MONTANA-DAKOTA UTILITIES CO.
A Division of MDU Resources Group, Inc.

Before the Public Service Commission of North Dakota

Case No. PU-17-295

Rebuttal Testimony
of
Patrick C. Darras

Q. Would you please state your name and business address?

A. Yes. My name is Patrick C. Darras, and my business address is 400 North Fourth Street, Bismarck, North Dakota 58501.

Q. What is your position with Montana-Dakota Utilities Co.?

A. I am the Vice President of Operations for Montana-Dakota Utilities Co. (Montana-Dakota) and Great Plains Natural Gas Co., Divisions of MDU Resources Group, Inc.

Q. Are you the same Patrick C. Darras who filed direct testimony in this proceeding?

A. Yes, I am.

Q. What is the purpose of your rebuttal testimony?

A. The purpose of this rebuttal testimony is to address recommendations made by Karl Pavlovic, testifying on behalf of the North Dakota Public Service Commission Advocacy Staff, regarding Montana-Dakota's proposed System Safety and Integrity Program (SSIP) and his proposal to remove the entire plant investment related to replacement

projects from 2018. I am also providing Montana-Dakota's updated SSIP and 2018-2022 Early Vintage Steel & Plastic Piping SSIP Project Plan.

Q. At Page 6, lines 13-15, Mr. Pavlovic states that in most cases infrastructure programs have been implemented and operate under regulation established by state regulatory authorities, often pursuant to an enacted statutory mandate. Do you agree this is necessary in the state of North Dakota?

A. I do not. Based on other rider mechanisms approved by this Commission, I believe the Commission has the authority to address this issue without the need for enabling legislation. Taking this step now provides a proactive approach to addressing pipeline safety issues. As noted by Mr. Pavlovic most of the long standing programs were established in the eastern part of the country to address cast iron, wrought iron, and non-cathodically protected steel infrastructure following two catastrophic gas events. I think it would be best to learn from those and not wait for a potentially catastrophic event to address pipe that PHMSA has identified in a bulletin warning of brittle-like cracking that is vulnerable to premature failures along with other piping systems that our DIMP program has identified as higher risk.

Q. Mr. Pavlovic identifies program parameters that are typically specified by regulation at page 6 lines 19-22 and page 7 lines 1-9. Do you agree with those program parameters and could those be established as part of Montana-Dakota's SSIP?

A. I do agree that program parameters could be established by the Commission through its final order in this case approving the Company's proposed mechanism set forth in the proposed SSIP tariff. In addition, as discussed in my direct testimony the Company envisions submitting an annual request for Commission approval of the replacement plan for the upcoming year thereby providing a match between revenue recovery and planned projects accepted by the Commission.

Q. Mr. Darras are you familiar with the U.S. Department of Energy's Office of Energy Policy and Systems Analysis report entitled Natural Gas Infrastructure Modernization Programs at Local Distribution Companies: Key Issues and Considerations dated January 2017 that Mr. Pavlovic provided as Exhibit No. KRP-1 to his testimony?

A. Yes, I am familiar with the U.S. Department of Energy's (DOE) report that Mr. Pavlovic included to provide the history and current status of the accelerated replacement programs in the states that have implemented such programs. I find the report helpful in supporting the Company's proposed SSIP by noting the following:

- there are several states currently addressing low pressure systems and Aldyl-A pipe,
- at least one jurisdiction (New York) is actually providing incentives to accelerate replacement of aging systems,
- the report confirms cost recovery for multiple years is important,

- West Virginia is the 39th state to implement an accelerated replacement program indicating Montana-Dakota's proposal is not a new and novel idea,
- it is noted that replacement programs are sometimes difficult to get into place in states where infrastructure development is opposed. This is certainly not the case in North Dakota with the abundance of natural gas present in the state and the state's policy of supporting extensions to provide natural gas to unserved communities in addition to the importance of pipeline safety recognized by the Commission.
- confirms that safety and reliability of LDC infrastructure continues to be a priority for State utility regulators as evidenced by the National Association of Regulatory Utility Commissioners (NARUC) Resolution GS-1 adopted in July 2013 titled "[A] Resolution Encouraging Natural Gas Line Investment and the Expedited Replacement of High-Risk Distribution Mains and Service Lines." The Resolution encourages States to fully explore, examine and implement alternative rate recovery mechanisms that will accelerate the modernization, replacement and expansion of the nation's natural gas pipeline systems.

The Company's proposed SSIP is consistent with the NARUC resolution and many of the state programs described in the DOE report.

Q. Do you agree with Mr. Pavlovic's testimony on page 8, line 3 where he states that "MDU's plans for implementation of the SSIP are set forth in two documents provided in response to discovery"?

A. No. Montana-Dakota provided the two documents referenced to provide further detail into estimated costs associated with projects that had been identified for replacement at that time. Montana-Dakota did not state that the two plans submitted were its "plans for implementation of the SSIP".

Q. Do you agree with Mr. Pavlovic's testimony on page 12 when he asks if MDU demonstrated that the infrastructure at the locations targeted in MDU's Low Pressure Replacement Plan are identified as High Risk by MDU's DIMP?

A. Yes, Mr. Pavlovic states that *"With regard to the Low Pressure Replacement Plan*, MDU has not demonstrated that the targeted low pressure systems are high risk as a consequence of operating at low pressure. "Saying that, MDU did not intend to show that in the Low Pressure Replacement Plan it submitted. The Low Pressure Replacement Plan was submitted as a way to show estimated costs broken out as requested in NDPSC data request 2-5. As page 3 of the plan states, "This report examines the replacement of MDU/GPNG's Low Pressure (LP) natural gas distribution systems in Western North Dakota." It further goes on to state that "MDU/GPNG serves ten towns in ND with low pressure distribution systems that consist of a total of approximately

400,000 linear feet of gas main, 7,200 steel customer service lines, 1,600 inside meters, and 26 gas regulator stations that will be retired and removed. A high-level estimate of the combined cost to replace the LP distribution system in all ten towns is $48.4 million."

Q. Do you have an update to provide the Commission?

A. As mentioned earlier, the documents referenced by Mr. Pavlovic were not intended to portray a fully inclusive replacement program. These documents represented an engineering study to quantify potential pipeline replacement candidates of Low Pressure and Aldyl-A systems for budgetary purposes. Montana-Dakota has further detail available today and is providing more information regarding the System Safety and Integrity Program (SSIP) as being developed to replace early vintage steel pipe (EVSP) and early vintage plastic pipe (EVPP). Attached as Exhibit No. ___(PCD-2) are the following documents:

- System Safety & Integrity Program (SSIP)
- North Dakota Early Vintage Steel & Plastic Piping SSIP Project Plan (2018 - 2022) - dated March 19, 2018.

As stated previously in my testimony, the plan will be reviewed and submitted to the Commission for approval annually with the primary focus being on the current working year.

Q. Do you agree with Mr. Pavlovic's conclusion that ALL 2018 replacement projects should be excluded from the proposed revenue requirement?

A. I do not. The projects have been substantiated as necessary for replacement of steel mains, associated fittings, and services in the communities of Gladstone, Fairview, New Salem, and Taylor; replacement of Aldyl-A plastic pipe installed between 1971 and 1982 in Gladstone, Fairview, New Salem, Eldridge, Barlow and Cleveland; along with moving meter sets connected to the corresponding services to a safer outside location. The systems have been identified for replacement according to Montana-Dakota's SSIP criteria.

Q. Are you moving forward with the 2018 replacement plans?

A. Yes, as mentioned above and provided in our most recent ND SSIP Plan, the process has begun to move forward with 2018 projects. To date RFP's have been sent out with proposals received back, and we are currently awarding contracts, ordering materials, and beginning the scheduling process.

Q. Does this conclude your rebuttal testimony?

A. Yes, it does.

System Safety & Integrity Program (SSIP)

MDU/GPNG Engineering Department

Revision 1 – 3/15/2018

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REVISION CONTROL SHEET		
Revision	Date	Comments
0	1/4/2018	Original Procedure
1	3/15/18	Minor grammatical changes

PURPOSE OF SSIP

Develop a structured replacement program for early vintage steel pipeline (EVSP) and early vintage plastic pipeline (EVPP) natural gas distribution systems. Incidental to the pipe replacement, inside meter sets connected to the corresponding services will also be removed to a safer outside location.

DEFINITIONS

DIMP – Distribution Integrity Management Program

Early Vintage Plastic Pipe (EVPP) – Plastic mains, service lines, and associated fittings installed earlier than 1/1/1995.

- *Pre-1983: These pipelines include pipe installed prior to 1/1/1983 that may be susceptible to possible Low Ductile Inner Wall (LDIW) characteristics that can result in slow crack growth and slit failures[1], as documented by* PHMSA–2004–19856*.*
- *Post-1982: These pipelines were installed between 1/1/1983 and 12/31/1994 and are classified as EVPP to account for different inventory levels and rates of new material adoption among the varying districts in MDU/GPNG*.

Early Vintage Steel Pipe (EVSP) – Steel mains, service lines, and associated fittings installed earlier than 1/1/1970. These pipelines are being slated for replacement to eliminate aging and/or obsolete pipelines, bare steel or poorly coated pipe, pipe with unknown attributes or missing data, gas meters located indoors, and/or mechanical couplings and fittings.

DIMP MODEL CALCULATIONS

Total Relative Risk Calculation

Risk is the product of the likelihood of an event occurring multiplied by the consequence of the event, as shown in Equation 1.

Equation 1. ***Total Relative Risk Score = Total Likelihood Score x Consequence Factor***

The DIMP model sums the assigned likelihood scores for each threat to calculate a total likelihood factor within a 50-foot grid (raster). The same summing calculation is also done for each of the assigned consequence factors within the same 50-foot grid. The total Likelihood is then multiplied by the total consequence factor to establish a total relative risk score for the grid.

[1]DEPARTMENT OF TRANSPORTATION Pipeline and Hazardous Materials Safety Administration [Docket No. PHMSA–2004–19856]

Example 1. DIMP Model Total Risk Score Calculation

Please note that example threat scores and consequence factors have been used to further clarify the calculation of total risk.

Table 1. Example Total Likelihood Score

THREAT	EXAMPLE THREAT SCORE		LIKELIHOOD FACTOR		LIKELIHOOD SCORE
Corrosion	0	X	0.7	=	0.0
Natural Forces	5	X	1.0	=	5.0
Excavation Damage	10	X	1.5	=	15.0
Other Outside Force Damage	15	X	0.9	=	13.5
Material, Weld or Joint Failure	20 20	X X	Material: 0.9 Weld/Joint Failure: 1.2	=	18.0 24.0
Equipment Failure	25	X	0.9	=	22.5
Incorrect Operation	30	X	1.0	=	30.0
Missing Data	35	X	1.5	=	52.5
Other	SME Determined	X	SME Determined	=	SME Determined
Total Likelihood Score					180.5

Table 2. Example Consequence Factor

CONSEQUENCE	EXAMPLE CONSEQUENCE SCORE		MODEL FACTOR*		CONSEQUENCE FACTOR
Population Density & Location	8	X	0.1	=	0.8
Potential Energy	2	X	0.1	=	0.2
Critical infrastructure Size & Location	10	X	0.3	=	3.0
Consequence Factor					4.0

*The model factor is used to scale the consequence factor, allowing stratification of total scores

Total Relative Risk Score = Total Likelihood Score (180.5) x Consequence Factor (4.0)

Total Relative Risk Score = 722

EXPLANATION OF PERFORMANCE METRICS

SSIP performance metrics are developed using DIMP outputs, as shown in Example 1, as well as SME input. This allows MDU to utilize measurable data that is consistent, repeatable, reproducible, and comparable. This data is transparent and scalable across entire MDU system. Leveraging SME expertise gives MDU flexibility to adapt to pipeline safety and operational concerns through the project selection process.

PROJECT SELECTION CRITERIA / PROCESS

Risk Ratio

To allow for comparison of relative risk between systems, a normalized total relative risk score is used. This normalized score is referred to as the "risk ratio" and is the DIMP total relative risk score normalized by the total pipe length of a selected system. The risk ratio is calculated using Equation 2.

Equation 2. $$\textbf{\textit{Risk Ratio}} = \frac{\sum(\textbf{\textit{Total Relative Risk Score}} \times \textbf{\textit{Pipe Length}})}{\sum \textbf{\textit{Pipe Length}}}$$

Prioritization of Projects

SSIP projects selection criteria will be based on risk ratio results and SME input. The risk ratio will be the primary selection criteria. Replacement projects with higher risk ratios will be the priority. Projects with similar scores may be reprioritized based on SME discretion. Factors that may lead to reprioritization include:

- Resource availability (staffing, materials, equipment, etc.)
- Contractor availability
- City/State infrastructure improvement projects (forced relocate, cost savings)
- Budget

Timetable

The prioritization methods described in Prioritization of Projects will be used to develop a rolling five-year replacement plan. This plan will be reviewed annually with primary focus being on the current working year. Projects to be completed during the current working year must be fully-developed and include detailed plans, permits, contracts, and any requisitions. Projects included in the remaining 4 years of the plan may not be fully developed and are subject to reprioritization as described in Prioritization of Projects. The hierarchy of the SSIP is illustrated in Figure 1.

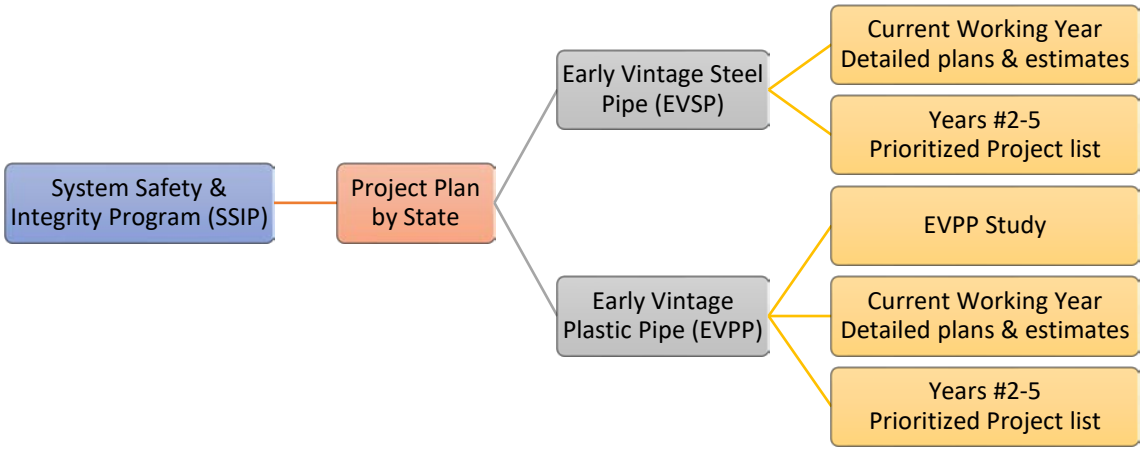

Figure 1. System Safety & Integrity Program (SSIP) Hierarchy Chart

North Dakota
Early Vintage Steel & Plastic Piping
SSIP Project Plan

2018 – 2022

MDU/GPNG Engineering Department

March 19, 2018

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PURPOSE OF SSIP PROJECT PLAN (2018 – 2022)

The purpose of this 2018-2022 plan is to identify natural gas distribution systems deemed high-risk according to MDU's System Safety and Integrity Program (SSIP) criteria. The following plan contains details for replacement of early vintage plastic pipeline (EVPP) and early vintage steel pipeline (EVSP) systems for the current working year and a list for subsequent years through 2022.

EARLY VINTAGE PLASTIC PIPE (EVPP)

EVPP Study

To quantify risk and further develop the Distribution Integrity Management Program (DIMP) model as it pertains to EVPP, a structured study will be performed on EVPP to determine the presence of Low Ductile Inner Wall (LDIW) characteristics and remaining life expectancy of specific vintages of EVPP. The study will utilize Subject Matter Expert (SME) input and DIMP model results to select replacement systems. Samples of each system will be tested by an independent third-party laboratory utilizing industry accepted test methods (ASTM D1598 or equivalent). Primary testing methods will be -

- **Bend-back Tests** - LDIW characteristics
- **Long Term Hydrostatic Stress-Rupture Tests** – Calculate remaining life expectancy

This study is needed because of a PHMSA bulletin[1] that warns of brittle-like cracking in older plastic pipe. The bulletin defines brittle-like cracking as "crack initiation in the pipe wall not immediately resulting in a full break followed by stable crack growth at stress levels much lower than the yield stress. This results in very tight, slit-like, openings and gas leaks." Additionally, a NTSB Investigation[2] calls out safety issues with plastic pipe, including: 1) vulnerability of plastic piping to premature failures; 2) adequacy of guidance relating to the installation and protection of plastic piping; and, 3) effectiveness of performance monitoring of plastic pipeline systems.

Selection Criteria/Process

Initial test candidates were selected from the Pre-1983 EVPP category due to higher risks as calculated by MDU's DIMP model. SME project selection was based off the upper- and lower-ends of this identified range of years from 1971-1982 and piping of unknown vintage. A summary of MDU's 2018 EVPP study and replacement plan is shown in Table 1.

Table 1. Early Vintage Plastic Pipe Replacement Projects (2018)

Description of EVPP System	Majority Vintage of EVPP	Risk Ratio
Gladstone (combined w/ EVSP)	Varies	172.8
Fairview (combined w/ EVSP)	Varies	147.2
New Salem (combined w/ EVSP)	Varies	116.8
Eldridge	1971	95.0
Barlow	1981	86.9
Cleveland	Unknown	85.7

[1] DEPARTMENT OF TRANSPORTATION Pipeline and Hazardous Materials Safety Administration. (2007 Aug 28). Pipeline Safety: Updated Notification of the Susceptibility to Premature Brittle-Like Cracking of Older Plastic Pipe. [Docket No. PHMSA–2004–19856].

[2] National Transportation Safety Board. (1998 April 23). Brittle-Like Cracking in Plastic Pipe for Gas Service. NTSB/SIR-98-/01.

EARLY VINTAGE STEEL PIPE (EVSP)

Selection Criteria/Process

The EVSP systems that will be replaced in 2018-2022 were selected and prioritized in accordance with MDU's SSIP. Each of the systems included in the 2018-2022 replacement plan has a relatively high risk ratio compared to other sections of EVSP in MDU's distribution systems. A summary of MDU's 2018 EVSP replacement plan is shown in Table 2.

Table 2. Early Vintage Steel Pipe Replacement Projects (2018)

Description of EVSP System	Risk Ratio
Fairview (combined w/ EVPP)	249.1
Gladstone (combined w/ EVPP)	174.7
New Salem (combined w/ EVPP)	167.2
Taylor	116.6

TIMETABLE

The current five-year replacement plan is shown in Table 3. This plan will be reviewed annually with primary focus being on the current working year. Projects to be completed during the current working year will be fully-developed and include detailed plans, permits, contracts, and any requisitions. Sample plan sheets have been included as "APPENDIX – SAMPLE PLAN SHEETS." Projects included in the remaining 4 years of the plan may not be fully developed and are subject to reprioritization as described in MDU's SSIP.

Table 3. Five-year Plan - EVPP & EVSP Replacement Projects (2018-2022)

Year	EVPP System	EVSP System
2018	Barlow Cleveland Eldridge Fairview (Concurrent w/ Fairview, MT) Gladstone New Salem	Fairview (Concurrent w/ Fairview, MT) Gladstone New Salem Taylor
2019	Glen Ullin Mandan Low Pressure Dickinson Low Pressure	Glen Ullin Mandan Low Pressure Dickinson Low Pressure
2020 - 2022	Mandan Low Pressure Dickinson Low Pressure	Mandan Low Pressure Dickinson Low Pressure

APPENDIX – SAMPLE PLAN SHEETS

PROPOSED		
	2" MDPE	3393"
	EXISTING PE MAIN, TO REMAIN	1636'
	SERVICE REPLACEMENTS	13
	SERVICE TIE OVERS	0
	2" PE VALVE	1

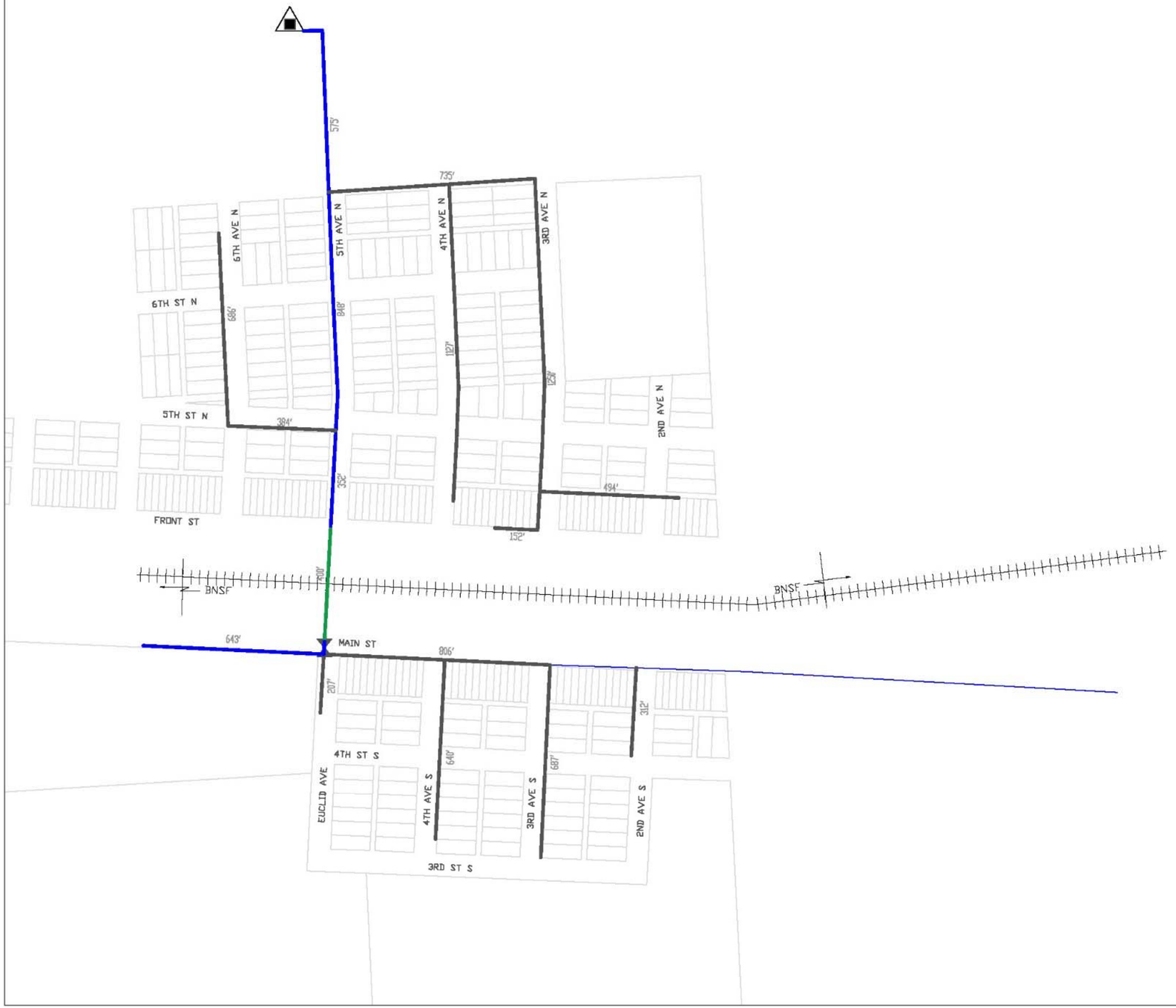
No.	Revision	Date	By

ALDYL-A REPLACEMENT PROJECT
BARLOW, NORTH DAKOTA

Scale	1"=200'
Prepared by	M. MARTIN
Date	XX-XX-XX
WO No.	XXXXXX

Drawing Name
OVERVIEW

SHEET
1 OF 1



N

PROPOSED		
	2" MDPE	7,500'
	4" MDPE	2,600''
	4" STEEL RR CROSSING	400'
	EXISTING PE MAIN, TO REMAIN	
	SERVICE REPLACEMENTS	65
	SERVICE TIE OVERS	7
⋈	4" PE VALVE	1

No.	Revision	Date	By

ALDYL-A REPLACEMENT PROJECT
CLEVELAND, NORTH DAKOTA

Scale	1"=400'
Prepared by	KHDC
Date	01-17-2018
WO No.	XXXXXX

Drawing Name
OVERVIEW

SHEET
1 OF 1

N

PROPOSED		
	2" MDPE	4000''
	EXISTING PE MAIN, TO REMAIN	9774'
	SERVICE REPLACEMENTS	29
	SERVICE TIE OVERS	0
⋈	2" PE VALVE	2

No. | Revision | By | Date

ALDYL-A REPLACEMENT PROJECT
ELDRIDGE, NORTH DAKOTA

Scale: 1"=400'
Prepared by: M. MARTIN
Date: XX-XX-XX
WO No.: XXXXXX

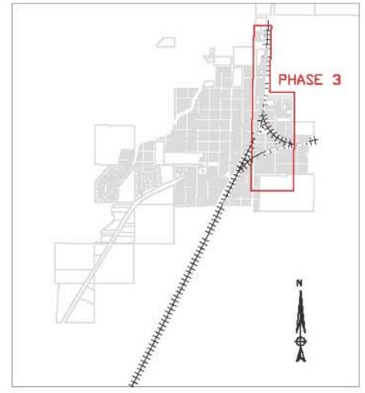
Drawing Name: OVERVIEW

SHEET 1 OF 1

PROPOSED		
	2" MDPE	5,090'
	4" MDPE	6,925'
	EXISTING PE MAIN, TO REMAIN	
	EXISTING STEEL MAIN, TO REMAIN	
	SERVICE REPLACEMENTS	33
	SERVICE TIE OVERS	26

N

VERIFY/ PRESSURE TEST		
AREA	MAIN	NO. OF SERVICES
3	1,050' 2" PE	3



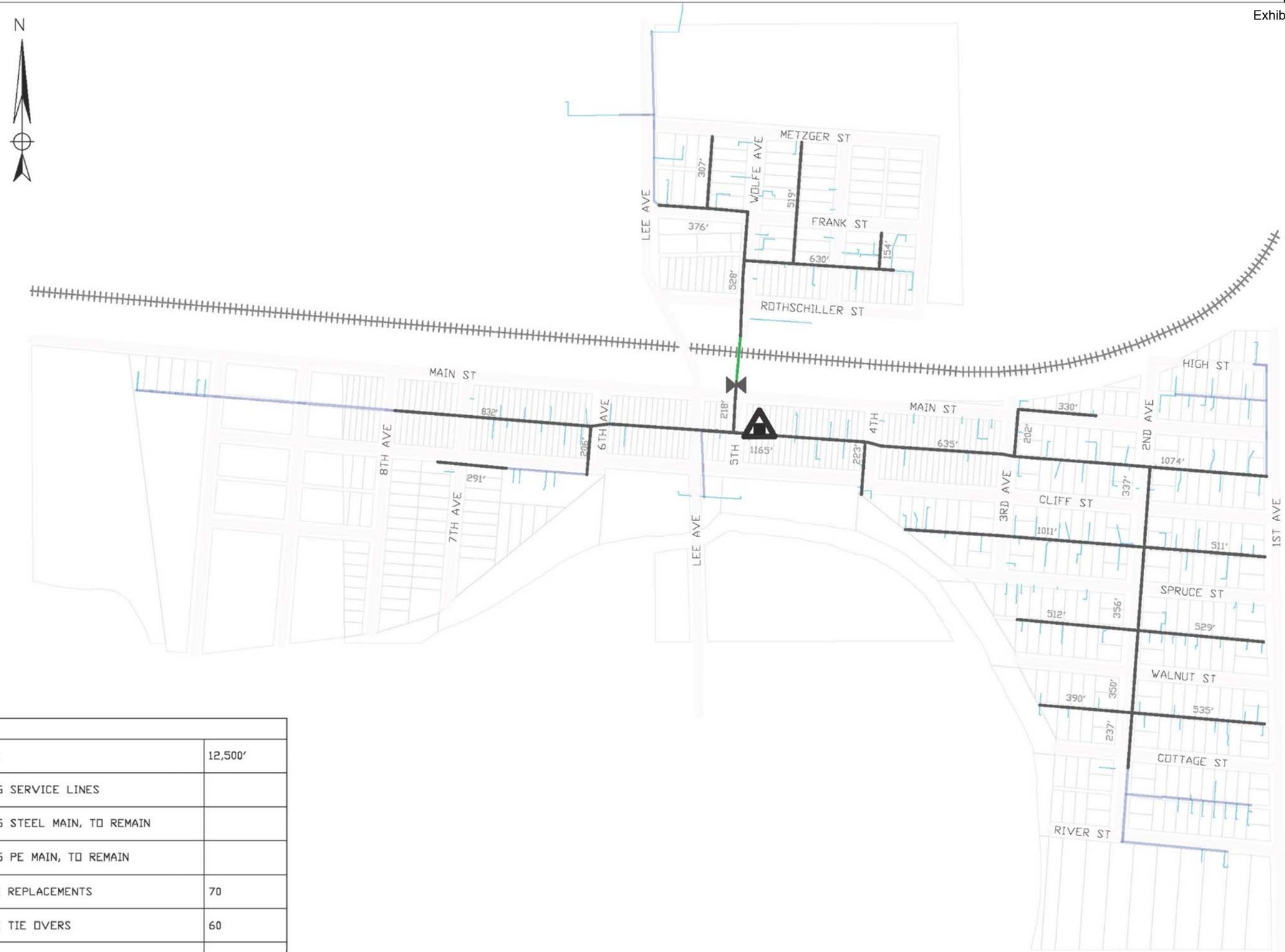
No.	Revision	Date	By

EVSP & EVPP REPLACEMENT PROJECT
FAIRVIEW, NORTH DAKOTA

Scale	1"=500'
Prepared by	KZ/KHDC
Date	02-02-18
WO No.	PENDING

Drawing Name
PHASE 3

SHEET
3 OF 3



PROPOSED		
	2" MDPE	12,500'
	EXISTING SERVICE LINES	
	EXISTING STEEL MAIN, TO REMAIN	
	EXISTING PE MAIN, TO REMAIN	
	SERVICE REPLACEMENTS	70
	SERVICE TIE OVERS	60
	2" PE VALVE	1

No.	Revision	Date	By

LOW PRESSURE AND EVPP/EVSP
REPLACEMENT PROJECT
Gladstone, ND

Scale	1"=400'
Prepared by	K. ZIMMERMAN
Date	01/12/18
WO No.	

Drawing Name
OVERVIEW

SHEET
1 OF 1

PROPOSED		
	2" MDPE	28,500'
	4" MDPE	16,900'
	EXISTING PE MAIN, TO REMAIN	
	EXISTING STEEL CROSSINGS, TO REMAIN	
	SERVICE REPLACEMENTS	336
	SERVICE TIE OVERS	86
	4" PE VALVE	5
	2" PE VALVE	1

No.	Revision	Date	By

STEEL & ALDYL-A REPLACEMENT PROJECT

NEW SALEM, NORTH DAKOTA

Scale	1"=800'
Prepared by	KHDC
Date	01-17-2018
WO No.	PENDING

Drawing Name
OVERVIEW

SHEET
1 OF 1

PROPOSED		
	2" MDPE	12,100'
	EXISTING SERVICE LINES	
	EXISTING STEEL MAIN, TO REMAIN	
	EXISTING PE MAIN, TO REMAIN	
	SERVICE REPLACEMENTS	70
	SERVICE TIE OVERS	60
	2" PE VALVE	1
	TOWN BORDER STATION	

No.	Revision	Date	By

Steel and Alyl-A Replacement Project
Taylor, ND

Scale	1"=350'
Prepared by	Kurt Zimmerman
Date	
WO No.	

Drawing Name
PLAN

SHEET
1 OF 1