Land 0.10		
WBL-ETWS-001A	10.53	210'x155'x165'x75'x5'x95'	ETWS	Industrial/Commercial 0.03	0.11	Tie-in
				Open Land 0.08		
WBL-SA-003	11.71	510'x105'x55'x795'x45'x700'	SA	Agricultural 5.35	5.36	End of pipeline, pipe and equipment storage
				Open Land 0.01		
Subtotal Acreage for Welcome 2nd Line					12.80	
Paynesville 2nd Branch Line						
PAY-ETWS-001	0.00	340'x60'x310'x50'	ETWS	Industrial/Commercial 0.01	0.28	Start of pipeline, bend
				Open Land 0.27		
PAY-ETWS-002	0.00	255'x25'x200'x290'x100'x55'x235'x540'	ETWS	Industrial/Commercial 0.04	1.83	Start of pipeline, bend
				Open Land 1.79		
PAY-ETWS-003	0.08	200'x75'x110'x255'x90'x70'x255'	ETWS	Open Land 0.69	0.87	Bends
				Residential 0.18		

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
PAY-ETWS-005	0.25	215'x30'x60'x75'x115'x95'x120'x120'	ETWS	Forested 0.09	0.48	Bends
				Industrial/Commercial 0.04		
				Open Land 0.35		
PAY-ETWS-006	0.41	200'x95'x120'x100'x155'	ETWS	Open Land	0.50	Bend, wetland crossing
PAY-ETWS-007	0.49	345'x50'x325'x55'	ETWS	Forested 0.04	0.39	HDD
				Open Land 0.35		
PAY-ETWS-008	0.49	305'x25'x310'x25'	ETWS	Forested 0.10	0.17	HDD
				Open Land 0.07		
PAY-ETWS-009	0.63	250'x25'x55'x275'x75'	ETWS	Forested 0.18	0.44	HDD
				Open Land 0.26		
PAY-ETWS-010	0.82	240'x125'x25'x90'x45'x140'x190'x80'	ETWS	Industrial/Commercial 0.02	0.52	HDD, bend
				Open Land 0.50		
PAY-ETWS-011	0.82	110'x55'x110'x55'	ETWS	Industrial/Commercial 0.01	0.12	HDD, bend
				Open Land 0.11		
PAY-ETWS-012	0.88	160'x65'x70'x30'x20'x35'x260'x50'x10'x25'x95'x75'x55'x50'x40'x125'x90'	ETWS	Forested 0.01	1.27	HDD, bend, turn around
				Industrial/Commercial 0.02		
				Open Land 1.24		
PAY-ETWS-013	0.88	210'x55'x195'x60'	ETWS	Forested 0.02	0.23	HDD, bend
				Industrial/Commercial 0.01		
				Open Land 0.20		
PAY-ETWS-014	1.05	200'x25'x110'x95'x50'	ETWS	Forested 0.19	0.20	Bend
				Open Land 0.01		
PAY-ETWS-015	1.05	200'x75'x105'x100'x100'	ETWS	Forested 0.30	0.38	Bend
				Open Land 0.08		
PAY-SA-001	1.15	400'x500'x350'x515'	SA	Agricultural 4.31	4.32	Laydown, middle of pipeline
				Open Land 0.01		
PAY-ETWS-016	1.37	280'x75'x1155'x80'x1180'x200'x85'	ETWS	Agricultural 0.47	1.53	Bend, HDD
				Forested 0.21		
				Industrial/Commercial 0.30		
				Open Land 0.55		
PAY-ETWS-017	1.41	55'x245'x55'x245'	ETWS	Agricultural 0.20	0.28	Bends
				Forested 0.08		
PAY-ETWS-017A	1.39	240'x65'x175'x150'x75'x200'	ETWS	Agricultural	0.59	Bends

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
PAY-ETWS-018	1.47	50'x15'x25'x40'x60'x75'x55'x15'x30'x260'	ETWS	Agricultural 0.23	0.24	Bends
				Forested 0.01		
PAY-ETWS-019	1.45	440'x30'x440'	ETWS	Agricultural	0.14	Bend, soil storage for wetland neckdown
PAY-ETWS-020	1.65	1060'x255'x45'x200'x1120'x35'	ETWS	Agricultural	1.09	HDD
PAY-ETWS-022	2.35	215'x90'x555'x75'x150'x110'x55'	ETWS	Industrial/Commercial 0.03	0.67	HDD
				Open Land 0.64		
PAY-ETWS-023	2.34	675'x125'x10'x65'x600'x55'	ETWS	Industrial/Commercial 0.05	0.77	HDD
				Open Land 0.72		
PAY-SA-002	2.34	295'x95'x990'x865'x335'x75'x30'x245'x220'x670'x40'x270'x90'	SA	Agricultural 5.62	9.93	End of pipeline, pipe and equipment storage
				Industrial/Commercial 3.15		
				Open Land 1.16		
Subtotal Acreage for Paynesville 2nd Branch Line					27.24	
Worthington 2nd Branch Line						
WOR-ETWS-001	19.26	180'x50'x80'x75'x80'x25'x180'x150'	ETWS	Agricultural 0.45	0.48	Receiver removal and line stop
				Industrial/Commercial 0.03		
WOR-ETWS-002	19.36	325'x50'x100'x75'x100'x75'x320'x200'	ETWS	Agricultural 1.29	1.30	Start of pipeline tie in
				Open Land 0.01		
WOR-SA-001	19.33	525'x175'x545'x195'	SA	Agricultural 2.18	2.32	Start of pipeline, pipe and equipment storage
				Open Land 0.14		
WOR-ETWS-003	19.48	330'x35'x345'x25'	ETWS	Agricultural 0.18	0.19	HDD
				Open Land 0.01		
WOR-ETWS-004	19.48	340'x50'x335'x50'	ETWS	Agricultural	0.37	HDD
WOR-ETWS-005	19.62	310'x25'x310'x30'	ETWS	Agricultural	0.18	HDD
WOR-ETWS-005A	19.86	150'x25'x150'x25'	ETWS	Agricultural	0.09	Soil storage at waterbody crossing
WOR-ETWS-005B	19.91	150'x25'x150'x25'	ETWS	Agricultural	0.09	Soil storage at waterbody crossing
WOR-ETWS-006	19.62	320'x50'x320'x55'	ETWS	Agricultural	0.36	HDD
WOR-ETWS-006A	19.86	150'x25'x150'x25'	ETWS	Agricultural	0.09	Soil storage at waterbody crossing

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
WOR-ETWS-006B	19.91	150'x25'x150'x25'	ETWS	Agricultural	0.09	Soil storage at waterbody crossing
WOR-ETWS-007	20.20	410'x25'x410'x25'	ETWS	Agricultural 0.22	0.23	Open cut road, workspace for bore if needed
				Open Land 0.01		
WOR-ETWS-008	20.20	410'x50'x410'x50'	ETWS	Agricultural 0.45	0.47	Open cut road, workspace for bore if needed
				Open Land 0.02		
WOR-ETWS-009	20.28	405'x25'x405'x25'	ETWS	Agricultural 0.21	0.23	Open cut road, workspace for bore if needed
				Open Land 0.02		
WOR-ETWS-010	20.28	410'x50'x405'x50'	ETWS	Agricultural 0.42	0.46	Open cut road, workspace for bore if needed
				Open Land 0.04		
WOR-ETWS-011	20.54	135'x75'x80'x50'	ETWS	Agricultural	0.12	Bend
WOR-ETWS-012	20.54	200'x75'x110'x130'x165'	ETWS	Agricultural	0.44	Bend
WOR-ETWS-013	20.64	200'x50'x125'x115'x130'	ETWS	Agricultural	0.30	Bend
WOR-ETWS-014	20.63	165'x110'x90'x75'	ETWS	Agricultural	0.22	Bend
WOR-ETWS-015	20.76	200'x130'x115'x125'x50'	ETWS	Agricultural	0.30	Bend
WOR-ETWS-016	20.76	75'x90'x110'x165'	ETWS	Agricultural	0.22	Bend
WOR-ETWS-017	20.87	150'x50'x85'x85'	ETWS	Agricultural	0.13	Bend
WOR-ETWS-018	20.87	200'x150'x120'x110'x75'	ETWS	Agricultural	0.42	Bend
WOR-SA-002	21.28	405'x465'x375'x460'	SA	Agricultural 3.71	4.11	Pipe and equipment storage
				Industrial/Commercial 0.07		
				Open Land 0.33		
WOR-ETWS-019	21.48	40'x60'x35'x60'	ETWS	Open Land	0.04	Bend
WOR-ETWS-020	21.48	200'x250'x145'x50'x75'x145'x130'x55'	ETWS	Agricultural	0.62	End of pipeline, bend
Subtotal Acreage for Worthington 2nd Branch Line					13.87	

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
Springfield 2nd Branch Line						
SPR-ETWS-001	13.82	215'x100'x150'x120'	ETWS	Agricultural 0.31 Open Land 0.10	0.41	Start of pipeline
SPR-ETWS-002	13.82	220'x50'x100'x75'x100'x75'x95'x240'	ETWS	Agricultural 0.31 Open Land 0.23	0.54	Start of pipeline tie in
SPR-SA-001	13.82	530'x95'x50'x220'x165'x345'x440'	SA	Agricultural 3.92 Forested 0.03 Open Land 0.33	4.28	Start of pipeline, pipe and equipment storage
SPR-ETWS-003	14.93	95'x180'x70'x40'x195'	ETWS	Agricultural 0.27 Industrial/Commercial 0.01 Open Land 0.04	0.32	Bend, open cut road, workspace for bore if needed
SPR-ETWS-004	14.90	505'x335'x105'x105'	ETWS	Agricultural 0.45 Open Land 0.07	0.52	Bend, open cut road, workspace for bore if needed
SPR-ETWS-005	14.97	210'x55'x160'x75'	ETWS	Agricultural 0.17 Open Land 0.05	0.22	Open cut road, workspace for bore if needed
SPR-ETWS-006	14.99	90'x105'x130'x40'x75'	ETWS	Agricultural 0.13 Open Land 0.09	0.22	Open cut road, workspace for bore if needed
SPR-ETWS-007	15.07	630'x45'x340'x265'x50'x40'	ETWS	Agricultural	0.52	HDD, open cut road, workspace for bore if needed
SPR-ETWS-008	15.04	755'x90'x125'x260'x320'x50'	ETWS	Agricultural	0.92	HDD, open cut road, workspace for bore if needed
SPR-ETWS-009	15.29	395'x25'x400'x25'	ETWS	Agricultural	0.23	HDD
SPR-ETWS-010	15.29	410'x50'x405'x50'	ETWS	Agricultural	0.46	HDD
SPR-ETWS-011	16.07	405'x25'	ETWS	Agricultural	0.23	HDD
SPR-ETWS-012	16.07	405'x50'	ETWS	Agricultural	0.46	HDD
SPR-ETWS-013	16.27	405'x25'x425'x35'	ETWS	Agricultural	0.24	HDD
SPR-ETWS-014	16.25	530'x70'x490'x50'	ETWS	Agricultural	0.58	HDD
SPR-ETWS-015	16.42	330'x50'x180'x230'x225'	ETWS	Agricultural 0.65 Open Land 0.03	0.68	Bend, open cut road, workspace for bore if needed

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
SPR-ETWS-016	16.44	210'x105'x145'x75'	ETWS	Agricultural 0.26	0.30	Bend, open cut road, workspace for bore if needed
				Open Land 0.04		
SPR-ETWS-017	16.50	145'x75'x90'x50'	ETWS	Agricultural 0.10	0.13	Bend, open cut road, workspace for bore if needed
				Open Land 0.03		
SPR-ETWS-018	16.50	300'x75'x120'x250'x245'	ETWS	Agricultural 0.82	0.87	Bend, open cut road, workspace for bore if needed
				Open Land 0.05		
SPR-ETWS-019	16.91	265'x30'x275'x25'	ETWS	Agricultural	0.15	Open cut road, workspace for bore if needed
SPR-ETWS-020	16.91	330'x50'x310'x55'	ETWS	Agricultural	0.37	Open cut road, workspace for bore if needed
SPR-ETWS-021	16.97	315'x25'x305'x30'	ETWS	Agricultural	0.18	Open cut road, workspace for bore if needed
SPR-ETWS-022	16.97	280'x55'x300'x50'	ETWS	Agricultural	0.33	Open cut road, workspace for bore if needed
SPR-ETWS-023	17.08	445'x55'x300'x1335'x340'x1145'x75'	ETWS	Agricultural	5.18	HDD, bend, pullback
SPR-SA-002	17.21	280'x125'x75'x535'x655'x550'	SA	Agricultural	6.21	Pipe and equipment storage
SPR-ETWS-024	17.29	535'x280'x280'x80'	ETWS	Agricultural	0.70	HDD, bend
SPR-ETWS-025	17.56	1025'x100'x210'x50'x840'x165'x60'x200'	ETWS	Agricultural 0.65	1.25	HDD, bend
				Industrial/Commercial 0.18		
				Open Land 0.41		
				Residential 0.01		
SPR-ETWS-026	17.53	470'x105'x240'x835'x55'x660'x75'	ETWS	Agricultural 1.60	1.65	HDD, bend
				Industrial/Commercial 0.01		
				Open Land 0.04		
SPR-ETWS-026A	17.75	120'x65'x155'x85'	ETWS	Industrial/Commercial 0.18	0.28	Daylight utilities at public road
				Open Land 0.03		
				Residential 0.07		
SPR-ETWS-027	17.84	495'x40'x525'x25'	ETWS	Agricultural 0.27	0.29	HDD
				Open Land 0.02		
SPR-ETWS-028	17.84	655'x50'x605'x75'	ETWS	Agricultural 0.68	0.72	HDD
				Open Land 0.04		
SPR-ETWS-029	17.95	455'x25'x430'x40'	ETWS	Open Land	0.25	Open cut road, workspace for bore if needed

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
SPR-ETWS-030	17.97	305'x75'x360'x50'	ETWS	Open Land	0.38	Open cut road, workspace for bore if needed
SPR-ETWS-031	18.10	200'x50'x125'x80'x40'	ETWS	Open Land	0.22	Bend
SPR-ETWS-032	18.10	200'x90'x75'x130'x75'	ETWS	Open Land	0.36	Bend
SPR-ETWS-033	19.21	195'x35'x220'x25'	ETWS	Agricultural	0.12	Open cut road, workspace for bore if needed
SPR-ETWS-034	19.21	325'x50'x285'x70'	ETWS	Agricultural	0.35	Open cut road, workspace for bore if needed
SPR-SA-003	19.24	685'x175'x475'x275'	SA	Agricultural	2.33	Pipe and equipment storage
SPR-ETWS-035	19.25	630'x40'x580'x35'	ETWS	Agricultural	0.35	Open cut road, workspace for bore if needed
SPR-ETWS-036	19.26	325'x70'x425'x80'	ETWS	Agricultural 0.42	0.43	Open cut road, workspace for bore if needed
				Industrial/Commercial 0.01		
SPR-ETWS-037	19.36	245'x30'x275'x45'	ETWS	Agricultural 0.13	0.16	Open cut road, workspace for bore if needed
				Open Land 0.03		
SPR-ETWS-038	19.34	420'x80'x365'x50'	ETWS	Agricultural 0.37	0.43	Open cut road, workspace for bore if needed
				Open Land 0.06		
SPR-ETWS-039	19.84	210'x35'x235'x25'	ETWS	Agricultural 0.10	0.13	Open cut road, workspace for bore if needed
				Open Land 0.03		
SPR-ETWS-040	19.84	345'x50'x300'x70'	ETWS	Agricultural 0.31	0.37	Open cut road, workspace for bore if needed
				Industrial/Commercial 0.01		
				Open Land 0.05		
SPR-ETWS-041	19.88	375'x25'x355'x35'	ETWS	Agricultural 0.17	0.20	Open cut road, workspace for bore if needed
				Open Land 0.03		
SPR-ETWS-042	19.90	245'x70'x290'x50'	ETWS	Agricultural 0.25	0.30	Open cut road, workspace for bore if needed
				Open Land 0.05		
SPR-ETWS-043	20.83	355'x40'x325'x25'	ETWS	Agricultural 0.17	0.19	Open cut road, workspace for bore if needed
				Open Land 0.02		
SPR-ETWS-044	20.83	180'x50'x240'x80'	ETWS	Agricultural 0.20	0.24	Open cut road, workspace for bore if needed
				Open Land 0.04		
SPR-ETWS-045	20.90	355'x200'x185'x40'	ETWS	Agricultural 0.13	0.15	Open cut road, workspace for bore if needed, bend
				Open Land 0.02		

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
SPR-ETWS-046	20.88	430'x80'x280'x95'x65'	ETWS	Agricultural 0.43	0.47	Open cut road, workspace for bore if needed, bend
				Open Land 0.04		
SPR-ETWS-047	21.03	650'x325'x155'x410'x170'	ETWS	Agricultural 1.92	2.34	HDD, bends, pullback
				Forested 0.26		
				Industrial/Commercial 0.01		
				Open Land 0.15		
SPR-ETWS-048	21.03	225'x75'x170'x60'x90'	ETWS	Agricultural	0.40	Bend
SPR-ETWS-049	21.14	65'x70'x90'x195'x135'x80'	ETWS	Industrial/Commercial 0.01	0.22	HDD, bend
				Open Land 0.21		
SPR-ETWS-050	21.18	260'x70'x90'x85'x120'x175'x55'x65'x40'x295'x175'x50'x200'	ETWS	Agricultural 0.96	1.36	HDD, end of pipeline
				Open Land 0.38		
				Industrial/Commercial 0.02		
SPR-SA-004	21.19	90'x475'x410'x355'x175'x295'	SA	Agricultural	3.42	End of pipeline, pipe and equipment storage
Subtotal Acreage for Springfield 2nd Branch Line					44.61	
Minnesota Interconnect 2nd Branch Line						
MIC-ETWS-001	17.64	400'x55'x175'x75'x160'x80'x220'x375'x220'	ETWS	Open Land	1.73	Facility removal and start of pipeline tie in
MIC-SA-001	17.64	435'x70'x70'x375'x85'x55'x40'x325'x320'	SA	Open Land	2.45	Start of pipeline, pipe and equipment storage
MIC-ETWS-002	17.72	275'x25'x280'x25'	ETWS	Forested 0.01	0.16	HDD
				Open Land 0.15		
MIC-ETWS-003	17.72	270'x50'x280'x35'x25'	ETWS	Forested 0.01	0.32	HDD
				Open Land 0.29		
				Residential 0.02		
MIC-ETWS-004	17.84	375'x80'x405'x50'x355'x250'x145'x70'	ETWS	Agricultural	1.24	HDD, bend, pullback
MIC-ETWS-005	17.86	255'x50'x40'x75'x235'	ETWS	Agricultural	0.26	HDD, bend
MIC-ETWS-006	18.08	55'x255'x145'x400'	ETWS	Agricultural 0.33	0.37	HDD, bend
				Open Land 0.04		
MIC-ETWS-007	18.03	360'x120'x130'x255'x80'	ETWS	Agricultural 0.63	0.70	HDD, bend, pullback
				Industrial/Commercial 0.01		
				Open Land 0.06		
MIC-SA-002	18.07	410'x75'x110'x45'x40'x55'x140'x190'x305'x125'	SA	Agricultural	3.40	Pipe and equipment storage

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
MIC-ETWS-008	18.42	415'x195'x50'x260'x25'x250'x160'x420'x90'x55"	ETWS	Agricultural 0.52	0.84	HDD, bend
				Open Land 0.32		
MIC-ETWS-008A	18.64	45'x45'	ETWS	Forested 0.01	0.02	Daylight utilities at public road
				Industrial/Commercial 0.01		
MIC-ETWS-008B	18.75	65'x15'	ETWS	Open Land	0.01	Daylight utilities at public road
MIC-ETWS8C	18.78	25'X50'	ETWS	Open Land	0.01	Daylight utilities at public road
MIC-ETWS-009	18.42	705'x320'x200'x65'x80'x75'x85'x25'x95'x435'x645'x95'x430'x680'x55'	ETWS	Agricultural 2.31	2.50	HDD, bend, pullback
				Open Land 0.19		
MIC-ETWS-009A	18.64	45'x45'x45'x45'	ETWS	Agricultural 0.01	0.02	Daylight utilities at public road
				Industrial/Commercial 0.01		
MIC-ETWS-009B	18.75	65'x15'x65'x15'	ETWS	Open Land	0.01	Daylight utilities at public road
MIC-ETWS-009C	18.78	15'x30'x15'x30'	ETWS	Open Land	0.01	Daylight utilities at public road
MIC-ETWS-010	18.81	380'x90'x165'x185'	ETWS	Agricultural	0.46	HDD, bend
MIC-ETWS-011	18.83	1160'x50'x575'x240'x670'x135'x60'x255'x75'	ETWS	Agricultural	2.43	HDD, bend, pullback
MIC-ETWS-012	18.83	50'x520'x60'x485'	ETWS	Agricultural	0.57	Pullback
MIC-ETWS-013	19.17	50'x115'x210'x50'x210'x110'	ETWS	Agricultural 0.36	0.37	End of pipeline, bend
				Open Land 0.01		
MIC-ETWS-014	19.17	170'x100'x125'x105'x185'x15'x40'x60'x60'x50'x35'x60'x40'x35'	ETWS	Agricultural 0.72	0.80	Facility removal and end of pipeline tie in
				Open Land 0.08		
MIC-SA-003	19.14	500'x400'x385'x10'x35'x210'x115'x50'x80'	SA	Agricultural 3.96	4.00	End of pipeline, pipe and equipment storage
				Open Land 0.04		
Subtotal Acreage for Minnesota Interconnect 2nd Branch Line					22.68	
Alexandria 2nd Branch Line						
ALX-ETWS-001	16.80	100'x100'	ETWS	Open Land	0.23	Start of pipeline
ALX-ETWS-002	16.80	75'x130'x210'x195'x50'x100'x75'x100'	ETWS	Forested 0.09	0.53	Facility removal and start of pipeline tie in
				Industrial/Commercial 0.02		
				Open Land 0.41		
				Wetland 0.01		

ID	MP	Dimensions	Type	Existing Land Use and Acres (Subtotals)	Total Area (acres)	Justification
ALX-ETWS-002A	17.20	390'x60'x50'x440'x75'	ETWS	Agricultural	0.74	
ALX-SA-001	16.80	280'x50'x75'x165'x310'x235'	SA	Forested 0.14 Open Land 1.66	1.80	Start of pipeline, pipe and equipment storage
ALX-ETWS-003	17.41	210'x30'x220'x25'	ETWS	Agricultural	0.12	HDD
ALX-ETWS-004	17.41	180'x50'x280'x30'x115'	ETWS	Agricultural 0.27 Forested 0.02	0.29	HDD
ALX-ETWS-005	17.64	535'x205'x415'x95'x145'x245'x150'x460'x75'	ETWS	Open Land	1.92	HDD, bends, turn around
ALX-ETWS-006	17.65	495'x95'x105'x355'x130'x280'x90'x70'x105'	ETWS	Open Land	2.47	HDD, bends
ALX-ETWS-007	17.84	65'x30'x65'x30'	ETWS	Forested	0.01	Road
ALX-ETWS-008	17.84	65'x30'x65'x30'	ETWS	Forested	0.02	Road
ALX-ETWS-009	17.87	65'x25'x65'x25'	ETWS	Forested	0.01	Road
ALX-ETWS-010	17.87	65'x25'x65'x25'	ETWS	Forested	0.01	Road
ALX-ETWS-011	17.94	325'x65'x160'x125'x65'	ETWS	Agricultural	0.37	HDD
ALX-ETWS-012	17.96	195'x65'x225'x215'	ETWS	Agricultural 0.46 Forested 0.02	0.48	HDD
ALX-ETWS-013	18.04	205'x235'x100'x75'x25'x85'x145'x205'x250'	ETWS	Agricultural 0.73 Open Land 0.02	0.75	Facility removal and end of pipeline tie in, bend
ALX-SA-002	18.07	420'x250'	SA	Agricultural 2.37	2.37	End of pipeline, pipe and equipment storage
Subtotal Acreage for Alexandria 2nd Branch Line					12.12	
Hugo Compressor Station Uprate						
Hugo	NA	480'x390'x100'x35'x380'x425'	ETWS	Industrial/ Commercial	4.53	Compressor station uprate and building installation
Subtotal Acreage for Hugo Compressor Station Uprate					4.53	
NL27 Total Acreage					242.54	

¹ Acres impacts for ETWS at the north end of the Lake Mills E-line and Albert Lea M500 E-line are counted in NL27 calculations; these workspaces are shared between the two projects.

² Acres for WIL-ETWS-16A are included in the aboveground facilities impacts as the Credit River MN #1 and are not counted here.

Appendix 8D
TARs and PARs for NL27 Project

Appendix 8D Temporary Access Roads and Permanent Access Roads for the NL27 Project

ID	MP	Type	Description	Length (feet)	Width (feet)	Existing Land Use (Subtotals)	Total Area (acres)
Lake Mills M500 E-line							
LMA TAR-001	42.46	Temporary	New TAR from 240th Street to LMA SA-001 and LMA-ETWS-001	205	35	Industrial/Commercial 0.01 Open Land 0.17	0.18
LMA-TAR-002	43.54	Temporary	New TAR from 725th Avenue to TWS near M.P. 43.54	495	50	Agricultural 0.60	0.60
LMA-TAR-003	44.04	Temporary	New TAR from 725th Avenue to LMA-ETWS-014	650	50	Agricultural 0.72 Open Land 0.04	0.76
LMA-TAR-004	44.14	Temporary	New TAR from 255th Street to LMA-ETWS-016	80	46	Agricultural 0.04 Industrial/Commercial 0.01 Open Land 0.02	0.07
LMA-TAR-005	44.19	Temporary	New TAR from 255th Street to LMA-ETWS-019	100	50	Industrial/Commercial 0.06 Open Land 0.07	0.13
LMA-TAR-006	44.36	Temporary	New TAR from 725th Avenue to LMA-SA-003	546	50	Agricultural 0.60 Open Land 0.03	0.63
LMA-PAR-001	44.80	Permanent	New PAR from 725th Avenue to the lake mills Tie-in Valve setting	50	2300	Agricultural 0.08 Open Land 1.21 Residential 0.27	1.56
Subtotal for Lake Mills M500 E-line							3.93
Albert Lea M500 E-line							
ALO-TAR-001	4.30	Temporary	New TAR from 92nd Avenue SW (partially including a private drive) to ALO-ETWS-009	3135	15-50	Agricultural 0.92 Industrial/Commercial 0.83 Open Land 0.27	2.02
ALO-TAR-002	4.89	Temporary	New TAR from SW 138th Street to ROW	4390	25-50	Agricultural 1.08 Industrial/Commercial 1.15 Open Land 0.21 Residential 0.02	2.46
ALO-TAR-003	5.62	Temporary	New TAR from SW 128th Street (partially including a private drive) to ROW	1965	25-50	Agricultural 1.32 Industrial/Commercial 0.02 Open Land 0.02	1.36

ID	MP	Type	Description	Length (feet)	Width (feet)	Existing Land Use (Subtotals)	Total Area (acres)
ALO-TAR-004	6.37	Temporary	New TAR from SW 92nd Avenue SW to ROW	1270	50	Agricultural 1.35 Open Land 0.07	1.42
ALO-TAR-004A	7.02	Temporary		25	30	Open Land	0.02
ALO-PAR-001	7.03	Permanent	New PAR from 118th street to access Albert Lea Tie-Facility	140	30-60	Open Land 0.02	0.02
Subtotal for Albert Lea M500 E-line							7.30
Willmar 3rd Branch Line Upstream							
WIL-TAR-001	3.35	Temporary	New TAR From Vernon Avenue to WIL- ETWS-001	225	30	Residential 0.02	0.02
WIL-TAR-002	3.39	Temporary	New TAR From Vernon Avenue to WIL- SA-001	520	30-50	Industrial/Commercial 0.27 Open Land 0.17	0.44
WIL-TAR-003	4.27	Temporary	New TAR from Credit River Blvd (partially including a private drive Hampshire Drive) to WIL- ETWS-011	1730	50	Forested 0.08 Industrial/Commercial 1.00 Open Land 0.59 Residential 0.09	1.76
WIL-TAR-003A	5.13	Temporary	New TAR from 196th Street E into TWS	300	40	Open Land	0.27
WIL-TAR-004	4.53	Temporary	New TAR from Credit River Blvd to WIL- ETWS-013	895	50	Forested 0.15 Open Land 0.88	1.03
Subtotal for Willmar 3rd Branch Line Upstream							3.52
Willmar 3rd Branch Line Downstream							
WDC-TAR-001	7.07	Temporary	New TAR from 122 ND Street to WDC- ETWS-008	835	50	Agricultural 0.57 Industrial/Commercial 0.02 Open Land 0.28	0.87
WDC-TAR-002	7.12	Temporary	New TAR from Post Avenue to WDC- ETWS-010	575	50	Agricultural 0.61 Open Land 0.04	0.65
WDC-TAR-003	7.61	Temporary	New TAR from County Road 51 to TWS	260	50	Agricultural 0.03 Open Land 0.13 Wetland 0.06	0.22
WDC-TAR-004	7.65	Temporary	New TAR from County Road 51 to WDC- ETWS-016	65	50	Agricultural 0.02 Open Land 0.03	0.05

ID	MP	Type	Description	Length (feet)	Width (feet)	Existing Land Use (Subtotals)	Total Area (acres)
WDC-TAR-005	8.39	Temporary	New TAR From WDC-SA-002 to WDC-ETWS-022	720	70-75	Agricultural 1.12	1.12
WDC-TAR-006	8.70	Temporary	New TAR From 114th Street to ROW	810	50	Agricultural 0.87 Open Land 0.05	0.92
WDC-TAR-007	9.85	Temporary	New TAR from Salem Avenue to WDC-SA-003	85	50	Agricultural 0.06 Open Land 0.03 Wetland 0.02	0.11
WDC-TAR-008	9.75	Temporary	New TAR from Salem Avenue to WDC-ETWS-032	615	20-50	Industrial/Commercial 0.02 Open Land 0.73	0.75
WDC-TAR-009	10.23	Temporary	New TAR from Highway 5 and 25 (partially including a private drive) to WDC-ETWS-033	630	40	Agricultural 0.15 Industrial/Commercial 0.03 Open Land 0.03 Residential 0.35	0.56
WDC-TAR-011	10.61	Temporary	New TAR from 114th Street (partially including a private drive) to WDC-ETWS-039	1200	50	Agricultural 0.02 Open Land 0.14 Residential 0.51	0.67
WDC-TAR-012	10.71	Temporary	New TAR from Tacoma Avenue to WDC-ETWS-041	1365	50	Agricultural 1.49 Open Land 0.04	1.53
WDC-TAR-013	10.95	Temporary	New TAR from 110th Street to WDC-SA-004	25	50	Agricultural 0.01 Open Land 0.02	0.03
WDC-PAR-001	10.95	Permanent	New PAR from 110th Street to Willmar DS Receiver	25	25	Open Land 0.01	0.01
WDC PAR-002	11.16	Permanent	New PAR from 110th Street to Willmar DS tie in valve setting	375	25-60	Agricultural 0.23 Open Land 0.05	0.28
Subtotal for Willmar 3rd Branch Line Downstream							7.77
Welcome 2nd Line							
WBL-TAR-001	11.23	Temporary	New TAR from 60th Avenue to ROW	1505	50	Agricultural 1.72 Industrial/Commercial 0.01 Open Land 0.03	1.76

ID	MP	Type	Description	Length (feet)	Width (feet)	Existing Land Use (Subtotals)	Total Area (acres)
WBL-PAR-001	11.70	Permanent	New PAR from 60th Avenue to Welcome Tie-in valve setting	100	60	Agricultural 0.09	0.11
						Open Land 0.02	
Subtotal for Welcome 2nd Line							1.87
Paynesville 2nd Branch Line							
PAY-PAR-001	0.00	Permanent	New PAR from Cty Hwy 12 to Paynesville Tie-In Valve Setting	115	30 - 60	Industrial/Commercial 0.07	0.13
						Open Land 0.06	
PAY-TAR-001	0.30	Temporary	New TAR from Cty Hwy 12 (partially including a private drive) to ROW	1480	50	Forested 0.02	1.69
						Industrial/Commercial 1.44	
						Open Land 0.23	
PAY-TAR-001A	0.00	Temporary	New TAR from Cty Hwy 12 to PAY ETWS-002	590	30	Industrial/Commercial 0.18	0.39
						Open Land 0.21	
PAY-TAR-002	0.90	Temporary	New TAR from Big Lake Road (partially including a private drive) to PAY-ETWS-012	565	50	Industrial/Commercial 0.23	0.66
						Open Land 0.43	
PAY-TAR-003	1.25	Temporary	New TAR from State Highway 23 (partially including a private drive) to PAY-SA-001	320	50	Agricultural 0.15	0.33
						Industrial/Commercial 0.16	
						Open Land 0.02	
PAY-TAR-004	1.62	Temporary	New TAR from State Highway 23 to PAY-ETWS-016	1127	50	Agricultural 0.58	1.31
						Industrial/Commercial 0.63	
						Open Land 0.10	
Subtotal for Paynesville 2nd Branch Line							4.51
Worthington 2nd Branch Line							
WOR-TAR-001	19.27	Temporary	New TAR from highway 86 to WOR-ETWS-001	330	50	Agricultural 0.21	0.33
						Industrial/Commercial 0.01	
						Open Land 0.11	
WOR-TAR-002	19.34	Temporary	New TAR from 780th Street to WOR-SA-001 and WOR-ETWS-002	565	50	Agricultural 0.60	0.67
						Open Land 0.07	

ID	MP	Type	Description	Length (feet)	Width (feet)	Existing Land Use (Subtotals)	Total Area (acres)
WOR-TAR-003	19.56	Temporary	New TAR from 780th Street (partially including a private drive) to WOR-ETWS-004	610	50	Agricultural 0.06	0.72
						Industrial/Commercial 0.02	
						Open Land 0.64	
WOR-TAR-004	19.63	Temporary	New TAR from 780th Street to WOR-ETWS-006	575	50	Agricultural 0.54	0.67
						Forested 0.08	
						Industrial/Commercial 0.01	
						Open Land 0.04	
WOR-TAR-005	21.24	Temporary	New TAR from 780th Street to WOR-SA-002	6870	50	Agricultural 0.29	0.35
						Industrial/Commercial 0.01	
						Open Land 0.05	
WOR-PAR-001	21.49	Permanent	New TAR from 780th Street to proposed facility lot and WOR-ETWS-020	285	25	Agricultural 0.06	0.17
						Industrial/Commercial 0.03	
						Open Land 0.08	
Subtotal for Worthington 2nd Branch Line							2.91
Springfield 2nd Branch Line							
SPR-TAR-001	15.32	Temporary	New TAR from Cty Hwy 116 to SPR-ETWS-009 and ROW	6,210	50	Agricultural 7.02	7.02
SPR-TAR-002	16.96	Temporary	New TAR from Township Road 74 (partially including a private drive) to SPR-ETWS-019 and SPR-ETWS-021	2020	50	Agricultural 2.24	2.30
						Open Land 0.06	
SPR-TAR-003	17.29	Temporary	New TAR from County Road 27 to SPR-SA-002	1,590	50	Agricultural 1.54	1.85
						Industrial/Commercial 0.31	
SPR-TAR-004	19.07	Temporary	New TAR from 280th Street to SPR-SA-003	35	50	Agricultural 0.04	0.04
SPR-TAR-005	21.14	Temporary	New TAR from 270th Street to SPR-SA-004	35	50	Agricultural 0.66	0.70
						Open Land 0.04	
SPR-TAR-006	21.15	Temporary	New TAR from State Highway 4 to SPR-SA-004	60	50	Open Land	0.08

ID	MP	Type	Description	Length (feet)	Width (feet)	Existing Land Use (Subtotals)	Total Area (acres)
SPR-PAR-001	19.90	Permanent	New PAR from Township Road 115 to Springfield 2nd branch line downstream RMV	30	30	Open Land	0.02
SPR-PAR-002	21.39	Permanent	New PAR from 780th to Springfield 2nd Branch Line Tie-In Valve Setting	65	30	Open Land	0.04
Subtotal for Springfield 2nd Branch Line							12.05
Minnesota Interconnect 2nd Branch Line							
MIC-TAR-001	17.64	Temporary	New TAR from 345th Avenue NW (partially including a private drive) MIC-ETWS-001	1,800	50	Forested 1.49	2.07
						Industrial/Commercial 0.02	
MIC-TAR-002	17.77	Temporary	New TAR from Verdin Street NW (partially including a private drive) to MIC-ETWS-006, MIC-SA-002 and MIC-ETWS-003	2,890	50	Agricultural 0.87	3.25
						Forested 1.26	
						Industrial/Commercial 0.91	
						Open Land 0.19	
MIC-TAR-003	18.47	Temporary	New TAR from 341st Avenue NW MIC-ETWS-008	195	50	Agricultural 0.18	0.23
						Open Land 0.05	
MIC-TAR-004	18.98	Temporary	New TAR from 337th Ln NW (partially including a private drive) MIC-ETWS-011 and ROW	250	50	Agricultural 0.83	1.66
						Industrial/Commercial 0.03	
						Open Land 0.80	
MIC-TAR-005	19.22	Temporary	New TAR from Kerry Street NW to MIC-SA-003	20	50	Open Land 0.02	0.02
MIC-PAR-001	19.2	Permanent	New AR for access to the MIC Tie-In Valve Setting	25	150	Open Land 0.07	0.07

ID	MP	Type	Description	Length (feet)	Width (feet)	Existing Land Use (Subtotals)	Total Area (acres)
Subtotal for Minnesota Interconnect 2nd Branch Line							7.30
Alexandira 2nd Branch Line							
ALX-TAR-001	16.80	Temporary	New TAR from 100th Avenue to ALX-ETWS-001	35	50	Forested 0.03 Open Land 0.01	0.04
ALX-TAR-001A	16.80	Temporary	New TAR from 100th Avenue to ALX-SA-001	80	50	Forested 0.05 Industrial/Commercial 0.02	0.07
ALX-TAR-002	17.06	Temporary	New TAR from private drive to ALX-ETWS-004	845	50	Agricultural 2.49 Residential 0.27 Open Land 0.05	2.81
ALX-TAR-003	17.82	Temporary	New TAR from 90th Avenue to ALX-ETWS-005	145	50	Industrial/Commercial 0.01 Open Land 0.12	0.13
ALX-TAR-004	18.07	Temporary	New TAR from 140th Street and proposed drive to ALX-ETWS-013 and ALX-SA-002	645	50	Agricultural 0.39 Industrial/Commercial 0.21	0.60
ALX-PAR-001	18.07	Permanent	New PAR from 140th Street to the new facility	140	50	Agricultural 0.18 Industrial/Commercial 0.05 Open Land 0.02	0.25
Subtotal for Alexandira 2nd Branch Line							3.90
NL27 Project Total							55.06

Resource Report 9

Air Quality and Noise



Resource Report No. 9

Air Quality and Noise

**Ventura to Farmington A-Line Abandonment and Capacity Replacement Project and
Northern Lights 2027 Expansion Project**

FERC Docket No. CP26-___-000

Volume I - Public

February 2026

**RESOURCE REPORT NO. 9 – AIR QUALITY AND NOISE
 SUMMARY OF FILING INFORMATION**

MINIMUM REQUIREMENT	LOCATION ADDRESSED
Describe existing air quality in the vicinity of the project – Title 18 Code of Federal Regulations. § 380.12(k)(1)	Section 9.1.1
Quantify the existing noise levels (day-night sound level (Ldn) and other applicable noise parameters) at noise sensitive areas and at other areas covered by relevant state and local noise ordinances. (§ 380.12(k)(2))	Section 9.2.1 and Table 9.2-1
Quantify existing and proposed emissions of compressor equipment, plus construction emissions, including nitrogen oxides (NOx) and carbon monoxide (CO), and the basis for these calculations. Summarize anticipated air quality impacts for the project. (§ 380.12(k)(3))	Sections 9.1.2, 9.1.3, 9.1.4 and 9.1.5, Tables 9.1-2 through 9.1-5, and Appendix 9A and Appendix 9C
Describe the existing compressor units at each station where new, additional, or modified compressor units are proposed, including the manufacturer, model number, and horsepower of the compressor units. For proposed new, additional, or modified compressor units, include the horsepower, type, and energy source. (§ 380.12(k)(4))	Section 9.1.2 and Resource Report 1, Section 1.3.3 and Figure 1-11
Identify any nearby noise-sensitive area by distance and direction from the proposed compressor unit building/enclosure. (§ 380.12(k)(4))	N/A
Identify any applicable state or local noise regulations. (§ 380.12(k)(4))	Section 9.2
Calculate the noise impact at noise-sensitive areas of the proposed compressor unit modifications or additions, specifying how the impact was calculated, including manufacturer’s data and proposed noise control equipment. (§ 380.12(k)(4))	N/A – no increase in noise emissions
Additional Information	Location Addressed
Include climate information as part of the air quality information provided for the project area.	Section 9.1.1
Identify potentially applicable federal and state air quality regulations.	Sections 9.1.1 and 9.1.2
Provide construction emissions (criteria pollutants, hazardous air pollutants, greenhouse gases) for proposed pipelines and aboveground facilities.	Section 9.1.5, Tables 9.1-3 through 9.1-5, and Appendix 9A and 9C
Provide copies of state and federal applications for air permits.	Will be filed when complete
Provide operation and fugitive emissions (criteria pollutants, hazardous air pollutants, greenhouse gases) for pipelines and aboveground facilities.	Section 9.1.6 and Tables 9.1-7 through 9.1-9 and Appendix 9B and 9D
Provide air quality modeling for entire compressor stations. N/A	N/A – minor update
Identify temporary and permanent emissions sources that may have cumulative air quality effects in addition to those resulting from the project.	Sections 9.3.1 and 9.3.2
Describe the existing noise environment and ambient noise surveys for compressor stations, liquefied natural gas facilities, meter and regulation facilities, and drilling locations.	Section 9.2.2, Tables 9.2-3 and 9.2-4
Identify any state or local noise regulations applicable to construction and operation of the project.	Section 9.2.1 and Tables 9.2-1 and 9.2-2
Indicate whether construction activities would occur over 24-hour periods.	Sections 9.2.3 and 9.2.4 and Table 9.2-5
Discuss construction noise impacts and quantify construction noise impacts from drilling, pile driving, dredging, etc.	Section 9.2.3 and 9.2.4
Quantify operation noise from aboveground facilities, including blowdowns.	Section 9.2.5
Describe the potential for the operation of the proposed facilities to result in an increase in perceptible vibration and how this would be prevented.	Section 9.2.7

Identify temporary and permanent noise sources that may have cumulative noise effects in addition to those resulting from the project.	Resource Report 1, Section 1.11
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Abbreviations and Acronyms

A-line	Northern Natural Gas’ 16-inch-diameter M500 A Mainline
°F	degrees Fahrenheit
C-line	Northern Natural Gas’ 30-inch-diameter M500 C line
CAA	Clean Air Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CO ₂	carbon dioxide
CO _{2e}	carbon dioxide equivalents
D-line	Northern Natural Gas’ 30-inch-diameter M500 D line
dB	decibels
dBA	A-weighted decibels
DOT	U.S. Department of Transportation
E-line	Northern Natural Gas’ 30-inch-diameter M500 E line
EPA	U.S. Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
GHG	greenhouse gas
HAP	hazardous air pollutant
HDD	Horizontal directional drill
HP	horse power
Hz	hertz
IAC	Iowa Administrative Code
IDNR	Iowa Department of Natural Resources
L _d	daytime sound level
L _{dn}	day-night level
L _{eq}	equivalent sound level (in decibels)
µg/m ³	micrograms per cubic meter
MPCA	Minnesota Pollution Control Administration
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NL27 Project	Northern Lights 2027 Expansion Project
NO ₂	nitrogen dioxide
Northern	Northern Natural Gas
NO _x	nitrogen oxides
NSA	Noise Sensitive Area
NSPS	New Source Performance Standards
NSR	New Source Review
PM	particulate matter
PM ₁₀	particulate matter with a diameter ≤ 10 microns
PM _{2.5}	particulate matter with a diameter ≤ 2.5 microns
ppb	parts per billion by volume
ppm	parts per million by volume

Projects	Ventura to Farmington A-line Abandonment and Capacity Replacement and Northern Lights 2027 Expansion Projects
PSD	Prevention of Significant Deterioration
psig	pound per square inch gauge
Scf	Square cubic foot
SO ₂	sulfur dioxide
tpy	tons per year
V2F Project	Ventura to Farmington A-Line Abandonment and Capacity Replacement Project
VOC	volatile organic compound(s)

9.0 RESOURCE REPORT 9 – AIR QUALITY AND NOISE

Northern’s application is composed of two discrete projects, the V2F Project and the NL27 Project (Projects). The two Projects will be built concurrently, and Northern has combined the two Projects into a single Section 7 application. Analysis and impacts are generally discussed separately for each Project throughout the application.

Resource Report 9 details effects of the proposed Project on existing air and noise environments and describes the potential construction and operational impacts on the environmental and any proposed measures Northern will implement to mitigate the effects.

Northern owns and operates a natural gas transmission pipeline system, including pipeline and associated aboveground facilities in Minnesota and Iowa. Northern is filing an application with FERC pursuant to section 7 of the Natural Gas Act. The V2F Project involves isolation and abandonment in-place of approximately 105.76 miles of 16-inch-diameter pipeline on Northern’s M500 A and 25.35 miles of 16-inch-diameter M500 J pipeline systems (collectively referred to as the A-line) from Ventura, Iowa to Farmington, Minnesota. To replace the capacity, Northern will construct three new pipeline extensions consisting of approximately 17.88 miles of 36-inch or 30-inch-diameter pipelines and associated aboveground appurtenances in Freeborn, Steele and Dakota counties, Minnesota.

The NL27 Project consists of the installation of ten pipeline extensions totaling 28.43 miles, a compressor station uprate and associated aboveground appurtenances in Minnesota for firm transportation requirements associated with Northern’s customers. The NL27 Project is in Freeborn, Steele, Scott, Carver, Martin, Stearns, Jackson, Watonwan, Isanti, Morrison, and Washington counties, Minnesota.

Tables 9.0-1 and 9.0-2 provide a list of Project components along with their associated Minnesota or Iowa counties.

Table 9.0-1 V2F Project Facilities and Location

Component	Project Facility	Facility Description	County, State
Lake Mills M500 E-line	8.29-mile pipeline	36-inch-diameter extension	Freeborn, MN
	Lake Mills compressor station	Temporary compression site	Worth, IA
Albert Lea M500 E-line	2.09-mile pipeline	36-inch-diameter extension	Steele, MN
	Owatonna compressor station	Temporary compression site	Steele, MN
Faribault M500 D-line	7.50-mile pipeline	30-inch-diameter extension	Dakota, MN
	Northfield #1	Temporary compression site	Dakota, MN
A-line Abandonment	Ventura compressor station	Pipeline disconnect site	Hancock, IA
	Farmington compressor station	Pipeline disconnect site	Dakota, MN
	La Crosse BL MNB73201 launcher /ABA05	Temporary compression site	Freeborn, MN

Table 9.0-2 NL27 Project Facilities and Location

Component	Project Facility	Facility Description	County, State
Lake Mills M500 E-line	2.32-mile pipeline	36-inch-diameter extension	Freeborn, MN
Albert Lea M500 E-line	3.42-mile pipeline	36-inch-diameter extension	Steele, MN
Willmar 3rd Branch Line Upstream	1.78-mile pipeline	24-inch-diameter extension	Scott, MN
Willmar 3rd Branch Line Downstream	4.78-mile pipeline	24-inch-diameter extension	Carver, MN
Welcome 2nd Line	1.24-mile pipeline	16-inch-diameter extension	Martin, MN
Paynesville 2nd Branch Line	2.45-mile pipeline	4-inch-diameter extension	Stearns, MN
Worthington 2nd Branch Line	2.17-mile pipeline	8-inch-diameter extension	Jackson, MN
Springfield 2nd Branch Line	7.40-mile pipeline	8-inch-diameter extension	Watonwan, MN
Minnesota Interconnect 2nd Branch Line	1.59-mile pipeline	12-inch-diameter extension	Isanti, MN
Alexandria 2nd Branch Line	1.28-mile pipeline	8-inch-diameter extension	Morrison, MN
Aboveground Facilities			
Hugo Compressor Station Uprate	Hugo compressor station	Turbine switch for newer model with increase of 700 horsepower	Washington, MN

9.1 Air Quality

9.1.1 Existing Air Quality and Climatology

For both Projects, the CAA, 42 U.S. Code Part 7401 et seq., amended in 1977 and 1990, is the basic federal statute governing air quality. The provisions of the CAA that are potentially relevant to construction and operation emission sources include the following: NAAQS, PSD air permits, NSR air permits, Title V air permits, NSPS air rules, and NESHAP air rules.

Section 109(b) of the CAA requires that the EPA establish NAAQS “requisite to protect” public health and public welfare (40 CFR Part 50). The CAA identifies two class types of NAAQS: primary standards and secondary standards. Primary standards are limits set to protect the public health of the most sensitive populations, such as asthmatics, children, and the elderly. Secondary standards are limits set to protect public welfare, such as protection against visibility impairment or damage to vegetation, wildlife, and structures. The CAA requires the EPA to periodically review and, if new data indicate, update the NAAQS.

The EPA has promulgated NAAQS for six criteria pollutants: ozone, PM, SO₂, oxides of nitrogen, CO₂, and lead. Standards for PM are categorized on the size of the PM based on diameters of 10 microns and 2.5 microns. The NAAQS for both Projects are summarized in Table 9.1-1.

Table 9.1–1 NAAQS for Criteria Pollutants

Pollutant	Primary Standard	Averaging Times	Secondary Standard
CO	9 ppm	8 hours	None
	35 ppm	1 hour	None
Lead	0.15 µg/m ³	Rolling 3-month average	Same as primary
NO ₂	53 ppb	Annual (arithmetic mean)	Same as primary
	100 ppb	1 hour	None
PM ₁₀	150 µg/m ³	24 hours	Same as primary
PM _{2.5}	9 µg/m ³	Annual (arithmetic mean)	0.15 µg/m ³
	35 µg/m ³	24 hours	Same as primary
Ozone	0.070 ppm (2015 std.)	8 hours	Same as primary
SO ₂	75 ppb	1 hour	-
	-	Annual (arithmetic mean)	10 ppb

Source: (EPA 2025)

For both Projects, the EPA compares ambient air criteria pollutant measurements to NAAQS to assess the status of the air quality of regions within the U.S. The regions are generally defined on a county level basis. Based on these comparisons, regions are designated as being in one of the following categories for the criteria air pollutants:

- **Attainment.** A region is designated as in “attainment” if monitoring shows that ambient concentrations of a specific pollutant are less than or equal to NAAQS. An attainment area for a NAAQS that has been redesignated from nonattainment is classified as a “maintenance area” for a 10-year period to ensure that the air quality improvements are sustained.
- **Nonattainment.** If the NAAQS are exceeded for a pollutant, then the region is designated as in “nonattainment” for that pollutant. Nonattainment areas can be further classified based on the severity of the exceedance of the relevant standard.
- **Unclassifiable.** An area is designated as “unclassifiable” if the ambient air monitoring data are incomplete and do not support a designation of attainment or nonattainment.

V2F Project

Hancock, and Worth Counties, Iowa, and Freeborn, Steele, and Dakota counties, Minnesota will be affected by air emissions from the construction of the proposed V2F Project. All counties are designated “attainment” for each of the NAAQS pollutants. (EPA 2025a) with the exception of Dakota County, Minnesota, which is currently in nonattainment for lead. Northern’s V2F Project will not result in any impacts on air quality with respect to lead.

Worth County, Iowa, is located at the southern end of the V2F Project. The average annual mean temperature for Worth County is 54.0°F , which ranges from a monthly average low of 5.0°F in January to a monthly average high of 81.0°F in July. The area receives 34.33 inches of precipitation per year. The annual precipitation includes an average of 38.0 inches of snowfall (U.S. Climate Data 2025).

Dakota County, Minnesota, is located at the northern end of the V2F Project. The average annual mean temperature for Dakota County is 55.0°F which ranges from a monthly average low of 4.0°F in January to a monthly average high of 82.0°F in July. The area receives 32.63 inches of precipitation per year. The annual precipitation includes an average of 42 inches of snowfall. (U.S. Climate Data 2025).

NL27 Project

Freeborn, Steele, Scott, Carver, Martin, Stearns, Jackson, Watonwan, Isanti, Morrison, and Washington counties, Minnesota will be affected by air emissions from the construction of the proposed NL27 Project. All counties are designated “attainment” for each of the NAAQS pollutants. (EPA 2025a).

All 11 counties are located in east-central and southeastern Minnesota. The average annual mean temperature for the region is 55.0 degrees F which ranges from a monthly average low of 4.0 degrees F in January to a monthly average high of 82.0 degrees F in July. The area receives roughly 32 inches of precipitation per year. The annual precipitation includes an average of 42 inches of snowfall. (U.S. Climate Data 2025).

Federal Class I Areas are established by Congress and include wilderness areas and national parks. These areas are afforded special protection under the CAA. Once designated as a Class I Area, an area cannot be re-designated to a lower classification. Class I areas are allowed the smallest degree of air quality deterioration through the NSR permitting process. Special consideration must be made in the permitting process when a Class I area is located near a proposed facility.

For both Projects, there are two federal Class I Areas in Minnesota: Voyageurs National Park and Boundary Waters Canoe Area Wilderness. Both Class I Areas are located in northern Minnesota. No Class I Areas are located within 100 kilometers (62.13 miles) of the Project, which is the maximum distance that must be considered under the PSD program.

9.1.2 Federal Permit Program and Requirements

9.1.2.1 New Source Review

For both Projects, pre-construction air permitting programs that regulate the construction of new stationary sources of air pollution are commonly referred to as NSR. NSR can be divided into two groups: major NSR and minor NSR. Major NSR includes two programs: PSD and Nonattainment NSR. Both major NSR programs are established at the federal level and typically implemented by a state or local permitting body with EPA review when these local authorities have either delegated jurisdiction by EPA or have EPA-approved State Implementation Plan programs. The minor NSR permitting program regulates pollutants from sources that do not require PSD or Nonattainment NSR permits. The purpose of minor NSR permits is to prevent the construction of sources that would interfere with attainment or maintenance of a NAAQS or violate the control strategy in nonattainment areas. Also, minor NSR permits often contain permit conditions to limit the sources’ emissions to avoid the need for PSD analysis or Nonattainment NSR.

The NL27 Project includes uprate of an existing natural-gas fired turbine with a newer model at the Hugo compression station located northeast of the Minneapolis metropolitan area in Washington County, Minnesota. At the Hugo compressor station, Northern also will replace

the existing natural gas fired emergency generator with a new natural gas fired emergency generator and install a natural gas fired fuel gas heater and natural gas building heater. The proposed work at the Hugo compressor station is subject to pre-construction NSR permitting. The proposed turbine will not trigger any requirements under PSD or NNSR and will be considered minor under the NSR rules. Northern intends to receive pre-construction authorization from the MPCA prior to installation of the new turbine. Emissions for the turbine are included in Section 9.1.5.

9.1.2.2 New Source Performance Standards

For both Projects, the EPA has promulgated NSPS based on specific emission source categories, and they are organized by subparts of 40 CFR Part 60. Depending upon the type of emission source and applicable subpart, these standards may include emission limits, work practice standards, and requirements for monitoring, recordkeeping and reporting. NSPS apply to new, modified or reconstructed stationary sources that meet criteria established in 40 CFR 60.

Subpart OOOOb – Standards of Performance for Crude Oil and Natural Gas Facilities

Subpart OOOOb (Standards of Performance for Crude Oil and Natural Gas Facilities for which Construction, Modification or Reconstruction Commenced After December 6, 2022) establishes emission standards and compliance schedules for the control of VOC emissions from affected facilities in the crude oil and natural gas production source category that commence construction, modification or reconstruction after December 6, 2022. This subpart is applicable to the NL27 Project as the turbine uprate will increase HP at the Hugo compressor station.

Subpart KKKKa - Standards of Performance for Stationary Gas Turbines

EPA published NSPS KKKKa in the Federal Register on January 15, 2025. NSPS KKKKa is applicable to affected facilities that began construction, modification or reconstruction on December 13, 2024. The proposed turbine uprate at the Hugo compressor station will be subject to NSPS KKKKa and intends to comply with the requirements.

Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines

Standards of Performance for Stationary Spark Ignition Internal Combustion Engines (Subpart JJJJ) applies to stationary spark ignition engine manufacturers and owners/operators. For natural gas-fired emergency engines manufactured after January 1, 2009, the applicable emission limits for engines greater than 130 HP rated capacity are specified in Subpart JJJJ as follows:

- For NOX, the limit is 2.0 grams per horsepower-hour or 160 parts per million by volume on a dry basis at 15% oxygen (O₂);
- For CO, the limit is 4.0 grams per horsepower-hour or 540 parts per million by volume on a dry basis at 15% O₂; and
- For VOCs, the limit is 1.0 grams per horsepower- hour or 86 parts per million by volume on a dry basis at 15% O₂.

9.1.2.3 National Emission Standards for Hazardous Air Pollutants

For both Projects, the EPA has promulgated NESHAPs based on specific industrial and emission source categories. NESHAP applicability also depends on the major and area source designation of the facility in terms of HAPs. A major source of HAPs is a facility that has the potential to emit 10 tpy or more of a single HAP, or 25 tpy or more of a combination of HAPs. Facilities that have potentials less than these are classified as area sources. Depending upon the specific variables of the facility (including major/area status), the applicable standards may include employing control devices (emission limits), work practice standards, and requirements for monitoring, recordkeeping and reporting.

Subpart ZZZZ – National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

40 CFR Part 63 Subpart ZZZZ establishes national emission limitations and operating limitations for HAPs emitted from stationary reciprocating internal combustion engines located at major and area (minor) sources of HAP emissions. This subpart also establishes requirements to demonstrate initial and continuous compliance with the emission limitations and operating limitations.

Subpart ZZZZ applies to the emergency natural gas fired engine. The new emergency engine generator will comply with the requirements of Subpart ZZZZ by meeting the requirements of NSPS Subpart JJJJ.

9.1.3 State Permit Program and Requirements

For both Projects, air permits are required in Minnesota and Iowa for stationary sources that emit regulated air pollutants unless the emissions or sources are exempted. Minnesota requires that stationary sources subject to NSPS or NESHAP requirements or those that exceed state permitting thresholds must obtain a state permit under Minnesota Rule 7007.0250. Minnesota state air permitting is only required for NL27 Project - Hugo compressor station for the proposed turbine uprate and natural gas fired heaters. Operational emissions sources for appurtenant facilities in Minnesota for both projects will not require state permitting. A copy of the air permit application will be provided to FERC upon submittal to MPCA.

For Iowa, the air permitting rules are listed in the Environmental Protection Commission rules of the IAC Chapter 22 (567 IAC 22). *The Small Unit Exemption*, listed 567 IAC 22.1(2)“w”(1) allows for the construction and operation of a stationary source if emissions are below specified thresholds. The operating emissions outlined in Section 9.1-5 demonstrate that emissions are less than the those listed in 567 IAC 22.1(2)“w”(1). Thus, the proposed operations for sources in Iowa (V2F only) will meet *The Small Unit Exemption*. No registration is required for this, only documentation. The calculations provided Appendix 9A are documentation that emissions will meet *The Small Unit Exemption*.

9.1.4 Clean Air Act General Conformity

The CAA contains the legislation that mandates the General Conformity rule to ensure that federal actions in nonattainment and maintenance areas do not interfere with a state’s timely attainment of the NAAQS. A General Conformity determination is required for each

pollutant where the total of direct and indirect emissions caused by a federal action (such as a FERC action) will equal or exceed de minimis levels as specified in 40 CFR Part 93.153, with the exceptions specified in 40 CFR Part 51.853(c), (d), or (e). General Conformity evaluations are not required for areas that are in attainment for NAAQS.

Neither Project is located in an attainment area for all pollutants of concern; therefore, a General Conformity analysis is not required.

9.1.5 Construction Emissions

V2F Project

Construction of the V2F Project will result in intermittent, temporary and localized emissions of criteria pollutants over the 36-month construction period. Northern is planning to commence the pipeline extension construction activities spring 2027 for the Lake Mills and Albert Lea M500 E-lines, spring 2028 for the Faribault M500 D-line, and planning to complete the A-line disconnects and abandonment spring/summer 2029. Construction activities along the pipeline installation and at the pipeline disconnect sites will result in emissions of fugitive dust from vehicular traffic, soil disturbance, emissions from natural gas, diesel- and gasoline-fired construction equipment, and emissions from pipeline venting. Large earth-moving equipment and other mobile sources are sources of combustion-related emissions, including criteria pollutants (i.e., NO_x, CO, VOCs, SO₂, PM₁₀ and PM_{2.5}) and small amounts of HAPs. Air pollutants from the construction equipment will be limited to the immediate vicinity of the construction area and will be temporary. The Project, as planned, will require no blasting. In addition, Northern will not complete any open burning as part of site-clearing activities.

NL27 Project

Construction of the NL27 Project will result in intermittent, temporary and localized emissions of criteria pollutants over the 9-month construction period. Northern is planning to commence the pipeline extension construction activities spring 2027. Construction activities along the pipeline installation will result in emissions of fugitive dust from vehicular traffic, soil disturbance, emissions from natural gas, diesel- and gasoline-fired construction equipment, and emissions from pipeline venting. Limited clearing and grading will be required for the Hugo compressor station uprate construction where all work will be contained within the fenceline of the Hugo compressor station. Large earth-moving equipment and other mobile equipment are sources of combustion-related emissions, including criteria pollutants (i.e., NO_x, CO, VOCs, SO₂, PM₁₀ and PM_{2.5}) and small amounts of HAPs. Air pollutants from the construction equipment will be limited to the immediate vicinity of the construction area and will be temporary. The Project, as planned, will require no blasting. In addition, Northern will not complete any open burning as part of site-clearing activities.

In accordance with Minn. R. 7011.0150 a person shall take reasonable precautions to prevent PM from becoming airborne in quantities sufficient to cause a nuisance. PM should not remain visible beyond the property where it originates. The MPCA may require reasonable measures including, but not limited to, use of water for control of dusts in construction operations; the grading of roads or the clearing of land; application of suitable materials such as asphalt, oil, water, or chemicals on unpaved roads, material stockpiles, and other surfaces

which can give rise to airborne dusts; installation and use of containment or control equipment to enclose or otherwise limit the emissions resulting from the handling and transfer of dusty materials; covering, at all times when in motion, open-bodied vehicles transporting materials likely to give rise to airborne dusts; prompt removal of earth or other material from paved streets or to which earth or other material has been transported by trucking or earth-moving equipment; and reducing the speed of vehicles traveling over on-property surfaces as necessary to minimize the generation of airborne dusts. The state of Iowa has a comparable standard under 567 IAC 23.3(2)(c).

For both Projects, construction-related emission estimates are based on typical construction equipment, hours of operation, and vehicle miles traveled by the construction equipment and supporting vehicles for each Project component. Construction of both Projects will generally take place during daytime hours. This schedule will allow equipment operators to assess the presence of fugitive emissions and to implement abatement measures, as needed. However, HDD activities, tie-ins, venting, compression, testing and commissioning, pressure testing, inspections, equipment delivery, electrical work requiring no heavy equipment, and dewatering and stormwater maintenance, and other time sensitive construction activities may extend beyond daytime hours (after 10 p.m.). Northern will employ dust control measures, such as watering access roads and public roads, storage piles and disturbed surfaces, during construction and restoration. The addition of construction stone to unpaved areas also will mitigate dust emissions. Additional measures that may be employed include imposing vehicle speed restrictions on unpaved areas, using gravel tracking pads at egress points to remove dirt from tires and tracks and restoring disturbed areas following construction. The data presented here is a conservative estimate, based on worst-case assumptions and EPA emission factors. The estimated air emissions from construction will be transient in nature with negligible impact on regional air quality.

V2F Project

For the V2F Project, the largest emissions will be associated with the venting of remnant natural gas from the abandoned A-line. Northern intends to transfer the majority of the natural gas in the A-line to other pipelines in the Northern system via the use of temporary compression to draw the pressure in the pipeline down to approximately 10 or 15 pounds per square inch. All remaining gas will be evacuated by means of venting. Due to total length of pipeline being abandoned (131.11 miles), Northern estimates that approximately 1,500,000 standard cubic feet of gas will be vented as part of the pipeline abandonment in 2029, which equates to 863 tons of CO₂e. This is a one-time event and will not be a recurring event.

Table 9.1-2 summarizes the estimated emissions of criteria pollutants, total HAPs and GHG emissions from A-line abandonment that will occur in 2029. Detailed calculations for the V2F Project are provided in Appendix 9A.

Table 9.1-2 Abandonment Activity Emissions Summary for the V2F Project

Description and County	Emissions (tons)								
	Criteria Pollutants						CO ₂ e	Formaldehyde	Total for All HAPS
	NO _x	CO	VOC	SO ₂	PM ₁₀	PM _{2.5}			
Engine Emissions									
Worth/IA	-	-	-	-	-	-	-	-	-

Description and County	Emissions (tons)								
	Criteria Pollutants						CO ₂ e	Formaldehyde	Total for All HAPS
	NO _x	CO	VOC	SO ₂	PM ₁₀	PM _{2.5}			
Hancock/IA	0.4	0.1	0.03	0.0	0.0	0.0	19.0	0.0	0.01
Freeborn/MN	-	-	-	-	-	-	-	-	-
Steele/MN	-	-	-	-	-	-	-	-	-
Dakota/MN	0.4	0.1	0.03	0.0	0.0	0.0	19.0	0.0	0.01
Temporary Compression^{1,2}									
Worth/IA	-	-	-	-	-	-	-	-	-
Hancock/IA	-	-	-	-	-	-	-	-	-
Freeborn/MN	0.6	0.1	0.0	0.0	0.0	0.0	27.0	0.01	0.01
Steele/MN	-	-	-	-	-	-	-	-	-
Dakota/MN	-	-	-	-	-	-	-	-	-
Unpaved Roads^{1,2}									
Worth/IA	-	-	-	-	-	-	-	-	-
Hancock/IA	-	-	-	-	0.08	0.01	-	-	-
Freeborn/MN	-	-	-	-	-	-	-	-	-
Steele/MN	-	-	-	-	-	-	-	-	-
Dakota/MN	-	-	-	-	0.08	0.01	-	-	-
Earthmoving^{1,2}									
Worth/IA	-	-	-	-	-	-	-	-	-
Hancock/IA	-	-	-	-	0.23	0.02	-	-	-
Freeborn/MN	-	-	-	-	-	-	-	-	-
Steele/MN	-	-	-	-	-	-	-	-	-
Dakota/MN	-	-	-	-	0.23	0.02	-	-	-
Venting for Tie-ins^{1,2}									
Worth/IA	-	-	-	-	-	-	-	-	-
Hancock/IA	-	-	-	-	-	-	-	-	-
Freeborn/MN	-	-	3.0	-	-	-	863	-	-
Steele/MN	-	-	-	-	-	-	-	-	-
Dakota/MN	-	-	-	-	-	-	-	-	-
Total emissions									
Worth/IA	-	-	-	-	-	-	-	-	-
Hancock/IA	0.4	0.1	-	-	0.31	0.03	19.0	-	-
Freeborn/MN	0.6	0.1	3.0	-	-	-	880	-	0.01
Steele/MN	-	-	-	-	-	-	-	-	-
Dakota/MN	0.4	0.1	-	-	0.31	0.03	19.0	-	-
Project Total	1.4	0.3	3.0	0.0	0.6	0.06	918	0.02	0.03

NOTE: “0.0” indicates emission values are <0.01

¹ The Project is expected to be completed in an approximate three-month period. These are expected to be one-time emissions and not recurring annually

² Emissions from abandonment activities such as excavation and ground clearing are expected to occur in Hancock County, IA and Dakota County, MN; while venting and temporary compression will occur in Steele County, MN

(-) means that pollutant does not apply

Fugitive dust will result from land clearing, grading, excavation, and vehicle traffic on paved and unpaved roads. The amount of dust generated will be a function of construction activity, soil type, soil moisture content, wind speed, precipitation, vehicle traffic, vehicle types, and road surface characteristics. Emissions will be greater during dry periods and in areas where fine-textured soils are subject to surface activity. Northern will employ proven construction-related practices to control fugitive dust such as application of water or other commercially available dust control agents on unpaved areas subject to frequent vehicle traffic in. Further, construction equipment will be operated only on an as-needed basis.

The fugitive dust from the construction activities and engine emissions from the construction equipment for the V2F Project are summarized in Table 9.1-3. Identified fugitive dust emissions are expected to be one time emissions occurring over the approximately nine months in 2027, five months in 2028 and three months in 2029. In this analysis, it was assumed that the construction equipment engines, on average, would comply with Tier 2 standards.

To complete the tie-ins, Northern will vent the following pipeline sections:

- approximately 1.5 million cubic feet from the Lake Mills M500 E-Line
- approximately 0.4 million cubic feet from the Albert Lea M500 E-line
- approximately 0.8 million cubic feet from the Faribault M500 D-line

Where possible, the pressure of the pipelines will be reduced through drawdown and Northern will vent the remaining natural gas in the pipelines prior to the tie-ins. Northern plans to vent approximately 2.7 million square cubic feet of gas for the V2F Project to complete tie-in activities. Detailed calculations, including assumed quantities of equipment type for the V2F Project, are provided in Appendix 9A. The combined summary of construction and abandonment emissions for the V2F Project is shown in Table 9.1-4.

Table 9.1-3 Construction Emissions Summary for the V2F Project

Description and County	Emissions (tons)								
	Criteria Pollutants						CO ₂ e	Formaldehyde	Total for All HAPS
	NO _x	CO	VOC	SO ₂	PM ₁₀	PM _{2.5}			
Engine Emissions									
Worth/IA									
Hancock/IA									
Freeborn/MN	88.9	17.7	5.0	0.03	2.8	2.8	4,114	0.6	1.0
Steele/MN	88.9	17.7	5.0	0.03	2.8	2.8	4,114	0.6	1.0
Dakota/MN	88.9	17.7	5.0	0.03	2.8	2.8	4,114	0.6	1.0
Temporary Compression^{1,2}									
Worth/IA	0.3	-	0.01	-	-	-	14.6	-	-
Hancock/IA	-	-	-	-	-	-	-	-	-
Freeborn/MN	-	-	-	-	-	-	-	-	-
Steele/MN	0.2	-	0.01	-	-	-	9.2	-	-
Dakota/MN	0.2	-	0.01	-	-	-	10.9	-	-
Unpaved Roads^{1,2}									
Worth/IA	-	-	-	-	-	-	-	-	-

Description and County	Emissions (tons)								
	Criteria Pollutants						CO ₂ e	Formaldehyde	Total for All HAPS
	NO _x	CO	VOC	SO ₂	PM ₁₀	PM _{2.5}			
Hancock/IA	-	-	-	-	-	-	-	-	-
Freeborn/MN	-	-	-	-	11.5	1.1	-	-	-
Steele/MN	-	-	-	-	11.5	1.1	-	-	-
Dakota/MN	-	-	-	-	11.5	1.1	-	-	-
Earthmoving^{1,2}									
Worth/IA	-	-	-	-	-	-	-	-	-
Hancock/IA	-	-	-	-	-	-	-	-	-
Freeborn/MN	-	-	-	-	6.9	0.7	-	-	-
Steele/MN	-	-	-	-	1.9	0.2	-	-	-
Dakota/MN	-	-	-	-	6.1	0.6	-	-	-
Venting for Tie-ins^{1,2}									
Worth/IA	-	-	3.0	-	-	-	863	-	-
Hancock/IA	-	-	-	-	-	-	-	-	-
Freeborn/MN	-	-	-	-	-	-	-	-	-
Steele/MN	-	-	0.8	-	-	-	230	-	-
Dakota/MN	-	-	1.6	-	-	-	460	-	-
Total emissions									
Worth/IA	0.3	-	3.0	-	-	-	878	-	-
Hancock/IA	-	-	-	-	-	-	-	-	-
Freeborn/MN	88.9	17.7	5.0	0.03	21.2	4.6	4,114	0.6	1.0
Steele/MN	89.1	17.7	5.8	0.03	16.2	4.1	4,353	0.6	1.0
Dakota/MN	89.1	17.7	6.6	0.03	20.4	4.5	4,585	0.6	1.0
Project Total	268	53.1	20.4	0.09	57.8	13.2	13,930	1.8	3.0

¹ Unpaved roads and earthmoving are a source of fugitive dust emissions from these operations, engine emissions from the equipment are included in engine emissions

² (-) means that pollutant does not apply

Table 9.1-4 Combined Construction & Abandonment Emissions Summary for the V2F Project

Description and County	Emissions (tons)								
	Criteria Pollutants						CO ₂ e	Formaldehyde	Total for All HAPS
	NO _x	CO	VOC	SO ₂	PM ₁₀	PM _{2.5}			
Abandonment Emissions									
Worth/IA	-	-	-	-	-	-	-	-	-
Hancock/IA	0.4	0.1	-	-	0.31	0.03	19.0	-	-
Freeborn/MN	0.6	0.1	3.0	-	-	-	880	-	0.01
Steele/MN	-	-	-	-	-	-	-	-	-
Dakota/MN	0.4	0.1	-	-	0.31	0.03	19.0	-	-
Construction Emissions									
Worth/IA	0.3	-	3.0	-	-	-	878	-	-
Hancock/IA	-	-	-	-	-	-	-	-	-

Description and County	Emissions (tons)								
	Criteria Pollutants						CO ₂ e	Formaldehyde	Total for All HAPS
	NO _x	CO	VOC	SO ₂	PM ₁₀	PM _{2.5}			
Freeborn/MN	88.9	17.7	5.0	0.03	21.2	4.6	4,114	0.6	1.0
Steele/MN	89.1	17.7	5.8	0.03	16.2	4.1	4,353	0.6	1.0
Dakota/MN	89.1	17.7	6.6	0.03	20.4	4.5	4,585	0.6	1.0
Total Emissions									
Worth/IA	0.3	-	3.0	-	-	-	878	-	-
Hancock/IA	0.4	0.1	-	-	0.3	0.03	19.0	-	-
Freeborn/MN	89.5	17.8	8.0	0.03	21.2	4.6	4,994	0.6	1.0
Steele/MN	89.1	17.7	5.8	0.03	16.2	4.1	4,353	0.6	1.0
Dakota/MN	89.5	17.8	6.6	0.03	20.7	4.5	4,604	0.6	1.0
Project Total	269	53.4	23.4	0.09	58.4	13.3	14,848	1.8	3.0

(-) means that pollutant does not apply

To minimize methane venting to the atmosphere during tie-in activities for the V2F Project, Northern will install a belowground line stop at the Faribault M500 D-Line. The use of a line stop to complete tie-in activities will eliminate the need to vent approximately 11.3 million scf of natural gas to the atmosphere during tie-in.

The V2F Project construction schedule will determine the period of time during which construction-related emissions will occur and also the total quantity of emissions. Construction is scheduled to begin April 2027 and be completed by November 2027 for the Lake Mills and Albert Lea M500 E-line; construction of the Faribault D-line will be constructed in 2028 over approximately five months and the final A-line disconnects and blowdown will be completed over approximately three months in 2029.

Table 9.1-5 below provides a breakdown of emissions by year.

Table 9.1-5 V2F Project Emissions by Year

Year	Emissions (tons) ¹								
	Criteria Pollutants						CO ₂ e	Formaldehyde	Total for All HAPS
	NO _x	CO	VOC	SO ₂	PM ₁₀	PM _{2.5}			
Abandonment Emissions									
2027	178	35.4	13.8	0.06	37.4	8.7	9,345	1.2	2.0
2028	89.1	17.7	6.6	0.03	20.4	4.5	4,585	0.6	1.0
2029	1.4	0.3	3.0	0.0	0.62	0.06	918	0.0	0.01
Project Total	269	53.4	23.4	0.09	58.4	13.3	14,848	1.8	3.0

(-) means that pollutant does not apply

During the construction period, some or all of the following work practices may be implemented:

- Cover or treat surfaces disturbed by construction activities with a dust suppressant until completion of activities at each site of disturbance

- Stabilize on-site unpaved roads and off-site unpaved access roads (e.g., using water or chemical stabilizer/suppressant)
- Restrict on-road vehicle speeds on unpaved roadways to 15 miles per hour
- Add construction stone to unpaved areas. Use gravel tracking pads at egress points to remove dirt from tires and tracks
- Restore disturbed areas following construction
- Sweep paved roads

Through the implementation of the work practices described above, and the short duration of the construction activities, the temporary emissions during construction of the V2F Project will be minimal and the impact of these emissions will be localized. Therefore, it is anticipated that these emissions will not have a significant impact on air quality.

NL27 Project

For NL27 Project, construction also results in combustion emissions from diesel and gasoline-fueled vehicles used in various construction activities. Combustion-related emissions will include NO_x, CO, VOCs, SO₂, PM₁₀, PM_{2.5}, and small amounts of HAPs. The EPA requires manufacturers of on- and off-road engines to certify their products to engine emission standards based on the year of manufacture. On-road equipment, like automobiles and pick-up trucks, have had a series of standards imposed since the 1970s.

Large construction equipment, such as a grader or a front-end loader, are generally powered by diesel engines. For diesel engines, the emission standards have been phased in over the past two decades in four steps, referred to as Tier 1 to Tier 4. The engine must comply with the emission standards in place based on the size of the engine for the year the engine was built and must comply with the appropriate standard throughout its useful life. The engine manufacturers must certify the engine emissions to the EPA. In 2010, the EPA required the sulfur concentration in diesel fuels be lowered from a historical concentration of 500 ppm to 15 ppm (ultra-low sulfur diesel fuel), which allows diesel engines to meet current Tier 4 emission requirements. Proper maintenance of construction equipment and use of low and ultra-low-sulfur diesel fuel will minimize engine emissions during NL27 Project construction. To reduce emissions from internal combustion engines, idling of construction vehicles will be minimized.

The fugitive dust from the construction activities and engine emissions from the construction equipment for the NL27 Project are summarized in Table 9.1-6. In this analysis, it was assumed that the construction equipment engines, on average, would comply with Tier 2 standards.

To complete the tie-ins for the NL27 Project, Northern will vent the following pipeline sections; the venting for the Lake Mills M500 E-line and Albert Lea M500 E-line are included in the venting calculations for the V2F Project (Table 9.1-3).

- approximately 50 feet of 4-inch-diameter pipeline on the Paynesville second branch line
- approximately 100 feet of 24-inch-diameter pipeline on the Wilmar 3rd branch line downstream
- approximately 100 feet of 24-inch-diameter pipeline on the Wilmar 3rd branch line upstream

- approximately 100 feet of 8-inch-diameter pipeline on the Alexandria 2nd branch line
- approximately 50 feet of 12-inch-diameter pipeline on the Minnesota Interconnect 2nd branch line
- approximately 50 feet of 8-inch-diameter pipeline on the Springfield 2nd branch line
- approximately 200 feet of 8-inch-diameter pipeline on the Worthington second branch line

The pressure of the pipelines will be reduced through drawdown and Northern will vent the remaining natural gas in the pipelines prior to the tie-ins. Northern plans to vent approximately 0.048 million scf of gas for the NL27 Project to complete tie-in activities. Detailed calculations, including assumed quantities of equipment type for the Project, are provided in Appendix 9A.

Table 9.1-6 Construction Emissions Summary for the NL27 Project

Description and MN County	Emissions (tons)								
	Criteria Pollutants						CO ₂ e	Formaldehyde	Total for All HAPS
	NO _x	CO	VOC	SO ₂	PM ₁₀	PM _{2.5}			
Engine Emissions									
Freeborn	88.9	17.7	5.0	0.03	2.8	2.8	4,112	0.6	1.0
Steele	88.9	17.7	5.0	0.03	2.8	2.8	4,112	0.6	1.0
Scott	88.9	17.7	5.0	0.03	2.8	2.8	4,112	0.6	1.0
Carver	126.6	25.2	7.0	0.05	4.0	3.9	5,844	0.8	1.4
Martin	88.9	17.7	5.0	0.03	2.8	2.8	4,112	0.6	1.0
Stearns	88.9	17.7	5.0	0.03	2.8	2.8	4,112	0.6	1.0
Jackson	88.9	17.7	5.0	0.03	2.8	2.8	4,112	0.6	1.0
Watonwan	139.0	27.8	7.9	0.05	4.4	4.3	6,424	0.9	1.5
Isanti	88.9	17.7	5.0	0.03	2.8	2.8	4,112	0.6	1.0
Morrison	88.9	17.7	5.0	0.03	2.8	2.8	4,112	0.6	1.0
Washington	1.9	0.4	0.1	0.00	0.1	0.1	90.3	0.01	0.02
Unpaved Roads^{1,2}									
Freeborn	-	-	-	-	11.5	1.1	-	-	-
Steele	-	-	-	-	11.5	1.1	-	-	-
Scott	-	-	-	-	11.5	1.1	-	-	-
Carver	-	-	-	-	15.0	1.5	-	-	-
Martin	-	-	-	-	11.5	1.1	-	-	-
Stearns	-	-	-	-	11.5	1.1	-	-	-
Jackson	-	-	-	-	11.5	1.1	-	-	-
Watonwan	-	-	-	-	17.1	1.7	-	-	-
Isanti	-	-	-	-	11.5	1.1	-	-	-
Morrison	-	-	-	-	11.5	1.1	-	-	-
Washington	-	-	-	-	0.2	0.02	-	-	-

Description and MN County	Emissions (tons)								
	Criteria Pollutants						CO ₂ e	Formaldehyde	Total for All HAPS
	NO _x	CO	VOC	SO ₂	PM ₁₀	PM _{2.5}			
Earthmoving^{1,2}									
Freeborn	-	-	-	-	2.1	0.2	-	-	-
Steele	-	-	-	-	3.0	0.3	-	-	-
Scott	-	-	-	-	1.6	0.2	-	-	-
Carver	-	-	-	-	4.1	0.4	-	-	-
Martin	-	-	-	-	1.2	0.1	-	-	-
Stearns	-	-	-	-	2.2	0.2	-	-	-
Jackson	-	-	-	-	1.9	0.2	-	-	-
Watonwan	-	-	-	-	6.3	0.7	-	-	-
Isanti	-	-	-	-	1.5	0.2	-	-	-
Morrison	-	-	-	-	1.2	0.1	-	-	-
Washington	-	-	-	-	0.9	0.1			
Venting for Tie-ins^{1,2}									
Freeborn	-	-	-	-	-	-	-	-	-
Steele	-	-	-	-	-	-	-	-	-
Scott	-	-	0.05	-	-	-	14.8	-	-
Carver	-	-	0.02	-	-	-	7.7	-	-
Martin	-	-	-	-	-	-	-	-	-
Stearns	-	-	0.00	-	-	-	0.2	-	-
Jackson	-	-	0.01	-	-	-	3.2	-	-
Watonwan	-	-	0.00	-	-	-	0.8	-	-
Isanti	-	-	0.01	-	-	-	2.3	-	-
Morrison	-	-	0.01	-	-	-	2.0	-	-
Washington	-	-	-	-	-	-	-	-	-
Total emissions									
Freeborn	88.9	17.7	5.0	0.03	16.4	4.1	4,112	0.6	1
Steele	88.9	17.7	5.0	0.03	17.3	4.2	4,112	0.6	1
Scott	88.9	17.7	5.0	0.03	15.9	4.1	4,127	0.6	1
Carver	126.6	25.2	7.0	0.05	23.2	5.8	5,851	0.8	1.4
Martin	88.9	17.7	5.0	0.03	15.5	4.0	4,112	0.6	1
Stearns	88.9	17.7	5.0	0.03	16.5	4.1	4,112	0.6	1
Jackson	88.9	17.7	5.0	0.03	16.2	4.1	4,115	0.6	1
Watonwan	139.0	27.8	7.9	0.05	27.9	6.7	6,425	0.9	1.5
Isanti	88.9	17.7	5.0	0.03	15.8	4.1	4,114	0.6	1
Morrison	88.9	17.7	5.0	0.03	15.5	4.0	4,114	0.6	1
Washington	1.9	0.4	0.1	0.00	1.2	0.2	90.3	0.01	0.02

Description and MN County	Emissions (tons)								
	Criteria Pollutants						CO ₂ e	Formaldehyde	Total for All HAPS
	NO _x	CO	VOC	SO ₂	PM ₁₀	PM _{2.5}			
Project Total	979	195	55.0	0.34	181	45.4	45,284	6.5	10.9

¹ Unpaved roads and earthmoving are a source of fugitive dust emissions from these operations, engine emissions from the equipment are included in engine emissions

² (-) means that pollutant does not apply

To minimize methane venting to the atmosphere during tie-in activities, Northern will install belowground line stops and/or utilize hot taps at the Wilmar Upstream 3rd branch line, Willmar Downstream 3rd branch line, Welcome 2nd line, Paynesville 2nd branch line, Worthington 2nd branch line, Springfield 2nd branch line, Minnesota Interconnect 2nd branch line and Alexandria 2nd branch line. The use of line stops and hot taps to complete tie-in activities will eliminate the need to vent approximately 36 million scf of natural gas to the atmosphere during tie-ins.

The NL27 Project construction schedule will determine the period of time during which construction-related emissions will occur and also the total quantity of emissions. Tree clearing will begin February and March 2027 and construction is scheduled to begin April or May 2027 and be completed by November 2027 for all NL27 Project components.

During the construction period, some or all of the following work practices may be implemented:

- Cover or treat surfaces disturbed by construction activities with a dust suppressant until completion of activities at each site of disturbance
- Stabilize on-site unpaved roads and off-site unpaved access roads (e.g., using water or chemical stabilizer/suppressant)
- Restrict on-road vehicle speeds on unpaved roadways to 15 miles per hour
- Add construction stone to unpaved areas. Use gravel tracking pads at egress points to remove dirt from tires and tracks
- Restore disturbed areas following construction
- Sweep paved roads

Through the implementation of the work practices described above, and the short duration of the construction activities, the temporary emissions during construction of the NL27 Project will be minimal and the impact of these emissions will be localized. Therefore, it is anticipated that these emissions will not have a significant impact on air quality.

9.1.6 Operational Emissions

V2F Project

The V2F Project will include only pipeline appurtenances (two new block valves) as stationary sources of fugitive air emissions (Table 9.1-7). Given the stated purpose of the V2F Project is to abandon the A-line pipeline and replace the lost capacity by installing the three separate pipeline extensions, Northern is proposing no incremental increase in capacity, and the Project will result in *de minimus* increase in operational greenhouse gas emissions and no incremental increase in downstream GHG emissions.

Table 9.1-7 Operational Fugitive Emissions Summary Ancillary Facilities for V2F Project

Facility Description and County	Annualized Emissions (tons per year) ¹	
	Methane (CH ₄)	CO _{2e}
Other Ancillary Facility Fugitives²		
Freeborn/MN	0.39	9.9
Dakota/MN	0.39	9.9
Project Total	0.79	19.7

¹ Annualized Emissions

² Other ancillary facilities include aboveground block valves, flanges and relief valves

NL27 Project

After the pipelines are in service, emissions from the NL27 pipelines and the related aboveground appurtenant facilities will be low. The proposed new turbine, replacement natural gas fired emergency generator, and new fuel gas heater at the Hugo compressor station has the potential to create more significant, consistent emissions. The gas starter for the turbine at the Hugo compressor station is being replaced by an electric start unit, so a small decrease in operational emissions is expected but accounted for herein. Additionally, Northern does not anticipate an increase in fugitive emissions from the Hugo compressor uprate. Northern has calculated the loss of methane, which is a GHG, through leaks associated with aboveground valves, flanges, and the operation of receivers. GHG emissions from the receiver and other appurtenant facilities associated with the Project are summarized in Table 9.1-8. Additionally, as a combustion source, emissions from the proposed Hugo turbine, which include NO_x, CO, PM, PM₁₀, PM_{2.5}, VOC, SO₂, HAP, and GHG, are summarized in Table 9.1-9 below.

Detailed calculations for operational emissions by Project component are included in Appendix 9B.

Table 9.1-8 Operational Fugitive Emissions Summary Ancillary Facilities for NL27 Project

Facility Description and County	Annualized Emissions (tons per year) ^{1, 3}	
	Methane (CH ₄)	CO _{2e}
Other Ancillary Facility Fugitives²		
Freeborn	0.4	9.9
Steele	0.4	9.9
Scott	0.4	9.9
Carver	-	-
Martin	0.4	9.9
Stearns	0.4	9.9
Jackson	0.8	19.7
Watonwan	-	-

Facility Description and County	Annualized Emissions (tons per year) ^{1, 3}	
	Methane (CH ₄)	CO _{2e}
Isanti	0.4	9.9
Morrison	0.4	9.9
Project Total	3.3	89.0

¹ Annualized Emissions – assumes one pig event every seven years, consisting of five pig launches/receipts per event

² Other ancillary facilities include aboveground valves, flanges and relief valves

³ There are no launchers associated with NL27 and no new receivers (three being relocated within the project area)

(-) means that pollutant does not apply

Table 9.1-9 Operational Turbine Emissions – Hugo Compressor Station Upgrade (Washington County)

Equipment	Emissions (tons)								
	Criteria Pollutants						CO _{2e}	Formaldehyde	Total for All HAPS
	NO _x	CO	VO C	SO ₂	PM ₁₀	PM _{2.5}			
Turbine	19.8	41.3	2.71	0.22	2.06	2.06	36,623	0.22	0.32
Emergency Generator	0.86	1.70	0.42	0.01	0.03	0.03	178	0.03	0.03
Heaters	0.19	0.16	0.01	0.00	0.01	0.01	230	0.00	0.00
Project Total	20.9	43.6	3.14	0.23	2.10	2.10	37,031	0.25	0.35

9.1.7 Air Quality Mitigation Measures

During construction of both Projects, Northern will employ dust control measures, such as watering access roads, storage piles and disturbed surfaces during construction and restoration. The addition of construction stone to unpaved areas also will mitigate dust emissions. Additional measures that may be employed include: imposing vehicle speed restrictions on unpaved areas, using gravel tracking pads at egress points to remove dirt from tires and tracks and restoring disturbed areas following construction.

Proper maintenance of construction equipment and use of ultra-low-sulfur diesel fuel will minimize engine emissions during both Projects construction. To reduce emissions from internal combustion engines, idling of construction vehicles will be minimized.

9.1.8 Climate Change

Northern understands the value of discussing a project’s GHG emissions as the FERC balances the benefits of a project, i.e., its demonstrated need and necessity against possible environmental impacts. Simply put, Northern believes responsible environmental management is good business; it benefits customers and improves the quality of the environment in which we live. Northern has programs to reduce methane, a contributor to greenhouse gas emissions. Appendix H contains a detailed discussion of the Project’s GHG emissions, and a summary of that discussion is below.

Northern has adopted maintenance and engineering measures to minimize venting of natural gas, reducing methane emissions. The use of third-party portable compression to draw down line pressure resulted in a savings of 223.78 MMscf, of natural gas emitted in 2021; this

equates to approximately 112,440 tons CO₂e. The use of hot taps reduces the length of a line that has to be blown down during maintenance. A line stop is inserted in the pipeline; a shorter length of pipe is blown down. Northern estimates this procedure resulted in the avoidance of 124.7 MMscf of natural gas released to the atmosphere; this equates to approximately 62,650 tons CO₂e. During normal pipeline operations, pipeline equipment, such as regulating stations, compressor stations, and town border stations, are utilized to draw down line pressure when needed, avoiding the venting of 65.2 MMscf or approximately 32,750 tons CO₂e of natural gas. Northern also uses flaring of gas as an alternative to venting natural gas, resulting in an estimated 15.4 MMscf, or approximately 7,740 tons CO₂e, of natural gas vented.

All told, in 2021, through operational best practices alone Northern achieved a 94.4% in methane reduction savings through flaring (95.5 MMscf of gas saved v. 5.6 MMscf of gas released); 89.75% of methane savings through capped blowdowns (26.1 MMscf of gas saved v. 3.0 MMscf of gas released); 65.0% of methane savings through pipeline operations (38.5 MMscf of gas saved v. 20.7 MMscf of gas released); and 100% methane savings through the use of vapor recovery units (1.2 MMscf of gas saved v. 0 MMscf of gas released).

In 2022, Northern replaced a total of seven antiquated compressor units, one unit at the Brownfield, Texas, station, two units at the Spraberry, Texas, station, and four units at the Ogden, Iowa, station. In 2023, Northern installed a compressor blowdown system at the Sunray, Texas, compressor station to route natural gas that would otherwise be vented to the atmosphere to the station fuel header during blowdown activities; and in May 2023, Northern commenced construction to replace four units at the North Branch, Minnesota, compressor station. The North Branch updates are due to be completed in late 2025. In 2024, Northern installed one vapor recovery system at the Spraberry, Texas, compressor station. The vapor recovery system will capture natural gas packing leak emissions from multiple reciprocating compressors and compress the gas to the station fuel system. The compressors are newly installed units which have operating conditions that permit the packing recovery system to be implemented. Northern uses advanced technology, such as LiDAR (light detection and ranging), optimal Gas Imaging (OGI), and a HiFlow Sampler™ technology, to identify the source of fugitive leaks. Northern then assigns a priority to leaks in order to respond to the sources with the greatest level of fugitive gas.

9.2 Noise Quality

Noise from construction and operation of both Projects was assessed to identify potential impacts on NSAs.

9.2.1 Acoustic Terminology

Sound is caused by vibrations that generate waves of pressure fluctuations in the surrounding medium. Sound levels are typically measured using a logarithmic dB scale as pressure fluctuations caused by sound sources can vary by several orders of magnitude. The logarithmic dB scale facilitates the comparison of different sound levels. Unwanted sound or sound that causes disturbance or annoyance is often called noise. The terms sound and noise are used interchangeably in this report.

Human hearing varies in sensitivity for different sound frequencies. The ear is most sensitive to sound frequencies between 800 and 8,000 Hz and is least sensitive to sound frequencies below 400 Hz or above 12,500 Hz. Consequently, several different frequency weighting schemes have been used to approximate the way the human ear responds to noise levels. The A-weighted decibel denoted as dBA is the most widely used weighting for this purpose.

The L_{eq} is the so-called equivalent continuous sound level which over a given time interval has the same total acoustic energy as the fluctuating measured sound level. Therefore, L_{eq} represents the average sound level recorded over a specific period of interest such as hourly ($L_{eq,1-hr}$), daytime ($L_{eq,day}$ or L_d), nighttime ($L_{eq,night}$ or L_n), etc.. FERC defines daytime hours as the hours between 7 a.m. and 10 p.m. and nighttime hours as the hours between 10 p.m. and 7 a.m. In the context of environmental assessments under FERC regulations, L_{eq} , L_d , and L_n are A-weighted sound levels.

For both Projects, FERC regulations also refer to the day-night average sound level (L_{dn}) to evaluate the noise impact of operation and construction activities on nearby NSAs. The L_{dn} is a 24-hour average A-weighted noise metric that applies a 10-dB penalty to the nighttime noise (L_n) to account for greater human sensitivity to noise during nighttime hours.

The L_{dn} is calculated according to the following formula:

$$L_{dn} = 10 \times \text{Log}_{10} \left(\frac{15}{24} \times 10^{(L_{eq(day)}/10)} + \frac{9}{24} \times 10^{((L_{eq(night)}+10)/10)} \right)$$

9.2.1.1 FERC Noise Rules and Requirements

FERC regulations at 18 CFR § 380.12(k)(2) require that any applicable state or local noise regulations be identified. Regulations further require, at 18 CFR § 380.12 (k)(4)(v), that an operator specify how the proposed Project will meet the regulations. In addition to any applicable state or local noise regulation, FERC requires that noise attributable to any new compressor station, compression added to an existing station, or any modification, upgrade or update of an existing station, must not exceed an L_{dn} of 55 dBA at any pre-existing NSA. For the V2F Project, Northern will not be adding any compression and the proposed venting activities are described below. For the NL27 Project, Northern will be uprating an existing turbine at the Hugo compressor station in Washington County, Minnesota. Northern also will apply the noise standards to its HDD activities for both Projects.

FERC Guidance Manual for Environmental Report Preparation states that construction activities that could or may occur during nighttime hours should be performed with the goal that the activity contribute noise levels at or below 55 dBA L_{dn} and 48.6 dBA L_{eq} , or no more than 10 dBA over background if ambient noise levels are above 55 dBA L_{dn} . The human ear's threshold of perception for noise change is considered to be 1 dBA (barely to not perceptible) with 3 dBA typically being just noticeable; 6 dBA being clearly noticeable to the human ear; and 10 dBA being perceived as twice as loud.

9.2.1.2 State Requirements

For the V2F Project, a review of noise related legislation for the state of Iowa found no applicable noise requirements for HDDs or construction noise.

For both Projects, a review of applicable state noise regulations identified Minnesota Rules Chapter 7030, which provides the Minnesota standards for noise. These standards describe the limiting levels of sound established on the basis of present knowledge for the preservation of health and welfare. These standards are designed to be consistent with sleep, speech, annoyance, and hearing conservation requirements for receivers within areas grouped according to land use activities. The Minnesota standards are described in Table 9.2-1.

Table 9.2-1 MPCA State Noise Standards

Land Use	Noise Area Classification	Day (7 a.m. – 10 p.m.) dBA		Night (10 p.m. – 7 a.m.) dBA	
		L ₁₀ of	L ₅₀ of	L ₁₀ of	L ₅₀ of
Residential	NAC-1	L ₁₀ of 65	L ₅₀ of 60	L ₁₀ of 55	L ₅₀ of 50
Commercial	NAC-2	L ₁₀ of 70	L ₅₀ of 65	L ₁₀ of 70	L ₅₀ of 65
Industrial	NAC-3	L ₁₀ of 80	L ₅₀ of 75	L ₁₀ of 80	L ₅₀ of 75

Notes:

NAC-1 includes household units, transient lodging and hotels, educational, religious, cultural entertainment, camping, and picnicking land uses.

NAC-2 includes retail and restaurants, transportation terminals, professional offices, parks, recreational, and amusement land uses.

NAC-3 includes industrial, manufacturing, transportation facilities (except terminals), and utilities land uses.

From MPCA, Minn. Rules § 7030.0040

The L₁₀ sound metric is the sound level over a one-hour monitoring period that is exceeded for 10% (6 minutes) of the hour. The L₅₀ sound metric is the sound level that is exceeded for 50% (thirty minutes) of the one-hour monitoring period.

Northern will conduct construction and operational activities within the standards set forth by the MPCA as outlined in Table 9.2-1 above and per FERC guidance.

9.2.1.3 County Requirements

No noise regulations were identified in Wright or Hancock counties, Iowa, or Freeborn, Steele or Dakota counties, Minnesota, that are applicable to the V2F Project.

No noise regulations were identified in Freeborn, Steele, Scott, Carver, Martin, Stearns, Jackson, Watonwan, Isanti, Morrison, and Washington counties, Minnesota, that are applicable to the NL27 Project.

9.2.1.4 Townships and City Requirements

There are currently no identified city or township noise regulations applicable to the V2F Project.

For the NL27 Project, the city or township noise regulations that specify applicable requirements different from those set forth by the MPCA are described in Table 9.2-2.

Table 9.2-2 City and Township Noise Standards

City or Township	Noise Standard Summary
Albert Lea	Sections 50.0930 and 50.0931 of Code of Ordinances of the City of Albert Lea <ul style="list-style-type: none"> • Item 50.0930(1)b. states a prohibition on noise and vibration pollution that adversely affects the surrounding area or adjoining premises. • Item 50.0931(4)a. limits nighttime noise generation to the higher of 50 dB or the local traffic noise level in any octave band above 300 Hz. • Item 50.0931(4)b. limits daytime noise generation to the higher of 20 dB above the Section 50.0931(4)b. limit or 10 dB above the local traffic noise level.
Wilmar, Welcome, Paynesville, Worthington, Springfield, Walbo	General noise nuisance ordinances exist that prohibit excessive noise under certain conditions, e.g., outside of daytime hours or all day on Sundays.
Alexandria	Section Five of Ordinance Number 129 <ul style="list-style-type: none"> • Subsection 12 provides two definitions of excessive noise: <ul style="list-style-type: none"> ○ Item (a) defines excessive noise as any noise measured in excess of 70 dB at the property line of the site which is the source of the noise or at 50 feet from a portable sound source. ○ Item (b) defines excessive noise between the hours of 11:00 pm and 7:00 am as any noise measured in excess of 60 dB at the property line of the site which is the source of the noise or at 50 feet from a portable sound source.

Compliance with FERC and MPCA noise standards is expected to result in compliance with city and township noise standards.

9.2.2 Existing Noise Levels

The V2F Project site is located in a rural area that is sparsely populated within Hancock and Wright counties, Iowa and Freeborn, Steele and Dakota counties, Minnesota. The dominant land use in the area is agricultural.

The NL27 Project site is located in a rural area spanning 11 separate counties that are generally sparsely populated within Minnesota. The dominant land use in the area is agricultural. The Willmar 3rd branch line upstream component is located in a more residential area.

Construction activities related to both Projects are expected to have a noise impact on the ambient environment and nearby NSAs. The noise impact from the operation of both Projects once completed is expected to be insignificant relative to ambient sound levels. The construction noise impacts will be associated with HDD activities along both Project corridors.

Northern will uprate a turbine at the Hugo compressor station via a like-for-like swap of the Taurus T60 turbine. A comparison of manufacturer sound data for the newer turbine against the manufacturer sound data for the older turbine shows that the newer turbine components are as quiet or quieter than the older turbine. No other significant noise sources are expected to be introduced at the Hugo compressor station. Therefore, operational noise impacts from the Hugo compressor station are expected to remain unchanged.

An assessment of the noise impacts of the construction activities requires that existing baseline noise levels be quantified in both Project areas. The applicable FERC guideline recommends that noise levels be representative of the existing conditions at NSAs which will be affected by HDDs. The applicable FERC guideline requires Northern to quantitatively describe existing noise levels at NSAs. Northern measured ambient noise levels at locations representative of NSAs along the Project routes. Both Projects include mixed residential and agricultural areas. A summary of the existing noise survey measurement methodology and results are presented below.

V2F Project

For the V2F Project, ambient noise measurements consisting of short-term 20-minute sound level measurements were collected between February 24, 2025, and February 28, 2025, along the Project corridor. Measurements were collected in accordance with ANSI SC1.100-2014 “Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas” where possible.

For the V2F Project, field observations were used to evaluate the potential impact of weather on sound level measurements. Measurements were taken during periods where predicted wind speeds were less than 11 miles per hour, relative humidity was below 90%, and temperature was within the operating range of the sound level meter. Measurements were not taken during periods of precipitation. Ambient noise measurements were not collected at the disconnect sites due to the limited work and existing noise at the operating compressor stations. Background ambient sound readings collected for the V2F Project are listed in Table 9.2-3.

Table 9.2-3 Background Ambient Sound Pressure Levels for the Monitoring Locations for the V2F Project

Facility	Measurement Location	Measurement Date(s)	Measured Daytime (LA90) [dBA] ¹	Measured Nighttime (LA90) [dBA] ¹	Calculated L _{dn} [dBA]
Lake Mills M500 E-Line (Freeborn, MN and Worth, IA)	LMA-ML4	February 27, 2025	45	30	44
	LMA-ML5	February 27, 2025	44	39 ²	47
	LMA-ML6	February 27, 2025	51	46 ²	54
	LMA-ML7	February 27, 2025	50	45 ²	52
	LMA-ML8	February 26, 2025	43	38 ²	45
	LMA-ML9	February 26, 2025	41	36 ²	44
	LMA-ML10	February 26, 2025	33	33	39
	LMA-ML10B	February 26, 2025	35	30 ²	38

Facility	Measurement Location	Measurement Date(s)	Measured Daytime (LA90) [dBA] ¹	Measured Nighttime (LA90) [dBA] ¹	Calculated L _{dn} [dBA]
	LMA-ML11A	February 26, 2025	36	32	39
	LMA-ML11B	February 26, 2025	38	31	39
	LMA-ML12	February 26, 2025	35	30 ²	38
Albert Lea M500 E-Line (Steele, MN) ⁵	ALO-ML02 W	February 27, 2025	33	29	36
	ALO-ML02 E	February 27, 2025	34	29	37
	ALO-ML03	February 27, 2025	43	29	42
Faribault M500 D-Line (Dakota, MN)	FAR-ML01	February 25, 2025	33	36	42
	FAR-ML02/03	February 25, 2025	35	33	40
	FAR-ML04	February 25, 2025	40	31	40
	FAR-ML05	February 25, 2025	34	31	38
	FAR-ML06	February 25, 2025	32	27 ²	35
	FAR-ML07	February 25, 2025	34	35	41
	FAR-ML07B	February 25, 2025	32	31	38
Lake Mills Compressor Station – Temporary Compression Site	LCS-ML13	February 26, 2025	34	37	43
	LCS-ML14	February 26, 2025	34	34	40
Owatonna Compressor Station - Temporary Compression Site	OCS-ML1A	-	34 ³	37 ³	43 ³
	OCS-ML1B	-	34 ³	37 ³	43 ³
Northfield #1 - Temporary Compression Site	NOR ML15	-	44 ⁴	39 ⁴	47 ⁴

¹ L₉₀ sound levels were used in place of L_{eq} to calculate L_{dn} sound level because they are considered to best represent ambient sound levels at NSAs.

² Nighttime levels are assumed based on daytime readings. Daytime readings were dominated by natural sounds with no vehicle passbys audible during measurements.

³ Sound levels at the Owatonna compressor station have been conservatively assumed to be similar to the Lake Mills compressor station

⁴ Sound levels at the Northfield Minnesota #1 were based Lake Mills compressor station and proximity to Highway 19.

⁵ South end of this Project component represents the ambient noise conditions at the La Crosse branch line MNB73201 launcher/ABA 05 (A-line abandonment temporary compression location)

NL27 Project

For the NL27 Project, ambient noise measurements consisting of short-term 20-minute sound level measurements were collected mostly between September 26, 2025 and December 16, 2025, but also included two measurements on February 26, 2025 and February 27, 2025, along the Project corridor. Measurements were collected in accordance with ANSI SC1.100-2014 “Methods to Define and Measure the Residual Sound in Protected Natural and Quiet Residential Areas” where possible.

For the NL27 Project, field observations were used to evaluate the potential impact of weather on sound level measurements. Measurements were taken during periods where

predicted wind speeds were less than 11 miles per hour, relative humidity was below 90%, and temperature was within the operating range of the sound level meter. Measurements were not taken during periods of precipitation. Ambient noise measurements were not collected at the disconnect sites due to the limited work and existing noise at the operating compressor stations. Background ambient sound readings collected for the NL27 Project are listed in Table 9.2-4.

Table 9.2-4 Background Ambient Sound Pressure Levels for the Monitoring Locations for the NL27 Project

Facility	Measurement Location	Measurement Date(s)	Measured Daytime (LA ₉₀) [dBA] ¹	Measured Nighttime (LA ₉₀) [dBA] ¹	Calculated L _{dn} [dBA]
Lake Mills M500 E-Line	LMA-ML-01	October 1, 2025	39	29 ²	39
	LMA-ML-02	February 26, 2025 February 27, 2025	45	30	44
	LMA-ML-03	October 1, 2025	45	35 ²	45
	LMA-ML-04	October 1, 2025	48	38 ²	48
Albert Lea M500 E-Line	ALO-ML-01	October 1, 2025	42	32 ²	42
	ALO-ML-02	October 1, 2025	45	35 ²	45
	ALO-ML-03	October 1, 2025	39	29 ²	39
Willmar 3rd Branch Line Upstream	WIL-ML-01	December 11, 2025	37	27 ²	37
	WIL-ML-02	February 26, 2025 December 11, 2025	34	44	50
	WIL-ML-03	February 26, 2025 December 11, 2025	32	37	43
	WIL-ML-04	February 26, 2025 December 11, 2025	31	37	43
	WIL-ML-05	December 11, 2025	38	28 ²	38
	WIL-ML-06	December 11, 2025	49	39 ²	49
Willmar 3rd Branch Line Downstream	WDC-ML-01	September 26, 2025	42	32 ²	42
	WDC-ML-02	September 26, 2025	39	29 ²	39
	WDC-ML-03	September 26, 2025	36	26 ²	36
	WDC-ML-04	September 26, 2025	40	30 ²	40
	WDC-ML-05	September 26, 2025	54	44 ²	54
	WDC-ML-06	September 26, 2025	41	31 ²	41
	WDC-ML-07	December 11, 2025	34	24 ²	34
	WDC-ML-08	September 26, 2025	36	26 ²	36
	WDC-ML-09	September 26, 2025	52	42 ²	52

Facility	Measurement Location	Measurement Date(s)	Measured Daytime (LA90) [dBA] ¹	Measured Nighttime (LA90) [dBA] ¹	Calculated L _{dn} [dBA]
Paynesville 2nd Branch Line	PAY-ML-01	December 11, 2025 December 16, 2025	44	33	43
	PAY-ML-02	December 16, 2025	56	46 ²	56
	PAY-ML-03	December 16, 2025	53	43 ²	53
Worthington 2nd Branch Line	WOR-ML-01	December 15, 2025	41	31 ²	41
	WOR-ML-02	December 15, 2025	38	32	40
Springfield 2nd Branch Line	SPR-ML-01	December 14, 2025	31	21 ²	31
	SPR-ML-02	December 14, 2025	36	26 ²	36
	SPR-ML-03	December 14, 2025	39	29 ²	39
	SPR-ML-04	December 14, 2025	37	27 ²	37
	SPR-ML-05	December 14, 2025	40	30 ²	40
	SPR-ML-06	December 14, 2025	41	31 ²	41
Minnesota Interconnect 2nd Branch Line	MIC-ML-01	December 10, 2025	30	20	30
	MIC-ML-02	December 10, 2025	34	21	33
	MIC-ML-03	December 10, 2025	38	28 ²	38
	MIC-ML-04	December 10, 2025	46	36 ²	46
	MIC-ML-05	December 10, 2025	45	35 ²	45
Alexandria 2nd Branch Line	ALX-ML-01	December 16, 2025	36	26 ²	36
	ALX-ML-02	December 16, 2025	33	23 ²	33

¹ L₉₀ sound levels were used in place of L_{eq} to calculate L_{dn} sound level because they are considered to best represent ambient sound levels at NSAs.

² Nighttime levels are assumed to be 10 dB below daytime readings.

9.2.3 Noise Impact Evaluation

In order to assess compliance with FERC’s requirements at NSAs, assessments were conducted for noise that will be generated from construction of both Projects, specifically the HDD activities. For V2F, HDDs will be completed at 19 locations. For NL27, HDDs will be completed at 31 locations. Northern plans that the entrance and exit HDD at each crossing would operate concurrently, but the HDD crossings themselves would operate consecutively.

For the V2F Project, temporary compression to evacuate gas from the 105.76 miles of the A-Line and 25.35 miles of the J-line. Approximately six portable natural-gas fired 300 HP units will be utilized continuously for approximately 80 hours to reduce the pressure in the A-line to 10 psig. Once the existing A-line pressure is approximately 10 psig, Northern will vent the remaining gas to the atmosphere, approximately 1.5 M standard cubic feet of natural gas. Approximately 26.6 M standard cubic feet of natural gas will be saved and not vented. The pipeline conditions at the start of the venting process and thereafter will result in subsonic gas flow. The highest noise generation from venting is expected at the start of the process

followed by a decrease in noise as the venting process progresses. The venting process can be described as transitory and short-term. Nevertheless, noise generated during venting may impact the nearby NSAs. Venting is anticipated to take place during the daytime hours only. Northern will inform nearby residents of the upcoming venting activities. Northern will utilize temporary light plants during the compression and venting.

For both Projects, Northern will comply with 18 CFR § 157.206(b)(5)(iii), which requires noise impact mitigation at any HDD between 10 p.m. and 7 a.m. to ensure a noise impact from drilling at any pre-existing NSA to a level at or below an L_{dn} of 55 dBA. Based on site-specific conditions, Northern may elect to reverse the entry and exit points for an HDD.

For both Projects, some construction activities, including HDD activities, tie-ins, venting, compression, testing and commissioning, pressure testing, inspections, equipment delivery, electrical work requiring no heavy equipment, and dewatering and stormwater maintenance, and other time sensitive construction activities may extend into nighttime hours past 10 p.m. and may include Sunday work. Artificial lighting only will be utilized, if necessary, to complete potential nighttime activities as described above. Lighting would be equipped with shields and aimed downward to minimize impact on nocturnal wildlife or surrounding residences. Lenses for the lighting would be yellow or amber to minimize impacts on residents and wildlife.

For both Projects, Northern obtained sound power ratings for HDD rigs and supporting equipment (mud pumps, bentonite mixing systems and excavators) from equipment manufacturer specification sheets. For equipment where manufacturer sound power data were unavailable, sound power data for comparable equipment from the Federal Highway Administration construction noise handbook were used. A summary of the sound power levels for equipment at the entry pit is provided in Table 9.2-5. A summary of the sound power levels for equipment at the exit pit is summarized in Table 9.2-6.

Table 9.2-5 Combined Equipment Sound Power at HDD Entry Pit

Equipment	Assumed Quantity Operating Simultaneously	Maximum Sound Power Level of Equipment (dBA)
HDD Drilling Rig ¹	1	104
Mud Pump Engines ¹	1	103
Mud Cleaner	1	102
Shaker	1	105
Bentonite Mixer ¹	1	92
Excavator ^{2,3}	1	103
Total Sound Modelled Sound Power Level		111

¹ Field measurements for typical HDD equipment

² Federal Highway Administration, Federal Highway Administration Highway Construction Noise Handbook. U.S. Department of Transportation. July 5, 2011, http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook00.cfm

³ Assumed operation time of 15 minutes during worst case hour

Table 9.2-6 Combined Equipment Sound Power at HDD Exit Pit

Equipment	Assumed Quantity Operating Simultaneously	Maximum Sound Power Level of Equipment (dBA)
HDD Drilling Rig ¹	1	104
Mud Pump	1	98
Bentonite Mixer ¹	1	92
Excavator ^{2,3}	1	103
	Total Sound Modelled Sound Power Level	107

¹ Field measurements for typical HDD equipment

² Federal Highway Administration, Federal Highway Administration Highway Construction Noise Handbook. U.S. Department of Transportation. July 5, 2011, http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook00.cfm

³ Assumed operation time of 15 minutes during worst case hour

Northern determined the distance between the entry and exit pits for the proposed HDDs to the nearest NSAs for each component of both Projects. The cumulative acoustical impact of the HDD operations at the entry and exit pits was evaluated at each of the identified NSAs, assuming the nearest pit to each NSA will be the entry pit and that a large HDD rig will be used for each HDD. These assumptions establish the worst-case condition for each HDD in both Projects. The cumulative acoustical impact from the HDD operations on the affected NSAs was calculated using CADNA/A acoustic modelling software (Version 2025 MR1), published by Datakustik GmbH, configured to implement ISO 9613-2 (2024) environmental noise propagation algorithms.

The cumulative noise impacts for both daytime-only construction and 24-hour HDD operation are detailed below. Northern will monitor the actual noise levels at the HDD locations during the pilot and ream process to verify the assumptions utilized in the modelling, sound level predictions, and the recommended mitigation measures. The selection and size of the HDD equipment to be used during the construction of both Projects has not been made, so the actual equipment that may be utilized may have substantially lower sound impacts if a smaller or more modern piece of equipment is selected.

9.2.3.1 Construction Noise Analysis

Construction of both Projects is expected to result in noise impacts. Construction activities will represent an intermittent, temporary noise source. Multiple HDDs are planned for the construction of both Projects. The entry and exit pits of an HDD represent a continuous, localized noise source during the HDD. The installation of a single HDD may require several days of work depending on the length and complexity of the HDD. Work will be primarily scheduled to occur during the daytime hours of 7 a.m. to 7 p.m.; however, some nighttime operations (10 p.m. to 7 a.m.) are possible due to site conditions. NSAs within 0.5 mile of the entrance and exit pits of the HDDs were identified using aerial imagery, land ownership records and field surveys.

The tables in Appendix 9G summarize the NSA locations within 0.5 mile of each HDD location for the V2F Project. The tables in Appendix 9J summarize the NSA locations nearest each HDD location for the NL27 Project. The noise impact analysis for each HDD was conservatively performed assuming the HDD pit nearest each individual NSA was an entry pit and the furthest HDD pit was the exit pit. The entrance pit has a higher sound

power level than the exit pit given the presence of the drill rig and additional supporting equipment. This assumption allows for the worst-case noise impact at each modeled NSA. Should field conditions require the HDD to be drilled in the opposite direction than what is currently being shown in the design drawings, no change in the noise analysis will be required.

People at nearby residences and buildings will hear the construction noise but the overall impact will be short-term. An aerial showing the locations of NSAs in the vicinity of the V2F Project is included as Figure 1-14 and the NSAs in the vicinity of the NL27 Project is included as Figure 1-15.

Construction of a pipeline typically involves installation of access roads, clearing and grubbing, delivery of materials, site grading and trenching, pipeline installation, HDD crossings, and restoration. The level of construction noise will vary over the entire construction period and will be highly dependent on the type of construction equipment being used at any given time. While construction of the V2F Project is planned to occur over a seven-month period in 2027 and 2028 and three months in 2029, concentrated construction activities will only occur at periodic intervals. While construction of the NL27 Project is planned to occur over a nine-month period in 2027, concentrated construction activities will only occur at periodic intervals.

For both Projects, Northern will comply with FERC regulations, which restrict HDDs occurring between 10 p.m. and 7 a.m. to a drilling noise impact at any pre-existing NSA to a nighttime sound level (L_n) of no more than 55 dBA (18 CFR 157.206(b)(5)(iii)). Furthermore, the HDD activities extending into the nighttime periods, will be performed with a goal that such activities contribute less than 55 dBA L_{dn} at the identified NSAs. Additionally, Northern will complete HDD activities for the NL27 Project so that noise levels at NSAs comply with the Minnesota daytime and nighttime noise standards.

The project schedules have been developed assuming HDD operations will occur primarily during daytime hours only (7 a.m. to 10 p.m.); however, some construction activities, including HDD activities, tie-ins, tie-ins, venting, compression, testing and commissioning, pressure testing, inspections, equipment delivery, electrical work requiring no heavy equipment, and dewatering and stormwater maintenance, and other time sensitive construction activities may extend beyond daytime hours (7 a.m. to 10 p.m.) and into Sundays, as necessary. HDDs may be conducted continuously (24 hours per day) and into Sunday, subject to local regulations, including overnight, at critical times such as during pullback of the pipe into the drill hole on the longer drills, in complex drill setups and where continuous drilling is required to maintain borehole integrity. For the V2F Project, Northern anticipates that six HDDs will require continuous operation beyond daytime hours to complete:

- LMA-P4-3
- ALO-P4-1
- FAR-P4-1
- FAR-P4-2
- FAR-P4-3
- FAR-P4-7

For the NL27 Project, Northern anticipates that three HDDs will require continuous operation beyond daytime hours to complete:

- ALO-P4-3
- WIL-P4-2
- PAY-P4-3

If Northern extends work past 10 p.m. at any HDD for either Project, Northern will employ noise mitigation measures, if necessary.

The cumulative noise impacts for both daytime-only construction and 24-hour HDD operation are detailed below. Northern will monitor the actual sound impact levels at the HDD locations during the pilot and ream process to verify the sound assumptions utilized in this modelling and the recommended mitigation measures.

The noise impacts for 24-hour HDD operation for the V2F Project are provided in Appendix 9H. The noise impacts for 24-hour HDD operation for the NL27 Project are provided in Appendix 9K. Northern will monitor the actual noise impacts at the HDD locations during the pilot and ream process to verify the sound assumptions utilized in this modelling and the recommended mitigation measures. The selection and size of the HDD equipment during the construction of the Project has not been made, so the actual equipment to be utilized may have substantially lower noise emissions if a smaller or more modern piece of equipment is selected.

Noise controls as presented in Appendix 9H and Appendix 9K are required to mitigate the noise impact of nighttime HDD operations. Should 24-hour construction at these locations be required, Northern will implement appropriate noise mitigation and conduct the HDDs with the goal of reducing noise impacts below an L_{dn} of 55 dBA. Factors such as multiple pullbacks, length of pullback, complexity of drill, and noise impacts on nearby NSAs will contribute to the decision to conduct 24-hour operation.

For the HDDs indicated in Appendix 9H and Appendix 9K that require mitigation methods beyond general work practices (Footnote A) for 24-hour operation, Northern has calculated the mitigated noise impacts with the recommended mitigation measures.

According to studies performed by the U.S. DOT, most construction equipment has a noise level between 75 and 85 dBA at a distance of 50 feet (U.S. DOT 2011). Northern is committed to implementing the noise mitigation measures noted in Appendix 9H and 9K. As an example of a suitable temporary noise barrier system, Northern has included specifications for the Behrens SK-8 Free-Standing Sound Barriers in Appendix 9F. For the V2F Project, noise walls for the HDDs are generally between 12 and 16 feet in height. For the NL27 Project, noise walls for the HDDs will be a minimum of 20 feet in height. The noise barrier system must be a standalone noise barrier with surface density of 2 lb/sf or greater and approved by NNG for use on the Project. . The SK-8 barrier panels shown in Appendix 9F meet these requirements and these barriers, or equivalent, will be utilized on both Projects. The site-specific HDD crossing figures in each HDD Plan (Appendix 1A-1 and 1A-2) depict wall orientations and layouts at each HDD where barrier walls are required for mitigation.

9.2.4 Temporary Compression on the V2F Project

In 2027, Northern will utilize two locations to evacuate gas from adjacent Northern mainlines in order to complete the tie-ins for two of the proposed extensions. This work will occur 24-hours a day until complete.

1. For the Lake Mills M500 E-line, Northern will utilize approximately three portable natural-gas fired 300 HP units for about 87 hours to reduce mainline pressures to approximately 10 psig. The three compressors are expected to operate 24 hours a day until this process is complete. Northern will vent the remaining gas to the atmosphere, approximately 1.5 M standard cubic feet of natural gas. Northern will reduce its venting by approximately 77.0 M standard cubic feet of natural gas. The temporary compression for Lake Mills M500 E-line will be located at Lake Mills compressor station.
2. For the Albert Lea M500 E-line, Northern will utilize approximately two portable natural-gas fired 300 HP units for about 55 hours to reduce mainline pressures to 10 psig. The two compressors are expected to operate 24 hours a day until this process is complete. Once the existing mainline pressures are approximately 10 psig, Northern will vent the remaining gas to the atmosphere, approximately 0.4 M standard cubic feet of natural gas. Northern will reduce its venting by approximately 32.2 M standard cubic feet of natural gas. The temporary compression for Albert Lea M500 E-line will be located at Owatonna compressor station.

In 2028, Northern will utilize one location to evacuate gas from adjacent Northern mainlines in order to complete the tie-ins for one of the proposed extensions. This work will occur 24-hours a day until complete.

3. For the Faribault M500 D-line, Northern will utilize approximately three portable natural-gas fired 300 HP units for approximately 65 hours to reduce mainline pressure 10 psig. Northern will operate three units during the daytime hours and two unit at night to reduce the noise impacts at the nearby NSAs. Once the existing mainline pressures are approximately 5 psig, Northern will vent the remaining gas to the atmosphere, approximately 0.8 M standard cubic feet. Northern will reduce its venting requirements by approximately 22.2 M standard cubic feet of natural gas. The temporary compression for Faribault M500 D-line will be located at the Northfield #1 site.

In 2029, Northern will utilize one facility, the La Crosse branch line MNB73201 launcher/ABA 05 at the south end of the Albert Lea M500 E-line, to evacuate gas from 105.76 miles of the A-line and 25.35 miles of the J-line. Approximately six portable natural-gas fired 300 HP units will be utilized continuously for approximately 80 hours to get the pressure in the A-line down to 10 psig. Once the existing A-line pressure is approximately 10 psig, Northern will vent the remaining gas to the atmosphere, approximately 1.5 M standard cubic feet of natural gas. Approximately 26.6 M standard cubic feet of natural gas will be saved and not vented.

Northern has identified representative NSAs within one mile of the temporary compression locations for each of the four proposed compression sites. An estimated sound power level of 113 dBA per 300 HP compression unit has been assumed for modelling. Noise impacts

were modelled using CadnaA acoustic modelling software. A summary of NSAs and noise modelling results are presented as Appendix 9I.

The closest representative NSA to the Lake Mills M500 E-Line temporary compression site is approximately 3,700 feet (0.71 mile). Noise impacts are estimated to be at levels similar to existing ambient sound levels at NSAs and 7 dB below the FERC 55 dBA L_{dn} criteria.

The closest representative NSA (OCS-NSA02) to the Albert Lea M500 E-Line temporary compression site is approximately 1,170 feet (0.22 mile). Noise impacts from the two proposed 300-hp compression units are estimated to be just above the FERC 55 dBA L_{dn} criteria and mitigation will be required to comply with FERC nighttime standards. The mitigation will include short 12-foot-high barrier wall and site-specific equipment orientation to decrease noise impact at the nearest receptor to below 55 dBA, L_{dn} .

The closest representative NSA (NOR-NSA01) to the Faribault M500 D-line temporary compression site is approximately 490 feet. Noise impacts from the three proposed 300-hp compression units are estimated to exceed the FERC 55 dBA L_{dn} criteria and noise mitigations will be implemented. The mitigation will include 24-foot-high barrier wall, operating only two compression units between 10 p.m. and 7 a.m., and site-specific equipment orientation to decrease noise impact at the nearest receptor to below 55 dBA, L_{dn} .

The closest representative NSA (ALO-NSA00) to the A-line abandonment temporary site (La Crosse branch line MNB73201 launcher/ABA 05) is approximately 530 feet. Noise impacts from the six proposed 300-hp compression units are estimated to exceed the FERC 55 dBA L_{dn} criteria and noise mitigations will be implemented. The mitigation will include 24-foot-high barrier walls, operating only four compression units between 10 p.m. and 7 a.m., and site-specific equipment orientation to decrease noise impact at the nearest receptor to below 55 dBA, L_{dn} .

Estimated locations of the proposed noise barrier walls for the temporary compression are depicted in Resource Report 1, Figure 1-10.

9.2.5 Operational Noise Impacts

The operation of the other V2F Project components is not expected to create new operational noise impacts upon completion of construction activities.

Northern will uprate a turbine at the Hugo compressor station via a like-for-like swap of the Taurus T60 turbine. A comparison of manufacturer's sound data for the newer turbine against the manufacturer's sound data for the older turbine shows that the newer turbine components are as quiet or quieter than the older turbine. No other significant noise sources are expected to be introduced at the Hugo compressor station. Therefore, operational noise impacts from the Hugo compressor station are expected to remain unchanged.

The operation of proposed NL27 tie-in valve settings is not expected to create new operational noise impacts upon completion of construction activities. The highest operational noise from valve settings is predicted to occur at the proposed Lake Mills tie-in valve setting. At the nearest NSA, the cumulative noise impact of the tie-in valve and existing ambient sound level is predicted to be 53 dBA L_{dn} and 48 dBA L_{10} , which is within FERC and MPCA limits, respectively. Noise from tie-in valve settings at other NL27 locations is expected to be lower.

The operation of the other NL27 Project components is not expected to create new operational noise impacts upon completion of construction activities.

9.2.6 Noise Mitigation Measures

Construction of both Projects will occur primarily during daytime hours, which will mitigate the perceived noise impacts on nearby NSAs. Nighttime operations (10 p.m. to 7 a.m.) are possible as noted in Section 9.3.1.

For both Projects, Northern will take steps to minimize engine idling and other non-essential noise generating activities. Northern will ensure that all combustion engine-driven machinery is equipped with mufflers. Northern will inform nearby residents of the Project and the upcoming construction activities, including venting and HDD operation, and will respond to and investigate concerns. Northern’s contractor will position equipment so noise propagates away from the nearest NSAs, and position non-noise generating equipment, such as the support vehicles, between the drilling operation and the nearby NSAs, where possible, to provide shielding. For the V2F Project HDDs that may operate beyond daytime hours, Northern will implement the noise mitigation measures as described in Appendix 9H unless on-site monitoring concludes that the actual impacts are less than those modeled in this report due to the use of smaller or quieter equipment. A summary of noise mitigation measures for each V2F Project HDD is provided in Table 9.2-7.

Table 9.2-7 Summary of Noise Mitigation Measures (V2F Project)^a

Pipeline Facility	Crossing Number/ Ref. Drawing	Duration of HDD	Mitigation Measures for HDD, if 24-hour operation is required ¹
Lake Mills M500 E-Line	LMA-P4-1	9 days	-
	LMA-P4-2	3 days	-
	LMA-P4-3 ¹	19 days	C ²
	LMA-P4-4	3 days	-
	LMA-P4-5	8 days	-
	LMA-P4-6	6 days	-
	LMA-P4-7	7 days	-
	LMA-P4-8	8 days	-
	LMA-P4-9	6 days	-
	LMA-P4-10	3 days	-
Albert Lea M500 E-Line	ALO-P4-1 ¹	23 days	-
	ALO-P4-2	3 days	-
Faribault M500 D-Line	FAR-P4-1 ¹	11 days	C ²
	FAR-P4-2 ¹	11 days	C ²
	FAR-P4-3 ¹	20 days	C ²

Pipeline Facility	Crossing Number/ Ref. Drawing	Duration of HDD	Mitigation Measures for HDD, if 24-hour operation is required ¹
	FAR-P4-5	7 days	-
	FAR-P4-6	6 days	-
	FAR-P4-7 ¹	22 days	-
	FAR-P4-8	3 days	-

^a Noise Mitigation Measures:

- A. Includes mitigations such as work practices (e.g. reduced idling), adjusting equipment orientation, or fitting individual pieces of equipment with localized mitigations (e.g., additional or improved mufflers)
- B. Utilize a small and more modern HDD rig than was utilized for the noise model
- C. Install sound barrier walls between entry pit and NSA
- D. Install sound barrier walls between entry and exit pits and NSAs
- E. Install sound enclosures around critical equipment such as the drill rig, mud pump engine, shaker
- F. Offer temporary relocation to residents

¹ HDD operations may extend past 10 p.m. during drilling, reaming and pullback and other time-sensitive activities

² Noise barrier walls will have a minimum height of 12 to 16 feet and a minimum surface density of 2-4 lb/ft².

³ L₁₀ sound levels from construction activities have been estimated based on a 3 dB correction factor to the modelled hourly L_{eq}.

For the NL27 Project HDDs that may operate beyond daytime hours, Northern will implement the noise mitigation measures as described in Appendix 9K unless on-site monitoring concludes that the actual impacts are less than those modeled in this report due to the use of smaller or quieter equipment. A summary of noise mitigation measures for each NL27 Project HDD is provided in Table 9.2-8.

Table 9.2-8 Summary of Noise Mitigation Measures (NL27 Project)

Pipeline Facility	Crossing Number/ Ref. Drawing	Drill Period	Duration of HDD (days)	Mitigation Measures for HDD, if 24- hour operation is required ¹
Lake Mills M500 E-line	LMA-P4-1	Day Only	4	-
	LMA-P4-2	Day Only	5	-
Albert Lea M500 E-line	ALO-P4-1	Day Only	5	-
	ALO-P4-2	Day Only	6	-
	ALO-P4-3 ¹	Day and Night	19	A, C ²
	ALO-P4-4	Day Only	5	-
	ALO-P4-5	Day Only	4	-
Willmar 3rd Branch Line Upstream	WIL-P4-1	Day Only	4	-
	WIL-P4-2	Day and Night	16	D ² , restriction on nighttime operations
	WIL-P4-3	Day Only	12	-
Willmar 3rd Branch Line Downstream	WDC-P4-1	Day Only	4	-
	WDC-P4-2	Day Only	4	-

Pipeline Facility	Crossing Number/ Ref. Drawing	Drill Period	Duration of HDD (days)	Mitigation Measures for HDD, if 24- hour operation is required ¹
	WDC-P4-3	Day Only	4	-
	WDC-P4-5	Day Only	4	-
	WDC-P4-6	Day Only	11	A
	WDC-P4-7	Day Only	5	A
	WDC-P4-8	Day Only	5	-
Welcome 2nd Line	No Drills			
Paynesville 2nd Branch Line	PAY-P4-1	Day Only	4	-
	PAY-P4-2	Day Only	3	-
	PAY-P4-3 ¹	Day and Night	15	A
Worthington 2nd Branch Line	WOR-P4-1	Day Only	5	A
Springfield 2nd Branch Line	SPR-P4-1	Day Only	8	-
	SPR-P4-2	Day Only	9	-
	SPR-P4-3	Day Only	10	-
	SPR-P4-4	Day Only	7	A
	SPR-P4-5	Day Only	4	-
Minnesota Interconnect 2nd Branch Line	MIC-P4-1	Day Only	9	C ²
	MIC-P4-2	Day Only	14	-
	MIC-P4-3	Day Only	12	-
Alexandria 2nd Branch Line	ALX-P4-1	Day Only	10	-
	ALX-P4-2	Day Only	8	-

^a Noise Mitigation Measures:

- A. Includes mitigations such as work practices (e.g. reduced idling), adjusting equipment orientation, or fitting individual pieces of equipment with localized mitigations (e.g., additional or improved mufflers)
- B. Utilize a small and more modern HDD rig than was utilized for the noise model
- C. Install sound barrier walls between the entry pit and NSAs or a barrier wall between the exit pit and NSA, whichever is closest.
- D. Install sound barrier walls between entry and exit pits and NSAs
- E. Install sound enclosures around critical equipment such as the drill rig, mud pump engine, shaker
- F. Offer temporary relocation to residents

¹ HDD operations may extend past 10 p.m. during drilling, reaming and pullback and other time-sensitive activities

² Noise barrier walls will have a minimum height of 20 feet and a minimum surface density of 2-4 lb/ft².

³ L₁₀ sound levels from construction activities have been estimated based on a 3 dB correction factor to the modelled hourly L_{eq}.

At the identified locations for both Projects, the contractor will be required to reduce the nighttime (L_n) sound level at NSAs to below 55 dBA between the hours of 10 p.m. and 7 a.m., should the construction schedule require operation during this time period. Noise mitigation options may include, but are not limited to: positioning equipment so noise propagates away from the NSA; locating the entry pit to maximize distance to NSAs; the installation of temporary sound barriers between the HDD sites and nearby residences; the use of smaller and quieter HDD equipment; the installation of sound enclosures, partial enclosures, or local screens around critical equipment such as the drill rig and shaker; or

temporary relocation of the residents, especially those residents within approximately 400 feet of the entry or exit pit, if HDD operations continue past 10 p.m.

9.2.7 Vibration Impacts

The FERC guidance manual for Environmental Report Preparation references vibration assessment in the context of blasting during construction and vibrations generated by facility operations only. The FTA Noise and Vibration Impact Assessment Manual provides criteria summarized in Table 9.2-9, which may be applicable to the Project construction activities.

Table 9.2-9 Construction Vibration Damage Criteria

Building/Structural Category	PPV (in/sec)¹
Reinforced concrete, steel or timber (no plaster)	0.5
Engineered concrete and masonry (no plaster)	0.3
Non-engineered timber and masonry buildings	0.2
Building extremely susceptible to vibration damage	0.12

¹ Peak particle velocity in inches per second.

Based on the HDD equipment list, summarized in Table 9.2-10, and 50-foot minimum distance to NSAs, vibration levels are anticipated to be below the FTA criteria at nearby NSAs.

Table 9.2-10 Equipment at HDD Pits

Equipment	Assumed Quantity Operating Simultaneously
HDD Drilling Rig	1
Mud Pump Engines	1
Mud Cleaner	1
Shaker	1
Bentonite Mixer	1
Excavator	1

Northern will take steps to minimize the impact of vibration, where possible, on nearby residences. Northern will inform nearby residents of the Project and the upcoming construction activities, including HDD operation and will respond and investigate concerns. Excavators and other heavy equipment must be used more than 50 feet from existing building structures, where possible. Northern’s contractor will route heavily loaded trucks and equipment away from residential streets and vibration sensitive sites, where possible. Northern’s contractor will sequence phases of construction activities such as earth-moving and ground impacting so as to not occur in the same time period and avoid nighttime activity.

Vibration levels are highly dependent on the equipment models, modes of operation, and local ground conditions. Northern’s contractor will monitor vibration levels at existing building structures if the 50-foot setback distance cannot be maintained due to site constraints. Preliminary analysis indicates that construction activities will not result in vibration levels near damage thresholds.

9.3 CUMULATIVE IMPACTS

9.3.1 Cumulative Air Quality Impacts

The impacts on air quality associated with both Projects during construction, which includes fugitive dust and combustion emissions from construction equipment and vehicles, will be short-term and localized and will subside after construction is complete.

While Northern has additional projects planned for Iowa and Minnesota, neither the geographic nor temporal regions of influence overlap with the proposed timeline for this Project. As noted above, impacts from construction related emissions are localized and short in duration. Moreover, operation of the pipeline facilities will result in limited emissions of methane, a GHG, which could have a negligible impact on climate change.

Operational emissions from both Projects could result in cumulative impacts with emissions from Northern’s existing facilities within a 50-mile radius. However, the existing nearby facilities currently maintain air quality permits from the MPCA and IDNR, and any modification or expansion would require a permit modification. Based on the limited emissions from both Projects coupled with permitted nearby facilities, Northern concludes that there will not be a significant cumulative impact on air quality during operation of both Projects.

9.3.2 Cumulative Noise Impacts

Construction noise associated with both Projects will be temporary and minor. Based on the distance of the unrelated projects listed in Resource Report 1, section 1.11 and taking into account noise attenuation and adherence to FERC's noise requirement of an Ldn of 55 dBA and the MPCA L10 65/55 dBA daytime and nighttime exclusionary noise limits, the cumulative noise impact associated with construction noise will be limited. The operation of both Projects is not expected to create on-going operational noise impacts upon completion of construction activities.

9.4 References

ANSI/ASA S12.9-1993/Part 3 (R2008). American National Standard Quantities and Procedures for Description and Measurement of Environmental Sound – Part 3: Short-term Measurements with an Observer Present.

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Appendix 9A
Detailed Calculation Sheets for Construction Emissions for V2F Project

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Appendix 9A - Construction Emission Calculations

Table 9A-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Pipeline Unpaved Roads tons	Earthmoving tons	TOTAL tons
CO	17.7			17.7
NO _x	88.9			88.9
PM ₁₀	2.8	11.5	2.1	16.4
PM _{2.5}	2.8	1.1	0.2	4.1
SO ₂	0.03			0.03
VOC	5.0			5.0
Individual HAP	0.6			0.6
Combined HAP	1.0			1.0
Methane	0.2			0.2
Nitrogen Dioxide	0.1			0.11
CO ₂	4,077			4,077
CO _{2e}	4,112			4,112

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Appendix 9A - Construction Emission Calculations

Table 9A-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	2	72	28	4032	310	0.56	174
All Terrain Vehicle (ATV)	4	72	28	8064	18	1.00	18
Backhoe	3	72	28	6048	75	0.21	16
Cuttings Cleaner System	2	72	28	4032	300	0.59	177
Dozers	3	72	28	6048	410	0.59	242
Dump Truck	8	72	28	16128	325	0.59	192
Generators	4	72	28	8064	430	0.68	292
Grader	3	72	28	6048	140	0.64	90
HDD Rig	1	72	28	2016	600	0.59	354
Mudd Unit	2	72	28	4,032	400	0.21	84
Pickup Trucks	12	72	28	24,192	250	0.59	148
Pipe Tractor Trailer	2	72	28	4,032	400	0.59	236
Scraper	2	72	28	4,032	488	0.59	288
SideBoom	6	72	28	12,096	240	0.59	142
Trackhoe	6	72	28	12,096	320	0.21	67
Water / Fuel Truck	2	72	28	4032	250	0.59	148
Welding Machine	6	72	28	12096	35	0.21	7
Welding Rig	4	72	28	8064	10	0.21	2
X-Ray Truck/Machine	2	72	28	4032	50	0.21	11

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, April 2004

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Appendix 9A - Construction Emission Calculations

Table 9A-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	4,032	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.65	3.34	0.10	0.10	0.00	149	0.01	0.00	151
All Terrain Vehicle (ATV)	8,064	18	0.4380	2.1610	4.44	0.267	0.259	0.002	194	0.011	0.005	0.07	0.35	0.71	0.04	0.04	0.00	31	0.00	0.00	31
Backhoe	6,048	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.04	0.25	0.49	0.03	0.02	0.00	20	0.00	0.00	20
Cuttings Cleaner System	4,032	177	0.1669	0.8425	4.00	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.15	0.10	0.10	0.00	152	0.01	0.00	154
Dozers	6,048	242	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.27	1.36	6.99	0.21	0.21	0.00	312	0.02	0.01	315
Dump Truck	16,128	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.57	2.87	14.78	0.45	0.44	0.01	660	0.04	0.02	665
Generators	8,064	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.80	2.19	11.27	0.34	0.33	0.00	503	0.03	0.01	507
Grader	6,048	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.20	0.52	2.45	0.08	0.08	0.00	116	0.01	0.00	117
HDD Rig	2,016	354	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.41	0.10	0.10	0.00	152	0.01	0.00	154
Mudd Unit	4,032	84	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.06	0.31	1.62	0.05	0.05	0.00	72	0.00	0.00	73
Pickup Trucks	24,192	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	1.21	2.94	15.73	0.52	0.50	0.01	761	0.04	0.02	768
Pipe Tractor Trailer	4,032	236	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.18	0.88	4.55	0.14	0.13	0.00	203	0.01	0.01	205
Scraper	4,032	288	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.21	1.08	5.55	0.17	0.16	0.00	248	0.01	0.01	250
Sideboom	12,096	142	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.58	1.41	7.55	0.25	0.24	0.00	365	0.02	0.01	369
Trackhoe	12,096	67	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.15	0.75	3.88	0.12	0.11	0.00	173	0.01	0.00	175
Water / Fuel Truck	4,032	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.20	0.49	2.62	0.09	0.08	0.00	127	0.01	0.00	128
Welding Machine	12,096	7	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.03	0.15	0.46	0.03	0.03	0.00	19	0.00	0.00	19
Welding Rig	8,064	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.01	0.08	0.08	0.01	0.01	0.00	4	0.00	0.00	4
X-Ray Truck/Machine	4,032	11	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.07	0.22	0.02	0.02	0.00	9	0.00	0.00	9

Freeborn County, MN	5.0	17.7	88.9	2.8	2.8	0.0	4077.3	0.2	0.1	4111.7
TOTALS	5.0	17.7	88.9	2.8	2.8	0.03	4,077	0.232	0.105	4,112

EPA 420-P-04-009, *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition*, USEPA, April 2004 - Tier 2 Engines
Load Factors from Appendix A of EPA 420_P-04-005, *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, USEPA, April 2004

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.1
Formaldehyde	0.118	0.6
Acetaldehyde	0.053	0.3
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0
TOTAL HAPS		1.0

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 Appendix 9A - Construction Emission Calculations

Table 9A-4 Temporary Compression Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (MMBtu)	Criteria Emission Factors (lb/mmbtu)						GHG Emission Factors (lb/mmbtu)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Temporary Compression (x3)	165	0.8	0.12	0.3860	3.17	0.038	0.038	0.001	110	1.450		0.01	0.02	0.20	0.00	0.00	0.00	7	0.09	0.00	9
Steele County, MN											0.0	0.0	0.2	0.0	0.0	0.0	6.9	0.1	0.0	9.5	
TOTALS											0.0	0.0	0.2	0.0	0.0	0.00	7	0.091	0.000	9	

EPA AP-42, Fifth Edition, Volume I Chapter 3: Stationary Internal Combustion Sources, Section 3.2, Table 3.2-1
 Load Factors from Appendix A of EPA 420_P-04-005, *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, USEPA, April 2004

HAP Pollutant Emissions - Construction Equipment

Air Toxic	HAP Emission Factors (lb/mmbtu)	Emissions (ton/yr)
Acetaldehyde	0.008	0.0
Formaldehyde	0.055	0.0
Benzene	0.002	0.0
1,3-Butadiene	0.001	0.0
Acrolein	0.008	0.0
TOTAL HAPS		0.0

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 Lake Mills M500E-Line
 Appendix 9A - Construction Emission Calculations

Table 9A-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean Vehicle Weight	S: Mean Vehicle Speed	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Terrain Vehicle (ATV)	4	6	28	3,360	0.25	10	0.256	0.026	0.43	0.04
Backhoe	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Dozers	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Grader	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Pickup Trucks	12	6	28	10,080	2	8	0.653	0.065	3.29	0.33
Pipe Tractor Trailer	2	6	28	504	2	8	0.653	0.065	0.16	0.02
Scraper	2	6	28	504	30	2	2.208	0.221	0.56	0.06
SideBoom	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Trackhoe	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Water / Fuel Truck	2	6	28	1,680	30	8	2.208	0.221	1.85	0.19
Welding Rig	4	6	28	1,008	2	5	0.653	0.065	0.33	0.03

Freeborn County, MN	11.49	1.15
TOTALS	11.49	1.15

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)
s 8.5 surface material silt content (%)

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Lake Mills M500E-Line

Appendix 9A - Construction Emission Calculations

Table 9A-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	84	72		0.058	0.0061	0.18	0.02
Topsoil removal by Scrapper for Access Roads, Laydown Yards	6	72		0.058	0.0061	0.01	0.00
Trench excavation and loading to storage piles	91	72		0.037	0.0039	0.12	0.01
Backfilling trench	82	72		0.012	0.0013	0.04	0.00
Topsoil replacement	81	72		0.012	0.0013	0.04	0.00
Wind Erosion Exposed Areas			23	0.38	0.0399	1.69	0.18

Steele County, MN	2.1	0.2
TOTALS	2.07	0.22

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): 2.32 miles, 25 feet wide, 1 foot deep, 1.25 tons per cubic yard = 84 tons per day
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: 2.32 miles, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 91 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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Appendix 9A - Construction Emission Calculations

Table 9A-7 Pipeline Interconnect Purge Emission Estimates

Operation	Blowdown Type	Blowdown loss per Type (scf)	Density of Natural Gas (lb/scf)	% VOC in Natural Gas	VOC Emissions (ton)	Methane Emissions (ton)	Methane Emissions (ton CO2e)
Lake Mills Compressor Station	One-time Purge	400,000	0.050	8%	0.8	9.2	258
TOTAL					1	9	258

Note 1: Northern estimates the loss of 0.4 million scf of natural gas as pressure is drawn down in the pipe being connected.

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Appendix 9A - Construction Emission Calculations

Table 9A-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Temporary Compression tons	Pipeline Unpaved Roads tons	Earthmoving tons	Purge Emissions tons	TOTAL tons
CO	17.7	0.0				17.7
NO _x	88.9	0.2				89.1
PM ₁₀	2.8	0.0	11.5	1.9		16.2
PM _{2.5}	2.8	0.0	1.1	0.2		4.1
SO ₂	0.03	0.00				0.03
VOC	5.0	0.0			0.8	5.8
Individual HAP	0.6	0.0				0.6
Combined HAP	1.0	0.0				1.0
Methane	0.2	0.1			9.2	9.5
Nitrogen Dioxide	0.1	0.0				0.11
CO ₂	4,077	7				4,084
CO _{2e}	4,114	9			230	4,354

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Albert Lea M500 E-Line (2027)
Appendix 9A - Construction Emission Calculations

Table 9A-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	2	72	28	4032	310	0.56	174
All Terrain Vehicle (ATV)	4	72	28	8064	18	1.00	18
Backhoe	3	72	28	6048	75	0.21	16
Cuttings Cleaner System	2	72	28	4032	300	0.59	177
Dozers	3	72	28	6048	410	0.59	242
Dump Truck	8	72	28	16128	325	0.59	192
Generators	4	72	28	8064	430	0.68	292
Grader	3	72	28	6048	140	0.64	90
HDD Rig	1	72	28	2016	600	0.59	354
Mudd Unit	2	72	28	4,032	400	0.21	84
Pickup Trucks	12	72	28	24,192	250	0.59	148
Pipe Tractor Trailer	2	72	28	4,032	400	0.59	236
Scraper	2	72	28	4,032	488	0.59	288
SideBoom	6	72	28	12,096	240	0.59	142
Trackhoe	6	72	28	12,096	320	0.21	67
Water / Fuel Truck	2	72	28	4032	250	0.59	148
Welding Machine	6	72	28	12096	35	0.21	7
Welding Rig	4	72	28	8064	10	0.21	2
X-Ray Truck/Machine	2	72	28	4032	50	0.21	11

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of *EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, USEPA, April 2004

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 Albert Lea M500 E-Line (2027)
 Appendix 9A - Construction Emission Calculations

Table 9A-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	4,032	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.65	3.34	0.10	0.10	0.00	149	0.01	0.00	151
All Terrain Vehicle (ATV)	8,064	18	0.4380	2.1610	4.44	0.267	0.259	0.002	194	0.011	0.005	0.07	0.35	0.71	0.04	0.04	0.00	31	0.00	0.00	31
Backhoe	6,048	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.04	0.25	0.49	0.03	0.02	0.00	20	0.00	0.00	21
Cuttings Cleaner System	4,032	177	0.1669	0.8425	4.00	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.15	0.10	0.10	0.00	152	0.01	0.00	154
Dozers	6,048	242	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.27	1.36	6.99	0.21	0.21	0.00	312	0.02	0.01	315
Dump Truck	16,128	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.57	2.87	14.78	0.45	0.44	0.01	660	0.04	0.02	666
Generators	8,064	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.80	2.19	11.27	0.34	0.33	0.00	503	0.03	0.01	508
Grader	6,048	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.20	0.52	2.45	0.08	0.08	0.00	116	0.01	0.00	117
HDD Rig	2,016	354	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.41	0.10	0.10	0.00	152	0.01	0.00	154
Mudd Unit	4,032	84	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.06	0.31	1.62	0.05	0.05	0.00	72	0.00	0.00	73
Pickup Trucks	24,192	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	1.21	2.94	15.73	0.52	0.50	0.01	761	0.04	0.02	768
Pipe Tractor Trailer	4,032	236	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.18	0.88	4.55	0.14	0.13	0.00	203	0.01	0.01	205
Scraper	4,032	288	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.21	1.08	5.55	0.17	0.16	0.00	248	0.01	0.01	250
Sideboom	12,096	142	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.58	1.41	7.55	0.25	0.24	0.00	365	0.02	0.01	369
Trackhoe	12,096	67	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.15	0.75	3.88	0.12	0.11	0.00	173	0.01	0.00	175
Water / Fuel Truck	4,032	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.20	0.49	2.62	0.09	0.08	0.00	127	0.01	0.00	128
Welding Machine	12,096	7	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.03	0.15	0.46	0.03	0.03	0.00	19	0.00	0.00	19
Welding Rig	8,064	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.01	0.08	0.08	0.01	0.01	0.00	4	0.00	0.00	4
X-Ray Truck/Machine	4,032	11	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.07	0.22	0.02	0.02	0.00	9	0.00	0.00	9

Steele County, MN	5.0	17.7	88.9	2.8	2.8	0.0	4077.3	0.2	0.1	4114.5
TOTALS	5.0	17.7	88.9	2.8	2.8	0.03	4,077	0.232	0.105	4,114

EPA 2004-P-04-009, *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition*, USEPA, April 2004 - Tier 2 Engines
 Load Factors from Appendix A of EPA 420_P-04-005, *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, USEPA, April 2004

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.1
Formaldehyde	0.118	0.6
Acetaldehyde	0.053	0.3
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0
TOTAL HAPS		1.0

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 Albert Lea M500 E-Line (2027)
 Appendix 9A - Construction Emission Calculations

Table 9A-4 Temporary Compression Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (MMBtu)	Criteria Emission Factors (lb/mmbtu)						GHG Emission Factors (lb/mmbtu)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Temporary Compression (x3)	165	0.8	0.12	0.3860	3.17	0.038	0.038	0.001	110	1.450		0.01	0.02	0.20	0.00	0.00	0.00	7	0.09	0.00	9
Steele County, MN											0.0	0.0	0.2	0.0	0.0	0.0	6.9	0.1	0.0	9.2	
TOTALS											0.0	0.0	0.2	0.0	0.0	0.00	7	0.091	0.000	9	

EPA AP-42, Fifth Edition, Volume I Chapter 3: Stationary Internal Combustion Sources, Section 3.2, Table 3.2-1
 Load Factors from Appendix A of EPA 420_P-04-005, *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, USEPA, April 2004

HAP Pollutant Emissions - Construction Equipment

Air Toxic	HAP Emission Factors (lb/mmbtu)	Emissions (ton/yr)
Acetaldehyde	0.008	0.0
Formaldehyde	0.055	0.0
Benzene	0.002	0.0
1,3-Butadiene	0.001	0.0
Acrolein	0.008	0.0
TOTAL HAPS		0.0

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 Appendix 9A - Construction Emission Calculations**

Table 9A-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean Vehicle Weight	S: Mean Vehicle Speed	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Terrain Vehicle (ATV)	4	6	28	3,360	0.25	10	0.256	0.026	0.43	0.04
Backhoe	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Dozers	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Grader	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Pickup Trucks	12	6	28	10,080	2	8	0.653	0.065	3.29	0.33
Pipe Tractor Trailer	2	6	28	504	2	8	0.653	0.065	0.16	0.02
Scraper	2	6	28	504	30	2	2.208	0.221	0.56	0.06
SideBoom	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Trackhoe	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Water / Fuel Truck	2	6	28	1,680	30	8	2.208	0.221	1.85	0.19
Welding Rig	4	6	28	1,008	2	5	0.653	0.065	0.33	0.03

Steele County, MN	11.49	1.15
TOTALS	11.49	1.15

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)
s 8.5 surface material silt content (%)

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V2F A-Line Abandonment and Capacity Replacement Project
Albert Lea M500 E-Line (2027)
Appendix 9A - Construction Emission Calculations**

Table 9A-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	76	72		0.058	0.0061	0.16	0.02
Topsoil removal by Scrapper for Access Roads, Laydown Yards	6	72		0.058	0.0061	0.01	0.00
Trench excavation and loading to storage piles	83	72		0.037	0.0039	0.11	0.01
Backfilling trench	74	72		0.012	0.0013	0.03	0.00
Topsoil replacement	74	72		0.012	0.0013	0.03	0.00
Wind Erosion Exposed Areas			21	0.38	0.0399	1.54	0.16

Steele County, MN	1.9	0.2
TOTALS	1.89	0.20

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): 2.09 miles, 25 feet wide, 1 foot deep, 1.25 tons per cubic yard = 76 tons per day
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: 2.09 miles, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 83 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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Appendix 9A - Construction Emission Calculations**

Table 9A-7 Pipeline Interconnect Purge Emission Estimates

Operation	Blowdown Type	Blowdown loss per Type (scf)	Density of Natural Gas (lb/scf)	% VOC in Natural Gas	VOC Emissions (ton)	Methane Emissions (ton)	Methane Emissions (ton CO2e)
Lake Mills Compressor Station	One-time Purge	400,000	0.050	8%	0.8	9.2	230
TOTAL					1	9	230

Note 1: Northern estimates the loss of 0.4 million scf of natural gas as pressure is drawn down in the pipe being connected.

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Faribault M500 D-Line (2028)
Appendix 9A - Construction Emission Calculations

Table 9A-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Temporary Compression tons	Pipeline Unpaved Roads tons	Earthmoving tons	Purge Emissions tons	TOTAL tons
CO	17.7	0.0				17.7
NO _x	88.9	0.2				89.1
PM ₁₀	2.8	0.0	11.5	6.1		20.4
PM _{2.5}	2.8	0.0	1.1	0.6		4.5
SO ₂	0.03	0.00				0.03
VOC	5.0	0.0			1.6	6.6
Individual HAP	0.6	0.0				0.6
Combined HAP	1.0	0.0				1.0
Methane	0.2	0.1			18.4	18.7
Nitrogen Dioxide	0.1	0.0				0.11
CO ₂	4,077	8				4,085
CO _{2e}	4,114	11			460	4,585

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Faribault M500 D-Line (2028)
Appendix 9A - Construction Emission Calculations

Table 9A-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	2	72	28	4032	310	0.56	174
All Terrain Vehicle (ATV)	4	72	28	8064	18	1.00	18
Backhoe	3	72	28	6048	75	0.21	16
Cuttings Cleaner System	2	72	28	4032	300	0.59	177
Dozers	3	72	28	6048	410	0.59	242
Dump Truck	8	72	28	16128	325	0.59	192
Generators	4	72	28	8064	430	0.68	292
Grader	3	72	28	6048	140	0.64	90
HDD Rig	1	72	28	2016	600	0.59	354
Mudd Unit	2	72	28	4,032	400	0.21	84
Pickup Trucks	12	72	28	24,192	250	0.59	148
Pipe Tractor Trailer	2	72	28	4,032	400	0.59	236
Scraper	2	72	28	4,032	488	0.59	288
SideBoom	6	72	28	12,096	240	0.59	142
Trackhoe	6	72	28	12,096	320	0.21	67
Water / Fuel Truck	2	72	28	4032	250	0.59	148
Welding Machine	6	72	28	12096	35	0.21	7
Welding Rig	4	72	28	8064	10	0.21	2
X-Ray Truck/Machine	2	72	28	4032	50	0.21	11

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling, USEPA, April 2004

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 Faribault M500 D-Line (2028)
 Appendix 9A - Construction Emission Calculations

Table 9A-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	4,032	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.65	3.34	0.10	0.10	0.00	149	0.01	0.00	151
All Terrain Vehicle (ATV)	8,064	18	0.4380	2.1610	4.44	0.267	0.259	0.002	194	0.011	0.005	0.07	0.35	0.71	0.04	0.04	0.00	31	0.00	0.00	31
Backhoe	6,048	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.04	0.25	0.49	0.03	0.02	0.00	20	0.00	0.00	21
Cuttings Cleaner System	4,032	177	0.1669	0.8425	4.00	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.15	0.10	0.10	0.00	152	0.01	0.00	154
Dozers	6,048	242	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.27	1.36	6.99	0.21	0.21	0.00	312	0.02	0.01	315
Dump Truck	16,128	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.57	2.87	14.78	0.45	0.44	0.01	660	0.04	0.02	666
Generators	8,064	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.80	2.19	11.27	0.34	0.33	0.00	503	0.03	0.01	508
Grader	6,048	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.20	0.52	2.45	0.08	0.08	0.00	116	0.01	0.00	117
HDD Rig	2,016	354	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.41	0.10	0.10	0.00	152	0.01	0.00	154
Mudd Unit	4,032	84	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.06	0.31	1.62	0.05	0.05	0.00	72	0.00	0.00	73
Pickup Trucks	24,192	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	1.21	2.94	15.73	0.52	0.50	0.01	761	0.04	0.02	768
Pipe Tractor Trailer	4,032	236	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.18	0.88	4.55	0.14	0.13	0.00	203	0.01	0.01	205
Scraper	4,032	288	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.21	1.08	5.55	0.17	0.16	0.00	248	0.01	0.01	250
SideBoom	12,096	142	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.58	1.41	7.55	0.25	0.24	0.00	365	0.02	0.01	369
Trackhoe	12,096	67	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.15	0.75	3.88	0.12	0.11	0.00	173	0.01	0.00	175
Water / Fuel Truck	4,032	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.20	0.49	2.62	0.09	0.08	0.00	127	0.01	0.00	128
Welding Machine	12,096	7	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.03	0.15	0.46	0.03	0.03	0.00	19	0.00	0.00	19
Welding Rig	8,064	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.01	0.08	0.08	0.01	0.01	0.00	4	0.00	0.00	4
X-Ray Truck/Machine	4,032	11	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.07	0.22	0.02	0.02	0.00	9	0.00	0.00	9

Dakota County, MN	5.0	17.7	88.9	2.8	2.8	0.0	4077.3	0.2	0.1	4114.5
TOTALS	5.0	17.7	88.9	2.8	2.8	0.03	4,077	0.232	0.105	4,114

EPA 2004-P-04-009, *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition*, USEPA, April 2004 - Tier 2 Engines
 Load Factors from Appendix A of EPA 420_P-04-005, *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, USEPA, April 2004

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.1
Formaldehyde	0.118	0.6
Acetaldehyde	0.053	0.3
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0
TOTAL HAPS		1.0

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 Appendix 9A - Construction Emission Calculations

Table 9A-4 Temporary Compression Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (MMBtu)	Criteria Emission Factors (lb/mmbtu)						GHG Emission Factors (lb/mmbtu)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Temporary Compression (x3)	195	0.8	0.12	0.3860	3.17	0.038	0.038	0.001	110	1.450		0.01	0.03	0.24	0.00	0.00	0.00	8	0.11	0.00	11
Dakota County, MN											0.0	0.0	0.2	0.0	0.0	0.0	8.2	0.1	0.0	10.9	
TOTALS											0.0	0.0	0.2	0.0	0.0	0.00	8	0.108	0.000	11	

EPA AP-42, Fifth Edition, Volume I Chapter 3: Stationary Internal Combustion Sources, Section 3.2, Table 3.2-1
 Load Factors from Appendix A of EPA 420_P-04-005, *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, USEPA, April 2004

HAP Pollutant Emissions - Construction Equipment

Air Toxic	HAP Emission Factors (lb/mmbtu)	Emissions (ton/yr)
Acetaldehyde	0.008	0.0
Formaldehyde	0.055	0.0
Benzene	0.002	0.0
1,3-Butadiene	0.001	0.0
Acrolein	0.008	0.0
TOTAL HAPS		0.0

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Appendix 9A - Construction Emission Calculations**

Table 9A-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean	S: Mean	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used		Vehicle Weight	Vehicle Speed	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Terrain Vehicle (ATV)	4	6	28	3,360	0.25	10	0.256	0.026	0.43	0.04
Backhoe	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Dozers	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Grader	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Pickup Trucks	12	6	28	10,080	2	8	0.653	0.065	3.29	0.33
Pipe Tractor Trailer	2	6	28	504	2	8	0.653	0.065	0.16	0.02
Scraper	2	6	28	504	30	2	2.208	0.221	0.56	0.06
SideBoom	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Trackhoe	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Water / Fuel Truck	2	6	28	1,680	30	8	2.208	0.221	1.85	0.19
Welding Rig	4	6	28	1,008	2	5	0.653	0.065	0.33	0.03

Dakota County, MN	11.49	1.15
TOTALS	11.49	1.15

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)
s 8.5 surface material silt content (%)

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Appendix 9A - Construction Emission Calculations**

Table 9A-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	258	72		0.058	0.0061	0.54	0.06
Topsoil removal by Scrapper for Access Roads, Laydown Yards	6	72		0.058	0.0061	0.01	0.00
Trench excavation and loading to storage piles	279	72		0.037	0.0039	0.37	0.04
Backfilling trench	251	72		0.012	0.0013	0.11	0.01
Topsoil replacement	238	72		0.012	0.0013	0.10	0.01
Wind Erosion Exposed Areas			66	0.38	0.0399	4.95	0.52

Dakota County, MN	6.1	0.6
TOTALS	6.09	0.64

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): 7.5 miles, 25 feet wide, 1 foot deep, 1.25 tons per cubic yard = 258 tons per day
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: 7.5 miles, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 279 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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Appendix 9A - Construction Emission Calculations**

Table 9A-7 Pipeline Interconnect Purge Emission Estimates

Operation	Blowdown Type	Blowdown loss per Type (scf)	Density of Natural Gas (lb/scf)	% VOC in Natural Gas	VOC Emissions (ton)	Methane Emissions (ton)	Methane Emissions (ton CO2e)
Lake Mills Compressor Station	One-time Purge	800,000	0.050	8%	1.6	18.4	460
TOTAL					2	18	460

Note 1: Northern estimates the loss of 0.8 million scf of natural gas as pressure is drawn down in the pipe being connected.

Appendix 9B
Detailed Calculation Sheets for Operational Emissions for V2F Project

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Appendix 9B - V2F Operational Emissions
Total
Criteria Pollutant and HAP Operating Emissions

Pollutant	Potential to Emit Facility	
	lbs/hour	tons/year
CO		
NO _x		
PM ₁₀		
PM _{2.5}		
SO ₂		
VOC	0.00	0.01
Individual HAP		
Combined HAP		
Methane	0.18	0.79
CO ₂		
CO _{2e}	4.5	19.7

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Appendix 9B - V2F Operational Emissions

Conger MN #1

Maximum Operation	8,760 hours/year
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VOC Pollutant Operating Emissions for Process Piping Fugitive Emissions

Component Type	Type of Service	Number of Components	Oil & Gas Production Emission Factors (lb/hr-component)	Percent VOC	Potential to Emit VOC Emission Rates		Potential to Emit Methane Emission Rates	
					lbs/hour	tons/year	lbs/hour	tons/year
Valves	Gas/Vapor	1	0.00992	1.05%	0.00	0.00	0.01	0.04
Flanges	Gas/Vapor	4	0.00086	1.05%	0.00	0.00	0.00	0.01
Compressor Seals	Gas/Vapor	4	0.0194	1.05%	0.00	0.00	0.08	0.34
Relief Valves	Gas/Vapor	0	0.0194	1.05%	0.00	0.00	0.00	0.00
Total								
					0.00	0.00	0.09	0.39
CO _{2e}								9.9

Notes:

- 1) Emission Factors from Table 2-1 from *Protocol for Equipment Leak Emission Estimates*; EPA-453/R-98-017 dated November 1995
- 2) Percent VOC for Gas/Vapor service based on gas analysis for similar facility

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Appendix 9B - V2F Operational Emissions

E-Line to D-Line Regulator Station

Maximum Operation	8,760 hours/year
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VOC Pollutant Operating Emissions for Process Piping Fugitive Emissions

Component Type	Type of Service	Number of Components	Oil & Gas Production Emission Factors (lb/hr-component)	Percent VOC	Potential to Emit VOC Emission Rates		Potential to Emit Methane Emission Rates	
					lbs/hour	tons/year	lbs/hour	tons/year
Valves	Gas/Vapor	1	0.00992	1.05%	0.00	0.00	0.01	0.04
Flanges	Gas/Vapor	4	0.00086	1.05%	0.00	0.00	0.00	0.01
Compressor Seals	Gas/Vapor	4	0.0194	1.05%	0.00	0.00	0.08	0.34
Relief Valves	Gas/Vapor	0	0.0194	1.05%	0.00	0.00	0.00	0.00
Total								
					0.00	0.00	0.09	0.39
CO _{2e}								9.9

- Notes:
- 1) Emission Factors from Table 2-1 from *Protocol for Equipment Leak Emission Estimates* ; EPA-453/R-98-017 dated November 1995
 - 2) Percent VOC for Gas/Vapor service based on gas analysis for similar facility

Appendix 9C
Detailed Calculation Sheets for Construction Emissions for NL27 Project

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Northern Lights 2027 Expansion Project
Lake Mills M500E-Line
Appendix 9C - Construction Emission Calculations

Table 9C-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Pipeline Unpaved Roads tons	Earthmoving tons	TOTAL tons
CO	17.7			17.7
NO _x	88.9			88.9
PM ₁₀	2.8	11.5	2.1	16.4
PM _{2.5}	2.8	1.1	0.2	4.1
SO ₂	0.03			0.03
VOC	5.0			5.0
Individual HAP	0.6			0.6
Combined HAP	1.0			1.0
Methane	0.2			0.2
Nitrogen Dioxide	0.1			0.11
CO ₂	4,077			4,077
CO _{2e}	4,112			4,112

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Lake Mills M500E-Line
Appendix 9C - Construction Emission Calculations

Table 9C-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	2	72	28	4032	310	0.56	174
All Terrain Vehicle (ATV)	4	72	28	8064	18	1.00	18
Backhoe	3	72	28	6048	75	0.21	16
Cuttings Cleaner System	2	72	28	4032	300	0.59	177
Dozers	3	72	28	6048	410	0.59	242
Dump Truck	8	72	28	16128	325	0.59	192
Generators	4	72	28	8064	430	0.68	292
Grader	3	72	28	6048	140	0.64	90
HDD Rig	1	72	28	2016	600	0.59	354
Mudd Unit	2	72	28	4,032	400	0.21	84
Pickup Trucks	12	72	28	24,192	250	0.59	148
Pipe Tractor Trailer	2	72	28	4,032	400	0.59	236
Scraper	2	72	28	4,032	488	0.59	288
SideBoom	6	72	28	12,096	240	0.59	142
Trackhoe	6	72	28	12,096	320	0.21	67
Water / Fuel Truck	2	72	28	4032	250	0.59	148
Welding Machine	6	72	28	12096	35	0.21	7
Welding Rig	4	72	28	8064	10	0.21	2
X-Ray Truck/Machine	2	72	28	4032	50	0.21	11

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition , USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling , USEPA, April 2004

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 Appendix 9C - Construction Emission Calculations

Table 9C-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	4,032	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.65	3.34	0.10	0.10	0.00	149	0.01	0.00	151
All Terrain Vehicle (ATV)	8,064	18	0.4380	2.1610	4.44	0.267	0.259	0.002	194	0.011	0.005	0.07	0.35	0.71	0.04	0.04	0.00	31	0.00	0.00	31
Backhoe	6,048	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.04	0.25	0.49	0.03	0.02	0.00	20	0.00	0.00	20
Cuttings Cleaner System	4,032	177	0.1669	0.8425	4.00	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.15	0.10	0.10	0.00	152	0.01	0.00	154
Dozers	6,048	242	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.27	1.36	6.99	0.21	0.21	0.00	312	0.02	0.01	315
Dump Truck	16,128	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.57	2.87	14.78	0.45	0.44	0.01	660	0.04	0.02	665
Generators	8,064	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.80	2.19	11.27	0.34	0.33	0.00	503	0.03	0.01	507
Grader	6,048	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.20	0.52	2.45	0.08	0.08	0.00	116	0.01	0.00	117
HDD Rig	2,016	354	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.41	0.10	0.10	0.00	152	0.01	0.00	154
Mudd Unit	4,032	84	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.06	0.31	1.62	0.05	0.05	0.00	72	0.00	0.00	73
Pickup Trucks	24,192	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	1.21	2.94	15.73	0.52	0.50	0.01	761	0.04	0.02	768
Pipe Tractor Trailer	4,032	236	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.18	0.88	4.55	0.14	0.13	0.00	203	0.01	0.01	205
Scraper	4,032	288	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.21	1.08	5.55	0.17	0.16	0.00	248	0.01	0.01	250
Sideboom	12,096	142	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.58	1.41	7.55	0.25	0.24	0.00	365	0.02	0.01	369
Trackhoe	12,096	67	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.15	0.75	3.88	0.12	0.11	0.00	173	0.01	0.00	175
Water / Fuel Truck	4,032	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.20	0.49	2.62	0.09	0.08	0.00	127	0.01	0.00	128
Welding Machine	12,096	7	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.03	0.15	0.46	0.03	0.03	0.00	19	0.00	0.00	19
Welding Rig	8,064	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.01	0.08	0.08	0.01	0.01	0.00	4	0.00	0.00	4
X-Ray Truck/Machine	4,032	11	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.07	0.22	0.02	0.02	0.00	9	0.00	0.00	9

Freeborn County, MN	5.0	17.7	88.9	2.8	2.8	0.0	4077.3	0.2	0.1	4111.7
TOTALS	5.0	17.7	88.9	2.8	2.8	0.03	4,077	0.232	0.105	4,112

EPA 2004-P-04-009, *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition*, USEPA, April 2004 - Tier 2 Engines
 Load Factors from Appendix A of EPA 420_P-04-005, *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, USEPA, April 2004

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.1
Formaldehyde	0.118	0.6
Acetaldehyde	0.053	0.3
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0
TOTAL HAPS		1.0

Federal Energy Regulatory Commission Resource Report No. 9

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Northern Lights 2027 Expansion Project

Lake Mills M500E-Line

Appendix 9C - Construction Emission Calculations

Table 9C-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean Vehicle Weight	S: Mean Vehicle Speed	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Terrain Vehicle (ATV)	4	6	28	3,360	0.25	10	0.256	0.026	0.43	0.04
Backhoe	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Dozers	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Grader	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Pickup Trucks	12	6	28	10,080	2	8	0.653	0.065	3.29	0.33
Pipe Tractor Trailer	2	6	28	504	2	8	0.653	0.065	0.16	0.02
Scraper	2	6	28	504	30	2	2.208	0.221	0.56	0.06
SideBoom	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Trackhoe	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Water / Fuel Truck	2	6	28	1,680	30	8	2.208	0.221	1.85	0.19
Welding Rig	4	6	28	1,008	2	5	0.653	0.065	0.33	0.03

Freeborn County, MN	11.49	1.15
TOTALS	11.49	1.15

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)

s 8.5 surface material silt content (%)

**Federal Energy Regulatory Commission Resource Report No. 9
Northern Natural Gas
Northern Lights 2027 Expansion Project
Lake Mills M500E-Line
Appendix 9C - Construction Emission Calculations**

Table 9C-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	84	72		0.058	0.0061	0.18	0.02
Topsoil removal by Scrapper for Access Roads, Laydown Yards	6	72		0.058	0.0061	0.01	0.00
Trench excavation and loading to storage piles	91	72		0.037	0.0039	0.12	0.01
Backfilling trench	82	72		0.012	0.0013	0.04	0.00
Topsoil replacement	81	72		0.012	0.0013	0.04	0.00
Wind Erosion Exposed Areas			23	0.38	0.0399	1.69	0.18

Steele County, MN	2.1	0.2
TOTALS	2.07	0.22

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): 2.32 miles, 25 feet wide, 1 foot deep, 1.25 tons per cubic yard = 84 tons per day
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: 2.32 miles, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 91 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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Northern Lights 2027 Expansion Project
Albert Lea M500E-Line
Appendix 9C - Construction Emission Calculations

Table 9C-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Pipeline Unpaved Roads tons	Earthmoving tons	TOTAL tons
CO	17.7			17.7
NO _x	88.9			88.9
PM ₁₀	2.8	11.5	3.0	17.3
PM _{2.5}	2.8	1.1	0.3	4.2
SO ₂	0.03			0.03
VOC	5.0			5.0
Individual HAP	0.6			0.6
Combined HAP	1.0			1.0
Methane	0.2			0.2
Nitrogen Dioxide	0.1			0.11
CO ₂	4,077			4,077
CO _{2e}	4,112			4,112

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Northern Lights 2027 Expansion Project
Albert Lea M500E-Line
Appendix 9C - Construction Emission Calculations

Table 9C-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	2	72	28	4032	310	0.56	174
All Terrain Vehicle (ATV)	4	72	28	8064	18	1.00	18
Backhoe	3	72	28	6048	75	0.21	16
Cuttings Cleaner System	2	72	28	4032	300	0.59	177
Dozers	3	72	28	6048	410	0.59	242
Dump Truck	8	72	28	16128	325	0.59	192
Generators	4	72	28	8064	430	0.68	292
Grader	3	72	28	6048	140	0.64	90
HDD Rig	1	72	28	2016	600	0.59	354
Mudd Unit	2	72	28	4,032	400	0.21	84
Pickup Trucks	12	72	28	24,192	250	0.59	148
Pipe Tractor Trailer	2	72	28	4,032	400	0.59	236
Scraper	2	72	28	4,032	488	0.59	288
SideBoom	6	72	28	12,096	240	0.59	142
Trackhoe	6	72	28	12,096	320	0.21	67
Water / Fuel Truck	2	72	28	4032	250	0.59	148
Welding Machine	6	72	28	12096	35	0.21	7
Welding Rig	4	72	28	8064	10	0.21	2
X-Ray Truck/Machine	2	72	28	4032	50	0.21	11

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition , USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling , USEPA, April 2004

Federal Energy Regulatory Commission Resource Report No. 9
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Northern Lights 2027 Expansion Project
Albert Lea M500E-Line
Appendix 9C - Construction Emission Calculations

Table 9C-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	4,032	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.65	3.34	0.10	0.10	0.00	149	0.01	0.00	151
All Terrain Vehicle (ATV)	8,064	18	0.4380	2.1610	4.44	0.267	0.259	0.002	194	0.011	0.005	0.07	0.35	0.71	0.04	0.04	0.00	31	0.00	0.00	31
Backhoe	6,048	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.04	0.25	0.49	0.03	0.02	0.00	20	0.00	0.00	20
Cuttings Cleaner System	4,032	177	0.1669	0.8425	4.00	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.15	0.10	0.10	0.00	152	0.01	0.00	154
Dozers	6,048	242	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.27	1.36	6.99	0.21	0.21	0.00	312	0.02	0.01	315
Dump Truck	16,128	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.57	2.87	14.78	0.45	0.44	0.01	660	0.04	0.02	665
Generators	8,064	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.80	2.19	11.27	0.34	0.33	0.00	503	0.03	0.01	507
Grader	6,048	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.20	0.52	2.45	0.08	0.08	0.00	116	0.01	0.00	117
HDD Rig	2,016	354	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.41	0.10	0.10	0.00	152	0.01	0.00	154
Mudd Unit	4,032	84	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.06	0.31	1.62	0.05	0.05	0.00	72	0.00	0.00	73
Pickup Trucks	24,192	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	1.21	2.94	15.73	0.52	0.50	0.01	761	0.04	0.02	768
Pipe Tractor Trailer	4,032	236	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.18	0.88	4.55	0.14	0.13	0.00	203	0.01	0.01	205
Scraper	4,032	288	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.21	1.08	5.55	0.17	0.16	0.00	248	0.01	0.01	250
Sideboom	12,096	142	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.58	1.41	7.55	0.25	0.24	0.00	365	0.02	0.01	369
Trackhoe	12,096	67	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.15	0.75	3.88	0.12	0.11	0.00	173	0.01	0.00	175
Water / Fuel Truck	4,032	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.20	0.49	2.62	0.09	0.08	0.00	127	0.01	0.00	128
Welding Machine	12,096	7	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.03	0.15	0.46	0.03	0.03	0.00	19	0.00	0.00	19
Welding Rig	8,064	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.01	0.08	0.08	0.01	0.01	0.00	4	0.00	0.00	4
X-Ray Truck/Machine	4,032	11	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.07	0.22	0.02	0.02	0.00	9	0.00	0.00	9

Steele County, MN	5.0	17.7	88.9	2.8	2.8	0.0	4077.3	0.2	0.1	4111.7
TOTALS	5.0	17.7	88.9	2.8	2.8	0.03	4,077	0.232	0.105	4,112

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.1
Formaldehyde	0.118	0.6
Acetaldehyde	0.053	0.3
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0
TOTAL HAPS		1.0

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 Northern Lights 2027 Expansion Project
 Albert Lea M500E-Line
 Appendix 9C - Construction Emission Calculations

Table 9C-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean Vehicle Weight	S: Mean Vehicle Speed	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Terrain Vehicle (ATV)	4	6	28	3,360	0.25	10	0.256	0.026	0.43	0.04
Backhoe	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Dozers	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Grader	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Pickup Trucks	12	6	28	10,080	2	8	0.653	0.065	3.29	0.33
Pipe Tractor Trailer	2	6	28	504	2	8	0.653	0.065	0.16	0.02
Scraper	2	6	28	504	30	2	2.208	0.221	0.56	0.06
SideBoom	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Trackhoe	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Water / Fuel Truck	2	6	28	1,680	30	8	2.208	0.221	1.85	0.19
Welding Rig	4	6	28	1,008	2	5	0.653	0.065	0.33	0.03

Steele County, MN	11.49	1.15
TOTALS	11.49	1.15

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)
s 8.5 surface material silt content (%)

**Federal Energy Regulatory Commission Resource Report No. 9
Northern Natural Gas
Northern Lights 2027 Expansion Project
Albert Lea M500E-Line
Appendix 9C - Construction Emission Calculations**

Table 9C-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	124	72		0.058	0.0061	0.26	0.03
Topsoil removal by Scrapper for Access Roads, Laydown Yards	6	72		0.058	0.0061	0.01	0.00
Trench excavation and loading to storage piles	134	72		0.037	0.0039	0.18	0.02
Backfilling trench	121	72		0.012	0.0013	0.05	0.01
Topsoil replacement	117	72		0.012	0.0013	0.05	0.01
Wind Erosion Exposed Areas			33	0.38	0.0399	2.44	0.26

Steele County, MN	3.0	0.3
TOTALS	3.00	0.31

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): 2.32 miles, 25 feet wide, 1 foot deep, 1.25 tons per cubic yard = 124 tons per day
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: 2.32 miles, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 134 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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Northern Lights 2027 Expansion Project
Willmar 3rd Branch Line Upstream
Appendix 9C - Construction Emission Calculations

Table 9C-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Pipeline Unpaved Roads tons	Earthmoving tons	Pipeline Venting tons	TOTAL tons
CO	17.7				17.7
NO _x	88.9				88.9
PM ₁₀	2.8	11.5	1.6		15.9
PM _{2.5}	2.8	1.1	0.2		4.1
SO ₂	0.03				0.03
VOC	5.0			0.05	5.0
Individual HAP	0.6				0.6
Combined HAP	1.0				1.0
Methane	0.2			0.5	0.8
Nitrogen Dioxide	0.1				0.11
CO ₂	4,077				4,077
CO _{2e}	4,112			14.8	4,127

Federal Energy Regulatory Commission Resource Report No. 9
Northern Natural Gas
Northern Lights 2027 Expansion Project
Willmar 3rd Branch Line Upstream
Appendix 9C - Construction Emission Calculations

Table 9C-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	2	72	28	4032	310	0.56	174
All Terrain Vehicle (ATV)	4	72	28	8064	18	1.00	18
Backhoe	3	72	28	6048	75	0.21	16
Cuttings Cleaner System	2	72	28	4032	300	0.59	177
Dozers	3	72	28	6048	410	0.59	242
Dump Truck	8	72	28	16128	325	0.59	192
Generators	4	72	28	8064	430	0.68	292
Grader	3	72	28	6048	140	0.64	90
HDD Rig	1	72	28	2016	600	0.59	354
Mudd Unit	2	72	28	4,032	400	0.21	84
Pickup Trucks	12	72	28	24,192	250	0.59	148
Pipe Tractor Trailer	2	72	28	4,032	400	0.59	236
Scraper	2	72	28	4,032	488	0.59	288
SideBoom	6	72	28	12,096	240	0.59	142
Trackhoe	6	72	28	12,096	320	0.21	67
Water / Fuel Truck	2	72	28	4032	250	0.59	148
Welding Machine	6	72	28	12096	35	0.21	7
Welding Rig	4	72	28	8064	10	0.21	2
X-Ray Truck/Machine	2	72	28	4032	50	0.21	11

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition , USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling , USEPA, April 2004

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 Willmar 3rd Branch Line Upstream
 Appendix 9C - Construction Emission Calculations

Table 9C-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	4,032	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.65	3.34	0.10	0.10	0.00	149	0.01	0.00	151
All Terrain Vehicle (ATV)	8,064	18	0.4380	2.1610	4.44	0.267	0.259	0.002	194	0.011	0.005	0.07	0.35	0.71	0.04	0.04	0.00	31	0.00	0.00	31
Backhoe	6,048	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.04	0.25	0.49	0.03	0.02	0.00	20	0.00	0.00	20
Cuttings Cleaner System	4,032	177	0.1669	0.8425	4.00	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.15	0.10	0.10	0.00	152	0.01	0.00	154
Dozers	6,048	242	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.27	1.36	6.99	0.21	0.21	0.00	312	0.02	0.01	315
Dump Truck	16,128	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.57	2.87	14.78	0.45	0.44	0.01	660	0.04	0.02	665
Generators	8,064	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.80	2.19	11.27	0.34	0.33	0.00	503	0.03	0.01	507
Grader	6,048	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.20	0.52	2.45	0.08	0.08	0.00	116	0.01	0.00	117
HDD Rig	2,016	354	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.41	0.10	0.10	0.00	152	0.01	0.00	154
Mudd Unit	4,032	84	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.06	0.31	1.62	0.05	0.05	0.00	72	0.00	0.00	73
Pickup Trucks	24,192	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	1.21	2.94	15.73	0.52	0.50	0.01	761	0.04	0.02	768
Pipe Tractor Trailer	4,032	236	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.18	0.88	4.55	0.14	0.13	0.00	203	0.01	0.01	205
Scraper	4,032	288	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.21	1.08	5.55	0.17	0.16	0.00	248	0.01	0.01	250
Sideboom	12,096	142	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.58	1.41	7.55	0.25	0.24	0.00	365	0.02	0.01	369
Trackhoe	12,096	67	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.15	0.75	3.88	0.12	0.11	0.00	173	0.01	0.00	175
Water / Fuel Truck	4,032	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.20	0.49	2.62	0.09	0.08	0.00	127	0.01	0.00	128
Welding Machine	12,096	7	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.03	0.15	0.46	0.03	0.03	0.00	19	0.00	0.00	19
Welding Rig	8,064	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.01	0.08	0.08	0.01	0.01	0.00	4	0.00	0.00	4
X-Ray Truck/Machine	4,032	11	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.07	0.22	0.02	0.02	0.00	9	0.00	0.00	9

Scott County, MN	5.0	17.7	88.9	2.8	2.8	0.0	4077.3	0.2	0.1	4111.7
TOTALS	5.0	17.7	88.9	2.8	2.8	0.03	4,077	0.232	0.105	4,112

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.1
Formaldehyde	0.118	0.6
Acetaldehyde	0.053	0.3
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0
TOTAL HAPS		1.0

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Appendix 9C - Construction Emission Calculations**

Table 9C-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean Vehicle Weight	S: Mean Vehicle Speed	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Terrain Vehicle (ATV)	4	6	28	3,360	0.25	10	0.256	0.026	0.43	0.04
Backhoe	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Dozers	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Grader	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Pickup Trucks	12	6	28	10,080	2	8	0.653	0.065	3.29	0.33
Pipe Tractor Trailer	2	6	28	504	2	8	0.653	0.065	0.16	0.02
Scraper	2	6	28	504	30	2	2.208	0.221	0.56	0.06
SideBoom	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Trackhoe	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Water / Fuel Truck	2	6	28	1,680	30	8	2.208	0.221	1.85	0.19
Welding Rig	4	6	28	1,008	2	5	0.653	0.065	0.33	0.03

Scott County, MN	11.49	1.15
TOTALS	11.49	1.15

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)

s 8.5 surface material silt content (%)

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Table 9C-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	64	72		0.058	0.0061	0.13	0.01
Topsoil removal by Scrapper for Access Roads, Laydown Yards	6	72		0.058	0.0061	0.01	0.00
Trench excavation and loading to storage piles	69	72		0.037	0.0039	0.09	0.01
Backfilling trench	62	72		0.012	0.0013	0.03	0.00
Topsoil replacement	63	72		0.012	0.0013	0.03	0.00
Wind Erosion Exposed Areas			18	0.38	0.0399	1.31	0.14

Scott County, MN	1.6	0.2
TOTALS	1.60	0.17

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): 2.32 miles, 25 feet wide, 1 foot deep, 1.25 tons per cubic yard = 64 tons per day
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: 2.32 miles, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 69 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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Appendix 9C - Construction Emission Calculations

Table 9C-7 Pipeline Interconnect Purge Emission Estimates

Operation	Blowdown Type	Blowdown loss per Type (scf)	Density of Natural Gas (lb/scf)	% VOC in Natural Gas	VOC Emissions (ton)	Methane Emissions (ton)	Methane Emissions (ton CO2e)
Purge for Interconnect Loop	One-time Purge	23,000	0.050	8%	0.0	0.5	15
TOTAL					0	1	15

Note 1: Northern estimates the loss of 0.4 million scf of natural gas as pressure is drawn down in the pipe being connected.

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Appendix 9C - Construction Emission Calculations

Table 9C-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Pipeline Unpaved Roads tons	Earthmoving tons	Pipeline Venting tons	TOTAL tons
CO	25.2				25.2
NO _x	126.6				126.6
PM ₁₀	4.0	15.0	4.1		23.2
PM _{2.5}	3.9	1.5	0.4		5.8
SO ₂	0.05				0.05
VOC	7.0			0.02	7.0
Individual HAP	0.8				0.8
Combined HAP	1.4				1.4
Methane	0.3			0.3	0.6
Nitrogen Dioxide	0.1				0.15
CO ₂	5,795				5,795
CO _{2e}	5,844			7.7	5,851

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Appendix 9C - Construction Emission Calculations

Table 9C-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	3	72	28	6048	310	0.56	174
All Terrain Vehicle (ATV)	6	72	28	12096	18	1.00	18
Backhoe	5	72	28	10080	75	0.21	16
Cuttings Cleaner System	3	72	28	6048	300	0.59	177
Dozers	5	72	28	10080	410	0.59	242
Dump Truck	12	72	28	24192	325	0.59	192
Generators	6	72	28	12096	430	0.68	292
Grader	5	72	28	10080	140	0.64	90
HDD Rig	2	72	28	4032	600	0.59	354
Mudd Unit	3	72	28	6,048	400	0.21	84
Pickup Trucks	18	72	28	36,288	250	0.59	148
Pipe Tractor Trailer	3	72	28	6,048	400	0.59	236
Scraper	3	72	28	6,048	488	0.59	288
SideBoom	4	72	28	8,064	240	0.59	142
Trackhoe	4	72	28	8,064	320	0.21	67
Water / Fuel Truck	3	72	28	6048	250	0.59	148
Welding Machine	4	72	28	8064	35	0.21	7
Welding Rig	3	72	28	6048	10	0.21	2
X-Ray Truck/Machine	2	72	28	4032	50	0.21	11

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of *EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, USEPA, April 2004

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Appendix 9C - Construction Emission Calculations

Table 9C-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	6,048	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.19	0.98	5.02	0.15	0.15	0.00	224	0.01	0.01	226
All Terrain Vehicle (ATV)	12,096	18	0.4380	2.1610	4.44	0.267	0.259	0.002	194	0.011	0.005	0.11	0.52	1.07	0.06	0.06	0.00	46	0.00	0.00	47
Backhoe	10,080	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.06	0.41	0.82	0.04	0.04	0.00	34	0.00	0.00	34
Cuttings Cleaner System	6,048	177	0.1669	0.8425	4.00	0.132	0.128	0.002	194	0.011	0.005	0.20	0.99	4.72	0.16	0.15	0.00	228	0.01	0.01	230
Dozers	10,080	242	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.45	2.26	11.65	0.35	0.34	0.00	520	0.03	0.01	525
Dump Truck	24,192	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.85	4.31	22.17	0.67	0.65	0.01	990	0.06	0.03	998
Generators	12,096	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	1.20	3.28	16.90	0.51	0.50	0.01	755	0.04	0.02	761
Grader	10,080	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.34	0.86	4.08	0.13	0.13	0.00	193	0.01	0.00	194
HDD Rig	4,032	354	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.26	1.33	6.82	0.21	0.20	0.00	305	0.02	0.01	307
Mudd Unit	6,048	84	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.09	0.47	2.43	0.07	0.07	0.00	108	0.01	0.00	109
Pickup Trucks	36,288	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	1.82	4.41	23.60	0.78	0.75	0.01	1142	0.06	0.03	1152
Pipe Tractor Trailer	6,048	236	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.26	1.33	6.82	0.21	0.20	0.00	305	0.02	0.01	307
Scraper	6,048	288	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.32	1.62	8.32	0.25	0.25	0.00	372	0.02	0.01	375
Sideboom	8,064	142	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.39	0.94	5.03	0.17	0.16	0.00	244	0.01	0.01	246
Trackhoe	8,064	67	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.10	0.50	2.59	0.08	0.08	0.00	116	0.01	0.00	117
Water / Fuel Truck	6,048	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.30	0.74	3.93	0.13	0.13	0.00	190	0.01	0.00	192
Welding Machine	8,064	7	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.02	0.10	0.31	0.02	0.02	0.00	13	0.00	0.00	13
Welding Rig	6,048	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.01	0.06	0.06	0.01	0.01	0.00	3	0.00	0.00	3
X-Ray Truck/Machine	4,032	11	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.07	0.22	0.02	0.02	0.00	9	0.00	0.00	9

Carver County, MN	7.0	25.2	126.6	4.0	3.9	0.0	5794.7	0.3	0.1	5843.6
TOTALS	7.0	25.2	126.6	4.0	3.9	0.05	5,795	0.329	0.150	5,844

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.1
Formaldehyde	0.118	0.8
Acetaldehyde	0.053	0.4
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0
TOTAL HAPS		1.4

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 Appendix 9C - Construction Emission Calculations

Table 9C-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean Vehicle Weight	S: Mean Vehicle Speed	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Terrain Vehicle (ATV)	6	6	28	5,040	0.25	10	0.256	0.026	0.65	0.06
Backhoe	5	6	28	1,260	20	2	1.840	0.184	1.16	0.12
Dozers	5	6	28	1,260	20	2	1.840	0.184	1.16	0.12
Grader	5	6	28	1,260	20	2	1.840	0.184	1.16	0.12
Pickup Trucks	18	6	28	15,120	2	8	0.653	0.065	4.93	0.49
Pipe Tractor Trailer	3	6	28	756	2	8	0.653	0.065	0.25	0.02
Scraper	3	6	28	756	30	2	2.208	0.221	0.83	0.08
SideBoom	4	6	28	1,008	20	2	1.840	0.184	0.93	0.09
Trackhoe	4	6	28	1,008	20	2	1.840	0.184	0.93	0.09
Water / Fuel Truck	3	6	28	2,520	30	8	2.208	0.221	2.78	0.28
Welding Rig	3	6	28	756	2	5	0.653	0.065	0.25	0.02

Carver County, MN	15.02	1.50
TOTALS	15.02	1.50

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)

s 8.5 surface material silt content (%)

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Appendix 9C - Construction Emission Calculations**

Table 9C-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	174	72		0.058	0.0061	0.36	0.04
Topsoil removal by Scrapper for Access Roads, Laydown Yards	6	72		0.058	0.0061	0.01	0.00
Trench excavation and loading to storage piles	187	72		0.037	0.0039	0.25	0.03
Backfilling trench	169	72		0.012	0.0013	0.07	0.01
Topsoil replacement	162	72		0.012	0.0013	0.07	0.01
Wind Erosion Exposed Areas			45	0.38	0.0399	3.36	0.35

Carver County, MN	4.1	0.4
TOTALS	4.13	0.43

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): 2.32 miles, 25 feet wide, 1 foot deep, 1.25 tons per cubic yard = 174 tons per day
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: 2.32 miles, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 187 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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Appendix 9C - Construction Emission Calculations

Table 9C-7 Pipeline Interconnect Purge Emission Estimates

Operation	Blowdown Type	Blowdown loss per Type (scf)	Density of Natural Gas (lb/scf)	% VOC in Natural Gas	VOC Emissions (ton)	Methane Emissions (ton)	Methane Emissions (ton CO2e)
Purge for Interconnect Loop	One-time Purge	12,000	0.050	8%	0.0	0.3	8
TOTAL					0	0	8

Note 1: Northern estimates the loss of 0.4 million scf of natural gas as pressure is drawn down in the pipe being connected.

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Table 9C-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Pipeline Unpaved Roads tons	Earthmoving tons	TOTAL tons
CO	17.7			17.7
NO _x	88.9			88.9
PM ₁₀	2.8	11.5	1.2	15.5
PM _{2.5}	2.8	1.1	0.1	4.0
SO ₂	0.03			0.03
VOC	5.0			5.0
Individual HAP	0.6			0.6
Combined HAP	1.0			1.0
Methane	0.2			0.2
Nitrogen Dioxide	0.1			0.11
CO ₂	4,077			4,077
CO _{2e}	4,112			4,112

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Table 9C-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	2	72	28	4032	310	0.56	174
All Terrain Vehicle (ATV)	4	72	28	8064	18	1.00	18
Backhoe	3	72	28	6048	75	0.21	16
Cuttings Cleaner System	2	72	28	4032	300	0.59	177
Dozers	3	72	28	6048	410	0.59	242
Dump Truck	8	72	28	16128	325	0.59	192
Generators	4	72	28	8064	430	0.68	292
Grader	3	72	28	6048	140	0.64	90
HDD Rig	1	72	28	2016	600	0.59	354
Mudd Unit	2	72	28	4,032	400	0.21	84
Pickup Trucks	12	72	28	24,192	250	0.59	148
Pipe Tractor Trailer	2	72	28	4,032	400	0.59	236
Scraper	2	72	28	4,032	488	0.59	288
SideBoom	6	72	28	12,096	240	0.59	142
Trackhoe	6	72	28	12,096	320	0.21	67
Water / Fuel Truck	2	72	28	4032	250	0.59	148
Welding Machine	6	72	28	12096	35	0.21	7
Welding Rig	4	72	28	8064	10	0.21	2
X-Ray Truck/Machine	2	72	28	4032	50	0.21	11

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition , USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling , USEPA, April 2004

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 Appendix 9C - Construction Emission Calculations

Table 9C-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	4,032	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.65	3.34	0.10	0.10	0.00	149	0.01	0.00	151
All Terrain Vehicle (ATV)	8,064	18	0.4380	2.1610	4.44	0.267	0.259	0.002	194	0.011	0.005	0.07	0.35	0.71	0.04	0.04	0.00	31	0.00	0.00	31
Backhoe	6,048	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.04	0.25	0.49	0.03	0.02	0.00	20	0.00	0.00	20
Cuttings Cleaner System	4,032	177	0.1669	0.8425	4.00	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.15	0.10	0.10	0.00	152	0.01	0.00	154
Dozers	6,048	242	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.27	1.36	6.99	0.21	0.21	0.00	312	0.02	0.01	315
Dump Truck	16,128	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.57	2.87	14.78	0.45	0.44	0.01	660	0.04	0.02	665
Generators	8,064	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.80	2.19	11.27	0.34	0.33	0.00	503	0.03	0.01	507
Grader	6,048	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.20	0.52	2.45	0.08	0.08	0.00	116	0.01	0.00	117
HDD Rig	2,016	354	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.41	0.10	0.10	0.00	152	0.01	0.00	154
Mudd Unit	4,032	84	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.06	0.31	1.62	0.05	0.05	0.00	72	0.00	0.00	73
Pickup Trucks	24,192	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	1.21	2.94	15.73	0.52	0.50	0.01	761	0.04	0.02	768
Pipe Tractor Trailer	4,032	236	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.18	0.88	4.55	0.14	0.13	0.00	203	0.01	0.01	205
Scraper	4,032	288	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.21	1.08	5.55	0.17	0.16	0.00	248	0.01	0.01	250
Sideboom	12,096	142	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.58	1.41	7.55	0.25	0.24	0.00	365	0.02	0.01	369
Trackhoe	12,096	67	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.15	0.75	3.88	0.12	0.11	0.00	173	0.01	0.00	175
Water / Fuel Truck	4,032	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.20	0.49	2.62	0.09	0.08	0.00	127	0.01	0.00	128
Welding Machine	12,096	7	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.03	0.15	0.46	0.03	0.03	0.00	19	0.00	0.00	19
Welding Rig	8,064	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.01	0.08	0.08	0.01	0.01	0.00	4	0.00	0.00	4
X-Ray Truck/Machine	4,032	11	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.07	0.22	0.02	0.02	0.00	9	0.00	0.00	9

Martin County, MN	5.0	17.7	88.9	2.8	2.8	0.0	4077.3	0.2	0.1	4111.7
TOTALS	5.0	17.7	88.9	2.8	2.8	0.03	4,077	0.232	0.105	4,112

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.1
Formaldehyde	0.118	0.6
Acetaldehyde	0.053	0.3
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0
TOTAL HAPS		1.0

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 Appendix 9C - Construction Emission Calculations

Table 9C-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean Vehicle Weight	S: Mean Vehicle Speed	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Terrain Vehicle (ATV)	4	6	28	3,360	0.25	10	0.256	0.026	0.43	0.04
Backhoe	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Dozers	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Grader	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Pickup Trucks	12	6	28	10,080	2	8	0.653	0.065	3.29	0.33
Pipe Tractor Trailer	2	6	28	504	2	8	0.653	0.065	0.16	0.02
Scraper	2	6	28	504	30	2	2.208	0.221	0.56	0.06
SideBoom	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Trackhoe	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Water / Fuel Truck	2	6	28	1,680	30	8	2.208	0.221	1.85	0.19
Welding Rig	4	6	28	1,008	2	5	0.653	0.065	0.33	0.03

Martin County, MN	11.49	1.15
TOTALS	11.49	1.15

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)

s 8.5 surface material silt content (%)

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Table 9C-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	45	72		0.058	0.0061	0.09	0.01
Topsoil removal by Scrapper for Access Roads, Laydown Yards	6	72		0.058	0.0061	0.01	0.00
Trench excavation and loading to storage piles	49	72		0.037	0.0039	0.06	0.01
Backfilling trench	44	72		0.012	0.0013	0.02	0.00
Topsoil replacement	46	72		0.012	0.0013	0.02	0.00
Wind Erosion Exposed Areas			13	0.38	0.0399	0.96	0.10

Martin County, MN	1.2	0.1
TOTALS	1.17	0.12

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): 2.32 miles, 25 feet wide, 1 foot deep, 1.25 tons per cubic yard = 45 tons per day
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: 2.32 miles, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 49 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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Table 9C-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Pipeline Unpaved Roads tons	Earthmoving tons	Pipeline Venting tons	TOTAL tons
CO	17.7				17.7
NO _x	88.9				88.9
PM ₁₀	2.8	11.5	2.2		16.5
PM _{2.5}	2.8	1.1	0.2		4.1
SO ₂	0.03				0.0
VOC	5.0			0.0	5.0
Individual HAP	0.6				0.6
Combined HAP	1.0				1.0
Methane	0.2			0.0	0.2
Nitrogen Dioxide	0.1				0.1
CO ₂	4,077				4,077
CO _{2e}	4,112			0.2	4,112

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Table 9C-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	2	72	28	4032	310	0.56	174
All Terrain Vehicle (ATV)	4	72	28	8064	18	1.00	18
Backhoe	3	72	28	6048	75	0.21	16
Cuttings Cleaner System	2	72	28	4032	300	0.59	177
Dozers	3	72	28	6048	410	0.59	242
Dump Truck	8	72	28	16128	325	0.59	192
Generators	4	72	28	8064	430	0.68	292
Grader	3	72	28	6048	140	0.64	90
HDD Rig	1	72	28	2016	600	0.59	354
Mudd Unit	2	72	28	4,032	400	0.21	84
Pickup Trucks	12	72	28	24,192	250	0.59	148
Pipe Tractor Trailer	2	72	28	4,032	400	0.59	236
Scraper	2	72	28	4,032	488	0.59	288
SideBoom	6	72	28	12,096	240	0.59	142
Trackhoe	6	72	28	12,096	320	0.21	67
Water / Fuel Truck	2	72	28	4032	250	0.59	148
Welding Machine	6	72	28	12096	35	0.21	7
Welding Rig	4	72	28	8064	10	0.21	2
X-Ray Truck/Machine	2	72	28	4032	50	0.21	11

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition , USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling , USEPA, April 2004

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Table 9C-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	4,032	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.65	3.34	0.10	0.10	0.00	149	0.01	0.00	151
All Terrain Vehicle (ATV)	8,064	18	0.4380	2.1610	4.44	0.267	0.259	0.002	194	0.011	0.005	0.07	0.35	0.71	0.04	0.04	0.00	31	0.00	0.00	31
Backhoe	6,048	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.04	0.25	0.49	0.03	0.02	0.00	20	0.00	0.00	20
Cuttings Cleaner System	4,032	177	0.1669	0.8425	4.00	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.15	0.10	0.10	0.00	152	0.01	0.00	154
Dozers	6,048	242	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.27	1.36	6.99	0.21	0.21	0.00	312	0.02	0.01	315
Dump Truck	16,128	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.57	2.87	14.78	0.45	0.44	0.01	660	0.04	0.02	665
Generators	8,064	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.80	2.19	11.27	0.34	0.33	0.00	503	0.03	0.01	507
Grader	6,048	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.20	0.52	2.45	0.08	0.08	0.00	116	0.01	0.00	117
HDD Rig	2,016	354	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.41	0.10	0.10	0.00	152	0.01	0.00	154
Mudd Unit	4,032	84	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.06	0.31	1.62	0.05	0.05	0.00	72	0.00	0.00	73
Pickup Trucks	24,192	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	1.21	2.94	15.73	0.52	0.50	0.01	761	0.04	0.02	768
Pipe Tractor Trailer	4,032	236	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.18	0.88	4.55	0.14	0.13	0.00	203	0.01	0.01	205
Scraper	4,032	288	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.21	1.08	5.55	0.17	0.16	0.00	248	0.01	0.01	250
Sideboom	12,096	142	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.58	1.41	7.55	0.25	0.24	0.00	365	0.02	0.01	369
Trackhoe	12,096	67	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.15	0.75	3.88	0.12	0.11	0.00	173	0.01	0.00	175
Water / Fuel Truck	4,032	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.20	0.49	2.62	0.09	0.08	0.00	127	0.01	0.00	128
Welding Machine	12,096	7	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.03	0.15	0.46	0.03	0.03	0.00	19	0.00	0.00	19
Welding Rig	8,064	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.01	0.08	0.08	0.01	0.01	0.00	4	0.00	0.00	4
X-Ray Truck/Machine	4,032	11	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.07	0.22	0.02	0.02	0.00	9	0.00	0.00	9

Stearns County, MN	5.0	17.7	88.9	2.8	2.8	0.0	4077.3	0.2	0.1	4111.7
TOTALS	5.0	17.7	88.9	2.8	2.8	0.03	4,077	0.232	0.105	4,112

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.1
Formaldehyde	0.118	0.6
Acetaldehyde	0.053	0.3
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0
TOTAL HAPS		1.0

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Table 9C-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean Vehicle Weight	S: Mean Vehicle Speed	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Terrain Vehicle (ATV)	4	6	28	3,360	0.25	10	0.256	0.026	0.43	0.04
Backhoe	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Dozers	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Grader	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Pickup Trucks	12	6	28	10,080	2	8	0.653	0.065	3.29	0.33
Pipe Tractor Trailer	2	6	28	504	2	8	0.653	0.065	0.16	0.02
Scraper	2	6	28	504	30	2	2.208	0.221	0.56	0.06
SideBoom	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Trackhoe	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Water / Fuel Truck	2	6	28	1,680	30	8	2.208	0.221	1.85	0.19
Welding Rig	4	6	28	1,008	2	5	0.653	0.065	0.33	0.03

Stearns County, MN	11.49	1.15
TOTALS	11.49	1.15

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)
s 8.5 surface material silt content (%)

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Appendix 9C - Construction Emission Calculations**

Table 9C-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	89	72		0.058	0.0061	0.19	0.02
Topsoil removal by Scrapper for Access Roads, Laydown Yards	6	72		0.058	0.0061	0.01	0.00
Trench excavation and loading to storage piles	96	72		0.037	0.0039	0.13	0.01
Backfilling trench	86	72		0.012	0.0013	0.04	0.00
Topsoil replacement	85	72		0.012	0.0013	0.04	0.00
Wind Erosion Exposed Areas			24	0.38	0.0399	1.78	0.19

Stearns County, MN	2.2	0.2
TOTALS	2.18	0.23

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): 2.32 miles, 25 feet wide, 1 foot deep, 1.25 tons per cubic yard = 89 tons per day
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: 2.32 miles, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 96 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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Table 9C-7 Pipeline Interconnect Purge Emission Estimates

Operation	Blowdown Type	Blowdown loss per Type (scf)	Density of Natural Gas (lb/scf)	% VOC in Natural Gas	VOC Emissions (ton)	Methane Emissions (ton)	Methane Emissions (ton CO2e)
Purge for Interconnect Loop	One-time Purge	345	0.050	8%	0.00	0.01	0.22
TOTAL					0.0	0.0	0.2

Note 1: Northern estimates the loss of 0.000345 million scf of natural gas as pressure is drawn down in the pipe being connected.

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Table 9C-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Pipeline Unpaved Roads tons	Earthmoving tons	Pipeline Venting tons	TOTAL tons
CO	17.7				17.7
NO _x	88.9				88.9
PM ₁₀	2.8	11.5	1.9		16.3
PM _{2.5}	2.8	1.1	0.2		4.1
SO ₂	0.03				0.03
VOC	5.0			0.0	5.0
Individual HAP	0.6				0.6
Combined HAP	1.0				1.0
Methane	0.2			0.1	0.3
Nitrogen Dioxide	0.1				0.11
CO ₂	4,077				4,077
CO _{2e}	4,112			3.2	4,115

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Table 9C-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	2	72	28	4032	310	0.56	174
All Terrain Vehicle (ATV)	4	72	28	8064	18	1.00	18
Backhoe	3	72	28	6048	75	0.21	16
Cuttings Cleaner System	2	72	28	4032	300	0.59	177
Dozers	3	72	28	6048	410	0.59	242
Dump Truck	8	72	28	16128	325	0.59	192
Generators	4	72	28	8064	430	0.68	292
Grader	3	72	28	6048	140	0.64	90
HDD Rig	1	72	28	2016	600	0.59	354
Mudd Unit	2	72	28	4,032	400	0.21	84
Pickup Trucks	12	72	28	24,192	250	0.59	148
Pipe Tractor Trailer	2	72	28	4,032	400	0.59	236
Scraper	2	72	28	4,032	488	0.59	288
SideBoom	6	72	28	12,096	240	0.59	142
Trackhoe	6	72	28	12,096	320	0.21	67
Water / Fuel Truck	2	72	28	4032	250	0.59	148
Welding Machine	6	72	28	12096	35	0.21	7
Welding Rig	4	72	28	8064	10	0.21	2
X-Ray Truck/Machine	2	72	28	4032	50	0.21	11

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition , USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling , USEPA, April 2004

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Table 9C-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	4,032	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.65	3.34	0.10	0.10	0.00	149	0.01	0.00	151
All Terrain Vehicle (ATV)	8,064	18	0.4380	2.1610	4.44	0.267	0.259	0.002	194	0.011	0.005	0.07	0.35	0.71	0.04	0.04	0.00	31	0.00	0.00	31
Backhoe	6,048	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.04	0.25	0.49	0.03	0.02	0.00	20	0.00	0.00	20
Cuttings Cleaner System	4,032	177	0.1669	0.8425	4.00	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.15	0.10	0.10	0.00	152	0.01	0.00	154
Dozers	6,048	242	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.27	1.36	6.99	0.21	0.21	0.00	312	0.02	0.01	315
Dump Truck	16,128	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.57	2.87	14.78	0.45	0.44	0.01	660	0.04	0.02	665
Generators	8,064	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.80	2.19	11.27	0.34	0.33	0.00	503	0.03	0.01	507
Grader	6,048	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.20	0.52	2.45	0.08	0.08	0.00	116	0.01	0.00	117
HDD Rig	2,016	354	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.41	0.10	0.10	0.00	152	0.01	0.00	154
Mudd Unit	4,032	84	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.06	0.31	1.62	0.05	0.05	0.00	72	0.00	0.00	73
Pickup Trucks	24,192	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	1.21	2.94	15.73	0.52	0.50	0.01	761	0.04	0.02	768
Pipe Tractor Trailer	4,032	236	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.18	0.88	4.55	0.14	0.13	0.00	203	0.01	0.01	205
Scraper	4,032	288	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.21	1.08	5.55	0.17	0.16	0.00	248	0.01	0.01	250
Sideboom	12,096	142	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.58	1.41	7.55	0.25	0.24	0.00	365	0.02	0.01	369
Trackhoe	12,096	67	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.15	0.75	3.88	0.12	0.11	0.00	173	0.01	0.00	175
Water / Fuel Truck	4,032	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.20	0.49	2.62	0.09	0.08	0.00	127	0.01	0.00	128
Welding Machine	12,096	7	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.03	0.15	0.46	0.03	0.03	0.00	19	0.00	0.00	19
Welding Rig	8,064	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.01	0.08	0.08	0.01	0.01	0.00	4	0.00	0.00	4
X-Ray Truck/Machine	4,032	11	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.07	0.22	0.02	0.02	0.00	9	0.00	0.00	9

Jackson County, MN	5.0	17.7	88.9	2.8	2.8	0.0	4077.3	0.2	0.1	4111.7
TOTALS	5.0	17.7	88.9	2.8	2.8	0.03	4,077	0.232	0.105	4,112

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.1
Formaldehyde	0.118	0.6
Acetaldehyde	0.053	0.3
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0
TOTAL HAPS		1.0

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Table 9C-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean	S: Mean	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used		Vehicle Weight	Vehicle Speed	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Terrain Vehicle (ATV)	4	6	28	3,360	0.25	10	0.256	0.026	0.43	0.04
Backhoe	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Dozers	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Grader	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Pickup Trucks	12	6	28	10,080	2	8	0.653	0.065	3.29	0.33
Pipe Tractor Trailer	2	6	28	504	2	8	0.653	0.065	0.16	0.02
Scraper	2	6	28	504	30	2	2.208	0.221	0.56	0.06
SideBoom	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Trackhoe	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Water / Fuel Truck	2	6	28	1,680	30	8	2.208	0.221	1.85	0.19
Welding Rig	4	6	28	1,008	2	5	0.653	0.065	0.33	0.03

Jackson County, MN	11.49	1.15
TOTALS	11.49	1.15

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)
s 8.5 surface material silt content (%)

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Table 9C-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	79	72		0.058	0.0061	0.16	0.02
Topsoil removal by Scrapper for Access Roads, Laydown Yards	6	72		0.058	0.0061	0.01	0.00
Trench excavation and loading to storage piles	85	72		0.037	0.0039	0.11	0.01
Backfilling trench	77	72		0.012	0.0013	0.03	0.00
Topsoil replacement	76	72		0.012	0.0013	0.03	0.00
Wind Erosion Exposed Areas			21	0.38	0.0399	1.59	0.17

Jackson County, MN	1.9	0.2
TOTALS	1.95	0.20

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): 2.32 miles, 25 feet wide, 1 foot deep, 1.25 tons per cubic yard = 79 tons per day
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: 2.32 miles, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 85 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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Appendix 9C - Construction Emission Calculations

Table 9C-7 Pipeline Interconnect Purge Emission Estimates

Operation	Blowdown Type	Blowdown loss per Type (scf)	Density of Natural Gas (lb/scf)	% VOC in Natural Gas	VOC Emissions (ton)	Methane Emissions (ton)	Methane Emissions (ton CO2e)
Purge for Interconnect Loop	One-time Purge	4,900	0.050	8%	0.0	0.1	3
TOTAL					0	0	3

Note 1: Northern estimates the loss of 0.4 million scf of natural gas as pressure is drawn down in the pipe being connected.

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Appendix 9C - Construction Emission Calculations

Table 9C-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Pipeline Unpaved Roads tons	Earthmoving tons	Pipeline Venting tons	TOTAL tons
CO	27.8				27.8
NO _x	139.0				139.0
PM ₁₀	4.4	17.1	6.3		27.9
PM _{2.5}	4.3	1.7	0.7		6.7
SO ₂	0.05				0.05
VOC	7.9			0.00	7.9
Individual HAP	0.9				0.9
Combined HAP	1.5				1.5
Methane	0.4			0.03	0.4
Nitrogen Dioxide	0.2				0.16
CO ₂	6,370				6,370
CO _{2e}	6,424			0.8	6,425

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Table 9C-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	4	72	28	8064	310	0.56	174
All Terrain Vehicle (ATV)	8	72	28	16128	18	1.00	18
Backhoe	6	72	28	12096	75	0.21	16
Cuttings Cleaner System	4	72	28	8064	300	0.59	177
Dozers	6	72	28	12096	410	0.59	242
Dump Truck	12	72	28	24192	325	0.59	192
Generators	8	72	28	16128	430	0.68	292
Grader	6	72	28	12096	140	0.64	90
HDD Rig	2	72	28	4032	600	0.59	354
Mudd Unit	4	72	28	8,064	400	0.21	84
Pickup Trucks	20	72	28	40,320	250	0.59	148
Pipe Tractor Trailer	2	72	28	4,032	400	0.59	236
Scraper	2	72	28	4,032	488	0.59	288
SideBoom	4	72	28	8,064	240	0.59	142
Trackhoe	4	72	28	8,064	320	0.21	67
Water / Fuel Truck	4	72	28	8064	250	0.59	148
Welding Machine	6	72	28	12096	35	0.21	7
Welding Rig	4	72	28	8064	10	0.21	2
X-Ray Truck/Machine	2	72	28	4032	50	0.21	11

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition , USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling , USEPA, April 2004

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Table 9C-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	8,064	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.26	1.30	6.69	0.20	0.20	0.00	299	0.02	0.01	301
All Terrain Vehicle (ATV)	16,128	18	0.4380	2.1610	4.44	0.267	0.259	0.002	194	0.011	0.005	0.14	0.69	1.42	0.09	0.08	0.00	62	0.00	0.00	62
Backhoe	12,096	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.08	0.50	0.99	0.05	0.05	0.00	41	0.00	0.00	41
Cuttings Cleaner System	8,064	177	0.1669	0.8425	4.00	0.132	0.128	0.002	194	0.011	0.005	0.26	1.33	6.29	0.21	0.20	0.00	305	0.02	0.01	307
Dozers	12,096	242	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.54	2.72	13.98	0.42	0.41	0.01	624	0.04	0.02	630
Dump Truck	24,192	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.85	4.31	22.17	0.67	0.65	0.01	990	0.06	0.03	998
Generators	16,128	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	1.60	4.38	22.53	0.68	0.66	0.01	1006	0.06	0.03	1015
Grader	12,096	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.40	1.04	4.90	0.16	0.15	0.00	231	0.01	0.01	233
HDD Rig	4,032	354	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.26	1.33	6.82	0.21	0.20	0.00	305	0.02	0.01	307
Mudd Unit	8,064	84	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.12	0.63	3.24	0.10	0.10	0.00	145	0.01	0.00	146
Pickup Trucks	40,320	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	2.02	4.90	26.22	0.86	0.84	0.01	1269	0.07	0.03	1280
Pipe Tractor Trailer	4,032	236	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.18	0.88	4.55	0.14	0.13	0.00	203	0.01	0.01	205
Scraper	4,032	288	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.21	1.08	5.55	0.17	0.16	0.00	248	0.01	0.01	250
Sideboom	8,064	142	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.39	0.94	5.03	0.17	0.16	0.00	244	0.01	0.01	246
Trackhoe	8,064	67	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.10	0.50	2.59	0.08	0.08	0.00	116	0.01	0.00	117
Water / Fuel Truck	8,064	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.40	0.98	5.24	0.17	0.17	0.00	254	0.01	0.01	256
Welding Machine	12,096	7	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.03	0.15	0.46	0.03	0.03	0.00	19	0.00	0.00	19
Welding Rig	8,064	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.01	0.08	0.08	0.01	0.01	0.00	4	0.00	0.00	4
X-Ray Truck/Machine	4,032	11	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.07	0.22	0.02	0.02	0.00	9	0.00	0.00	9

Watonwan County, MN	7.9	27.8	139.0	4.4	4.3	0.1	6370.2	0.4	0.2	6423.9
TOTALS	7.9	27.8	139.0	4.4	4.3	0.05	6,370	0.362	0.165	6,424

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.2
Formaldehyde	0.118	0.9
Acetaldehyde	0.053	0.4
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0
TOTAL HAPS		1.5

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 Appendix 9C - Construction Emission Calculations

Table 9C-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean Vehicle Weight	S: Mean Vehicle Speed	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Terrain Vehicle (ATV)	8	6	28	6,720	0.25	10	0.256	0.026	0.86	0.09
Backhoe	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Dozers	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Grader	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Pickup Trucks	20	6	28	16,800	2	8	0.653	0.065	5.48	0.55
Pipe Tractor Trailer	2	6	28	504	2	8	0.653	0.065	0.16	0.02
Scraper	2	6	28	504	30	2	2.208	0.221	0.56	0.06
SideBoom	4	6	28	1,008	20	2	1.840	0.184	0.93	0.09
Trackhoe	4	6	28	1,008	20	2	1.840	0.184	0.93	0.09
Water / Fuel Truck	4	6	28	3,360	30	8	2.208	0.221	3.71	0.37
Welding Rig	4	6	28	1,008	2	5	0.653	0.065	0.33	0.03

Watonwan County, MN	17.13	1.71
TOTALS	17.13	1.71

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)
s 8.5 surface material silt content (%)

**Federal Energy Regulatory Commission Resource Report No. 9
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Appendix 9C - Construction Emission Calculations**

Table 9C-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	269	72		0.058	0.0061	0.56	0.06
Topsoil removal by Scrapper for Access Roads, Laydown Yards	6	72		0.058	0.0061	0.01	0.00
Trench excavation and loading to storage piles	290	72		0.037	0.0039	0.39	0.04
Backfilling trench	261	72		0.012	0.0013	0.11	0.01
Topsoil replacement	247	72		0.012	0.0013	0.11	0.01
Wind Erosion Exposed Areas			69	0.38	0.0399	5.15	0.54

Watonwan County, MN	6.3	0.7
TOTALS	6.33	0.66

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): 2.32 miles, 25 feet wide, 1 foot deep, 1.25 tons per cubic yard = 269 tons per day
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: 2.32 miles, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 290 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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Appendix 9C - Construction Emission Calculations

Table 9C-7 Pipeline Interconnect Purge Emission Estimates

Operation	Blowdown Type	Blowdown loss per Type (scf)	Density of Natural Gas (lb/scf)	% VOC in Natural Gas	VOC Emissions (ton)	Methane Emissions (ton)	Methane Emissions (ton CO2e)
Purge for Interconnect Loop	One-time Purge	1,200	0.050	8%	0.0	0.0	1
TOTAL					0	0	1

Note 1: Northern estimates the loss of 0.4 million scf of natural gas as pressure is drawn down in the pipe being connected.

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Appendix 9C - Construction Emission Calculations

Table 9C-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Pipeline Unpaved Roads tons	Earthmoving tons	Pipeline Venting tons	TOTAL tons
CO	17.7				17.7
NO _x	88.9				88.9
PM ₁₀	2.8	11.5	1.5		15.8
PM _{2.5}	2.8	1.1	0.2		4.1
SO ₂	0.03				0.03
VOC	5.0			0.0	5.0
Individual HAP	0.6				0.6
Combined HAP	1.0				1.0
Methane	0.2			0.1	0.3
Nitrogen Dioxide	0.1				0.11
CO ₂	4,077				4,077
CO _{2e}	4,112			2.3	4,114

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Appendix 9C - Construction Emission Calculations

Table 9C-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	2	72	28	4032	310	0.56	174
All Terrain Vehicle (ATV)	4	72	28	8064	18	1.00	18
Backhoe	3	72	28	6048	75	0.21	16
Cuttings Cleaner System	2	72	28	4032	300	0.59	177
Dozers	3	72	28	6048	410	0.59	242
Dump Truck	8	72	28	16128	325	0.59	192
Generators	4	72	28	8064	430	0.68	292
Grader	3	72	28	6048	140	0.64	90
HDD Rig	1	72	28	2016	600	0.59	354
Mudd Unit	2	72	28	4,032	400	0.21	84
Pickup Trucks	12	72	28	24,192	250	0.59	148
Pipe Tractor Trailer	2	72	28	4,032	400	0.59	236
Scraper	2	72	28	4,032	488	0.59	288
SideBoom	6	72	28	12,096	240	0.59	142
Trackhoe	6	72	28	12,096	320	0.21	67
Water / Fuel Truck	2	72	28	4032	250	0.59	148
Welding Machine	6	72	28	12096	35	0.21	7
Welding Rig	4	72	28	8064	10	0.21	2
X-Ray Truck/Machine	2	72	28	4032	50	0.21	11

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition , USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling , USEPA, April 2004

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Appendix 9C - Construction Emission Calculations

Table 9C-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	4,032	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.65	3.34	0.10	0.10	0.00	149	0.01	0.00	151
All Terrain Vehicle (ATV)	8,064	18	0.4380	2.1610	4.44	0.267	0.259	0.002	194	0.011	0.005	0.07	0.35	0.71	0.04	0.04	0.00	31	0.00	0.00	31
Backhoe	6,048	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.04	0.25	0.49	0.03	0.02	0.00	20	0.00	0.00	20
Cuttings Cleaner System	4,032	177	0.1669	0.8425	4.00	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.15	0.10	0.10	0.00	152	0.01	0.00	154
Dozers	6,048	242	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.27	1.36	6.99	0.21	0.21	0.00	312	0.02	0.01	315
Dump Truck	16,128	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.57	2.87	14.78	0.45	0.44	0.01	660	0.04	0.02	665
Generators	8,064	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.80	2.19	11.27	0.34	0.33	0.00	503	0.03	0.01	507
Grader	6,048	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.20	0.52	2.45	0.08	0.08	0.00	116	0.01	0.00	117
HDD Rig	2,016	354	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.41	0.10	0.10	0.00	152	0.01	0.00	154
Mudd Unit	4,032	84	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.06	0.31	1.62	0.05	0.05	0.00	72	0.00	0.00	73
Pickup Trucks	24,192	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	1.21	2.94	15.73	0.52	0.50	0.01	761	0.04	0.02	768
Pipe Tractor Trailer	4,032	236	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.18	0.88	4.55	0.14	0.13	0.00	203	0.01	0.01	205
Scraper	4,032	288	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.21	1.08	5.55	0.17	0.16	0.00	248	0.01	0.01	250
Sideboom	12,096	142	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.58	1.41	7.55	0.25	0.24	0.00	365	0.02	0.01	369
Trackhoe	12,096	67	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.15	0.75	3.88	0.12	0.11	0.00	173	0.01	0.00	175
Water / Fuel Truck	4,032	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.20	0.49	2.62	0.09	0.08	0.00	127	0.01	0.00	128
Welding Machine	12,096	7	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.03	0.15	0.46	0.03	0.03	0.00	19	0.00	0.00	19
Welding Rig	8,064	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.01	0.08	0.08	0.01	0.01	0.00	4	0.00	0.00	4
X-Ray Truck/Machine	4,032	11	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.07	0.22	0.02	0.02	0.00	9	0.00	0.00	9

Isanti County, MN	5.0	17.7	88.9	2.8	2.8	0.0	4077.3	0.2	0.1	4111.7
TOTALS	5.0	17.7	88.9	2.8	2.8	0.03	4,077	0.232	0.105	4,112

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.1
Formaldehyde	0.118	0.6
Acetaldehyde	0.053	0.3
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0
TOTAL HAPS		1.0

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 Appendix 9C - Construction Emission Calculations

Table 9C-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean Vehicle Weight	S: Mean Vehicle Speed	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Terrain Vehicle (ATV)	4	6	28	3,360	0.25	10	0.256	0.026	0.43	0.04
Backhoe	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Dozers	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Grader	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Pickup Trucks	12	6	28	10,080	2	8	0.653	0.065	3.29	0.33
Pipe Tractor Trailer	2	6	28	504	2	8	0.653	0.065	0.16	0.02
Scraper	2	6	28	504	30	2	2.208	0.221	0.56	0.06
SideBoom	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Trackhoe	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Water / Fuel Truck	2	6	28	1,680	30	8	2.208	0.221	1.85	0.19
Welding Rig	4	6	28	1,008	2	5	0.653	0.065	0.33	0.03

Isanti County, MN	11.49	1.15
TOTALS	11.49	1.15

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)
s 8.5 surface material silt content (%)

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Appendix 9C - Construction Emission Calculations**

Table 9C-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	58	72		0.058	0.0061	0.12	0.01
Topsoil removal by Scrapper for Access Roads, Laydown Yards	6	72		0.058	0.0061	0.01	0.00
Trench excavation and loading to storage piles	62	72		0.037	0.0039	0.08	0.01
Backfilling trench	56	72		0.012	0.0013	0.02	0.00
Topsoil replacement	57	72		0.012	0.0013	0.02	0.00
Wind Erosion Exposed Areas			16	0.38	0.0399	1.20	0.13

Isanti County, MN	1.5	0.2
TOTALS	1.46	0.15

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): 2.32 miles, 25 feet wide, 1 foot deep, 1.25 tons per cubic yard = 58 tons per day
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: 2.32 miles, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 62 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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Appendix 9C - Construction Emission Calculations

Table 9C-7 Pipeline Interconnect Purge Emission Estimates

Operation	Blowdown Type	Blowdown loss per Type (scf)	Density of Natural Gas (lb/scf)	% VOC in Natural Gas	VOC Emissions (ton)	Methane Emissions (ton)	Methane Emissions (ton CO2e)
Purge for Interconnect Loop	One-time Purge	3,600	0.050	8%	0.0	0.1	2
TOTAL					0	0	2

Note 1: Northern estimates the loss of 0.4 million scf of natural gas as pressure is drawn down in the pipe being connected.

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Appendix 9C - Construction Emission Calculations

Table 9C-1 Construction Emission Estimates - Total ProjectC

Pollutant	Engine Emissions tons	Pipeline Unpaved Roads tons	Earthmoving tons	Pipeline Venting tons	TOTAL tons
CO	17.7				17.7
NO _x	88.9				88.9
PM ₁₀	2.8	11.5	1.2		15.5
PM _{2.5}	2.8	1.1	0.1		4.0
SO ₂	0.03				0.03
VOC	5.0			0.0	5.0
Individual HAP	0.6				0.6
Combined HAP	1.0				1.0
Methane	0.2			0.1	0.3
Nitrogen Dioxide	0.1				0.11
CO ₂	4,077				4,077
CO _{2e}	4,112			2	4,114

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Appendix 9C - Construction Emission Calculations

Table 9C-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	2	72	28	4032	310	0.56	174
All Terrain Vehicle (ATV)	4	72	28	8064	18	1.00	18
Backhoe	3	72	28	6048	75	0.21	16
Cuttings Cleaner System	2	72	28	4032	300	0.59	177
Dozers	3	72	28	6048	410	0.59	242
Dump Truck	8	72	28	16128	325	0.59	192
Generators	4	72	28	8064	430	0.68	292
Grader	3	72	28	6048	140	0.64	90
HDD Rig	1	72	28	2016	600	0.59	354
Mudd Unit	2	72	28	4,032	400	0.21	84
Pickup Trucks	12	72	28	24,192	250	0.59	148
Pipe Tractor Trailer	2	72	28	4,032	400	0.59	236
Scraper	2	72	28	4,032	488	0.59	288
SideBoom	6	72	28	12,096	240	0.59	142
Trackhoe	6	72	28	12,096	320	0.21	67
Water / Fuel Truck	2	72	28	4032	250	0.59	148
Welding Machine	6	72	28	12096	35	0.21	7
Welding Rig	4	72	28	8064	10	0.21	2
X-Ray Truck/Machine	2	72	28	4032	50	0.21	11

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition , USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling , USEPA, April 2004

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Appendix 9C - Construction Emission Calculations

Table 9C-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	4,032	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.65	3.34	0.10	0.10	0.00	149	0.01	0.00	151
All Terrain Vehicle (ATV)	8,064	18	0.4380	2.1610	4.44	0.267	0.259	0.002	194	0.011	0.005	0.07	0.35	0.71	0.04	0.04	0.00	31	0.00	0.00	31
Backhoe	6,048	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.04	0.25	0.49	0.03	0.02	0.00	20	0.00	0.00	20
Cuttings Cleaner System	4,032	177	0.1669	0.8425	4.00	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.15	0.10	0.10	0.00	152	0.01	0.00	154
Dozers	6,048	242	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.27	1.36	6.99	0.21	0.21	0.00	312	0.02	0.01	315
Dump Truck	16,128	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.57	2.87	14.78	0.45	0.44	0.01	660	0.04	0.02	665
Generators	8,064	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.80	2.19	11.27	0.34	0.33	0.00	503	0.03	0.01	507
Grader	6,048	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.20	0.52	2.45	0.08	0.08	0.00	116	0.01	0.00	117
HDD Rig	2,016	354	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.13	0.66	3.41	0.10	0.10	0.00	152	0.01	0.00	154
Mudd Unit	4,032	84	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.06	0.31	1.62	0.05	0.05	0.00	72	0.00	0.00	73
Pickup Trucks	24,192	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	1.21	2.94	15.73	0.52	0.50	0.01	761	0.04	0.02	768
Pipe Tractor Trailer	4,032	236	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.18	0.88	4.55	0.14	0.13	0.00	203	0.01	0.01	205
Scraper	4,032	288	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.21	1.08	5.55	0.17	0.16	0.00	248	0.01	0.01	250
Sideboom	12,096	142	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.58	1.41	7.55	0.25	0.24	0.00	365	0.02	0.01	369
Trackhoe	12,096	67	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.15	0.75	3.88	0.12	0.11	0.00	173	0.01	0.00	175
Water / Fuel Truck	4,032	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.20	0.49	2.62	0.09	0.08	0.00	127	0.01	0.00	128
Welding Machine	12,096	7	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.03	0.15	0.46	0.03	0.03	0.00	19	0.00	0.00	19
Welding Rig	8,064	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.01	0.08	0.08	0.01	0.01	0.00	4	0.00	0.00	4
X-Ray Truck/Machine	4,032	11	0.2789	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.07	0.22	0.02	0.02	0.00	9	0.00	0.00	9

Morrison County, MN	5.0	17.7	88.9	2.8	2.8	0.0	4077.3	0.2	0.1	4111.7
TOTALS	5.0	17.7	88.9	2.8	2.8	0.03	4,077	0.232	0.105	4,112

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.1
Formaldehyde	0.118	0.6
Acetaldehyde	0.053	0.3
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0
TOTAL HAPS		1.0

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 Appendix 9C - Construction Emission Calculations

Table 9C-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean	S: Mean	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used		Vehicle Weight	Vehicle Speed	PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
All Terrain Vehicle (ATV)	4	6	28	3,360	0.25	10	0.256	0.026	0.43	0.04
Backhoe	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Dozers	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Grader	3	6	28	756	20	2	1.840	0.184	0.70	0.07
Pickup Trucks	12	6	28	10,080	2	8	0.653	0.065	3.29	0.33
Pipe Tractor Trailer	2	6	28	504	2	8	0.653	0.065	0.16	0.02
Scraper	2	6	28	504	30	2	2.208	0.221	0.56	0.06
SideBoom	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Trackhoe	6	6	28	1,512	20	2	1.840	0.184	1.39	0.14
Water / Fuel Truck	2	6	28	1,680	30	8	2.208	0.221	1.85	0.19
Welding Rig	4	6	28	1,008	2	5	0.653	0.065	0.33	0.03

Morrison County, MN	11.49	1.15
TOTALS	11.49	1.15

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)
s 8.5 surface material silt content (%)

**Federal Energy Regulatory Commission Resource Report No. 9
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Alexandria 2nd Branch Line
Appendix 9C - Construction Emission Calculations**

Table 9C-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	47	72		0.058	0.0061	0.10	0.01
Topsoil removal by Scrapper for Access Roads, Laydown Yards	6	72		0.058	0.0061	0.01	0.00
Trench excavation and loading to storage piles	50	72		0.037	0.0039	0.07	0.01
Backfilling trench	45	72		0.012	0.0013	0.02	0.00
Topsoil replacement	47	72		0.012	0.0013	0.02	0.00
Wind Erosion Exposed Areas			13	0.38	0.0399	0.99	0.10

Morrison County, MN	1.2	0.1
TOTALS	1.20	0.13

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): 2.32 miles, 25 feet wide, 1 foot deep, 1.25 tons per cubic yard = 47 tons per day
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: 2.32 miles, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 50 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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Appendix 9C - Construction Emission Calculations

Table 9C-7 Pipeline Interconnect Purge Emission Estimates

Operation	Blowdown Type	Blowdown loss per Type (scf)	Density of Natural Gas (lb/scf)	% VOC in Natural Gas	VOC Emissions (ton)	Methane Emissions (ton)	Methane Emissions (ton CO2e)
Purge for Interconnect Loop	One-time Purge	3,100	0.050	8%	0.0	0.1	2
TOTAL					0	0	2

Note 1: Northern estimates the loss of 0.4 million scf of natural gas as pressure is drawn down in the pipe being connected.

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Appendix 9C - Construction Emission Calculations

Table 9C-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Pipeline Unpaved Roads tons	Earthmoving tons	TOTAL tons
CO	0.4			0.4
NO _x	1.9			1.9
PM ₁₀	0.1	0.2	0.9	1.2
PM _{2.5}	0.1	0.0	0.1	0.2
SO ₂	0.00			0.00
VOC	0.1			0.1
Individual HAP	0.01			0.01
Combined HAP	0.02			0.02
Methane	0.0			0.0
Nitrogen Dioxide	0.0			0.00
CO ₂	89.5			89.5
CO _{2e}	90.3			90.3

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Appendix 9C - Construction Emission Calculations

Table 9C-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Air Compressor	1	72	4	288	310	0.56	174
Backhoe	1	72	4	288	75	0.21	16
Dump Truck	2	72	4	576	325	0.59	192
Generators	1	72	4	288	430	0.68	292
Pickup Trucks	4	72	4	1,152	250	0.59	148
Welding Rig	1	72	4	288	10	0.21	2

Assume seven month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of *EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, USEPA, April 2004

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 Hugo Compressor Station
 Appendix 9C - Construction Emission Calculations

Table 9C-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Air Compressor	288	174	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.01	0.05	0.24	0.01	0.01	0.00	11	0.00	0.00	11
Backhoe	288	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.00	0.01	0.02	0.00	0.00	0.00	1	0.00	0.00	1
Dump Truck	576	192	0.1669	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.02	0.10	0.53	0.02	0.02	0.00	24	0.00	0.00	24
Generators	288	292	0.3085	0.8425	4.34	0.132	0.128	0.002	194	0.011	0.005	0.03	0.08	0.40	0.01	0.01	0.00	18	0.00	0.00	18
Pickup Trucks	1,152	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.06	0.14	0.75	0.02	0.02	0.00	36	0.00	0.00	37
Welding Rig	288	2	0.5508	4.1127	4.30	0.500	0.485	0.002	194	0.011	0.005	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0

Washington County, MN	0.1	0.4	1.9	0.1	0.1	0.0	89.5	0.0	0.0	90.3
TOTALS	0.1	0.4	1.9	0.1	0.1	0.00	90	0.005	0.002	90

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.0
Formaldehyde	0.118	0.0
Acetaldehyde	0.053	0.0
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0

TOTAL HAPS	0.0
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 Appendix 9C - Construction Emission Calculations

Table 9C-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean Vehicle Weight	S: Mean Vehicle Speed	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Backhoe	1	6	4	36	20	2	1.840	0.184	0.03	0.00
Pickup Trucks	4	6	4	480	2	8	0.653	0.065	0.16	0.02
Welding Rig	1	6	4	36	2	5	0.653	0.065	0.01	0.00

Washington County, MN	0.20	0.02
TOTALS	0.20	0.02

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)
s 8.5 surface material silt content (%)

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Hugo Compressor Station
Appendix 9C - Construction Emission Calculations**

Table 9C-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	0	72		0.058	0.0061	0.00	0.00
Topsoil removal by Scrapper for Access Roads, Laydown Yards	42	72		0.058	0.0061	0.09	0.01
Trench excavation and loading to storage piles	0	72		0.037	0.0039	0.00	0.00
Backfilling trench	0	72		0.012	0.0013	0.00	0.00
Topsoil replacement	38	72		0.012	0.0013	0.02	0.00
Wind Erosion Exposed Areas			11	0.38	0.0399	0.79	0.08

Washington County, MN	0.9	0.1
TOTALS	0.89	0.09

Assumptions:

Construction schedule of 7 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): No pipeline removal activities planned
Topsoil removal (roads/laydown): 1 acres, 0.5 foot deep, 1.25 tons per cubic yard = 6 tons per day
Trench excavation and loading: No trenching activities planned
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

Appendix 9D
Detailed Calculation Sheets for Operational Emissions for NL27 Project

Northern Natural Gas Company - Hugo Compressor Station
AQ Facility ID# 16300110
Major Amendment
Compressor Turbine - Taurus 60-7800S

Emission Unit ID: EQUI4

Horsepower 7,782 hp (0 °F)
 Brake Specific Fuel Consumption 8267 Btu/Bhp-hr (LHV, 0 °F)
 Total Heat Input 64.33 MMBtu/hr (LHV, 0 °F)
 71.41 MMBtu/hr (HHV, 30 °F)
 Operating Hours 8760 hr/yr
 Natural Gas Heat Content 1020 Btu/scf
 Fuel Consumption 613.25 MMscf/yr (based on 0 °F)
 70,006.2 scf/hr (based on 0 °F)
 Quantity 1

Pollutant	Emission Factor ^{1,2,3}		Emission Rate		Emission Factor Reference
	ppmvd@15%O ₂	lb/MMBtu	lb/hr ⁶	ton/yr ⁷	
NO _x	15.00	0.060 LHV	3.87	19.83	Vendor Data
CO	25.00	0.061 LHV	3.93	41.72	Vendor Data
CO ₂ ⁴		117.0 HHV	8,353	36,586	40 CFR 98 Subpart C
CH ₄ ⁴		0.002 HHV	0.1574	0.6895	40 CFR 98 Subpart C
N ₂ O ⁴		0.0002 HHV	0.0157	0.0690	40 CFR 98 Subpart C
CO ₂ e ⁴		117.1 HHV	8,361	36,623	40 CFR 98 Subpart C
PM ₁₀		0.0066 HHV	0.47	2.06	AP-42 Table 3.1-2a (4/00)
PM _{2.5}		0.0066 HHV	0.47	2.06	AP-42 Table 3.1-2a (4/00)
VOC	5.00	0.007 LHV	0.45	2.71	Vendor Data (20% of UHC)
SO ₂ (Maximum Hourly)		0.0571 HHV	4.08		20 grains S / 100 scf
SO ₂ (Average Annual)		0.000714 HHV		0.22	0.25 grains S / 100 scf
Formaldehyde		7.10E-04 HHV	0.05	0.22	AP-42 Table 3.1-3 (4/00)
1,3-Butadiene		4.30E-07 HHV	3.07E-05	1.34E-04	AP-42 Table 3.1-3 (4/00)
Acetaldehyde		4.00E-05 HHV	2.86E-03	1.25E-02	AP-42 Table 3.1-3 (4/00)
Acrolein		6.40E-06 HHV	4.57E-04	2.00E-03	AP-42 Table 3.1-3 (4/00)
Benzene		1.20E-05 HHV	8.57E-04	3.75E-03	AP-42 Table 3.1-3 (4/00)
Ethylbenzene		3.20E-05 HHV	2.29E-03	1.00E-02	AP-42 Table 3.1-3 (4/00)
Naphthalene		1.30E-06 HHV	9.28E-05	4.07E-04	AP-42 Table 3.1-3 (4/00)
PAH		2.20E-06 HHV	1.57E-04	6.88E-04	AP-42 Table 3.1-3 (4/00)
Propylene Oxide		2.90E-05 HHV	2.07E-03	9.07E-03	AP-42 Table 3.1-3 (4/00)
Toluene		1.30E-04 HHV	9.28E-03	4.07E-02	AP-42 Table 3.1-3 (4/00)
Xylene		6.40E-05 HHV	4.57E-03	2.00E-02	AP-42 Table 3.1-3 (4/00)
Total		1.03E-03	7.34E-02	0.32	

Notes:

1. Emission factors for NO_x, CO, and VOC obtained from manufacturer data. Vendor Data (20% of UHC). VOC based on 20% of vendor data for unburned hydrocarbon.
2. Emission factors for PM and SO₂ based on AP-42 (AP-42 Section 3.1 - Stationary Gas Turbines, Table 3.1-2a). PM = PM₁₀ = PM_{2.5} is assumed
3. Emission factors for HAPs based on AP-42 factors (AP-42 Section 3.1 - Stationary Gas Turbines, Table 3.1-3).
4. Emission factors based on 40 CFR 98 Subpart C. Updated January 2025.
5. HHV heat input based on HHV=1.11*LHV

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7. Annual emission rate based on combination of potential operating modes as provided on following page for NO_x, CO, and VOC. The operating modes are 100 hours at low load (low load hours are based on <50% load), 500 hours at low temp (< 30 °F) and 100 startups and shutdowns per year. The remainder of the hours per year are based on emissions at normal load (60 °F). Normal operation is considered to be 50%-100% load. All other pollutants are based on horsepower and brake specific fuel consumption at 30 °F.

Single Fuel Emission Units

EQUI ID		EQUI 05					
Heat Input (BTU/hr)		6.45568					
Unlimited Hours (hr/yr)		8760					
Limited Hours (hr/yr)		500					
Firing Type		4SRB 90-105% Load					
Pollutant	Emission Factor (lb/MMSCF)	Other Emission Factor (lb/MMBtu)	Control Efficiency (%)	Unrestricted Emission Rate (lb/hr)	Controlled Emission Rate (lb/hr)	Unrestricted Emissions (tpy)	Limited Emissions (tpy)
Particulate Matter	1.94E-02			1.25E-01	1.25E-01	5.49E-01	3.13E-02
PM < 10 micron	1.94E-02			1.25E-01	1.25E-01	5.49E-01	3.13E-02
PM < 2.5 micron	1.94E-02			1.25E-01	1.25E-01	5.49E-01	3.13E-02
Nitrogen Oxides	2.21E+00	5.26E-01		3.40E+00	3.40E+00	1.49E+01	8.49E-01
Carbon Monoxide	3.72E+00	1.05E+00		6.79E+00	6.79E+00	2.97E+01	1.70E+00
Sulfur Dioxide	5.88E-04			3.80E-03	3.80E-03	1.66E-02	9.49E-04
Volatile Organic Compounds	2.96E-02	2.63E-01		1.70E+00	1.70E+00	7.44E+00	4.24E-01
HAPs - Total	3.25E-02			2.10E-01	2.10E-01	9.18E-01	5.24E-02
Carbon Dioxide	1.10E+02			7.10E+02	7.10E+02	3.11E+03	1.78E+02
Methane	2.20E-03			1.42E-02	1.42E-02	6.23E-02	3.56E-03
Nitrous Oxide	2.20E-04			1.42E-03	1.42E-03	6.23E-03	3.56E-04
Carbon Dioxide Equivalent	1.10E+02	1.10E+02		7.11E+02	7.11E+02	3.11E+03	1.78E+02
1,1,2,2-Tetrachloroethane	2.53E-05			1.63E-04	1.63E-04	7.15E-04	4.08E-05
1,1,2-Trichloroethane	2.53E-05			1.63E-04	1.63E-04	7.15E-04	4.08E-05
1,1-Dichloroethane	1.13E-05			7.29E-05	7.29E-05	3.20E-04	1.82E-05
1,2-Dibromoethane (Ethylene dibromide); EDB	2.13E-05			1.38E-04	1.38E-04	6.02E-04	3.44E-05
1,2-Dichloropropane	1.30E-05			8.39E-05	8.39E-05	3.68E-04	2.10E-05
1,3-Butadiene	6.63E-04			4.28E-03	4.28E-03	1.87E-02	1.07E-03
1,3-Dichloropropene	1.30E-05			8.39E-05	8.39E-05	3.68E-04	2.10E-05
2,2,4-trimethylpentane	0.00E+00			0.00E+00	0.00E+00	0.00E+00	0.00E+00
Acetaldehyde	2.79E-03			1.80E-02	1.80E-02	7.89E-02	4.50E-03
Acrolein	2.63E-03			1.70E-02	1.70E-02	7.44E-02	4.24E-03
Benzene	1.58E-03			1.02E-02	1.02E-02	4.47E-02	2.55E-03
Benzo(e)pyrene	0.00E+00			0.00E+00	0.00E+00	0.00E+00	0.00E+00
Biphenyl	0.00E+00			0.00E+00	0.00E+00	0.00E+00	0.00E+00
Carbon tetrachloride	1.77E-05			1.14E-04	1.14E-04	5.00E-04	2.86E-05
Chlorobenzene (Monochlorobenzene)	1.29E-05			8.33E-05	8.33E-05	3.65E-04	2.08E-05
Chloroform	1.37E-05			8.84E-05	8.84E-05	3.87E-04	2.21E-05
Dichloromethane (Methylene chloride)	4.12E-05			2.66E-04	2.66E-04	1.16E-03	6.65E-05
Ethylbenzene	2.48E-05			1.60E-04	1.60E-04	7.01E-04	4.00E-05
Formaldehyde	2.05E-02			1.32E-01	1.32E-01	5.80E-01	3.31E-02
Hexane	0.00E+00			0.00E+00	0.00E+00	0.00E+00	0.00E+00
Methanol	3.06E-03			1.98E-02	1.98E-02	8.65E-02	4.94E-03
Naphthalene	9.71E-05			6.27E-04	6.27E-04	2.75E-03	1.57E-04
Phenol	0.00E+00			0.00E+00	0.00E+00	0.00E+00	0.00E+00
Polycyclic organic matter	2.38E-04			1.54E-03	1.54E-03	6.73E-03	3.84E-04
Styrene	1.19E-05			7.68E-05	7.68E-05	3.36E-04	1.92E-05
Toluene	5.58E-04			3.60E-03	3.60E-03	1.58E-02	9.01E-04
Vinyl chloride (chloroethene)	7.18E-06			4.64E-05	4.64E-05	2.03E-04	1.16E-05
Xylenes, Total	1.95E-04			1.26E-03	1.26E-03	5.51E-03	3.15E-04

Other Emission Factor and/or Control Efficiency Factor Notes:

Federal Energy Regulatory Commission Resource Report No. 9

Northern Natural Gas

Northern Lights 2027 Expansion Project

Total Appurtenant Facility Operating Emissions

Appendix 9D

Criteria Pollutant and HAP Operating Emissions

Pollutant	Potential to Emit Facility	
	lbs/hour	tons/year
CO		
NO _x		
PM ₁₀		
PM _{2.5}		
SO ₂		
VOC	0.01	0.04
Individual HAP		
Combined HAP		
Methane	0.81	3.55
CO ₂		
CO _{2e}	22.7	99.3

Federal Energy Regulatory Commission Resource Report No. 9
Northern Natural Gas
Northern Lights 2027 Expansion Project
Lake Mills Tie-In Valve Setting (Freeborn Co)
Appendix 9D

Maximum Operation	8,760 hours/year
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VOC Pollutant Operating Emissions for Process Piping Fugitive Emissions

Component Type	Type of Service	Number of Components	Oil & Gas Production Emission Factors (lb/hr-component)	Percent VOC	Potential to Emit VOC Emission Rates		Potential to Emit Methane Emission Rates	
					lbs/hour	tons/year	lbs/hour	tons/year
Valves	Gas/Vapor	1	0.00992	1.05%	0.00	0.00	0.01	0.04
Flanges	Gas/Vapor	4	0.00086	1.05%	0.00	0.00	0.00	0.01
Compressor Seals	Gas/Vapor	4	0.0194	1.05%	0.00	0.00	0.08	0.34
Relief Valves	Gas/Vapor	0	0.0194	1.05%	0.00	0.00	0.00	0.00
Total					0.00	0.00	0.09	0.39
CO _{2e}								11.0

Notes:

- 1) Emission Factors from Table 2-4 from *Protocol for Equipment Leak Emission Estimates*; EPA-453/R-98-017 dated November 1995
- 2) Percent VOC for Gas/Vapor service based on gas analysis for similar facility

Federal Energy Regulatory Commission Resource Report No. 9
Northern Natural Gas
Northern Lights 2027 Expansion Project
Alberta Lea Tie-In Valve Setting (Steele Co)
Appendix 9D

Maximum Operation	8,760 hours/year
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VOC Pollutant Operating Emissions for Process Piping Fugitive Emissions

Component Type	Type of Service	Number of Components	Oil & Gas Production Emission Factors (lb/hr-component)	Percent VOC	Potential to Emit VOC Emission Rates		Potential to Emit Methane Emission Rates	
					lbs/hour	tons/year	lbs/hour	tons/year
Valves	Gas/Vapor	1	0.00992	1.05%	0.00	0.00	0.01	0.04
Flanges	Gas/Vapor	4	0.00086	1.05%	0.00	0.00	0.00	0.01
Compressor Seals	Gas/Vapor	4	0.0194	1.05%	0.00	0.00	0.08	0.34
Relief Valves	Gas/Vapor	0	0.0194	1.05%	0.00	0.00	0.00	0.00
Total					0.00	0.00	0.09	0.39
CO _{2e}								11.0

Notes:

- 1) Emission Factors from Table 2-4 from *Protocol for Equipment Leak Emission Estimates*; EPA-453/R-98-017 dated November 1995
- 2) Percent VOC for Gas/Vapor service based on gas analysis for similar facility

Federal Energy Regulatory Commission Resource Report No. 9
Northern Natural Gas
Northern Lights 2027 Expansion Project
Willmar 3rd Branch Line Downstream Tie-In Valve Setting (Scott Co)
Appendix 9D

Maximum Operation	8,760 hours/year
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VOC Pollutant Operating Emissions for Process Piping Fugitive Emissions

Component Type	Type of Service	Number of Components	Oil & Gas Production Emission Factors (lb/hr-component)	Percent VOC	Potential to Emit VOC Emission Rates		Potential to Emit Methane Emission Rates		
					lbs/hour	tons/year	lbs/hour	tons/year	
Valves	Gas/Vapor	1	0.00992	1.05%	0.00	0.00	0.01	0.04	
Flanges	Gas/Vapor	4	0.00086	1.05%	0.00	0.00	0.00	0.01	
Compressor Seals	Gas/Vapor	4	0.0194	1.05%	0.00	0.00	0.08	0.34	
Relief Valves	Gas/Vapor	0	0.0194	1.05%	0.00	0.00	0.00	0.00	
Total						0.00	0.00	0.09	0.39
CO _{2e}								11.0	

Notes:

- 1) Emission Factors from Table 2-4 from *Protocol for Equipment Leak Emission Estimates*; EPA-453/R-98-017 dated November 1995
- 2) Percent VOC for Gas/Vapor service based on gas analysis for similar facility

Federal Energy Regulatory Commission Resource Report No. 9
Northern Natural Gas
Northern Lights 2027 Expansion Project
Welcome Tie-Valve Setting (Martin Co)
Appendix 9D

Maximum Operation	8,760 hours/year
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VOC Pollutant Operating Emissions for Process Piping Fugitive Emissions

Component Type	Type of Service	Number of Components	Oil & Gas Production Emission Factors (lb/hr-component)	Percent VOC	Potential to Emit VOC Emission Rates		Potential to Emit Methane Emission Rates		
					lbs/hour	tons/year	lbs/hour	tons/year	
Valves	Gas/Vapor	1	0.00992	1.05%	0.00	0.00	0.01	0.04	
Flanges	Gas/Vapor	4	0.00086	1.05%	0.00	0.00	0.00	0.01	
Compressor Seals	Gas/Vapor	4	0.0194	1.05%	0.00	0.00	0.08	0.34	
Relief Valves	Gas/Vapor	0	0.0194	1.05%	0.00	0.00	0.00	0.00	
Total						0.00	0.00	0.09	0.39
CO _{2e}								11.0	

Notes:

- 1) Emission Factors from Table 2-4 from *Protocol for Equipment Leak Emission Estimates*; EPA-453/R-98-017 dated November 1995
- 2) Percent VOC for Gas/Vapor service based on gas analysis for similar facility

Federal Energy Regulatory Commission Resource Report No. 9
Northern Natural Gas
Northern Lights 2027 Expansion Project
Paynesville Tie-In Valve Setting (Stearns Co)
Appendix 9D

Maximum Operation	8,760 hours/year
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VOC Pollutant Operating Emissions for Process Piping Fugitive Emissions

Component Type	Type of Service	Number of Components	Oil & Gas Production Emission Factors (lb/hr-component)	Percent VOC	Potential to Emit VOC Emission Rates		Potential to Emit Methane Emission Rates		
					lbs/hour	tons/year	lbs/hour	tons/year	
Valves	Gas/Vapor	1	0.00992	1.05%	0.00	0.00	0.01	0.04	
Flanges	Gas/Vapor	4	0.00086	1.05%	0.00	0.00	0.00	0.01	
Compressor Seals	Gas/Vapor	4	0.0194	1.05%	0.00	0.00	0.08	0.34	
Relief Valves	Gas/Vapor	0	0.0194	1.05%	0.00	0.00	0.00	0.00	
Total						0.00	0.00	0.09	0.39
CO _{2e}								11.0	

Notes:

- 1) Emission Factors from Table 2-4 from *Protocol for Equipment Leak Emission Estimates*; EPA-453/R-98-017 dated November 1995
- 2) Percent VOC for Gas/Vapor service based on gas analysis for similar facility

Federal Energy Regulatory Commission Resource Report No. 9
Northern Natural Gas
Northern Lights 2027 Expansion Project
Springfield 2nd Branch Line Downstream RMV (Watonwan Co)
Appendix 9D

Maximum Operation	8,760 hours/year
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VOC Pollutant Operating Emissions for Process Piping Fugitive Emissions

Component Type	Type of Service	Number of Components	Oil & Gas Production Emission Factors (lb/hr-component)	Percent VOC	Potential to Emit VOC Emission Rates		Potential to Emit Methane Emission Rates		
					lbs/hour	tons/year	lbs/hour	tons/year	
Valves	Gas/Vapor	1	0.00992	1.05%	0.00	0.00	0.01	0.04	
Flanges	Gas/Vapor	4	0.00086	1.05%	0.00	0.00	0.00	0.01	
Compressor Seals	Gas/Vapor	4	0.0194	1.05%	0.00	0.00	0.08	0.34	
Relief Valves	Gas/Vapor	0	0.0194	1.05%	0.00	0.00	0.00	0.00	
Total						0.00	0.00	0.09	0.39
CO _{2e}								11.0	

Notes:

- 1) Emission Factors from Table 2-4 from *Protocol for Equipment Leak Emission Estimates*; EPA-453/R-98-017 dated November 1995
- 2) Percent VOC for Gas/Vapor service based on gas analysis for similar facility

Federal Energy Regulatory Commission Resource Report No. 9
Northern Natural Gas
Northern Lights 2027 Expansion Project
Springfield 2nd branch line tie-in valve setting (Watowwan Co)
Appendix 9D

Maximum Operation	8,760 hours/year
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VOC Pollutant Operating Emissions for Process Piping Fugitive Emissions

Component Type	Type of Service	Number of Components	Oil & Gas Production Emission Factors (lb/hr-component)	Percent VOC	Potential to Emit VOC Emission Rates		Potential to Emit Methane Emission Rates		
					lbs/hour	tons/year	lbs/hour	tons/year	
Valves	Gas/Vapor	1	0.00992	1.05%	0.00	0.00	0.01	0.04	
Flanges	Gas/Vapor	4	0.00086	1.05%	0.00	0.00	0.00	0.01	
Compressor Seals	Gas/Vapor	4	0.0194	1.05%	0.00	0.00	0.08	0.34	
Relief Valves	Gas/Vapor	0	0.0194	1.05%	0.00	0.00	0.00	0.00	
Total						0.00	0.00	0.09	0.39
CO _{2e}								11.0	

Notes:

- 1) Emission Factors from Table 2-4 from *Protocol for Equipment Leak Emission Estimates*; EPA-453/R-98-017 dated November 1995
- 2) Percent VOC for Gas/Vapor service based on gas analysis for similar facility

Federal Energy Regulatory Commission Resource Report No. 9
Northern Natural Gas
Northern Lights 2027 Expansion Project
MIC Tie-In Valve Setting (Isanti Co)
Appendix 9D

Maximum Operation	8,760 hours/year
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VOC Pollutant Operating Emissions for Process Piping Fugitive Emissions

Component Type	Type of Service	Number of Components	Oil & Gas Production Emission Factors (lb/hr-component)	Percent VOC	Potential to Emit VOC Emission Rates		Potential to Emit Methane Emission Rates		
					lbs/hour	tons/year	lbs/hour	tons/year	
Valves	Gas/Vapor	1	0.00992	1.05%	0.00	0.00	0.01	0.04	
Flanges	Gas/Vapor	4	0.00086	1.05%	0.00	0.00	0.00	0.01	
Compressor Seals	Gas/Vapor	4	0.0194	1.05%	0.00	0.00	0.08	0.34	
Relief Valves	Gas/Vapor	0	0.0194	1.05%	0.00	0.00	0.00	0.00	
Total						0.00	0.00	0.09	0.39
CO _{2e}								11.0	

Notes:

- 1) Emission Factors from Table 2-4 from *Protocol for Equipment Leak Emission Estimates*; EPA-453/R-98-017 dated November 1995
- 2) Percent VOC for Gas/Vapor service based on gas analysis for similar facility

Federal Energy Regulatory Commission Resource Report No. 9
Northern Natural Gas
Northern Lights 2027 Expansion Project
Alexandria 2nd branch line tie-in valve setting (Morrison Co)
Appendix 9D

Maximum Operation	8,760 hours/year
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VOC Pollutant Operating Emissions for Process Piping Fugitive Emissions

Component Type	Type of Service	Number of Components	Oil & Gas Production Emission Factors (lb/hr-component)	Percent VOC	Potential to Emit VOC Emission Rates		Potential to Emit Methane Emission Rates		
					lbs/hour	tons/year	lbs/hour	tons/year	
Valves	Gas/Vapor	1	0.00992	1.05%	0.00	0.00	0.01	0.04	
Flanges	Gas/Vapor	4	0.00086	1.05%	0.00	0.00	0.00	0.01	
Compressor Seals	Gas/Vapor	4	0.0194	1.05%	0.00	0.00	0.08	0.34	
Relief Valves	Gas/Vapor	0	0.0194	1.05%	0.00	0.00	0.00	0.00	
Total						0.00	0.00	0.09	0.39
CO _{2e}								11.0	

Notes:

- 1) Emission Factors from Table 2-4 from *Protocol for Equipment Leak Emission Estimates*; EPA-453/R-98-017 dated November 1995
- 2) Percent VOC for Gas/Vapor service based on gas analysis for similar facility

Appendix 9E
Detailed Calculation Sheets for Abandonment for V2F Project

Federal Energy Regulatory Commission Resource Report No. 9
Northern Natural Gas
V2F A-Line Abandonment and Capacity Replacement Project
A-Line Abandonment (2029)
Appendix 9E - Construction Emission Calculations for A-line Abandonment

Table 9E-1 Construction Emission Estimates - Total Project

Pollutant	Engine Emissions tons	Temporary Compression tons	Pipeline Unpaved Roads tons	Earthmoving tons	Purge Emissions tons	TOTAL tons
CO	0.2	0.1				0.3
NO _x	0.8	0.6				1.4
PM ₁₀	0.0	0.0	0.2	0.5		0.7
PM _{2.5}	0.0	0.0	0.0	0.0		0.1
SO ₂	0.00	0.00				0.00
VOC	0.1	0.0			3.0	3.1
Individual HAP	0.0	0.0				0.0
Combined HAP	0.0	0.0				0.0
Methane	0.0	0.3			34.5	34.8
Nitrogen Dioxide	0.0	0.0				0.00
CO ₂	38	20				58
CO _{2e}	38	27			863	928

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Northern Natural Gas
V2F A-Line Abandonment and Capacity Replacement Project
A-Line Abandonment (2029)
Appendix 9E - Construction Emission Calculations for A-line Abandonment

Table 9E-2 Construction Equipment Schedule

Equipment	Pipeline			Total Hours Equipment Usage	Maximum Power (HP)	Load Factor	Loaded Power (HP)
	Quantity	Hrs/Wk	Weeks Used				
Backhoe	1	72	2	144	75	0.21	16
Grader	1	72	2	144	140	0.64	90
Hydrotest Truck	1	72	2	144	100	0.43	43
Light Tower	6	72	2	864	50	0.43	22
Man Lift	1	72	2	144	50	0.43	22
Pickup Trucks	6	72	2	864	250	0.59	148
Skid Steer Loader	1	72	2	144	75	0.59	44

Assume three month schedule, four weeks per month, 72 hours per week

EPA 420-P-04-009, Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition, USEPA, April 2004 - Tier 2 Engines

Load Factors from Appendix A of *EPA 420_P-04-005, Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, USEPA, April 2004

Federal Energy Regulatory Commission Resource Report No. 9
 Northern Natural Gas
 V2F A-Line Abandonment and Capacity Replacement Project
 A-Line Abandonment (2029)
 Appendix 9E - Construction Emission Calculations for A-line Abandonment

Table 9E-3 Construction Equipment Engine Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (HP)	Criteria Emission Factors (g/hp-hr)						GHG Emission Factors (g/hp-hr)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Backhoe	144	16	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.00	0.01	0.01	0.00	0.00	0.00	0	0.00	0.00	0
Grader	144	90	0.3384	0.8667	4.10	0.132	0.128	0.002	194	0.011	0.005	0.00	0.01	0.06	0.00	0.00	0.00	3	0.00	0.00	3
Hydrotest Truck	144	43	0.3384	0.8667	4.70	0.240	0.233	0.002	194	0.011	0.005	0.00	0.01	0.03	0.00	0.00	0.00	1	0.00	0.00	1
Light Tower	864	22	0.3672	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.01	0.03	0.10	0.01	0.01	0.00	4	0.00	0.00	4
Man Lift	144	22	0.3672	1.5323	4.73	0.339	0.329	0.002	194	0.011	0.005	0.00	0.01	0.02	0.00	0.00	0.00	1	0.00	0.00	1
Pickup Trucks	864	148	0.3085	0.7475	4.00	0.132	0.128	0.002	194	0.011	0.005	0.04	0.11	0.56	0.02	0.02	0.00	27	0.00	0.00	27
Skid Steer Loader	144	44	0.3672	2.3655	4.70	0.240	0.233	0.002	194	0.011	0.005	0.00	0.02	0.03	0.00	0.00	0.00	1	0.00	0.00	1

Hancock County, IA	0.0	0.1	0.4	0.0	0.0	0.00	19	0.0	0.0	19
Dakota County, MN	0.0	0.1	0.4	0.0	0.0	0.00	19	0.0	0.0	19
TOTALS	0.1	0.2	0.8	0.0	0.0	0.00	38	0.002	0.001	38

EPA 420-P-04-009, *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression Ignition*, USEPA, April 2004 - Tier 2 Engines
 Load Factors from Appendix A of EPA 420_P-04-005, *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, USEPA, April 2004

HAP Pollutant Emissions - Construction Equipment

Air Toxic	Fraction of VOC	Emissions (ton/yr)
Benzene	0.020	0.0
Formaldehyde	0.118	0.0
Acetaldehyde	0.053	0.0
1,3-Butadiene	0.002	0.0
Acrolein	0.003	0.0

TOTAL HAPS	0.0
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Federal Energy Regulatory Commission Resource Report No. 9
 Northern Natural Gas
 V2F A-Line Abandonment and Capacity Replacement Project
 A-Line Abandonment (2029)
 Appendix 9E - Construction Emission Calculations for A-line Abandonment

Table 9E-4 Temporary Compression Emissions

Equipment	Total Hours Equipment Usage	Loaded Power (MMBtu)	Criteria Emission Factors (lb/mmbtu)						GHG Emission Factors (lb/mmbtu)			Criteria Emissions (tons)						GHG Emissions (tons)			
			VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	VOC	CO	NOx	PM ₁₀	PM _{2.5}	SO ₂	CO ₂	Methane	N ₂ O	CO _{2e}
Temporary Compression (x6)	480	0.8	0.12	0.3860	3.17	0.038	0.038	0.001	110	1.450	0.005	0.02	0.07	0.58	0.01	0.01	0.00	20	0.27	0.00	27
Freeborn County, MN											0.0	0.1	0.6	0.0	0.0	0.0	20.1	0.3	0.0	27.0	
TOTALS											0.0	0.1	0.6	0.0	0.0	0.00	20	0.265	0.001	27	

EPA AP-42, Fifth Edition, Volume I Chapter 3: Stationary Internal Combustion Sources, Section 3.2, Table 3.2-1
 Load Factors from Appendix A of EPA 420_P-04-005, *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling*, USEPA, April 2004

HAP Pollutant Emissions - Construction Equipment

Air Toxic	HAP Emission Factors (lb/mmbtu)	Emissions (ton/yr)
Acetaldehyde	0.008	0.0
Formaldehyde	0.055	0.0
Benzene	0.002	0.0
1,3-Butadiene	0.001	0.0
Acrolein	0.008	0.0
TOTAL HAPS		0.01

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 Northern Natural Gas
 V2F A-Line Abandonment and Capacity Replacement Project
 A-Line Abandonment (2029)
 Appendix 9E - Construction Emission Calculations for A-line Abandonment

Table 9E-5 Fugitive Dust Emissions from Unpaved Roads during Pipeline Installation

Equipment	Quantity	Pipeline		VMT	W: Mean Vehicle Weight	S: Mean Vehicle Speed	Emission Factors (lb/VMT)		Emissions (tons)	
		Days/Wk	Weeks Used				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Backhoe	1	6	2	18	20	2	1.840	0.184	0.02	0.00
Grader	1	6	2	18	20	2	1.840	0.184	0.02	0.00
Pickup Trucks	6	6	2	360	2	8	0.653	0.065	0.12	0.01

Hancock County, IA	0.08	0.01
Dakota County, MN	0.08	0.01
TOTALS	0.15	0.02

AP 42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2

Surface Silt content based on Table 13.2.2-1 - Construction Sites

Each Vehicle is assumed to travel 1.5 mile per day on site, except ATV, Water Truck, and Pickup, which are assumed to travel five miles per day.

Constants	PM	PM ₁₀	PM _{2.5}	
k	4.9	1.5	0.15	lb/VMT
a	0.7	0.9	0.9	
b	0.45	0.45	0.45	

P 105 days with 0.01 inches rain (Figure 13.2.2-1)

s 8.5 surface material silt content (%)

Table 9E-6 Fugitive Dust Emissions from Earthmoving Activities

Construction Activity	Daily Material Handling Rate (ton/day)	Construction Days	Average Exposed Area (acres)	Emission Factors (lb/ton)		Emissions (tons)	
				PM ₁₀	PM _{2.5}	PM ₁₀	PM _{2.5}
Topsoil removal by Scrapper for Pipeline	0	72		0.058	0.0061	0.00	0.00
Topsoil removal by Scrapper for Access Roads, Laydown Yards	18	72		0.058	0.0061	0.04	0.00
Trench excavation and loading to storage piles	47	72		0.037	0.0039	0.06	0.01
Backfilling trench	42	72		0.012	0.0013	0.02	0.00
Topsoil replacement	16	72		0.012	0.0013	0.01	0.00
Wind Erosion Exposed Areas			5	0.38	0.0399	0.34	0.04

Hancock County, IA	0.23	0.02
Dakota County, MN	0.23	0.02
TOTALS	0.46	0.05

Assumptions:

Construction schedule of 2 month, 4 weeks per month, six days per week.
Topsoil removal (pipeline): There will be no topsoil removal for pipeline.
Topsoil removal (roads/laydown): 0.25 acres, 0.5 foot deep, 1.25 tons per cubic yard = 18 tons per day
Disconnect excavation and loading:<0.1 mile, 2 yards wide, 1.5 yards deep, 1.25 tons per yard = 47 tons per day
Topsoil removal by Scrapper emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scrapper
Trench excavation and loading to storage piles emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, truck loading by batch dump
Backfilling trench and topsoil replacement emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, overburden replacement
As worst case, PM ₁₀ is set equal to Total Particulate Matter. PM _{2.5} is set to 0.105 times PM ₁₀ per Table 11.9-1
Wind Erosion Exposed Areas emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, wind erosion of exposed areas (ton/yr/acre)
Average Exposed Area - Total disturbed area during construction is assumed as 166 acres, assume 25 percent is exposed at any time.

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A-Line Abandonment (2029)
Appendix 9E - Construction Emission Calculations for A-line Abandonment**

Table 9E-7 Pipeline Interconnect Purge Emission Estimates

Operation	Blowdown Type	Blowdown loss per Type (scf)	Density of Natural Gas (lb/scf)	% VOC in Natural Gas	VOC Emissions (ton)	Methane Emissions (ton)	Methane Emissions (ton CO2e)
La Crosse MNB73201 Branch Line Launcher	One-time Purge	1,500,000	0.050	8%	3.0	34.5	863
TOTAL					3	35	863
Freeborn County, MN					3	35	863
TOTALS					3	35	863

Note 1: Northern estimates the loss of 1.5 million scf of natural gas as pressure is drawn down in the pipe being connected.

Appendix 9F
Noise Barrier Wall Specifications for V2F and NL27 Projects

Reference: V2F and NL27 Projects

ACOUSTIC BARRIER WALL SPECIFICATIONS

HDDs associated with the V2F and NL27 Projects may require noise mitigation beyond work practice standards to comply with 18 Code of Federal Regulations § 157.206(b)(5)(iii). When Project work is required during the nighttime hours of 10 p.m. –7 a.m. noise mitigation in the form of barrier walls may be implemented by Northern. The decision to implement mitigation is dependant on equipment noise, local background noise, and the efficacy of the proposed abatement strategy.

To allow for flexibility general barrier wall specifications are provided along with sample options and guidelines to increase the efficacy of implemented barrier walls. The layouts of barriers varies depending on the location of nearby NSAs. The layouts are provided as Appendix B.

Any implemented noise barrier walls must adhere to the following guidelines:

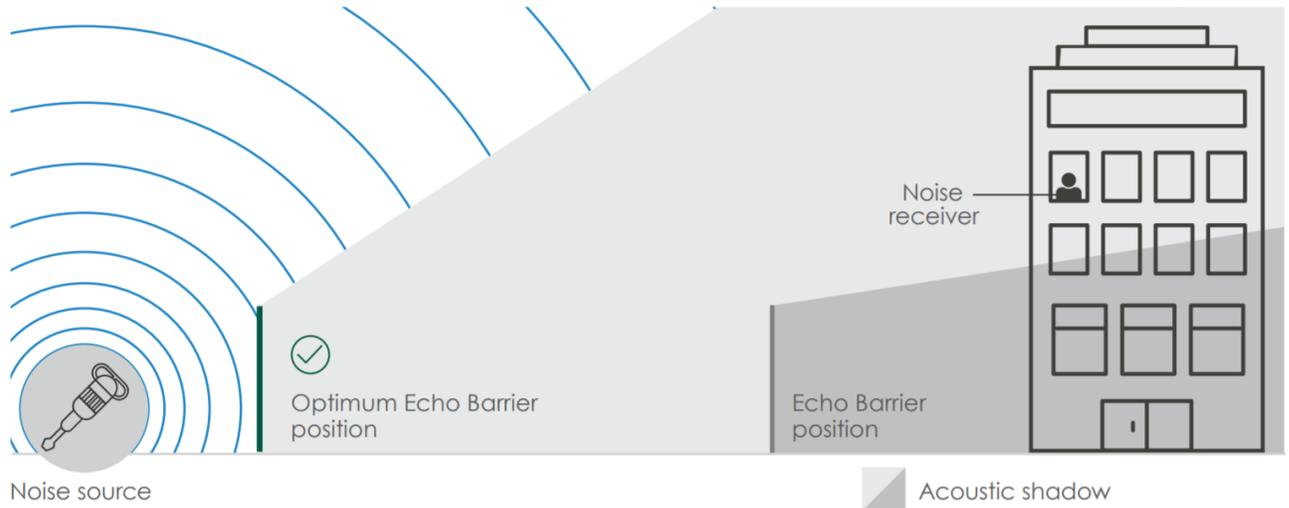
- Barrier walls shall have a minimum face weight or density of 2 to 4 lbs/ft². Higher face densities are recommended if possible.
- Barrier walls should be free of gaps. If gaps are present, mass loaded vinyl sheets such as Echo H9 construction barriers may be used to overlap the gaps.
- Barrier walls must be a minimum of 3 feet above the tallest noise source on-site

General recommendations to improve the efficacy of installed noise barriers are as follow:

- The distance between the noise barrier and the noise sources must be minimized to increase the acoustic shadow as shown in Figure 1.
- Absorptive barriers using porous materials are preferred over reflective barriers such as metal or precast concrete. Porous barrier are more effectively able to reduce the impact of noise reflected by parallel barriers

Reference: V2F and NL27 Projects

Figure 1 – Barrier Wall Location Placement



BARRIER WALL DESIGN

Northern is proposing the following options for barrier wall constructions for HDDs associated with Auburn. Alternative constructions, that adhere to the guidelines and general specifications for noise barriers, may also be implemented.

OPTION 1 – FREE STANDING NOISE BARRIER, BEHRENS SK-8

Galvanized barrier with acoustic infill available in several heights (16', 20', and 24'). Are supplied in 8' and 12' lengths. A structural engineer should be retained to confirm that footings provide adequate counterbalance for windloads.

Reference: V2F and NL27 Projects

Figure 2 – Behrens SK-8 Mobile Noise Barrier

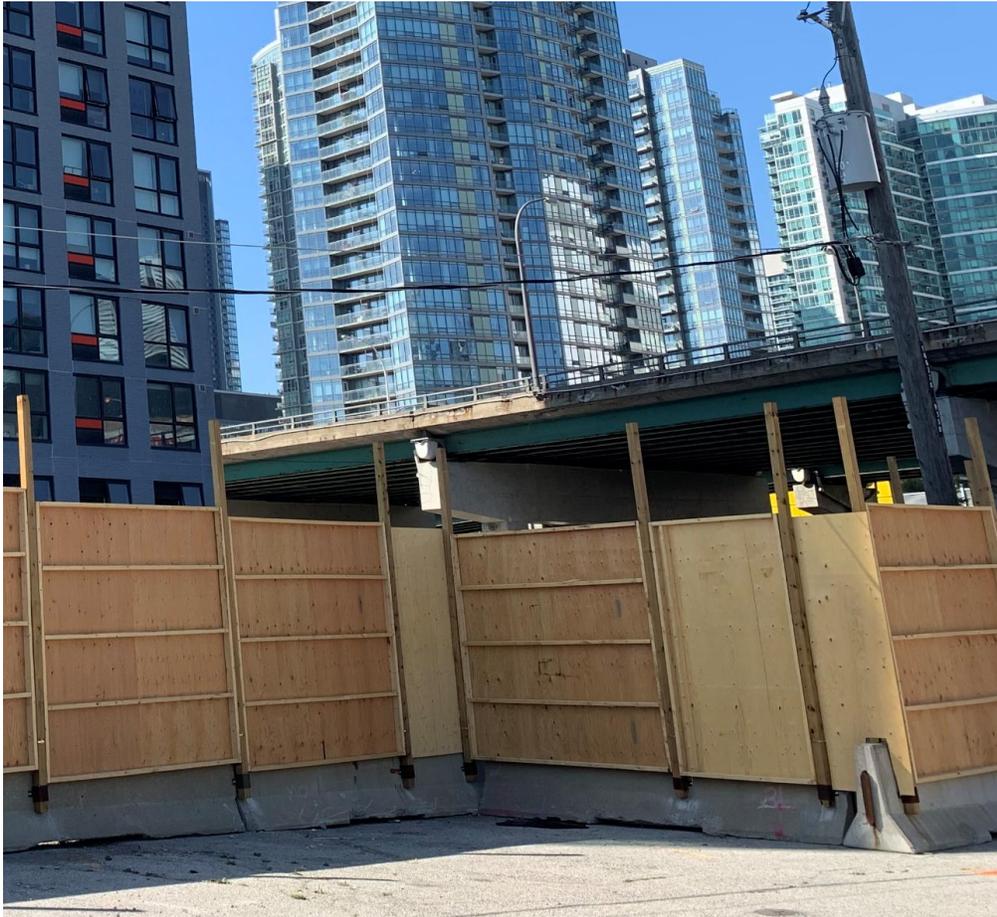


OPTION 2 – JERSEY BARRIER, PLYWOOD/MASS LOADED VINYL COMBINATION

A combination of jersey barrier footings, plywood and wooden posts, and mass loaded vinyl sheets may be used as a noise barrier. A structural engineer should be retained to confirm that footings provide adequate counterbalance for wind loads. Wooden posts should be fastened to jersey barriers using adequate fasteners. Mass loaded vinyl should be attached to plywood to increase noise reduction efficacy.

Reference: V2F and NL27 Projects

Figure 3 – Concrete/Wood Acoustic Barriers



OPTION 3 – SEACAN CONTAINER BARRIER

“Seacan” containers, as shown in Figure 3 may be used as noise barriers. Relatively inexpensive, seacan containers are multipurpose noise barriers that may also provide on-site storage in addition to noise mitigation. They require a large site footprint as compared to traditional noise barriers. A structural engineer should be retained to confirm that containers are secured together adequately for wind loading. Containers are available in 40 ft. sections making installation relatively quick compared to options 1, 3, and 4.

Reference: V2F and NL27 Projects

Figure 4 – Sea Can Container Barrier



OPTION 4 – PRECAST CONCRETE BARRIERS

Precast concrete barriers as shown in Figure 4 may also be used as noise barriers. Generally more expensive option than option 1, 2, 4, precast concrete barriers are much more durable. They are commonly available in 10 ft., 12 ft., and 14 ft. heights.

Reference: V2F and NL27 Projects

Figure 5 – Precast Concrete Barriers



OPTION 5 – LOW HEIGHT (<10 FT) BARRIERS

In mitigation scenarios where noise sources are shorter than 7 ft. temporary barriers using mass loaded vinyl sheets may be used such as Echo H9 sheets. Sheets are fastened directly to site hoarding or mesh fences as shown in Figure 5. Applications that require additional height will require a supporting structure of wood or steel, as the mass loaded vinyl sheets provide no structural support.

Reference: V2F and NL27 Projects

Figure 6 – Echo H9 Loaded Vinyl Sheets on Mesh Fence



Appendix 9G
Identified NSA Locations within 0.5 mile of HDD segments for V2F Project

Appendix 9G
Identified NSA Locations within 0.5 mile of HDD segments for V2F Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
Faribault M500 D- Line						
FAR-P4-1	NSA12	Residence at 6905 290th St W	44.531	-93.207	2610 ft. North-Northeast	11 days
	NSA13	Residence at 7150 292nd St W	44.525	-93.213	890 ft. West-Northwest	
	NSA14	Residence at 6723 300th St W	44.516	-93.206	2330 ft. Southeast	
FAR-P4-2	NSA09	Residence at 28740 Garrett Ave	44.534	-93.207	730 ft. East-Northeast	11 days
	NSA10	Residence at 28412 Garrett Ave	44.538	-93.21	720 ft. Northwest	
	NSA11	Residence at 28645 Garrett Ave	44.534	-93.212	674 ft. West-Northwest	
	NSA12	Residence at 6905 290th St W	44.531	-93.207	1080 ft. Southeast	
FAR-P4-3	NSA06	Residence at 27640 Galaxie Ave W	44.549	-93.204	600 ft. Northeast	20 days
	NSA07	Residence at 6520 280th St W	44.543	-93.199	2030 ft. East	
	NSA08	Residence at 27755 Galaxie Ave W	44.547	-93.208	710 ft. West-Southwest	
	NSA10	Residence at 28412 Garrett Ave	44.538	-93.21	1750 ft. South-Southwest	
FAR-P4-5	NSA05	Residence at 26965 Galaxie Ave W	44.56	-93.208	1980 ft. Southwest	7 days
	NSA04	Residence at 6775 265th St W	44.566	-93.203	250 ft. West	
FAR-P4-6	NSA02	Residence at 25805 Fairgreen Ave	44.575	-93.188	1370 ft. East-Southeast	6 days
	NSA03	Residence at 5805 255th St W	44.58	-93.184	2490 ft. East-Northeast	
	NSA15	Residence at 6298 255th St W	44.58	-93.194	920 ft. North	
FAR-P4-7	NSA02	Residence at 25805 Fairgreen Ave	44.575	-93.188	1560 ft. East	22 days
	NSA03	Residence at 5805 255th St W	44.58	-93.184	1310 ft. Southeast	
	NSA15	Residence at 6298 255th St W	44.58	-93.194	1670 ft. Southwest	
	NSA16	Residence at 5700 245th St West	44.593	-91.18	2240 ft. Northeast	
FAR-P4-8	NSA01	Residence at 5590 245th St West	44.594	-93.179	630 ft. East-Southeast	3 days
	NSA16	Residence at 5700 245th St West	44.593	-91.18	540 ft. South-Southeast	
Albert Lea M500 E-Line						
ALO-P4-1	NSA01	Residence at SW 90th Ave	43.86113	-93.3907	1240 ft. East	23 days

Appendix 9G
Identified NSA Locations within 0.5 mile of HDD segments for V2F Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
ALO-P4-2	NSA03	Residence at 9610 State Hwy 30	43.87993	-93.3945	1280 ft. Northwest	3 days
	NSA02	Residence at 9415 State Hwy 30	43.8732	-93.3909	1170 ft. South	
Lake Mills M500 E-Line						
LMA-P4-1	NSA13	Residence at 69494 165th St.	43.593	-93.468	1070 ft. Southeast	19 days
LMA-P4-2	NSA10	Residence at 70596 180th St	43.617	-93.457	750 ft. Northwest	3 days
LMA-P4-3	NSA02	Residence at 19757 710th Ave	43.638	-93.45	810 ft. West	19 days
	NSA03	Residence at 71216 200th St	43.644	-93.446	520 ft. Northeast	
	NSA04	Residence at 70926 200th St	43.641	-93.451	1280 ft. Southwest	
LMA-P4-4	NSA05	Residence at 71022 County Rd 46	43.659	-93.448	430 ft. East	3 days
	NSA06	Residence at 70885 County Rd 46	43.658	-93.451	340 ft. West	
LMA-P4-5	NSA05	Residence at 71022 County Rd 46	43.659	-93.448	1320 ft. South-Southeast	7 days
	NSA06	Residence at 70885 County Rd 46	43.658	-93.451	1530 ft. South	
LMA-P4-6	NSA08	Residence at 22913 715th Ave	43.687	-93.439	2430 ft. East-Northeast	6 days
	NSA09	Residence at 225th St	43.681	-93.439	1070 ft. East	
LMA-P4-7	NSA07	Residence at 22913 715th Ave	43.694	-93.439	2420 ft. North-Northeast	7 days
	NSA08	Residence at 22913 715th Ave	43.687	-93.439	860 ft. East-Southeast	
	NSA09	Residence at 225th St	43.681	-93.439	1690 ft. Southeast	
LMA-P4-8	NSA01	Residence at 23654 State Hwy 13	43.697	-93.431	1190 ft. East-Southeast	8 days
	NSA07	Residence at 22913 715th Ave	43.694	-93.439	690 ft. Southwest	
	NSA11	Residence at 72017 240th St	43.702	-93.428	2410 ft. Northeast	
LMA-P4-9	NSA01	Residence at 23654 State Hwy 13	43.697	-93.431	1040 ft. South-Southeast	6 days
	NSA07	Residence at 22913 715th Ave	43.694	-93.439	1710 ft. Southwest	
	NSA11	Residence at 72017 240th St	43.702	-93.428	1570 ft. Northeast	
	NSA12	Residence at 71912 240th St	43.705	-93.43	2200 ft. North-Northeast	

Appendix 9G
Identified NSA Locations within 0.5 mile of HDD segments for V2F Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
LMA-P4-10	NSA01	Residence at 23654 State Hwy 13	43.697	-93.431	2010 ft. South	3 days
	NSA11	Residence at 72017 240th St	43.702	-93.428	330 ft. East	
	NSA12	Residence at 71912 240th St	43.705	-93.43	800 ft. North	

Appendix 9H

Estimated Noise Impacts Due to the Project HDDs

Appendix 9H
Estimated Noise Impacts Due to the Project HDDs for V2F Project

Drill ID	Location	Lat. of NSA	Long. of NSA	Distance and Direction to closest NSA	Existing Ambient L_{dn} (dBA)	Estimated L_{dn} due to Project Construction without Mitigation (dBA)	Estimated L₁₀ due to Project Construction without Mitigation (dBA)	Estimated L_{dn} due to Project Construction with Proposed Mitigation (dBA)	Specific Mitigation Measures Proposed for Nighttime Drilling^a	L_{dn} of Construction plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
Lake Mills M500 E-Line											
LMA-P4-1	NSA13	43.593	-93.468	1070 ft. Southeast	38	46	51	45.6	-	46.3	8
LMA-P4-2	NSA10	43.617	-93.457	750 ft. Northwest	39	50	55	49.6	-	49.9	11
LMA-P4-3 ¹	NSA02	43.638	-93.45	810 ft. West	38	55	51	54.6	-	54.7	17
	NSA03	43.644	-93.446	520 ft. Northeast	39	62	58	52.5	C	52.7	14
	NSA04	43.641	-93.451	1280 ft. Southwest	38	55	51	54.5	-	54.6	17
LMA-P4-4	NSA05	43.659	-93.448	430 ft. East	44	53	58	53.4	-	53.8	10
	NSA06	43.658	-93.451	340 ft. West	44	57	62	57.0	-	57.2	13
LMA-P4-5	NSA05	43.659	-93.448	1320 ft. South-Southeast	44	44	49	43.6	-	46.8	3
	NSA06	43.658	-93.451	1530 ft. South	44	42	47	42.4	-	46.3	2
LMA-P4-6	NSA08	43.687	-93.439	2430 ft. East-Northeast	54	39	44	39.4	-	54.1	0
	NSA09	43.681	-93.439	1070 ft. East	52	46	52	46.5	-	53.1	1

Appendix 9H
Estimated Noise Impacts Due to the Project HDDs for V2F Project

Drill ID	Location	Lat. of NSA	Long. of NSA	Distance and Direction to closest NSA	Existing Ambient L_{dn} (dBA)	Estimated L_{dn} due to Project Construction without Mitigation (dBA)	Estimated L₁₀ due to Project Construction without Mitigation (dBA)	Estimated L_{dn} due to Project Construction with Proposed Mitigation (dBA)	Specific Mitigation Measures Proposed for Nighttime Drilling^a	L_{dn} of Construction plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
LMA-P4-7	NSA07	43.694	-93.439	2420 ft. North-Northeast	47	39	44	39.3		47.7	1
	NSA08	43.687	-93.439	860 ft. East-Southeast	54	49	54	49.2	-	55.2	1
	NSA09	43.681	-93.439	1690 ft. Southeast	52	41	46	41.0	-	52.3	0
LMA-P4-8	NSA01	43.696	-93.431	1190 ft. East-Southeast	47	45	50	45.3	-	49.2	2
	NSA07	43.694	-93.439	690 ft. Southwest	47	50	55	50.3	-	51.9	5
	NSA11	43.702	-93.428	2410 ft. Northeast	44	38	43	37.9		44.9	1
LMA-P4-9	NSA01	43.696	-93.431	1040 ft. South-Southeast	47	47	52	47.3	-	50.1	3
	NSA07	43.694	-93.439	1710 ft. Southwest	47	43	48	42.6	-	48.3	1
	NSA11	43.702	-93.428	1570 ft. Northeast	44	42	47	42.4	-	46.3	2
	NSA12	43.705	-93.43	2200 ft. North-Northeast	44	40	45	39.6	-	45.3	1
LMA-P4-10	NSA01	43.696	-93.431	2010 ft. South	47	42	47	41.6	-	48.1	1
	NSA11	43.702	-93.428	330 ft. East	44	59	64	58.8	-	58.9	15
	NSA12	43.705	-93.43	800 ft. North	44	50	55	49.7	-	50.7	7

Appendix 9H
Estimated Noise Impacts Due to the Project HDDs for V2F Project

Drill ID	Location	Lat. of NSA	Long. of NSA	Distance and Direction to closest NSA	Existing Ambient L_{dn} (dBA)	Estimated L_{dn} due to Project Construction without Mitigation (dBA)	Estimated L₁₀ due to Project Construction without Mitigation (dBA)	Estimated L_{dn} due to Project Construction with Proposed Mitigation (dBA)	Specific Mitigation Measures Proposed for Nighttime Drilling^a	L_{dn} of Construction plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
Albert Lea M500 E-Line											
ALO-P4-1 ¹	NSA01	43.861	-93.391	1240 ft. East	36	54	50	53.7	-	53.8	18
ALO P4-2	NSA03	43.873	-93.391	1280 ft. Northwest	37	45	50	45.1	-	45.7	9
	NSA02	43.88	-93.394	1170 ft. South	37	46	51	45.8	-	46.3	9
Faribault M500 D-line											
FAR-P4-1 ¹	NSA12	44.531	-93.207	2610 ft. North-Northeast	47	43	46.7	-	47.5	8	47
	NSA13	44.525	-93.213	890 ft. West-Northwest	57	54	53.0	B or C	53.2	13	57
	NSA14	44.516	-93.206	2330 ft. Southeast	48	44	47.5	-	48.2	8	48
FAR-P4-2 ¹	NSA09	44.534	-93.207	730 ft. East-Northeast	60	56	54.7	C	54.9	15	60
	NSA10	44.538	-93.21	720 ft. Northwest	56	52	54.8	-	55.0	15	56
	NSA11	44.534	-93.212	674 ft. West-Northwest	60	57	54.4	C	54.6	15	60
	NSA12	44.531	-93.207	1080 ft. Southeast	55	52	54.9	-	55.0	15	55

Appendix 9H
Estimated Noise Impacts Due to the Project HDDs for V2F Project

Drill ID	Location	Lat. of NSA	Long. of NSA	Distance and Direction to closest NSA	Existing Ambient L_{dn} (dBA)	Estimated L_{dn} due to Project Construction without Mitigation (dBA)	Estimated L₁₀ due to Project Construction without Mitigation (dBA)	Estimated L_{dn} due to Project Construction with Proposed Mitigation (dBA)	Specific Mitigation Measures Proposed for Nighttime Drilling^a	L_{dn} of Construction plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
FAR-P4-3 ¹	NSA06	44.549	-93.204	600 ft. Northeast	60	57	52.9	C	53.1	13	60
	NSA07	44.543	-93.199	2030 ft. East	49	46	48.9	-	49.4	9	49
	NSA08	44.547	-93.208	710 ft. West-Southwest	59	56	52.6	C	52.8	13	59
	NSA10	44.538	-93.21	1750 ft. South-Southwest	48	44	47.7	-	48.4	8	48
FAR P4-5	NSA04	44.566	-93.203	250 ft. West	60	65	60.3	-	60.3	22	60
	NSA05	44.56	-93.208	1980 ft. Southwest	40	45	39.7	-	42.8	3	40
FAR P4-6	NSA02	44.575	-93.188	1370 ft. East-Southeast	44	49	44.4	-	44.8	10	44
	NSA03	44.58	-93.184	2490 ft. East-Northeast	38	43	37.7	-	39.5	5	38
	NSA15	44.58	-93.194	920 ft. North	46	51	46.1	-	46.4	11	46
FAR P4-7 ¹	NSA02	44.575	-93.188	1560 East	47	43	46.5	-	46.8	12	47
	NSA03	44.58	-93.184	1310 ft. Southeast	53	50	53.4	-	53.5	18	53
	NSA15	44.58	-93.194	1670 ft. Southwest	51	48	51.0		51.1	16	51
	NSA16	44.593	-91.18	2240 ft. Northeast	46	42	45.6		46.9	6	46

Appendix 9H
Estimated Noise Impacts Due to the Project HDDs for V2F Project

Drill ID	Location	Lat. of NSA	Long. of NSA	Distance and Direction to closest NSA	Existing Ambient L_{dn} (dBA)	Estimated L_{dn} due to Project Construction without Mitigation (dBA)	Estimated L₁₀ due to Project Construction without Mitigation (dBA)	Estimated L_{dn} due to Project Construction with Proposed Mitigation (dBA)	Specific Mitigation Measures Proposed for Nighttime Drilling^a	L_{dn} of Construction plus Ambient L_{dn} (dBA)	Potential Increase Above Ambient (dB)
FAR P4-8	NSA01	44.594	-93.179	630 ft. East-Southeast	53	58	52.8	-	53.0	12	53
	NSA16	44.593	-91.180	540 ft. South-Southeast	54	59	53.9	-	54.1	13	54

^a Noise Mitigation Measures:

- A. Institute work practices such as reduced idling, fitting equipment with residential mufflers
- B. Utilize a small and more modern HDD rig than was utilized for the noise model
- C. Install sound barrier walls between entry pit and NSA
- D. Install sound barrier walls between entry and exit pits and NSAs
- E. Install sound enclosures around critical equipment such as the drill rig, mud pump engine, shaker
- F. Offer temporary relocation to residents

¹ HDD operations may extend past 7 p.m. during drilling, reaming and pullback and other time-sensitive activities

² Noise barrier walls will have a minimum height of 20 feet

³ L₁₀ sound levels from construction activities have been estimated based on a 3 dB correction factor to the modelled hourly L_{eq}

Appendix 9I

Estimated Noise Impacts Due to Temporary Compression

Appendix 9I
Estimated Noise Impacts Due to Temporary Compression

Location	Description of NSA	Lat. of NSA	Long. of NSA	Distance and Direction to closest NSA	Existing Ambient L _{dn} (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation DAY / NIGHT (dBA)	Estimated L ₁₀ due to Project Construction with Mitigation DAY / NIGHT (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation (dBA)	Specific Mitigation Measures Proposed for 24-hour Compression ^a	L _{dn} of Construction plus Ambient L _{dn} (dBA)	Potential Increase Above Ambient (dB)
Temporary Compression Site- Lake Mill Compressor Station											
NSA01	Residence at 337 County Route 105	43.425	-93.450	4,730 ft. South-Southeast	43	43.5 / 43.5	43.5 / 43.5	46.9	-	48.4	5.4
NSA02	Residence at 4662 Dogwood Avenue	43.439	-93.44	4,830 ft. East	43	44.1 / 44.1	44.1 / 44.1	47.5	-	48.8	5.8
NSA03	Residence at 4732 Bluebill Ave	43.449	-93.47	5,460 ft. Northwest	43	43.9 / 43.9	43.9 / 43.9	47.3	-	48.7	5.7
NSA04	Residence at 4601 Bluebill Avenue	43.430	-93.469	3,710 ft. Southwest	43	45.9 / 45.9	45.9 / 45.9	49.3	-	50.2	7.2
Temporary Compression Site - Northfield #1											
NSA01	Residence at 3645 Lonsdale Blvd E	44.471	-93.228	250 ft. Southeast	43	64.5 / 63.5	53.6 / 50.9	54.8	24-ft barrier	55.0	12.0
NSA02	Residence at 7901 330th St W	44.472	-93.225	780 ft. East-Northeast	43	61.1 / 59.6	49.9 / 47.4	51.3	24-ft barrier	51.9	8.9
NSA03	Residence at 3435 Lonsdale Blvd E	43.956	-93.380	860 ft. Northwest	43	63.3 / 60.7	52.1 / 51.0	54.6	24-ft barrier	54.9	11.9

Appendix 9I
Estimated Noise Impacts Due to Temporary Compression

Location	Description of NSA	Lat. of NSA	Long. of NSA	Distance and Direction to closest NSA	Existing Ambient L _{dn} (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation DAY / NIGHT (dBA)	Estimated L ₁₀ due to Project Construction with Mitigation DAY / NIGHT (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation (dBA)	Specific Mitigation Measures Proposed for 24-hour Compression ^a	L _{dn} of Construction plus Ambient L _{dn} (dBA)	Potential Increase Above Ambient (dB)
NSA04	Residence at 3435 Lonsdale Blvd E	44.471	-93.231	880 ft. West-Southwest	43	61.2 / 59.4	51.5 / 49.5	53.3	24-ft barrier	53.6	10.6
Temporary Compression Site- Owatonna Compressor Station											
NSA01	8500 SW 88th St	43.9644	-93.3726	1,690 ft. Northeast	43	54.3 / 54.3	48.8 / 48.8	52.2	16-ft barrier	52.7	9.7
NSA02	8539 SW 88th St	43.9606	-93.3738	1,170 ft. East-Southeast	43	57.5 / 57.5	50.9 / 50.9	54.3	16-ft barrier	54.6	11.6
NSA03	9369 SW 92nd Ave	43.9563	-93.3797	2,090 ft. South	43	49.1 / 49.1	49.1 / 49.1	52.5	-	53.0	10.0
NSA04	9370 SW 92nd Ave	43.9672	-93.3800	2050 ft. North-Northwest	43	49.7 / 49.7	49.7 / 49.7	53.1	-	53.5	10.5

^a Noise Mitigation Measures:

- A. Institute work practices such as reduced idling, fitting equipment with residential mufflers
- B. Utilize a small and more modern HDD rig than was utilized for the noise model
- C. Install sound barrier walls between entry pit and NSA
- D. Install sound barrier walls between entry and exit pits and NSAs
- E. Install sound enclosures around critical equipment such as the drill rig, mud pump engine, shaker
- F. Offer temporary relocation to residents

²Noise barrier walls will have a minimum height of 20 feet

³L₁₀ sound levels from construction activities have been estimated based on a 3 dB correction factor to the modelled hourly L_{eq}

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
Lake Mills M500 E-line						
LMA P4-1	LMA-NSA05	Residence at 72919 255th Street	43.7233	-93.4111	2470 NE	4 days
	LMA-NSA06	Residence at 72641 255th Street	43.7233	-93.4167	1650 NNE	
	LMA-NSA07	Residence at 72379 255th Street	43.7231	-93.4207	1690 NNW	
	LMA-NSA08	Residence at 25285 725th Avenue	43.7208	-93.4194	760 NNW	
	LMA-NSA09	Residence at 25237 725th Avenue	43.7201	-93.4192	530 NNW	
	LMA-NSA10	Residence at 24906 725th Avenue	43.7156	-93.4166	1170 SSE	
LMA P4-2	LMA-NSA04	Residence at 72868 255th Street	43.7251	-93.4116	940 ENE	5 days
	LMA-NSA05	Residence at 72919 255th Street	43.7233	-93.4111	1090 E	
	LMA-NSA06	Residence at 72641 255th Street	43.7233	-93.4167	410 WSW	
	LMA-NSA07	Residence at 72379 255th Street	43.7231	-93.4207	1470 W	
	LMA-NSA08	Residence at 25285 725th Avenue	43.7208	-93.4194	1510 SW	
	LMA-NSA09	Residence at 25237 725th Avenue	43.7201	-93.4192	1660 SW	
Albert Lea M500 E-line						
ALO-P4-1	ALO-NSA03	Residence at 9610 State Highway 30	43.8799	-93.3949	2130 WSW	5 days
	ALO-NSA04	Residence at 14340 SW 92nd Avenue	43.8840	-93.3855	1090 N	
ALO-P4-2	ALO-NSA04	Residence at 14340 SW 92nd Avenue	43.8840	-93.3855	1800 SSW	6 days
ALO-P4-3	ALO-NSA06	Residence at 9001 SW 128th Street	43.9016	-93.3830	720 NE	19 days
	ALO-NSA07	Residence at 8819 SW 128th Street	43.9059	-93.3794	2500 NE	
ALO-P4-4	ALO-NSA06	Residence at 9001 SW 128th Street	43.9016	-93.3830	1520 S	5 days
	ALO-NSA07	Residence at 8819 SW 128th Street	43.9059	-93.3794	1200 E	
	ALO-NSA09	Residence at 12529 SW 92nd Avenue	43.9104	-93.3859	1560 NNW	
ALO-P4-5	ALO-NSA12	Residence at 8533 SW 118th Street	43.9157	-93.3735	1890 SSE	4 days
	ALO-NSA13	Residence at 8428 SW 118th Street	43.9213	-93.3715	1140 E	
	ALO-NSA15	Residence at 8500 SW 118th Street	43.9218	-93.3727	860 ENE	

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
Willmar 3rd Branch Line Upstream						
WIL-P4-1	WIL-NSA04	Residence at 8776 204th Street E	44.6546	-93.3439	2410 SSE	4 days
	WIL-NSA05	Residence at 20265 Vernon Avenue	44.6558	-93.3478	1700 S	
	WIL-NSA06	Residence at 19845 Vernon Avenue	44.6624	-93.3479	680 NNE	
	WIL-NSA07	Residence at 19746 Vernon Avenue	44.6635	-93.3493	980 NNW	
	WIL-NSA08	Residence at 19980 Vernon Avenue	44.6593	-93.3497	540 SW	
	WIL-NSA09	Residence at 19812 Vernon Avenue	44.6626	-93.3497	680 NNW	
	WIL-NSA10	Residence at 19950 Vernon Avenue	44.6598	-93.3502	440 SW	
	WIL-NSA11	Residence at 19720 Vernon Avenue	44.6641	-93.3513	1320 NNW	
	WIL-NSA12	Residence at 19781 Dakota Avenue	44.6645	-93.3554	2090 NW	
	WIL-NSA13	Residence at 19811 Dakota Avenue	44.6633	-93.3558	1940 WNW	
	WIL-NSA14	Residence at 19923 Dakota Avenue	44.6612	-93.3558	1720 W	
	WIL-NSA16	Residence at 19661 Dakota Avenue	44.6646	-93.3572	2500 WNW	
	WIL-P4-2	WIL-NSA12	Residence at 19781 Dakota Avenue	44.6645	-93.3554	
WIL-NSA15		Residence at 19631 Dakota Avenue	44.6654	-93.3571	1830 ESE	
WIL-NSA16		Residence at 19661 Dakota Avenue	44.6646	-93.3572	1920 ESE	
WIL-NSA17		Residence at 19545 Dakota Avenue	44.6662	-93.3581	1500 E	
WIL-NSA18		Residence at 8031 Credit River Boulevard	44.6686	-93.3583	1520 ENE	
WIL-NSA19		Residence at 7960 Credit River Boulevard	44.6694	-93.3593	1440 NE	
WIL-NSA20		Residence at 19550 Dakota Avenue	44.6664	-93.3593	1170 ESE	
WIL-NSA21		Residence at 19646 Dakota Avenue	44.6650	-93.3594	1360 SE	
WIL-NSA22		Residence at 19700 Dakota Avenue	44.6636	-93.3598	1630 SE	
WIL-NSA23		Residence at 7816 Credit River Boulevard	44.6691	-93.3625	800 NNE	
WIL-NSA24		Residence at 7814 Credit River Boulevard	44.6700	-93.3631	1100 N	
WIL-NSA25		Residence at 19545 Hampshire Court	44.6659	-93.3632	460 SSE	

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
	WIL-NSA26	Residence at 19556 Hampshire Court	44.6650	-93.3647	790 SSW	
	WIL-NSA27	Residence at 7640 Credit River Boulevard	44.6691	-93.3661	970 NW	
	WIL-NSA29	Residence at 7615 Credit River Boulevard	44.6678	-93.3679	760 E	
	WIL-NSA30	Residence at 7423 Gensmer Circuit	44.6706	-93.3697	1110 NNE	
	WIL-NSA31	Residence at 19415 Southfork Drive	44.6674	-93.3704	150 SE	
	WIL-NSA32	Residence at 19375 Southfork Drive	44.6694	-93.3708	610 N	
	WIL-NSA33	Residence at 19385 Southfork Drive	44.6683	-93.3719	350 NW	
	WIL-NSA34	Residence at 19555 Southfork Drive	44.6661	-93.3719	650 SSW	
	WIL-NSA35	Residence at 19495 Southfork Drive	44.6671	-93.3728	540 WSW	
	WIL-NSA36	Residence at 19525 Southfork Drive	44.6668	-93.3733	710 WSW	
	WIL-NSA37	Residence at 19321 Southfork Drive	44.6694	-93.3739	1010 NW	
	WIL-NSA38	Residence at 19476 Southfork Drive	44.6673	-93.3748	1060 W	
	WIL-NSA39	Residence at 7200 196th Street E	44.6663	-93.3750	1210 WSW	
	WIL-NSA40	Residence at 19400 Southfork Drive	44.6683	-93.3751	1140 W	
	WIL-NSA41	Residence at 19430 Southfork Drive	44.6676	-93.3754	1200 W	
	WIL-NSA42	Residence at 19260 Southfork Drive	44.6696	-93.3755	1410 WNW	
	WIL-NSA43	Residence at 7120 196th Street E	44.6670	-93.3769	1600 W	
	WIL-NSA44	Residence at 7055 196th Street E	44.6657	-93.3781	2020 WSW	
WIL-P4-3	WIL-NSA27	Residence at 7640 Credit River Boulevard	44.6691	-93.3661	2130 ENE	12 days
	WIL-NSA29	Residence at 7615 Credit River Boulevard	44.6678	-93.3679	1610 E	
	WIL-NSA30	Residence at 7423 Gensmer Circuit	44.6706	-93.3697	1520 NE	
	WIL-NSA31	Residence at 19415 Southfork Drive	44.6674	-93.3704	970 E	
	WIL-NSA32	Residence at 19375 Southfork Drive	44.6694	-93.3708	1020 ENE	
	WIL-NSA33	Residence at 19385 Southfork Drive	44.6683	-93.3719	590 ENE	

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
	WIL-NSA34	Residence at 19555 Southfork Drive	44.6661	-93.3719	850 SE	
	WIL-NSA35	Residence at 19495 Southfork Drive	44.6671	-93.3728	430 SE	
	WIL-NSA36	Residence at 19525 Southfork Drive	44.6668	-93.3733	430 SSE	
	WIL-NSA37	Residence at 19321 Southfork Drive	44.6694	-93.3739	570 N	
	WIL-NSA38	Residence at 19476 Southfork Drive	44.6673	-93.3748	290 SW	
	WIL-NSA39	Residence at 7200 196th Street E	44.6663	-93.3750	630 SSW	
	WIL-NSA40	Residence at 19400 Southfork Drive	44.6683	-93.3751	310 WNW	
	WIL-NSA41	Residence at 19430 Southfork Drive	44.6676	-93.3754	360 WSW	
	WIL-NSA42	Residence at 19260 Southfork Drive	44.6696	-93.3755	740 NNW	
	WIL-NSA43	Residence at 7120 196th Street E	44.6670	-93.3769	570 SE	
	WIL-NSA44	Residence at 7055 196th Street E	44.6657	-93.3781	920 S	
	WIL-NSA45	Residence at 19435 Texas Avenue	44.6709	-93.3786	1010 NNW	
	WIL-NSA46	Residence at 19375 Foxfield Drive	44.6689	-93.3804	620 WNW	
	WIL-NSA47	Residence at 19626 Texas Avenue	44.6650	-93.3804	1290 SSW	
	WIL-NSA48	Residence at 19325 Foxfield Drive	44.6695	-93.3804	760 NW	
	WIL-NSA49	Residence at 19425 Foxfield Drive	44.6683	-93.3806	620 W	
	WIL-NSA50	Residence at 19455 Foxfield Drive	44.6679	-93.3810	730 W	
Willmar 3rd Branch Line Downstream						
WDC-P4-1	WDC-NSA04	Residence at 11775 122nd Street	44.7819	-93.8239	2070 NNE	4 days
	WDC-NSA05	Residence at 12655 County Road 153	44.7736	-93.8279	1230 S	
	WDC-NSA06	Residence at 12630 County Road 153	44.7742	-93.8291	1040 SSW	
	WDC-NSA08	Residence at 12055 122nd Street	44.7817	-93.8304	1620 NNW	
	WDC-NSA10	Residence at 12275 122nd Street	44.7816	-93.8367	2500 NW	

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
WDC-P4-2	WDC-NSA08	Residence at 12055 122nd Street	44.7817	-93.8304	2550 E	4 days
	WDC-NSA09	Residence at 12250 122nd Street	44.7835	-93.8346	1560 ENE	
	WDC-NSA10	Residence at 12275 122nd Street	44.7816	-93.8367	920 E	
	WDC-NSA11	Residence at 11870 Post Avenue	44.7879	-93.8392	2080 NNE	
	WDC-NSA12	Residence at 12650 122nd Street	44.7828	-93.8456	1210 W	
	WDC-NSA13	Residence at 12755 122nd Street	44.7819	-93.8474	1680 W	
	WDC-NSA14	Residence at 12175 County Road 51	44.7833	-93.8483	1930 W	
	WDC-NSA17	Residence at 12050 County Road 51	44.7849	-93.8502	2560 WNW	
WDC-P4-3	WDC-NSA11	Residence at 11870 Post Avenue	44.7879	-93.8392	2420 E	4 days
	WDC-NSA12	Residence at 12650 122nd Street	44.7828	-93.8456	1580 SSE	
	WDC-NSA13	Residence at 12755 122nd Street	44.7819	-93.8474	1730 S	
	WDC-NSA14	Residence at 12175 County Road 51	44.7833	-93.8483	1220 S	
	WDC-NSA15	Residence at 12040 County Road 51	44.7886	-93.8496	490 NNW	
	WDC-NSA17	Residence at 12050 County Road 51	44.7849	-93.8502	800 SW	
	WDC-NSA19	Residence at 11720 County Road 51	44.7912	-93.8521	1570 NNW	
	WDC-NSA20	Residence at 13020 122nd Street	44.7848	-93.8546	1610 SW	
	WDC-NSA21	Residence at 13035 122nd Street	44.7817	-93.8548	2460 SW	
	WDC-NSA22	Residence at 13190 122nd Street	44.7851	-93.8580	2360 WSW	
WDC-P4-5	WDC-NSA29	Residence at 13950 114th Street	44.7967	-93.8797	2270 ESE	4 days
	WDC-NSA30	Residence at 14210 114th Street	44.7967	-93.8835	1390 SE	
	WDC-NSA31	Residence at 11125 Salem Avenue	44.7999	-93.8843	990 ENE	
	WDC-NSA32	Residence at 11220 Salem Avenue	44.7967	-93.8891	910 SSW	
	WDC-NSA33	Residence at 11075 Highway 25	44.8028	-93.8901	1240 NNW	
	WDC-NSA34	Residence at 14570 Highway 5 & 25	44.8018	-93.8931	1250 NW	

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
	WDC-NSA35	Residence at 14755 Highway 5 & 25	44.7984	-93.8962	1730 WSW	
	WDC-NSA36	Residence at 14760 Highway 5 & 25	44.8006	-93.8971	1990 WNW	
WDC-P4-6	WDC-NSA32	Residence at 11220 Salem Avenue	44.7967	-93.8891	1820 ESE	11 days
	WDC-NSA33	Residence at 11075 Highway 25	44.8028	-93.8901	1990 NE	
	WDC-NSA34	Residence at 14570 Highway 5 & 25	44.8018	-93.8931	1230 NNE	
	WDC-NSA35	Residence at 14755 Highway 5 & 25	44.7984	-93.8962	260 SW	
	WDC-NSA36	Residence at 14760 Highway 5 & 25	44.8006	-93.8971	660 ENE	
	WDC-NSA37	Residence at 10945 Sunset Road	44.8048	-93.8998	1840 NNW	
	WDC-NSA38	Residence at 10880 Sunset Road	44.8062	-93.9011	2390 NNW	
	WDC-NSA39	Residence at 14925 110th Street	44.8031	-93.9019	1370 NNW	
	WDC-NSA40	Residence at 14935 110th Street	44.8022	-93.9022	1130 NW	
	WDC-NSA41	Residence at 15040 114th Street	44.8002	-93.9040	1220 W	
	WDC-NSA42	Residence at 15050 114th Street	44.7988	-93.9049	1490 WSW	
	WDC-NSA43	Residence at 11045 Tacoma Avenue	44.8035	-93.9071	2420 NW	
	WDC-NSA44	Residence at 11125 Tacoma Avenue	44.8022	-93.9074	2260 WNW	
	WDC-P4-7	WDC-NSA35	Residence at 14755 Highway 5 & 25	44.7984	-93.8962	
WDC-NSA36		Residence at 14760 Highway 5 & 25	44.8006	-93.8971	1580 E	
WDC-NSA37		Residence at 10945 Sunset Road	44.8048	-93.8998	1750 NE	
WDC-NSA38		Residence at 10880 Sunset Road	44.8062	-93.9011	1970 NNE	
WDC-NSA39		Residence at 14925 110th Street	44.8031	-93.9019	920 NE	
WDC-NSA40		Residence at 14935 110th Street	44.8022	-93.9022	660 NNE	
WDC-NSA41		Residence at 15040 114th Street	44.8002	-93.9040	250 WSW	
WDC-NSA42		Residence at 15050 114th Street	44.7988	-93.9049	770 SW	
WDC-NSA43		Residence at 11045 Tacoma Avenue	44.8035	-93.9071	1020 NW	

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
	WDC-NSA44	Residence at 11125 Tacoma Avenue	44.8022	-93.9074	800 WNW	
WDC-P4-8	WDC-NSA36	Residence at 14760 Highway 5 & 25	44.8006	-93.8971	2390 ESE	5 days
	WDC-NSA37	Residence at 10945 Sunset Road	44.8048	-93.8998	1510 E	
	WDC-NSA38	Residence at 10880 Sunset Road	44.8062	-93.9011	1280 ENE	
	WDC-NSA39	Residence at 14925 110th Street	44.8031	-93.9019	960 E	
	WDC-NSA40	Residence at 14935 110th Street	44.8022	-93.9022	960 ESE	
	WDC-NSA41	Residence at 15040 114th Street	44.8002	-93.9040	1160 SSE	
	WDC-NSA42	Residence at 15050 114th Street	44.7988	-93.9049	1610 S	
	WDC-NSA43	Residence at 11045 Tacoma Avenue	44.8035	-93.9071	410 WNW	
	WDC-NSA44	Residence at 11125 Tacoma Avenue	44.8022	-93.9074	580 SW	
	Paynesville 2nd Branch Line					
PAY-P4-1	PAY-NSA02	Residence at 22272 County Highway 43	45.4448	-94.5546	2580 E	4 days
	PAY-NSA03	Residence at 22522 County Road 12	45.4475	-94.5554	2630 ENE	
	PAY-NSA05	Residence at 22264 County Highway 43	45.4447	-94.5564	2100 E	
	PAY-NSA06	Residence at 21808 Fellows Road	45.4426	-94.5576	1890 ESE	
	PAY-NSA07	Residence at 22483 County Road 12	45.4472	-94.5584	1900 ENE	
	PAY-NSA09	Residence at 22525 County Road 12	45.4482	-94.5606	1750 NE	
	PAY-NSA10	Residence at 22055 Highway 23	45.4428	-94.5621	850 SE	
	PAY-NSA11	Residence at 22523 County Road 12	45.4467	-94.5639	880 NNE	
	PAY-NSA12	Residence at 22185 Highway 23	45.4420	-94.5643	710 SE	
	PAY-NSA13	Residence Two at 22056 Highway 23	45.4456	-94.5652	480 NNW	
	PAY-NSA14	Residence One at 22056 Highway 23	45.4454	-94.5656	450 NW	
	PAY-NSA15	Residence at 21745 Big Lake Road	45.4382	-94.5663	1880 S	
	PAY-NSA16	Residence at 22212 Highway 23	45.4438	-94.5675	360 WNW	
	PAY-NSA17	Residence at 22426 Highway 23	45.4419	-94.5718	1530 WSW	

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
	PAY-NSA19	Residence at 22656 Highway 23	45.4417	-94.5748	2290 WSW	
PAY-P4-2	PAY-NSA10	Residence at 22055 Highway 23	45.4428	-94.5621	1920 E	3 days
	PAY-NSA11	Residence at 22523 County Road 12	45.4467	-94.5639	2300 NE	
	PAY-NSA12	Residence at 22185 Highway 23	45.4420	-94.5643	1330 E	
	PAY-NSA13	Residence Two at 22056 Highway 23	45.4456	-94.5652	1770 NE	
	PAY-NSA14	Residence One at 22056 Highway 23	45.4454	-94.5656	1650 NE	
	PAY-NSA15	Residence at 21745 Big Lake Road	45.4382	-94.5663	1190 SE	
	PAY-NSA16	Residence at 22212 Highway 23	45.4438	-94.5675	910 NE	
	PAY-NSA17	Residence at 22426 Highway 23	45.4419	-94.5718	610 W	
	PAY-NSA18	Residence at 21439 Big Lake Road	45.4360	-94.5737	2000 SSW	
	PAY-NSA19	Residence at 22656 Highway 23	45.4417	-94.5748	1380 W	
	PAY-P4-3	PAY-NSA20	Residence at 23040 Highway 23	45.4405	-94.5830	
PAY-NSA21		Residence at 23408 Highway 23	45.4405	-94.5903	1790 NNW	
PAY-NSA22		Residence at 23467 Highway 23	45.4378	-94.5918	1320 WNW	
PAY-NSA23		Residence at 23615 Highway 23	45.4372	-94.5952	1290 NNE	
PAY-NSA24		Residence at 21626 County Road 123	45.4361	-94.5968	810 N	
Worthington 2nd Branch Line						
WOR-P4-1	WOR-NSA01	Residence at 44727 780th Street	43.6148	-95.1799	270 WSW	5 days
Springfield 2nd Branch Line						
SPR-P4-1	SPR-NSA04	Residence at 76297 310th Street	44.0359	-94.5440	2170 ESE	8 days
	SPR-NSA05	Residence at 30450 760th Avenue	44.0442	-94.5488	2240 NE	
	SPR-NSA06	Residence at 30799 760th Avenue	44.0394	-94.5501	760 NE	
	SPR-NSA08	Residence at 31385 760th Avenue	44.0311	-94.5502	2460 S	
	SPR-NSA10	Residence at 75426 310th Street	44.0375	-94.5602	1750 WSW	

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
SPR-P4-2	SPR-NSA09	Residence at 75455 300th Street	44.0490	-94.5602	1610 ENE	9 days
SPR-P4-3	SPR-NSA12	Residence at 74462 300th Street	44.0603	-94.5754	1810 E	10 days
	SPR-NSA13	Residence at 74531 290th Street	44.0636	-94.5794	1370 E	
	SPR-NSA15	Residence at 29402 740th Avenue	44.0605	-94.5870	1180 SSW	
	SPR-NSA16	Residence at 74124 290th Street	44.0659	-94.5874	1220 NW	
	SPR-NSA18	Residence at 73931 290th Street	44.0635	-94.5918	1890 W	
SPR-P4-4	SPR-NSA13	Residence at 74531 290th Street	44.0636	-94.5794	1880 ESE	7 days
	SPR-NSA15	Residence at 29402 740th Avenue	44.0605	-94.5870	1520 S	
	SPR-NSA16	Residence at 74124 290th Street	44.0659	-94.5874	260 ESE	
	SPR-NSA17	Residence at 28567 740th Avenue	44.0700	-94.5905	1490 NNW	
	SPR-NSA18	Residence at 73931 290th Street	44.0635	-94.5918	1330 SW	
SPR-P4-5	SPR-NSA27	Residence at 72474 270th Street	44.0952	-94.6303	2360 E	4 days
	SPR-NSA28	Residence at 27168 Highway 4	44.0924	-94.6389	1490 S	
	SPR-NSA29	Residence at 26960 Highway 4	44.0951	-94.6390	490 S	
	SPR-NSA30	Residence at 26697 Highway 4	44.0994	-94.6401	750 NNW	
	SPR-NSA31	Residence at 26415 Highway 4	44.1036	-94.6409	2300 NNW	
Minnesota Interconnect 2nd Branch Line						
MIC-P4-1	MIC-NSA01	Residence at 34175 Verdin Street NW	45.5897	-93.3189	170 NW	9 days
	MIC-NSA03	Residence at 2328 345th Avenue NW	45.5941	-93.3252	2080 NNW	
	MIC-NSA04	Residence at 34423 Verdin Street NW	45.5933	-93.3259	1940 NW	
	MIC-NSA05	Residence Two at 33955 Walbo Drive NW	45.5848	-93.3261	2000 SW	
	MIC-NSA06	Residence One at 33955 Walbo Drive NW	45.5850	-93.3265	1990 SW	
	MIC-NSA07	Residence at 34273 Verdin Street NW	45.5911	-93.3266	1540 WNW	
	MIC-NSA08	Residence at 34105 Verdin Street NW	45.5875	-93.3268	1520 WSW	

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
	MIC-NSA09	Townhall at 2405 341st Avenue NW	45.5877	-93.3276	1700 WSW	
	MIC-NSA11	Residence at 2482 343rd Avenue NW	45.5904	-93.3292	2070 WNW	
	MIC-NSA12	Residence at 2485 343rd Avenue NW	45.5913	-93.3299	2350 WNW	
	MIC-NSA13	Residence at 2533 341st Avenue NW	45.5878	-93.3308	2470 W	
	MIC-NSA14	Residence at 2490 343rd Avenue NW	45.5905	-93.3313	2620 WNW	
	MIC-NSA15	Residence at 2551 341st Avenue NW	45.5881	-93.3314	2600 W	
MIC-P4-2	MIC-NSA01	Residence at 34175 Verdin Street NW	45.5897	-93.3189	2010 E	14 days
	MIC-NSA03	Residence at 2328 345th Avenue NW	45.5941	-93.3252	1700 NNE	
	MIC-NSA04	Residence at 34423 Verdin Street NW	45.5933	-93.3259	1400 N	
	MIC-NSA05	Residence Two at 33955 Walbo Drive NW	45.5848	-93.3261	1750 S	
	MIC-NSA06	Residence One at 33955 Walbo Drive NW	45.5850	-93.3265	1650 S	
	MIC-NSA07	Residence at 34273 Verdin Street NW	45.5911	-93.3266	550 N	
	MIC-NSA08	Residence at 34105 Verdin Street NW	45.5875	-93.3268	750 S	
	MIC-NSA09	Townhall at 2405 341st Avenue NW	45.5877	-93.3276	710 SSW	
	MIC-NSA11	Residence at 2482 343rd Avenue NW	45.5904	-93.3292	680 WNW	
	MIC-NSA12	Residence at 2485 343rd Avenue NW	45.5913	-93.3299	1020 NW	
	MIC-NSA13	Residence at 2533 341st Avenue NW	45.5878	-93.3308	560 SE	
	MIC-NSA14	Residence at 2490 343rd Avenue NW	45.5905	-93.3313	730 NNE	
	MIC-NSA15	Residence at 2551 341st Avenue NW	45.5881	-93.3314	390 SE	
	MIC-NSA16	Residence at 2607 341st Avenue NW	45.5877	-93.3327	380 S	
MIC-NSA17	Residence at 2636 341st Avenue NW	45.5867	-93.3331	750 S		
MIC-NSA18	Residence at 2727 Highway 95 NW	45.5855	-93.3337	1200 SSW		
MIC-NSA19	Residence at 2670 341st Avenue NW	45.5868	-93.3340	800 SSW		

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
	MIC-NSA20	Residence at 2698 341st Avenue NW	45.5867	-93.3348	930 SW	
	MIC-NSA21	Residence at 33946 Eidelweiss Street NW	45.5835	-93.3355	2050 SSW	
	MIC-NSA22	Residence at 2733 Highway 95 NW	45.5855	-93.3357	1400 SW	
	MIC-NSA23	Residence at 2738 341st Avenue NW	45.5869	-93.3357	1040 SW	
	MIC-NSA24	Residence at 2610 343rd Avenue NW	45.5906	-93.3365	1200 NW	
	MIC-NSA25	Residence at 2792 341st Avenue NW	45.5866	-93.3367	1300 SW	
	MIC-NSA26	Residence at 2784 Highway 95 NW	45.5845	-93.3373	1950 SW	
	MIC-NSA27	Residence at 2834 341st Avenue NW	45.5870	-93.3380	1530 WSW	
	MIC-NSA28	Residence at 2836 Highway 95 NW	45.5831	-93.3381	2490 SW	
	MIC-NSA29	Residence at 2825 341st Avenue NW	45.5877	-93.3384	1520 WSW	
	MIC-NSA30	Residence at 2838 341st Avenue NW	45.5871	-93.3391	1770 WSW	
MIC-P4-3	MIC-NSA05	Residence Two at 33955 Walbo Drive NW	45.5848	-93.3261	2630 ESE	12 days
	MIC-NSA06	Residence One at 33955 Walbo Drive NW	45.5850	-93.3265	2510 ESE	
	MIC-NSA07	Residence at 34273 Verdin Street NW	45.5911	-93.3266	2550 ENE	
	MIC-NSA08	Residence at 34105 Verdin Street NW	45.5875	-93.3268	2230 E	
	MIC-NSA09	Townhall at 2405 341st Avenue NW	45.5877	-93.3276	2010 E	
	MIC-NSA11	Residence at 2482 343rd Avenue NW	45.5904	-93.3292	1860 ENE	
	MIC-NSA12	Residence at 2485 343rd Avenue NW	45.5913	-93.3299	1910 NE	
	MIC-NSA13	Residence at 2533 341st Avenue NW	45.5878	-93.3308	1200 E	
	MIC-NSA14	Residence at 2490 343rd Avenue NW	45.5905	-93.3313	1450 NE	
	MIC-NSA15	Residence at 2551 341st Avenue NW	45.5881	-93.3314	1060 E	
	MIC-NSA16	Residence at 2607 341st Avenue NW	45.5877	-93.3327	700 E	
	MIC-NSA17	Residence at 2636 341st Avenue NW	45.5867	-93.3331	730 SE	

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
	MIC-NSA18	Residence at 2727 Highway 95 NW	45.5855	-93.3337	960 SSE	
	MIC-NSA19	Residence at 2670 341st Avenue NW	45.5868	-93.3340	530 SE	
	MIC-NSA20	Residence at 2698 341st Avenue NW	45.5867	-93.3348	450 SSE	
	MIC-NSA21	Residence at 33946 Eidelweiss Street NW	45.5835	-93.3355	1420 SE	
	MIC-NSA22	Residence at 2733 Highway 95 NW	45.5855	-93.3357	830 S	
	MIC-NSA23	Residence at 2738 341st Avenue NW	45.5869	-93.3357	330 SSW	
	MIC-NSA24	Residence at 2610 343rd Avenue NW	45.5906	-93.3365	1030 NNW	
	MIC-NSA25	Residence at 2792 341st Avenue NW	45.5866	-93.3367	540 SW	
	MIC-NSA26	Residence at 2784 Highway 95 NW	45.5845	-93.3373	840 SE	
	MIC-NSA27	Residence at 2834 341st Avenue NW	45.5870	-93.3380	640 NE	
	MIC-NSA28	Residence at 2836 Highway 95 NW	45.5831	-93.3381	1100 SSE	
	MIC-NSA29	Residence at 2825 341st Avenue NW	45.5877	-93.3384	740 W	
	MIC-NSA30	Residence at 2838 341st Avenue NW	45.5871	-93.3391	500 NNE	
	MIC-NSA31	Residence at 2928 337th Lane NW	45.5811	-93.3411	1740 S	
	MIC-NSA32	Residence at 2962 337th Lane NW	45.5815	-93.3422	1670 SSW	
	MIC-NSA33	Residence at 33813 Kerry Street NW	45.5814	-93.3457	2170 SW	
	MIC-NSA34	Residence Two at 3172 Highway 95 NW	45.5869	-93.3468	1800 WNW	
	MIC-NSA35	Residence One at 3172 Highway 95 NW	45.5866	-93.3475	1960 W	
	MIC-NSA36	Residence at 33912 Kerry Street NW	45.5832	-93.3485	2410 WSW	
	MIC-NSA37	Residence at 33924 Kerry Street NW	45.5849	-93.3487	2260 W	
	MIC-NSA38	Residence at 33958 Kerry Street NW	45.5843	-93.3490	2390 WSW	
	MIC-NSA39	Residence Two at 3300 Highway 95 NW	45.5864	-93.3498	2530 W	
Alexandria 2nd Branch Line						
ALX-P4-1	ALX-NSA08	Residence at 9716 140th Street	45.9630	-94.4588	2310 NE	10 days

Appendix 9J
Identified NSA Locations within 0.5 mile of HDD segments for NL27 Project

HDD Location	NSA	NSA TYPE	Coordinates		Approximate Distance and Direction (feet)	Duration (days)
			Latitude	Longitude		
	ALX-NSA09	Residence at 13334 90th Avenue	45.9528	-94.4719	2470 SSW	
	ALX-NSA10	Residence at 13752 90th Avenue	45.9588	-94.4725	680 WSW	
	ALX-NSA11	Residence at 13923 90th Avenue	45.9606	-94.4734	990 WNW	
	ALX-NSA12	Residence at 13635 90th Avenue	45.9568	-94.4741	1420 SW	
ALX-P4-2	ALX-NSA10	Residence at 13752 90th Avenue	45.9588	-94.4725	600 S	8 days
	ALX-NSA11	Residence at 13923 90th Avenue	45.9606	-94.4734	340 W	
	ALX-NSA12	Residence at 13635 90th Avenue	45.9568	-94.4741	1420 SSW	

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Lat. of NSA	Long. of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
Lake Mills M500 E-line											
LMA P4-1 (Daytime only)	LMA-NSA05	43.7233	-93.4111	2470 NE	48	41	46	41	N/A - Daytime Only	49	1
	LMA-NSA06	43.7233	-93.4167	1650 NNE	48	45	50	45	N/A - Daytime Only	50	2
	LMA-NSA07	43.7231	-93.4207	1690 NNW	48	45	50	45	N/A - Daytime Only	50	2
	LMA-NSA08	43.7208	-93.4194	760 NNW	45	52	57	52	N/A - Daytime Only	52	7
	LMA-NSA09	43.7201	-93.4192	530 NNW	45	55	60	55	N/A - Daytime Only	55	10
	LMA-NSA10	43.7156	-93.4166	1170 SSE	45	48	53	48	N/A - Daytime Only	50	5
LMA P4-2 (Daytime only)	LMA-NSA04	43.7251	-93.4116	940 ENE	48	50	55	50	N/A - Daytime Only	52	4
	LMA-NSA05	43.7233	-93.4111	1090 E	48	49	54	49	N/A - Daytime Only	51	3
	LMA-NSA06	43.7233	-93.4167	410 WSW	48	57	62	57	N/A - Daytime Only	58	10
	LMA-NSA07	43.7231	-93.4207	1470 W	48	46	51	46	N/A - Daytime Only	50	2
	LMA-NSA08	43.7208	-93.4194	1510 SW	45	45	51	45	N/A - Daytime Only	48	3
	LMA-NSA09	43.7201	-93.4192	1660 SW	45	45	50	45	N/A - Daytime Only	48	3

- Notes:
1. Construction L_{dn} sound levels are calculated without any nighttime component if HDD operations are to occur only during daytime hours. In these instances, nighttime ambient sound levels are assumed to be 10 dB below daytime ambient sound levels when calculating L_{dn} ambient sound levels.
 2. L₁₀ sound levels from construction activities have been estimated based on a +3 dB correction to the modelled hourly L_{eq} sound levels.
 3. If mitigation measures are not predicted to be required, L_{dn} sound levels are based on construction activity without mitigation.
 4. Noise Mitigation Measures:
 - A. Institute work practices such as reduced idling, fitting equipment with residential mufflers. A 5 dB drop in overall sound levels is assumed.
 - B. Utilize a smaller and modernized HDD rig compared to what is assumed in the modelling.
 - C. Install sound barrier walls between the entry pit and NSAs or a barrier wall between the exit pit and NSA, whichever is closest.
 - D. Install sound barrier walls between entry and exit pits and NSAs.
- For options C and D, the minimum noise barrier wall height is 20 feet with a minimum surface density of 2-4 lb/ft².

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
Albert Lea M500 E-line											
P4-1 (Daytime Only)	ALO-NSA03	43.8799	-93.3949	2130 WSW	42	42	47	42	N/A - Daytime Only	45	3
	ALO-NSA04	43.8840	-93.3855	1090 N	42	49	54	49	N/A - Daytime Only	50	8
P4-2 (Daytime Only)	ALO-NSA04	43.8840	-93.3855	1800 SSW	42	43	48	43	N/A - Daytime Only	46	4
P4-3 (Daytime and Nighttime)	ALO-NSA06	43.9016	-93.3830	720 NE	45	60	56	52	Predicted noncompliance with FERC L _{dn} limits and MPCA L ₁₀ limits. Mitigation measure 'A' and 'C' required.	53	8
	ALO-NSA07	43.9059	-93.3794	2500 NE	45	48	45	44	-	48	3
P4-4 (Daytime Only)	ALO-NSA06	43.9016	-93.3830	1520 S	45	45	50	45	N/A - Daytime Only	48	3
	ALO-NSA07	43.9059	-93.3794	1200 E	45	48	53	48	N/A - Daytime Only	50	5
	ALO-NSA09	43.9104	-93.3859	1560 NNW	45	45	50	45	N/A - Daytime Only	48	3
P4-5 (Daytime Only)	ALO-NSA12	43.9157	-93.3735	1890 SSE	45	43	48	43	N/A - Daytime Only	47	2
	ALO-NSA13	43.9213	-93.3715	1140 E	39	48	53	48	N/A - Daytime Only	49	10
	ALO-NSA15	43.9218	-93.3727	860 ENE	39	50	56	50	N/A - Daytime Only	51	12

- Notes:
1. Construction L_{dn} sound levels are calculated without any nighttime component if HDD operations are to occur only during daytime hours. In these instances, nighttime ambient sound levels are assumed to be 10 dB below daytime ambient sound levels when calculating L_{dn} ambient sound levels.
 2. L₁₀ sound levels from construction activities have been estimated based on a +3 dB correction to the modelled hourly L_{eq} sound levels.
 3. If mitigation measures are not predicted to be required, L_{dn} sound levels are based on construction activity without mitigation.
 4. Noise Mitigation Measures:
 - A. Institute work practices such as reduced idling, fitting equipment with residential mufflers. A 5 dB drop in overall sound levels is assumed.
 - B. Utilize a smaller and modernized HDD rig compared to what is assumed in the modelling.
 - C. Install sound barrier walls between the entry pit and NSAs or a barrier wall between the exit pit and NSA, whichever is closest.
 - D. Install sound barrier walls between entry and exit pits and NSAs.

For options C and D, the minimum noise barrier wall height is 20 feet with a minimum surface density of 2-4 lb/ft².

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
Willmar 3rd Branch Line Upstream											
P4-1 (Daytime Only)	WIL-NSA04	44.6546	-93.3439	2410 SSE	37	41	46	41	N/A - Daytime Only	43	6
	WIL-NSA05	44.6558	-93.3478	1700 S	37	45	50	45	N/A - Daytime Only	45	8
	WIL-NSA06	44.6624	-93.3479	680 NNE	37	53	58	53	N/A - Daytime Only	53	16
	WIL-NSA07	44.6635	-93.3493	980 NNW	37	49	54	49	N/A - Daytime Only	49	12
	WIL-NSA08	44.6593	-93.3497	540 SW	37	56	61	56	N/A - Daytime Only	56	19
	WIL-NSA09	44.6626	-93.3497	680 NNW	37	52	57	52	N/A - Daytime Only	52	15
	WIL-NSA10	44.6598	-93.3502	440 SW	37	57	62	57	N/A - Daytime Only	57	20
	WIL-NSA11	44.6641	-93.3513	1320 NNW	37	46	52	46	N/A - Daytime Only	47	10
	WIL-NSA12	44.6645	-93.3554	2090 NW	34	42	47	42	N/A - Daytime Only	43	9
	WIL-NSA13	44.6633	-93.3558	1940 WNW	34	43	48	43	N/A - Daytime Only	43	9
	WIL-NSA14	44.6612	-93.3558	1720 W	34	43	49	43	N/A - Daytime Only	44	10
WIL-NSA16	44.6646	-93.3572	2500 WNW	34	40	45	40	N/A - Daytime Only	41	7	
P4-2 (Daytime and Nighttime)	WIL-NSA12	44.6645	-93.3554	2370 ESE	34	49	45	40	Predicted noncompliance with FERC L _{dn} limits and/or MPCA L ₁₀ limits. Mitigation measure 'A' and 'D' required.	41	7
	WIL-NSA15	44.6654	-93.3571	1830 ESE	34	51	48	42		43	9
	WIL-NSA16	44.6646	-93.3572	1920 ESE	34	51	47	41		42	8
	WIL-NSA17	44.6662	-93.3581	1500 E	34	53	50	44		44	10
	WIL-NSA18	44.6686	-93.3583	1520 ENE	34	53	50	45		45	11
	WIL-NSA19	44.6694	-93.3593	1440 NE	34	54	50	46		46	12
	WIL-NSA20	44.6664	-93.3593	1170 ESE	34	55	52	46		46	12
	WIL-NSA21	44.6650	-93.3594	1360 SE	34	54	51	44		44	10
	WIL-NSA22	44.6636	-93.3598	1630 SE	34	52	49	43		43	9
WIL-NSA23	44.6691	-93.3625	800 NNE	32	59	55	51	In addition to the above	51	19	

**Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project**

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L_{dn}¹ (dBA)	Estimated L_{dn} due to Project Construction without Mitigation (dBA)	Estimated L₁₀ due to Project Construction without Mitigation² (dBA)	Estimated L_{dn} due to Project Construction with Proposed Mitigation³ (dBA)	Proposed Mitigation Measures⁴	Estimated L_{dn} due to Construction with Proposed Mitigation³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
	WIL-NSA24	44.6700	-93.3631	1100 N	32	56	53	49	mitigation measures, nighttime activity is limited to the mud pump, lighting, and welding rig operating for a maximum of 90 overnight minutes, with no more than 40 operational minutes over any one-hour span.	49	17
	WIL-NSA25	44.6659	-93.3632	460 SSE	32	64	61	49		49	17
	WIL-NSA26	44.6650	-93.3647	790 SSW	32	59	56	45		45	13
	WIL-NSA27	44.6691	-93.3661	970 NW	32	58	54	50		50	18
	WIL-NSA28	44.6683	-93.3671	990 WNW	32	58	55	50		50	18
	WIL-NSA29	44.6678	-93.3679	760 E	32	60	56	50		50	18
	WIL-NSA30	44.6706	-93.3697	1110 NNE	32	56	53	49		49	17
	WIL-NSA31	44.6674	-93.3704	201 SW	32	74	71	55		55	23
	WIL-NSA32	44.6694	-93.3708	610 N	32	61	58	54		54	22
	WIL-NSA33	44.6683	-93.3719	350 NW	31	67	63	53		53	22
	WIL-NSA34	44.6661	-93.3719	650 SSW	31	61	57	46		46	15
	WIL-NSA35	44.6671	-93.3728	540 WSW	31	62	59	49		49	18
	WIL-NSA36	44.6668	-93.3733	710 WSW	31	60	56	47		47	16
	WIL-NSA37	44.6694	-93.3739	1010 NW	31	57	53	48		48	17
	WIL-NSA38	44.6673	-93.3748	1060 W	31	56	53	46		46	15
	WIL-NSA39	44.6663	-93.3750	1210 WSW	31	55	52	44		44	13
	WIL-NSA40	44.6683	-93.3751	1140 W	31	56	52	46		46	15
	WIL-NSA41	44.6676	-93.3754	1200 W	31	55	52	45		45	14
	WIL-NSA42	44.6696	-93.3755	1410 WNW	31	54	50	45		45	14
	WIL-NSA43	44.6670	-93.3769	1600 W	49	53	49	43		50	1
	WIL-NSA44	44.6657	-93.3781	2020 WSW	49	50	47	40	50	1	

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L_{dn}¹ (dBA)	Estimated L_{dn} due to Project Construction without Mitigation (dBA)	Estimated L₁₀ due to Project Construction without Mitigation² (dBA)	Estimated L_{dn} due to Project Construction with Proposed Mitigation³ (dBA)	Proposed Mitigation Measures⁴	Estimated L_{dn} due to Construction with Proposed Mitigation³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
P4-3 (Daytime Only)	WIL-NSA27	44.6691	-93.3661	2130 ENE	32	42	47	42	N/A - Daytime Only	42	10
	WIL-NSA28	44.6683	-93.3671	1830 E	32	43	48	43	N/A - Daytime Only	43	11
	WIL-NSA29	44.6678	-93.3679	1610 E	32	44	49	44	N/A - Daytime Only	44	12
	WIL-NSA30	44.6706	-93.3697	1520 NE	32	45	50	45	N/A - Daytime Only	45	13
	WIL-NSA31	44.6674	-93.3704	970 E	32	49	54	49	N/A - Daytime Only	49	17
	WIL-NSA32	44.6694	-93.3708	1020 ENE	32	48	53	48	N/A - Daytime Only	48	16
	WIL-NSA33	44.6683	-93.3719	590 ENE	31	53	58	53	N/A - Daytime Only	53	22
	WIL-NSA34	44.6661	-93.3719	850 SE	31	50	55	50	N/A - Daytime Only	50	19
	WIL-NSA35	44.6671	-93.3728	430 SE	31	56	61	56	N/A - Daytime Only	56	25
	WIL-NSA36	44.6668	-93.3733	430 SSE	31	56	61	56	N/A - Daytime Only	56	25
	WIL-NSA37	44.6694	-93.3739	570 N	31	54	59	54	N/A - Daytime Only	54	23
	WIL-NSA38	44.6673	-93.3748	290 SW	31	60	65	60	N/A - Daytime Only	60	29
	WIL-NSA39	44.6663	-93.3750	630 SSW	31	53	58	53	N/A - Daytime Only	53	22
	WIL-NSA40	44.6683	-93.3751	310 WNW	31	59	65	59	N/A - Daytime Only	59	28
	WIL-NSA41	44.6676	-93.3754	360 WSW	31	58	63	58	N/A - Daytime Only	58	27
	WIL-NSA42	44.6696	-93.3755	740 NNW	31	52	57	52	N/A - Daytime Only	52	21
	WIL-NSA43	44.6670	-93.3769	570 SE	49	54	59	54	N/A - Daytime Only	55	6
	WIL-NSA44	44.6657	-93.3781	920 S	49	50	55	50	N/A - Daytime Only	52	3
	WIL-NSA45	44.6709	-93.3786	1010 NNW	38	49	54	49	N/A - Daytime Only	49	11
	WIL-NSA46	44.6689	-93.3804	620 WNW	38	53	58	53	N/A - Daytime Only	53	15
WIL-NSA47	44.6650	-93.3804	1290 SSW	49	46	52	46	N/A - Daytime Only	51	2	
WIL-NSA48	44.6695	-93.3804	760 NW	38	51	56	51	N/A - Daytime Only	51	13	
WIL-NSA49	44.6683	-93.3806	620 W	38	53	58	53	N/A - Daytime Only	53	15	
WIL-NSA50	44.6679	-93.3810	730 W	38	51	56	51	N/A - Daytime Only	51	13	

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Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Notes:

1. Construction L_{dn} sound levels are calculated without any nighttime component if HDD operations are to occur only during daytime hours. In these instances, nighttime ambient sound levels are assumed to be 10 dB below daytime ambient sound levels when calculating L_{dn} ambient sound levels.
2. L_{10} sound levels from construction activities have been estimated based on a +3 dB correction to the modelled hourly L_{eq} sound levels.
3. If mitigation measures are not predicted to be required, L_{dn} sound levels are based on construction activity without mitigation.
4. Noise Mitigation Measures:
 - A. Institute work practices such as reduced idling, fitting equipment with residential mufflers. A 5 dB drop in overall sound levels is assumed.
 - B. Utilize a smaller and modernized HDD rig compared to what is assumed in the modelling.
 - C. Install sound barrier walls between the entry pit and NSAs or a barrier wall between the exit pit and NSA, whichever is closest.
 - D. Install sound barrier walls between entry and exit pits and NSAs.For options C and D, the minimum noise barrier wall height is 20 feet with a minimum surface density of 2-4 lb/ft².

**Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project**

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
Willmar 3rd Branch Line Downstream											
P4-1 (Daytime Only)	WDC-NSA04	44.7819	-93.8239	2070 NNE	42	43	48	43	N/A - Daytime Only	45	3
	WDC-NSA05	44.7736	-93.8279	1230 S	42	47	52	47	N/A - Daytime Only	48	6
	WDC-NSA06	44.7742	-93.8291	1040 SSW	42	49	54	49	N/A - Daytime Only	50	8
	WDC-NSA08	44.7817	-93.8304	1620 NNW	42	45	50	45	N/A - Daytime Only	47	5
	WDC-NSA10	44.7816	-93.8367	2500 NW	42	40	45	40	N/A - Daytime Only	44	2
P4-2 (Daytime Only)	WDC-NSA08	44.7817	-93.8304	2550 E	42	40	45	40	N/A - Daytime Only	44	2
	WDC-NSA09	44.7835	-93.8346	1560 ENE	42	45	50	45	N/A - Daytime Only	47	5
	WDC-NSA10	44.7816	-93.8367	920 E	42	50	55	50	N/A - Daytime Only	50	8
	WDC-NSA11	44.7879	-93.8392	2080 NNE	42	42	48	42	N/A - Daytime Only	45	3
	WDC-NSA12	44.7828	-93.8456	1210 W	39	47	52	47	N/A - Daytime Only	48	9
	WDC-NSA13	44.7819	-93.8474	1680 W	39	44	50	44	N/A - Daytime Only	46	7
	WDC-NSA14	44.7833	-93.8483	1930 W	39	43	48	43	N/A - Daytime Only	44	5
	WDC-NSA17	44.7849	-93.8502	2560 WNW	39	40	45	40	N/A - Daytime Only	43	4
P4-3 (Daytime Only)	WDC-NSA11	44.7879	-93.8392	2420 E	42	41	46	41	N/A - Daytime Only	44	2
	WDC-NSA12	44.7828	-93.8456	1580 SSE	39	45	50	45	N/A - Daytime Only	46	7
	WDC-NSA13	44.7819	-93.8474	1730 S	39	44	49	44	N/A - Daytime Only	45	6
	WDC-NSA14	44.7833	-93.8483	1220 S	39	47	52	47	N/A - Daytime Only	48	9
	WDC-NSA15	44.7886	-93.8496	490 NNW	39	55	60	55	N/A - Daytime Only	55	16
	WDC-NSA17	44.7849	-93.8502	800 SW	39	51	56	51	N/A - Daytime Only	51	12
	WDC-NSA19	44.7912	-93.8521	1570 NNW	39	45	50	45	N/A - Daytime Only	46	7
	WDC-NSA20	44.7848	-93.8546	1610 SW	39	45	50	45	N/A - Daytime Only	46	7
	WDC-NSA21	44.7817	-93.8548	2460 SW	39	41	46	41	N/A - Daytime Only	43	4

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
	WDC-NSA22	44.7851	-93.8580	2360 WSW	39	41	46	41	N/A - Daytime Only	43	4
P4-5 (Daytime Only)	WDC-NSA29	44.7967	-93.8797	2270 ESE	36	41	46	41	N/A - Daytime Only	42	6
	WDC-NSA30	44.7967	-93.8835	1390 SE	36	46	51	46	N/A - Daytime Only	46	10
	WDC-NSA31	44.7999	-93.8843	990 ENE	40	49	54	49	N/A - Daytime Only	49	9
	WDC-NSA32	44.7967	-93.8891	910 SSW	40	50	55	50	N/A - Daytime Only	51	11
	WDC-NSA33	44.8028	-93.8901	1240 NNW	54	47	52	47	N/A - Daytime Only	55	1
	WDC-NSA34	44.8018	-93.8931	1250 NW	54	47	52	47	N/A - Daytime Only	55	1
	WDC-NSA35	44.7984	-93.8962	1730 WSW	54	44	49	44	N/A - Daytime Only	54	0
	WDC-NSA36	44.8006	-93.8971	1990 WNW	54	43	48	43	N/A - Daytime Only	54	0
P4-6 (Daytime Only)	WDC-NSA32	44.7967	-93.8891	1820 ESE	40	43	48	40	N/A - Daytime Only	43	3
	WDC-NSA33	44.8028	-93.8901	1990 NE	54	42	47	39	N/A - Daytime Only	54	0
	WDC-NSA34	44.8018	-93.8931	1230 NNE	54	47	52	44	N/A - Daytime Only	54	0
	WDC-NSA35	44.7984	-93.8962	260 SW	54	61	66	57	Predicted noncompliance with MPCA L ₁₀ limits. Mitigation measure 'A' required.	58	4
	WDC-NSA36	44.8006	-93.8971	660 ENE	54	53	58	50	N/A - Daytime Only	55	1
	WDC-NSA37	44.8048	-93.8998	1840 NNW	36	43	48	40	N/A - Daytime Only	41	5
	WDC-NSA38	44.8062	-93.9011	2390 NNW	36	41	46	37	N/A - Daytime Only	40	4
	WDC-NSA39	44.8031	-93.9019	1370 NNW	34	46	51	42	N/A - Daytime Only	43	9
	WDC-NSA40	44.8022	-93.9022	1130 NW	34	47	52	44	N/A - Daytime Only	44	10
	WDC-NSA41	44.8002	-93.9040	1220 W	41	47	52	43	N/A - Daytime Only	45	4
WDC-NSA42	44.7988	-93.9049	1490 WSW	41	45	50	42	N/A - Daytime Only	44	3	
WDC-NSA43	44.8035	-93.9071	2420 NW	41	40	45	37	N/A - Daytime Only	42	1	
WDC-NSA44	44.8022	-93.9074	2260 WNW	41	41	46	38	N/A - Daytime Only	43	2	

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
P4-7 (Daytime Only)	WDC-NSA35	44.7984	-93.8962	1970 ESE	54	43	48	40	N/A - Daytime Only	54	0
	WDC-NSA36	44.8006	-93.8971	1580 E	54	45	50	42	N/A - Daytime Only	54	0
	WDC-NSA37	44.8048	-93.8998	1750 NE	36	44	49	41	N/A - Daytime Only	42	6
	WDC-NSA38	44.8062	-93.9011	1970 NNE	36	43	48	40	N/A - Daytime Only	41	5
	WDC-NSA39	44.8031	-93.9019	920 NE	34	50	55	47	N/A - Daytime Only	47	13
	WDC-NSA40	44.8022	-93.9022	660 NNE	34	53	58	50	N/A - Daytime Only	50	16
	WDC-NSA41	44.8002	-93.9040	250 WSW	41	62	67	58	Predicted noncompliance with MPCA L ₁₀ limits. Mitigation measure 'A' required.	58	17
	WDC-NSA42	44.7988	-93.9049	770 SW	41	51	56	48	N/A - Daytime Only	49	8
	WDC-NSA43	44.8035	-93.9071	1020 NW	41	49	54	45	N/A - Daytime Only	47	6
	WDC-NSA44	44.8022	-93.9074	800 WNW	41	51	56	47	N/A - Daytime Only	48	7
P4-8 (Daytime Only)	WDC-NSA36	44.8006	-93.8971	2390 ESE	54	41	46	41	N/A - Daytime Only	54	0
	WDC-NSA37	44.8048	-93.8998	1510 E	36	46	51	46	N/A - Daytime Only	46	10
	WDC-NSA38	44.8062	-93.9011	1280 ENE	36	47	52	47	N/A - Daytime Only	47	11
	WDC-NSA39	44.8031	-93.9019	960 E	34	50	55	50	N/A - Daytime Only	50	16
	WDC-NSA40	44.8022	-93.9022	960 ESE	34	49	54	49	N/A - Daytime Only	49	15
	WDC-NSA41	44.8002	-93.9040	1160 SSE	41	47	53	47	N/A - Daytime Only	48	7
	WDC-NSA42	44.7988	-93.9049	1610 S	41	45	50	45	N/A - Daytime Only	46	5
	WDC-NSA43	44.8035	-93.9071	410 WNW	41	57	62	57	N/A - Daytime Only	57	16
WDC-NSA44	44.8022	-93.9074	580 SW	41	54	59	54	N/A - Daytime Only	54	13	

- Notes:
1. Construction L_{dn} sound levels are calculated without any nighttime component if HDD operations are to occur only during daytime hours. In these instances, nighttime ambient sound levels are assumed to be 10 dB below daytime ambient sound levels when calculating L_{dn} ambient sound levels.
 2. L₁₀ sound levels from construction activities have been estimated based on a +3 dB correction to the modelled hourly L_{eq} sound levels.
 3. If mitigation measures are not predicted to be required, L_{dn} sound levels are based on construction activity without mitigation.
 4. Noise Mitigation Measures:

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Estimated Noise Impacts Due to the Project HDDs for NL27 Project

- A. Institute work practices such as reduced idling, fitting equipment with residential mufflers. A 5 dB drop in overall sound levels is assumed.
- B. Utilize a smaller and modernized HDD rig compared to what is assumed in the modelling.
- C. Install sound barrier walls between the entry pit and NSAs or a barrier wall between the exit pit and NSA, whichever is closest.
- D. Install sound barrier walls between entry and exit pits and NSAs.

For options C and D, the minimum noise barrier wall height is 20 feet with a minimum surface density of 2-4 lb/ft².

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
Paynesville 2nd Branch Line											
P4-1 (Daytime Only)	PAY-NSA02	45.4448	-94.5546	2580 E	56	40	45	40	N/A - Daytime Only	56	0
	PAY-NSA03	45.4475	-94.5554	2630 ENE	53	40	45	40	N/A - Daytime Only	53	0
	PAY-NSA05	45.4447	-94.5564	2100 E	56	42	47	42	N/A - Daytime Only	56	0
	PAY-NSA06	45.4426	-94.5576	1890 ESE	56	43	48	43	N/A - Daytime Only	56	0
	PAY-NSA07	45.4472	-94.5584	1900 ENE	53	43	48	43	N/A - Daytime Only	53	0
	PAY-NSA09	45.4482	-94.5606	1750 NE	53	44	49	44	N/A - Daytime Only	53	0
	PAY-NSA10	45.4428	-94.5621	850 SE	56	50	56	50	N/A - Daytime Only	57	1
	PAY-NSA11	45.4467	-94.5639	880 NNE	53	50	55	50	N/A - Daytime Only	55	2
	PAY-NSA12	45.4420	-94.5643	710 SE	56	52	57	52	N/A - Daytime Only	58	2
	PAY-NSA13	45.4456	-94.5652	480 NNW	53	55	60	55	N/A - Daytime Only	57	4
	PAY-NSA14	45.4454	-94.5656	450 NW	53	56	61	56	N/A - Daytime Only	58	5
	PAY-NSA15	45.4382	-94.5663	1880 S	56	43	48	43	N/A - Daytime Only	56	0
	PAY-NSA16	45.4438	-94.5675	360 WNW	56	58	63	58	N/A - Daytime Only	60	4
	PAY-NSA17	45.4419	-94.5718	1530 WSW	56	45	50	45	N/A - Daytime Only	56	0
PAY-NSA19	45.4417	-94.5748	2290 WSW	56	41	46	41	N/A - Daytime Only	56	0	
P4-2 (Daytime Only)	PAY-NSA10	45.4428	-94.5621	1920 E	56	43	48	43	N/A - Daytime Only	56	0
	PAY-NSA11	45.4467	-94.5639	2300 NE	53	41	46	41	N/A - Daytime Only	53	0
	PAY-NSA12	45.4420	-94.5643	1330 E	56	47	52	47	N/A - Daytime Only	56	0
	PAY-NSA13	45.4456	-94.5652	1770 NE	53	44	49	44	N/A - Daytime Only	53	0
	PAY-NSA14	45.4454	-94.5656	1650 NE	53	44	50	44	N/A - Daytime Only	54	1
	PAY-NSA15	45.4382	-94.5663	1190 SE	56	47	53	47	N/A - Daytime Only	57	1
	PAY-NSA16	45.4438	-94.5675	910 NE	56	50	55	50	N/A - Daytime Only	57	1

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
	PAY-NSA17	45.4419	-94.5718	610 W	56	54	59	54	N/A - Daytime Only	58	2
	PAY-NSA18	45.4360	-94.5737	2000 SSW	56	43	48	43	N/A - Daytime Only	56	0
	PAY-NSA19	45.4417	-94.5748	1380 W	56	47	52	47	N/A - Daytime Only	56	0
P4-3 (Daytime and Nighttime)	PAY-NSA20	45.4405	-94.5830	1930 NE	44	51	47	47	-	49	5
	PAY-NSA21	45.4405	-94.5903	1790 NNW	44	52	48	48	-	49	5
	PAY-NSA22	45.4378	-94.5918	1320 WNW	44	55	51	51	-	52	8
	PAY-NSA23	45.4372	-94.5952	1290 NNE	44	55	51	51	-	52	8
	PAY-NSA24	45.4361	-94.5968	810 N	44	59	55	55	Predicted noncompliance with FERC L _{dn} limits and MPCA L ₁₀ limits. Mitigation measure 'A' required.	55	11

- Notes:
1. Construction L_{dn} sound levels are calculated without any nighttime component if HDD operations are to occur only during daytime hours. In these instances, nighttime ambient sound levels are assumed to be 10 dB below daytime ambient sound levels when calculating L_{dn} ambient sound levels.
 2. L₁₀ sound levels from construction activities have been estimated based on a +3 dB correction to the modelled hourly L_{eq} sound levels.
 3. If mitigation measures are not predicted to be required, L_{dn} sound levels are based on construction activity without mitigation.
 4. Noise Mitigation Measures:
 - A. Institute work practices such as reduced idling, fitting equipment with residential mufflers. A 5 dB drop in overall sound levels is assumed.
 - B. Utilize a smaller and modernized HDD rig compared to what is assumed in the modelling.
 - C. Install sound barrier walls between the entry pit and NSAs or a barrier wall between the exit pit and NSA, whichever is closest.
 - D. Install sound barrier walls between entry and exit pits and NSAs.

For options C and D, the minimum noise barrier wall height is 20 feet with a minimum surface density of 2-4 lb/ft².

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
Worthington 2nd Branch Line											
P4-1 (Daytime Only)	WOR-NSA01	43.6148	-95.1799	270 WSW	41	61	66	57	Predicted noncompliance with MPCA L ₁₀ limits. Mitigation measure 'A' required.	57	16

- Notes:
1. Construction L_{dn} sound levels are calculated without any nighttime component if HDD operations are to occur only during daytime hours. In these instances, nighttime ambient sound levels are assumed to be 10 dB below daytime ambient sound levels when calculating L_{dn} ambient sound levels.
 2. L₁₀ sound levels from construction activities have been estimated based on a +3 dB correction to the modelled hourly L_{eq} sound levels.
 3. If mitigation measures are not predicted to be required, L_{dn} sound levels are based on construction activity without mitigation.
 4. Noise Mitigation Measures:
 - A. Institute work practices such as reduced idling, fitting equipment with residential mufflers. A 5 dB drop in overall sound levels is assumed.
 - B. Utilize a smaller and modernized HDD rig compared to what is assumed in the modelling.
 - C. Install sound barrier walls between the entry pit and NSAs or a barrier wall between the exit pit and NSA, whichever is closest.
 - D. Install sound barrier walls between entry and exit pits and NSAs.
 For options C and D, the minimum noise barrier wall height is 20 feet with a minimum surface density of 2-4 lb/ft².

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
Springfield 2nd Branch Line											
P4-1 (Daytime Only)	SPR-NSA04	44.0359	-94.5440	2170 ESE	41	42	47	42	N/A - Daytime Only	44	3
	SPR-NSA05	44.0442	-94.5488	2240 NE	41	42	47	42	N/A - Daytime Only	44	3
	SPR-NSA06	44.0394	-94.5501	760 NE	41	51	56	51	N/A - Daytime Only	52	11
	SPR-NSA08	44.0311	-94.5502	2460 S	41	40	45	40	N/A - Daytime Only	44	3
	SPR-NSA10	44.0375	-94.5602	1750 WSW	41	44	49	44	N/A - Daytime Only	46	5
P4-2 (Daytime Only)	SPR-NSA09	44.0490	-94.5602	1610 ENE	41	45	50	45	N/A - Daytime Only	46	5
P4-3 (Daytime Only)	SPR-NSA12	44.0603	-94.5754	1810 E	37	43	48	43	N/A - Daytime Only	44	7
	SPR-NSA13	44.0636	-94.5794	1370 E	37	47	52	47	N/A - Daytime Only	47	10
	SPR-NSA15	44.0605	-94.5870	1180 SSW	40	48	53	48	N/A - Daytime Only	49	9
	SPR-NSA16	44.0659	-94.5874	1220 NW	37	47	52	47	N/A - Daytime Only	47	10
	SPR-NSA18	44.0635	-94.5918	1890 W	40	43	48	43	N/A - Daytime Only	45	5
P4-4 (Daytime Only)	SPR-NSA13	44.0636	-94.5794	1880 ESE	37	43	48	40	N/A - Daytime Only	42	5
	SPR-NSA15	44.0605	-94.5870	1520 S	40	45	50	42	N/A - Daytime Only	44	4
	SPR-NSA16	44.0659	-94.5874	260 ESE	37	61	66	56	Predicted noncompliance with MPCA L10 limits. Mitigation measure 'A' required.	56	19
	SPR-NSA17	44.0700	-94.5905	1490 NNW	37	45	50	42	N/A - Daytime Only	43	6
	SPR-NSA18	44.0635	-94.5918	1330 SW	40	47	52	44	N/A - Daytime Only	45	5

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
P4-5 (Daytime Only)	SPR-NSA27	44.0952	-94.6303	2360 E	31	41	46	41	N/A - Daytime Only	41	10
	SPR-NSA28	44.0924	-94.6389	1490 S	31	45	51	45	N/A - Daytime Only	46	15
	SPR-NSA29	44.0951	-94.6390	490 S	31	55	60	55	N/A - Daytime Only	55	24
	SPR-NSA30	44.0994	-94.6401	750 NNW	31	51	56	51	N/A - Daytime Only	51	20
	SPR-NSA31	44.1036	-94.6409	2300 NNW	31	41	46	41	N/A - Daytime Only	42	11

- Notes:
1. Construction L_{dn} sound levels are calculated without any nighttime component if HDD operations are to occur only during daytime hours. In these instances, nighttime ambient sound levels are assumed to be 10 dB below daytime ambient sound levels when calculating L_{dn} ambient sound levels.
 2. L₁₀ sound levels from construction activities have been estimated based on a +3 dB correction to the modelled hourly L_{eq} sound levels.
 3. If mitigation measures are not predicted to be required, L_{dn} sound levels are based on construction activity without mitigation.
 4. Noise Mitigation Measures:
 - A. Institute work practices such as reduced idling, fitting equipment with residential mufflers. A 5 dB drop in overall sound levels is assumed.
 - B. Utilize a smaller and modernized HDD rig compared to what is assumed in the modelling.
 - C. Install sound barrier walls between the entry pit and NSAs or a barrier wall between the exit pit and NSA, whichever is closest.
 - D. Install sound barrier walls between entry and exit pits and NSAs.
 For options C and D, the minimum noise barrier wall height is 20 feet with a minimum surface density of 2-4 lb/ft².

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
Minnesota Interconnect 2nd Branch Line											
P4-1 (Daytime Only)	MIC-NSA01	45.5897	-93.3189	170 NW	30	65	70	55	Predicted noncompliance with MPCA L ₁₀ limits. Mitigation measure 'C' required.	55	25
	MIC-NSA03	45.5941	-93.3252	2080 NNW	30	42	47	42	N/A - Daytime Only	42	12
	MIC-NSA04	45.5933	-93.3259	1940 NW	30	43	48	43	N/A - Daytime Only	43	13
	MIC-NSA05	45.5848	-93.3261	2000 SW	30	42	47	42	N/A - Daytime Only	43	13
	MIC-NSA06	45.5850	-93.3265	1990 SW	30	42	48	42	N/A - Daytime Only	43	13
	MIC-NSA07	45.5911	-93.3266	1540 WNW	30	45	50	45	N/A - Daytime Only	45	15
	MIC-NSA08	45.5875	-93.3268	1520 WSW	30	45	50	45	N/A - Daytime Only	45	15
	MIC-NSA09	45.5877	-93.3276	1700 WSW	30	44	49	44	N/A - Daytime Only	44	14
	MIC-NSA11	45.5904	-93.3292	2070 WNW	30	42	47	42	N/A - Daytime Only	42	12
	MIC-NSA12	45.5913	-93.3299	2350 WNW	30	41	46	41	N/A - Daytime Only	41	11
	MIC-NSA13	45.5878	-93.3308	2470 W	34	40	45	40	N/A - Daytime Only	41	7
	MIC-NSA14	45.5905	-93.3313	2620 WNW	30	40	45	40	N/A - Daytime Only	40	10
MIC-NSA15	45.5881	-93.3314	2600 W	34	40	45	40	N/A - Daytime Only	41	7	
P4-2 (Daytime Only)	MIC-NSA01	45.5897	-93.3189	2010 E	30	42	47	42	N/A - Daytime Only	42	12
	MIC-NSA03	45.5941	-93.3252	1700 NNE	30	44	49	44	N/A - Daytime Only	44	14
	MIC-NSA04	45.5933	-93.3259	1400 N	30	46	51	46	N/A - Daytime Only	46	16
	MIC-NSA05	45.5848	-93.3261	1750 S	30	44	49	44	N/A - Daytime Only	44	14
	MIC-NSA06	45.5850	-93.3265	1650 S	30	44	49	44	N/A - Daytime Only	45	15
	MIC-NSA07	45.5911	-93.3266	550 N	30	54	59	54	N/A - Daytime Only	54	24

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L_{dn}¹ (dBA)	Estimated L_{dn} due to Project Construction without Mitigation (dBA)	Estimated L₁₀ due to Project Construction without Mitigation² (dBA)	Estimated L_{dn} due to Project Construction with Proposed Mitigation³ (dBA)	Proposed Mitigation Measures⁴	Estimated L_{dn} due to Construction with Proposed Mitigation³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
MIC-NSA08		45.5875	-93.3268	750 S	30	51	56	51	N/A - Daytime Only	51	21
MIC-NSA09		45.5877	-93.3276	710 SSW	30	52	57	52	N/A - Daytime Only	52	22
MIC-NSA11		45.5904	-93.3292	680 WNW	30	52	57	52	N/A - Daytime Only	52	22
MIC-NSA12		45.5913	-93.3299	1020 NW	30	49	54	49	N/A - Daytime Only	49	19
MIC-NSA13		45.5878	-93.3308	560 SE	34	54	59	54	N/A - Daytime Only	54	20
MIC-NSA14		45.5905	-93.3313	730 NNE	30	52	57	52	N/A - Daytime Only	52	22
MIC-NSA15		45.5881	-93.3314	390 SE	34	57	62	57	N/A - Daytime Only	57	23
MIC-NSA16		45.5877	-93.3327	380 S	34	57	62	57	N/A - Daytime Only	57	23
MIC-NSA17		45.5867	-93.3331	750 S	34	51	56	51	N/A - Daytime Only	51	17
MIC-NSA18		45.5855	-93.3337	1200 SSW	46	47	52	47	N/A - Daytime Only	49	3
MIC-NSA19		45.5868	-93.3340	800 SSW	34	50	55	50	N/A - Daytime Only	50	16
MIC-NSA20		45.5867	-93.3348	930 SW	34	49	54	49	N/A - Daytime Only	49	15
MIC-NSA21		45.5835	-93.3355	2050 SSW	46	42	47	42	N/A - Daytime Only	47	1
MIC-NSA22		45.5855	-93.3357	1400 SW	46	45	50	45	N/A - Daytime Only	49	3
MIC-NSA23		45.5869	-93.3357	1040 SW	38	48	53	48	N/A - Daytime Only	48	10
MIC-NSA24		45.5906	-93.3365	1200 NW	30	47	52	47	N/A - Daytime Only	47	17
MIC-NSA25		45.5866	-93.3367	1300 SW	38	46	51	46	N/A - Daytime Only	47	9
MIC-NSA26		45.5845	-93.3373	1950 SW	46	42	47	42	N/A - Daytime Only	48	2
MIC-NSA27		45.5870	-93.3380	1530 WSW	38	45	50	45	N/A - Daytime Only	45	7
MIC-NSA28		45.5831	-93.3381	2490 SW	46	40	45	40	N/A - Daytime Only	47	1
MIC-NSA29		45.5877	-93.3384	1520 WSW	38	45	50	45	N/A - Daytime Only	45	7
MIC-NSA30		45.5871	-93.3391	1770 WSW	38	43	48	43	N/A - Daytime Only	44	6

**Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project**

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L_{dn}¹ (dBA)	Estimated L_{dn} due to Project Construction without Mitigation (dBA)	Estimated L₁₀ due to Project Construction without Mitigation² (dBA)	Estimated L_{dn} due to Project Construction with Proposed Mitigation³ (dBA)	Proposed Mitigation Measures⁴	Estimated L_{dn} due to Construction with Proposed Mitigation³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
P4-3 (Daytime Only)	MIC-NSA05	45.5848	-93.3261	2630 ESE	30	39	44	39	N/A - Daytime Only	40	10
	MIC-NSA06	45.5850	-93.3265	2510 ESE	30	40	45	40	N/A - Daytime Only	40	10
	MIC-NSA07	45.5911	-93.3266	2550 ENE	30	40	45	40	N/A - Daytime Only	40	10
	MIC-NSA08	45.5875	-93.3268	2230 E	30	41	46	41	N/A - Daytime Only	41	11
	MIC-NSA09	45.5877	-93.3276	2010 E	30	42	47	42	N/A - Daytime Only	42	12
	MIC-NSA11	45.5904	-93.3292	1860 ENE	30	43	48	43	N/A - Daytime Only	43	13
	MIC-NSA12	45.5913	-93.3299	1910 NE	30	42	48	42	N/A - Daytime Only	43	13
	MIC-NSA13	45.5878	-93.3308	1200 E	34	47	52	47	N/A - Daytime Only	47	13
	MIC-NSA14	45.5905	-93.3313	1450 NE	30	45	50	45	N/A - Daytime Only	45	15
	MIC-NSA15	45.5881	-93.3314	1060 E	34	48	53	48	N/A - Daytime Only	48	14
	MIC-NSA16	45.5877	-93.3327	700 E	34	52	57	52	N/A - Daytime Only	52	18
	MIC-NSA17	45.5867	-93.3331	730 SE	34	51	56	51	N/A - Daytime Only	51	17
	MIC-NSA18	45.5855	-93.3337	960 SSE	46	49	54	49	N/A - Daytime Only	51	5
	MIC-NSA19	45.5868	-93.3340	530 SE	34	54	59	54	N/A - Daytime Only	54	20
	MIC-NSA20	45.5867	-93.3348	450 SSE	34	56	61	56	N/A - Daytime Only	56	22
	MIC-NSA21	45.5835	-93.3355	1420 SE	46	46	51	46	N/A - Daytime Only	49	3
	MIC-NSA22	45.5855	-93.3357	830 S	46	51	56	51	N/A - Daytime Only	52	6
	MIC-NSA23	45.5869	-93.3357	330 SSW	38	59	64	59	N/A - Daytime Only	59	21
	MIC-NSA24	45.5906	-93.3365	1030 NNW	30	48	53	48	N/A - Daytime Only	48	18
	MIC-NSA25	45.5866	-93.3367	540 SW	38	54	59	54	N/A - Daytime Only	54	16
MIC-NSA26	45.5845	-93.3373	840 SE	46	50	55	50	N/A - Daytime Only	52	6	
MIC-NSA27	45.5870	-93.3380	640 NE	38	53	58	53	N/A - Daytime Only	53	15	
MIC-NSA28	45.5831	-93.3381	1100 SSE	46	48	53	48	N/A - Daytime Only	50	4	
MIC-NSA29	45.5877	-93.3384	740 W	38	52	57	52	N/A - Daytime Only	52	14	

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
	MIC-NSA30	45.5871	-93.3391	500 NNE	38	55	60	55	N/A - Daytime Only	55	17
	MIC-NSA31	45.5811	-93.3411	1740 S	45	43	49	43	N/A - Daytime Only	47	2
	MIC-NSA32	45.5815	-93.3422	1670 SSW	45	44	49	44	N/A - Daytime Only	47	2
	MIC-NSA33	45.5814	-93.3457	2170 SW	45	41	46	41	N/A - Daytime Only	47	2
	MIC-NSA34	45.5869	-93.3468	1800 WNW	46	43	48	43	N/A - Daytime Only	48	2
	MIC-NSA35	45.5866	-93.3475	1960 W	46	42	47	42	N/A - Daytime Only	48	2
	MIC-NSA36	45.5832	-93.3485	2410 WSW	45	40	45	40	N/A - Daytime Only	46	1
	MIC-NSA37	45.5849	-93.3487	2260 W	45	41	46	41	N/A - Daytime Only	46	1
	MIC-NSA38	45.5843	-93.3490	2390 WSW	45	40	45	40	N/A - Daytime Only	46	1
	MIC-NSA39	45.5864	-93.3498	2530 W	45	40	45	40	N/A - Daytime Only	46	1

- Notes:
1. Construction L_{dn} sound levels are calculated without any nighttime component if HDD operations are to occur only during daytime hours. In these instances, nighttime ambient sound levels are assumed to be 10 dB below daytime ambient sound levels when calculating L_{dn} ambient sound levels.
 2. L₁₀ sound levels from construction activities have been estimated based on a +3 dB correction to the modelled hourly L_{eq} sound levels.
 3. If mitigation measures are not predicted to be required, L_{dn} sound levels are based on construction activity without mitigation.
 4. Noise Mitigation Measures:
 - A. Institute work practices such as reduced idling, fitting equipment with residential mufflers. A 5 dB drop in overall sound levels is assumed.
 - B. Utilize a smaller and modernized HDD rig compared to what is assumed in the modelling.
 - C. Install sound barrier walls between the entry pit and NSAs or a barrier wall between the exit pit and NSA, whichever is closest.
 - D. Install sound barrier walls between entry and exit pits and NSAs.
- For options C and D, the minimum noise barrier wall height is 20 feet with a minimum surface density of 2-4 lb/ft².

Appendix 9K
Estimated Noise Impacts Due to the Project HDDs for NL27 Project

Drill ID	Location	Latitude of NSA	Longitude of NSA	Distance (ft) and Direction to closest NSA	Existing Ambient L _{dn} ¹ (dBA)	Estimated L _{dn} due to Project Construction without Mitigation (dBA)	Estimated L ₁₀ due to Project Construction without Mitigation ² (dBA)	Estimated L _{dn} due to Project Construction with Proposed Mitigation ³ (dBA)	Proposed Mitigation Measures ⁴	Estimated L _{dn} due to Construction with Proposed Mitigation ³ plus Ambient (dBA)	Potential Increase Above Ambient (dB)
Alexandria 2nd branch line											
P4-1 (Daytime Only)	ALX-NSA08	45.9630	-94.4588	2310 NE	36	42	47	42	N/A - Daytime Only	43	7
	ALX-NSA09	45.9528	-94.4719	2470 SSW	33	41	46	41	N/A - Daytime Only	41	8
	ALX-NSA10	45.9588	-94.4725	680 WSW	33	52	57	52	N/A - Daytime Only	52	19
	ALX-NSA11	45.9606	-94.4734	990 WNW	33	49	54	49	N/A - Daytime Only	49	16
	ALX-NSA12	45.9568	-94.4741	1420 SW	33	45	51	45	N/A - Daytime Only	46	13
P4-2 (Daytime Only)	ALX-NSA10	45.9588	-94.4725	600 S	33	53	58	53	N/A - Daytime Only	53	20
	ALX-NSA11	45.9606	-94.4734	340 W	33	59	64	59	N/A - Daytime Only	59	26
	ALX-NSA12	45.9568	-94.4741	1420 SSW	33	46	51	46	N/A - Daytime Only	46	13

- Notes:
1. Construction L_{dn} sound levels are calculated without any nighttime component if HDD operations are to occur only during daytime hours. In these instances, nighttime ambient sound levels are assumed to be 10 dB below daytime ambient sound levels when calculating L_{dn} ambient sound levels.
 2. L₁₀ sound levels from construction activities have been estimated based on a +3 dB correction to the modelled hourly L_{eq} sound levels.
 3. If mitigation measures are not predicted to be required, L_{dn} sound levels are based on construction activity without mitigation.
 4. Noise Mitigation Measures:
 - A. Institute work practices such as reduced idling, fitting equipment with residential mufflers. A 5 dB drop in overall sound levels is assumed.
 - B. Utilize a smaller and modernized HDD rig compared to what is assumed in the modelling.
 - C. Install sound barrier walls between the entry pit and NSAs or a barrier wall between the exit pit and NSA, whichever is closest.
 - D. Install sound barrier walls between entry and exit pits and NSAs.

For options C and D, the minimum noise barrier wall height is 20 feet with a minimum surface density of 2-4 lb/ft².

Resource Report 10

Alternatives



Resource Report No. 10

Alternatives

**Ventura to Farmington A-Line Abandonment and Capacity Replacement Project
and Northern Lights 2027 Expansion Project**

FERC Docket No. CP26-____-000

Volume I - Public

February 2026

**RESOURCE REPORT NO. 10 – ALTERNATIVES
 SUMMARY OF FILING INFORMATION**

MINIMUM REQUIREMENTS	LOCATION ADDRESSED
Address the “no action” alternative. (§ 380.12(I)(1))	Section 10.1
For large projects, address the effect of energy conservation or energy alternatives to the project. (§ 380.12(I)(1))	Sections 10.2 and 10.3
Identify system alternatives considered during the identification of the project and provide the rationale for rejecting each alternative. (§ 380.12(I)(1))	Section 10.4
Identify major and minor route alternatives considered to avoid impact on sensitive environmental areas (for example, wetlands, parks, or residences) and provide sufficient comparative data to justify the selection of the proposed route. (§ 380.12(I)(2)(ii))	Section 10.5
Identify alternative sites considered for the location of major new aboveground facilities and provide sufficient comparative data to justify the selection of the proposed site. (§ 380.12(I)(2)(ii))	Section 10.6
ADDITIONAL INFORMATION	
Ensure that project objectives that serve as the basis for evaluating alternatives are consistent with the purpose and need discussion in Resource Report 1.	Section 10.0
Identify and evaluate alternatives identified by stakeholders.	Not applicable
Clearly identify and compare the corresponding segments of route alternatives and route variations with the segments of the proposed route that they would replace if adopted.	Not applicable

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Abbreviations and Acronyms

A-line	Northern Natural Gas’ 16-inch-diameter M500 A Mainline
D-line	Northern Natural Gas’ 30-inch-diameter M500 D Mainline
E-line	Northern Natural Gas’ 30-inch-diameter M500 E Mainline
FERC	Federal Energy Regulatory Commission
HDD	horizontal directional drill
MP	milepost
NL27 Project	Northern Lights 2027 Expansion Project
Northern	Northern Natural Gas
PHMSA	Pipeline and Hazardous Materials Administration
Projects	Ventura to Farmington A-Line Abandonment and Capacity Replacement Project and Northern Lights 2027 Expansion Project
ROW	right of way
V2F Project	Ventura to Farmington A-Line Abandonment and Capacity Replacement Project

10.0 RESOURCE REPORT 10 – ALTERNATIVES

Northern’s application is composed of two discrete projects, the V2F Project and the NL27 Project. The two Projects will be built concurrently, and Northern has combined the two Projects into a single Section 7 application due to their geographic overlap and interdependence. Analysis and impacts are generally discussed separately for each Project throughout the environmental report

Resource Report 10 describes the alternatives that were evaluated for Northern’s V2F and NL27 Projects, including a no-action alternative, energy conservation alternative, alternative energy sources, pipeline system alternatives, and route alternatives. These alternatives were evaluated to determine whether they will be reasonable and environmentally preferable to the proposed action. The following evaluation criteria were used in this analysis for both Projects:

- Does the alternative have the ability to meet the Project’s objectives?
- Is the alternative technically and economically feasible and practical?
- Does the alternative offer a substantial environmental advantage over the proposed Project?

Northern owns and operates a natural gas transmission pipeline system, including pipeline and associated aboveground facilities in Minnesota and Iowa. Northern is filing an application with FERC pursuant to section 7 of the Natural Gas Act. The V2F Project involves isolation and abandonment in-place of approximately 105.76 miles of 16-inch-diameter pipeline on Northern’s M500 A and 25.35 miles of 16-inch-diameter M500 J pipeline systems (collectively referred to as the A-line) from Ventura, Iowa, to Farmington, Minnesota. To replace the capacity, Northern will construct three new pipeline extensions consisting of approximately 17.88 miles of 36-inch- and 30-inch-diameter pipelines and associated aboveground appurtenances in Freeborn, Steele and Dakota counties, Minnesota.

The NL27 Project consists of the installation of ten pipeline extensions totaling 28.43 miles, a compressor station uprate, and associated aboveground appurtenances in Minnesota for firm transportation requirements associated with Northern’s customers. The NL27 Project is in Freeborn, Steele, Scott, Carver, Martin, Stearns, Jackson, Watonwan, Isanti, Morrison, and Washington counties, Minnesota.

Since a majority of the alternatives described in Resource Report 10 occur on a state-wide or regional level, the two Projects are analyzed collectively, except where otherwise noted. Tables 10.0-1 and 10.0-2 provide a list of both Project components along with their associated Minnesota or Iowa counties.

Table 10.0-1 V2F Project Facilities and Location

Component	Project Facility	Facility Description	County, State
Lake Mills M500 E-line	8.29-mile pipeline	36-inch-diameter extension	Freeborn, MN
	Lake Mills compressor station	Temporary compression site	Worth, IA
Albert Lea M500 E-line	2.09-mile pipeline	36-inch-diameter extension	Steele, MN
	Owatonna compressor station	Temporary compression site	Steele, MN

Component	Project Facility	Facility Description	County, State
Faribault M500 D-line	7.50-mile pipeline	30-inch-diameter extension	Dakota, MN
	Northfield #1	Temporary compression site	Dakota, MN
A-line Abandonment	Ventura compressor station	Pipeline disconnect site	Hancock, IA
	Farmington compressor station	Pipeline disconnect site	Dakota, MN
	La Crosse BL MNB73201 launcher /ABA05	Temporary compression site	Freeborn, MN

Table 10.0-2 NL27 Project Facilities and Location

Component	Project Facility	Facility Description	County, State
Lake Mills M500 E-line	2.32-mile pipeline	36-inch-diameter extension	Freeborn, MN
Albert Lea M500 E-line	3.42-mile pipeline	36-inch-diameter extension	Steele, MN
Willmar 3rd Branch Line Upstream	1.78-mile pipeline	24-inch-diameter extension	Scott, MN
Willmar 3rd Branch Line Downstream	4.78-mile pipeline	24-inch-diameter extension	Carver, MN
Welcome 2nd Line	1.24-mile pipeline	16-inch-diameter extension	Martin, MN
Paynesville 2nd Branch Line	2.45-mile pipeline	4-inch-diameter extension	Stearns, MN
Worthington 2nd Branch Line	2.17-mile pipeline	8-inch-diameter extension	Jackson, MN
Springfield 2nd Branch Line	7.40-mile pipeline	8-inch-diameter extension	Watonwan, MN
Minnesota Interconnect 2nd Branch Line	1.59-mile pipeline	12-inch-diameter extension	Isanti, MN
Alexandria 2nd Branch Line	1.28-mile pipeline	8-inch-diameter extension	Morrison, MN
Aboveground Facilities			
Hugo Compressor Station Uprate	Hugo compressor station	Turbine switch for newer model with increase of 700 horsepower	Washington, MN

The stated objectives of the V2F Project are to abandon sections of the A-line and to construct the three pipeline extensions to ensure that Northern is capable of meeting gas transportation requirements and continuing to provide reliable and safe gas deliveries throughout its market area.

The NL27 Project objective is to meet gas transportation requirements and continue to provide reliable and safe gas deliveries throughout its market area by extending ten pipelines throughout Northern’s market area. Therefore, a preferable alternative must be able to meet these objectives or provide an equal volume of natural gas to Northern’s customers. An alternative that does not meet this objective cannot be considered a reasonable alternative and is not considered in our

evaluation. The exception is the No-Action Alternative, which is required to be evaluated under the National Environmental Policy Act.

Technically practical alternatives must be able to meet each Project objective using proven construction methods. An alternative that will require the use of a new or unique construction method may not be technically practical because the required technology is experimental or unproven. Such an alternative, with certain exceptions, cannot be considered a reasonable alternative and is not considered in this evaluation. Economically practical alternatives will result in an action that generally maintains the price competitive nature of the action. An alternative that renders the action too expensive to implement cannot be considered a reasonable alternative and is not considered in this evaluation.

To determine if an alternative provides a significant environmental advantage, the impacts of the alternative must be compared to the impacts of both Projects on each resource. An alternative that results in equal or minor environmental benefit is typically not incorporated into the Projects' respective plans because the alternative merely shifts the impacts from one area and/or set of resources to another area and/or set of resources.

10.1 No-Action Alternative

V2F Project

Under the No-Action Alternative, Northern would not abandon the A-line in place and would not construct the three pipeline extensions and associated aboveground appurtenances for the V2F Project.

On August 25, 2016, Northern experienced a pipeline rupture in Lincoln County, Kansas, on its M640A mainline, resulting in a Department of Transportation, PHMSA Corrective Action Order. The Order required Northern to reduce the pressure on a segment of the A-line and conduct remedial measures such as hydrostatic pressure tests, in-line inspections, and close-interval surveys to eliminate the pressure restriction placed on the affected segment. These activities would have environmental impacts associated with ground disturbance that would likely exceed the impacts associated with the V2F Project. Northern identified abandonment of the A-line as the remediation alternative in the Remedial Work Plan submitted to the PHMSA, Southwest Region, April 17, 2017, in response to the Corrective Action Order CPF No. 4-2016-1010H.

NL27 Project

Under the no-action alternative, Northern would not construct any component of the NL27 Project and consequently would be unable to meet the natural gas requirements of its customers. The customers, however, would still require additional natural gas transportation capacity to meet residential and commercial growth demands. This includes the delivery of natural gas to heat homes and businesses, as well as supplying natural gas for appliance and machinery operation. The Project is designed to optimize the placement of facilities to meet customer needs.

If no action is taken by Northern, other natural gas transmission companies would most likely be required to construct new facilities to meet the requirements for additional capacity. This action would result in similar or greater environmental impact in another area but would not eliminate the impact. The no-action alternative was found not to be a feasible alternative for either purpose.

Because the pipeline capacity is needed to support current customer requirements, and because potential environmental impacts and costs incurred with continued operation of the A-line are unnecessary and unreasonable, Northern found the No-Action Alternative to be infeasible for both Projects.

10.2 Energy Conservation

Energy conservation reduces the need for natural gas and other energy resources. Energy conservation is not considered a viable alternative to both Projects because the entire volume of the natural gas product delivered as a result of the Projects are subscribed by Northern’s customers to meet residential and commercial growth demands in spite of on-going conservation efforts.

10.3 Energy Alternatives

Various energy generating sources were considered as alternatives for both Projects, including geothermal resources; hydroelectric power and wind generation; solar power; biomass resources; nuclear power; and petroleum and coal-based energy. Because the purpose of the Projects is to abandon portions of the existing A-line, construct new pipeline extensions, and expand existing pipeline segments in order to maintain a consistent delivery capacity in Northern’s system, these alternative energy generating sources are not feasible alternatives to the Projects.

10.4 System Alternatives

System alternatives can include looping or new pipelines along existing ROW, alternative pipe diameters or compression scenarios, or alternative placement of pipeline loop that may avoid sensitive resource areas. Northern evaluated several system alternatives that could meet the objectives of both Projects but would utilize a different existing natural gas pipeline system or a different configuration of Northern's pipeline facilities. Northern evaluated the following system alternatives:

V2F Project

- **Alternative D1:** This alternative includes installation of 1.67 miles of Lake Mills M500 E 36-inch-diameter pipeline, 8.37 miles of Albert Lea M500 E 36-inch-diameter pipeline, 7.10 miles of Faribault M500 D 30-inch-diameter pipeline, and a Faribault Unit 1 compressor restage. This alternative has similar total install length to the Project but requires additional compression and compressor station modifications to create the pressure differential needed to operate at a higher pressure to maintain operational capacity.
- **Alternative R:** This alternative includes a “like-for-like” replacement of the M500 A-line to be abandoned with 105.76 miles of new 16-inch-diameter pipeline. This alternative significantly increases cost and environmental impact along with increased impacts to landowners with limited operational advantages over the Project. As with Alternative D1, Alternative R requires additional compression and compressor station modifications to create the pressure differential needed to operate at a higher pressure to maintain operational capacity.
- **Alternative E1:** This alternative includes installation of 4.79 miles of Lake Mills M500 E 36-inch-diameter pipeline, 7.45 miles of Albert Lea M500 E 36-inch-diameter pipeline, 1.87 miles of Faribault M500 D 30-inch-diameter pipeline, 3.50 miles of Faribault M500 E 24-inch-diameter pipeline (starting at the end of the current M500 E-line/end of Project

Faribault D loop), and a Faribault Unit 1 compressor restage. This alternative has similar total install length to the Project but requires additional compression and compressor station modifications to create the pressure differential needed to operate at a higher pressure to maintain operational capacity.

- **Alternative LM:** This alternative includes installation of a new 15,900 horsepower turbine at the Lake Mills compressor station, 2.07 miles of Albert Lea M500 E 36-inch-diameter pipeline, and 7.10 miles of Faribault M500 D 30-inch-diameter pipeline. This alternative avoids eight miles of upstream loop by adding a compressor unit at the Lake Mills compressor station. This alternative was excluded since it would increase the Ventura North fuel consumption by approximately 5% at design throughput.

The pipeline components for the V2F Project were selected to minimize impacts on environmental resources and landowners by paralleling existing lines.

NL27 Project

Northern evaluated several system alternatives for the NL27 Project. The proposed Project includes the pipeline components that were selected to minimize impacts to environmental resources and landowners by paralleling existing pipelines. Further, Northern selected pipeline routes were the shortest and most effective at meeting the proposed natural gas volumes at the various receipt points. Northern did not evaluate pipeline systems owned by others as there are no other natural gas pipelines operating within a reasonable distance of both Project areas.

10.5 Route Alternatives

The goal of the route selection analysis for the proposed three pipeline extensions on the V2F Project and ten pipeline expansions on the NL27 Project were to identify alignments that represent a minimal and acceptable level of environmental impact coupled with attainment of the Projects goals of maintaining Northern’s delivery capacity. Northern sought to identify routes that utilize existing easements, fit within their multiple line rights, and maximize co-location.

To this end, Northern has completed the following:

- Identified technical requirements
- Developed routing criteria
- Identified potential routing alternatives
- Evaluated the potential environmental impacts of each alternative route
- Evaluated routing alternatives against routing criteria

Paramount in the development of routing criteria is the proximity of the proposed route to existing utility infrastructure. Ground reconnaissance, aerial photography and National Wetland Inventory maps were used to study routing alternatives. The intent of the evaluation is to identify the most environmentally sound and efficient route and the route with the least impact on landowners and the least adverse impact on the environment.

A set of preliminary routes was initially developed and screened with respect to the following parameters.

- Use of existing corridors and minimization of the need to create new corridors
- Potential impacts on cultural and environmental resources

- Land use concerns
- Proximity to residential/congested areas
- Engineering and construction criteria
- Operation and maintenance considerations
- Supporting infrastructure

During the design phase, Northern evaluated two route alternatives for the V2F Project that varied from the preliminary routes; both on the Faribault M500 D-line. A description of the route alternatives is provided below. Northern did not consider route alternatives for the Lake Mills M500 E-line or the Albert Lea M500 E-line for the V2F Project as the proposed routes parallel existing pipelines with generally a 25-foot-offset. Figures 10-1 and 10-2 depict the two V2F route alternatives.

Northern also evaluated six route alternatives for the NL27 Project that varied from the preliminary routes; two for the Wilmar 3rd branch line downstream, two for the Paynesville 2nd branch line, one for the Worthington 2nd branch line, and one for the Alexandria 2nd branch line. A description of the route alternatives are provided below. Northern did not consider route alternatives for the remaining lines for the NL27 Project as the proposed routes parallel existing pipelines with generally a 25-foot-offset. Figures 10-3 through 10-8 depict the six NL27 route alternatives.

V2F Project

Route Alternative 1 Faribault M500 D-line

Between MP 99.85 and MP 101.43 on the Faribault M500 D-line, Northern’s original route followed the west side of Galaxie Avenue to utilize a mainline block valve that was proposed along Garrett Avenue. However, after an evaluation of land use along the proposed route, Northern shifted its centerline to the east side of Galaxie Avenue to avoid impacting a horse ranch and multiple associated paddocks and generally parallel Northern’s other pipelines in the area.

Route Alternative 2 Faribault M500 D-line

Between MP 101.82 and MP 102.22 on the Faribault M500 D-line, Northern evaluated a route alternative for a Canadian Pacific Kansas City railroad crossing. Based on past project experience, Canadian Pacific Kansas City has specific design and crossing depth requirements. The original route did not have enough space for an HDD pullback. The geotechnical information at the original crossing location also indicated the presence of shallow bedrock, which increases the difficulty for an HDD to meet the minimum depth requirements under the railroad without casing. The proposed railroad crossing was shifted approximately 3,000 feet south to an area that has no steep side slopes; Northern also converted the crossing to an auger bore to obtain the depth and crossing angle required by the railroad. Moving the crossing location south also allowed Northern to eliminate crossing its existing pipelines twice in a short distance and better parallel its existing lines.

NL27 Project

Route Alternative 1 Willmar 3rd branch line downstream

Between MP 9.30 and MP 9.70 on the Willmar 3rd branch line downstream, Northern’s original route followed the existing line. However, after an evaluation of land use along the proposed route, Northern shifted its centerline to the north to avoid impacting 0.2 mile of forested land and minimize tree clearing.

Route Alternative 2 Willmar 3rd branch line downstream

At MP 9.90 to the terminus on the Willmar 3rd branch line downstream, Northern implemented a reroute to eliminate impacts to wetlands and landowners and minimize constructability concerns with ROW with limited access points.

Route Alternative 3 Paynesville 2nd branch line

Between MP 0.84 and MP 1.32 on the Paynesville 2nd branch line, Northern's original route followed the north side of Highway 23 to avoid tree clearing. However, after an evaluation of land use along the proposed route, Northern shifted its centerline to the south side of Highway 23 to avoid impacting a Minnesota Department of Transportation newly constructed stormwater pond and associated state road ROW. The revised route stays south of Highway 23 for a longer distance and generally parallels Northern's other pipeline in the area.

Route Alternative 4 Paynesville 2nd branch line

Between MP 0.00 and MP 0.80 on the Paynesville 2nd branch line, Northern evaluated a route alternative for a 2,800-foot HDD that crossed a large wetland complex and Kolling Creek. The original route did not have enough space for an HDD pullback. General soils information for the original crossing location also indicated a low factor of safety (which corresponds probability of an inadvertent return in the wetland or creek during the HDD. Moving the proposed pipeline centerline south also allowed Northern to minimize the length of the HDD and soil conditions indicate a higher factor of safety at the current Kolling Creek crossing.

Route Alternative 5 Worthington 2nd branch line

Between MP 20.55 and MP 20.90 on the Worthington 2nd branch line, Northern's original route paralleled its existing pipeline. However, after an evaluation of the proposed route, Northern located a potentially National Register of Historic Places-eligible cultural site (an old post office) within its proposed centerline. Following a recommendation from its cultural resources subconsultant, Northern shifted the centerline approximately 365 feet to the south to avoid the cultural resource. The deviation is primarily isolated to one landowner.

Route Alternative 6 Alexandria 2nd branch line

Between MP 16.80 and MP 18.07 on the Alexandria 2nd branch line, Northern evaluated a greenfield route alternative for a 2,200-foot HDD that crossed a large wetland complex and deviated a maximum of 0.35 mile to the north from its existing pipeline. After completion of the biological field work, Northern determined the proposed route that paralleled its existing line had lesser environmental impacts. The proposed route also impacts no new landowners.

10.6 Aboveground Site Alternatives

V2F Project

Due to the minimal length of the V2F Project, the only aboveground appurtenances that will be required are installation of two new block valves inside existing facilities on the Lake Mills M500 E-line and Faribault M500 E-line. No other aboveground facilities are proposed for the V2F Project.

Aboveground site alternatives were not considered for the pipeline appurtenant facilities. The proposed facilities are located within existing aboveground facilities.

NL27 Project

Northern elected to uprate the Hugo compressor station to utilize an existing facility and not impact new landowners with a pipeline installation. Aboveground site alternatives were not considered for the proposed uprate at the Hugo compressor station and pipeline appurtenant facilities. The proposed NL27 Project facilities are either located within or adjacent to existing aboveground facilities or are located within the pipeline construction footprint, as is required for pipeline tie-ins locations.

10.7 Temporary Compression Site Alternatives

Northern selected the three temporary compression sites for the V2F Project’s E-line and D-line on the extensions to minimize the venting required to complete the tie-ins. Northern selected the A-line temporary compression location on the V2F Project to minimize the volume of natural gas venting required for the A-line abandonment. Northern evaluated other potential site alternatives but all would have required increased venting volumes or would not have provided access to the adjacent Northern pipelines that are being accessed.

No temporary compression sites are required for the NL27 Project.

Resource Report 10

Figures

Figure 10-1
Route Alternative 1 – V2F Faribault M500 D-line

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Figure No.

10-1

Title

**Route Alternative1
V2F - Faribault M500 D-Line**

Client/Project

Northern Natural Gas
Ventura to Farmington A-Line Abandonment & Capacity
Replacement Project

17260813

Project Location

Dakota County, Minnesota

Prepared by JM on 2025-10-06

TR by JL on 2025-10-27

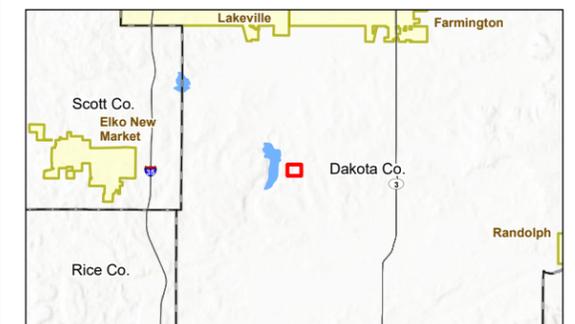
IR by SK on 2026-01-28



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Legend

- Environmental Survey Boundary
- Temporary Workspace
- Extra Temporary Workspace
- Temporary Access Road
- Alternative Route
- Proposed Pipeline
- Mile Post
- HDD
- National Hydrography Dataset
 - Perennial Stream
 - Intermittent Stream
 - Ephemeral Stream
 - Canal/Ditch
 - Waterbody



Notes

1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec, Esri, USCB, USGS, MNDNR
3. Background: 2023 NAIP



Figure 10-2
Route Alternative 2 – V2F Faribault M500 D-line

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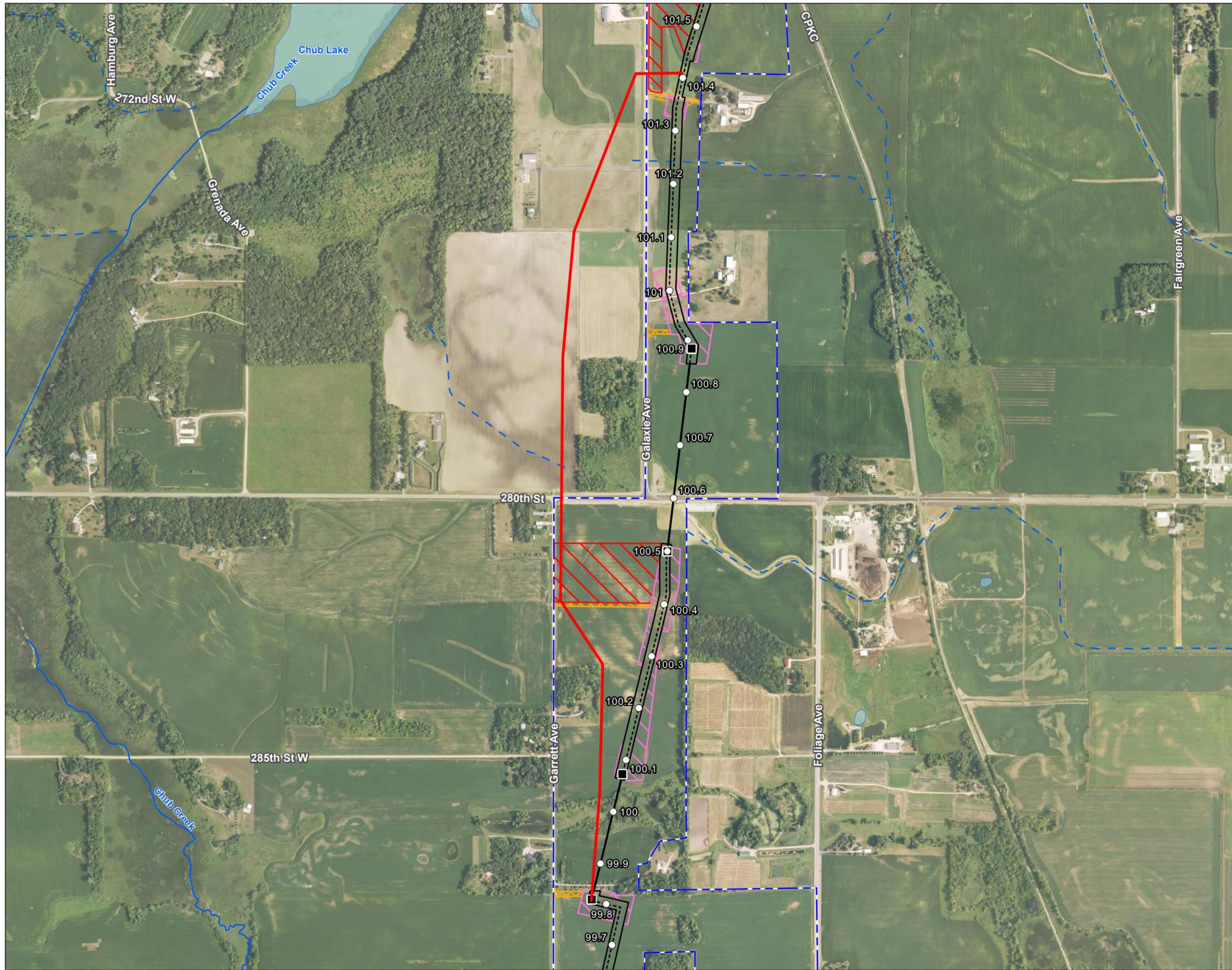
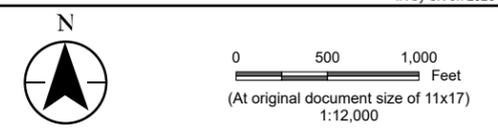


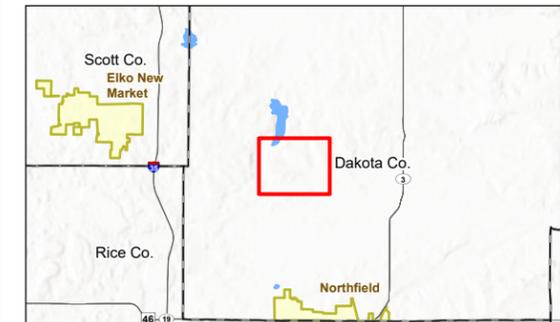
Figure No. 10-2

**Route Alternative 2
V2F - Faribault M500 D-Line**

Client/Project: Northern Natural Gas, Ventura to Farmington A-Line Abandonment & Capacity Replacement Project
Project Location: Dakota County, Minnesota



- Legend**
- Environmental Survey Boundary
 - Existing Lot
 - Temporary Workspace
 - Extra Temporary Workspace
 - Staging Area
 - Temporary Access Road
 - Alternative Route
 - Proposed Pipeline
 - Mile Post
 - HDD
- National Hydrography Dataset**
- Perennial Stream
 - Intermittent Stream
 - Ephemeral Stream
 - Canal/Ditch
 - Waterbody



- Notes**
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, Esri, USCB, USGS, MNDNR
 3. Background: 2023 NAIP

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Figure 10-3
Route Alternative 1 – NL27 Wilmar 3rd Branch Line Downstream

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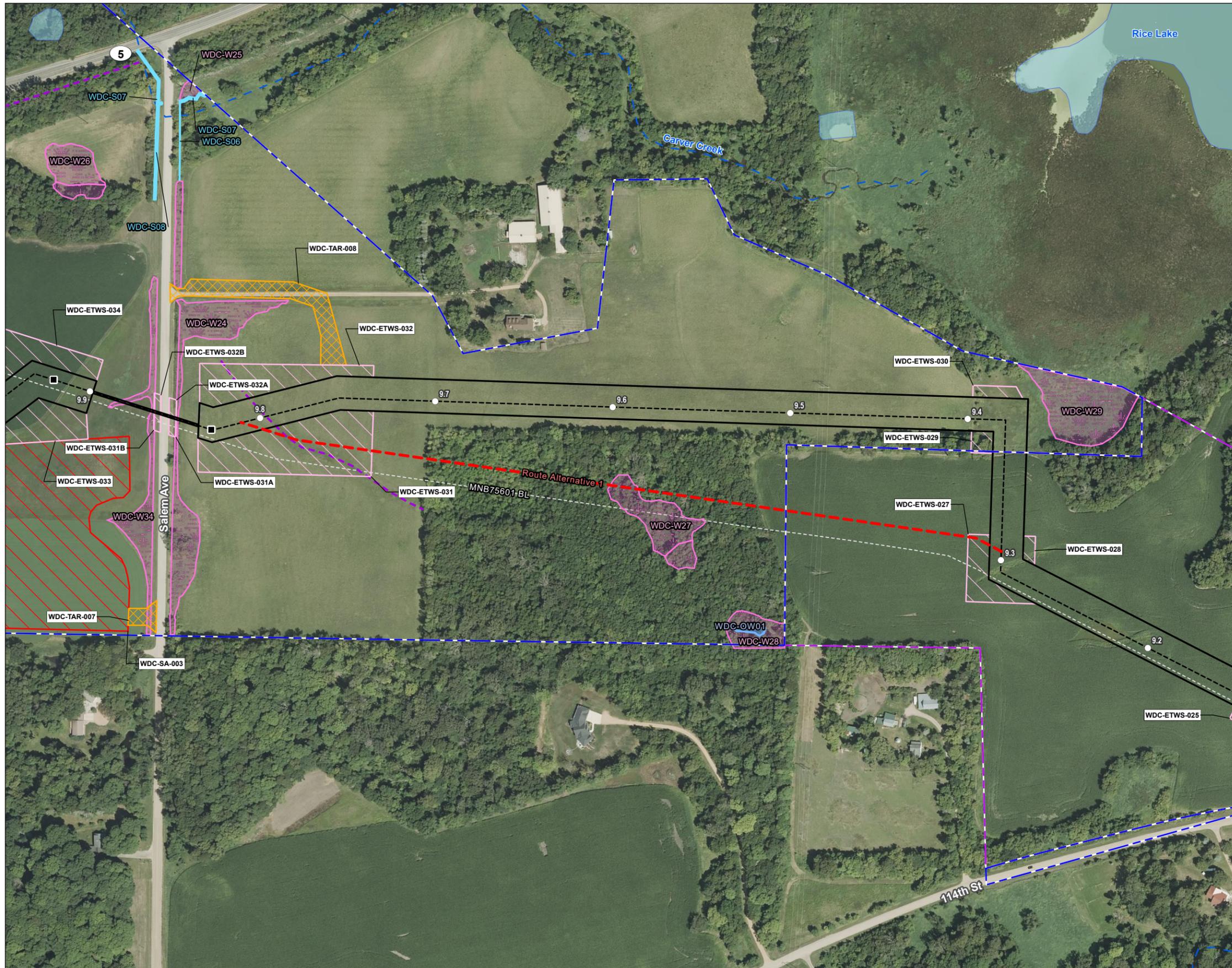
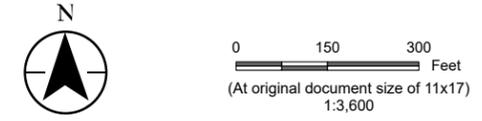
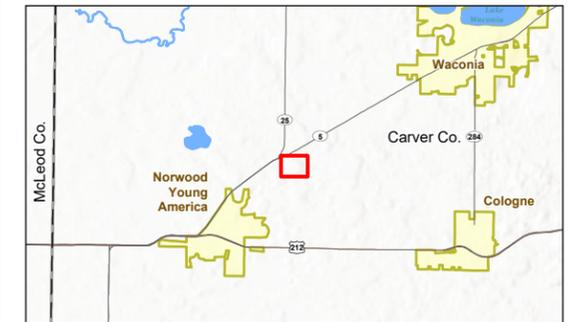


Figure No. **10-3**
 Title **Route Alternative 1
 NL27 - Willmar 3rd Branch Line Downstream**
 Client/Project Northern Natural Gas 172609138
 Northern Lights 2027
 Expansion Project
 Project Location Carver County, Minnesota Prepared by JM on 2025-12-15
 TR by SF on 2026-01-15
 IR by SK on 2026-01-15



- Legend
- Environmental Survey Boundary
 - Environmental Survey Boundary To Be Surveyed
 - Temporary Workspace
 - Extra Temporary Workspace
 - Temporary Access Road
 - Staging Area
 - Proposed Pipeline
 - Existing Pipeline
 - Route Alternative
 - Mile Post
 - HDD
 - Upland Drainage Feature
 - Field Delineated Waterway
 - Field Delineated Waterway
 - Field Delineated Open Water
 - Field Delineated Wetland
 - National Hydrography Dataset
 - Perennial Stream
 - Intermittent Stream
 - Canal/Ditch
 - Waterbody



Notes
 1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, Northern Natural Gas, Esri, USCB, USGS
 3. Background: 2023 NAIP

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Figure 10-4
Route Alternative 2 – NL27 Wilmar 3rd Branch Line Downstream

Figure 10-5
Route Alternative 3 – NL27 Paynesville 2nd Branch Line

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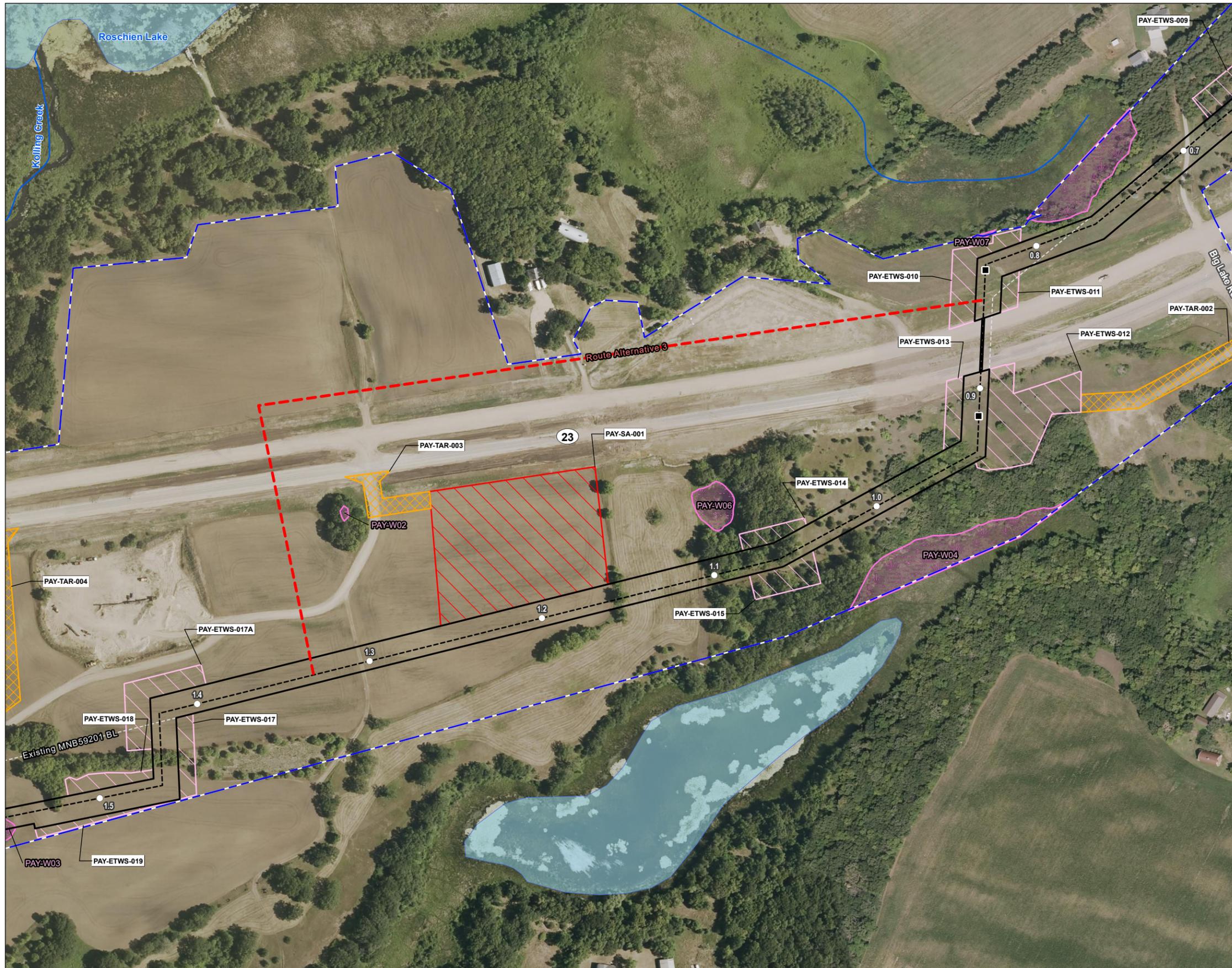
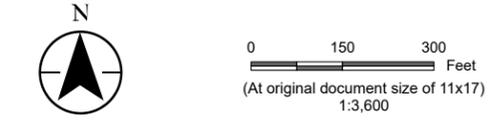
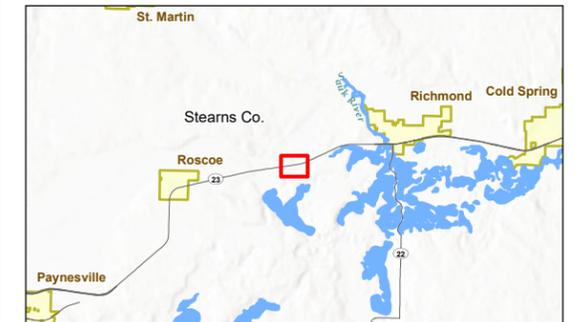


Figure No. **10-5**
 Title **Route Alternative 3
 NL27 - Paynesville 2nd branch line**
 Client/Project Northern Natural Gas 172609138
 Northern Lights 2027
 Expansion Project
 Project Location Stearns County, Minnesota Prepared by JM on 2025-12-15
 TR by SF on 2026-01-15
 IR by SK on 2026-01-15



- Legend
- Environmental Survey Boundary
 - Temporary Workspace
 - Extra Temporary Workspace
 - Temporary Access Road
 - Staging Area
 - Proposed Pipeline
 - Existing Pipeline
 - Route Alternative
 - Mile Post
 - HDD
 - Field Delineated Wetland
 - National Hydrography Dataset
 - Perennial Stream
 - Intermittent Stream
 - Canal/Ditch
 - Waterbody



Notes
 1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, Northern Natural Gas, Esri, USCB, USGS
 3. Background: 2023 NAIP

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Figure 10-6
Route Alternative 4 – NL27 Paynesville 2nd Branch Line

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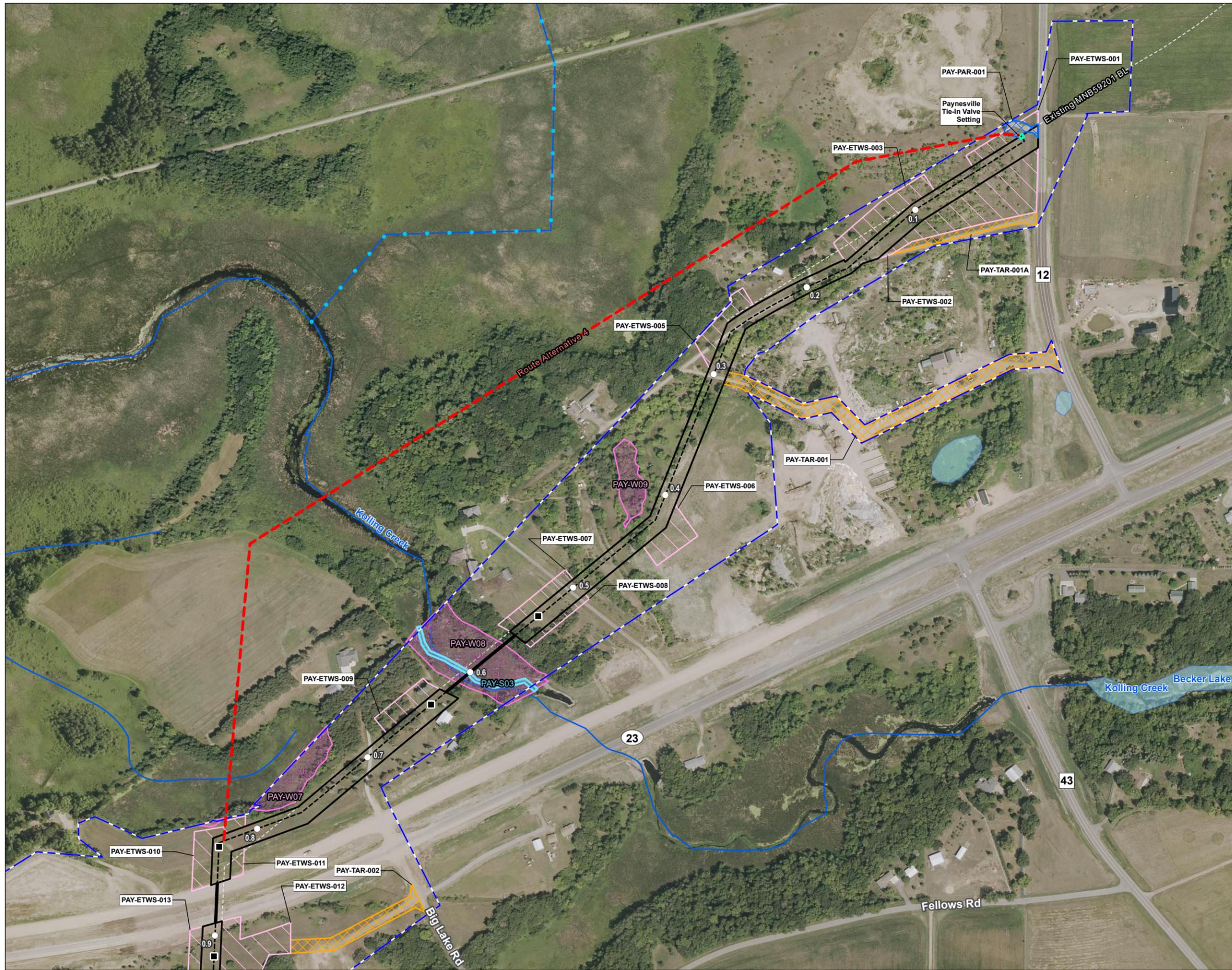
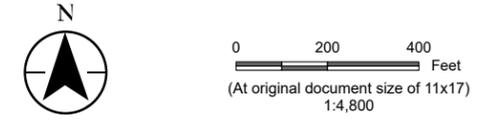
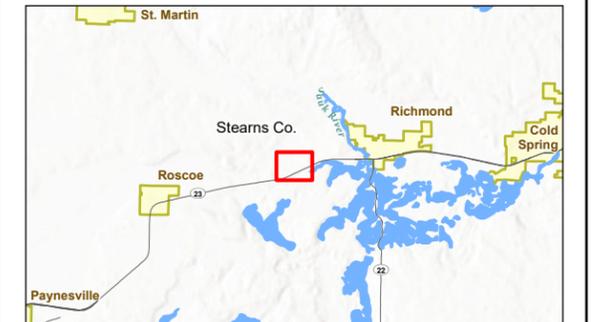


Figure No. **10-6**
 Title **Route Alternative 4
 NL27 - Paynesville 2nd branch line**
 Client/Project Northern Natural Gas
 Northern Lights 2027
 Expansion Project 172609138
 Project Location Stearns County, Minnesota Prepared by JM on 2025-12-15
 TR by SF on 2026-01-15
 IR by SK on 2026-01-15



- Legend
- Environmental Survey Boundary
 - Proposed Facility
 - Permanent Access Road
 - Temporary Workspace
 - Extra Temporary Workspace
 - Temporary Access Road
 - Proposed Pipeline
 - Existing Pipeline
 - Route Alternative
 - Mile Post
 - HDD
 - Field Delineated Waterway
 - Field Delineated Wetland
 - National Hydrography Dataset
 - Perennial Stream
 - Intermittent Stream
 - Canal/Ditch
 - Waterbody



Notes
 1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, Northern Natural Gas, Esri, USCB, USGS
 3. Background: 2023 NAIP

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Figure 10-7
Route Alternative 5 – NL27 Worthington 2nd Branch Line

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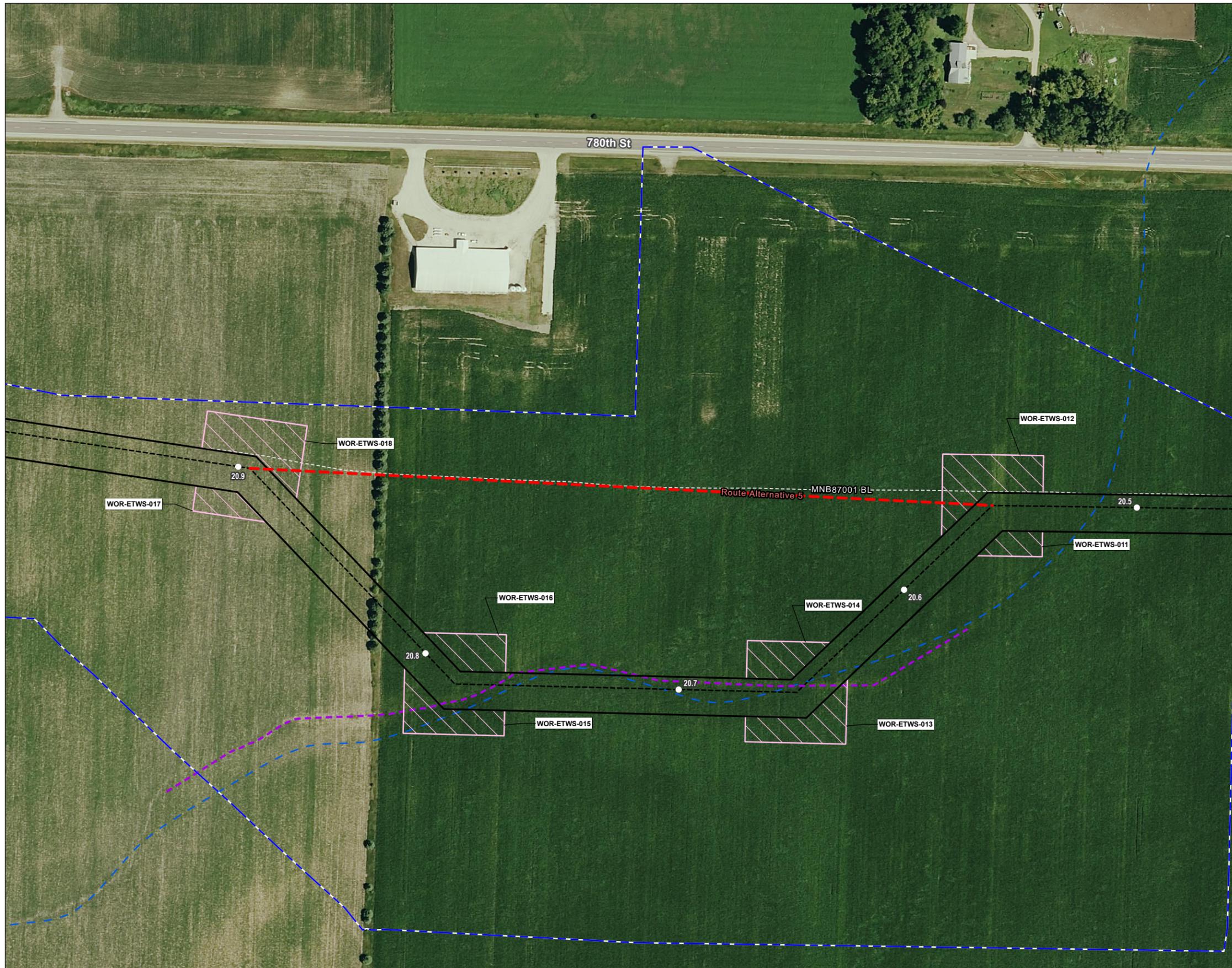


Figure No. 10-7

Title
**Route Alternative 5
NL27 - Worthington 2nd branch line**

Client/Project Northern Natural Gas 172609138
Northern Lights 2027
Expansion Project

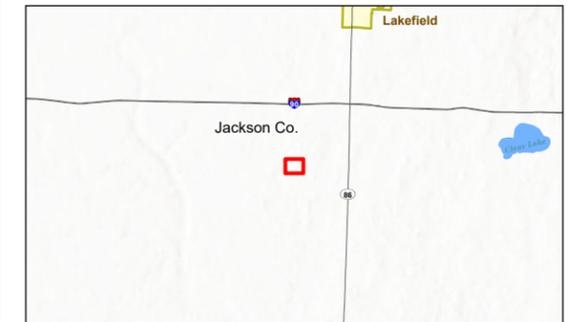
Project Location Jackson County, Minnesota Prepared by JM on 2025-12-15
TR by SF on 2026-01-15
IR by SK on 2026-01-15



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Legend

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- Temporary Workspace
- Extra Temporary Workspace
- Proposed Pipeline
- Existing Pipeline
- Route Alternative
- Mile Post
- Upland Drainage Feature
- National Hydrography Dataset
 - Perennial Stream
 - Intermittent Stream
 - Canal/Ditch
 - Waterbody



- Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
 2. Data Sources: Stantec, Northern Natural Gas, Esri, USCB, USGS
 3. Background: 2023 NAIP



Figure 10-8
Route Alternative 6 – NL27 Alexandria 2nd Branch Line

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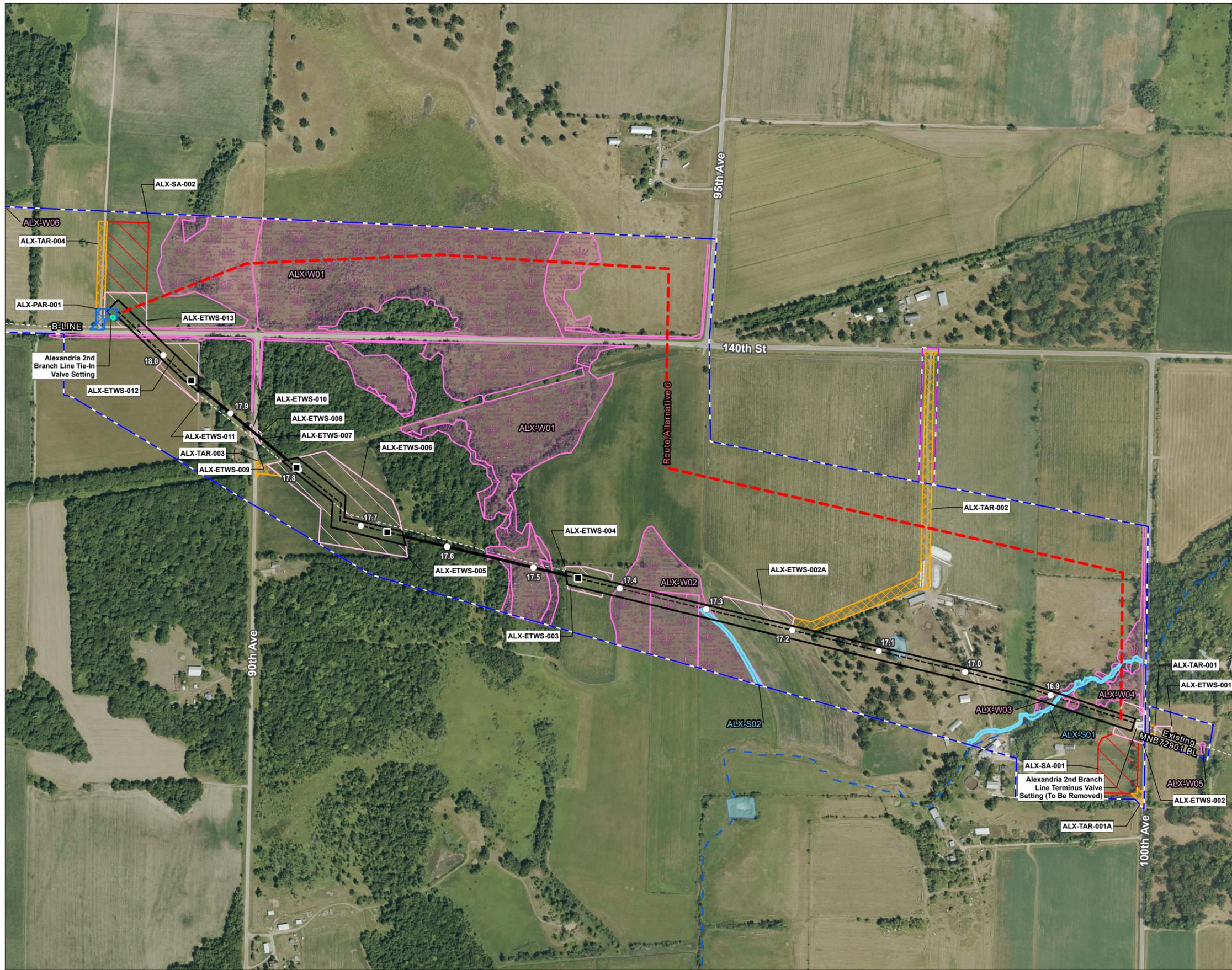


Figure No.

10-8

Title

Route Alternative 6
NL27 - Alexandria 2nd branch line

Client/Project
Northern Natural Gas
Northern Lights 2027
Expansion Project

172609138

Project Location
Morrison County, Minnesota

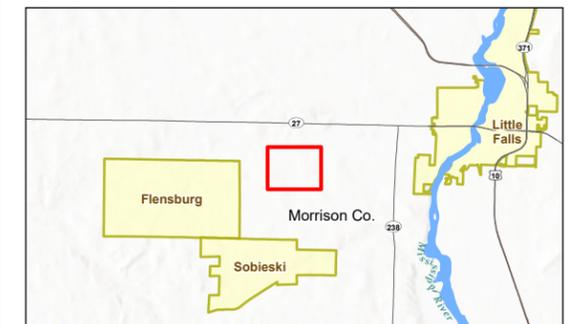
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Legend

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- Permanent Access Road
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- Temporary Access Road
- Staging Area
- Proposed Pipeline
- Existing Pipeline
- Route Alternative
- Mile Post
- HDD
- Field Delineated Waterway
- Field Delineated Wetland
- National Hydrography Dataset
- Perennial Stream
- Intermittent Stream
- Canal/Ditch
- Waterbody



Notes

1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec, Northern Natural Gas, Esri, USCB, USGS
3. Background: 2023 NAIP



Resource Report 11

Reliability and Safety



Resource Report No. 11

Reliability and Safety

**Ventura to Farmington A-Line Abandonment and Capacity Replacement Project and
Northern Lights 2027 Expansion Project**

FERC Docket No. CP26-____-000

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**RESOURCE REPORT 11 – RELIABILITY AND SAFETY
 SUMMARY OF FILING INFORMATION**

MINIMUM REQUIREMENT	LOCATION ADDRESSED
Describe how the project facilities would be designed, constructed, operated, and maintained to minimize potential hazard to the public from the failure of project components as a result of accidents or natural catastrophes. (§ 380.12(m))	Sections 11.4, 11.5, and 11.6
ADDITIONAL INFORMATION	
Identify by milepost and in table form, all U.S. Department of Transportation class locations and areas of concern (for example, high consequence areas), as defined in Title 49 CFR § 192.903, for the proposed route, alternative routes, and compressor stations and explain the basis for high consequence area identification.	Sections 11.3.1 and 11.3.2
Discuss the outcome of the consultations with local fire departments and emergency response agencies relative to whether additional equipment, training, and support are needed in the project area.	Section 11.6.5

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Abbreviations and Acronyms

A-line	Northern Natural Gas’s 16-inch-diameter M500 A Mainline
API	American Petroleum Institute
CFR	Code of Federal Regulations
CP	cathodic protection
D-line	Northern Natural Gas’ 30-inch-diameter M500 D line
E-line	Northern Natural Gas’ 36-inch-diameter M500 E line
DOT	Department of Transportation
ETWS	Extra temporary workspace
FERC	Federal Energy Regulatory Commission
HCA	high consequence area
HDD	Horizontal directional drill
IDOT	Iowa Department of Transportation
LEPC	local emergency planning committees
MCA	Moderate consequence area
MDOT	Minnesota Department of Transportation
MP	milepost
NL27 Project	Northern Lights 2027 Expansion Project
Northern	Northern Natural Gas
OCC	Northern’s Operations Communication Center
OQP	Operator Qualification Plan
OSHA	Occupational Safety and Health Administration
PHMSA	Pipeline and Hazardous Materials Safety Administration
PIR	potential impact radius
Projects	Ventura to Farmington A-Line Abandonment and Capacity Replacement Project and Northern Lights 2027 Expansion Project
RMV	rupture mitigation valve
ROW	right of way
SCADA	supervisory control and data acquisition
V2F Project	Ventura to Farmington A-Line Abandonment and Capacity Replacement Project

11.0 RESOURCE REPORT 11 – RELIABILITY AND SAFETY

Northern’s application is composed of two discrete projects, the V2F Project and the NL27 Project. The two Projects will be built concurrently, and Northern has combined the two Projects into a single Section 7 application due to their geographic overlap and interdependence. Analysis and impacts are generally discussed separately for each Project throughout the environmental report.

Resource Report 11 describes the reliability and safety aspects of Northern’s V2F and NL27 Projects. The report addresses the potential hazard to the public from failure of facility components resulting from accidents or natural catastrophes, how these events may affect reliability, and what procedures and design features have been used to reduce potential hazards.

Northern owns and operates a natural gas transmission pipeline system, including pipeline and associated aboveground facilities in Minnesota and Iowa. Northern is filing an application with FERC pursuant to Section 7 of the Natural Gas Act. The V2F Project involves isolation and abandonment in-place of approximately 105.76 miles of 16-inch-diameter pipeline on Northern’s M500 A and 25.35 miles of 16-inch-diameter M500 J pipeline systems (collectively referred to as the A-line) from Ventura, Iowa, to Farmington, Minnesota. To replace the capacity, Northern will construct three new pipeline extensions consisting of approximately 17.88 miles of 36-inch- and 30-inch-diameter pipelines and associated aboveground appurtenances in Freeborn, Steele and Dakota counties, Minnesota.

The NL27 Project consists of the installation of ten pipeline extensions totaling 28.43 miles, a compressor station uprate, and associated aboveground appurtenances in Minnesota for firm transportation requirements associated with Northern’s customers. The NL27 Project is in Freeborn, Steele, Scott, Carver, Martin, Stearns, Jackson, Watonwan, Isanti, Morrison, and Washington counties, Minnesota.

Since a majority of the reliability and safety items described in Resource Report 11 occur on a state-wide or regional level, the two Projects are analyzed collectively, except where otherwise noted. Tables 11.0-1 and 11.0-2 provide a list of both Project components along with their associated Minnesota or Iowa counties.

Table 11.0-1 V2F Project Facilities and Location

Component	Project Facility	Facility Description	County, State
Lake Mills M500 E-line	8.29-mile pipeline	36-inch-diameter extension	Freeborn, MN
	Lake Mills compressor station	Temporary compression site	Worth, IA
Albert Lea M500 E-line	2.09-mile pipeline	36-inch-diameter extension	Steele, MN
	Owatonna compressor station	Temporary compression site	Steele, MN
Faribault M500 D-line	7.50-mile pipeline	30-inch-diameter extension	Dakota, MN
	Northfield #1	Temporary compression site	Dakota, MN

Component	Project Facility	Facility Description	County, State
A-line Abandonment	Ventura compressor station	Pipeline disconnect site	Hancock, IA
	Farmington compressor station	Pipeline disconnect site	Dakota, MN
	La Crosse BL MNB73201 launcher /ABA05	Temporary compression site	Freeborn, MN

Table 11.0-2 NL27 Project Facilities and Location

Component	Project Facility	Facility Description	County, State
Lake Mills M500 E-line	2.32-mile pipeline	36-inch-diameter extension	Freeborn, MN
Albert Lea M500 E-line	3.42-mile pipeline	36-inch-diameter extension	Steele, MN
Willmar 3rd Branch Line Upstream	1.78-mile pipeline	24-inch-diameter extension	Scott, MN
Willmar 3rd Branch Line Downstream	4.78-mile pipeline	24-inch-diameter extension	Carver, MN
Welcome 2nd Line	1.24-mile pipeline	16-inch-diameter extension	Martin, MN
Paynesville 2nd Branch Line	2.45-mile pipeline	4-inch-diameter extension	Stearns, MN
Worthington 2nd Branch Line	2.17-mile pipeline	8-inch-diameter extension	Jackson, MN
Springfield 2nd Branch Line	7.40-mile pipeline	8-inch-diameter extension	Watonwan, MN
Minnesota Interconnect 2nd Branch Line	1.59-mile pipeline	12-inch-diameter extension	Isanti, MN
Alexandria 2nd Branch Line	1.28-mile pipeline	8-inch-diameter extension	Morrison, MN
Aboveground Facilities			
Hugo Compressor Station Uprate	Hugo compressor station	Turbine switch for newer model with increase of 700 horsepower	Washington, MN

11.1 Hazards

The transportation of natural gas by pipeline potentially generates some risk to the public in the event of an incident and subsequent release of gas. Historically, impacts on public safety from pipeline transportation of natural gas have been directly related to leaks or line breaks, often due to corrosion; leaks or line breaks due to external forces not associated with pipeline operations, including seismic forces and/or damage from third-party excavation near buried pipeline sections; or equipment malfunctions (PHMSA 2025).

The composition of natural gas in interstate pipeline systems can vary depending on the geologic formation where the gas is sourced. The primary component of the natural gas transported in interstate transmission pipelines is methane, a colorless, odorless, and tasteless gas. In Northern’s pipeline system, the volume of methane ranges from 74% to 98%; the volume of ethane ranges from 0% to 13%; and the volume of propane ranges from 0% to 7% (Northern 2025). Isobutane, butane, isopentane, pentane, and other light hydrocarbons each range from 0% to less than 1% of the overall composition of Northern’s natural gas.

Although not chemically toxic, methane is classified as a simple asphyxiant with a slight inhalation hazard. Exposure to high concentrations can result in serious injury or death due to oxygen deficiency. The specific gravity of methane is 0.55, which is lighter than air. This means methane tends to rise at normal atmospheric temperatures and disperses rapidly in the atmosphere. In general, unconfined mixtures of methane in air are not flammable or explosive because of the dilution of the methane by air. However, mixtures of methane in air are flammable at concentrations between 5% and 15% methane by volume. Methane has an ignition temperature above 1,000 degrees Fahrenheit (Northern 2021b). An unconfined mixture of methane and air is not explosive; however, it may ignite and burn if there is an ignition source. A flammable concentration within an enclosed space in the presence of an ignition source can explode. Methane is buoyant at atmospheric temperatures and disperses rapidly in air. Methane would not pool in low-lying areas under normal atmospheric conditions.

Ethane and propane can constitute up to 14% and 7% of natural gas by volume, respectively, in Northern’s pipeline system. Ethane and propane are, generally, not toxic. As with methane, ethane and/or propane are classified as simple asphyxiates, possessing slight inhalation hazards. Mixtures of ethane in air are flammable at concentrations between 3.0% and 12.4% ethane by volume, and mixtures of propane in air are flammable at concentrations between 2.1% and 9.5% propane by volume. Ethane and propane represent a small percentage of the natural gas in Northern’s pipeline system and would constitute a small percentage of an accidental release. Although these compounds are heavier than air and could pool in low lying areas, the pooling effect would be temporary. As with natural gas in general, these compounds would mix and disperse rapidly into the atmosphere during a release under normal atmospheric conditions.

11.2 Pipeline Accident Data

Since 1970, the DOT, PHMSA has collected pipeline incident reports and combined them to provide 20-year trend data to the public. Natural gas pipeline operators have been required to report incidents that involve fatalities, property damage of more than \$50,000, injury requiring in-patient hospitalization, release of gas, or those considered significant by the operator (“significant” incidents). A total of 291 onshore natural gas pipeline transmission incidents meeting these criteria were reported from 2022 through 2024 (PHMSA 2025).

Table 11.2-1 presents the primary causes of reported significant onshore natural gas transmission pipeline incidents, along with the percentage distribution compared to the total number of incidents for the time period from 2022 to 2024 (PHMSA 2025). The most common pipeline incidents reported during 2022 to 2024 were caused by material/weld/equipment failure. Corrosion remains a major concern for gas transmission pipelines. However, the use of an external protective coating and a CP system required on all pipelines installed after July 1971 significantly reduces the rate of failure compared to unprotected or partially protected pipe. Historically, excavation damage was

the most common incident; however, since April 1982, operators and contractors have been required to participate in One Call public utility locate programs. These locate programs have minimized pipeline incidents caused by excavation damage by reducing unauthorized excavation activities near pipelines and allowing authorized excavations to be conducted in a safe manner by locating pipelines and utilities in the excavation area.

Table 11.2-1 Natural Gas Transmission Incidents by Cause ¹

Cause	Number of Incidents – Onshore Transmission 2022	Number of Incidents – Onshore Transmission 2023	Number of Incidents – Onshore Transmission 2024	Percentage of Total for 2024
Corrosion	13	14	10	10.2
Excavation damage	10	9	10	10.2
Incorrect operation	7	7	5	5.0
Equipment failure or material failure of pipe or weld	64	43	55	57.0
Natural force damage	4	6	3	3.0
Other outside force damage	9	3	5	5.4
All other causes	3	1	9	9.2
Total	110	83	97	100

¹ DOT PHMSA Pipeline Incidents, Onshore transmission from 2022 to 2024.

11.3 Safety Standards for Pipelines

The proposed Project pipelines will be designed, constructed, operated, and maintained in accordance with the PHMSA 49 CFR Part 192. The PHMSA regulations in 49 CFR Part 192 specify material selection and qualification, minimum design requirements, operating and maintenance schedules, and protection from internal, external, and atmospheric corrosion. These federal safety standards, together with pipeline integrity management programs and recent advances in pipeline manufacturing, construction, and inspection techniques, minimize the potential for pipeline failure. Pipelines and facilities also will be abandoned in accordance with PHMSA 49 CFR § 192.727.

The construction details for the proposed pipeline abandonments and new pipeline segments for the V2F and NL27 Projects are discussed in Resource Report 1, Section 1.5.

11.3.1 DOT Class Locations

PHMSA regulations in 49 CFR § 192.5 define area classifications based on population density near the pipeline. Areas of higher population face more stringent requirements. A “class location unit” is defined as an area that extends 220 yards (660 feet) on either side of the centerline of any continuous one-mile length of pipeline. The four area classifications are defined as follows.

- Class 1: Location with 10 or fewer buildings intended for human occupancy
- Class 2: Location with more than 10 but less than 46 buildings intended for human occupancy

- Class 3: Location with 46 or more buildings intended for human occupancy or where the pipeline lies within 100 yards of either a building, or small, well-defined outside area (e.g., playground, recreational area, outdoor theater, or place of public assembly) that is occupied by 20 or more people at least 5 days a week for 10 weeks in any 12-month period
- Class 4: Location ends 220 yards from the nearest building with four or more stories above ground or when a cluster of buildings intended for human occupancy requires a Class 2 or 3 location, the class location ends 220 yards from the nearest building in the cluster

Class locations representing more populated areas require higher safety factors in pipeline design, testing, and operation. Pipelines constructed within a Class 1 location must be installed with a minimum depth of cover of 30 inches in normal soil and 18 inches in consolidated rock. Class 2, Class 3, and Class 4 locations, as well as drainage ditches of public roads and railroad crossings, require a minimum cover of 36 inches in normal soil and 24 inches in consolidated rock. Class locations also specify the maximum distance of a specific point on the pipeline and a mainline block valve (e.g., 10.0 miles in Class 1; 7.5 miles in Class 2; 4.0 miles in Class 3; and 2.5 miles in Class 4). Table 11.3-1 and 11.3-2 summarize the existing and design class locations crossed by both Projects pipeline facilities by MP, respectively.

Table 11.3-1 Class Locations for the V2F Project Pipeline Facilities

Beginning MP	Ending MP	Existing Class for Proposed Facilities	Design Class for Proposed Facilities
Lake Mills M500 E-line			
34.20	42.49	Class 1	Class 2
Albert Lea M500 E-line			
1.55	3.64	Class 1	Class 2
Faribault M500 D-line			
97.37	104.87	Class 1	Class 3

Table 11.3-2 Class Locations for the NL27 Project Pipeline Facilities

Beginning MP	Ending MP	Existing Class for Proposed Facilities	Design Class for Proposed Facilities
Lake Mills M500 E-line			
42.49	44.81	Class 1	Class 2
Albert Lea M500 E-line			
3.64	7.06	Class 1	Class 2
Willmar 3rd Branch Line Upstream			
3.35	3.63	Class 1	Class 3
3.63	5.13	Class 2	Class 3
Willmar 3rd Branch Line Downstream			
6.38	11.16	Class 1	Class 3
Welcome 2nd Line			
10.47	11.71	Class 1	Class 3

Beginning MP	Ending MP	Existing Class for Proposed Facilities	Design Class for Proposed Facilities
Paynesville 2nd Branch Line			
0.00	2.45	Class 1	Class 3
Worthington 2nd Branch Line			
19.34	21.51	Class 1	Class 3
Springfield 2nd Branch Line			
13.82	21.22	Class 1	Class 3
Minnesota Interconnect 2nd Branch Line			
17.64	18.07	Class 1	Class 3
18.07	18.58	Class 2	Class 3
18.58	18.61	Class 1	Class 3
18.61	18.88	Class 2	Class 3
18.88	19.15	Class 1	Class 3
19.15	19.23	Class 2	Class 3
Alexandria 2nd Branch Line			
16.80	18.08	Class 1	Class 3

Pipe design regulations for steel pipe are contained in 49 CFR Part 192, Subpart C, section 192.105, and specify a formula for the pipeline’s design pressure. Sections 192.107 through 192.115 contain the components of the design formula, including yield strength, wall thickness, design factor, longitudinal joint factor, and temperature derating factor. Component design will be adjusted based on specific conditions for both Projects.

11.3.2 HCAs and Integrity Management Planning

PHMSA promulgated a rule for pipeline integrity management in high consequence areas for gas transmission pipelines that has been incorporated into 49 CFR Part 192, Subpart O. This rule requires that an integrity management plan be developed to document procedures under which pipeline integrity will be monitored and maintained for those areas where the pipeline traverses’ lands or facilities that are considered HCAs.

PHMSA regulations in 49 CFR § 192.903 identify a formula that is utilized to estimate the distance from a potential explosion at which death, injury, or significant property damage may occur adjacent to natural gas transmission pipelines and associated facilities. This distance is known as the potential impact radius and is defined as the radius of a circle within which potential failure of a pipeline could have significant impact on people or property.

Potential impact circles that contain 20 or more structures intended for human occupancy; buildings housing populations of limited mobility; buildings that would be hard to evacuate (e.g., nursing homes or schools); or buildings and outside areas occupied by more than 20 persons on a

specified minimum number of days each year, are defined as HCAs (PHMSA 2011). Criteria to define an MCA is outlined under PHMSA’s 49 CFR Part 192.3.

Northern has calculated the PIR for all points along both Projects, respectively to determine the presence of HCAs and MCAs. No HCAs will be impacted by either Project. Northern has determined the V2F Project will affect one MCA on the Lake Mills M500 E-line extension from MP 40.6 to 40.8 (the Interstate 90 corridor) while the NL27 Project will affect two MCAs on the Willmar 3rd branch upstream line extension from MP 10.81 to MP 11.06 and from MP 11.61 to MP 11.90.

11.3.3 Pipeline Markers

In accordance with PHMSA regulations in 49 CFR § 192.707, Northern will clearly and frequently mark its pipelines along the ROW, including at intersections with roadways, railroads, and other utilities; waterbody crossings; and other important areas. These markers will alert the public to the general location of the pipeline to help prevent encroachment and potential damage caused by third-party excavation. Markers are typically offset from the physical pipe centerline. Northern participates in state One Call systems to help ensure the safety of anyone excavating near existing pipelines.

Northern will install markers for newly installed pipelines on both Projects and aboveground appurtenances (e.g., block valves inside existing facilities).

11.3.4 Operations, Maintenance and Emergency Planning

Pipeline operating regulations contained in 49 CFR § 192.615, Subpart L, requires each pipeline operator to establish an operation and maintenance plan and an emergency plan that includes procedures to minimize hazards in a natural gas pipeline emergency. Key elements of the plans include the procedures listed below.

- Responding to and managing an emergency incident (i.e., gas leakages, fires, explosions, and natural disasters)
- Establishing and maintaining communication, as well as notifying local fire, police, and public officials, of incidents and coordinating emergency response
- Promptly and effectively responding to emergencies
- Ensuring Northern personnel are properly trained and supplied with the appropriate equipment, tools, and materials for dealing with an emergency
- Protecting and securing life over property when dealing with hazards
- Performing an emergency shutdown of the system when necessary and safely restoring service following outages

Northern will design both the V2F and NL27 pipelines with a 0.6 design factor for the E-lines and with a 0.5 design factor for all other pipeline extensions to protect against future class location changes. Changes in population density near the proposed facilities will be monitored to document that the new facilities meet the appropriate design criteria and safety standards where class locations change. When changes in population density occur, Northern may replace sections of pipe, reduce the operating pressure in the line or take other similar safety measures to achieve the required measure of safety. The new class location also may require an increase in the frequency of inspection.

Northern’s emergency response program and other pipeline safety monitoring program aspects are summarized in Section 11.6.

11.4 Safety Standards for Aboveground Appurtenances

Separate subparts of 49 CFR Part 192 address the design of additional pipeline components, including valves. The proposed V2F Project includes the installation of two block valves inside existing facilities. The proposed NL27 Project requires the relocation of three existing receivers as well as the installation of two new receiver facilities, nine new valve settings, including one new RMV facility; expansion of one block valve setting; and removal of one receiver facility and three existing valve settings. Construction and operation of the new facilities and valve settings will occur within the confines of the workspace boundaries of the NL27 Project and associated facility easements will be acquired. All Project components will conform to the safety standards.

11.5 Safety Standards for Construction

During construction, the applicable requirements of OSHA will be followed. All applicable requirements for construction set forth under 49 CFR Part 192 and 29 CFR Parts 1910 and 1926 will be emphasized by Northern to all employees and contractors as part of general practices. Additional safety standards requiring training during construction are further outlined below.

11.5.1 Traffic Control

Eight gravel public roads and two private driveways are proposed for open-cut crossing methods for the V2F Project. Ten gravel public roads and 12 private driveways are proposed for open-cut crossing methods for the NL27 Project. In general, the impact on traffic and transportation facilities and public inconvenience at crossings will be minimized by Northern’s road crossing plans for both Projects. Northern will coordinate with local highway departments in advance of construction of each component of the two Projects and develop and post detours in advance of the open-cut crossings. For the private driveways being crossed via open cut methods for both Projects, Northern will coordinate with the landowners regarding the specific timing of the crossings at least three days in advance and will minimize any restrictions to the landowners by maintaining access as much as possible with steel plates. Due to the residential areas being crossed and open-cut roadway crossings, Northern has developed traffic control plans for both Projects. A traffic control plan is included in Resource Report 1, Appendix 1G.

The remaining public roads will be crossed via HDD, which will not restrict access for the general public and eliminate the need for any detours. Normal traffic flow can be maintained. Northern’s construction contractor will provide traffic warning signs along road crossings as recommended by the Iowa and Minnesota Manual of Uniform Traffic Control Devices (IDOT 2009, MDOT 2024) and required by local and/or state road encroachment permits.

Northern will utilize tanker trucks to transport water for hydrostatic testing. The hydrostatic testing is a limited-time construction activity and the impacts are expected to be temporary and of short duration. Northern expects the truck driver will have a commercial driver’s license, and the truck will have normal safety features for a vehicle of its size.

Further, Northern will coordinate with local authorities, as required by local and/or state road permits before construction begins to ensure that both Northern and representatives of the local authorities have appropriate contact information.

11.5.2 Affected Residences

Construction activities in residential areas for both Projects will be temporary and limited to the time required to safely install the pipelines. Northern will install safety fence along its workspace, as needed, and where there is potential for public access. Neither Project is located in proximity (0.25-mile) to any schools, churches, nursing homes, or childcare organizations that may warrant additional safety precautions. The V2F Project will not affect any residences. The NL27 Project will be at 25 feet from one residence on the Willmar 3rd branch line downstream for a temporary access road. Northern discussed mitigation and coordination that will occur with these landowners in Resource Report 8, Section 8.2.2. Site-specific residential construction plans also are provided in Appendix 8E.

11.5.3 Working over Existing In-service Pipelines

Northern avoids construction activities over existing operating pipelines whenever possible, but is capable of safely doing so when subsurface conditions allow. Northern will cross in-service pipelines on both Projects via both open cut and trenchless methods. Northern’s engineers will assess the potential stresses imposed by equipment and materials traveling over existing pipelines and make recommendations as necessary (e.g., additional soil cover, timber mats, minimal separation distance) for protecting the in-service pipeline and public from potential hazards. Northern also will use hydrovac excavation or mechanical methods to expose the existing pipeline at the cross-over locations. Northern has included ETWS workspace in the V2F and NL27 Projects where these crossovers occur along HDDs; specifically at public road crossings. Northern also employs spotters for large equipment. As part of Northern’s damage prevention procedure, the contractor will hydro-excavate a pothole or excavate a small trench to locate the existing pipeline and then install a poly-vinyl chloride pipe in the ground recording depth, MP and other relevant information on the pipe.

11.5.4 Minimum Distances between Pipelines

Northern will maintain a 25-foot offset on both Projects between existing pipelines and the proposed pipelines except for areas with deviations due to landowner requests and/or environmental and engineering constraints. These deviations are further discussed in Resource Reports 8 and 10.

11.5.5 Public Access

Northern will restrict the public from easily accessible workspaces (e.g., road crossings) by installing temporary safety fencing and barriers around areas of active construction on both Projects.

11.5.6 Utility Crossovers

Crossing over or under existing pipelines or other utility infrastructure is common for all types of utilities and will be completed in a safe manner. Northern and its contractors will avoid unnecessary crossings of foreign lines when possible and will follow existing safety procedures in areas where crossovers are unavoidable.

Typically, crossovers are installed under existing pipelines. Some crossovers require deeper excavation, additional workspace, and exposure of the crossed utility. All of these factors increase

impacts on the surrounding land and require extra care during installation of the new pipeline. Before a crossover is allowed, Northern will work with the utility owner to agree upon a crossing method that satisfies both companies' policies and public safety codes. Northern's construction inspectors and pipeline construction contractors have extensive experience and knowledge of the proper means and methods for safely installing pipeline crossovers.

Both Projects, as designed, will cross foreign in-service pipelines, utilities and other Northern pipelines. Northern's engineers will assess the potential stresses imposed by equipment and materials on the existing pipeline and make recommendations as necessary (e.g., additional soil cover, timber mats) for protecting the in-service pipelines and public from potential hazards. ETWS has been included in both Projects' respective workspace to allow for pot-holing to expose utility infrastructure during construction, specifically during HDDs of public road crossings.

11.5.7 Welding

Northern's policy is that only company-approved and certified welders are permitted to work on its facilities. The welding activities are carried out under the supervision of a Northern welding inspector and follow Northern's welding procedures. Additionally, the qualified welders meet the standards of American Society of Mechanical Engineers, Boiler and Pressure Vessel Code § IX, American Petroleum Institute 1104 (API 1999), and 49 CFR Part 192. All contract welders will be required to comply with applicable OSHA rules specified under 29 CFR Parts 1910 and 1926.

11.5.8 Blasting

Based on collected geologic, geophysical, and geotechnical data, Northern does not anticipate blasting will be required for either Project. Resource Report 6, Section 6.3 provides additional discussion about the potential for blasting during construction of both Projects.

11.6 Pipeline Safety Monitoring Program

11.6.1 Material Construction

Safety begins at the pipe mill or manufacturer where the piping and other facility components are manufactured. Northern representatives inspect the piping, coating, and other components to document that it meets quality control standards and specifications. During construction, the integrity of pipeline coatings (which are designed to protect the pipeline against corrosion) are inspected, examined, corrected, or repaired if necessary and are verified on-site by qualified inspectors. Pipe girth welds will be non-destructively tested in accordance with PHMSA requirements before installation is considered complete. In addition, proposed piping for both Projects will be pressure tested to a pressure 1.25 to 1.50 times higher than its maximum allowable operating pressure according to class locations and before being placed in service.

11.6.2 Observations and Inspections

Once the V2F and NL27 Projects are installed, Northern will implement a number of routine monitoring measures, including the following:

- Monitoring CP periodically
- Testing relief valves
- Testing fire and gas systems annually

- Observing surface conditions on and near the property for indications of leaks, construction activity, or any other factors which may affect safety and operation
- Inspecting valve settings and observing area construction activities
- Conducting leak surveys at least once every calendar year or as required by regulations

During inspections of the Northern system, Northern employees look for signs of unusual activity on the ROW. Upon discovery of an unusual activity, Northern personnel will respond immediately to assess the nature of the activity and remedy with prescribed corrective action. Additional tests may be conducted using analyzers to verify the effectiveness of the CP system. Any missing or damaged pipeline markers used to identify the location of the pipeline will be promptly replaced or repaired.

11.6.3 SCADA Monitoring

In addition to the PHMSA-required actions listed above, Northern will monitor the pipeline systems using a supervisory control and data acquisition system. SCADA systems are used to monitor and control facilities or equipment in industries such as telecommunications, water and waste control, energy, oil and gas refining, and transportation. A SCADA system gathers information year-round 24 hours per day and transfers the information back to Northern's Operations Communication Center, which is described in Section 11.6.5 below. The system alerts Northern personnel that a leak may have occurred and carries out the necessary analysis and control.

Northern's pipeline system is monitored by a gas control department located in Omaha, Nebraska. Both Projects facilities will be monitored for flow and pressure with data communicated to the gas control department. Alarms, which include high- and low-pressure indicators, also are monitored by the system and activated at the gas control department.

11.6.4 Employee Qualification Program

As part of the requirements of 49 Part CFR 192, Subpart N, Northern also maintains and follows a written employee qualification program. This program includes training to ensure that Northern employees have the necessary knowledge and skills to perform their tasks in a manner that ensures the safe operation of pipeline facilities. The program also includes a OQP to ensure that individuals who perform covered tasks on the system are qualified in accordance with 49 CFR Part 192, Subpart N. The OQP requires all individuals who perform covered tasks on the system, including contractors, be qualified to perform the covered tasks and be able to recognize and react to abnormal operating conditions. Elements of the OQP include the following:

- Identification of the covered tasks
- Evaluation and qualifications of individuals
- Presence of non-qualified individuals
- Performance contributing to an incident
- Reasonable cause to verify qualification
- Communication of change
- Subsequent qualification intervals
- Recordkeeping
- Training requirements
- Regulatory agency notification

11.6.5 Emergency Response

Northern has designated the OCC to manage its 24-hour emergency response capabilities. The OCC’s toll-free number (1-888-367-6671) will be included in all communications with property owners and other identified stakeholders, posted on all pipeline markers, and provided to local emergency agencies in the vicinity of the pipeline facilities. The OCC is staffed year-round 24 hours per day. When a call is received regarding the either Project, trained OCC personnel will record the information and notify the Project manager, who will either address the concern or contact the appropriate company subject matter expert to provide a timely response.

Northern has a Public Awareness and Damage Prevention Program that calls for communication with emergency responders on an annual basis. Communication revolves around pipeline safety: how to identify a pipeline marker, what a pipeline ROW is and looks like, who to call in case of an emergency, physical properties of natural gas, and what is expected of first responders during an emergency.

Northern employs an emergency management response team to respond to pipeline leaks and other emergencies. Team members conduct regular mock and table-top drills. In the event of a leak or emergency, a “call burst” is sent to team members. Response to the situation is conducted using a command and control system and is directed from a state-of-the-art command center in Northern’s Omaha, Nebraska, headquarters building. Northern has established an alternate command center in south Omaha, Nebraska.

Northern has developed emergency response plans for its entire system. Operating personnel attend training for emergency response procedures and plans, pursuant to OSHA regulations in 29 CFR Part 1910. Northern will review, revise, and develop new emergency response plans as necessary before placing the new facilities in operation. Northern will meet with local emergency planning committees, including fire departments and police departments, to review their plans. Northern will work with these LEPCs to communicate the specifics about the pipeline facilities in the area and the need for emergency response. Northern also will meet periodically with these entities to review and revise their plans when necessary. LEPC personnel will be involved in any operator-simulated emergency exercises and post-exercise critiques, if conducted. Northern will use all available, reasonable, and relevant means to support the continued operation of the pipelines and facilities if an emergency occurs.

No special fire-fighting apparatus is required to fight a high-pressure natural gas fire at the proposed facilities. The most effective and immediate way to begin to address a high-pressure gas pipeline rupture is to shut off the gas source. Northern has valves spaced along the pipelines that can be used to isolate each pipeline segment.

11.7 Integrity Management Program

Northern has developed a pipeline integrity management program to improve pipeline safety along its entire pipeline system. This program was implemented to comply with the prescriptively based requirements of 49 CFR Part 192, Subpart O. Northern implements the program through the following:

- Assessing the integrity of pipelines in HCAs, MCAs and other areas
- Improving integrity management data systems within the company
- Increasing the integrity and reliability of the pipeline system
- Improving the government’s role in reviewing the adequacy of integrity programs and plans

The new pipelines on both Projects will be incorporated into Northern’s integrity management program. The information that Northern gathers about its system is incorporated into the integrity management program. Northern decides where and when to internally inspect the pipeline based on accumulated data. Risk assessment of the pipeline system determines what inspection criteria are required. This may include in-line inspection tools (e.g., smart pigs) that are designed to provide specific integrity information about the condition of the pipe, as well as inspection tools and practices that Northern has determined will be the most effective.

11.7.1 Pressure Testing

Pressure tests are an integral part of Northern’s pipeline integrity management program. Pipelines are designed to operate at certain pressures based on the pipe metal’s yield strength, diameter, and wall thickness. Hydrostatic pressure testing or pneumatic pressure testing will be conducted in accordance with 49 CFR Part 192, Subpart J, to verify the integrity of the pipeline before being placed into service. The components (pipelines and associated facilities and aboveground appurtenances) installed for both Projects will be tested between one and eight hours. Any significant loss of pressure will indicate that a leak may have occurred and warrant further inspection and, where necessary, repair. Additional information on hydrostatic or pneumatic pressure testing is located in Resource Report 1, Section 1.5.5.13.

11.7.2 Periodic Inspections

As part of regular operation and maintenance practices, Northern will periodically inspect its pipelines for both Projects for leaks and safety hazards by walking, driving, flying, or other appropriate means of traversing the ROW. Northern also will inspect its CP anode beds to verify adequate corrosion protection. Inspectors will access the ROW using public roads and acquire permission from affected landowners before entering their properties.

11.7.3 Cathodic Protection

The new underground structures that are used to transport natural gas are required by the PHMSA regulations in 49 CFR Part 192, Subpart I, to have an external protective coating (Section 192.461) and must have a CP system (Section 192.463) designed to work with the coating to protect the underground structures from corrosion. Following construction and installation of the facilities required for both Projects, Northern will install low-voltage CP systems at optimal locations to help protect buried pipelines from corrosion. Northern intends to install its CP systems within certified construction workspaces and in accordance with FERC’s regulations. All rectifiers and electrical equipment will be enclosed inside locked metal boxes. Additional mitigation systems will be installed to protect the piping and associated facilities from corrosion caused by induced alternating current. Aboveground structures will be coated to prevent atmospheric exposure and corrosion.

For both Projects, Northern is required by PHMSA to assess the actual pipe-to-soil potentials of newly installed underground structures. Northern will disconnect the existing pipelines from the ground beds and connect the proposed pipeline to this existing system. Northern will then monitor the areas to determine where additional CP may be required. If monitoring shows that additional CP is required or modifications are needed, Northern will complete this work within one year of the in-service date in accordance with PHMSA regulations in 49 CFR Part 192, Subpart I, Section 192.455.

Northern also is required by the PHMSA regulations in 49 CFR Part 192, Subpart I, Section 192.465, to constantly monitor the effectiveness of the CP systems and promptly correct any deficiencies found. Following the modification and balancing of the CP system, Northern personnel will routinely check the voltage and amperage of the rectifiers as well as the pipe-to-soil potentials. Adjustments will be made as conditions change. In addition to maintenance activities, annual CP surveys will be completed to determine pipe-to-soil potentials. Close-interval surveys also will be conducted on a periodic basis.

11.8 Public Education Program

Northern complies with API 1162 (API, 2003) for its Public Awareness Program. Following this guidance, Northern identifies the target audiences (e.g., general public, libraries, affected landowners, local public officials, emergency responders, LEPC, media, and One Call centers) that should receive correspondence and provides information, as appropriate, to ensure adequate reporting to Northern or the appropriate emergency response organization.

Northern will minimize the possibility of excavation-related damage to the pipelines by adhering to the damage prevention requirements listed below:

- General notification of the public in the vicinity of the pipeline, in addition to notification of individuals or companies engaged in excavation activities, to make them aware of how to determine the general location of underground pipelines before excavation activities begin.
- Participating in One Call systems and maintaining responsibility to mark and prevent damage to pipelines for excavation activities by:
 - Temporarily marking the buried pipeline in the excavation area prior to any work being done
 - Inspecting the pipeline during and after excavation activities to verify the integrity of the pipeline. Northern will have personnel observe all excavations that occur on the ROW to document that no damage occurs during excavations

Northern may perform a targeted mail program to communicate public awareness and damage prevention information to residences, businesses, and places of congregation. Mailings will occur if:

- The area is located in what has been designated as an HCA or MCA
- Conditions exist that elevate the potential for third-party damage
- Specific local conditions warrant more frequent communication

11.9 Security and Terrorism

Safety and security concerns have changed the way pipeline operators and regulators must consider terrorism, both in approving new projects and in operating existing facilities. The Office of Homeland Security is tasked with the mission of coordinating the efforts of all executive departments and agencies to prevent, prepare for, protect against, respond to, and recover from terrorist attacks within the FERC, in cooperation with other federal agencies, industry trade groups, and interstate natural gas companies, is working to improve pipeline security practices, strengthen communications within the industry, and extend public outreach in an ongoing effort to secure pipeline infrastructure.

The likelihood of future acts of terrorism or sabotage occurring on the V2F Project or NL27 Project facilities is unpredictable given the disparate motives and abilities of terrorist groups. The continuing need to construct facilities to support the future natural gas pipeline infrastructure is not diminished from the threat of any such acts. Northern is committed to cooperating with FERC, along with other federal, state, and local agencies to protect its energy facilities, employees, and the neighboring public.

11.10 Valve Isolation Safety

Northern will install and operate a number of valves for the Projects to allow for isolation of facilities and segments of pipelines for maintenance or in event of an emergency. Valves at pipeline appurtenances will be manually operated except for those that are required to be remotely controlled in accordance with PHMSA 49 CFR Part 192.

There are no RMVs associated with the V2F Project.

One RMV facility will be installed with the NL27 Project, on the on the Springfield 2nd branch line component.

11.11 References

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- Iowa DOT. 2009. Manual on Uniform Traffic Control Devices. [Traffic and Safety Manual](#).
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- Northern. 2021a. Gas Quality by Date. Available online: <https://www.northernnaturalgas.com/infopostings/GasQuality/Pages/GasQualityByDate.aspx>. Accessed January 29, 2026.
- Northern. 2021b. Northern Safety Data Sheet. Available online: http://www.northernnaturalgas.com/Document%20Postings/Natural_Gas_SDS_080216.pdf. Accessed January 29, 2026.
- PHMSA. 2011. Fact Sheet: High Consequence Areas. Available online: <http://primis.phmsa.dot.gov/comm/FactSheets/FSHCA.htm>. Accessed January 29, 2026.
- PHMSA. 2025. Pipeline Incidents by System Type, Available online: [Oracle Analytics Interactive Dashboards - SC Incident Trend](#). Accessed January 29, 2026.
- 29 CFR 1910. Occupational Safety and Health Standards.
- 29 CFR 1926. Safety and Health Regulations for Construction.
- 49 CFR Part 192. Transportation of Natural and other Gas by Pipeline: Minimum Federal Safety Standards.

Resource Report 12

PCB Contamination



Resource Report No. 12

PCB Contamination

**Ventura to Farmington A-Line Abandonment and Capacity Replacement Project and
Northern Lights 2027 Expansion Project**

FERC Docket No. CP26-___-000

Volume I - Public

February 2026

RESOURCE REPORT NO. 12 – PCB CONTAMINATION
SUMMARY OF FILING INFORMATION

MINIMUM REQUIREMENT	LOCATION ADDRESSED
For projects involving the replacement or abandonment of facilities determined to have PCBs, provide a statement that activities would comply with an approved EPA disposal permit or with the requirements of the TSCA. (§ 380.12(n)(1))	Section 12.1
For compressor station modification on sites that have been determined to have soils contaminated with PCBs, describe the status of remediation efforts completed to date. (§ 380.12(n)(2))	Not applicable

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	Northern’s Environmental Procedure 410.404 for PCBs during Abandonment of Pipeline
	Northern’s Environmental Procedure 410.405 for Sampling for PCBs during Pipeline Removal
	Northern’s Environmental Procedure 410.405a for Wipe Sampling Sections

Abbreviations and Acronyms

A-line	Northern Natural Gas’ 16-inch-diameter M500 A Mainline
D-line	Northern Natural Gas’ 30-inch-diameter M500 D Mainline
E-line	Northern Natural Gas’ 30-inch-diameter M500 E Mainline
EPA	U.S. Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
NL27 Project	Northern Lights 2027 Expansion Project
Northern	Northern Natural Gas
PCBs	polychlorinated biphenyls
ppm	parts per million
Projects	Ventura to Farmington A-Line Abandonment and Capacity Replacement Project and Northern Lights 2027 Expansion Project
$\mu\text{g}/100\text{ cm}^2$	micrograms per 100 cm squared
V2F Project	Ventura to Farmington A-Line Abandonment and Capacity Replacement Project

12.0 RESOURCE REPORT 12 – PCB CONTAMINATION

Northern’s application is composed of two discrete projects, the V2F Project and the NL27 Project. The two Projects will be built concurrently, and Northern has combined the two Projects into a single Section 7 application due to their geographic overlap and interdependence. Analysis and impacts are generally discussed separately for each Project throughout the environmental report.

Resource Report 12 describes on-site PCB contamination for Northern’s V2F and NL27 Projects. The EPA regulations address PCBs in natural gas pipeline systems and PCB-contaminated pipeline abandonment procedures and requirements. Resource Report 12 is required for filings involving the replacement, abandonment by removal, or abandonment in place of pipeline facilities determined to have PCBs in excess of 50 ppm in pipeline liquids. Resource Report 12 also is required for compressor station modification on sites that have been determined to have PCB-contaminated soil at concentrations in excess of 50 ppm. Since much of Northern’s pipeline system was installed prior to the 1980s, there is a potential that the pipelines have PCBs in excess of 50 ppm in pipeline liquids (e.g., lubricants and sealants) associated with facilities being removed.

Northern owns and operates a natural gas transmission pipeline system, including pipeline and associated aboveground facilities in Minnesota and Iowa. Northern is filing an application with FERC pursuant to Section 7 of the Natural Gas Act. The V2F Project involves isolation and abandonment in-place of approximately 105.76 miles of 16-inch-diameter pipeline on Northern’s M500 A and 25.35 miles of 16-inch-diameter M500 J pipeline systems (collectively referred to as the A-line) from Ventura, Iowa, to Farmington, Minnesota. To replace the capacity, Northern will construct three new pipeline extensions consisting of approximately 17.88 miles of 36-inch- and 30-inch-diameter pipelines and associated aboveground appurtenances in Freeborn, Steele and Dakota counties, Minnesota.

The NL27 Project consists of the installation of ten pipeline extensions totaling 28.43 miles, a compressor station uprate, and associated aboveground appurtenances in Minnesota for firm transportation requirements associated with Northern’s customers. The NL27 Project is in Freeborn, Steele, Scott, Carver, Martin, Stearns, Jackson, Watonwan, Isanti, Morrison, and Washington counties, Minnesota.

Since a majority of onsite PCB contamination described in Resource Report 12 occurs on a state-wide or regional level, the two Projects are analyzed collectively, except where otherwise noted. Tables 12.0-1 and 12.0-2 provide a list of both Projects components along with their associated Minnesota or Iowa counties.

Table 12.0-1 V2F Project Facilities and Location

Component	Project Facility	Facility Description	County, State
Lake Mills M500 E-line	8.29-mile pipeline	36-inch-diameter extension	Freeborn, MN
	Lake Mills compressor station	Temporary compression site	Worth, IA
Albert Lea M500 E-line	2.09-mile pipeline	36-inch-diameter extension	Steele, MN
	Owatonna compressor station	Temporary compression site	Steele, MN
Faribault M500 D-line	7.50-mile pipeline	30-inch-diameter extension	Dakota, MN
	Northfield #1	Temporary compression site	Dakota, MN
A-line Abandonment	Ventura compressor station	Pipeline disconnect site	Hancock, IA
	Farmington compressor station	Pipeline disconnect site	Dakota, MN
	La Crosse BL MNB73201 launcher /ABA05	Temporary compression site	Freeborn, MN

Table 12.0-2 NL27 Project Facilities and Location

Component	Project Facility	Facility Description	County, State
Lake Mills M500 E-line	2.32-mile pipeline	36-inch-diameter extension	Freeborn, MN
Albert Lea M500 E-line	3.42-mile pipeline	36-inch-diameter extension	Steele, MN
Willmar 3rd Branch Line Upstream	1.78-mile pipeline	24-inch-diameter extension	Scott, MN
Willmar 3rd Branch Line Downstream	4.78-mile pipeline	24-inch-diameter extension	Carver, MN
Welcome 2nd Line	1.24-mile pipeline	16-inch-diameter extension	Martin, MN
Paynesville 2nd Branch Line	2.45-mile pipeline	4-inch-diameter extension	Stearns, MN
Worthington 2nd Branch Line	2.17-mile pipeline	8-inch-diameter extension	Jackson, MN
Springfield 2nd Branch Line	7.40-mile pipeline	8-inch-diameter extension	Watonwan, MN
Minnesota Interconnect 2nd Branch Line	1.59-mile pipeline	12-inch-diameter extension	Isanti, MN
Alexandria 2nd Branch Line	1.28-mile pipeline	8-inch-diameter extension	Morrison, MN
Aboveground Facilities			
Hugo Compressor Station Uprate	Hugo compressor station	Turbine switch for newer model with increase of 700 horsepower	Washington, MN

The V2F Project does not involve the addition of or modification of compressor stations. The NL27 Project is proposing a modification of the Hugo compressor station, which will include a turbine uprate. The new pipeline extensions for both the V2F Project and NL27 Project will not contain any liquids that would contain PCBs.

Northern’s PCB disposal procedures are discussed in Section 12.1 below; these procedures meet the requirements outlined in the Toxic Substances Control Act as established under EPA regulations.

For the V2F Project, Northern will not pig the pipe prior to abandonment of the A-line. Due to the age of the pipeline and previous repair methods, the pipeline cannot be cleaned by pigging prior to its abandonment. Without pigging, the most likely potential to encounter liquids in the existing system will be during the abandonment activities at the two disconnect sites for the V2F Project.

For the NL27 Project, no abandonment of existing pipe will occur. All pipe installed will be new pipe for capacity expansion; therefore, no PCB contamination is anticipated for the NL27 Project.

12.1 Pipe Removal

The V2F Project will include pipe removal at two disconnect sites, where the existing A-line pipeline will be cut and capped, and at the same-ditch replacement of the Faribault M500 D-line from MP 104.53 to the terminus of the D-line. Northern has laboratory data from previous wipe sampling that shows PCBs are not present in either of these locations. The NL27 Project will not involve any major pipe removal except for small sections at the tie-in locations.

For both Projects, secondary containment will be installed below all pipe segments to be cut prior to initiation of the cutting activity. The sampling for and disposal of PCB-contaminated facilities will be in accordance with Northern’s PCB Mega Rule Marking Requirements (environmental procedure 410.403), PCB Disposal Requirements (environmental procedure 410.301), Abandonment of Pipeline (environmental procedure 410.404), and Sampling for PCBs During Pipeline Removal (environmental procedure 410.405), provided as Appendix 12A.

Prior to fully cutting the pipe, a hole will be cut in the top of the pipe and the pipe will be inspected for free liquids. In the event liquids are present, they will be removed by a vacuum truck prior to cutting the pipe segment. Any liquids captured in secondary containment will be containerized and tested for PCB contamination. Should the liquids contain PCB levels 50 ppm or higher, the liquids will be transported to an approved PCB disposal site by a licensed contractor. Any non-hazardous liquids will be disposed of through a petroleum recycler.

Any piping which tests above 10 $\mu\text{g}/100 \text{ cm}^2$ (50 ppm) in a wipe test will be grouted per Northern procedures (refer to environmental procedure 410.404) and the Toxic Substances Control Act regulations (40 Code of Federal Regulations § 761.60).

Appendix 12A

Northern’s Environmental Procedure 410.301 for PCB Disposal Requirements

**Northern’s Environmental Procedure 410.403 for PCB Mega Rule Marking
Procedures**

**Northern’s Environmental Procedure 410.404 for PCBs during Abandonment of
Pipeline**

**Northern’s Environmental Procedure 410.405 for Sampling for PCBs during
Pipeline Removal**

Northern’s Environmental Procedure 410.405a for Wipe Sampling Sections

1 PURPOSE:

The purpose of this procedure is to provide regulatory guidance for transportation and disposal of polychlorinated biphenyl (PCB) wastes off-site in accordance with Environmental Protection Agency (EPA) regulations under the Toxic Substance Control Act (TSCA), 40 CFR Part 761.

2 RESPONSIBILITY FOR ADMINISTRATION:

Operations Manager, Environmental Skill Employees, Division Environmental Specialist (DES) or Project Manager

3 GENERAL:

3.1 The following are the disposal methods available for PCB wastes:

3.1.1 Liquid PCB waste (50 ppm PCBs or greater) must be incinerated at an incinerator approved to accept PCB wastes. Organic liquid PCB waste (e.g., condensate and diesel fuel) that is between 2 and 50 ppm PCBs must be managed as used oil.

3.1.2 PCB contaminated articles, such as pipe and equipment can be disposed of at a municipal landfill, non-hazardous industrial landfill, or scrap metal smelter if it is contaminated at levels less than 500 ppm or 100ug/100cm² PCBs. If pipe is less than 4-inches in diameter and a wipe sample cannot be obtained, the pipe is considered PCB-contaminated at a level of 50 to 500 ppm and disposed of accordingly. If pipe is 4-inches or greater in diameter and contaminated at levels 500 ppm or greater or 100ug/100cm² or greater, the material must be decontaminated before it can be disposed of at a municipal landfill, industrial landfill, or scrap smelter. It can be disposed of at a chemical waste landfill if drained of all free flowing liquids without decontamination. (Per environmental procedure 410.401, Sampling and Recordkeeping for PCBs, a wipe template is 10cm x 10cm, which equals 100cm².)

4 RELATED PROCEDURES:

OP 150.101	Motor Carrier Safety
EA 390.106	Manifesting and Other Transport Requirements for Off-Site Disposal
EA 410.101	PCB Storage and On-site Handling
EA 410.202	Marking Requirements
EA 410.401	Sampling and Recordkeeping for PCBs

5 PROCEDURE:

5.1 Package PCB wastes or material in a secure, non-leaking, Department of Transportation (DOT) approved containers or in a manner approved under the DOT regulations. See environmental procedure 410.101, Storage and On-site Handling, for packaging requirements and/or consult with the safety department.

5.2 Determine the type of facility at which the PCB waste will be disposed using the information in the General section above. Contact the DES for guidance and information on available disposal facilities.

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- 5.3 For PCB wastes that fill more than $\frac{1}{2}$ of a gondola, contact the DES directly to determine arrangements for disposal.
 - 5.4 Prior to offering the PCB waste for transport to a disposal facility, prepare a hazardous waste manifest in accordance with the instructions located in environmental procedure 390.106 and include the additional information set out below:
 - 5.4.1 For each bulk load of PCBs: The identity of the PCB waste, the earliest date of removal from service for disposal, and the weight in kilograms of the PCB waste.
 - 5.4.2 For each PCB article container or PCB container: The unique identifying number of the container, the type of waste (e.g., soil, debris, small capacitors), the earliest date of removal from service for disposal, and the weight in kilograms of the PCB waste. (Note: Each PCB article within a PCB article container does not require a unique identifying number.)
 - 5.4.3 For each PCB article not in a PCB container or PCB article container: The serial number, if available, or other method of unique identification, the date of removal from service for disposal, and the weight in kilograms of the PCB waste in each PCB Article.
 - 5.4.4 Contact the DES for assistance in preparation of the manifest to confirm the need for an EPA ID number and proper description of the out of service date.
 - 5.5 Label each container to be shipped offsite in accordance with DOT and TSCA requirements as follows:
 - 5.5.1 DOT substance or waste by name and UN or NA identification number, (e.g., Polychlorinated Biphenyls UN2315).
 - 5.5.2 TSCA PCB sticker. Refer to environmental procedure 410.202, Marking Requirements.
 - 5.6 If the Northern Natural Gas (Northern) facility uses an independent transporter to transport the PCB waste to a commercial storer or disposer, the facility shall confirm by telephone, or by other means of confirmation agreed to by both parties, that the commercial storer or disposer actually received the manifested waste in the following manner:
 - 5.6.1 The Northern facility shall confirm receipt of the waste by close of business the day after it receives the manifest hand-signed by the commercial storer or disposer.
 - 5.6.2 If the Northern facility has not received the hand-signed manifest within 35 days after the independent transporter accepted the PCB waste, the facility shall telephone, or communicate with by some other agreed-upon means, the disposer or commercial storer to determine whether the PCB waste was actually received. If the PCB waste was not received, the facility shall contact the independent transporter to determine the disposition of the PCB waste.
 - 5.6.3 If the Northern facility does not receive a hand-signed manifest from an EPA-approved facility within 10 days from the date of the telephone call or other agreed upon means of communication, to the independent transporter, the facility must submit an "exception report" to the EPA. See environmental procedure 390.106, Manifesting and Other Transport Requirements for Off-Site Disposal.

- 5.6.4 If the Northern facility is required to keep an Annual Document Log, all telephone conversations must be recorded in that document. See environmental procedure 410.101, PCB Storage and On-site Handling.
- 5.7 PCBs must be disposed of within 1 year of the date that they were removed from service and placed in a storage area. Always ship PCB waste to an off-site disposal location at least 90 days before the 1 year time period will elapse. See environmental procedure 410.101 PCB Storage and On-Site Handling for proper storage and storage time limits.
- 5.8 If an independent transporter is used, contact the commercial facility by telephone when the signed copy of the manifest is received to confirm the waste material was received by the commercial facility. If the waste was not received by the commercial facility, contact the DES.
- 5.9 The disposal facility is required to prepare and submit to the generating facility a "Certificate of Disposal" within 30 days of disposal so that the facility can verify that the waste was disposed within the 1 year time limit. Contact the disposal facility if the Certificate of Disposal is not received in a timely manner.

6 RECORDS:

- 6.1 Submit shipping manifests and Certificates of Disposal to the company approved records management system. Use the category, PCB DISPOSAL on the Document Submittal Form. These records will be kept for the life of the facility.

7 REVISION HISTORY:

Responsibility for Procedure:

Address all questions on this procedure to the director of environmental.

Revisions:

Rev. 3	02/28/04	
Rev. 4	01/01/06	
Rev. 5	10/13/11	Corrected denominators in section 3.1.2. Added section 5.3 to contact the DES for disposal options if PCB wastes fill more than ½ of a gondola.
Rev. 6	07/31/12	Updated the Related Procedures section and added detail stating that if the pipe is less than 4-inches in diameter and a wipe sample cannot be obtained, the pipe is considered PCB-contaminated at a level of 50 to 500 ppm and disposed of accordingly.
Rev. 7	01/21/15	Publish Only: References to 110.420 Motor Carrier Safety were changed to procedure number 150.101 Motor Carrier Safety.
Rev. 8	10/02/20	Publish Only: Updated outdated references to environmental manual.
Rev. 9	11/27/24	Publish Only: Updated the company logo and program names of systems used by the company.

1 PURPOSE:

The purpose of this procedure is to ensure all portions of the Northern system subject to the PCB Mega Rule are marked using the PCB marked as required under the PCB regulations.

2 RESPONSIBILITY FOR ADMINISTRATION:

Team, DES or Project Manager

3 GENERAL:

None

4 RELATED PROCEDURES:

EA 410.202 PCB Marking Requirements

5 PROCEDURE:

- 5.1 Mark all aboveground sources of PCB contamination such as compressors, valves, drips, pipeline liquid tanks, etc. that contain or collect pipeline liquids contaminated with PCBs at levels at or greater than 50 ppm using the Large PCB Mark described in Procedure 410.202 PCB Marking Requirements.
- 5.2 Underground equipment, including pipe, does not need to be marked.
- 5.3 All pipe and equipment that is removed from service and has been determined to be contaminated with PCBs at levels at 50 ppm PCBs or 10 ug/100cm² or above, must be marked in accordance with Procedure 410.202 PCB Marking Requirements. Use large or small mark depending on the size of the equipment removed.
- 5.4 As pipe is being removed from service, it must also be marked as follows for the purpose of characterizing the pipeline:
 - 5.4.1 Use a permanent marker
 - 5.4.2 Mark on the external service
 - 5.4.3 Mark on the upstream side of the pipe segment
 - 5.4.4 Mark the joint number
 - 5.4.5 Mark the flow direction using an arrow
 - 5.4.6 Mark the top of the joint by the words "TOP"
 - 5.4.7 Mark where wipe sample was collected, if appropriate with the words "Sample Point."

6 RECORDS:

None

7 REVISION HISTORY:

Responsibility for Procedure:

Address all questions on this procedure to the director of environmental.

Revisions:

Rev. 3 02/28/04

Rev. 4 01/01/06

Rev. 5 11/27/24 Publish Only: Updated the company logo

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- 5.4 If liquid samples cannot be collected, then wipe samples, in accordance with environmental procedure 410.401 Sampling and Recordkeeping for PCBs, should be collected from both ends of each “segment” of pipe. At a minimum, sample all ends of all pipeline sections to be abandoned in place.
- 5.4.1 If the pipeline section to be abandoned is between the pressure side of one compressor station and the suction side of the next compressor station downstream, at a minimum, sample all ends of the abandoned pipe.
- 5.4.2 If the pipeline section to be abandoned is longer than the distance between the pressure side of one compressor station and the suction side of the next compressor station downstream, divide the pipeline section, for purposes of sampling, into smaller pipeline sections no longer than the distance from the pressure side of one compressor station to the suction side of the next compressor station downstream. Consider each of the smaller sections to be a separate abandonment and sample each one, at a minimum, at all ends.
- 5.4.3 Use the following procedure to locate representative sample collection sites in pipeline sections at points other than the suction and pressure side of compressor stations, or the ends of the pipeline section to be abandoned.
- 5.4.3.1 Assign a unique identifying sequential number to each kilometer or fraction of a kilometer length of pipe within the entire pipeline section.
- 5.4.3.2 Use a random number table or a random number generator to select each representative sample collection site from a complete list of the sequential identification numbers.
- 5.4.3.3 Samples may be collected by removing any covering soil, cutting the pipe to gain access to the sampling location, and collecting the surface sample with the pipe in place, rather than completely removing the pipeline sections to collect the surface sample.
- 5.5 Assume that the PCB surface concentration for an entire pipeline section is the arithmetic mean of the PCB surface concentrations measured at the ends of the pipeline section. If additional representative samples were taken in a pipeline section, assume that the PCB surface concentration for the entire pipeline section is the arithmetic mean of the concentrations measured in all representative samples taken.
- 5.6 Evaluate the results of the characterization, if any, and do the following:
- 5.6.1 Remove liquids through pigging operations or other methods. Pipeline cannot contain any free flowing liquids.
- 5.6.2 For pipe that is 4-inches or less in diameter, include pipe in One Call system or fill at least 50% with a hardening slurry or high density polyurethane foam. Seal ends of the segment to be abandoned.
- 5.6.3 For pipe that is greater than 4-inches in diameter and tests less than 50 ppm or 10 $\mu\text{g}/100\text{ cm}^2$ there is not special abandonment requirements under the PCB Mega Rule.

- 5.6.4 For pipe that is greater than 4-inches in diameter and tests between 50 ppm (10 $\mu\text{g}/100\text{ cm}^2$) and 500 ppm (100 $\mu\text{g}/100\text{cm}^2$), seal both ends of the segment to be abandoned.
- 5.6.5 For pipe that is greater than 4-inches in diameter and tests greater 500 ppm or 100 $\mu\text{g}/\text{cm}^2$, fill at least 50% with hardening slurry (cement) or high density polyurethane foam. If pipeline is located at a water crossing, only hardening slurry is allowed. Seal both ends of the segment to be abandoned.

6 RECORDS:

- 6.1 Documentation of the abandonment process will be kept with the project file.
- 6.2 Maintain PCB sampling records in accordance with environmental procedure 410.401.

7 REVISION HISTORY:

Responsibility for Procedure:

Address all questions on this procedure to the director of environmental.

Revisions:

- | | | |
|--------|----------|--|
| Rev. 3 | 02/28/04 | |
| Rev. 4 | 01/01/06 | |
| Rev. 5 | 10/02/20 | Publish Only: Added description of PCB wipe-sampling protocol for pipeline abandonment in place. |
| Rev. 6 | 11/27/24 | Publish Only: Updated the company logo |

1 PURPOSE:

The purpose of this procedure is to ensure all portions of the Northern system are in environmental compliance with regulations when pipe is removed from the system for reuse or disposal.

2 RESPONSIBILITY FOR ADMINISTRATION:

Team Leader, Environmental Skilled Person, Division Environmental Specialist (DES), Project Manager and Construction Coordinator

3 GENERAL:

None

4 RELATED PROCEDURES:

EA 410.401	Sampling and Recordkeeping for PCBs
EA 410.403	PCB Mega Rule Marking Requirements
EA 410.101	Storage and On-Site Handling
EA 410.301	PCB Disposal Requirements
EA 410.408	Storage for Reuse
EA 470.101	Sale and Purchase of Used Material

5 PROCEDURE:

- 5.1 Prior to removal of pipe, characterization of the pipe to determine PCB contamination may be required. All coal tar based coatings must be sampled for the presence of PCBs prior to removal or disposal. Follow environmental procedure 410.401, Sampling and Recordkeeping for PCBs.
- 5.2 If pipe is 4 inches or less in inside diameter, no sampling is required if the pipe is to be reused within the system or destined for disposal. The pipe must be presumed to be PCB-contaminated at greater than or equal to 50 ppm but less than 500 ppm. Because the piping cannot be properly tested due to size, the pipe may not be used in another manner (e.g., sold).
- 5.3 If the pipe is greater than 4-inches in diameter and still in service, collect liquid samples in accordance with environmental procedure 410.401, Sampling and Recordkeeping for PCBs from all condensate collection points along the portion of the pipeline to be removed. Collection points include compressors, filters, scrubbers, drips and tanks. Sampling must occur within 72 hours of the last transmission of gas. If no liquid samples can be collected due to lack of liquids in that portion of the system or sampling did not occur within 72 hours of the last transmission of gas, wipe samples must be collected at the time of removal. If liquids are present, the line must be characterized based on collection of liquid samples.
- 5.4 Results of liquid sampling should be evaluated by reviewing one upstream sample point to the next downstream sample point. The PCB concentration of the entire pipeline system between those two sampling points is assumed to be the concentration of the upstream sample point. For example, as to points A, B and C below the results should be interpreted as follows:

- 5.8 Mark joints removed for reuse or disposal in accordance with environmental procedure, 410.202, PCB Marking Requirements.
- 5.9 Store joints destined for disposal or reuse within the system in accordance with environmental procedure 410.101, Storage and On-site Handling.
- 5.10 Pipe that is less than 4 inches in diameter can be reused within the system or disposed of in a municipal landfill, industrial non hazardous waste landfill, hazardous waste landfill, or other TSCA disposal facility only after discussion with the DES. The material can also be sent to an authorized scrap metal smelter, refer to environmental procedure 470.101, Sale and Purchase of Used Materials. All free-flowing liquids must be removed.
- 5.11 Pipe that is greater than 4 inches in diameter and contaminated at levels less than 500 ppm PCBs or 100 $\mu\text{g}/\text{cm}^2$ can be reused within the system or disposed of in a municipal landfill, industrial non hazardous waste landfill, hazardous waste landfill, or other TSCA disposal facility. The material can also be sent to an authorized scrap metal smelter, refer to environmental procedure 470.101, Sale and Purchase of Used Materials. All free-flowing liquids must be removed.
- 5.12 Pipe that is greater than 4-inches in diameter and contaminated at levels greater than 500 ppm or 100 $\mu\text{g}/\text{cm}^2$ PCBs, must be decontaminated before it can be reused within the system or disposed in a municipal or industrial landfill. Contact the DES for options.
- 5.13 All coal tar based coatings contaminated at levels greater than 50 ppm must be removed before the pipe can be reused within the system. When the sale of used equipment is contemplated refer to environmental procedure 470.101, Sale and Purchase of Used Materials.

6 RECORDS:

- 6.1 Maintain PCB sampling records in accordance with environmental procedure 410.401.

7 REVISION HISTORY:

Responsibility for Procedure:

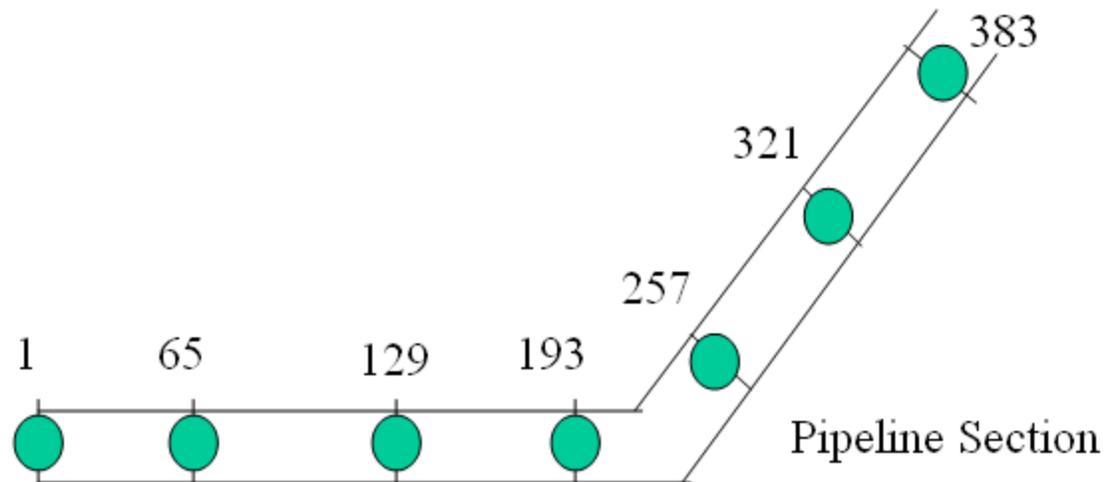
Address all questions on this procedure to the director of environmental.

Revisions:

- | | | |
|--------|----------|--|
| Rev. 3 | 02/28/04 | |
| Rev. 4 | 01/01/06 | |
| Rev. 5 | 02/28/08 | |
| Rev. 6 | 04/10/13 | Publish Only: Updated procedure for formatting and removed specific reference to the Mega Rule from the Purpose, as this procedure applies to all pipeline removal, including during construction. |
| Rev. 7 | 10/02/20 | Publish Only: Added description of PCB wipe-sampling protocol for pipeline removal. |
| Rev. 8 | 11/27/24 | Publish Only: Updated the company logo |

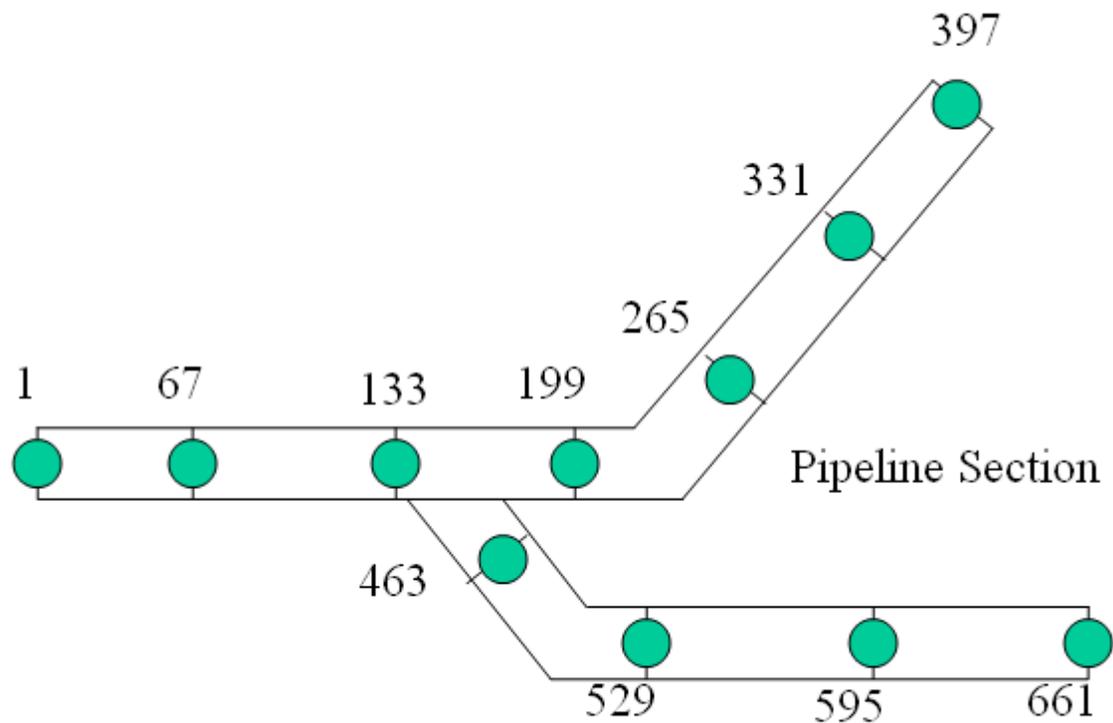
Wipe Sampling Pipeline Sections that are shorter than 3 miles

1. Determine number of 40 ft. segments (e.g., 2.9 miles has 383 segments)
2. Sample the first and last segments (e.g., 1 and 383)
3. To find other sampling points, divide total number of segments by 6 (e.g., $383/6 = 64$)
4. Take samples sampling interval determined in 3. Above. (e.g., every 64th segment)



Wipe Sampling Pipeline Sections that are longer than 3 miles

1. Sample every one-half mile.
2. 66 Segments equal one half mile.



Resource Report 13

Engineering and Design Material



Resource Report No. 13

Engineering and Design Material

**Ventura to Farmington A-Line Abandonment and Capacity Replacement Project
and Northern Lights 2027 Expansion Project**

FERC Docket No. CP26-__-000

Volume I - Public

February 2026

**RESOURCE REPORT NO. 13 – ENGINEERING AND DESIGN MATERIAL
 SUMMARY OF FILING INFORMATION**

MINIMUM REQUIREMENT	LOCATION ADDRESSED
Provide a detailed plot plan showing the location of all major components to be installed, including compression, pretreatment, liquefaction, storage, transfer piping, vaporization, truck loading/unloading, vent stacks, pumps, and auxiliary or appurtenant service facilities.	Not applicable
Provide a detailed layout of the fire protection system showing the location of fire water pumps, piping, hydrants, hose reels, dry chemical systems, high expansion foam systems, and auxiliary or appurtenant service facilities.	Not applicable
Provide a layout of the hazard detection system showing the location of combustible-gas detectors, fire detectors, heat detectors, smoke or combustion product detectors, and low temperature detectors. Identify those detectors that activate automatic shutdowns and the equipment that would shut down. Include all safety provisions incorporated in the plant design, including automatic and manually activated emergency shutdown systems.	Not applicable
Provide a detailed layout of the spill containment system showing the location of impoundments, sumps, subdikes, channels, and water removal systems.	Not applicable
Provide manufacturer's specifications, drawings, and literature on the fail-safe shut-off valve for each loading area at a marine terminal (if applicable).	Not applicable
Provide a detailed layout of the fuel gas system showing all taps with process components.	Not applicable
Provide copies of company, engineering firm, or consultant studies of a conceptual nature that show the engineering planning or design approach to the construction of new facilities or plants.	Not applicable
Provide engineering information on major process components related to the first six items above, which include (as applicable) function, capacity, type, manufacturer, drive system (horsepower, voltage), operating pressure, and temperature.	Not applicable
Provide manuals and construction drawings for LNG storage tank(s).	Not applicable
Provide up-to-date piping and instrumentation diagrams. Include a description of the instrumentation and control philosophy, type of instrumentation (pneumatic, electronic), use of computer technology, and control room display and operation. Also, provide an overall schematic diagram of the entire process flow system, including maps, materials, and energy balances.	Not applicable
Provide engineering information on the plant's electrical power generation system, distribution system, emergency power system, uninterruptible power system, and battery backup system.	Not applicable
Identify all codes and standards under which the plant (and marine terminal, if applicable) will be designed, and any special considerations or safety provisions that were applied to the design of plant components.	Not applicable
Provide a list of all permits or approvals from local, state, federal, or Native American groups or Indian agencies required prior to and during construction of the plant, and the status of each, including the date filed, the date issued, and any known obstacles to approval. Include a description of data records required for submission to such agencies and transcripts of any public hearings by such agencies. Also provide copies of any correspondence relating to the actions by all, or any, of these agencies regarding all required approvals.	Not applicable
Identify how each applicable requirement will comply with Title 49 Code of Federal Regulations (CFR) part 193 and the National Fire Protection Association 59A LNG Standards. For new facilities, the siting requirements of 49 CFR part 193, subpart B, must be given special attention. If applicable, vapor dispersion calculations from LNG spills over water should also be presented to ensure compliance with the U.S. Coast Guard's LNG regulations in 33 CFR part 127.	Not applicable
Provide seismic information specified in "Data Requirements for the Seismic Review of LNG Facilities" (National Bureau of Standards Information Report 84-2833, available from Federal Energy Regulatory Commission staff) for facilities that would be located in zone 2, 3, or 4 of the Uniform Building Code Seismic Map of the United States.	Not applicable

Table of Contents

13.0 RESOURCE REPORT 13 – ENGINEERING AND DESIGN MATERIAL 13-1

Abbreviations and Acronyms

A-line	Northern Natural Gas’ 16-inch-diameter M500 A Mainline
FERC	Federal Energy Regulatory Commission
NL27 Project	Northern Lights 2027 Expansion Project
Northern Projects	Northern Natural Gas Ventura to Farmington A-Line Abandonment and Capacity Replacement Project and Northern Lights 2027 Expansion Project
V2F Project	Ventura to Farmington A-Line Abandonment and Capacity Replacement Project

13.0 RESOURCE REPORT 13 – ENGINEERING AND DESIGN MATERIAL

Northern’s application is composed of two discrete projects, the V2F Project and the NL27 Project. The two Projects will be built concurrently, and Northern has combined the two Projects into a single Section 7 application due to their geographic overlap and interdependence. Analysis and impacts are generally discussed separately for each Project throughout the environmental report.

Northern owns and operates a natural gas transmission pipeline system, including pipeline and associated aboveground facilities in Minnesota and Iowa. Northern is filing an application with FERC pursuant to Section 7 of the Natural Gas Act.

The V2F Project involves isolation and abandonment in-place of approximately 105.76 miles of 16-inch-diameter pipeline on Northern’s M500 A and 25.35 miles of 16-inch-diameter M500 J pipeline systems (collectively referred to as the A-line) from Ventura, Iowa, to Farmington, Minnesota. To replace the capacity, Northern will construct three new pipeline extensions consisting of approximately 17.88 miles of 36-inch- and 30-inch-diameter pipelines and associated aboveground appurtenances in Freeborn, Steele and Dakota counties, Minnesota.

The NL27 Project consists of the installation of ten pipeline extensions totaling 28.43 miles, a compressor station uprate, and associated aboveground appurtenances in Minnesota for firm transportation requirements associated with Northern’s customers. The NL27 Project is in Freeborn, Steele, Scott, Carver, Martin, Stearns, Jackson, Watonwan, Isanti, Morrison, and Washington counties, Minnesota.

In accordance with 18 Code of Federal Regulations § 380.12(o), Resource Report 13 is not applicable because neither of the Projects will involve construction of new, or recommissioning of existing, liquefied natural gas facilities.