Attachment G

2022 Dewatering Plan

2022 Dewatering Plan

Farmington Compressor Station

Northern Natural Gas

Dakota County, Minnesota

March 11, 2022

Project Numbers: 193708647, 193708648, & 193708825

BACKGROUND

Northern Natural Gas (Northern) continues to renovate their Farmington compressor station, which has included water appropriations and dewatering activities periodically since 2018.

INTRODUCTION

Northern competed a thorough review of all potential projects that are scheduled to occur within the Farmington compressor station in 2022 and assessed all dewatering needs associated with those projects. A total of four projects will occur within or directly adjacent to the Farmington compressor station between May and August 2022.

Northern has reviewed the projects and put forth a significant effort to account for all dewatering needs that are anticipated during the 2022 construction season to include all dewatering activities on the property in one dewatering plan and water appropriation permit. Additionally, Northern has altered construction and dewatering schedules, proposed workspaces, and construction methods to reduce potential dewatering volumes.

The following documents and related information are incorporated by reference to comprise the Northern Dewatering Plan (Plan) for construction activities that will occur at and near the Farmington compressor station during the 2022 construction season. This Plan has been generated as a supplemental document to accompany the Individual Water Appropriation Permit application to be submitted to the MDNR, via the Minnesota Permitting and Reporting System.

1. PROJECT LOCATION AND DESCRIPTION

1. Project Location

The projects are located within and adjacent to the existing Farmington compressor station in Section 36, Township 114 North, Range 20 West (T114N, R20W), Farmington, Dakota County, Minnesota. Project location maps that detail specific areas of disturbance are included in Attachment A.

2. Project Description

As a part of the projects, Northern plans to Northern proposes to modify existing pipeline facilities and to extend a watermain to facility building constructed in 2022.

M450B Farmington-to-North Branch ILI Mods Project

The purpose of this project is to make modifications on approximately 500 feet of M450B mainline. Northern will utilize 23.79 acres of temporary workspace within the Farmington compressor station and approximately 0.72 acre of temporary workspace south of 212th Street West to complete the Project. Dewatering for this project component will occur between May 5 and July 23, 2022.

M500B Ventura-to-Faribault Pipe Replacement Milepost 106.76 Project

The purpose of this project to replace 385 feet of 24-inch-diameter pipe with 26-inch-diameter pipe on the Ventura to Farmington M500B mainline. Based on figures

provided by Northern on September 22, 2021, Northern will utilize 23.79 acres of temporary workspace within the Farmington compressor station and an approximately 0.72 acre of temporary workspace south of 212th Street West to complete the Project. Dewatering for this project component will occur between May 5 and July 23, 2022.

M500D-30in-H-R22 Ventura-Farmington Project

The purpose of this project is to perform two pipe cut-outs to hydrostatically test 0.7-mile of the 30" M500D pipeline. Hydrostatic test water will be hauled off and disposed of at an approved facility. Northern will utilize 0.98 acre of temporary workspace within the Farmington compressor station, and approximately 0.73 acre of temporary workspace northwest of the 220th Street West and Denmark Avenue intersection, accessed by a 0.69-acre temporary access road, to complete the project. No dewatering will occur at the temporary workspace northwest of the 220th Street West and Denmark Avenue intersection. Dewatering for this project component will occur between July 5 and July 23, 2022.

Farmington Waterline Project

The purpose of this project is to extend a watermain from the southern boundary of the Farmington compressor station approximately 700 feet north to a new facility building that was constructed in 2021. Dewatering for this project component will occur between August 1 and August 21, 2022.

The approximate locations of project workspaces are shown on the attached maps (Attachment A).

2. INSTALLATION DEWATERING PLAN

A geotechnical report dated November 6, 2019, states soils encountered within the Project area consisted of fill and or clay soils over poorly graded sands. Additionally, groundwater was measured within the soil borings approximately 6.5-FT below existing ground or between elevations 896 to 898 feet above mean sea level.

Northern will complete dewatering activities to support the construction Projects within and adjacent to the Farmington compressor station. Northern will only remove the water needed to safely work within the excavated areas of the Projects.

Dewatering wells will be installed around the perimeter of the excavations and discharge groundwater to the discharge header system mentioned below.

The Projects approximate well location are shown on the Dewatering Plan Figure, included in Attachment B.

Dewatering wells will be installed to a depth not to exceed 25 feet, with 5-horsepower pumps with maximum pumping rate of 250 gallons per minute (GPM) capabilities. The discharge collected from the wells at each project location will be transported via an 18-inch diameter HDPE fused header pipe with valves and flanged connections that can be operated to direct the discharge to the designated location. The discharge will be

monitored using a flow meter and regulated with valves as needed.

Dewatering for multiple project components will occur concurrently during the construction of the Projects. The cumulative monthly discharges will not exceed 29,999,000 gallons in a 30-day period. Northern estimates the maximum pumping rate, as designed, at any one time for the Projects could be 7,250 GPM. Northern is requesting a pumping rate for the wellpoint system of 4,850 GPM.

The estimated total volumes and the anticipated number of wells needed to complete each project component are identified in the table below.

Project Components	**Pumping Duration**		**Anticipated Number of Wells**	**Estimated Volume of Discharge (gallons)**
	Start	**Stop**		
Discharge to the North Site (Site A)				
M450B and M500B projects	5/5/2022		23	2,000,000
M450B and M500B projects	5/6/2022	5/31/2022	24	14,391,000
M450B and M500B projects	6/1/2022	6/15/2022	24	11,219,500
M450B and M500B projects	6/16/2022	6/30/2022	24	11,219,500
M450B, M500B, and M500D Hydrostatic Test Projects	7/5/2022	7/23/2022	4	29,999,000
Farmington Watermain project	8/1/2022	8/21/2022	6	29,999,000
Discharge to the South Site (Site B)				
M450B and M500B projects	5/5/2022	5/31/2022	24	13,608,000
M450B and M500B projects	6/1/15/2022	6/15/2022	22	7,560,000

3. DISCHARGE DEWATERING PLAN

Northern will install a dewatering header system to direct the discharges from each dewatering well system to a specific discharge location. Due to the proximity of the Projects to a designated trout stream, dewatering discharge occurring between May 5 and August 21 will be discharged directly into the ditch north of the Farmington compressor station or the directly adjacent to the Vermillion River (see Discharge Location Figure in Attachment B). Northern will install and discharge into a straw bale structure at the discharge location. Within the straw bale structure, a baffle device with an upward 90-degree bend will be installed on the discharge pipe. This design will cause the discharge water to flow upward into the air before falling into the straw bale structure, which will minimize the potential for scouring and sediment transport. The environmental inspector (EI) will watch for scouring on the banks of the ditch during dewatering and will change the dewatering location as necessary. Temperature of the water extracted will be maintained, as near as practical, from withdrawal to discharge at the ditch. Northern will use a light-colored fabric to cover the dewatering hose to minimize thermal absorption and maintain the temperature of the water.

1. Discharge Site A

   Discharge Site A is located in a ditch north of the compressor station, shown on the Dewatering Figure (Attachment A).

   Northern anticipates that between May 5, and August 21, 2022, approximately 98,828,000 gallons of water will be discharged at a pumping rate of 4,850 GPM, with a maximum cumulative rate of 7,250 GPM, will be discharged to Discharge Site A.

2. Discharge Site B

   Discharge Site B is located within a roadside ditch adjacent to the Vermilion River, southwest of the 212th Street West and Denmark Avenue intersection, shown on the Discharge Location Figure (Attachment A).

   Northern anticipates between May 5 and June 15, 2022, approximately 21,168,000 gallons of water will be discharged at a pumping rate of 700 GPM, with a maximum cumulative rate of 1,750 GPM, will be discharged to Discharge Site B.

Northern estimates the total discharge for the projects between May and August 2022 will be 119,996,000 gallons.

4. CONTINGENCY PLANNING

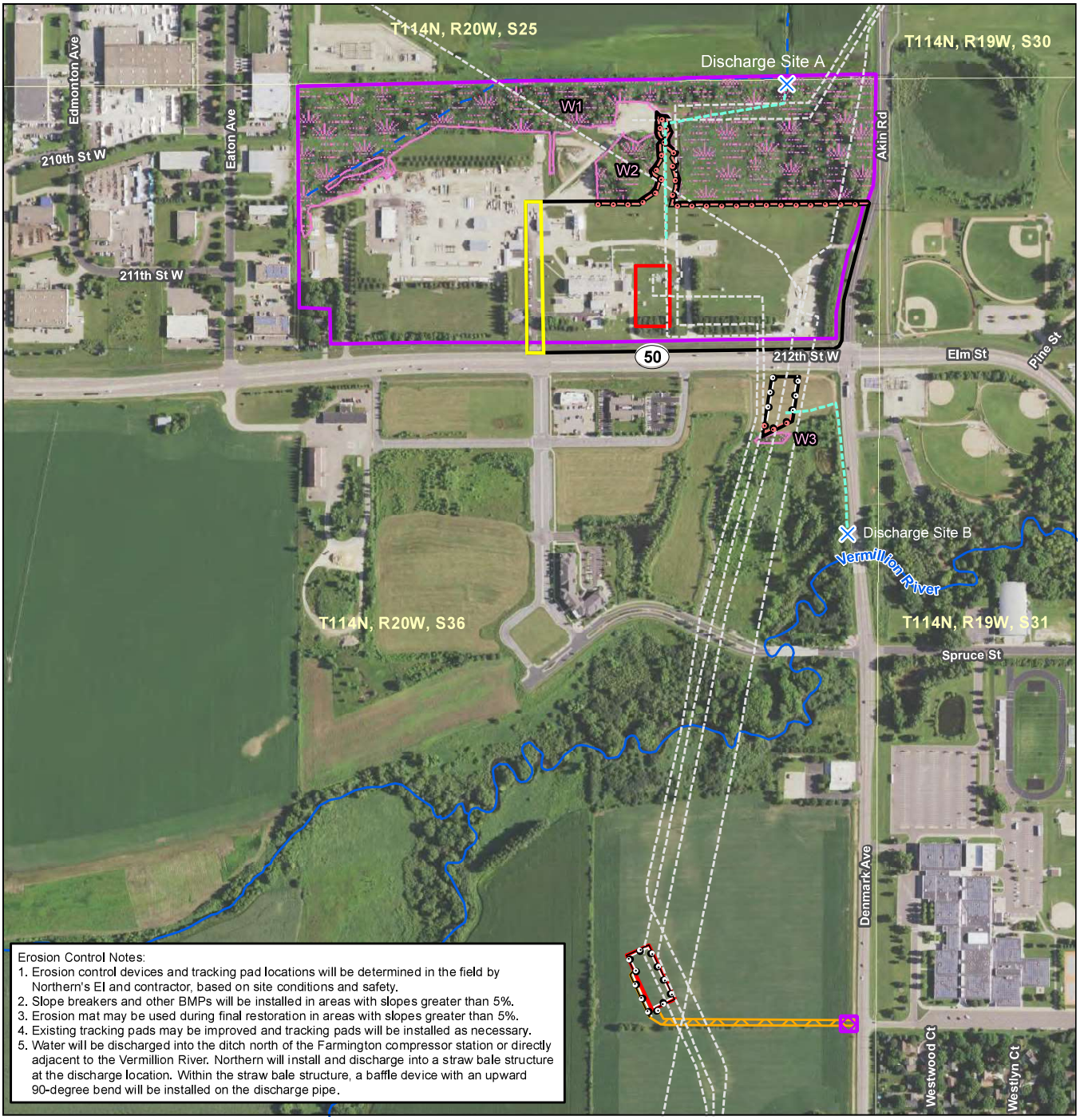
Due to the volume of anticipated water that can be generated from these Projects and the proximity of the Projects to the Vermillion River, Northern may implement a series of measures to reduce the effect discharge has on offsite resources. Northern will only dewater and discharge enough water to safely work with excavated areas within the Projects. Whenever possible, Northern will reduce pumping rates to minimize volume of

water discharged. Northern may implement the following practices: rotation of discharge locations, discharge within the compressor station to allow for infiltration, discharge to multiple locations at once, temporarily reduce pumping rates, and/or discharge water other approved locations.

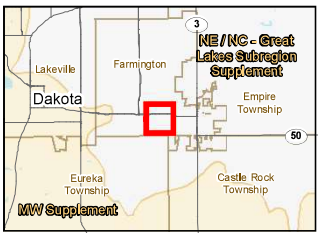
If, at any time, flooding conditions occur downstream of the Projects, Northern will reduce and/or relocate discharge location to a site within the compressor station. If necessary, Northern will temporarily halt pumping if flooding conditions continue to occur.

ATTACHMENT A

DEWATERING FIGURE



Erosion Control Notes:
1. Erosion control devices and tracking pad locations will be determined in the field by Northern's EI and contractor, based on site conditions and safety.
2. Slope breakers and other BMPs will be installed in areas with slopes greater than 5%.
3. Erosion mat may be used during final restoration in areas with slopes greater than 5%.
4. Existing tracking pads may be improved and tracking pads will be installed as necessary.
5. Water will be discharged into the ditch north of the Farmington compressor station or directly adjacent to the Vermillion River. Northern will install and discharge into a straw bale structure at the discharge location. Within the straw bale structure, a baffle device with an upward 90-degree bend will be installed on the discharge pipe.



Notes
1. Coordinate System: NAD 1983 StatePlane Minnesota South FIPS 2203 Feet
2. Data Sources: Stantec, USGS, NADS
3. Background: 2019 NAIP

Legend
- Existing Pipeline
- Farmington Compressor Station
- Temporary Workspace (Farmington Water Line Project)
- Temporary Workspace (M450B & M500B)
- Temporary Workspace (M500D)
- Temporary Access Road (M500D)
- Approximate Discharge Location
- Approximate Discharge Route
- Redundant Silt Fence
- Silt Fence
- Tracking Pad
- Previously Delineated Wetland

National Hydrography Dataset
- Perennial Stream
- Intermittent Stream
- Waterbody*

*No features within data frame

0 350 700 Feet
(At original document size of 8.5x11)
1:8,400

N

Stantec | Northern Natural Gas

Project Location
T114N, R20W, S36,
C. of Farmington, Dakota Co., MN

Prepared by JM on 2022-03-04
TR by MZ on 2022-03-07
IR by XX on 2022-XX-XX

Client/Project 193708825 / 193708647 / 193708648
Northern Natural Gas
Farmington Compressor Station
Dewatering & Erosion Control Plan

Figure No.
3

Title
Erosion Control Plan

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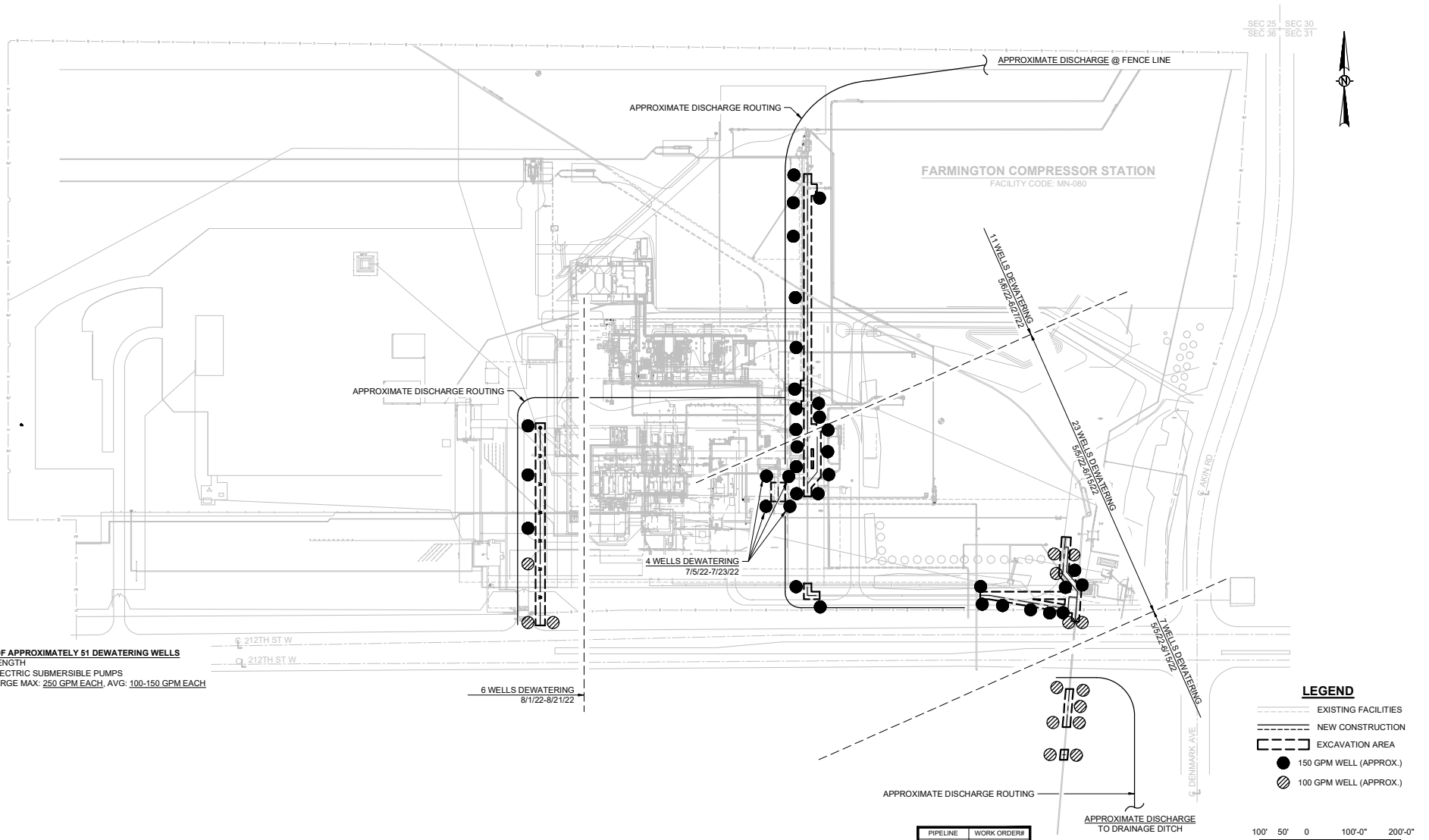
ATTACHMENT B

DEWATERING PLAN SET

Stantec



TOTAL OF APPROXIMATELY 51 DEWATERING WELLS
- 29 LF LENGTH
- 5 HP ELECTRIC SUBMERSIBLE PUMPS
- DISCHARGE MAX: 250 GPM EACH, AVG: 100-150 GPM EACH

LEGEND
- EXISTING FACILITIES
- NEW CONSTRUCTION
- EXCAVATION AREA
- 150 GPM WELL (APPROX.)
- 100 GPM WELL (APPROX.)

PIPELINE	WORK ORDER#
N/A	01127308
30" MNM80104	OO132989
26" MNM80102	01137537
24" MNM86501	01134634

100' 50' 0 100'-0" 200'-0"
SCALE: 1" = 100'-0"

SCALE DISCLAIMER:
NOTED SCALE APPLIES TO 22"x34" PAPER SIZE ONLY

3/8/2022 10:34 AM J:\PROJECTS\NNG\2022\PIPELINE ASSESMENT\FARMINGTON DEWATERING\FARMINGTON DEWATERING\PLANT 3D MODELS\FARMINGTON DEWATERING 2022

INTERNAL INFORMATION
DISTRIBUTION/COPIES LIMITED TO PROJECT NEEDS

NO.	REVISION - DESCRIPTION	BY	DATE	CHK'D	APP'D
P	ISSUED FOR PRELIMINARY	JTG			

PRELIMINARY DRAWING
DO NOT USE FOR CONSTRUCTION

STATUS	CHECKED BY	CHECKED DATE	APPROVED BY	APPROVED DATE
PRELIM				
BID				
CONST.				

FAC. CODE: MN-080		REL. WO. AS NOTED
PL# AS NOTED		CONST. YR 2022
ST# N/A		PO# N/A
	BY	DATE
DESIGN	JTG	2/2/22
DRAWN	JTG	2/2/22
ASSUL'T		
FILE NO.: TBD		
SCALE: N/A		

FARMINGTON COMPRESSOR STATION
2022 FARMINGTON DEWATERING
SITE CIVIL PLAN
SEC 36, T114N, R20W
DAKOTA COUNTY, MINNESOTA

Northern Natural Gas

WORK ORDER NO.
AS NOTED

DWG. NO.
S5-1E
P

Attachment H

Dewatering Analysis Technical Memorandum

Stantec

Memo

To:	Kelly Henry 1120 Centre Pointe Drive Suite 400 Mendota Heights, MN 55120	From:	Justin Soberaski 733 Marquette Avenue Suite 1000 Minneapolis, MN 55402
File:	227705326	Date:	November 4, 2022

Reference: Radius of Influence Estimation at Farmington Compressor Station Improvements Project

BACKGROUND AND OBJECTIVE

Northern Natural Gas (Northern) plans to complete dewatering activities to support future construction projects at the existing Farmington Compressor Station (Site) shown on **Figure 1**. The Farmington Compressor Station has been in operation since 1961. Water appropriations and dewatering activities associated with construction projects have periodically occurred at the Site for several years. Northern has obtained Minnesota Department of Natural Resources (DNR) Water Appropriation Permits and developed dewatering plans in coordination with the DNR for past temporary dewatering activities.

Northern is preparing a discretionary Environment Assessment Worksheet (EAW) for planned construction projects that would potentially exceed the mandatory EAW threshold pursuant to Minnesota Rules 4410.4300, Subpart 24(A): *For a new appropriation for commercial or industrial purposes of either surface water or ground water averaging 30,000,000 gallons per month; or a new appropriation of either ground water or surface water for irrigation of 540 acres or more in one continuous parcel from one source of water, the DNR is the responsible governmental unit (RGU).*

An early coordination meeting with the DNR was held on September 13, 2022 to discuss the environmental review process. During this meeting, the DNR District Appropriations Hydrologist, Joe Richter, recommended completing an analysis to evaluate the potential drawdown impacts of the proposed dewatering at the Site to nearby wells. The purpose of this memorandum is to summarize the methodology used to estimate the Radius of Influence (Ro) or the extent (distance) and findings of the dewatering analysis for the planned dewatering activities.

SITE CHARACTERIZATION DATA

Figure 1 shows the northern portion of the Site is located less than 1,000 feet from the North Branch of the Vermillion River and the southern portion of the Site is located approximately 1,000 to 2,000 feet from the Vermillion River. There are several unnamed surface water bodies in the vicinity of the Site and a drainage ditch within the Site boundary which are included in the National Hydrography Dataset (USGS, 2022).

The Farmington Compressor Station Improvement Project Environmental Assessment Worksheet (EAW; Section 11; Stantec, 2022) provides a summary of the geology underlying the Site and depth to groundwater. The geology is comprised of unconsolidated Quaternary deposits (glacial deposits) that are estimated to be at least 83 feet thick (Stantec, 2022). The depth to groundwater ranges from 2-to-12 feet with an average depth of 5 feet (Stantec, 2022). The water table at the Site is unconfined.

Figure 1 shows the surficial geology as mapped by the Minnesota Geological Survey (MGS; MGS, 2019). The geological units shown on **Figure 1** are summarized below:

Reference: **Radius of Influence Estimation at Farmington Compressor Station Improvements Project**

- **New Ulm Formation** – is a glacial outwash deposit that is located at the Site and is comprised of sand to gravelly sand.
- **Floodplain Alluvium** – is a fluvial deposit that is located along the North Branch of the Vermillion River and along the Vermillion River and is comprised of gravelly sand to sandy silt. Generally, this deposit consists of coarse-grained sediment (sand and gravel) in channels, and finer-grained sediment (fine-grained sand and silt) on floodplains.
- **Cromwell Formation** - is a glacial outwash deposit that is mapped to the west and north of the Site and is comprised of sand to gravelly sand.

In June 2015, a subsurface geological investigation was completed in the southern portion of the Site (near 212 Street West). Groundwater level measurements, soil boring logs, and geotechnical laboratory test results are provided in the 2015 Investigation Report (Terracon, 2015). Groundwater was identified between 7 and 8 feet below ground surface (bgs) and poorly graded sand (fine to coarse-grained) was observed in each of the five advanced soil borings. Each soil boring was continuously sampled from ground surface to depths between 20 to 30 feet bgs. Geotechnical laboratory tests were performed for grain size analysis at three different intervals and within two different soil borings. The laboratory test results identified the material type to be poorly graded sand and poorly graded sand with silty clay.

The EAW (Section 12; Stantec, 2022) provides a comprehensive review of water wells in the vicinity of the Site. **Figure 1** shows the location of commercial, domestic, irrigation and monitoring wells in the vicinity of the Site as provided in the EAW (Stantec, 2022).

METHODOLOGY AND ASSUMPTIONS

The most reliable means of estimating the Ro is by Jacob analysis of a pumping test. This method will reveal the degree of connection with surface water bodies and recharge from other aquifers (Powers, 1992). Large values (i.e., distance) for Ro are typically for confined aquifers (Powers, 1992). Since the water table at the Site is unconfined and dewatering activities have periodically occurred for several years with no measurable drawdown reported at nearby wells, smaller values for Ro are anticipated.

Lacking results from a completed pumping test, it is possible to estimate Ro based on an empirical relationship developed by Sichardt. This equation provides Ro as a function of drawdown H-h and K:

$$Ro = 3000\ (H - h)\ \sqrt{K}$$

Where:

H = the total head of the water table aquifer in meters (m)
h = the total head of the dewatered aquifer in m
Ro = radius of influence in m, calculated via Sichardt's equation
K = hydraulic conductivity, in m/second (s)

An example for estimating Ro using the Sichardt equation is provided by the Environmental Protection and Growth Management Department (EPGMD), Broward County, Florida (EPGMD, 2022).

The relationship between the total head of the water table aquifer (H) and the total head of the dewatered aquifer (h) is equal to anticipated drawdown within the excavation due to groundwater pumping during dewatering activities. This assumes dewatering activities within the excavation is performed long enough for

pseudo steady-state conditions to be reached. Based on the average estimated depth to groundwater of 5 ft bgs (Stantec, 2022) and the maximum estimated depth to groundwater during excavation dewatering of 12 ft bgs, the anticipated drawdown within the excavation is assumed to be 7 feet (H-h = 7 feet (2.1m)).

Based on the underlying geology (anticipated to be comprised of glacial outwash sand), a reference hydraulic conductivity (K) value for glacial outwash sand of 283.5 feet/day ($1x10^{-3}$ m/s; MPCA, 2022) was assumed.

RESULTS AND CONCLUSIONS

Solving for Ro using the Sichardt's equation returns an estimated Ro (extent at which drawdown could be observed due to groundwater extraction during dewatering activities) to be less than 700 feet from dewatering locations. The calculation used to estimate Ro is provided in **Attachment 1**.

A sensitivity analysis was completed by varying the order of magnitude of K **(Attachment 1)**. The sensitivity analysis shows Ro is smaller with fine-grained soil types and larger with coarse-grained soil types. The sensitivity analysis also shows the uncertainty of Ro if a different soil type other than the reference K for glacial outwash sand is assumed.

The North Branch of the Vermillion River and the Vermillion River are likely in hydraulic connection with the water table aquifer and are expected to represent groundwater boundary conditions (i.e., hydraulic head remains constant). The Ro is not anticipated to reach either of these boundary conditions, however, if it did, they would be expected to limit further expansion of the Ro.

Unique Well ID 501772, 207728, and 412591 are active wells located within the Site boundary and depending on the location of the planned dewatering activities could observe drawdown impacts. According to the well logs on the Minnesota Well Index, Unique Well ID 501772 is identified as a monitoring well, Unique Well ID 207728 is identified as a domestic well, and Unique Well ID 412591 is a remedial well. All other wells shown within the Site boundary have been sealed (**Figure 1**).

There are no reported water supply wells located within 700 feet (the estimated Ro distance) of the Site boundary (**Figure 1**). There is one monitoring well within 700 feet (the estimated Ro distance) of the Site boundary (**Figure 1**). Unique Well ID 639314 is located approximately 500 feet south of the Site, is an active monitoring well, is 10 feet deep, and is not used for water supply. Depending on the location of the planned dewatering activities, this monitoring well could observe drawdown impacts.

REFERENCES

EPGMD, 2022. Environmental Protection and Growth Management Department, Broward County, Florida. Calculation Methods for Radius of Influence and Dewatering Flow Rate From Aquifer Test Data.
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Reference: **Radius of Influence Estimation at Farmington Compressor Station Improvements Project**

MGS, 2019. Lusardi, B.A., Gowan, A.S., McDonald, J.M., Marshall, K.J., Meyer, G.N., Wagner, K.G. (2019). S-23 Geologic Map of Minnesota – Quaternary Geology. Minnesota Geological Survey. Retrieved from the University of Minnesota Digital Conservancy, https://hdl.handle.net/11299/208552

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Stantec, 2020. Farmington Compressor Station Improvement Project Environmental Assessment Worksheet, Prepared for Norther Natural Gas. November 2022.

Terracon, 2015. Investigation Report and Guidance Document 4-06, submitted to Minnesota Pollution Control Agency on behalf of Northern Natural Gas, Farmington Facility, October 30, 2015

USGS, 2022. NHD Flowlines / Waterbodies: National Hydrography Dataset - Minnesota, USGS, USEPA, Last accessed November 4, 2022
https://gisdata.mn.gov/dataset/waternational-hydrography-data

ATTACHMENTS

Figure 1 – Site Location

Attachment 1 – Radius of Influence Calculation

Stantec Consulting Services Inc.

Justin Soberaski P.G. (MN)
Associate Hydrogeologist

Phone: 612 712 2106
Justin.Soberaski@stantec.com

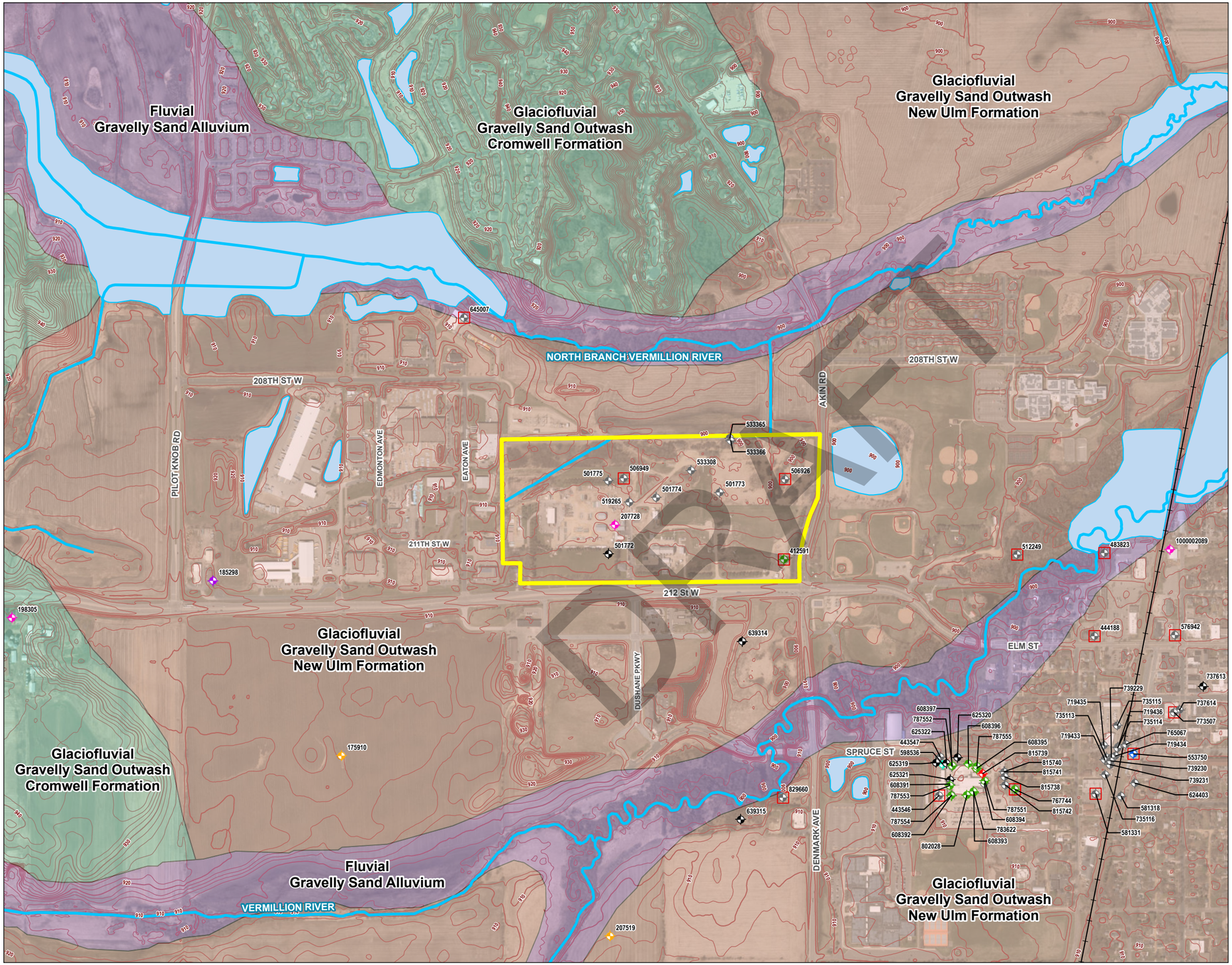


Figure No.
1

DRAFT

Title
Site Location

Client/Project 227705326
Northern Natural Gas
Farmington Compressor Station

Project Location Prepared by BRM on 11/2/2022
Farmington, MN

N

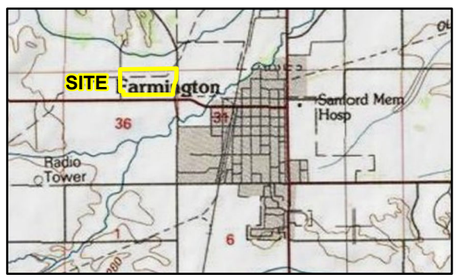
0 500 1,000 Feet
(At original document size of 11x17)
1:10,000

Legend

MDH Wells
- Commercial Well
- Domestic Well
- Dewatering Well
- Irrigation Well
- Monitoring Well
- Piezometer
- Remedial Well
- Sealed Well
- Grain Elevator Well (use?)
- Unverified Well

- Approximate Site Boundary
- NHD Flowline
- NHD Waterbody
- Ground Surface Contour - 2 feet

Surface Geology
- Fluvial Alluvium
- Glaciofluvial Outwash (Cromwell Fm.)
- Glaciofluvial (New Ulm Fm.)



Notes
1. Coordinate System: NAD 1983 StatePlane Minnesota South FIPS 2203 Feet
2. MDH Wells: Minnesota Health Department Well Index, https://mnwellindex.web.health.state.mn.us/
3. NHD Flowlines / Waterbodies: National Hydrography Dataset - Minnesota, USGS, USEPA, https://gisdata.mn.gov/dataset/water-national-hydrography-data
4. Geology: Minnesota Geological Survey, D-1 Surficial Geology of Minnesota Database, https://mngs-umn.opendata.arcgis.com/apps/d-1-surficial-geology-of-minnesota/explore
5. Topo: Minnesota Department of Natural Resources MnTOPO web application,http://arcgis.dnr.state.mn.us/maps/mntopo/

Stantec