APPENDIX I

Natural Heritage Information System and Archaeological and Historic Resource Maps

Minnesota Energy Connection Project
Route Permit Application
MPUC Docket No. E002/TL-22-132
October 2023

PUBLIC DOCUMENT NON-PUBLIC DATA HAS BEEN EXCISED

Page 1

Page 2

Page 3

Page 4

Page 5

Page 6

Sherco Solar West

Sherco Substation

Substation near Garvin

POPE
STEARNS
SHERBURNE
BIG STONE
SWIFT
KANDIYOHI
MEEKER
WRIGHT
ANOKA
LAC QUI PARLE
CHIPPEWA
HENNEPIN
YELLOW MEDICINE
RENVILLE
MCLEOD
CARVER
SCOTT
SIBLEY
LINCOLN
LYON
REDWOOD
NICOLLET
LE SUEUR
RICE
BROWN

Willmar
Litchfield
Buffalo
Big Lake
Monticello
Montevideo
Granite Falls
Hutchinson
Waconia
Glencoe
Redwood Falls
Marshall
New Ulm

0 15 Miles

N

Natural Heritage Information System (NHIS) Data:
Copyright 2022 State of Minnesota, Department of Natural Resources.
Data included here were provided by the Division of Ecological and Water Resources, Minnesota Department of Natural Resources (DNR), and were current as of February 15, 2022. These data are not based on an exhaustive inventory of the state. The lack of data for any geographic area shall not be construed to mean that no significant features are present.

ND
MN
WI
SD
IA

Protected and Confidential – Natural Heritage Information System and Archaeological and Historic Resource Map Index

Substations
Blue Route
Purple Route
Connector Segments
Green Segment
Interstate
US Highway
MN Highway
County Road
Railroad
Municipality
County Boundary

Xcel Energy®

DISCLAIMER: This information is believed to be correct but is subject to change and is not warranted.

Date: 10/27/2023

PUBLIC DOCUMENT NON-PUBLIC DATA HAS BEEN EXCISED

PUBLIC DOCUMENT NON-PUBLIC DATA HAS BEEN EXCISED

PUBLIC DOCUMENT NON-PUBLIC DATA HAS BEEN EXCISED

PUBLIC DOCUMENT NON-PUBLIC DATA HAS BEEN EXCISED

PUBLIC DOCUMENT NON-PUBLIC DATA HAS BEEN EXCISED

PUBLIC DOCUMENT NON-PUBLIC DATA HAS BEEN EXCISED

APPENDIX J

Air and GHG Emissions Estimates

Minnesota Energy Connection Project
Route Permit Application
MPUC Docket No. E002/TL-22-132
October 2023

Xcel Energy
Minnesota Energy Connection Project
Construction Emission Calculations
Summary

	Construction Emissions (tons)					
	Criteria Pollutants					
Description	**NOx**	**CO**	**VOC**	**SO_2**	**PM_{10}**	**$PM_{2.5}$**
Off-Road Engine Emissions	302.50	66.66	21.76	0.15	11.06	10.97
Helicopter Engine Emissions	0.04	170.32	0.01	--	0.51	0.05
Unpaved Roads	--	--	--	--	32.42	3.24
Commuters and Delivery Vehicles	--	--	--	--	--	--
Earthmoving	--	--	--	--	353.46	37.30
TOTAL	**302.54**	**236.98**	**21.77**	**0.15**	**397.44**	**51.57**

Xcel Energy
Minnesota Energy Connection Project
Construction Emission Calculations
Emission Factors for Construction Engines

Equipment	Quantity [a]	Total Hours Used [b]	Max Power (HP)	Load Factor [c]	Loaded Power (HP)	Emission Factors [d,e] (g/hp-hr) VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SO_2
Air Compressor	5	14,700	80	1	80	0.367	2.366	4.700	0.240	0.240	0.002
ATV	10	12,232	20	0.5	10	0.438	2.161	4.440	0.267	0.267	0.002
Backhoe	4	9,120	75	0.8	60	0.367	2.366	4.700	0.240	0.240	0.002
Bulldozer	8	14,480	250	1	250	0.309	0.748	4.000	0.132	0.132	0.002
Compactor	1	200	300	1	300	0.167	0.843	4.335	0.132	0.132	0.002
Fork Lift	8	18,956	120	1	120	0.167	0.843	4.335	0.132	0.132	0.002
Concrete Mixer Truck	8	23,040	325	1	325	0.338	0.867	4.100	0.180	0.180	0.002
Dump Truck	3	11,970	325	0.8	260	0.338	0.867	4.100	0.180	0.180	0.002
Excavator	11	35,900	138	1	138	0.309	0.748	4.000	0.132	0.132	0.002
Front End Loader	15	43,040	196	1	196	0.309	0.748	4.000	0.132	0.132	0.002
Generator	3	14,976	250	0.5	125	0.167	0.843	4.335	0.132	0.132	0.002
Boom truck	34	58,668	50	1	50	0.338	0.867	4.100	0.180	0.180	0.002
Pickup Truck	58	229,276	150	0.25	38	0.167	0.843	4.335	0.132	0.132	0.002
Skid steer loader	20	57,556	50	1	50	0.309	0.748	4.000	0.132	0.132	0.002
Water truck	5	13,904	100	0.5	50	0.637	2.366	4.700	0.240	0.240	0.002
Welding machine	9	17,405	35	0.8	28	0.367	2.366	4.700	0.240	0.240	0.002
Grader	1	2,880	35	0.8	28	0.438	2.161	4.44	0.267	0.259	0.002
Large Crane	11	30,750	15	0.21	3	0.438	2.161	4.44	0.267	0.259	0.002
Medium Crane	13	46,410	450	0.7	315	0.3085	0.7475	4.0	0.132	0.128	0.002
Fuel Truck	1	3,000	200	0.59	118	0.3085	0.7475	4.0	0.132	0.128	0.002
2-inch Water Pump	6	0	5	0.69	3	0.438	2.161	4.44	0.267	0.259	0.002
Semitruck/Trailer	22	66,480	500	0.59	500	0.167	0.843	4.335	0.132	0.132	0.002
Light Tower	18	40,500	50	1	50	0.438	2.161	4.44	0.267	0.259	0.002

[a] Equipment counts based on experience with construction of a similar projects.

[b] Generally assumes work will occur 7 am - 7 pm, Monday through Saturday.

[c] 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.

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

[e] GHG emission factors from Title 40 Subchapter C Part 98 Subpart C Table C-1 and C-2 to Subpart C.

Assumption:

393.5 hp-hr/MMBtu

453.6 g/lb

Xcel Energy

Minnesota Energy Connection Project

Construction Emission Calculations

Emission Estimates from Construction Engines

	Potential Emissions (tons)					
Equipment	**VOC**	**CO**	**NOx**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**
Air Compressor	0.48	3.07	6.09	0.31	0.31	0.00
ATV	0.06	0.29	0.60	0.04	0.04	0.00
Backhoe	0.22	1.43	2.83	0.14	0.14	0.00
Bulldozer	1.23	2.98	15.96	0.53	0.53	0.01
Compactor	0.01	0.06	0.29	0.01	0.01	0.00
Fork Lift	0.42	2.11	10.87	0.33	0.33	0.01
Concrete Mixer Truck	2.79	7.15	33.84	1.49	1.49	0.02
Dump Truck	1.16	2.97	14.07	0.62	0.62	0.01
Excavator	1.68	4.08	21.84	0.72	0.72	0.01
Front End Loader	2.87	6.95	37.20	1.22	1.22	0.02
Generator	0.34	1.74	8.95	0.27	0.27	0.00
Boom truck	1.09	2.80	13.26	0.58	0.58	0.01
Pickup Truck	1.58	7.98	41.09	1.25	1.25	0.02
Skid steer loader	0.98	2.37	12.69	0.42	0.42	0.01
Water truck	0.49	1.81	3.60	0.18	0.18	0.00
Welding machine	0.20	1.27	2.52	0.13	0.13	0.00
Grader	0.04	0.19	0.39	0.02	0.02	0.00
Large Crane	0.05	0.23	0.47	0.03	0.03	0.00
Medium Crane	4.97	12.05	64.46	2.13	2.06	0.03
Fuel Truck	0.12	0.29	1.56	0.05	0.05	0.00
Light Tower	0.98	4.82	9.91	0.60	0.58	0.00
TOTAL	**21.76**	**66.66**	**302.50**	**11.06**	**10.97**	**0.15**

Xcel Energy

Minnesota Energy Connection Project

Construction Emission Calculations

Emission Factors for Helocoptor Engines

Equipment	Engine Mode [a]	Quantity [b]	Hours per Day	Days per Week	Number of Weeks	Total Hours Used	Fuel Flow [c] (kg/s)	Max Power [b] (HP)	Load Factor [c]	Loaded Power (HP)	Loaded Power (mmBtu)	Emission Factors [c] (g/kg fuel flow)					
												VOC	CO	NOx	PM_{10}	$PM_{2.5}$	SO_2
Turboshaft Engine <600 SHP	Ground Idle	1	0.75	5	92	345	0.018	350	0.13	46	2.58	61.82	81.74	1.85	0.12	0.12	--
	Hover and Climb	1	0.75	5	92	345	0.039	350	0.87	305	5.67	7.93	9.91	5.43	0.17	0.17	--
	Approach	1	0.75	5	92	345	0.028	350	0.46	161	4.15	15.79	20.1	3.78	0.14	0.14	--
	Flight	1	4.75	5	92	2,185	0.037	350	0.8	280	5.44	8.69	10.88	5.18	0.17	0.17	--

[a] Assumes each flight is approximately 2.5 hours in duration which includes 0.25 hrs each of ground idle, hover and climb, and approach.

[b] Equipment counts and use based on experience with similar projects.

[c] From Guidance on the Determination of Helicopter Emissions, Edition 2, Dec 2015

[d] GHG emission factors from Title 40 Subchapter C Part 98 Subpart C Table C-1 and C-2 to Subpart C.

Conversions:

453.6	g/lb
43.1	Mj/kg fuel
1055.06	Mj/mmBtu
0.041	mmBtu/kg

Xcel Energy

Minnesota Energy Connection Project

Construction Emission Calculations

Potential Emissions from Helocoptor Engines

	Potential Emissions (ton/yr)				
Equipment	**VOC**	**CO**	**NOx**	**PM_{10}**	**$PM_{2.5}$**
Turboshaft Engine <600 SHP	4.30E-03	1.14E+02	9.52E-04	2.10E-02	2.85E-02
	1.21E-03	1.38E+01	1.87E-02	2.09E-01	5.45E-03
	1.77E-03	2.79E+01	6.90E-03	9.10E-02	8.93E-03
	1.28E-03	1.51E+01	1.64E-02	1.87E-01	5.79E-03
TOTAL	**0.01**	**170.32**	**0.04**	**0.51**	**0.05**

Xcel Energy
Minnesota Energy Connection Project
Construction Emission Calculations
Fugitive Dust Emissions from Unpaved Roads

Equipment	Quantity [a]	Total Days Used	VMT [b]	W	Emission Factor (lb/VMT) [c] PM_{10}	Emission Factor (lb/VMT) [c] $PM_{2.5}$	Emissions (tons) PM_{10}	Emissions (tons) $PM_{2.5}$
ATV	10	1,223	612	20	1.73	0.17	0.53	0.05
Backhoe	4	912	456	50	2.62	0.26	0.60	0.06
Bulldozer	8	1,448	724	20	1.73	0.17	0.63	0.06
Fork Lift	8	1,896	948	20	1.73	0.17	0.82	0.08
Concrete Mixer Truck	8	2,304	9,216	20	1.73	0.17	7.99	0.80
Dump Truck	3	1,197	599	21	1.77	0.18	0.53	0.05
Excavator	11	3,590	1,795	22	1.81	0.18	1.62	0.16
Front End Loader	15	4,304	2,152	23	1.85	0.18	1.99	0.20
Boom truck	34	5,867	2,933	24	1.88	0.19	2.76	0.28
Pickup Truck	58	22,928	11,464	24	1.88	0.19	10.79	1.08
Piping Truck	0	0	0	25	1.92	0.19	0.00	0.00
Skid steer loader	20	5,756	2,878	26	1.95	0.20	2.81	0.28
Water truck	5	1,390	695	20	1.73	0.17	0.60	0.06
Welding Machine	9	1,741	870	20	1.73	0.17	0.75	0.08
Grader	1	288	144	20	1.73	0.17	0.12	0.01
Large Crane	11	3,075	1,538	50	2.62	0.26	2.01	0.20
Medium Crane	13	4,641	2,321	25	1.92	0.19	2.22	0.22
2-inch Water Pump	6	0	0	25	1.92	0.19	0.00	0.00
Semitruck/Trailer	22	6,648	3,324	25	1.92	0.19	3.19	0.32
TOTAL	**--**	**--**	**--**	**--**	**--**	**--**	**32.42**	**3.24**

[a] Equipment counts are estimated based current construction plan.

[b] Each vehicle is assumed to travel 0.5 mile per day on site.

[c] AP-42 Section 13.2.2 Unpaved Roads, dated November 2006, Equations 1a and 2 TOTALS 11.19 1.12 Surface Silt content based on Table 13.2.2-1 - construction sites.

Eq 1a: $E = k * (s/12)^a * (W/3)^b$

Eq 2: $E_{ext} = E * [(365-P)/365]$

Constants	PM	PM_{10}	$PM_{2.5}$
k (lb/VMT)	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

where:

VMT = Vehicle Miles Traveled

W = Mean Vehicle Weight, tons

S = Mean Vehicle Speed, mph

P = 120 days with at least 0.01 inches rain, EPA's AP-42 Figure 13.2.2-1

s = 8.5 surface material silt content (%) for construction sites, EPA's AP-42 Table 13.2.2-1

E = size-specific emission factor, lb/ VMT

E_{ext} = annual size-specific emission factor extrapolated for natural migration, lb/VMT

Xcel Energy
Minnesota Energy Connection Project
Construction Emission Calculations
Fugitive Dust Emissions from Earthmoving Activities

Summary of Fugitive Dust Emissions From Earthmoving Activities

Construction Activity	Daily Material Handling Construction Rate [a] (ton/day)	Handling Time (days)	Average Exposed Area (acres)	Emission Factors [b - d] (lb/ton) PM_{10}	Emission Factors [b - d] (lb/ton) $PM_{2.5}$	Emissions (tons) PM_{10}	Emissions (tons) $PM_{2.5}$
Topsoil removed by scraper [e]	29,563.8	216	---	0.058	0.0061	185.19	19.48
Topsoil replacement	29,563.8	216	---	0.012	0.0013	38.31	4.15
Wind erosion of exposed areas	--	216	3,166.50	0.38	0.03999	129.95	13.68
TOTAL						**353.46**	**37.30**

Notes and Assumptions:

[a] Soil density: 1.25 tons per yard.

[b] As worst case, PM_{10} is set equal to Total Particulate Matter. $PM_{2.5}$ is set to 0.105 times PM_{10} per AP-42 Section 11.9 Table 11.9-1.

[c] 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).

[d] Emission factor: AP-42 Section 11.9 Western Surface Coal Mining, Table 11.9-4, July 1998, topsoil removal by scraper.

[e] Assumes the entire workspace is cleared to 1 foot deep, 1.25 tons per cubic yard. This is highly conservative, as only areas required for construction will be disturbed.

Construction Schedule[a]	
Total Days:	216

[a]Assumes construction will occur during a 9 month construction season, 6 days a week.

Topsoil Removed by Scraper

County/Facility	Total (Acres)	Soil Volume (yd^3)	Soil Weight (ton)	Daily Material Handling Rate (ton/day)
Worst case (Blue Route)	3166.50	5,108,620	6,385,775	29,564
TOTAL	**3166.50**	**5,108,620**	**6,385,775**	**29,564**

Xcel Energy
Minnesota Energy Connection Project
Greenhouse Gas Emission Calculations
Summary

	Greenhouse Gas Emissions From Construction Engines (tons)			
Description	**CO_2**	**CH_4**	**N_2O**	**CO_2e [a]**
Off-Road Engine Emissions	0.00	0.00	0.00	0.00
Commuters and Delivery Vehicles	4,843.67	0.00	0.00	4843.67
Helicopter Engines Emissions	1,291.82	0.05	0.05	1,309.15
TOTAL	**6,135.49**	**0.05**	**0.05**	**6,152.82**

[a] CO_2e = carbon dioxide equivalent. Includes global warming potentials from 40 CFR 98 Table A-1.

Global Warming Potentials		
CO_2	**CH_4**	**N_2O**
1	25	298

Source: 40 CFR 98 Table A-1:

Xcel Energy

Minnesota Energy Connection Project

Greenhouse Gas Emission Calculations

Emission Estimates from Construction Engines

Equipment	Quantity [a]	Hours per Day	Days per Week	Number of Weeks	Total Hours Used [b]	Max Power (HP)	Load Factor [c]	Loaded Power (HP)	Emission Factors [d,e] (g/hp-hr)			Potential Emissions [f] (tons)			
									CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO_2e
Air Compressor	5	10	0	0	0	80	1	80	188.262	0.008	0.002	0.00	0.00	0.00	0.00
ATV	10	10	0	0	0	20	0.5	10	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Backhoe	4	10	0	0	0	75	0.8	60	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Bulldozer	8	10	0	0	0	250	1	250	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Compactor	1	10	0	0	0	300	1	300	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Fork Lift	8	10	0	0	0	120	1	120	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Concrete Mixer Truck	8	10	0	0	0	325	1	325	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Dump Truck	3	10	0	0	0	325	0.8	260	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Excavator	11	10	0	0	0	138	1	138	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Front End Loader	15	10	0	0	0	196	1	196	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Generator	3	10	0	0	0	250	0.5	125	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Boom truck	34	10	0	0	0	50	1	50	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Pickup Truck	58	10	0	0	0	150	0.25	38	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Skid steer loader	20	10	0	0	0	50	1	50	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Water truck	5	10	0	0	0	100	0.5	50	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Welding machine	9	10	0	0	0	35	0.8	28	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Grader	1	10	0	0	0	35	0.8	28	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Large Crane	11	10	0	0	0	15	0.21	3	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Medium Crane	13	10	0	0	0	450	0.7	315	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Fuel Truck	1	10	0	0	0	200	0.59	118	188.262	0.008	0.002	0.00	0.00	0.00	0.00
2-inch Water Pump	6	10	0	0	0	500	0.59	500	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Semitruck/Trailer	22	10	6	0	0	50	1	50	188.262	0.008	0.002	0.00	0.00	0.00	0.00
Light Tower	18	10	0	0	0	50	1	50	188.262	0.008	0.002	0.00	0.00	0.00	0.00
TOTAL	--	--	--	--	--	--						**0.00**	**0.00**	**0.000**	**0.00**

[a] Equipment counts based on experience with construction of a similar projects.

[b] Generally assumes work will occur 7 am - 7 pm, Monday through Saturday.

[c] 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.

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

[e] GHG emission factors from Title 40 Subchapter C Part 98 Subpart C Table C-1 and C-2 to Subpart C.

[f] CO_2e is carbon dioxide equivalent and includes global warming potentials from 40 CRF Part 98 Table A-1.

Global Warming Potentials		
CO_2	CH_4	N_2O
1	25	298

Source: 40 CFR 98 Table A-1: https://www.ecfr.gov/current/title-40/chapter-I/subchapter-C/part-98#Table-A-1-to-Subpart-A-of-Part-98

Xcel Energy

Minnesota Energy Connection Project

Greenhouse Gas Emission Calculations

Emission Factors for Helocoptor Engines

Equipment	Engine Mode [a]	Quantity [b]	Hours per Day	Days per Week	Number of Weeks	Total Hours Used	Fuel Flow [c] (kg/s)	Max Power (HP)	Load Factor [c]	Loaded Power (HP)	Fuel Usage (MMBtu)	Emission Factors [d] (kg/mmBtu)			Potential Emissions (tons)			
												CO_2	CH_4	N_2O	CO_2	CH_4	N_2O	CO_2e [e]
Turboshaft Engine <600 SHP	Ground Idle	1	0.75	5	92	345	0.018	350	0.13	46	893.1	72.22	0.003	0.001	71.10	0.00	0.00	72.05
	Hover and Climb	1	0.75	5	92	345	0.039	350	0.87	305	1,964.2	72.22	0.003	0.001	156.36	0.01	0.01	158.46
	Approach	1	0.75	5	92	345	0.028	350	0.46	161	1,438.5	72.22	0.003	0.001	114.51	0.00	0.00	116.05
	Flight	1	4.75	5	92	2185	0.037	350	0.8	280	11,931.6	72.22	0.003	0.001	949.85	0.04	0.04	962.59
	Total	**1**	**7**	**5**	**92**	**3,220**									**1,291.82**	**0.05**	**0.05**	**1,309.15**

[a] Assumes each flight is approximately 2.5 hours in duration which includes 0.25 hrs each of ground idle, hover and climb, and approach.

[b] Equipment counts and use based on experience with similar projects.

[c] From Guidance on the Determination of Helicopter Emissions, Edition 2, Dec 2015

[d] GHG emission factors from Title 40 Subchapter C Part 98 Subpart C Table C-1 and C-2 to Subpart C.

[a] CO_2e = carbon dioxide equivalent. Includes global warming potentials from 40 CFR 98 Table A-1.

Conversions:

453.6	g/lb
43.1	MJ/kg fuel
1055.06	MJ/mmBtu
0.041	mmBtu/kg
2000	lb/ton

1	kg/mmbtu
1000	g/kg
453.6	g/lb

Xcel Energy
Minnesota Energy Connection Project
Greenhouse Gas Emission Calculations
Greenhouse Gas Emissions from On Road Construction Traffic

On-Road Vehicles					
	Vehicles per day	**Miles per vehicle**	**Number of Days**	**Fuel Used (gallons)**	**CO_2 Emissions [a] (tons)**
Commuter Vehicles - Gasoline [b,c]	210	60	648	371,127	3,636
Delivery Trucks - Diesel [d]	22	60	530	107,631	1,208
Concrete Mixer Trucks - Diesel [e]	8	60	288	40,659	456.34

[a] Assumes 1 gallon of gasoline = 8,887 grams CO_2 and 1 gallon of diesel = 10,180 g CO_2, per US EPA's "Greenhouse Gas Emissions from a Typical Passenger Vehicle," available online at: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100U8YT.pdf

[b] Assumes commuters travel 30 miles each way (60 miles round trip) per day, with a fuel economy of 24 miles per gallon, per US EPA and US Department of Energy Fuel Economy data for combined city and highway driving in 2023, available online at: https://www.fueleconomy.gov/feg/download.shtml.

[c] Assumes commuters will travel for 27 months, 6 days a week.

[d] Assumes delivery trucks travel 30 miles each way (60 miles round trip) per day, with a fuel economy of 6.5 miles per gallon, industry average.

[e] Assumes concrete mixer trucks travel 30 miles each way (60 miles round trip) per day, with a fuel economy of 3.4 miles per gallon, industry average.

1 short ton =	907,185	grams
1 gal gasoline =	8,887	g CO2
1 gal diesel =	10,182	g CO2

APPENDIX K

Draft Vegetation Management Plan

Minnesota Energy Connection Project
Route Permit Application
MPUC Docket No. E002/TL-22-132
October 2023

DRAFT VEGETATION MANAGEMENT PLAN
MINNESOTA ENERGY CONNECTION PROJECT

MPUC Docket Nos. E002 /CN-22-131
& E002/TL-22-132

October 2023

Northern States Power Company

Xcel Energy®
RESPONSIBLE BY NATURE™

414 Nicollet Mall
Minneapolis, MN 55401

Contents

1 INTRODUCTION

The Minnesota Energy Connection Project (Project) involves construction of an approximately 171- to 174-mile long, double circuit 345 kilovolt (kV) transmission line connecting Xcel Energy's Sherburne County Generation Station (Sherco) Substation in Sherburne County to a new substation in Lyon County. Two existing substations (Sherco Substation and Sherco Solar West Substation) will be modified to accommodate interconnection of the new transmission lines and three new substations (Voltage Support, Intermediate, and Terminal Substations) will also be constructed for the Project.

This Vegetation Management Plan (VMP or Plan) is intended to describe Xcel Energy's standards for handling of vegetation removal and protection of existing vegetation during site preparation and construction and for revegetation of areas of exposed soil during restoration following Project construction.

Xcel Energy provides this draft VMP for consideration as part of the route permit proceedings.

2 GENERAL RIGHT-OF-WAY VEGETATION MANAGEMENT

Xcel Energy's standard practice is to clear all woody vegetation within the full right-of-way width for construction of new transmission lines. This includes cases where a new line will be located within an existing right-of-way such as for double circuiting a new line with an existing line. The purpose of clearing to the full extent of the right-of-way is to ensure adequate and safe working spaces for crews during construction, as well as to provide appropriate clearances for safe, reliable operation of the lines once construction is complete. There are limited circumstances when this practice is modified and selected vegetation can remain within the right-of-way provided National Electric Safety Code (NESC) clearance requirements are met. While the removal of woody vegetation within the right-of-way is necessary, efforts are made to protect existing, compatible, low-growing vegetation in order to minimize construction impacts such as soil erosion, wetland damage, or habitat loss. The following is a list of general practices that will be used to minimize vegetation impacts related to Project construction.

- Use erosion control best management practices (BMPs) to intercept stormwater runoff from areas disturbed as part of clearing operations. Stormwater BMPs are addressed in the Stormwater Pollution Prevention Plan (SWPPP).

- Minimize rutting by using matting materials in wetland areas for all construction activities, including right-of-way clearing activities; or perform work on firm or frozen ground that can support the equipment used.
- Minimize soil disturbance in steeply sloped areas, to the extent possible and/or practicable.
- Limit construction activities, including vegetation removal, to the right-of-way and off right-of-way access.
- To the extent practicable, limit traffic in the right-of-way between transmission structure locations to a single access path.
- Limit staging and lay-down areas to previously disturbed areas where practicable.
- Use construction mats to minimize impacts within wetlands and other areas with easily disturbed soils when construction during winter (frozen) months is not possible.
- To the extent practicable, complete construction in wet organic soils when the ground is frozen.
- When existing low-growing vegetation is disturbed during construction restoration efforts, focus on establishing compatible (low growing) non-invasive species within the right-of-way.

3 VEGETATION REMOVAL

The Project will require the clearing of vegetation within the right-of-way and along temporary construction access paths. Tall woody vegetation that may interfere with safe construction and safe and reliable operation of the transmission line will be removed and managed through the operational life of the Project.

Clearing of vegetation will occur prior to other construction activities as allowed by landowner agreements and permit conditions. Clearing may be accomplished with the use of chainsaws, mowers, and hydraulic tree-cutting equipment. Vegetation will be cut at, or slightly above, the ground surface. Rootstock or stumps will typically be left in place unless transmission structure installation or construction access requires otherwise, or at the request of the landowner.

Landowners will be notified to allow them to harvest trees within easement boundaries prior to the initiation of clearing. The landowner will retain the title to all timber material, if desired. Non-merchantable material, including trees, brush, and slash, will be either cut and scattered, placed in windrow piles, chipped, or burned within the right-

of-way. Non-merchantable felled material may also be removed from the right-of-way in a fashion that does not cause erosion unless BMPs are installed.

3.1 UPLAND VEGETATION REMOVAL

The cut and scatter method, where understory trees, branches and brush are simply cut, sectioned into smaller pieces, and scattered across the site, may be used in areas where limited clearing is necessary, and access is challenging. The purpose of this method is to limit unnecessary equipment access and hauling which could potentially disturb existing ground or vegetation.

Woody vegetation may be chipped and scattered over the right-of-way to a maximum depth of one inch in non-agricultural upland areas.

3.2 WETLAND VEGETATION REMOVAL

The use of heavy equipment in wetlands will be minimized to the extent practicable. Wetland impact minimization will be accomplished by:

- constructing in wetlands during frozen conditions to the extent feasible;
- working in dry conditions;
- using low ground-pressure tires or specialized tracked vehicles; and
- using matting materials when the ground is not frozen.

These BMPs are intended to minimize damage to wetland vegetation and soils.

Removal of trees and shrubs from forested wetlands may be necessary in some locations. The removal of woody vegetation within forested wetlands will be conducted in accordance with U.S. Army Corps of Engineers permit conditions. Within these areas, all trees and large shrub species will be cleared to ground level. Small diameter trees and shrubs (<6" diameter) will be cut and debris scattered in place. Large diameter trees and shrubs (>6" diameter) will be hauled out of wetland areas to suitable upland locations and treated according to applicable procedures. If the cut and scatter method is used within wetland areas, no slash material will be left in the wetlands. Chipping or scattering of chips will not occur in wetlands.

Stump removal may occur within wetlands only where stumps interfere with the placement of construction mats or pole locations or pose a risk to construction tires and equipment. Where removal is required for access, stumps will be ground to a point at or slightly below the ground surface using low ground-pressure track-mounted

equipment. Woody materials generated by stump grinding may be thin-spread in the wetland; but said material will not be mounded.

4 HERBICIDE USE

Herbicides may be used within the right-of-way to control regrowth of woody species, prevent the re-sprout of the stumps of tall-growing tree species or to control listed invasive or noxious weed species. All herbicide use will be in accordance with manufacturer's specifications and all applicable federal and state regulations. Herbicides designated for upland use will not be used within 75 feet of the vegetative buffer of waterbodies. Herbicides used in or near wetlands and waterbodies must be designed for use in wet areas as designated by manufacture's specifications and federal and state regulations. Herbicides will not be used on public lands without any required permits/approvals and will not be used at organic farms or other properties where landowners prohibit their use.

The contractor applying herbicide will be required to obtain any necessary permits and/or certifications prior to herbicide placement and will be required to keep proper documentation of location and timing of herbicide use. Treatment shall conform to manufacturers' specifications.

5 NOXIOUS WEEDS AND INVASIVE SPECIES CONTROL

Xcel Energy has identified mitigation measures to be implemented to prevent the introduction and spread of new infestations of noxious weeds and invasive species (NWIS) due to the Project on lands disturbed by construction activities.

Preventing the introduction by the Project of NWIS from outside of the Project area is primarily accomplished by ensuring that, prior to arrival onside, equipment is cleaned and visible dirt or plant parts are removed using methods such as vehicle washing, high pressure compressed air blowers or brushing. A variety of methods can be used to control NWIS that are already present within the Project right-of-way or access routes. These include completing tree and brush clearing during the winter, treating NWIS infested areas with herbicide prior to start of clearing, spreading mulch along access paths, and routing access paths away from NWIS infested areas.

Winter clearing limits the likelihood of construction equipment coming in contact with NWIS plant parts or seeds and reduces the chances of spreading those parts throughout the right-of-way. Treatment of NWIS areas with herbicides before they are able to go to seed can also minimize spread. If any mulch is used on the Project, it will consist of state-certified weed-free material or mulch derived from onsite locations. The contractor will be responsible for locating and documenting the source of certified

weed-free mulch. Copies of the applicable certification documentation must be made available upon request to the appropriate agencies. Mulch derived from onsite locations may be spread up to six inches deep in upland areas to provide ground protection along access paths. Upon abandonment of access routes, woodchip mulch will be spread evenly to a depth no greater than one inch. No mulch will be spread in wetland locations. Major infestation areas due to the Project which are identified during the first growing season will be treated with the use of herbicides or by mechanical methods.

6 SEEDING AND REVEGETATION

Revegetation of areas disturbed by construction activities will take place as soon as practicable following construction completion in those areas. Seedbed preparation will be dependent on the site conditions following construction activities and may include tilling to a minimum depth of four inches with a disc, field cultivator, or chisel plow, breaking up large clumps and firming the soil surface. Prior to seeding, prepared beds should be sufficiently soft to allow for seed penetration and mulch anchoring, while sufficiently firm to provide surface soil stability. Seeding and mulching should occur parallel to ground contours as practicable.

In areas where stumps remain within areas of cleared forest, it may not be practical to access large areas of ground with seeding and seedbed preparation equipment. In these areas, smaller vehicles may be required to perform tasks such as smoothing ruts, preparing seedbeds with small rakes, and surface packing after seeding. Fertilizers and other soil amendments are not recommended and will only be applied as requested by and agreed to with landowners.

Because of the linear nature of transmission line projects, there are typically many different landcover types and plant communities impacted by Project construction. In general, restoration is likely to be consistent with historic vegetation and use, where practicable and consistent with safe and reliable transmission line operation. In cases where there are exposed soils in areas such as roadsides, field edges and other locations dominated by non-native species, a Minnesota state seed mix from the 25 series (Non-Native Grassland) will typically be used. These are certified seed mixes which are designed for regional land cover types and meet minimum standards for seed purity, germination rate, weed seed content and pure live seed weight, and are certified as noxious weed free. In locations where disturbances are within previously undisturbed natural areas which contain native plant species, an appropriate native seed mix will be used. On private agricultural lands, agents will work with landowners to develop appropriate measures for reseeding of disturbed soils which may involve planting of row crops. Pastures will be seeded with landowner-specified seed mix.

6.1 SEEDING METHODS

Seeding methods may include broadcast, seed drilling or hydroseeding. Broadcast seeding is the most commonly used method for relatively small, disturbed areas, which are typically what is seen in transmission line construction. Seed is uniformly distributed by a mechanical, hand-operated seeder; or in small seeding areas, by hand. Following seeding, the surface is typically raked with a cultipacker, harrow, or hand rake. The bed is to be firmed as appropriate to site conditions.

Drilled seed will typically be sown at a depth of approximately 0.25 inches; however some native seed mixes contain small seed which needs to be more shallow. If native seed mixes are being installed via seed drill, equipment will be able to accommodate and uniformly distribute different sizes of seed at the required depth. Feeding mechanisms will be able to evenly distribute different seed types at the rates specified. Seedbed soil is to be suitably firmed immediately following seed drilling. Seed drilling is only used in areas with a larger disturbance footprint.

Hydroseeding involves applying seed in a broadcast, hydromulch slurry. The hydromulch mix allows the installer to see where application has taken place, ensuring uniform coverage of the seeding area. The hydro-seeder must provide for continuous agitation of slurry and provide for a uniform flow of slurry. This method is not recommended for diverse native seed mixed because of the range of seed sized and necessary planting depths.

When used, native seed mixes are typically most successful when installed between April 1 to June 30, or when soil temperatures have fallen below 55 degrees Fahrenheit in the fall. However, seeding will also be completed outside of those time periods, as areas are ready for revegetation. This is to facilitate permanent vegetation cover as soon as possible. Additional seed may be installed in areas where initial seeding is not successful. Temporary seed (oats or winter wheat) may also be applied in those situations as a cover crop.

Temporary seeding of cover crop will occur in locations where unfrozen, bare soil surface conditions and ruts will not be permanently restored within 30 days of completion of active work. Temporary restoration activities will include the repair of rutted surfaces and an even broadcast-seeding of the temporary cover-crop seed mix at a rate appropriate to the cover crop to provide erosion control of the soils. No mulch is to be applied in wetland areas.

6.2 NATURAL REVEGETATION

In many cases, natural revegetation by early successional native species following tree clearing is expected to occur. In areas where native species voluntarily revegetate the right-of-way, active restoration and seeding may not be required. Regular monitoring will take place to ensure that NWIS within the right-of-way are controlled, that desirable native plant species become the dominant vegetation communities in natural areas, and that bare soils are quickly stabilized to reduce erosion. In areas of minimal disturbance, vegetation will be allowed to regenerate naturally.

Where standing water is not present, and where surrounding vegetation is dominated by abundant native species, the seeding of bare soils created by rutting, using the temporary cover-crop seed mix may be sufficient for cover while native species revegetate the area.

In areas where wetland plant communities are dominated by native species with rhizomatous root systems that will likely recolonize areas of limited disturbance rapidly, bare soils may be broadcast-seeded with the seasonally appropriate temporary cover-crop. In areas where disturbed and bare soils are sufficient to preclude revegetation from the local, native seed source, a native wetland seed mix will be applied.

7 EROSION CONTROL

In some cases, temporary erosion control methods will be necessary to stabilize soils and give the seed time to germinate. Erosion control measures may consist of anchored straw mulch, hydromulch, wood chip mulch, or erosion control blankets. When used, the contractor will be responsible for acquiring certified weed-free mulch. If used, erosion control blanketing will be wildlife-friendly non-welded weave in order to minimize impacts to small wildlife. Mulch or blanketing will be required on disturbed, exposed soils on all slopes greater than five percent, and on dry, sandy soils prone to erosion by wind or rain.

If there are locations where seeding is not possible, and there is adequate seed bank present in the soil, temporary stabilization using erosion control matting or mulch will be installed and maintained in a similar manner as in seeded areas. Dormant seeding may be used after soil temperatures have fallen below 55 degrees Fahrenheit when lower temperatures prevent seed from germinating. If dormant seeding is performed, temporary erosion control measures will be installed as indicated in the project SWPPP.

8 MONITORING

The Permittee will be required to monitor and control NWIS due to the Project within the right-of-way throughout Project construction. Infestations of NWIS along the right-of-way will be reported to the appropriate agencies. The Permittee will be required to meet easement and lease conditions and obligations, and will continue to work with landowners and the appropriate agencies to achieve standards set forth in easement or lease agreements.

The Permittee will monitor areas where seeding and erosion control measures have been implemented and will follow-up with reseeding measures where vegetative cover by the specified seed mix, or revegetation by the local, native seed source is inadequate to provide long term stability and sustainable native plant communities.