COMMERCE DEPARTMENT

Supplemental Information Inquiry #1

To: Ellen Heine
Xcel Energy

Sent via email to ellen.l.heine@xcelenergy.com

From: Rich Davis
Energy Environmental Review and Analysis

Date: August 20, 2024

Project: Mankato to Mississippi River Project
23-157

Respond: Preferably no later than August 27, 2024

Please respond to the following questions or provide the requested data or information. Staff will use the information provided to develop the environmental document for the project, which is a public document. Your response, in its entirety, will be included in the environmental document as an appendix; therefore, **responses will be publicly available** unless otherwise designated by the respondent as "nonpublic information" pursuant to Minnesota Statute § 13.02, subdivision 12.

Directions: Responses to questions should be contained within this form to the greatest extent possible (11-point Calibri, plain text font, RGB 192, 0, 0). Attach supporting documentation as necessary. While data and information requests, for example, shapefiles or draft plans, will not be contained within this form, document their submittal using this form as follows: "*Requested information* sent to *whom* by *what means* on *date*." Co-applicants please consolidate your reply into a single response.

Do not eFile your response. Return the completed form, as a PDF, along with necessary supporting documentation, and/or requested data or information to richard.davis@state.mn.us. Contact me at (507) 380-6859 with questions.

1. Shapefiles of applicant-proposed alternative, referred to as Route Option 4 West A in Xcel's letter dated July 3, 2024.

A shapefile of the Xcel Energy-proposed alternative referred to as Route Option 4 West A in its July 3, 2024, letter was sent to Rich Davis, Energy Environmental Review and Analysis, by email with file attached on August 27, 2024. The file name is: Mankato_Mississippi_River_Transmission_Route_4West_A_20240826.zip.

2. Please provide the following GIS sources if available: Xcel digitized center pivot irrigation; Xcel digitized residences and non-residential/commercial structures; county-specific parks and trails; parcel data; most up to date transmission line and substation data; zoning data.

As available, Xcel Energy provided GIS files in a compiled geodatabase via a file sharing link for download (file was too large to email) to Rich Davis, Energy Environmental Review and Analysis, on August 27, 2024. Files within the GDB included: digitized center pivot irrigation (none were digitized or identified), digitized residences and non-residential/commercial structures, county-specific parks and trails, parcel data, the most up to date existing transmission line and substation data, and zoning data for the proposed routes clipped to the requested route width in the Route Permit Application. The file name of this is MMRTP_Application_ProjectData_20240827.gbd.zip.

Please note, if GIS data is required for any of the new additional route alignments or route alternatives that came up in scoping meetings and the comment period, please let Xcel Energy know this is required and we will prepare that data (it has not completely been developed at this time since those routes were not part of the RPA and not all within the Project Study Area).

3. Please provide a copy of the cultural resources literature review(s) and the associated cultural resource data. This includes but is not limited to data included in Appendix O. If the locations of resources have been digitized, please also provide the GIS data.

A copy of the cultural resources literature review and associated cultural resource data for the MMRTP project is being provided via email and through a file sharing link to Rich Davis, Energy Environmental Review and Analysis, on August 27, 2024. The literature review and mapbook are titled:

- 06_RPA_TRADE SECRET_Cultural_Mapbook_20240219.pdf and
- 07_TRADE SECRET_FINAL Xcel_MMRT_Cultural Lit Review_20240208-compressed (1).pdf.

These are also included as the Trade Secret version of Appendix O to the Route Permit Application so all data is visible (file names – 15-Appendix O TRADE SECRET_Part2 of 4.pdf , 16-Appendix O TRADE SECRET_Part3 of 4.pdf, 17-Appendix O TRADE SECRET_Part4 of 4.pdf)

The digitized cultural data (file name is Mankato_Mississippi_River_Cultural_Shapefiles_20240826.zip) contains the following layers:

- Architectural sites
- Archaeological sites
- Unrecorded cemeteries.

Supplemental Information Inquiry 2

To: Ellen Heine
Xcel Energy

Sent via email to ellen.l.heine@xcelenergy.com

From: Rich Davis
Energy Environmental Review and Analysis

Date: November 19, 2024

Project: Mankato to Mississippi River Project
23-157

Respond: November 27, 2024

Please respond to the following questions or provide the requested data or information. Staff will use the information provided to develop the environmental document for the project, which is a public document. Your response, in its entirety, will be included in the environmental document as an appendix; therefore, **responses will be publicly available** unless otherwise designated by the respondent as "nonpublic information" pursuant to Minnesota Statute § 13.02, subdivision 12.

Directions: Responses to questions should be contained within this form to the greatest extent possible (11-point Calibri, plain text font, RGB 192, 0, 0). Attach supporting documentation as necessary. While data and information requests, for example, shapefiles or draft plans, will not be contained within this form, document their submittal using this form as follows: "*Requested information* sent to *whom* by *what means* on *date*." Co-applicants please consolidate your reply into a single response.

Do not eFile your response. Return the completed form, as a PDF, along with necessary supporting documentation, and/or requested data or information to richard.davis@state.mn.us. Contact me at (507)380-6859 with questions.

1. This request pertains to Route Segment 9 and Route Segment 18. In a meeting between Xcel and EERA held on 10/02/2024, Xcel noted that should Route Segment 9 be selected by the Commission as part of the final route, the existing line to the west would be reconstructed on the new alignment. Route Segment 9 and Route Segment 18 would replace portions of the applicant-proposed Segment 1 North option, specifically replacing a component of 1F. It is EERA's understanding that 1F is proposed to be double-circuited with an existing 115 kV line. Based on our meeting, it is our understanding that the existing 115 kV (that 1F would be double-circuited with) would be removed and reconstructed as a double-circuited line with the alternative's ROW (Route Segment 9 or Route Segment 18's ROW). In other words, the existing line would be moved further to the east and co-located with Route Segment 9 or Route Segment 18. Please confirm our understanding and that this scenario applies both to Route Segment 9 and Route Segment 18.

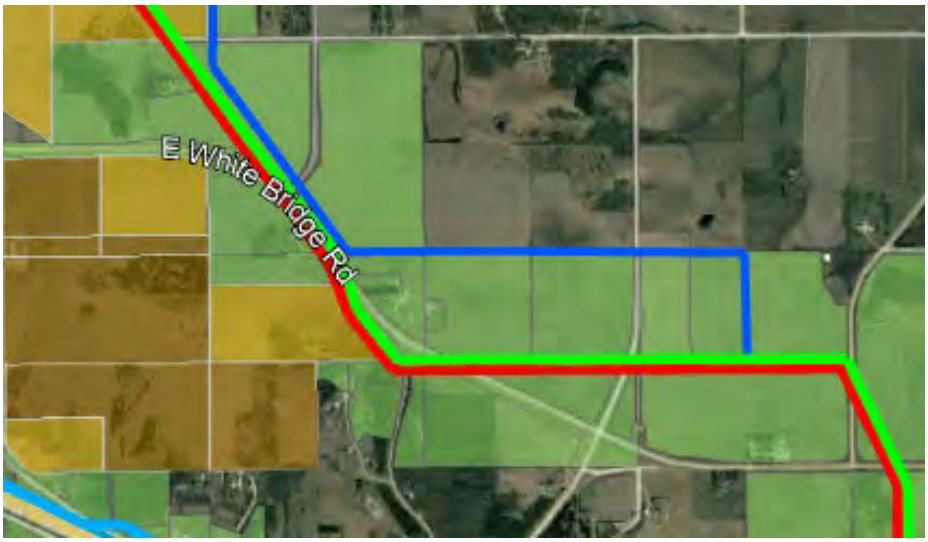
Xcel Energy, Inc. (Xcel Energy) provided the following text response to this request and submitted to Rich Davis of the Minnesota Department of Commerce (DOC) – Energy Environmental Review and Analysis (EERA) on November 27, 2024.

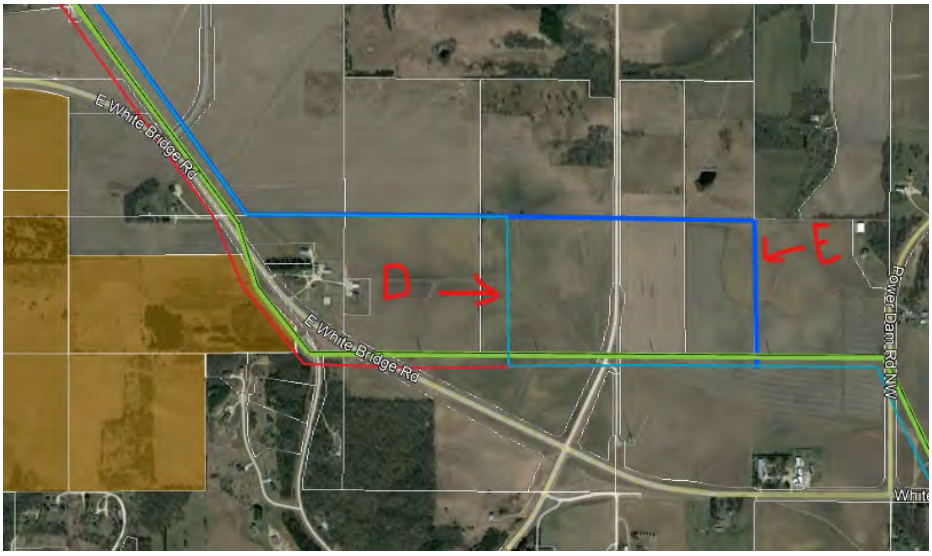
That is correct. If either Route Segment 9 or Route Segment 18 are selected the corresponding portion of the existing 115 kV line will be shifted to the new alignment to be double-circuited with thew new 345 kV line.

2. This request pertains to Route Segment 12 (CapX Co-Locate). Based on clarification provided by Dale Thomforde via email received on 10/19/2024, the alignment for this alternative was modified to go around Prairie Island Indian Community's property. As discussed in a meeting between Xcel and EERA held on 10/22/2024, this was the original intent in Mr. Thomforde's proposed alternative as outlined in his 7/30/2024 scoping comment. As such, the alignment will be modified to reflect his original described alternative. EERA requested that Xcel propose a wider route width in this area to accommodate Mr. Thomforde's request and to also allow for flexibility should the Commission select this alternative but opt to keep the line parallel the existing line. Xcel provided an updated kmz via email on 10/24/2024. Within this kmz, the requested wider route width was provided and labeled in the kmz as "MMRT_PUC_NotificationArea_20241022." At the southern-most part of the corrected alignment, the route width is shown wider as requested but also extends approximately a half-mile to the east. Please provide an explanation of why the route width extends approximately a half-mile to the east from the alignment.

Xcel Energy provided the following text response and screenshots to this request and submitted to Rich Davis of DOC – EERA on November 27, 2024.

The route width is extended wider to accommodate a potential alignment that Ellen Heine provided to Dale Thomforde and Rich Davis in an email on 10/18/24, prior to receiving Dale's update/correction, as shown in the first screenshot below. Dale responded to that email with a change in what Ellen had provided. Note, his proposed alignment cuts through the middle of a parcel (see second screenshot below, options labeled D for Dale and E for Ellen). Xcel Energy's understanding was that Rich felt that we should include both options when developing the route width. If that understanding was incorrect the route can be adjusted to be narrower in this area.

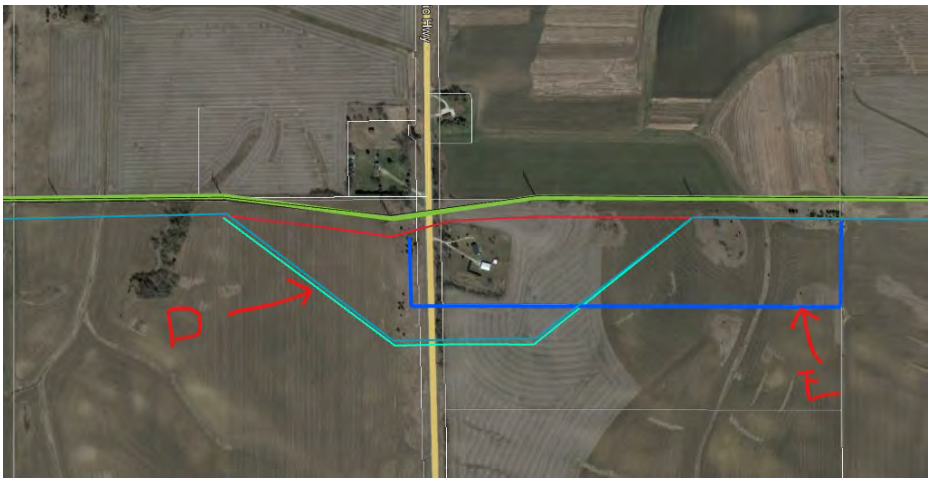




3. This request pertains to Route Segment 12 (CapX Co-Locate). Based on clarification provided by Dale Thomforde via email received on 10/19/2024, the alignment for this alternative was modified to go south of the property located east of County Highway 63. As discussed in a meeting between Xcel and EERA held on 10/22/2024, this was the original intent in Mr. Thomforde's proposed alternative as outlined in his 7/30/2024 scoping comment. As such, the alignment will be modified to reflect his original described alternative. EERA requested that Xcel propose a wider route width in this area to accommodate Mr. Thomforde's request and to also allow for flexibility should the Commission select this alternative but opt to keep the line parallel the existing line. Xcel provided an updated kmz via email on 10/24/2024. Within this kmz, the requested wider route width was provided and labeled in the kmz as "MMRT_PUC_NotificationArea_20241022." At the eastern end of the corrected alignment, the route width is shown wider as requested but also extends approximately a 0.2 mile to the east. Please provide an explanation of why the route width extends approximately a 0.2 mile to the east from the alignment.

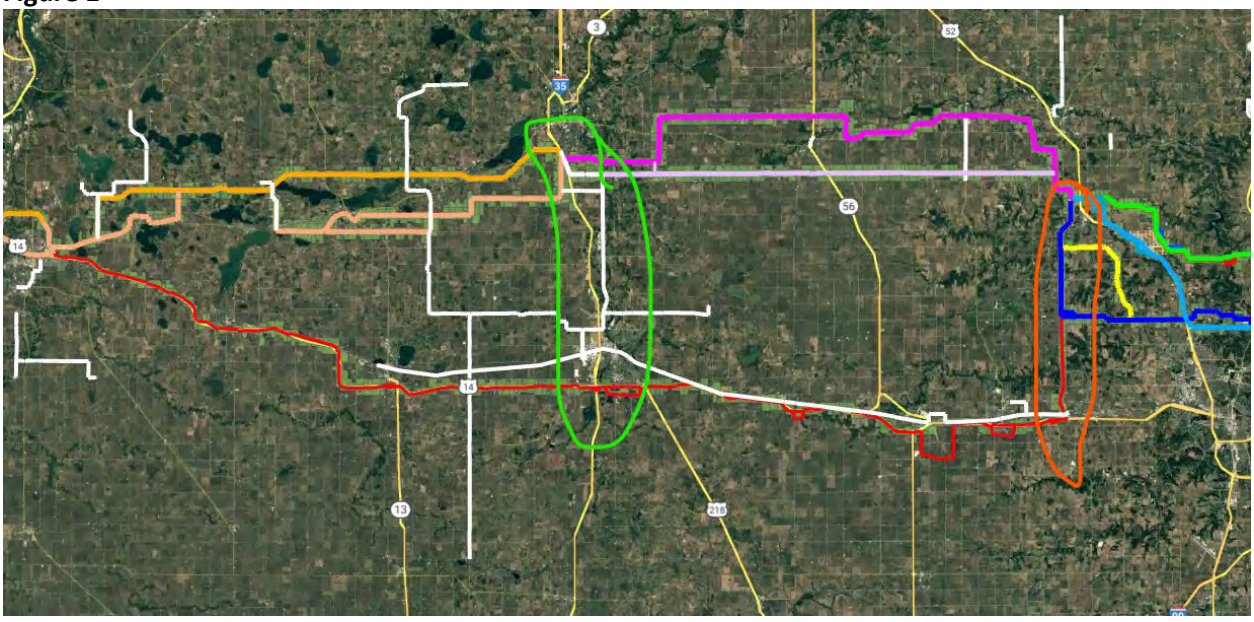
Xcel Energy provided the following text response and screenshots to this request and submitted to Rich Davis of DOC – EERA on November 27, 2024.

Similar answer as to question 2 above: The route width is extended wider to accommodate a potential alignment that Ellen Heine provided to Dale Thomforde and Rich Davis in an email on 10/18/24, prior to receiving Dale's update/correction, as shown in the first screenshot below. Dale responded to that email with a change in what Ellen had provided. Dale's proposed alignment does not follow parcel lines (see second screenshot below, options labeled D for Dale and E for Ellen). Our understanding was that Rich felt that we should include both options when developing the route width. If that understanding was incorrect the route can be adjusted in this area.



4. This request pertains to Route Segment 17 (Hwy 14 option). Xcel's August 28, 2024 letter responding to scoping comments noted the potential future need to connect to the West Faribault Substation. This was also noted in Xcel's route permit application (Section 2.7 Design Options to Accommodate Future Expansion). The potential connection of the project's 345 kV transmission line to the substation would serve the future purpose of connecting the lower voltage transmission system to the backbone (345 kV) transmission system. Your email dated 10/18/2024 to EERA reiterated: "The proposed alignments in our application did not connect at the West Faribault Substation, but routed close to it, based on the expectation that in the next several years it will be necessary to connect that sub to the 345 kV system. We are doing some more research to try to clarify when that would be needed, and what the alternative would be if the 345 isn't close (possible other system upgrades, etc.) but wanted to note that a Hwy 14 alignment may necessitate a future, additional 15ish mile 345 kV line (green circle in the screenshot below for approximate location) to connect to West Faribault." The screenshot provided by Xcel is shown below as Figure 1. Please provide an estimated construction timeline that Xcel would anticipate that the connection to the West Faribault Substation could be required and any updates on the potential for the 15-mile new transmission line and its necessity.

Figure 1



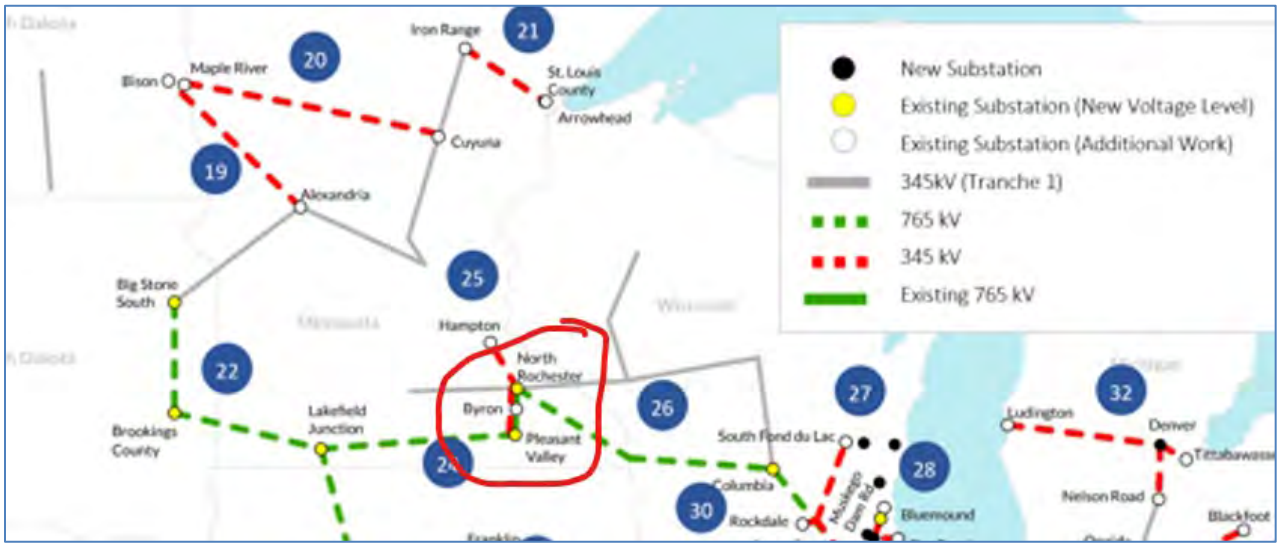
Xcel Energy provided the following text response to this request and submitted to Rich Davis of DOC – EERA on November 27, 2024.

A construction schedule is not available at this time as the exact timing for when there will be a need to connect the 345 kV system to the West Faribault Substation is not known at this time. However, we expect there will be a need to connect the 345 kV system to the West Faribault Substation in 10-15 years. The exact timing of the need for this connection will depend on potential generation retirements and the development of new renewable generation in this area.

5. This request pertains to Route Segment 17 (Hwy 14 option). Xcel's August 28, 2024 letter responding to scoping comments states: "In addition, the Highway 14 would also require a new approximately 13-mile long 345 kV connection from the Byron Substation to the North Rochester Substation. There is already a 345 kV transmission line between these two substations such that this new 345 kV line could be double-circuited with the existing line. However, this area of the system is expected to require an additional 345 kV connection from the Byron Substation to the North Rochester Substation in the future and double-circuiting with this existing 345 kV line at this time would make this future 345 kV connection more difficult." Your email dated 10/18/2024 to EERA reiterated this point and circled the area in question in orange in Figure 1 above. For inclusion in the EIS, please provide addition detail of what would make the future 345 kV connection "more difficult." Please also provide an estimated construction timeline that Xcel would anticipate that the additional 345 kV line could be required.

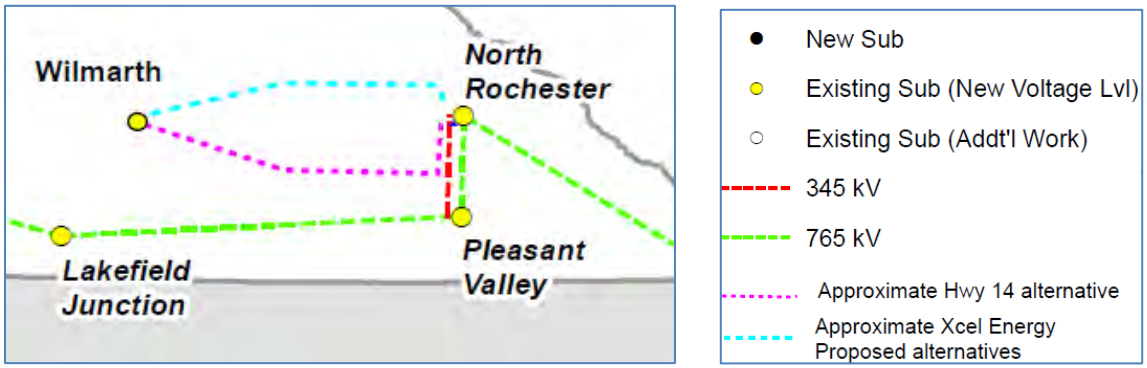
   Xcel Energy provided the following text response and screenshots to this request and submitted to Rich Davis of DOC – EERA on November 27, 2024.

The MISO Tranche 2.1 portfolio is expected to be approved in December 2024. That portfolio includes a new 345 kV transmission line from Pleasant Valley to North Rochester with an in-service date of 2032 (as well as a new 765 kV line from Lakefield Junction to Pleasant Valley to North Rochester to Columbia (in Madison, WI)). See screenshot below and the link to MISO's web site.



MISO Long Range Transmission Planning Tranche 2.1

The Pleasant Valley to North Rochester project follows an existing 345 kV transmission line (line #0979) and assumes rebuilding that line to a double-circuit 345/345 kV line. If the Highway 14 alignment is selected for the MMRT Project the Byron to North Rochester portion of that option would involve double-circuiting with the existing line 0979. This would mean that it is no longer possible to double-circuit that portion of the upcoming LRTP Tranche 2.1 Pleasant Valley to North Rochester line with the existing line, as that position will be taken. This will necessitate finding a new route for the LRTP 2 Tranche 2.1 345 kV line. We have attempted to illustrate with some edits to the MISO map as shown below (note this does not show existing lines such as the existing Pleasant Valley to North Rochester 345 kV line).



6. This request pertains to Route Segment 17 (Hwy 14 option). Xcel's email dated 10/14/2024 states: "For the north/south segment of the Hwy 14 alternative the preliminary alignment would double-circuit with the Byron-North Rochester 345 kV line. But we are still evaluating constructability and outage constraints associated with doing that, so it could change, or impact the construction schedule." Please provide final clarification on whether the north/south part of this route segment would or would not be double-circuited with the Byron-North Rochester 345 kV line and provide any updates on potential implications for the construction schedule.

   Xcel Energy provided the following text response and screenshots to this request and submitted to Rich Davis of DOC – EERA on November 27, 2024.

If this route option is selected Xcel Energy plans to double-circuit the north/south portion of the line from Byron to North Rochester with the existing 345 kV line. There will likely be some constraints on construction timing for this portion, but it is not expected to significantly impact overall project schedule.

7. This request pertains to Route Segment 17 (Hwy 14 option). In a meeting between Xcel and EERA held on 10/02/2024, EERA and Xcel discussed means of defining an anticipated alignment for the Route Segment 17 (Hwy 14 option). Xcel reiterated that the Route Segment 17 (Hwy 14 option) would need to terminate at the North Rochester Substation (which is also where the applicant's proposed Segment 2 terminates). Xcel's August 28, 2024 letter also noted the need to terminate this alternative at the substation; specifically, your letter stated: "As the Project requires a connection to the North Rochester Substation, a Highway 14 Route Alternative (HWY 14-ALT) would need to also include a new 345 kV connection from the Byron Substation north to the North Rochester Substation." As discussed on 10/02/2024, it is EERA's understanding that should Segment 4 West (as proposed in RPA, this includes: 4K, 4L, 4N, 4H, 4O, 4P) be selected by the Commission as part of the final route, the anticipated route corridor for the portion of the Route Segment 17 (Hwy 14 option) going north/south between the Byron Substation and the North Rochester Substation would be one in the same as the north/south portion of Segment 4 West between the Byron Substation and the North Rochester Substation. Xcel noted this would imply that there could be two lines running north/south. Please confirm that two lines running north/south in this area would be constructable and feasible. Please also confirm if double circuiting is a potential in this area.

Xcel Energy provided the following text response and attached system illustrations to this request and submitted to Rich Davis of DOC – EERA on November 27, 2024.

Segment 4 of the MMRT project includes the relocation of a portion of the 161 kV line between North Rochester and the Chester Substation (east of Rochester). No portion of the Segment 4 is proposed to be double-circuited with the existing 345 kV line (see question 5 above for more on this item). If Segment 4 West is selected approximately 3.3 miles of the new line would be double-circuited with the existing North Rochester to Northern Hills 161 kV line. If Route 4 West-A is selected approximately 11.3 miles would be double-circuited with the existing 161 kV line.

Note, there are a number of existing lines in this area that connect to the North Rochester Substation. The enclosed System Illustrations for Supplemental Information Inquiry 2, Question 7 shows the configuration and locations of the lines that would result from the project for the following potential route choice combinations:

- 2 North or 2 South & 4 West
- 2 North or 2 South & 4 West-A
- Hwy 14/Route Segment 17 & 4 West
- Hwy 14/Route Segment 17 & 4 West-A

8. Please provide local zoning data where available.

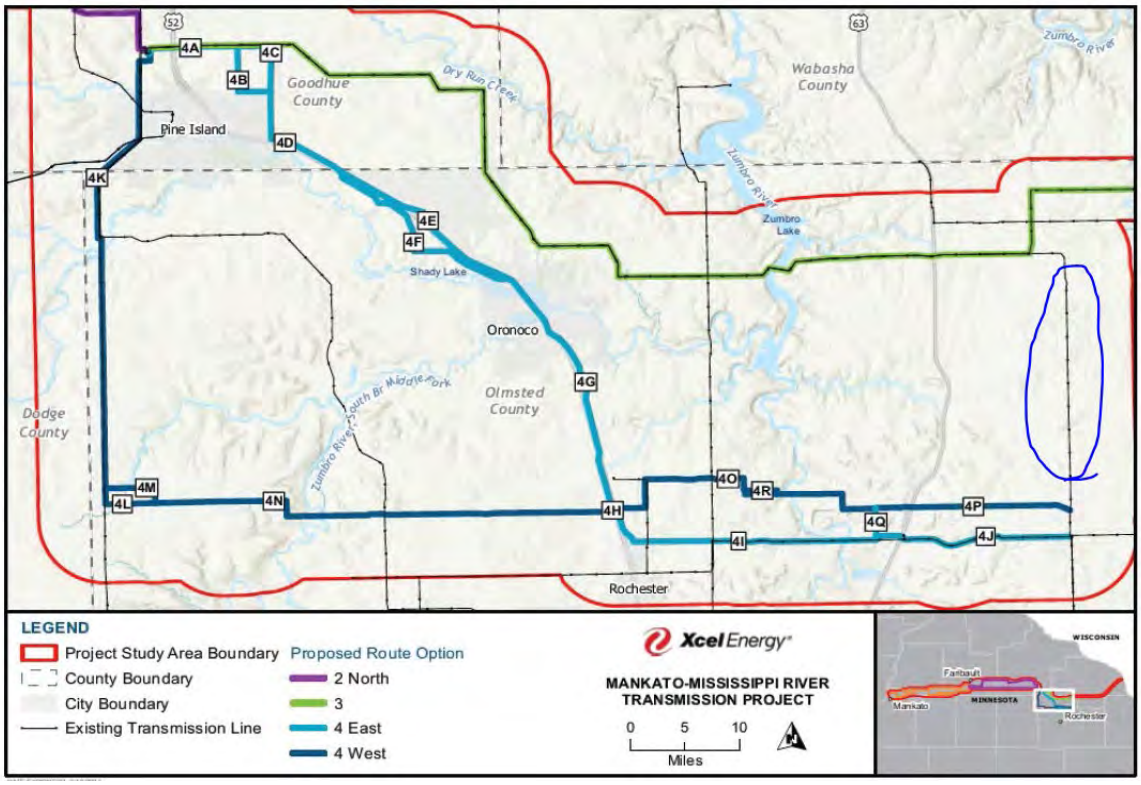
Xcel Energy provided the following text response and attached pdf maps to this request and submitted to Rich Davis of DOC – EERA on November 27, 2024.

Xcel Energy was able to find zoning data for the affected counties as listed below:

- Goodhue County : https://experience.arcgis.com/experience/a22bf3b838b743aeb718a48b520dd94e/page/Goodhue-County-Zoning/
- Rice County: PDF Map Attached.
- Wabasha County: PDF Map Attached.
- Omstead County: https://gweb01.co.olmsted.mn.us/WebApps/OlmstedCountyGISMap/
- Dodge County: https://dodgecountymn.gov/departments/land_use2.php (Zoning Maps by Township can be found here)
- Waseca County: Shapefile Attached.
- LeSueur County: PDF Map Attached.
- Blue Earth County: https://www.blueearthcountymn.gov/346/Zoning-Maps (Zoning Maps by Township can be found here)

9. If Proposed Route Option 4 East or 4 West were selected, please confirm if the portion of the existing 161 kV line circled in blue Figure 2 would be removed or remain in place.

Figure 2

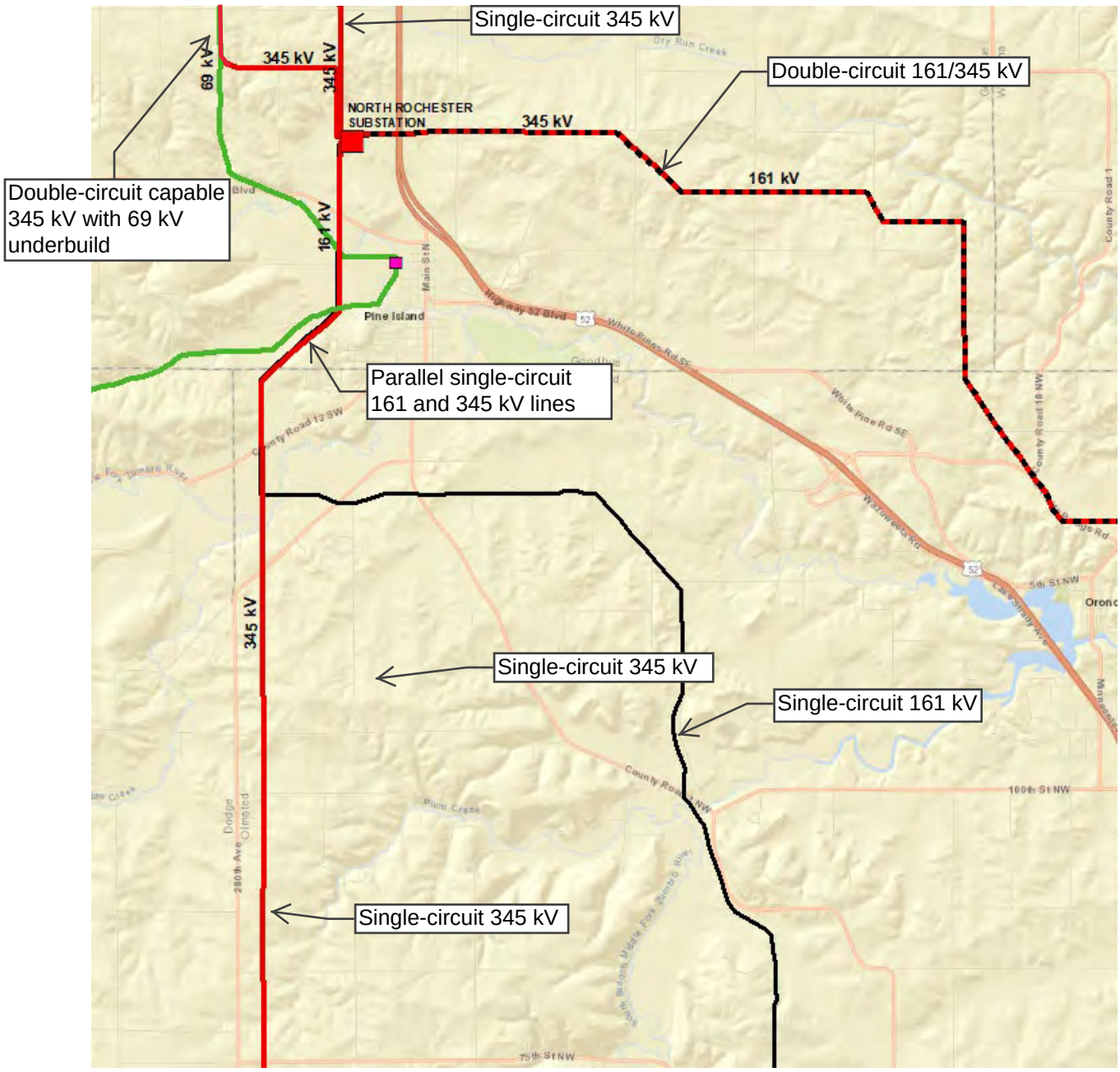


Xcel Energy provided the following text response to this request and submitted to Rich Davis of DOC – EERA on November 27, 2024

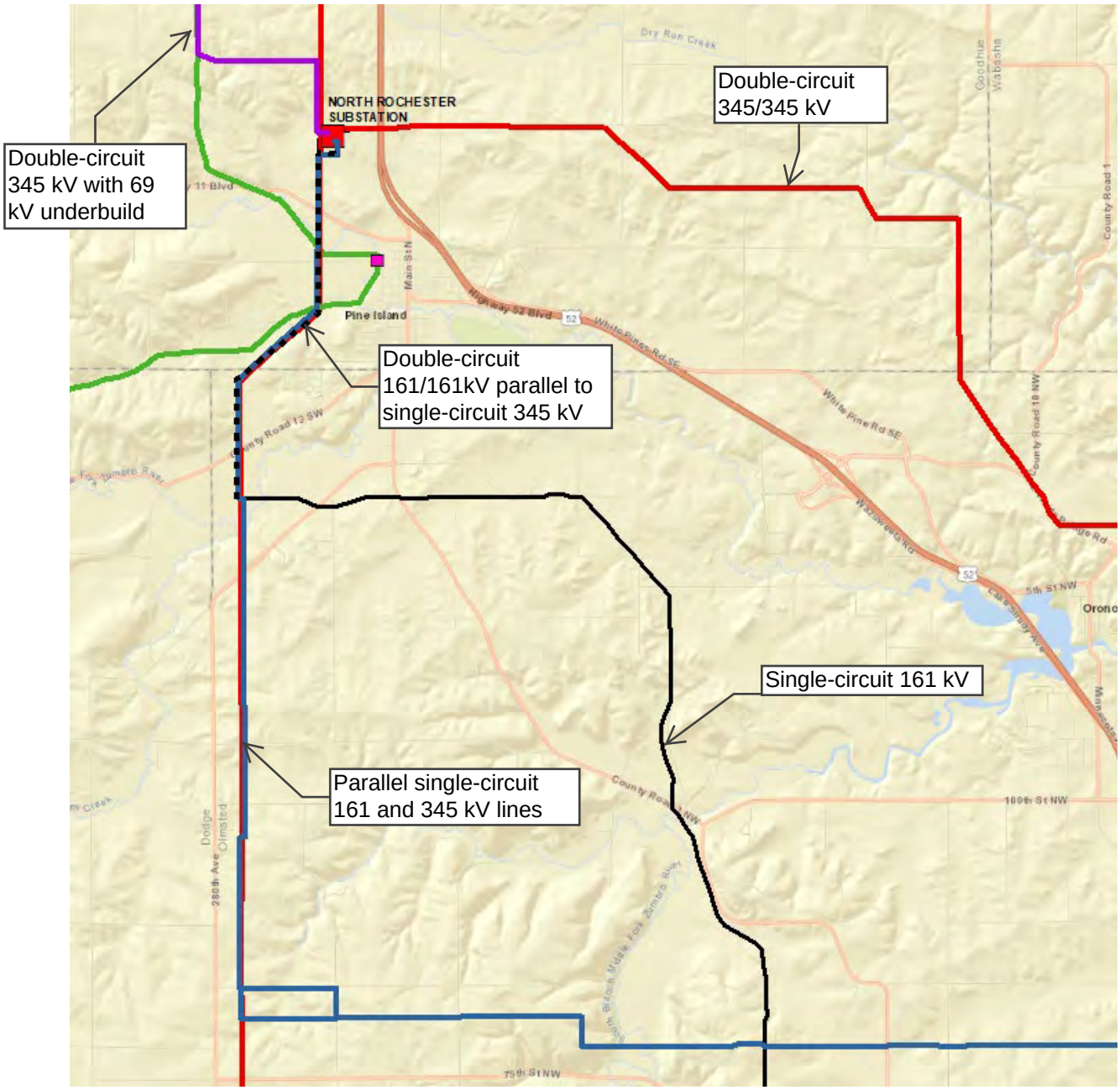
The status of this segment needs further investigation by the applicants to confirm future intent.

System Illustrations for Supplemental Information Inquiry 2, Question 7

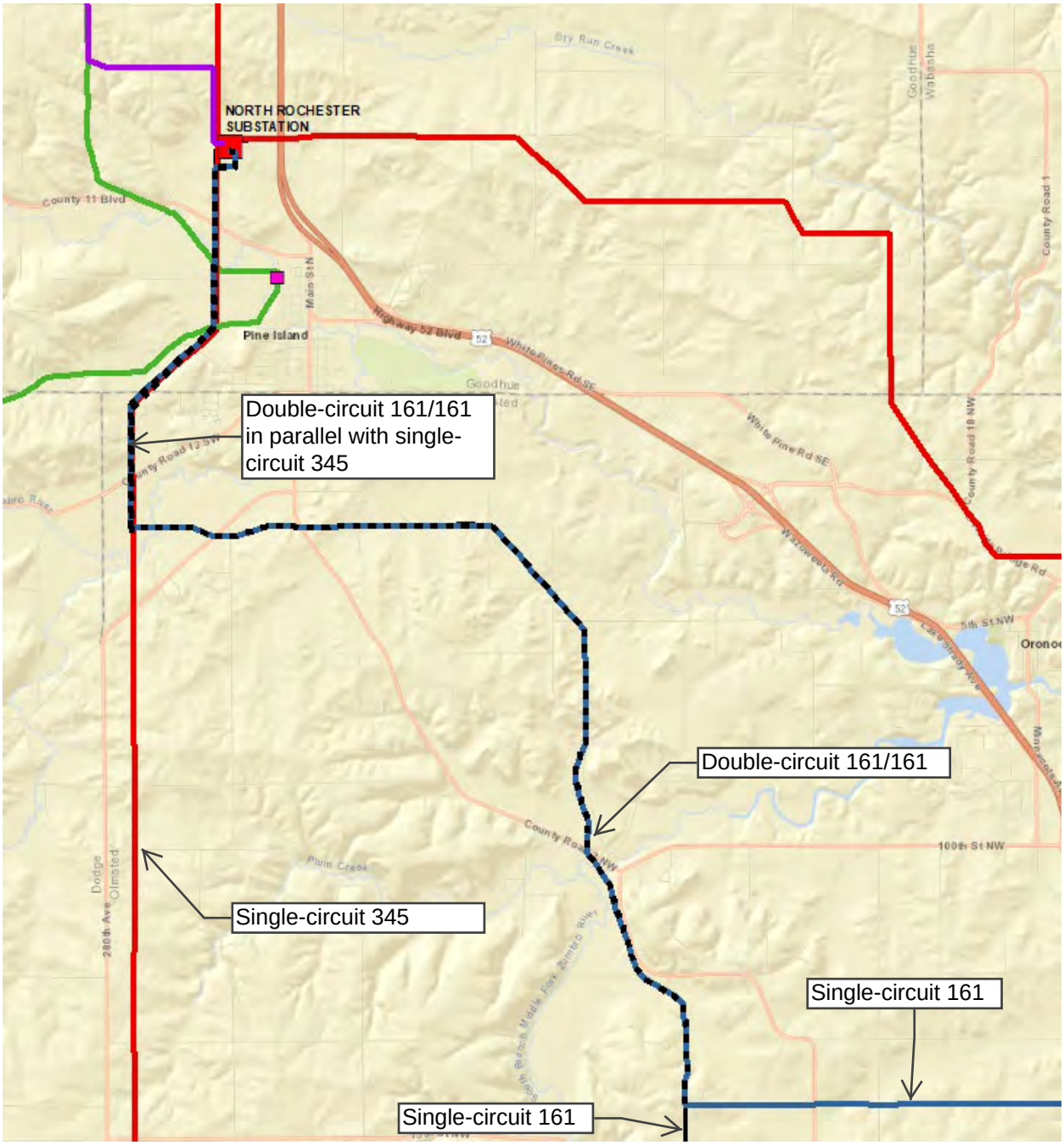
Existing System



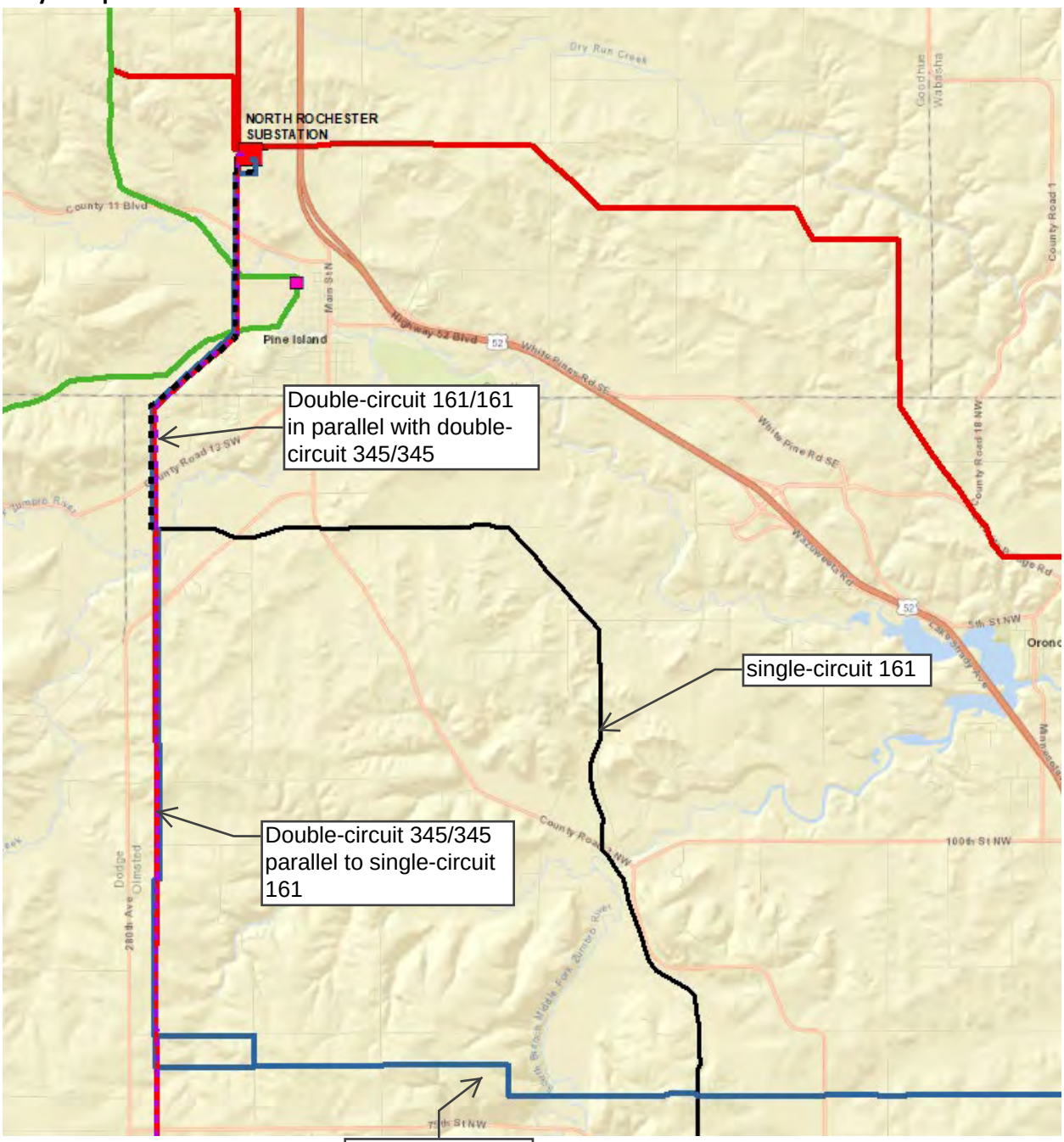
2 North or 2 South & 4 West



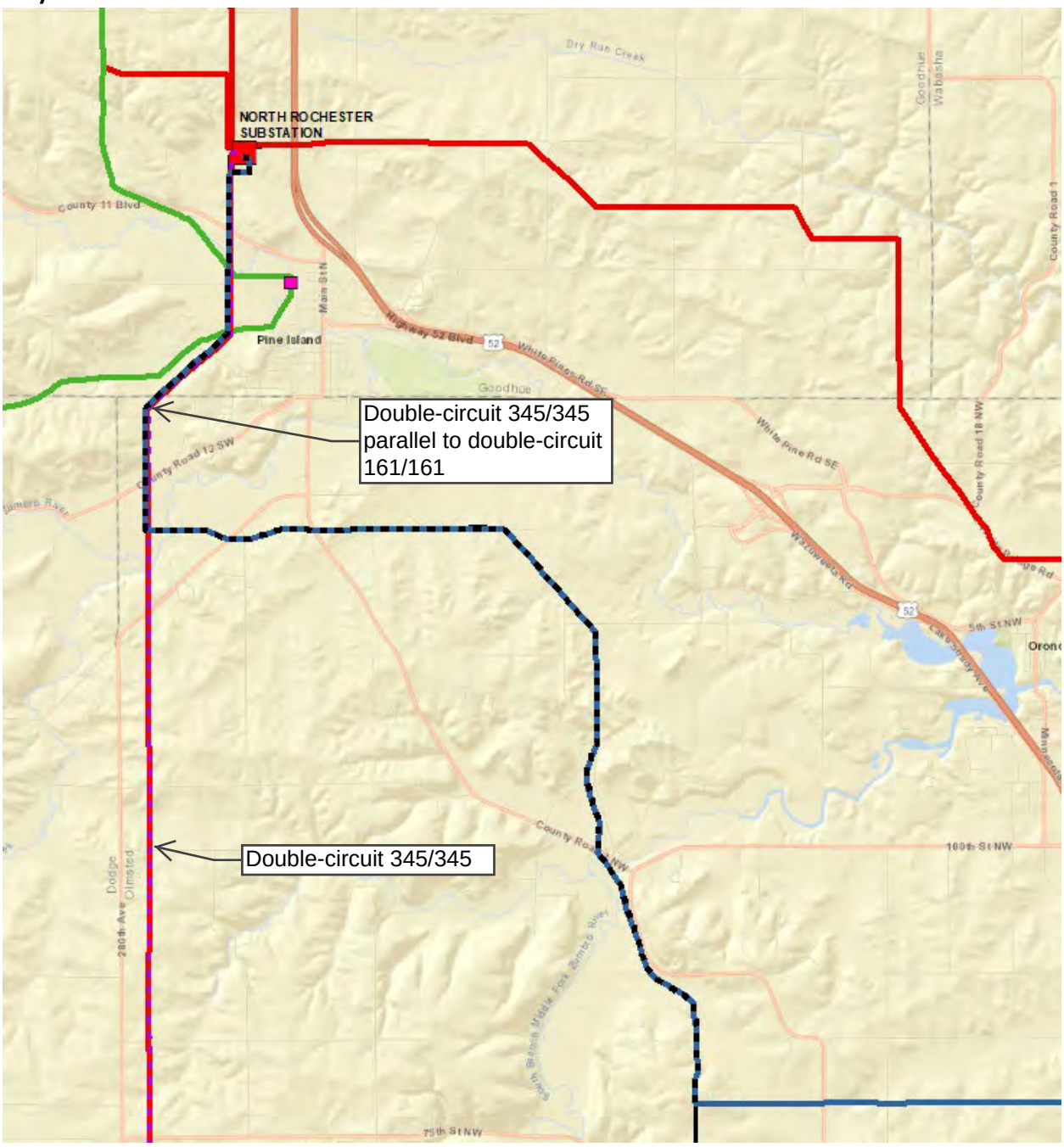
2 North or 2 South & 4 West A



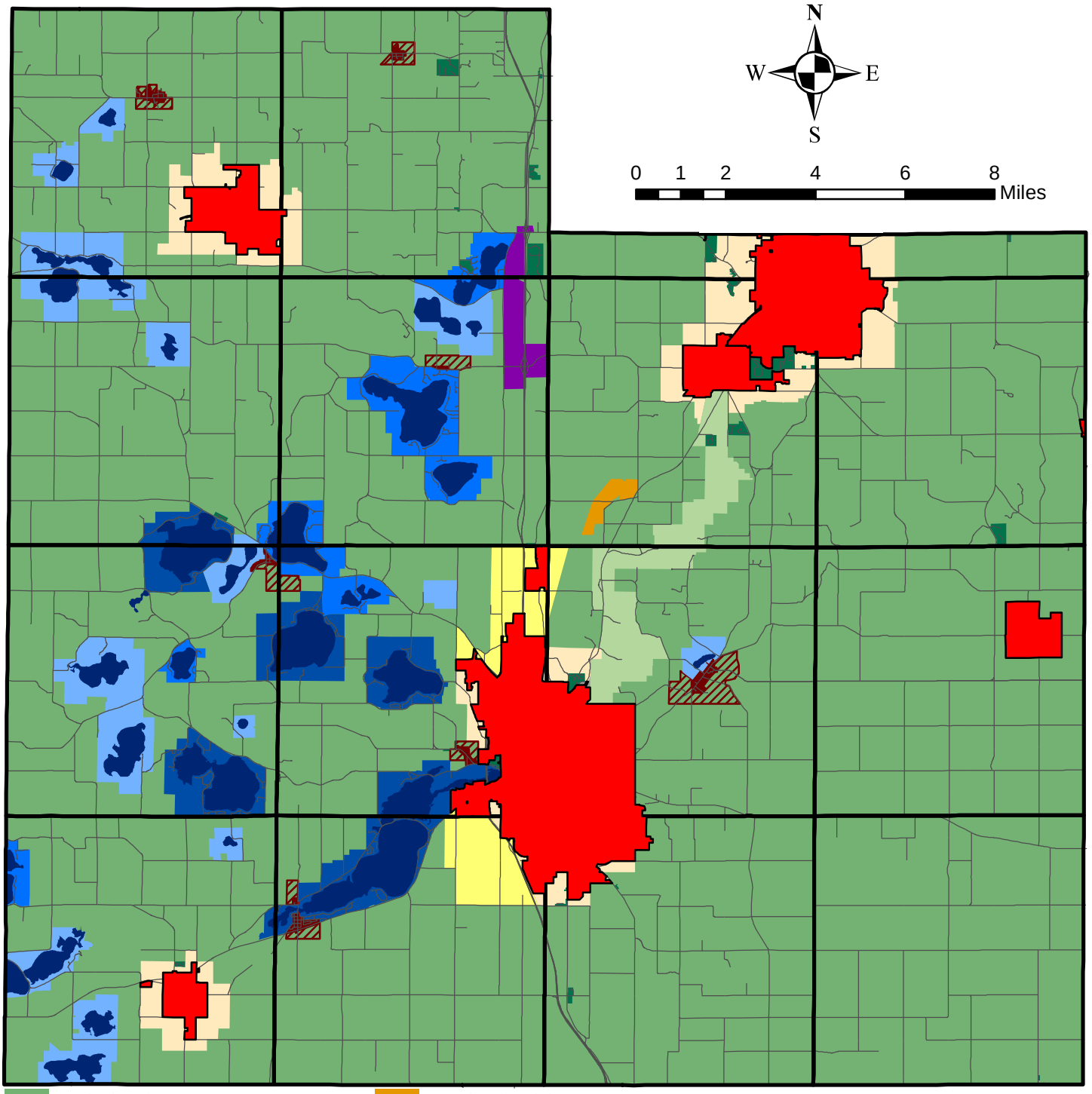
Hwy 14 Option & 4 West



Hwy 14 & 4 West-A



Rice County Zoning Map



- Agricultural
- General Development Shoreland
- Recreational Development Shoreland
- Natural Environment Shoreland
- Wild and Scenic River
- Highway Commercial
- Limited Industrial
- Rural Industrial
- Rural Residential
- Urban Reserve
- Urban Reserve Industrial
- Village Mixed Use
- Village Planned Unit Development Overlay
- Roads
- Protected Lake
- Incorporated City
- Township

Amended: January 23, 2024

GIS by Rice County

Map features are representations of original data sources and do not replace or modify land surveys, deeds, or other legal instruments defining land ownership or use.

Wabasha County Zoning Districts

0 1.5 3 6 9 Miles

MOUNT PLEASANT
T 111 N - R 13 W

LAKE
T 111 N - R 12 W

T 111 N - R 11 W
PEPIN

Lake City

Wabasha

T 110 N - R 13 W
GILLFORD

T 110 N - R 12 W
WEST ALBANY

T 110 N - R 11 W
GLASGOW

T 110 N - R 10 W
GREENFIELD

CHESTER
T 110 N - R 14 W

Zumbro Falls

Kellogg

Mazeppa

HYDE PARK
T 109 N - R 13 W

Millville

OAKWOOD
T 109 N - R 12 W

HIGHLAND
T 109 N - R 11 W

T 109 N - R 10 W
WATOPA

MINNEISKA
T 109 N - R 9 W

MAZEPPA
T 109 N - R 14 W

ZUMBRO

Hammond

Minneiska

T 108 N - R 12 W
ELGIN

Plainview

PLAINVIEW
T 108 N - R 11 W

Elgin

Zoning Districts

- A-1
- A-2
- A-3
- R-1
- Municipal Zoning

Roads

- US/ State Hwy
- CSAH/ Co Rd

Townships

- Township Boundaries

Water Features

- Lake/ River

N W E S

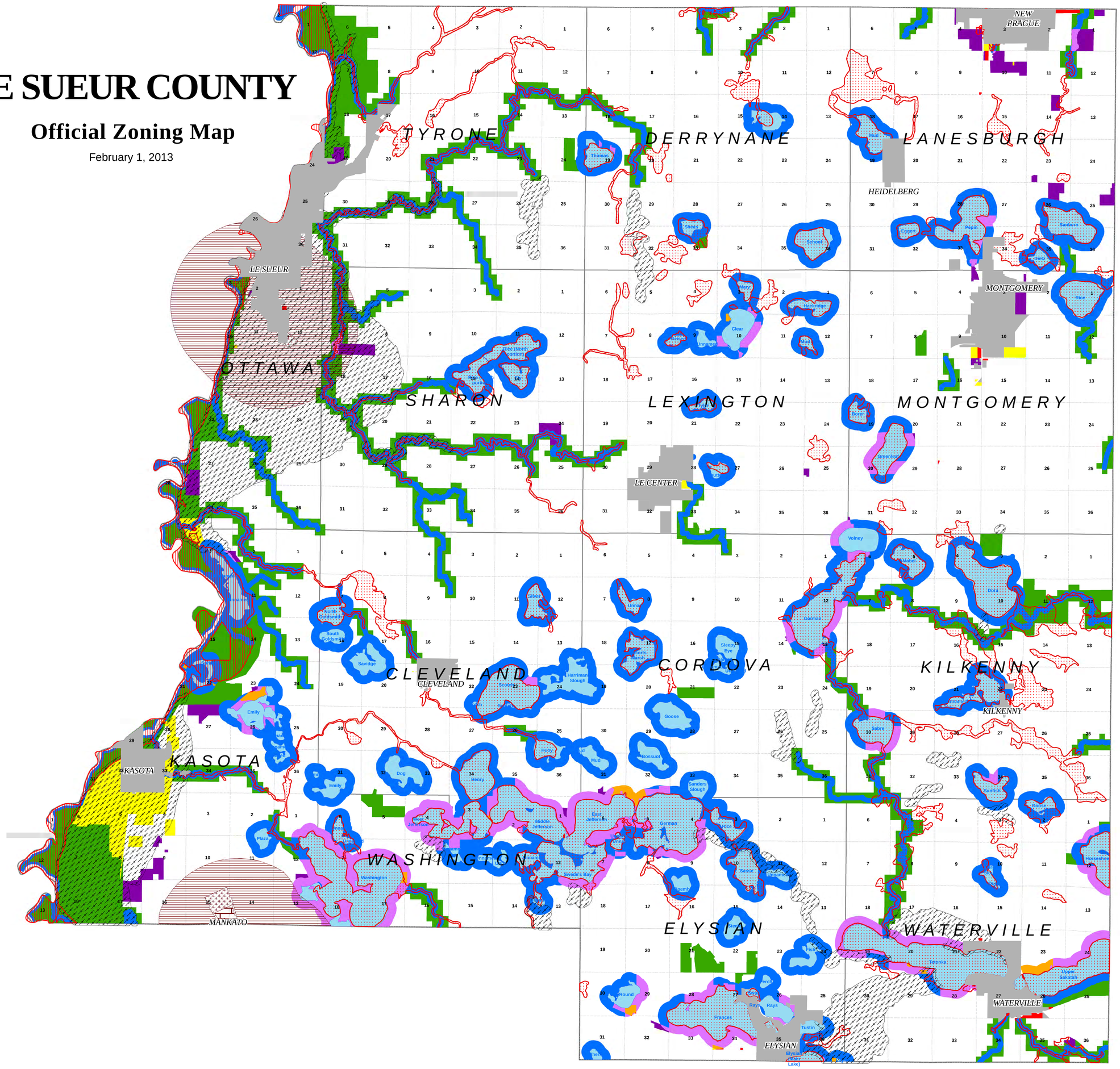
Map created by Wabasha County GIS using data obtained from Wabasha County Environmental Services. This data is believed to be accurate, but Wabasha County is not responsible for any errors or omissions. Please contact Wabasha County GIS with any questions at 651-565-5164.

5/3/2012

LE SUEUR COUNTY

Official Zoning Map

February 1, 2013



LEGEND

Zoning Districts

- Agricultural
- Conservancy
- Special Protection
- Recreational Commercial
- Recreational Residential
- Urban/Rural Residential
- General Business
- General Industry

Overlay Districts

- Mineral Resources

Flood Plain

- Flood Fringe
- Floodway

Airport

- Zone A
- Zone B
- Zone C

Lakes

City

Map created by Le Sueur County GIS Department with map data created by I&S Group.
Other Data Credits:
- Federal Emergency Management Agency
- Minnesota Department of Natural Resources
- USDA Natural Resources Conservation Service
- City of Mankato - Department of Planning and Zoning
- City of Le Sueur - Department of Planning and Zoning

Darrell Pettis, Le Sueur County Administrator
February 1st, 2013

Coordinate System: NAD 1983 HARN Adj MN Le Sueur Feet
Projection: Lambert Conformal Conic
Datum: NAD 1983 HARN Adj MN Le Sueur
False Easting: 500,000.0000
False Northing: 100,000.0000
Central Meridian: -93.1333
Standard Parallel 1: 44.3000
Standard Parallel 2: 44.6667
Latitude Of Origin: 44.1947
Units: Foot US

Le Sueur County

Le Sueur County GIS Coordinator - Justin Lutterman - 507.357.8577

COMMERCE DEPARTMENT

Supplemental Information Inquiry #3

To: Ellen Heine
Xcel Energy

Sent via email to ellen.l.heine@xcelenergy.com

From: Rich Davis
Energy Environmental Review and Analysis

Date: January 15, 2025

Project: Mankato to Mississippi River Project
23-157

Respond: January 23, 2025

Please respond to the following questions or provide the requested data or information. Staff will use the information provided to develop the environmental document for the project, which is a public document. Your response, in its entirety, will be included in the environmental document as an appendix; therefore, **responses will be publicly available** unless otherwise designated by the respondent as "nonpublic information" pursuant to Minnesota Statute § 13.02, subdivision 12.

Directions: Responses to questions should be contained within this form to the greatest extent possible (11-point Calibri, plain text font, RGB 192, 0, 0). Attach supporting documentation as necessary. While data and information requests, for example, shapefiles or draft plans, will not be contained within this form, document their submittal using this form as follows: "*Requested information* sent to *whom* by *what means* on *date*."

Do not eFile your response. Return the completed form, as a PDF, along with necessary supporting documentation, and/or requested data or information to richard.davis@state.mn.us. Contact me at (507)380-6859 with questions.

A note on property ownership questions/answers below: Xcel Energy does not own any property in Minnesota. The entity which owns properties within Minnesota is Northern States Power Company, a Minnesota corporation (NSPM). Anywhere Xcel Energy is noted as the property owner, the legal owner is technically NSPM.

1. The joint certificate of need application and route permit application indicates the Wilmarth Substation would be upgraded to include new substation equipment. It also notes the expansion area would be approximately 0.8 acre in size located on the northeast corner of the existing substation. To better understand potential impacts for the upgrades to this substation, please provide:
    a. A shapefile showing the location of the 0.8-acre expansion area.
    Please see separately provided shapefiles of the Wilmarth - Prelim Grading Concept (zip file WilmarthSub_Shapefiles_20250123.zip) of the proposed Wilmarth Substation expansion area.
    b. Confirmation that the expansion area and access to it would be on Xcel-owned property.
    Xcel Energy confirms that the expansion area and access to it will be on Xcel Energy (NSPM)-owned property (also see separately provided shapefile WilmarthSub_Parcels within above referenced zip file for property boundaries).

c. Additional explanation on why the expansion is necessary.
To improve regional electrical system stability and reliability, Xcel Energy is planning to add a 345 kV transmission line from the existing Wilmarth Substation to the existing North Rochester Substation, as part of the Mankato – Mississippi River 345 kV Transmission Project. This requires the addition of equipment (see 1.e below) for which there is not sufficient space within the current footprint. The yard, fence, and retaining wall would need to be expanded northward to fit the new equipment.

d. Confirmation that the existing fence would be removed and new fencing would be installed around the expanded border.
Xcel Energy confirms that the existing fence in the expansion area will be removed and new fencing will be installed to accommodate the expanded area at the northeast corner of the existing Wilmarth Substation site.

e. Please include a list of new equipment to be installed.
Proposed new equipment to be installed at the Wilmarth Substation includes: 2 new 345 kV circuit breakers; 4 new 345 kV group-operated switches; 3 new 1-phase bus stands; rigid bus to extend the existing rigid bus to the switches; and flexible bus to connect the switches to the breakers.

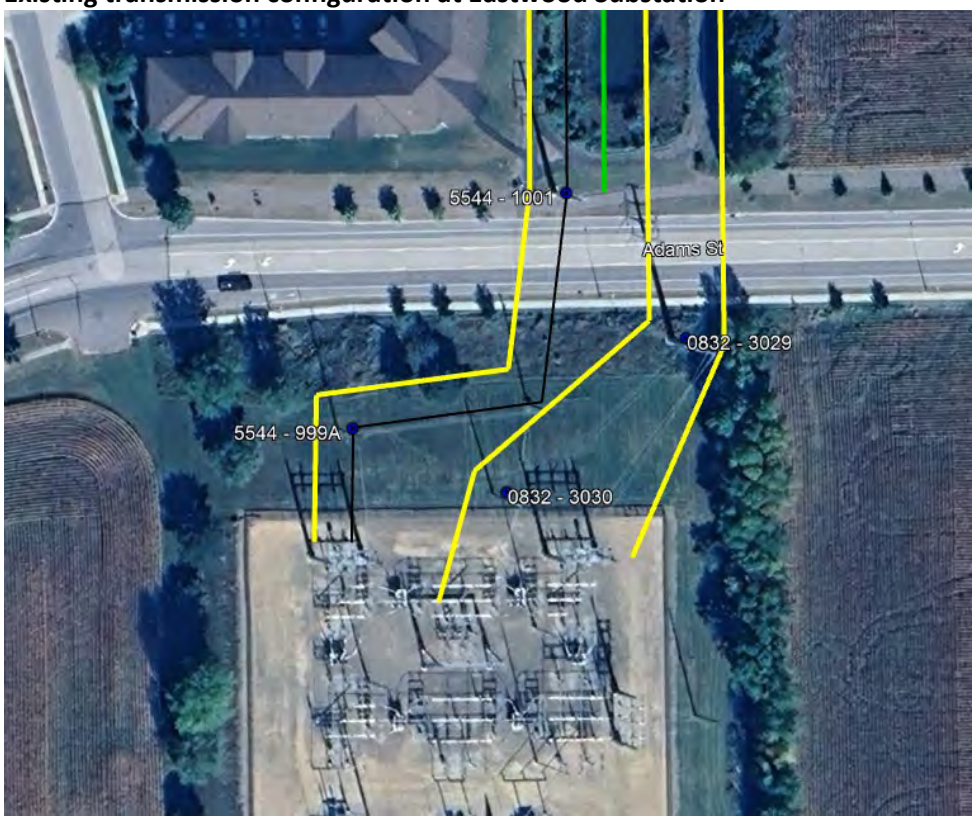
f. Please provide an estimated duration of construction activities at the substation.
The total time to construct the proposed expansion of the Wilmarth Substation (grading + equipment installation) is expected to be 1-1.5 years. However, this timeline is dependent upon various factors (e.g., supply chain, material availability, workforce/labor, weather, outage windows, etc.) and may change as the start of construction time nears. Xcel Energy estimates it will require approximately 10 weeks to complete grading for the pad expansion.

Xcel Energy provided the above text responses in this document and the enclosed shapefiles via email to Rich Davis of the DOC EERA on 1/24/2025.

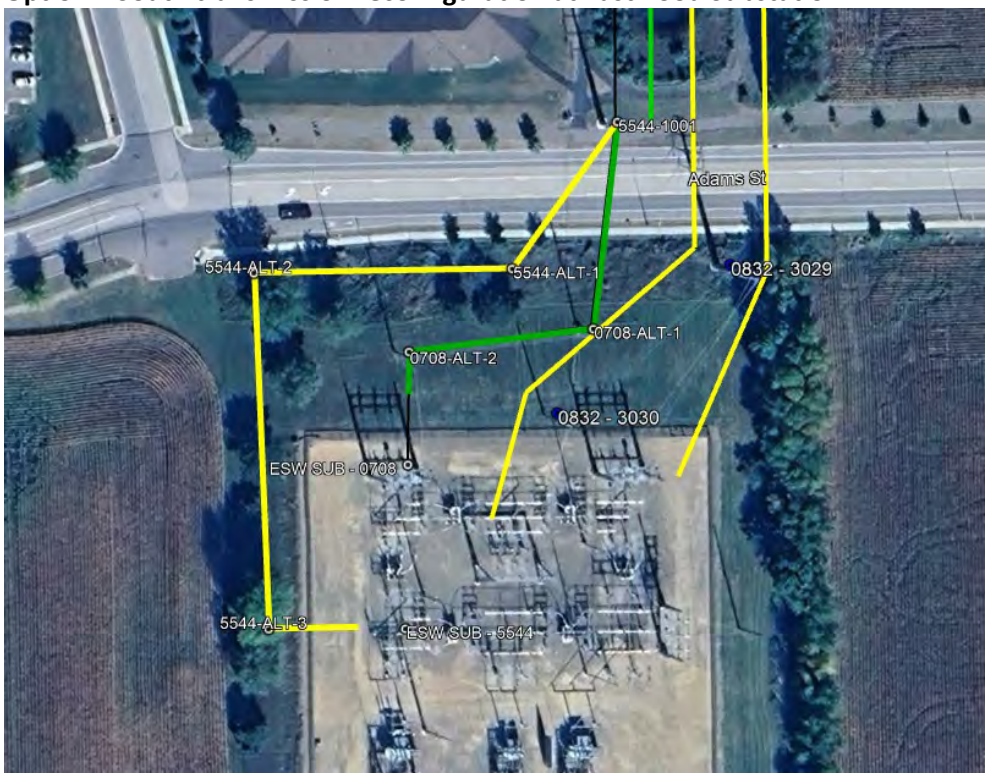
2. The joint certificate of need application and route permit application indicates the Eastwood Substation would be modified if Route Option 1 South were selected. To better understand potential impacts for the upgrades to this substation, please provide:
   a. Please confirm Xcel Energy owns the Eastwood Substation and areas subject to modifications/access to get to these areas.
   Yes, the Eastwood Substation is owned by Xcel Energy (NSPM), and any substation expansion will be within NSPM-owned property. See attached Eastwood Prelim GA (general arrangement) for equipment expansion areas.
   b. It is EERA's understanding that if Route Option 1 South were selected, the existing 69 kV line would terminate at the Eastwood Substation. This means the 69 kV line would no longer be needed between the Eastwood Substation and the Wilmarth Substation, and that existing ROW would be used for the installation of the new 345 kV line. Please confirm.
   Yes, that is correct. If Route Option 1 South is selected the 345 kV line would replace the 69 kV line, which would terminate at the Eastwood Substation instead of at the Wilmarth Substation.
   c. It is also EERA's understanding that if Route Option 1 South were selected, 500 feet of new 69 kV transmission line would be installed to connect the existing line into the substation. Please provide a shapefile indicating where the new 500 feet of transmission line would be located and additional information on why it would be needed.

Yes, that is correct. See screenshots below and attached MMRT_EastwoodSub_Shapefiles_20250124. The additional 500 feet of 69 kV is necessary to connect the line to the Eastwood Substation. The first figure shows the existing configuration where the 69 kV line (green) terminates just north of the substation but does not connect to the substation. The second figure shows the proposed re-termination for the 115 kV line 5544 and proposed new termination of 69 kV line 0708 into the Eastwood Substation.

Existing transmission configuration at Eastwood Substation



Option 1 South transmission reconfiguration at Eastwood Substation



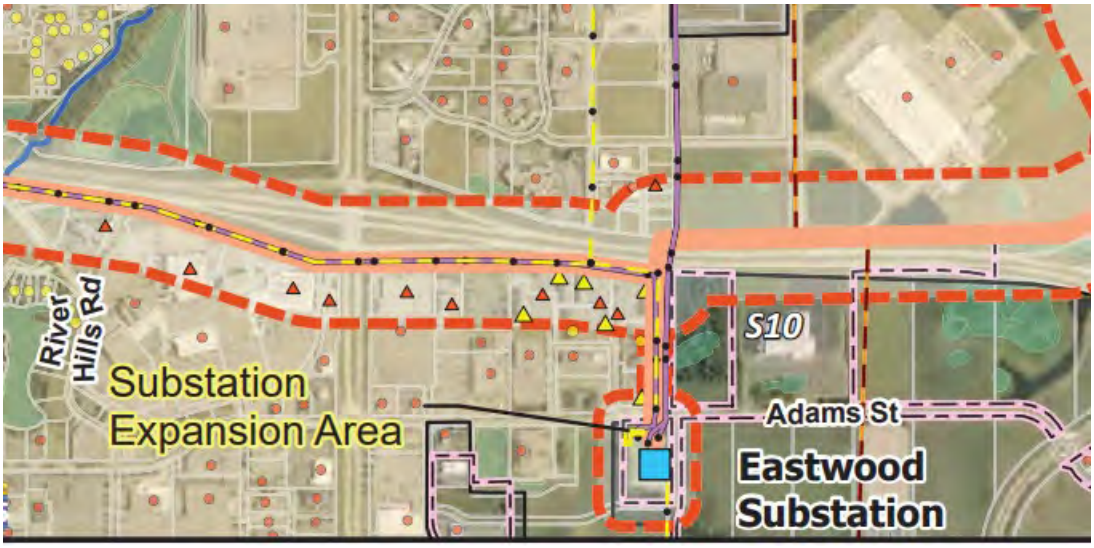
d. Confirm the expansion area would be contained within the area outlined in orange around the existing substation area in Figure 1 below. Note that Figure 1 is a snippet from the application's detailed mapbook for Segment 1, pg 1 of 11. This additional route width was not included in the original shapefile of the project area provided by Xcel to EERA in August 2024. EERA will include the additional route width area in the EIS's analysis upon confirmation of this information request.
Confirmed; the expansion area noted and shown in the attached drawings is encompassed within the orange dashed project area boundary shown in the figure below.

e. Please provide information on whether the existing fence line is subject to change.
The existing fence will need to be modified to accommodate the expansion area shown in the plans.

f. Please include a list of new equipment to be installed should the modifications be required (i.e., if Route Option 1 South is selected by the Commission) and how that relates to the why the expansion would be necessary.
Should Route Option 1 South be selected the expansion at the Eastwood Substation will require installation of a new 69/115 kV transformer on the north side of the site as shown in the enclosed preliminary Eastwood Substation General Arrangement.

g. Please provide an estimated duration of construction activities at the substation.
Construction activities at the Eastwood Substation are expected to take approximately 10 months (including grading and equipment installation).

Figure 1:



Xcel Energy provided the above text responses and screenshots in this document and the enclosed shapefiles and general arrangement plan via email to Rich Davis of the DOC EERA on 1/24/2025.

3. The joint certificate of need application and route permit application indicates the North Rochester Substation would be upgraded to include new substation equipment. It also notes the modifications would be contained within the existing fence line area. To better understand potential impacts for the upgrades to this substation, please provide:
    a. Please include a list of new equipment to be installed.
    New equipment that is planned to be installed at the North Rochester Substation includes new 345 kV circuit breakers, new 345 kV switches, new rigid and flexible bus, bus stands and an expansion of the EEE (Electrical Equipment Enclosure)

    b. Please provide an estimated duration of construction activities at the substation.
    Construction activities at the North Rochester are expected to take up to a year dependent upon various factors (e.g., supply chain, material availability, workforce/labor, weather, outage windows, etc.) and may change as the start of construction time nears.

Xcel Energy provided the above text responses in this document via email to Rich Davis of the DOC EERA on 1/24/2025.

4. As Xcel is aware, CFERS, LLC Scoping Comments for EIS at 15 (August 1, 2024) (eDocket No. 20247-209158-01) requested the EIS study the "Highway 14 Route Alternative." This alternative was recommended by CFERS to end at the Byron Substation. In Xcel's August 28, 2024 response to scoping comments letter, Xcel noted the following:
    a. "the Highway 14 Route Alternative would also require a new approximately 13-mile long 345 kV connection from the Byron Substation to the North Rochester Substation. There is already a 345 kV transmission line between these two substations such that this new

345 kV line could be double-circuited with the existing line. However, this area of the system is expected to require an additional 345 kV connection from the Byron Substation to the North Rochester Substation in the future and double circuiting with this existing 345 kV line at this time would make this future 345 kV connection more difficult.

In addition to this information, can Xcel please also provide indication of whether any upgrades or modifications would be required to the Byron Substation should this alternative be selected? If yes, please provide the same level of detail as was requested for the other substations in Questions 1 through 3.

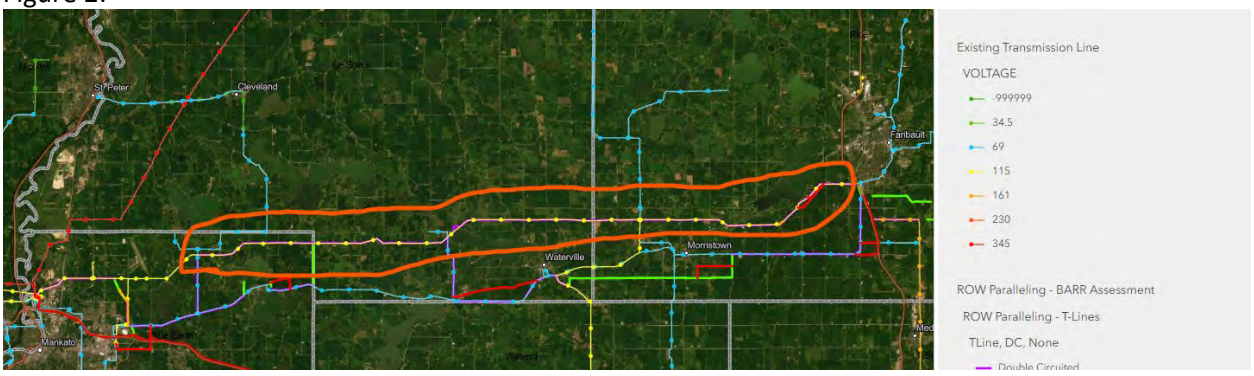
If the Highway 14 Route Alternative is selected, no modifications would be required at the Byron Substation as part of the Mankato – Mississippi Transmission Project.

Xcel Energy provided the above text response in this document via email to Rich Davis of the DOC EERA on 1/24/2025.

5. Please confirm if the part of Segment 2 circled in orange below would be double-circuited with an existing 69 kV line or a 115 kV line. The application indicates it would be double-circuited with an existing 69 kV line. However, EERA/Barr's spatial data indicates there is only a 115 kV line within the circled area.

   The area circled in the screenshot below is a portion of Route Option 1 North, which would involve double-circuiting the proposed 345 kV transmission line with an existing 115 kV transmission line. Route Option 2 North is to the east of the area shown in the image below. (Note: Route Option 2 North involves double-circuiting the proposed 345 kV transmission line with an existing 69 kV line for a portion of the route)

Figure 2:



Xcel Energy provided the above text response in this document via email to Rich Davis of the DOC EERA on 1/24/2025.

6. This information request corresponds to what the EIS refers to as Segment 4 West. The application indicates that Route Option 4 West would not be double-circuited. However, Xcel indicated in your July 3rd, 2024 letter (when requesting the addition of the Route Option 4 West-A) that upon further coordination with Dairyland Power Cooperative and Rochester Public Utilities, double-circuiting would be possible with the existing 161 kV line. Xcel also noted in your November 27, 2024 response to Supplemental Information Inquiry #2 that "If Segment 4 West is selected approximately 3.3 miles of the new line would be double-circuited with the existing North Rochester to Northern Hills 161 kV line." Please confirm the analysis in the EIS can

now assume that the portion of Route Option 4 West circled in orange below would be double-circuited with an existing 161 kV line if selected.

That is correct. For Route Option 4 West, the proposed 161 kV line would be double-circuited for approximately 3.3 miles with the existing 161 kV line as described. In the initial application, our understanding was that the 161 kV lines could not be double-circuited with the proposed 345 kV transmission for reliability reasons, however, after additional evaluation it was determined that they could be double-circuited without impacting system reliability.

Figure 3:

Xcel Energy provided the above text response in this document via email to Rich Davis of the DOC EERA on 1/24/2025.

7. Assuming the answer to Question #6 is yes, please confirm the table below can be modified to include the bolded red text and still accurately describes the typical structures that would be used in this scenario. Please also confirm the structure would look similar to Figure 4. If it would be different, please provide a photo.

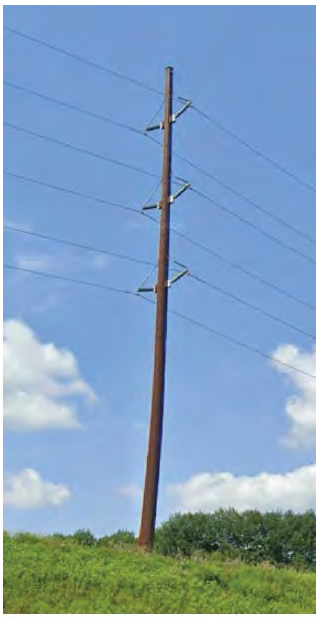
   Yes, the text added in red in the table below is accurate, and the photo of the structure below the table shows the correct type of structure for either a 161/69 kV or a 161/161 kV.

   Xcel Energy provided the above text response in this document via email to Rich Davis of the DOC EERA on 1/24/2025

Table

Line Type	Structure Type	Structure Material	Typical ROW Width (feet)	Typical Structure Height (feet)	Foundation Diameter (feet)	Average Span Between Structures (feet)
161 kV Single-Circuit	Monopole W/ Davit Arms	Galvanized or Self-Weathering Steel	100	75-140	6-8	350-700
161/69 kV **or 161/161** kV Double-Circuit	Monopole W/ Davit Arms	Galvanized or Self-Weathering Steel	100	75-140	6-8	350-700

Figure 4:



161/69 kV Steel Double-Circuit Monopole Structure

8. The joint application did not note the presence of any center pivot irrigation systems. Additionally, no comments received during scoping noted the presence of any center pivot irrigation systems. Can Xcel please confirm you are not aware of any center pivot irrigation systems within the route widths of the proposed routes or their alternatives?
   Confirmed. At this time, Xcel Energy is not aware of any center-pivot irrigation systems within proposed routes or route alternatives.

Xcel Energy provided the above text response in this document via email to Rich Davis of the DOC EERA on 1/24/2025

9. This question pertains to the Chester Junction Substation Alternative. Please describe a summary of the Chester Junction Substation Alternative and what it entails to make it a feasible alternative.

   The Chester Junction Substation Alternative would require acquisition of an approximately 40-acre parcel near the junction location to construct a new substation. Construction of this new substation would involve construction of a pad and installation of a perimeter fence, a 161/345 kV transformer and 8 circuit breakers, as well as additional standard substation equipment. In order to make it a feasible alternative Xcel Energy notes the following concerns:

   - Xcel Energy has not identified any potential sites for this new substation at this time
   - We have not made any accommodations for material procurement at this time
     - This alternative would require 8 additional breakers than are currently planned for the proposed Project. These breakers currently have a 2.5 year lead time.
     - This alternative would require a new 345/161 kV transformer that is not currently part of the Project. There is currently an approximately 4 year lead time for these transformers so the earliest that this alternative could be placed in service is 2030.
   - RPU has not engaged in any planning for their needed transmission upgrades that are required for this alternative. (see #10 below for more detail on line rebuilds)

   Xcel Energy could likely reserve breakers for delivery in 2028/2029, however acquiring a transformer would be more complicated because of very limited availability. We are currently evaluating potential options.

   The preliminary estimated cost for construction and connection of a Chester Junction Substation is as follows:

   - Ancillary transmission line to connect to substation (assume less than 0.5 miles) = $2.5 million
   - Land for substation (40 acres, assume $26k/acre) and right-of-way = $1.1 million
   - Substation equipment and construction = $30.0 million
   - Total estimate = $33.6 million

   Xcel Energy provided the above text response in this document via email to Rich Davis of the DOC EERA on 1/24/2025.

10. This question pertains to the Chester Junction Substation Alternative. In Xcel's response to EIS scoping comments, Xcel stated that three 161 kV lines would need to be rebuilt to a higher capacity to avoid overloads. Which three 161 kV lines, specifically, would need to be rebuilt to a higher capacity and what would that capacity need to be? Please provide a map or shapefile of their locations.

    The line rebuild segments are as follows and shown in the screenshot below and attached shapefiles (ChesterJunction_161kV_Rebuilds_20250124.zip)

    - Crosstown to Cascade 161 kV line will need to be rebuilt to a minimum of 1500 Amps, depending on conductor type and input from Rochester Public Utilities (RPU). This existing line is approximately 1.21 miles in length and the cost to rebuild this line is approximately $4.8 million.
    - Crosstown to Silver Lake 161 kV line will need to be rebuilt to a minimum of 1500 Amps, depending on conductor type and input from RPU. This existing line is approximately 0.36 miles in length and the cost to rebuild this line is approximately $1.8 million.

- Cascade to Bamber 161 kV line will need to be rebuilt to between 1000-2000 Amps, depending on conductor type and input from RPU. This existing line is approximately 4.33 miles in length and the cost to rebuild this line is approximately $10.8 million.

Xcel Energy provided the above text response and screenshot in this document via email to Rich Davis of the DOC EERA on 1/24/2025.

11. This question pertains to the Chester Junction Substation Alternative. In Xcel's response to EIS scoping comments, you stated that the alternative would negatively impact the project's economic benefits. What are the underlying assumptions for the economic impacts cited? We are specifically interested, related to the prior question, in what portion of the economic impact is construction-based versus due to operational changes.

In addition to MISO's need analysis, Xcel Energy conducted additional economic analyses to further support the need for the Project. Xcel Energy's economic need analysis is discussed in Section 4.3.2 of the application. This section of the application also discusses all of the assumptions used by Xcel Energy in conducting its economic analysis of the Project. The economic analyses conducted by Xcel Energy is due to operational changes in system as opposed to construction-based as this analysis looks at projects after they are in-service.

Xcel Energy conducted economic analyses using PROMOD software, short for PROduction MODeling (PROMOD), which is used to support economic transmission planning. The PROMOD software simulates the electric market on an hourly constrained-dispatch basis using models containing generation unit locations and operating characteristics, transmission grid topology, and market system operations. The PROMOD software can calculate the future cost of producing electricity, market congestion, and energy losses based on these assumptions. One of the economic analyses conducted by Xcel Energy was to

calculate the adjusted production cost (APC) savings benefit of the Project to the MISO footprint and LRZ1. APC savings are utilized to measure the economic benefits of proposed transmission projects. These savings are calculated as the difference in total production costs of energy for a generation fleet adjusted for import costs and export revenues with and without the proposed transmission project. Xcel Energy determined that the Project will provide up to $2.1 billion in economic savings across the MISO footprint over the first 20 years that the Project is in service and up to $3.8 billion in economic savings across the MISO footprint over the first 40 years.

Xcel Energy conducted a similar economic analysis for the Chester Junction System Alternative. As noted in Xcel Energy's scoping comments, while the Chester Junction Alternative would still provide APC benefits to the MISO footprint in its first 20 years, the APC savings benefits to the Project partners (Xcel Energy, SMP, and DPC), would be negative. Specifically, the APC benefits to the MISO footprint are expected to be $130.59 million while the APC benefits to the Project partners are expected to be -$2.85 million for the first 20 years that the Project is in-service. The reduction in economic benefits as compared to the proposed Project and the negative benefits to the Project partners is due to the fact that adding the Chester Junction Substation along the 345 kV line causes additional power from the 345 kV line to flow onto the 161 kV system that is at capacity resulting in additional system congestion. System congestion increases costs for electricity consumers because it prevents the delivery of the lowest-cost power generation to where it is needed, forcing the system to rely on higher-cost generation sources, ultimately resulting in higher energy costs.

Xcel Energy provided the above text response in this document via email to Rich Davis of the DOC EERA on 1/24/2025.

12. This question pertains to Segment 1 South shown in Figure 5 below. The blue dotted line in Figure 5 is an existing 69 kV line. It's our understanding that the segment would be double-circuited with the 69 kV line. Please confirm that the existing line may be moved to the opposite side of Walnut Avenue if the final project alignment is on the opposite side of the road.
    Confirmed, the 69 kV line would follow the 345 kV alignment here and be in an underbuilt position.

Figure 5:

Xcel Energy provided the above text response in this document via email to Rich Davis of the DOC EERA on 1/24/2025.

COMMERCE DEPARTMENT

Supplemental Information Inquiry #4

To: Ellen Heine
Xcel Energy

Sent via email to ellen.l.heine@xcelenergy.com

From: Rich Davis
Energy Environmental Review and Analysis

Date: March 17, 2025

Project: Mankato to Mississippi River Project
23-157

Respond: March 25, 2025

Please respond to the following questions or provide the requested data or information. Staff will use the information provided to develop the environmental document for the project, which is a public document. Your response, in its entirety, will be included in the environmental document as an appendix; therefore, **responses will be publicly available** unless otherwise designated by the respondent as "nonpublic information" pursuant to Minnesota Statute § 13.02, subdivision 12.

Directions: Responses to questions should be contained within this form to the greatest extent possible (11-point Calibri, plain text font, RGB 192, 0, 0). Attach supporting documentation as necessary. While data and information requests, for example, shapefiles or draft plans, will not be contained within this form, document their submittal using this form as follows: "*Requested information* sent to *whom* by *what means* on *date*."

Do not eFile your response. Return the completed form, as a PDF, along with necessary supporting documentation, and/or requested data or information to richard.davis@state.mn.us. Contact me at (507)380-6859 with questions.

1. With this supplemental information inquiry, EERA is providing an Excel spreadsheet titled "Mankato to Mississippi EMF_MF Info Request.xlsx." The contents of this spreadsheet include the information provided in Xcel's application as "Table 7-18: Calculated Electric Field for the Operation of Proposed Single/Double Circuit Transmission Line Designs" and "Table 7-19: Calculated Magnetic Field for the Operation of Proposed Single/Double Circuit Transmission Line Designs." As noted in the Excel file, EERA is requesting the following additional information be included to supplement the application and for inclusion in the EIS:
    a. Indication of which segment (1, 2, 3 or 4) each row in the table corresponds to..
    b. An approximate latitude and longitude of the sub-segment each row in the table corresponds to.
    c. Indication of the distance to the proposed centerline for the location where the maximum calculated electric field occurs.
    d. Indication of the distance to the proposed centerline for the location where the maximum calculated magnetic field occurs.

    The above information is requested for completion in the Excel file.

    Per discussions in a Teams call held on March 21, 2025 with EERA, Barr, Xcel and HDR staff, the format for providing the information to address items 1a – 1d above was modified. Because there were multiple cases along the route alternatives with different structure configuration

"cases", with multiple incidences of some cases occurring within each route segment, it was not possible to represent the data as described above. Instead, each case was mapped to line segments based on end point nodes. While evaluating the initial EMF data it was also determined that additional cases, which had not been included in the initial application needed to be evaluated.

The following items representing each of the calculated cases were provided to Barr and EERA via email sent by Stephanie Griffin on April 9, 2025:

- **EMF nodes_cases.xlsx**: This spreadsheet includes tabs showing columns for each Electric and Magnetic fields listing which case or cases correspond with each of the structure type and circuits present.
- **MMRT_EMF_Cases_20250409.zip**: This file includes GIS shapefiles which spatially represent where each of the EMF cases are located along the route alternatives.
- **MMRT_EMF_Nodes_20250409**.kml: Google Earth file including nodes corresponding to end points of each case shown in the shapefiles and pdf maps.
- **EMF Case Overview Maps_20250409.pdf:** This is a pdf map set showing the cases listed in the spreadsheet and included in the GIS data.
- **EMF Cross-Sections_Revised.pdf**: This document includes structure drawings for cases 1 through 12.
- **25-0151-05854_LRTP4_EMF_AN_Results_Memo_Additional_Cases_HWY14.pdf**: This document includes structure drawings for Cases 12, 13 and 14 and corresponding tables and graphs depicting calculated noise, electric fields and magnetic fields for each. These cases had not been included in the initial application.

2. For the below-listed alternatives, please confirm if any of these options would be anticipated to have a maximum calculated electric and/or magnetic field exceeding those provided in the application.
    a. Segment 4 CapX Co-Locate Option
        i. This is what was referred to during scoping as Route Segment 12.
        ii. Description from scoping decision: EERA received a public scoping comment requesting the EIS study an option to construct the 161 kV line parallel to the existing CapX line along Route Option 3. This route segment starts at the North Rochester Substation and would Parallel Segment 3 to 40th Avenue NE. This route segment would reduce project related impacts on the natural environment and human settlements by paralleling the existing CapX alignment.

        Xcel Energy's engineering contractor is in the process of running the analysis for this configuration and the results are not yet available. Once results are available engineering will utilize options to adjust spacing, height or other parameters to ensure EMF values do not exceed those of other cases described above and in the attachments provided.

    b. Segment 4 West Mod
        i. Note: This is what was referred to during scoping as Route Segment 13.
        ii. Description from scoping decision: The applicant requested the EIS study a route segment that would double circuit with the existing North Rochester to Northern Hills 161 kV line. Alternative 13 starts at the North Rochester

Substation and would double circuit the existing transmission line for 11.3 miles south where it would connect to Segment 4 West. This route segment would reduce project related impacts on the natural environment and human settlement by paralleling the existing CapX alignment.

Xcel Energy's engineering contractor is in the process of running the analysis for this configuration and the results are not yet available. Once results are available engineering will utilize options to adjust spacing, height or other parameters to ensure EMF values do not exceed those of other cases described above and in the attachments provided.

c. Route Segment 17
    i. Note: This is also referred to as "the Hwy 14 Option"
    ii. Description from scoping decision: Commentors suggested that the EIS evaluate a route option for the 345 kV transmission line from the Wilmarth Substation along State Highway 14 to the North Rochester Substation. The Route Segment 17 (Highway 14 Option) is primarily located within or adjacent to the U.S. Highway 14 ROW. The typical route width is 1,000 feet, centered on the anticipated alignment extending 500 feet on each side. The route width is wider in some locations

This single-circuit 345 kV configuration is included in the documents provided in response to question 1 above as Case 12. A structure drawing and corresponding tables and graphs depicting calculated noise, electric fields and magnetic fields for Case 12 are included in 25-0151-05854_LRTP4_EMF_AN_Results_Memo_Additional_Cases_HWY14.pdf.

3. Xcel's application states in Section 7.3.1 Proximity to Residences: "displacement of residential properties is not anticipated if any of the Proposed Routes are selected by the Commission." Section 7.3.1 of the application also includes tables summarizing the number of residences located within the ROW; the contents of that section is summarized in Table 1 below. Table 1 also summarizes the total number of residences identified in the EIS as within the ROW. Please respond to the following questions regarding the potential for the project to result in displacement:
    a. What are the parameters in which Xcel would consider displacement of residential structures within the ROW necessary?

As indicated in the Route Permit Application, Xcel Energy does not plan to displace any residences associated with the Project based on the final Commission approved route. In some cases, there may be residences along proposed alignments that were missed during digitization, and therefore not identified in the structure point data provided with the application (see 3.b below for more detail). In the event that a residence is identified within the approved route and within the required transmission line ROW, Xcel Energy would revise the alignment to avoid such impact and avoid displacement.

This same information was provided via email by Ellen Heine on April 4, 2025 to EERA and Barr staff.

It is possible that a new residence(s) may become located within the Commission approved route or be identified as permitting continues for the Project. In such cases, Xcel Energy will work to revise the alignment and needed ROW to avoid displacement of residences and residential facilities.

b. A shapefile of the points used to determine the locations of residences present within the ROWs of Segment 1 and Segment 4 is provided as an attachment. Please indicate if Xcel has any firsthand knowledge that these points are not residential structures.

Xcel Energy does not have firsthand knowledge that the points (provided in the EERA shapefile) are not residential structures and has not completed field review of such to confirm this as of this time. Residence data included in the Route Permit Application was completed via aerial photo review and digitization. In some cases the manual digitization process may have missed some residences due to the amount of tree coverage and/or timing of aerial photography in a given location (i.e. leaf on or leaf off). Xcel Energy further notes that land use changes have been occurring throughout the permitting process, including residential development in certain Project locations (e.g., North Rochester). Xcel Energy will continue to update the residential point data as we are made aware of new residences or residences that were not included in the initial mapping, which could further inform the permitting process, selection of the route, and potential revision of the final transmission line alignment.

Note: In the shapefile provided with this request there were 6 structure points in Mankato (south of Hwy 14) that differed slightly than those initially proved. This difference was due to the fact that these points represented buildings that were part of an apartment complex, and, while the project team digitized structures by placing a point in the center of a residential structure, the points provided in this request were placed at the edge of off those buildings closest to the proposed transmission alignment (also note, two of the 6 points appear to be identifying garages or other outbuildings associated with the apartments). As routes are refined and finalized Xcel Energy will ensure that final alignments will meet all NESC/NERC clearances and setbacks.

This same information was provided via email by Ellen Heine on April 4, 2025 to EERA and Barr staff.

Table 1: Summary of Residences within the ROW per Application and EIS

Segment	Total count of residences within 75' as indicated in application	Total count of residences within 75' as indicated in EIS
1 North	0	0
1 South	2	11
2 North	0	1
2 South	0	0
3	0	0
	Total count of residences within 50'	Total count of residences within 75'

	as indicated in application	as indicated in EIS
4 East	1	3
4 West	0	0

ELECTRIC

Structure Type	Circuits Present	Corresponding Segment (1, 2, 3 or 4)	Maximum within ROW
Single Pole, Davit Arm, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV	Case 1	6.2 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild	Wilmarth – North Rochester 345 kV & Line 832 115 kV	Case 2	2 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild	Wilmarth – North Rochester 345 kV & Line 706, 707 or 708 69 kV	Case 3a, Case 3b, Case 3c	1.5 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV / Line 964 345 kV	Case 4	6.4 kV/m
Single Pole, Tangent/Dav it Arm, 345 kV Double Circuit	Wilmarth – North Rochester 345 kV & Line 964 345 kV	Case 5	5.2 kV/m
Single Pole, Tangent/Dav it Arm, 345 kV Double Circuit with 69 kV Underbuild	Wilmarth – North Rochester 345 kV , Line 964 345 kV & Line 739 69 kV	Case 6	1.2 kV/m
Single Pole, Davit, 161/69 kV Double Circuit	North Rochester – Chester 161 kV & Peoples Line 69 kV	Case 7	1.5 kV/m
Single Pole, Tangent, 345 kV Double Circuit	North Rochester – Tremval 345 kV, Line 965 345 kV	Case 8	6.3 kV/m
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 9	1.3 kV/m
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit	North Rochester – Chester 161 kV & Line 979 345 kV	Case 10a	6.9 kV/m
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit	North Rochester – Chester 161 kV / Line 965 345 kV, North Rochester – River 345 kV	Case 10b	6.2 kV/m
Single Pole, Davit, 161 kV Single Circuit	North Rochester – Chester 161 kV	Case 11	2.7 kV/m

Single Pole, Tangent, 345 kV Double Circuit Single Circuit	Wilmarth – North Rochester 345 kV	Case 12	6.2 kV/m
Single Pole, Tangent, 345 kV Double Circuit	Wilmarth – North Rochester 345 kV, Line 979 345 kV	Case 13	4.9 kV/m
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit	North Rochester –Chester 161 kV, Line 5310 161 kV / Wilmarth –North Rochester 345 kV, Line 979 345 kV	Case 14	5.0 kV/m

MAGNETIC

Structure Type	Circuits Present	Corresponding Segment (1, 2, 3 or 4)	Maximum within ROW (mG)
Single Pole, Davit Arm, 345 kV Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV	Case 1	77
Single Pole, Davit Arm, 345 kV Single Circuit (Max Loading)		Case 1	167
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 832 115 kV	Case 2	65
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild (Max Loading)		Case 2	114
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 708 69 kV	Case 3a	55
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3a	96
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 707 69 kV	Case 3b	27
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3b	59
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 706 69 kV	Case 3c	31
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3c	62

Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV / Line 964 345 kV	Case 4	78
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit (Max Loading)		Case 4	246
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit (Average Loading)	Wilmarth – North Rochester 345 kV & Line 964 345 kV	Case 5	74
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit (Max Loading)		Case 5	224
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV , Line 964 345 kV & Line 739 69 kV	Case 6	19
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit with 69 kV Underbuild (Max Loading)		Case 6	59

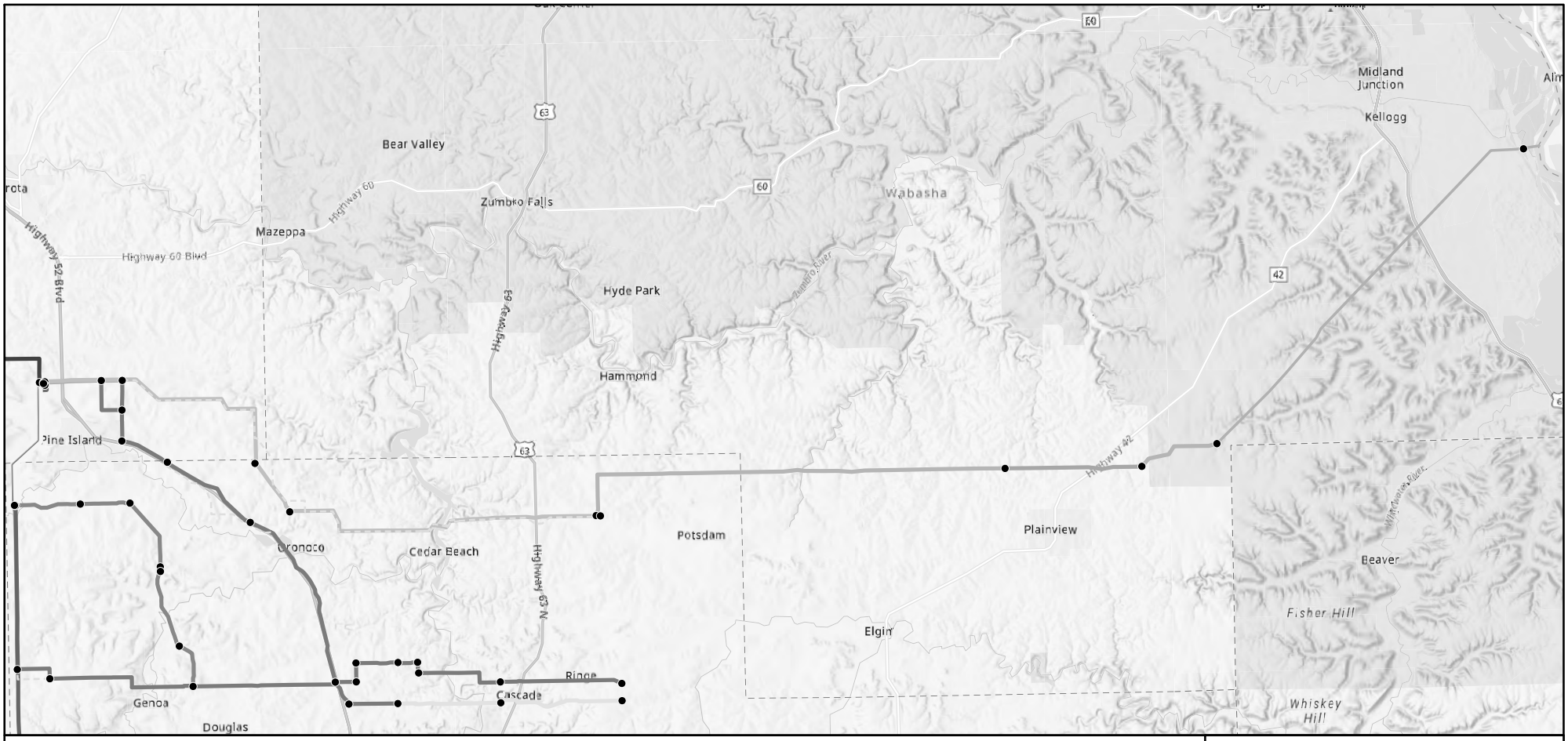
Single Pole, Davit, 161/69 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV & Peoples Line 69 kV	Case 7	5 mG
Single Pole, Davit, 161/69 kV Double Circuit (Max Loading)			21 mG
Single Pole, Tangent, 345 kV Double Circuit with 69 kV Underbuild (Average Loading)	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 8	105 mG
Single Pole, Tangent, 345 kV Double Circuit with 69 kV Underbuild (Max Loading)			190 mG
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild (Average Loading)	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 9	23 mG
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild (Max Loading)			41 mG
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit (Average Loading)	North Rochester – Chester 161 kV & Line 979 345 kV	Case 10a	150 mG
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit (Max Loading)			400 mG

Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV / Line 965 345kV, North Rochester – River 345 kV	Case 10b	111 mG
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit (Max Loading)	North Rochester – Chester 161 kV / Line 965 345kV, North Rochester – River 345 kV		205 mG
Single Pole, Davit, 161 kV Single Circuit (Average Loading)	North Rochester – Chester 161 kV	Case 11	8 mG
Single Pole, Davit, 161 kV Single Circuit (Max Loading)	North Rochester – Chester 161 kV		27 mG
Single Pole, Tangent, 345 kV Double Circuit Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV	Case 12	76 mG
Single Pole, Tangent, 345 kV Double Circuit Single Circuit (Max Loading)			164 mG
Single Pole, Tangent, 345 kV Double Circuit (Average Loading)	Wilmarth – North Rochester 345 kV, Line 979 345 kV	Case 13	85 mG
Single Pole, Tangent, 345 kV Double Circuit (Max Loading)			222 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Average Loading)	North Rochester –Chester 161 kV, Line 5310 161 kV / Wilmarth –North Rochester 345 kV, Line 979 345 kV	Case 14	85 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Max Loading)			222 mG

CASE NODES

	from	to	
Case 1	N2	N4	
Case 1	N3	N41	
Case 1	N42	N43	
Case 1	N47	N6	
Case 1	N7	N49	
Case 1	N53	N55	
Case 1	N9	N18	
Case 1	N8	N18	
Case 1	N9	N10	
Case 1	N11	N12	
Case 2	N4	N8	
Case 3a	N41	N42	
Case 3a	N43	N47	
Case 3a	N49	N53	
Case 3b	N55	N9	
Case 3c	N10	N11	
Case 3c	N12	N15	
Case 4	N15	N16	
Case 5	N16	N17	
Case 6	N17	N19	
Case 7	N31	N32	
Case 8	N25	N27	
Case 9	N24	N25	
Case 10a	N28	N33	
Case 10b	N28	N29	
Case 11	N29	N32	
Case 11	N33	N39	
Case 12	N37	N37.1	1B north of
Case 12	N37.1	N38	1B north of
Case 12	N37.1	N37.2	Hwy 14
Case 13	N37.2	N37.3	Byron to 16
Case 14	N37.3	N37.4	DC 161 par
Case 15	N37.3	N50	DC 161/161

EMF CASES: **SEGMENT 3**



LEGEND

- EMF Nodes
- Case 1
- Case 10a
- Case 10b
- Case 10c
- Case 11
- Case 12
- Case 13
- Case 14
- Case 2
- Case 2a
- Case 3a
- Case 3b
- Case 3c
- Case 4
- Case 5
- Case 6
- Case 7
- Case 7a
- Case 8
- Case 9
- Proposed Alt

Xcel Energy®

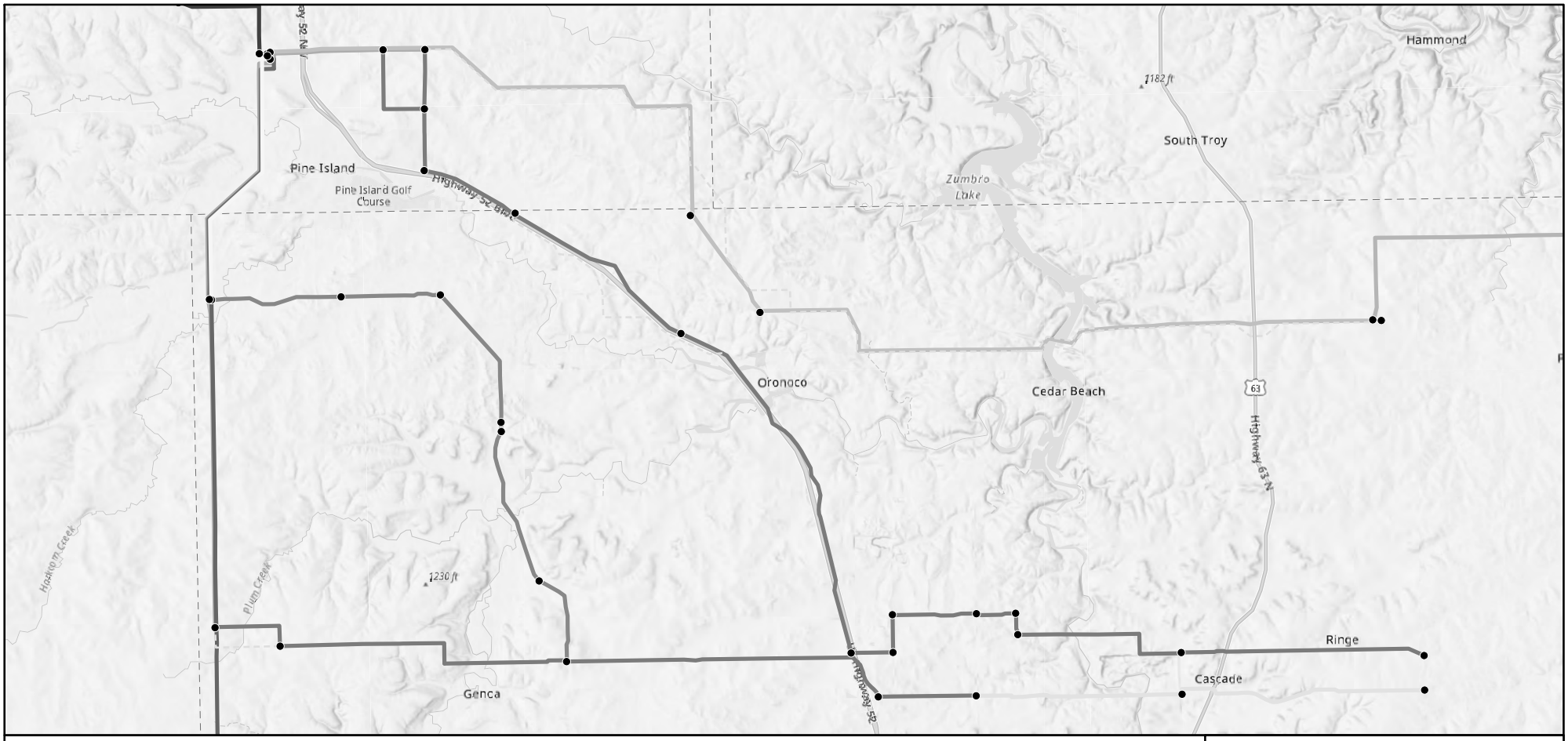
MANKATO-MISSISSIPPI RIVER TRANSMISSION PROJECT

0 5 10

Miles

DATE EXPORTED: 4/9/2025

EMF CASES: **SEGMENT 4**



LEGEND

- EMF Nodes
- Case 1
- Case 10a
- Case 10b
- Case 10c
- Case 11
- Case 12
- Case 13
- Case 14
- Case 2
- Case 2a
- Case 3a
- Case 3b
- Case 3c
- Case 4
- Case 5
- Case 6
- Case 7
- Case 7a
- Case 8
- Case 9
- Proposed Alt

Xcel Energy®

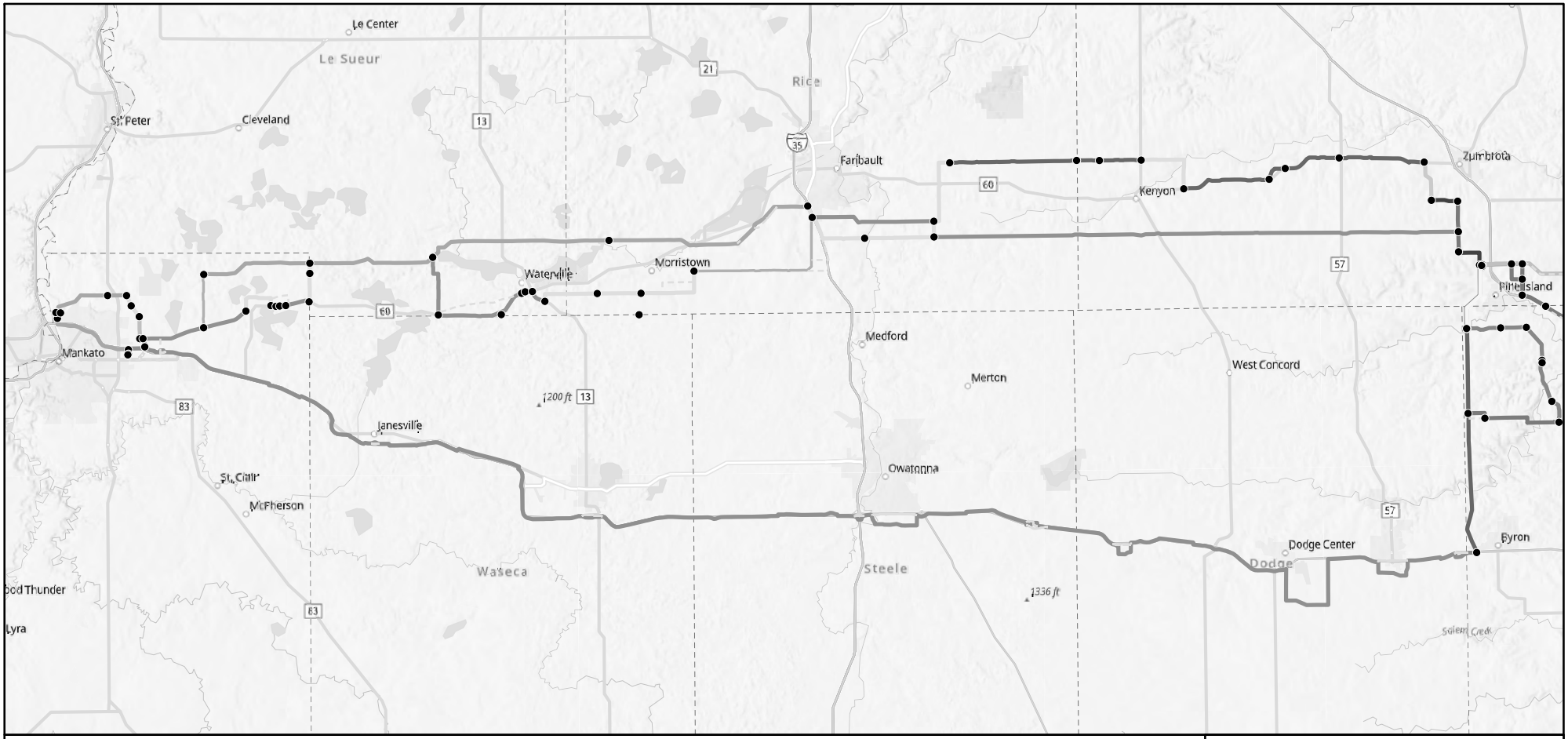
MANKATO-MISSISSIPPI RIVER TRANSMISSION PROJECT

0 5 10

Miles

DATE EXPORTED: 4/9/2025

EMF CASES: HIGHWAY 14



LEGEND

- EMF Nodes
- Case 1
- Case 10a
- Case 10b
- Case 10c
- Case 11
- Case 12
- Case 13
- Case 14
- Case 2
- Case 2a
- Case 3a
- Case 3b
- Case 3c
- Case 4
- Case 5
- Case 6
- Case 7
- Case 7a
- Case 8
- Case 9
- Proposed Alt

Xcel Energy®

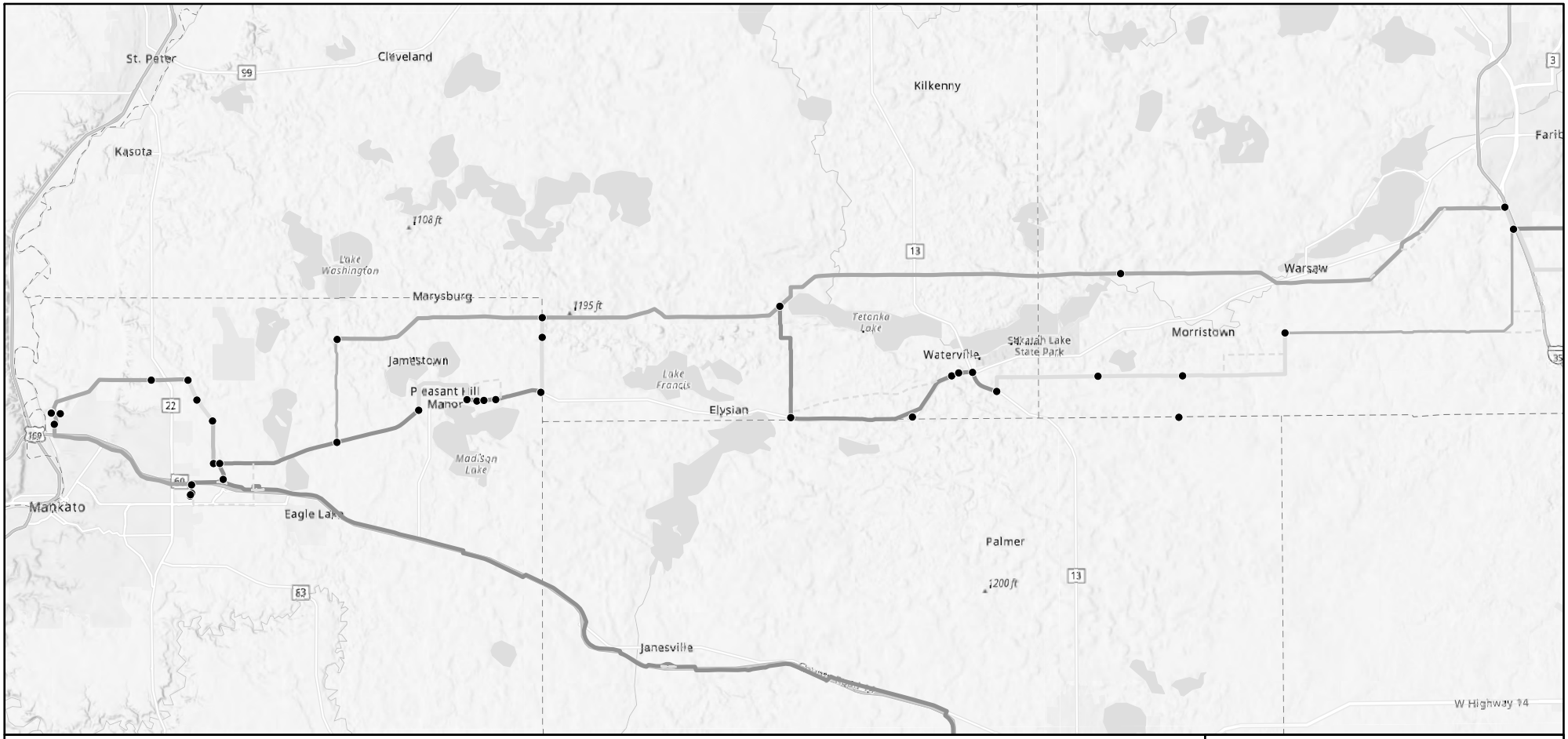
MANKATO-MISSISSIPPI RIVER TRANSMISSION PROJECT

0 5 10

Miles

DATE EXPORTED: 4/9/2025

EMF CASES: **SEGMENT 1**



LEGEND

- EMF Nodes
- Case 1
- Case 10a
- Case 10b
- Case 10c
- Case 11
- Case 12
- Case 13
- Case 14
- Case 2
- Case 2a
- Case 3a
- Case 3b
- Case 3c
- Case 4
- Case 5
- Case 6
- Case 7
- Case 7a
- Case 8
- Case 9
- Proposed Alt

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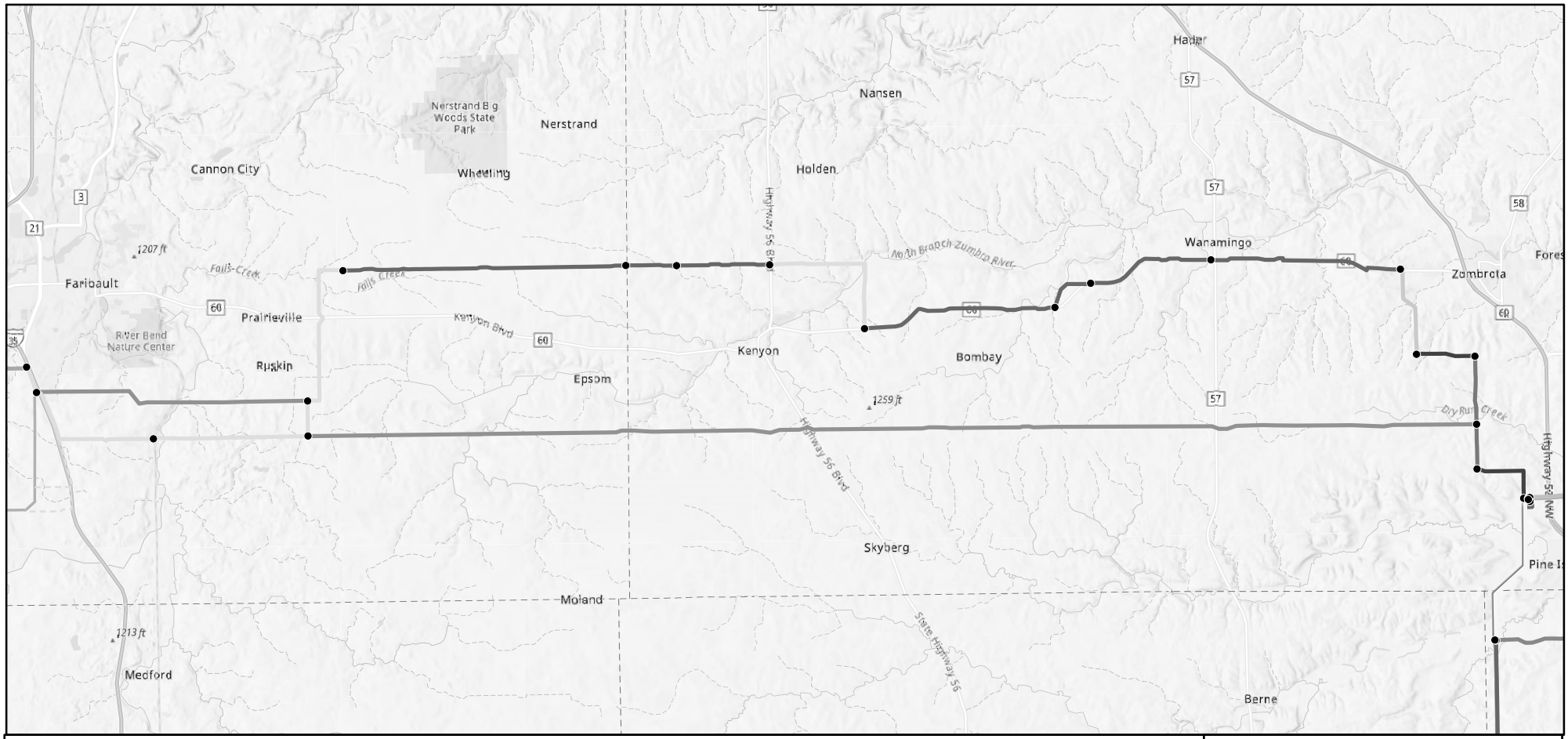
0 5 10

Miles

DATE EXPORTED: 4/9/2025

EMF CASES: **SEGMENT 2**



LEGEND

- EMF Nodes
- Case 1
- Case 10a
- Case 10b
- Case 10c
- Case 11
- Case 12
- Case 13
- Case 14
- Case 2
- Case 2a
- Case 3a
- Case 3b
- Case 3c
- Case 4
- Case 5
- Case 6
- Case 7
- Case 7a
- Case 8
- Case 9
- Proposed Alt

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0 5 10

Miles

DATE EXPORTED: 4/9/2025

Case 1:
Nodes:

N2-N3
N3-N3.1
N9.1-N9.2
N9.6-N6
N7-N7.2
N10.4-N11.1
N8-N14
N7.1-N8
N8-N13.1
N13.2-N13.3

ND-279434

	NEW 345KV WILMARTH - WEST FARIBAULT
Conductor	345kV TP 636 kcmil 26/7 ACSR "Grosbeak"
Bundle Configuration	Double Bundle/18 inch spacing
Shield Wire	AFL OPGW DNO-10723 CC 47/47/555 48 FIBER
Line Rating - Maximum	718.3 MW/1,202 Amperes
Line Rating - Average	330.9 MW/554 Amperes
Average Elevation	1,200 Feet
ROW Width	150 Feet

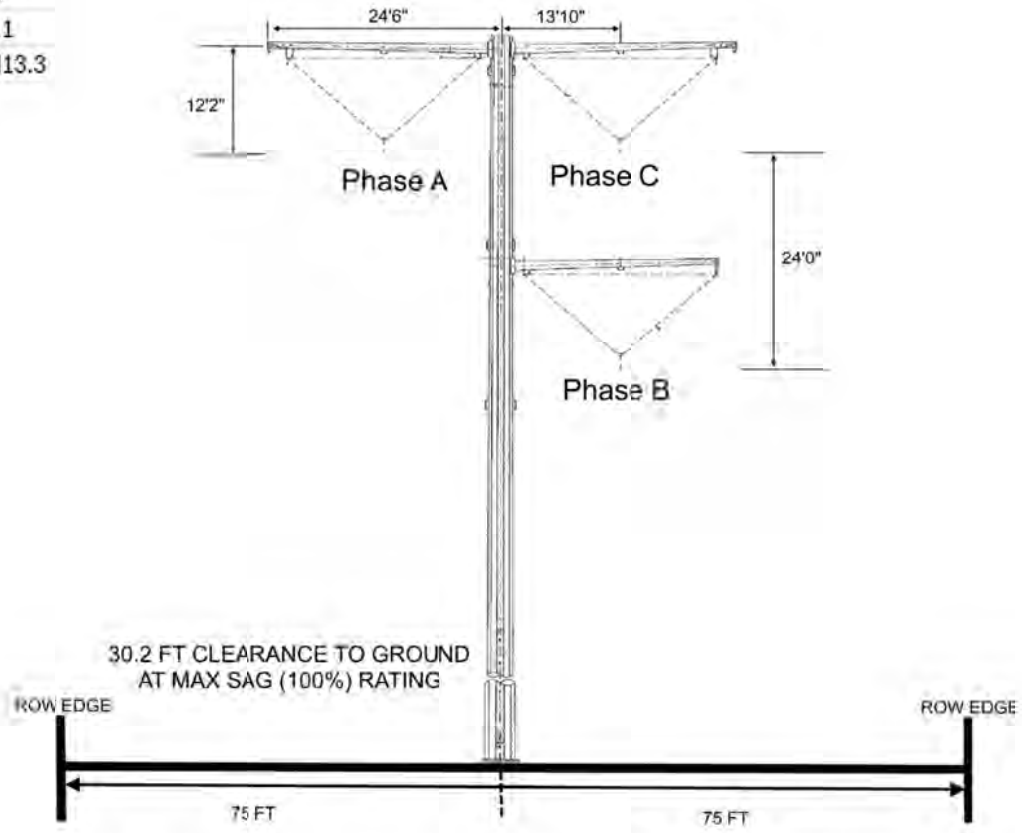


Figure 41: Wilmarth – West Faribault Single Circuit

Case 2: ND-279480
Nodes:
N5-N7.1

	NEW 345KV WILMARTH - WEST FARIBAULT	UNDERBUILD 115kV Line 832
Conductor	345kV TP 636 kcmil 26/7 ACSR "Grosbeak"	115kV TP 336 kcmil 26/7 ACSR "Linnet"
Bundle Configuration	Double Bundle/18 inch spacing	Single Bundle
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER
Line Rating - Maximum	718.3 MW/1,202 Amperes	135 MW/678 Amperes
Line Rating - Average	330.9 MW/554 Amperes	83.2 MW/418 Amperes
Average Elevation	1,000 Feet	
ROW Width	150 Feet	

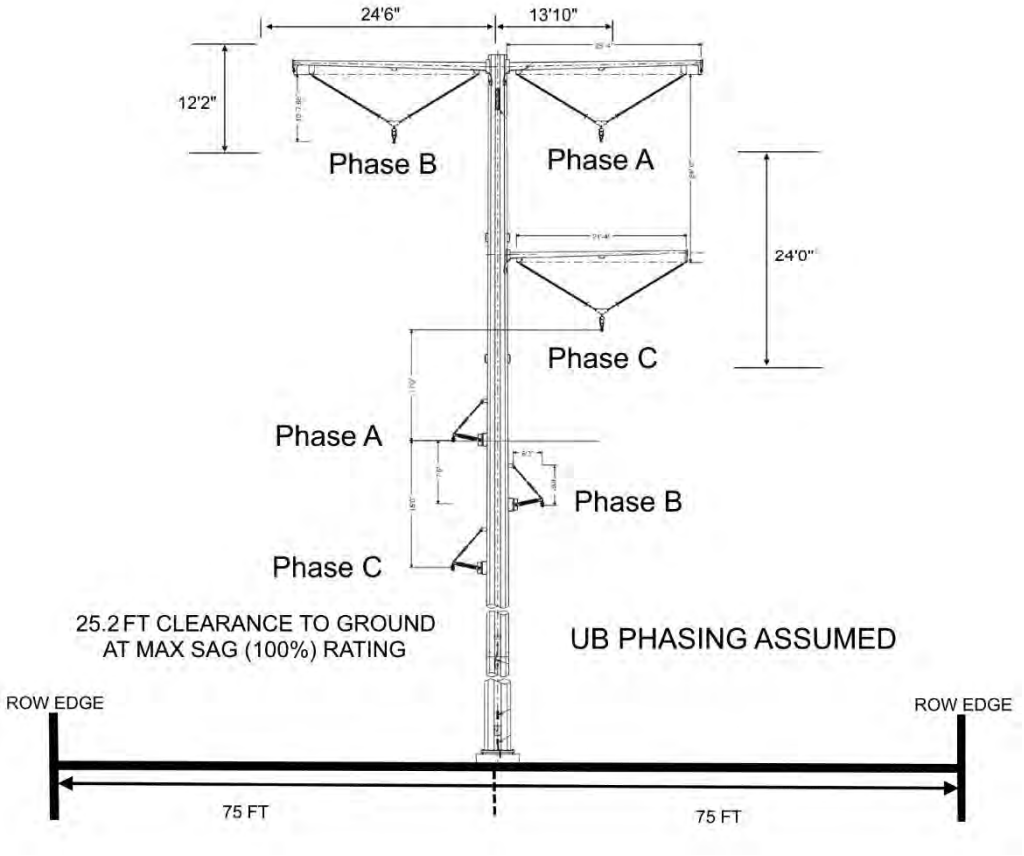


Figure 42: WIlmarth – West Faribault with 115 kV Underbuild

Case 3a: ND-279480

Nodes:

N3.2-N9.1

N9.2-N9.6

N7.2-N10.4

N7.2-N7

	NEW 345KV WILMARTH - WEST FARIBAULT	UNDERBUILD 69kV Line 708
Conductor	345kV TP 636 kcmil 26/7 ACSR "Grosbeak"	69kV TP 336 kcmil 26/7 ACSR "Linnet"
Bundle Configuration	Double Bundle/18 inch spacing	Single Bundle
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER
Line Rating - Maximum	718.3 MW/1,202 Amperes	57 MW/477 Amperes
Line Rating - Average	330.9 MW/554 Amperes	37.3 MW/312 Amperes
Average Elevation	1,100 Feet	
ROW Width	150 Feet	

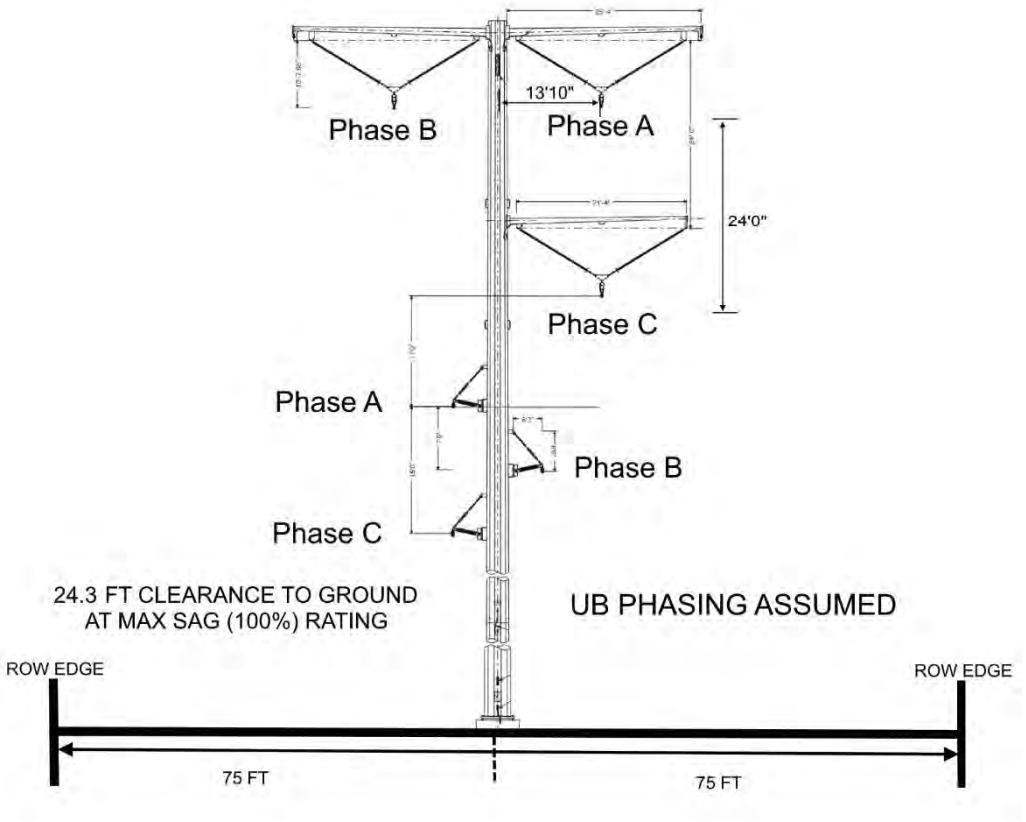


Figure 43: Wilmarth – West Faribault Circuit with 69 kV Underbuild

Case 3b: ND-279480

Nodes:

N11.1-N8

	NEW 345KV WILMARTH - WEST FARIBAULT	UNDERBUILD 69kV Line 707
Conductor	345kV TP 636 kcmil 26/7 ACSR "Grosbeak"	69kV TP 336 kcmil 26/7 ACSR "Linnet"
Bundle Configuration	Double Bundle/18 inch spacing	Single Bundle
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555-48 FIBER	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER
Line Rating - Maximum	718.3 MW/1,202 Amperes	14 MW/117 Amperes
Line Rating - Average	330.9 MW/554 Amperes	6.1 MW/51 Amperes
Average Elevation	1,100 Feet	
ROW Width	150 Feet	

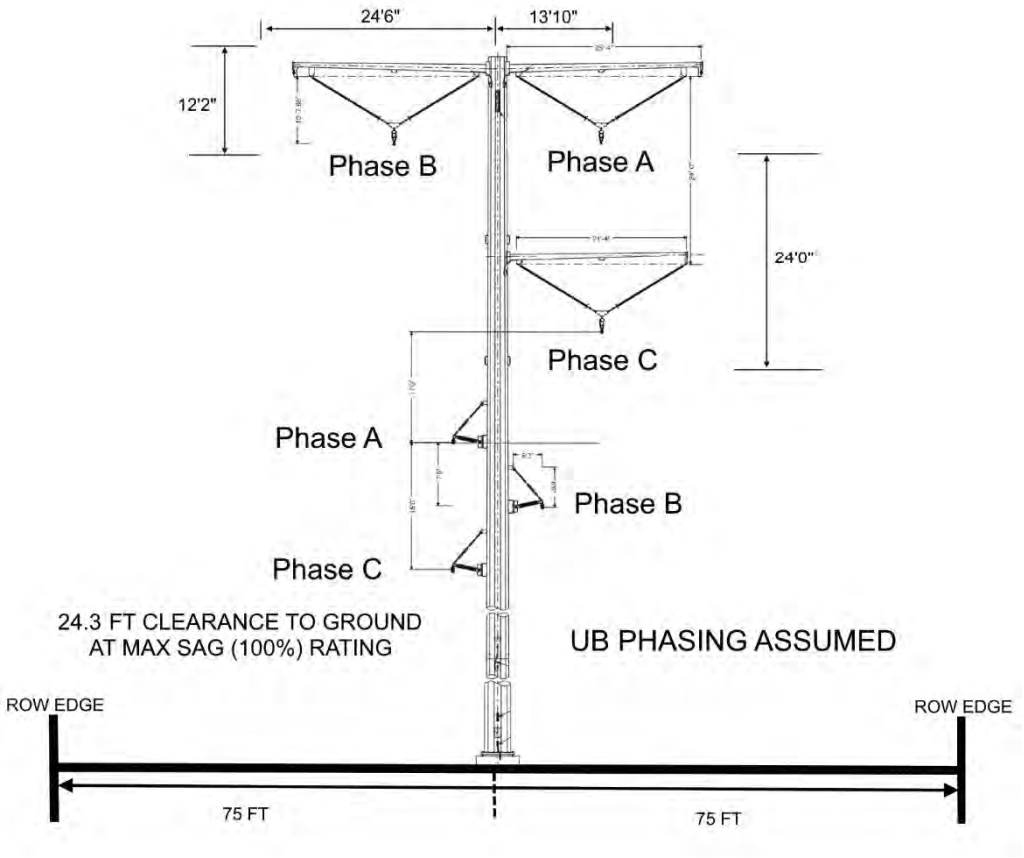


Figure 44: Wilmarth – West Faribault Circuit with 69 kV Underbuild

Case 3c:
Nodes:
N13.1-N13.2
N13.3-N13.6

ND-279480

	NEW 345KV WEST FARIBAULT - NORTH ROCHESTER	UNDERBUILD 69kV Line 706
Conductor	345kV TP 636 kcmil 26/7 ACSR "Grosbeak"	69kV TP 336 kcmil 26/7 ACSR "Linnet"
Bundle Configuration	Double Bundle/18 inch spacing	Single Bundle
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER
Line Rating - Maximum	718.3 MW/1,202 Amperes	19 MW/159 Amperes
Line Rating - Average	330.9 MW/554 Amperes	12 MW/100 Amperes
Average Elevation	1,100 Feet	
ROW Width	150 Feet	

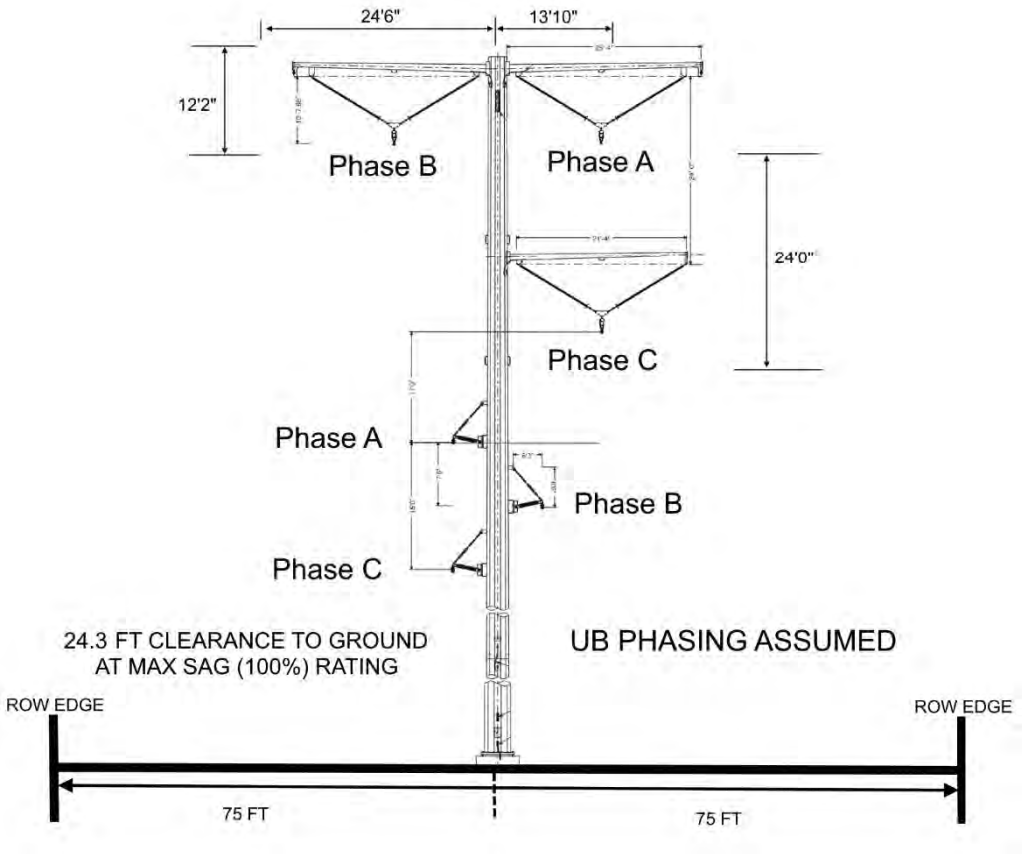


Figure 45: West Faribault – North Rochester Circuit with 69 kV Underbuild

Case 4:
Nodes:
N13.6-N13.7

	NEW 345KV WEST FARIBAULT - NORTH ROCHESTER	Parallel Line - 345 kV 964
Conductor	345kV TP 636 kcmil 26/7 ACSR "Grosbeak"	397.5 kcmil TACSR/VR2 26/7 IBIS/VR2
Bundle Configuration	Double Bundle/18 inch spacing	Double Bundle/18 inch spacing
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER
Line Rating - Maximum	718.3 MW/1,202 Amperes	989 MW/1,655 Amperes
Line Rating - Average	330.9 MW/554 Amperes	127.9 MW/214 Amperes
Average Elevation	1,100 Feet	
ROW Width	150 Feet	N/A

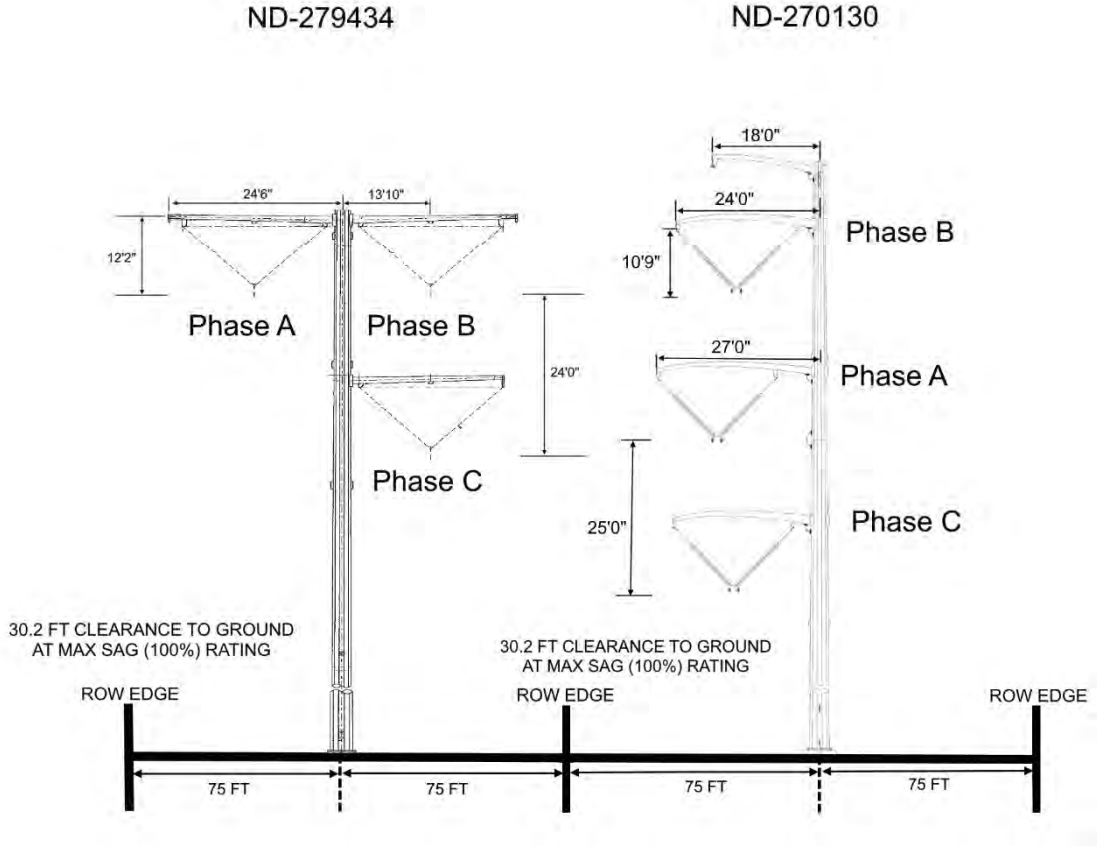


Figure 46: West Faribault – North Rochester Parallel to 345 kV Circuit

Case 5:
Nodes:
N13.7-N13.8
N14.1-N14.2

NH-257359

	NEW 345KV WEST FARIBAULT - NORTH ROCHESTER	EXISTING Line - 345 kV 964
Conductor	345kV TP 636 kcmil 26/7 ACSR "Grosbeak"	397.5 kcmil TACSR/VR2 26/7 IBIS/VR2
Bundle Configuration	Double Bundle/18 inch spacing	Double Bundle/18 inch spacing
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER
Line Rating - Maximum	718.3 MW/1,202 Amperes	989 MW/1,655 Amperes
Line Rating - Average	330.9 MW/554 Amperes	127.9 MW/214 Amperes
Average Elevation	1,200 Feet	
ROW Width	150 Feet	

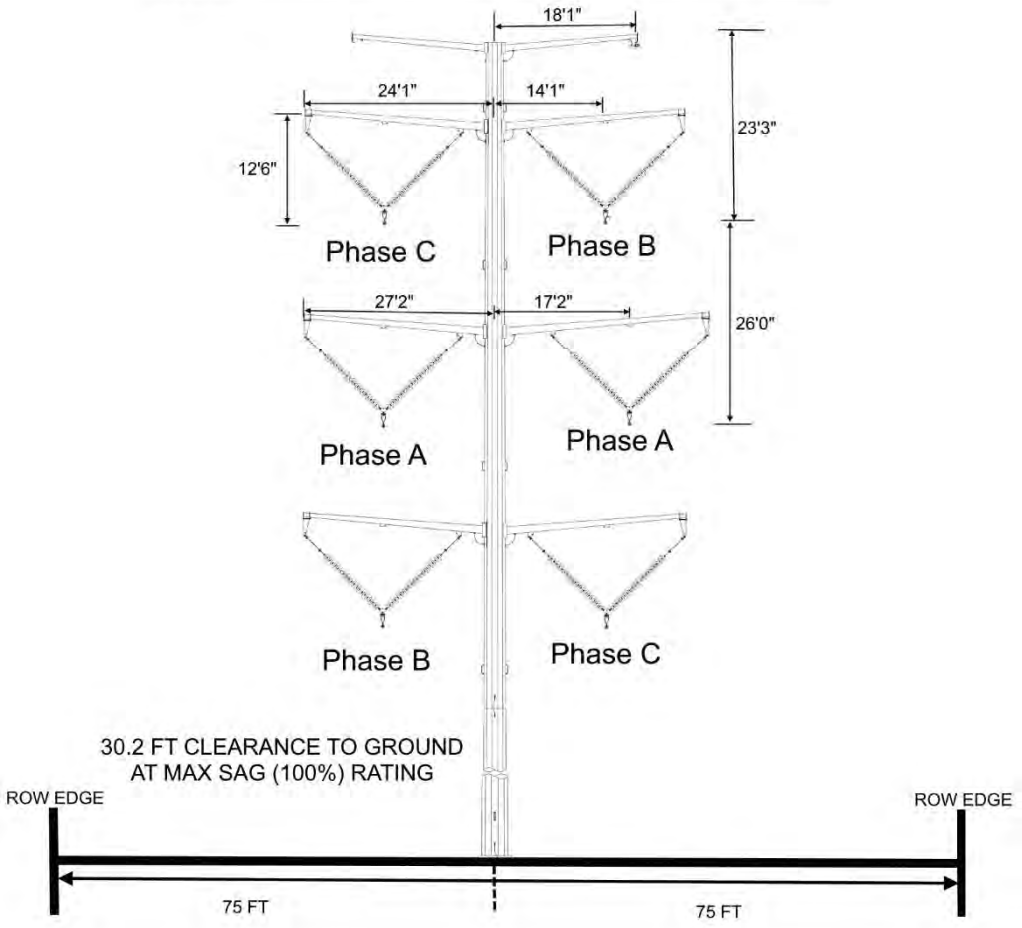


Figure 47: West Faribault – North Rochester Double Circuit

Case 6:
Nodes:
N13.8-N14.1

NH-257360

	EXISTING Line - 345 kV 964	NEW 345KV WEST FARIBAULT - NORTH ROCHESTER	UNDERBUILD 69kV - Line 0739
Conductor	397.5 kcmil TACSR/VR2 26/7 IBIS/VR2	345kV TP 636 kcmil 26/7 ACSR "Grosbeak"	397.5 Kcmil ACSR/VR2 26/7 IBIS/VR2
Bundle Configuration	Double Bundle/18 inch spacing	Double Bundle/18 inch spacing	Single Bundle
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER	N/A
Line Rating - Maximum	989 MW/1,655 Amperes	718.3 MW/1,202 Amperes	11 MW/ 92 Amperes
Line Rating - Average	127.9 MW/214 Amperes	330.9 MW/554 Amperes	6.2 MW/52 Amperes
Average Elevation	1,200 Feet		
ROW Width	150 Feet		

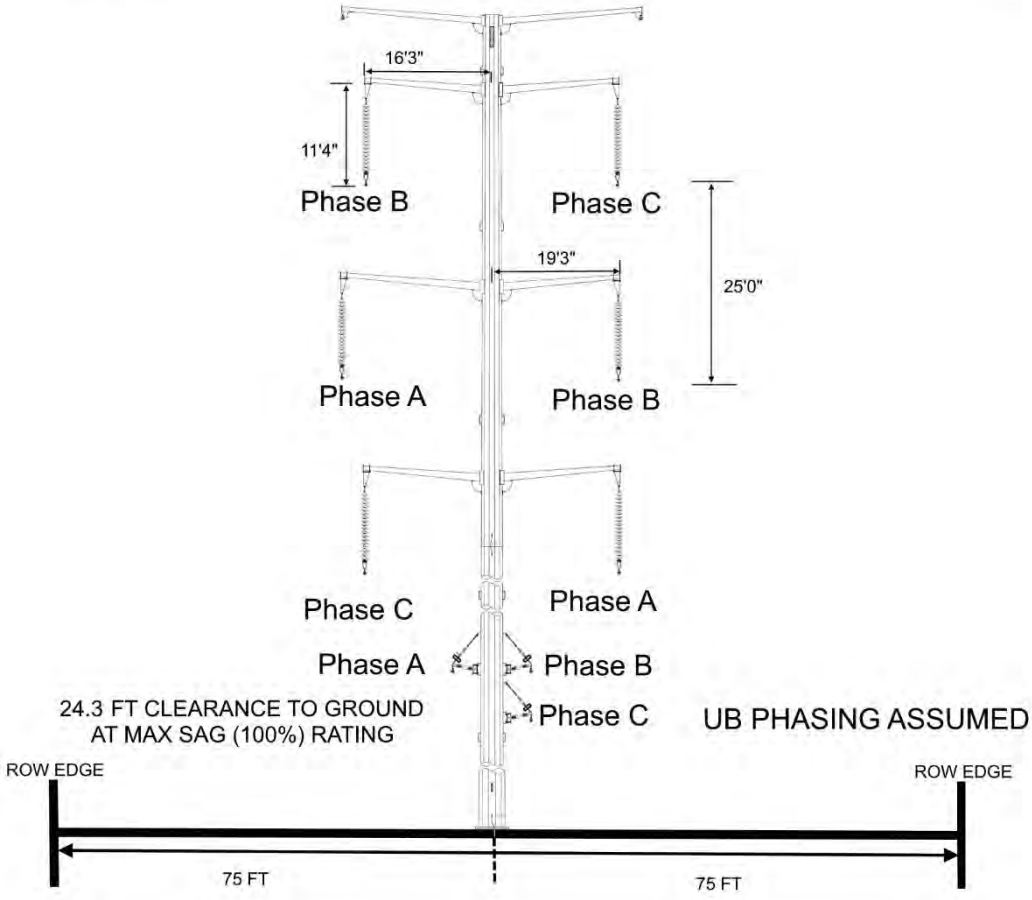


Figure 48: Wilmarth – North Rochester Double Circuit with 69 kV Underbuild

Case 7:
Nodes:
N26.2-N29

NEW 161 KV STRUCTURE

	NEW 161KV Line - 5309 NORTH ROCHESTER - CHESTER	DOUBLE CIRCUIT Line - PEOPLES 69 kV
Conductor	161kV 397.5 26/7 ZTACSR "Ibis"	69kV TP 336 kcmil 26/7 ACSR "Linnet"
Bundle Configuration	Single Bundle	Single Bundle
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER
Line Rating - Maximum	59 MW/212 Amperes	6 MW/50 Amperes
Line Rating - Average	17.4 MW/62 Amperes	4 MW/33 Amperes
Average Elevation	1,000 Feet	
ROW Width	100 Feet	

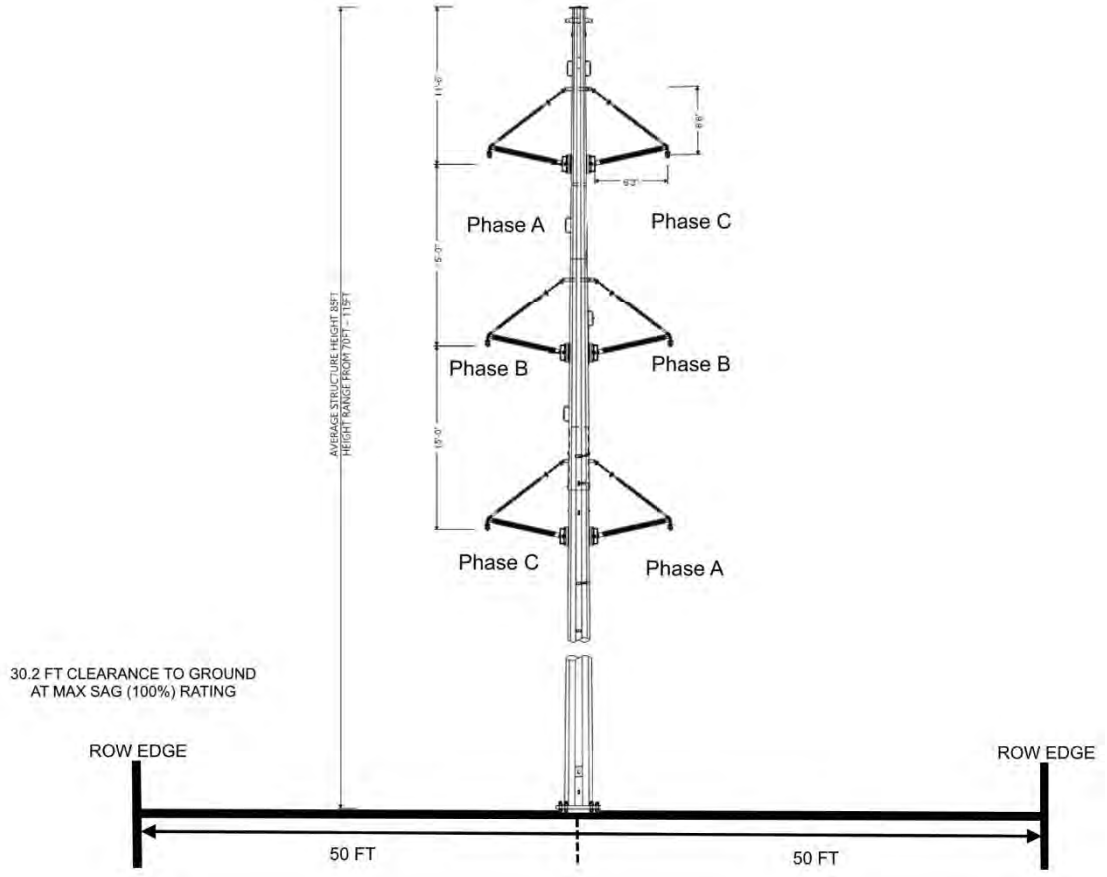


Figure 49: North Rochester – Chester 161kV Double Circuit Peoples Line 69 kV

Case 8:
Nodes:
N18-N18.1
N18.2-N19

NH-270130

	NEW 345KV NORTH ROCHESTER - RIVER 345KV	EXISTING 345kV Line 965
Conductor	345kV 954 kcmil 54/7 ACSS/TW "Cardinal"	954 kcmil ACSS/TW 20/7 CARDINAL
Bundle Configuration	Double Bundle/18 inch spacing	Double Bundle/18 inch spacing
Shield Wire	1/2" EHS	1/2" EHS
Line Rating - Maximum	691.8 MW/1,158 Amperes	755 MW/1,263 Amperes
Line Rating - Average	333.7 MW/558 Amperes	422.7 MW/707 Amperes
Average Elevation	1,100 Feet	
ROW Width	150 Feet	

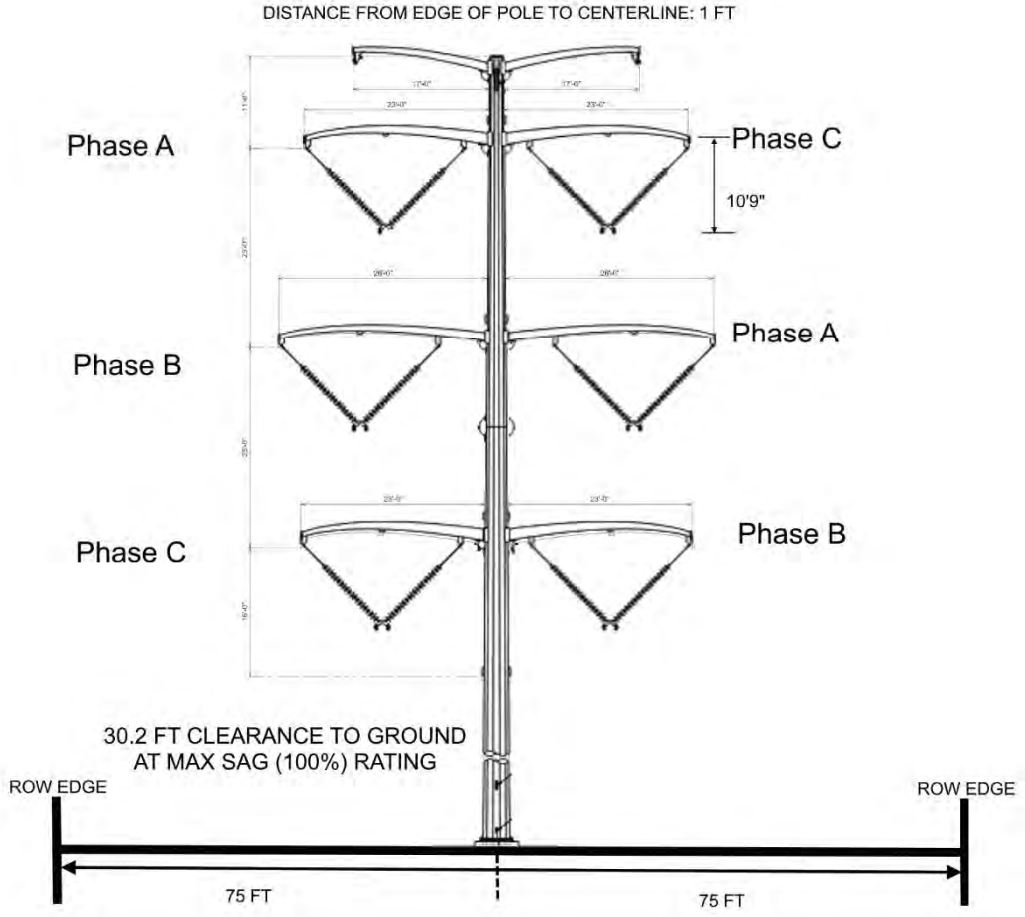


Figure 50: North Rochester – River 345 kV Double Circuit Line 965 345 kV

Case 9:
Nodes:
N18.1-N18.2

NH-257656

	NEW 345KV NORTH ROCHESTER - RIVER 345kV	EXISTING 345kV Line 965	UNDERBUILD 69kV Line - Peoples
Conductor	345kV 954 kcmil 54/7 ACSS/TW "Cardinal"	954 kcmil ACSS/TW 20/7 CARDINAL	477 kcmil 26/7 HAWK ACSR
Bundle Configuration	Double Bundle/18 inch spacing	Double Bundle/18 inch spacing	Single Bundle
Shield Wire	1/2" EHS	1/2" EHS	1/2" EHS
Line Rating - Maximum	691.8 MW/1,158 Amperes	755 MW/1,263 Amperes	6 MW/50 Amperes
Line Rating - Average	333.7 MW/558 Amperes	422.7 MW/707 Amperes	4 MW/33 Amperes
Average Elevation	1,100 Feet		
ROW Width	150 Feet		

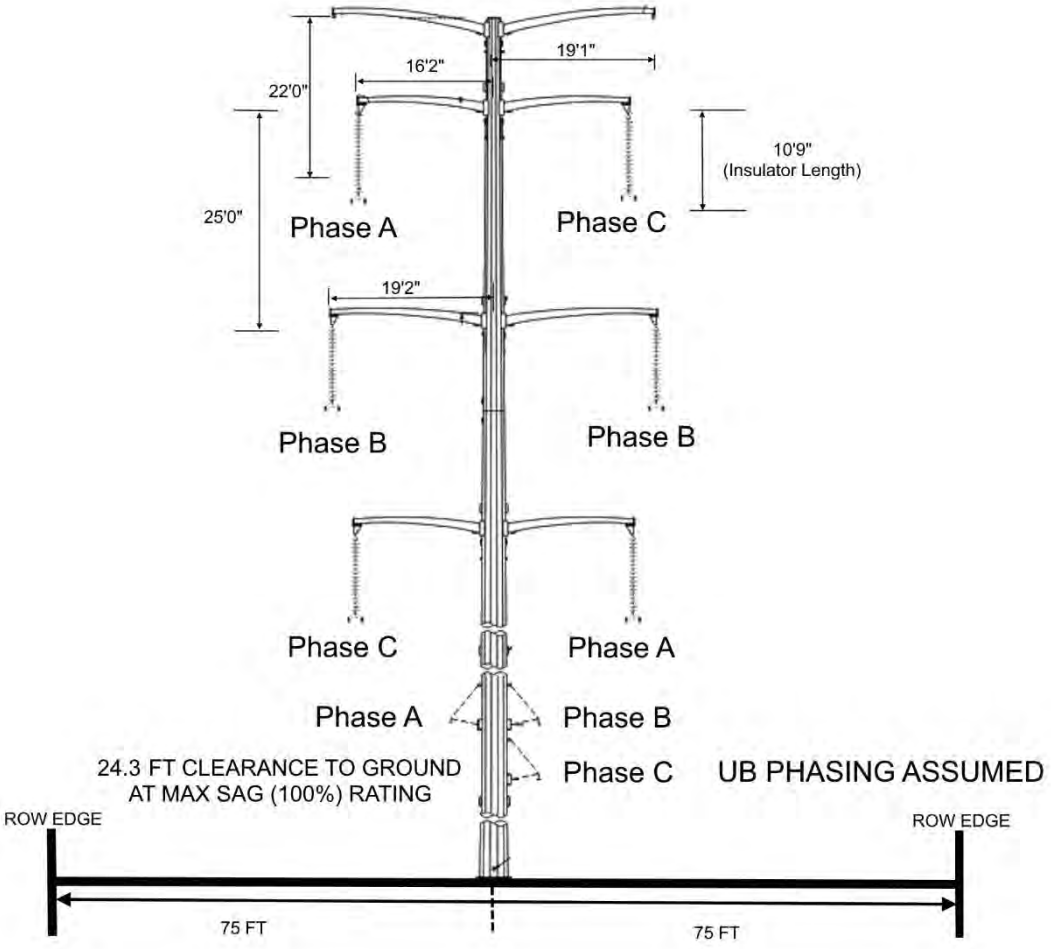


Figure 51: North Rochester – River 345 kV Double Circuit Line 965 345 kV and Underbuild Peoples 69 kV

Case 10a:
Nodes:
N21-N31

	NEW 161KV NORTH ROCHESTER - CHESTER 161KV	Parallel 345kV Line 979
Conductor	161kV 397.5 26/7 ZTACSR "Ibis"	795 kcmil ACSR 26/7
Bundle Configuration	Single Bundle	Double Bundle/18 inch spacing
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER
Line Rating - Maximum	59 MW/212 Amperes	1,052 MW/1,760 Amperes
Line Rating - Average	17.4 MW/62 Amperes	393.7 MW/659 Amperes
Average Elevation	1,100 Feet	
ROW Width	100 Feet	N/A

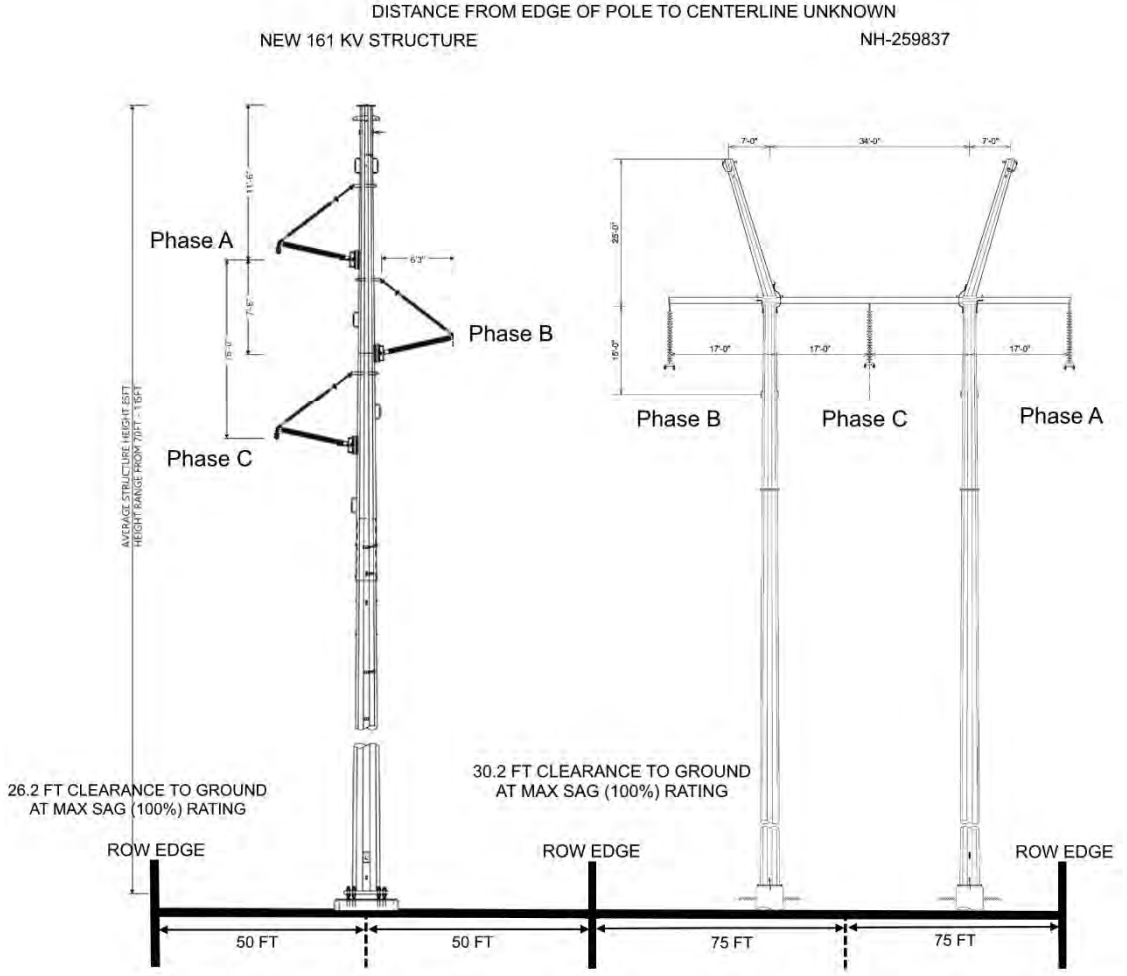


Figure 52: North Rochester – Chester 161 kV Single Circuit – Parallel Line 979 345 kV

Case 10b:
Nodes:
N21-N51
N51-N54

	NEW 161KV NORTH ROCHESTER - CHESTER 161KV	DOUBLE CIRCUIT 345kV Line 965	NEW 345KV NORTH ROCHESTER - RIVER 345KV
Conductor	161kV 397.5 26/7 ZTACSR "Ibis"	954 kcmil ACSS/TW 20/7 CARDINAL	345kV 954 kcmil 54/7 ACSS/TW "Cardinal"
Bundle Configuration	Single Bundle	Double Bundle/18 inch spacing	Double Bundle/18 inch spacing
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER	1/2" EHS	1/2" EHS
Line Rating - Maximum	59 MW/212 Amperes	755 MW/1,263 Amperes	691.8 MW/1,158 Amperes
Line Rating - Average	17.4 MW/62 Amperes	422.7 MW/707 Amperes	333.7 MW/558 Amperes
Average Elevation	1,000 Feet	1,100 Feet	
ROW Width	100 Feet	150 Feet	

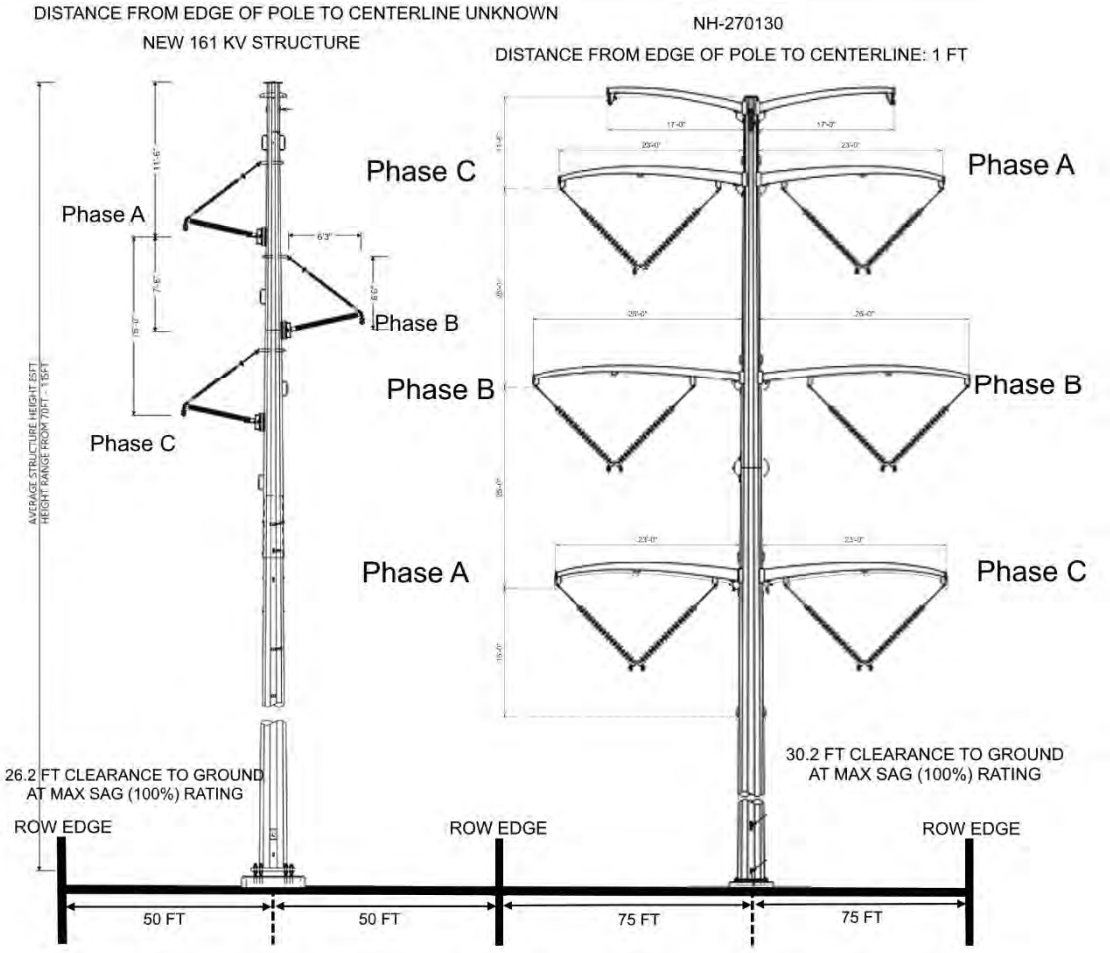


Figure 53: North Rochester – Chester Parallel Double Circuit North Rochester – River 345 kV, Line 965 345 kV

Case 11:
Nodes:
N23.1-N29
N31-N34
N22-N23
N51-N23.1

NEW 161 KV STRUCTURE

	NEW 161KV NORTH ROCHESTER - CHESTER 161KV
Conductor	161kV 397.5 26/7 ZTACSR "Ibis"
Bundle Configuration	Single Bundle
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555 48 FIBER
Line Rating - Maximum	59 MW/212 Amperes
Line Rating - Average	17.4 MW/62 Amperes
Average Elevation	1,000 Feet
ROW Width	100 Feet

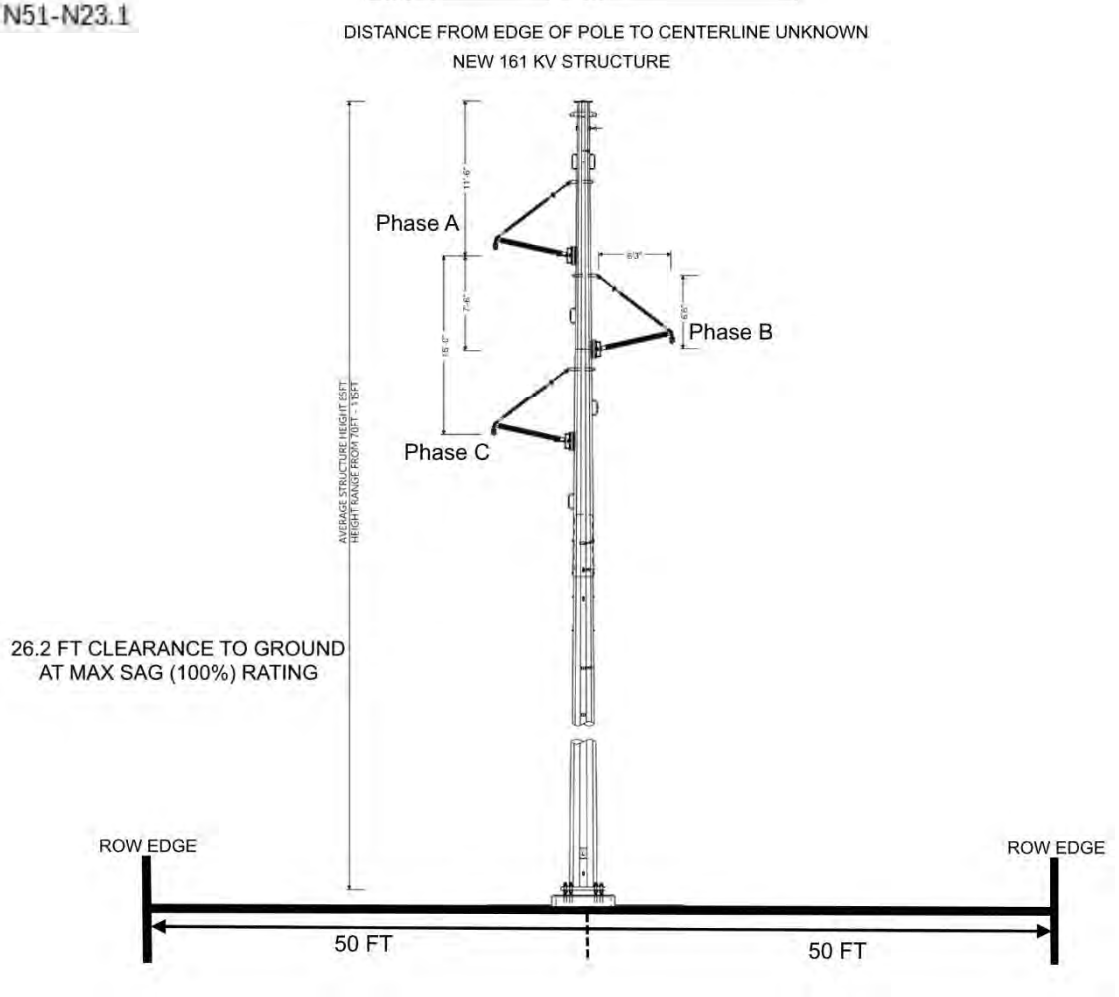


Figure 54: North Rochester – Chester Single Circuit 161 kV

POWER ENGINEERS, INC.
303 U.S. ROUTE ONE
FREEPORT, ME 04032 USA

PHONE 207-869-1284
FAX 207-869-1299

MEMORANDUM

DATE: April 4, 2025

TO: Todd Obermoeller (POWER-STL)

C: Juan Restrepo Diaz (POWER-ORL)
PW 0239854_0000.03.07
25-0151-05856_LRTP4_EMF_AN_for_CON_RPA_HWY14.zip

FROM: Kiva Martz, P.E. (POWER-FRE)

SUBJECT: 0239854_0000 N-LRTP 4 Wilmarth-North Rochester-River Crossing

MESSAGE

This memo provides the inputs and contains the results obtained from the additional EMF and Audible Noise analysis to accompany the updated public filing application for the state of Minnesota. The application, included with this memo, only includes these three new cases analyzed. Please find the complete compilation of all data pasted below in this document. Please feel free to reach out to me if anything in this memo requires clarification.

As part of the MISO LRTP4 Wilmarth to North Rochester to Minnesota Border RPA project, three new cases have been studied due to a new "Highway 14" route. These cases contain the proposed structures carrying the new 345 kV Wilmarth – North Rochester circuit. The three new cases are detailed below in Appendix A.

For two of these additional cases, two configurations were reviewed in order to meet the requirement of 50 dBA at the edge of ROW. The two variations reviewed were for the cases with the existing 345 kV 979 Circuit and include 1) the existing 345 kV 979 Circuit keeping its existing phase conductor but with an increase of 11 feet, from minimum conductor clearances, for both 345 kV phase conductor heights (assumed to represent average height of the conductors) and 2) the existing 345 kV 979 Circuit having its conductor replaced to match the new Wilmarth – North Rochester 345 kV Circuit's phase conductors and results reviewed with minimum conductor clearances. Only the second variation with the updated conductor sizes are included in the attached application.

Tables and plots of the three new cases reviewed are included in Appendix B of this memo. Two variations of the audible noise results for the cases with the existing 345 kV 979 Circuit are included, as described above.

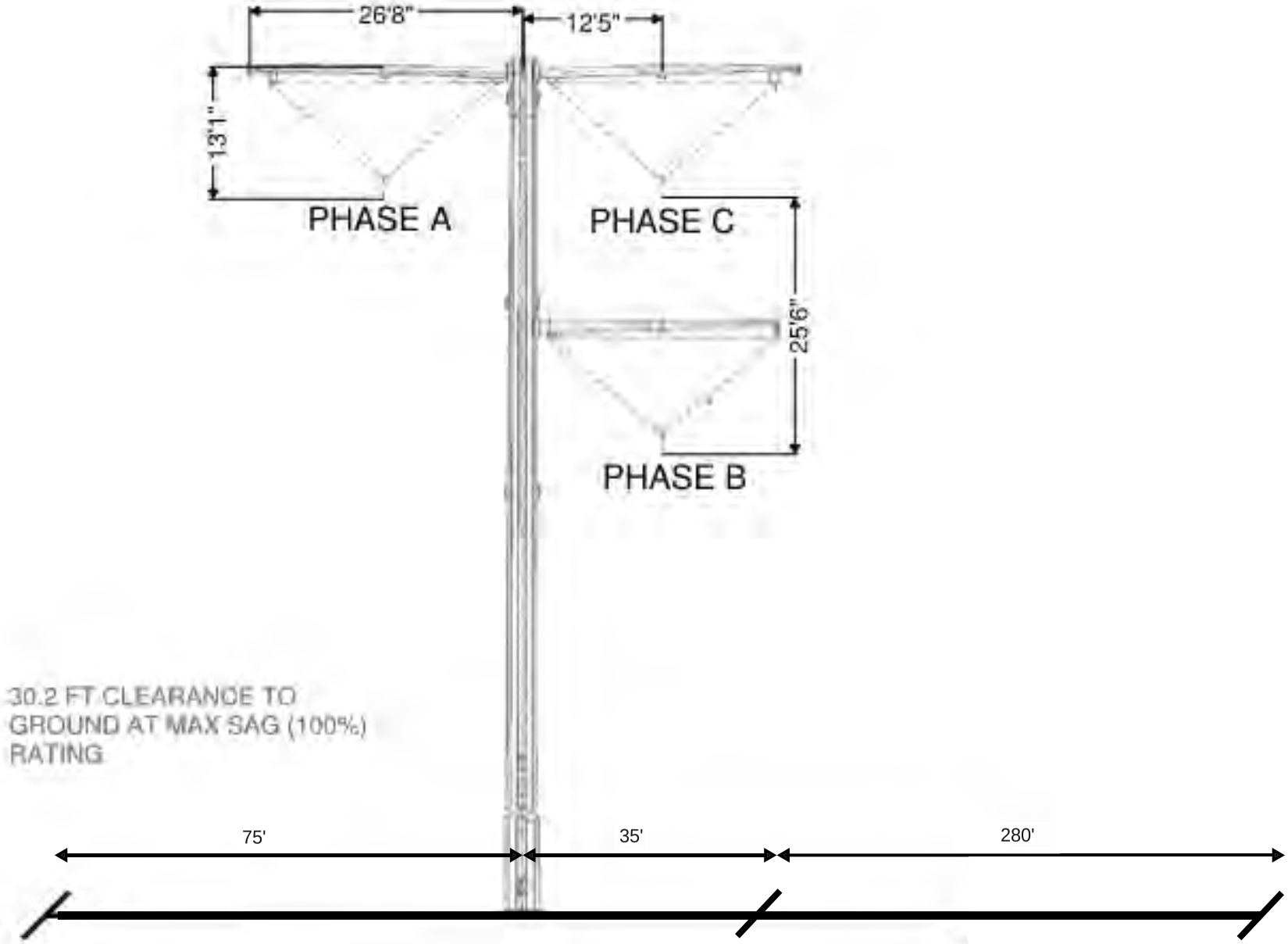
Sincerely,

Kiva Martz

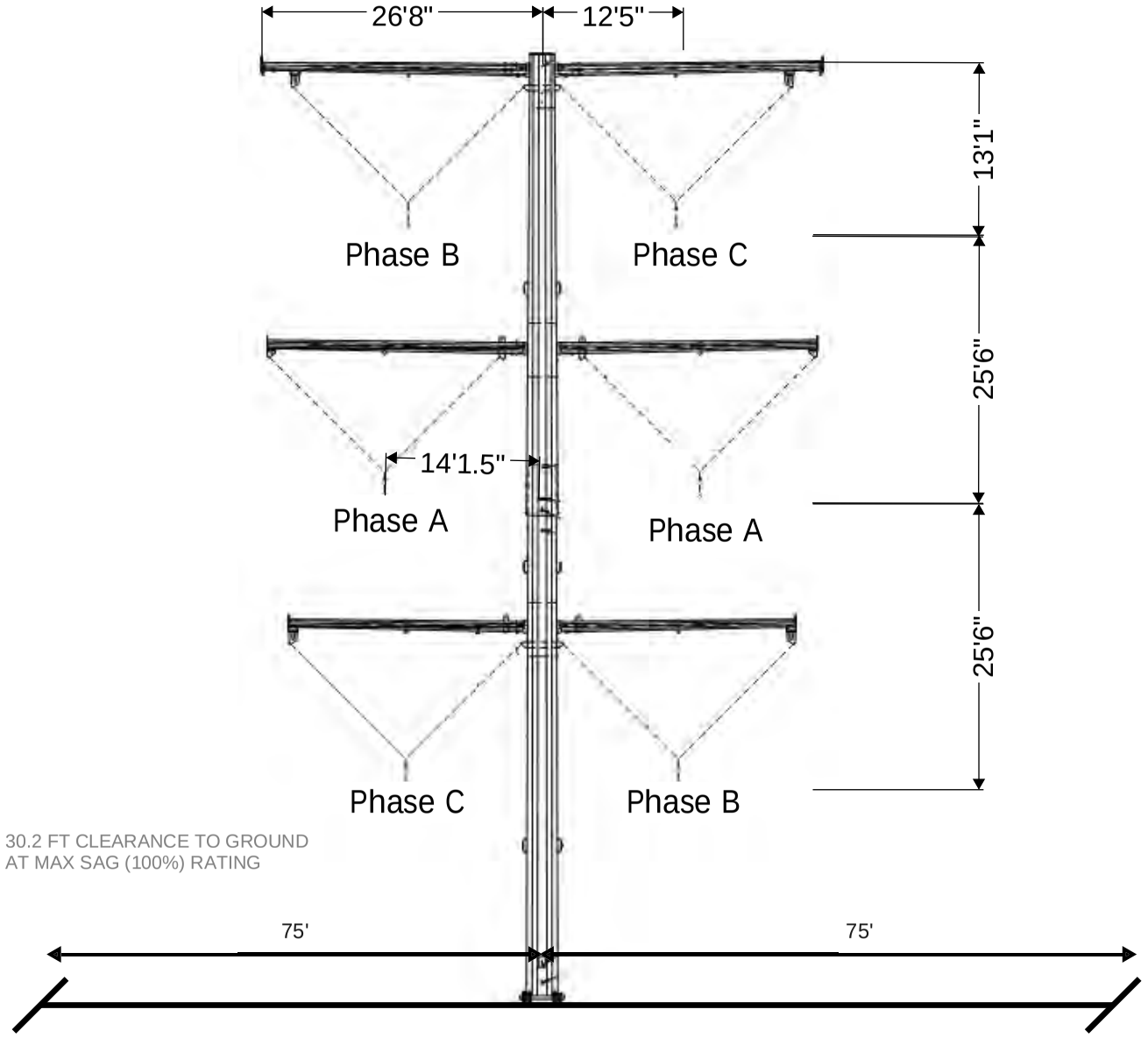
Kiva Martz, P.E.

APPENDIX A – INPUTS

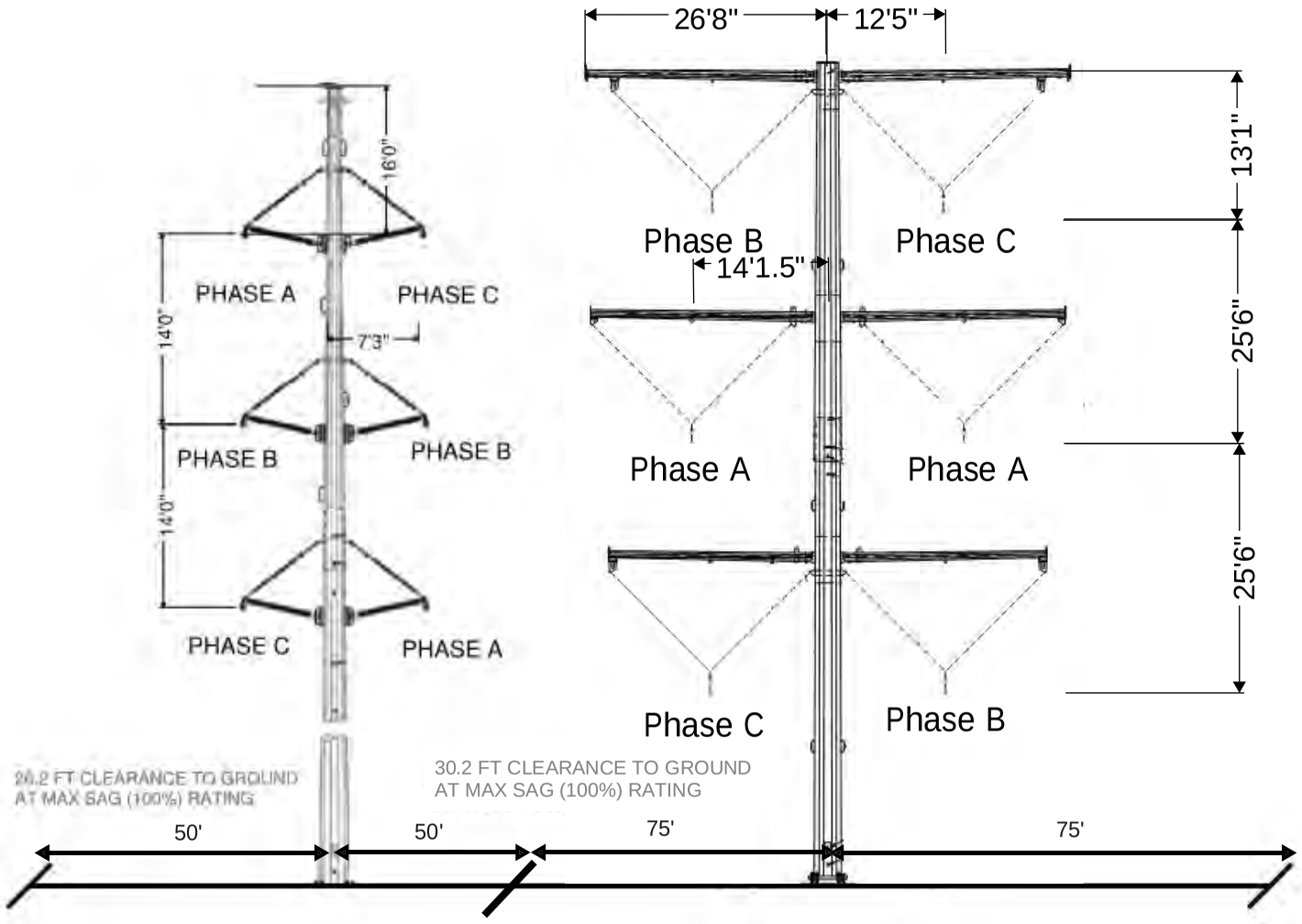
	NEW 345 kV WILMARTH - WEST FARIBAULT
Conductor	TP 636 kcmil 26/7 ACSR "Grosbeak"
Bundle Configuration	Double Bundle / 18 inch spacing
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555 48 Fiber
Line Rating - Maximum	718.3 MW / 1,202 amperes
Line Rating Average	330.9 MW / 554 amperes
Average Elevation	1,200 feet
ROW Width	150 feet



	NEW 345 kV WILMARTH - WEST FARIBAULT	PARALLEL 345 kV LINE 979
Conductor	TP 636 kcmil 26/7 ACSR "Grosbeak"	TP 636 kcmil 26/7 ACSR "Grosbeak"
Bundle Configuration	Double Bundle / 18 inch spacing	Double Bundle / 18 inch spacing
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555 48 Fiber	AFL OPGW DNO-10723 CC-47/47/555 48 Fiber
Line Rating - Maximum	718.3 MW / 1,202 amperes	1,052 MW / 1,760 amperes
Line Rating Average	330.9 MW / 554 amperes	393.7 MW / 659 amperes
Average Elevation	1,100 feet	
ROW Width	150 feet	



	REROUTE 161 kV NORTH ROCHESTER - CHESTER 5309	PARALLEL 161 kV LINE 5310	NEW 345 kV WILMARTH - WEST FARIBAULT	PARALLEL 345 kV LINE 979
Conductor	397.5 26/7 ZTACSR "Ibis"	795 kcmil ACSS 26/7 "Drake"	TP 636 kcmil 26/7 ACSR "Grosbeak"	TP 636 kcmil 26/7 ACSR "Grosbeak"
Bundle Configuration	Single	Single	Double Bundle / 18 inch spacing	Double Bundle / 18 inch spacing
Shield Wire	AFL OPGW DNO-10723 CC-47/47/555 48 Fiber	AFL OPGW DNO-10723 CC-47/47/555 48 Fiber	AFL OPGW DNO-10723 CC-47/47/555 48 Fiber	AFL OPGW DNO-10723 CC-47/47/555 48 Fiber
Line Rating - Maximum	59 MW / 212 amperes	68 MW / 244 amperes	718.3 MW / 1,202 amperes	1,052 MW / 1,760 amperes
Line Rating Average	17.4 MW / 62 amperes	19.0 MW / 68 amperes	330.9 MW / 554 amperes	393.7 MW / 659 amperes
Average Elevation	1,100 feet			
ROW Width	100 feet		150 feet	



APPENDIX B – RESULTS

Table 6.3-1 Calculated Audible Noise for the Operation of Proposed Single/Double Circuit Transmission Line Designs

Structure Type	Circuits Present	Noise L_5 (Edge of Right-of-Way, dBA)*	Noise L_{50} (Edge of Right-of-Way, dBA)*
Single Pole, Tangent, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV	47.3	43.8
Single Pole, Tangent, 345 kV Double Circuit (Matching Conductor)	Wilmarth – North Rochester 345 kV, Line 979 345 kV	48.7	45.2
Single Pole, Tangent, 345 kV Double Circuit (Phase Conductor Adjustment)		53.4	49.9
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Matching Conductor)	North Rochester – Chester 161 kV, Line 5310 161 kV / Wilmarth – North Rochester 345kV, Line 979 345 kV	48.7	45.2
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Phase Conductor Adjustment)		53.4	49.9

Table 6.3-2 Calculated Electric Field for the Operation of Proposed Single/Double Circuit Transmission Line Designs

Structure Type	Circuits Present	Maximum within ROW	Maximum at Edge of ROW	Distance to Proposed ROW Centerline (Feet)														
				-250	-200	-150	-100	-75	-50	-25	0	25	50	75	100	150	200	250
Single Pole, Tangent, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV	6.2 kV/m	3.5 kV/m	0.1 kV/m	0.1 kV/m	0.2 kV/m	0.5 kV/m	0.8 kV/m	1.3 kV/m	1.4 kV/m	4.5 kV/m	5.1 kV/m	1.7 kV/m	0.7 kV/m	0.3 kV/m	0.1 kV/m	0.1 kV/m	0.1 kV/m
Single Pole, Tangent, 345 kV Double Circuit	Wilmarth – North Rochester 345 kV, Line 979 345 kV	4.9 kV/m	0.3 kV/m	0 kV/m	0 kV/m	0.1 kV/m	0.1 kV/m	0.3 kV/m	1.3 kV/m	4.3 kV/m	3.5 kV/m	4.3 kV/m	1.3 kV/m	0.3 kV/m	0.1 kV/m	0.1 kV/m	0 kV/m	0 kV/m
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit	North Rochester – Chester 161 kV, Line 5310 161 kV / Wilmarth – North Rochester 345 kV, Line 979 345 kV	5.0 kV/m	0.3 kV/m	0 kV/m	0 kV/m	0 kV/m	0.9 kV/m	1.2 kV/m	0.9 kV/m	0.4 kV/m	1.3 kV/m	4.3 kV/m	3.5 kV/m	4.3 kV/m	1.3 kV/m	0.1 kV/m	0.1 kV/m	0 kV/m

Table 6.3-3 Calculated Magnetic Field for the Operation of Proposed Single/Double Circuit Transmission Line Designs

Structure Type	Circuits Present	Maximum within ROW	Maximum at Edge of ROW	Distance to Proposed ROW Centerline (Feet)														
				-250	-200	-150	-100	-75	-50	-25	0	25	50	75	100	150	200	250
Single Pole, Tangent, 345 kV Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV	76 mG	48 mG	2 mG	3 mG	5 mG	10 mG	15 mG	26 mG	45 mG	72 mG	62 mG	32 mG	17 mG	10 mG	5 mG	3 mG	2 mG
Single Pole, Tangent, 345 kV Single Circuit (Max Loading)		164 mG	105 mG	4 mG	6 mG	10 mG	21 mG	33 mG	55 mG	98 mG	156 mG	135 mG	69 mG	37 mG	22 mG	10 mG	6 mG	4 mG
Single Pole, Tangent, 345 kV Double Circuit (Average Loading)	Wilmarth – North Rochester 345 kV, Line 979 345 kV	85 mG	14 mG	0 mG	1 mG	1 mG	4 mG	8 mG	19 mG	49 mG	85 mG	62 mG	29 mG	14 mG	8 mG	3 mG	2 mG	1 mG
Single Pole, Tangent, 345 kV Double Circuit (Max Loading)		222 mG	45 mG	1 mG	2 mG	4 mG	10 mG	19 mG	41 mG	109 mG	215 mG	175 mG	87 mG	45 mG	26 mG	11 mG	6 mG	4 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV, Line 5310 161 kV / Wilmarth – North Rochester 345 kV, Line 979 345 kV	85 mG	14 mG	0 mG	0 mG	1 mG	3 mG	8 mG	7 mG	9 mG	19 mG	49 mG	84 mG	62 mG	29 mG	8 mG	3 mG	2 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Max Loading)		222 mG	45 mG	1 mG	1 mG	1 mG	10 mG	28 mG	21 mG	18 mG	40 mG	109 mG	214 mG	175 mG	87 mG	26 mG	11 mG	6 mG

Figure 6.3-1 Calculated Electric Fields (kV/m) for Proposed Single Pole, Tangent, 345 kV Single Circuit - Wilmarth – North Rochester 345 kV

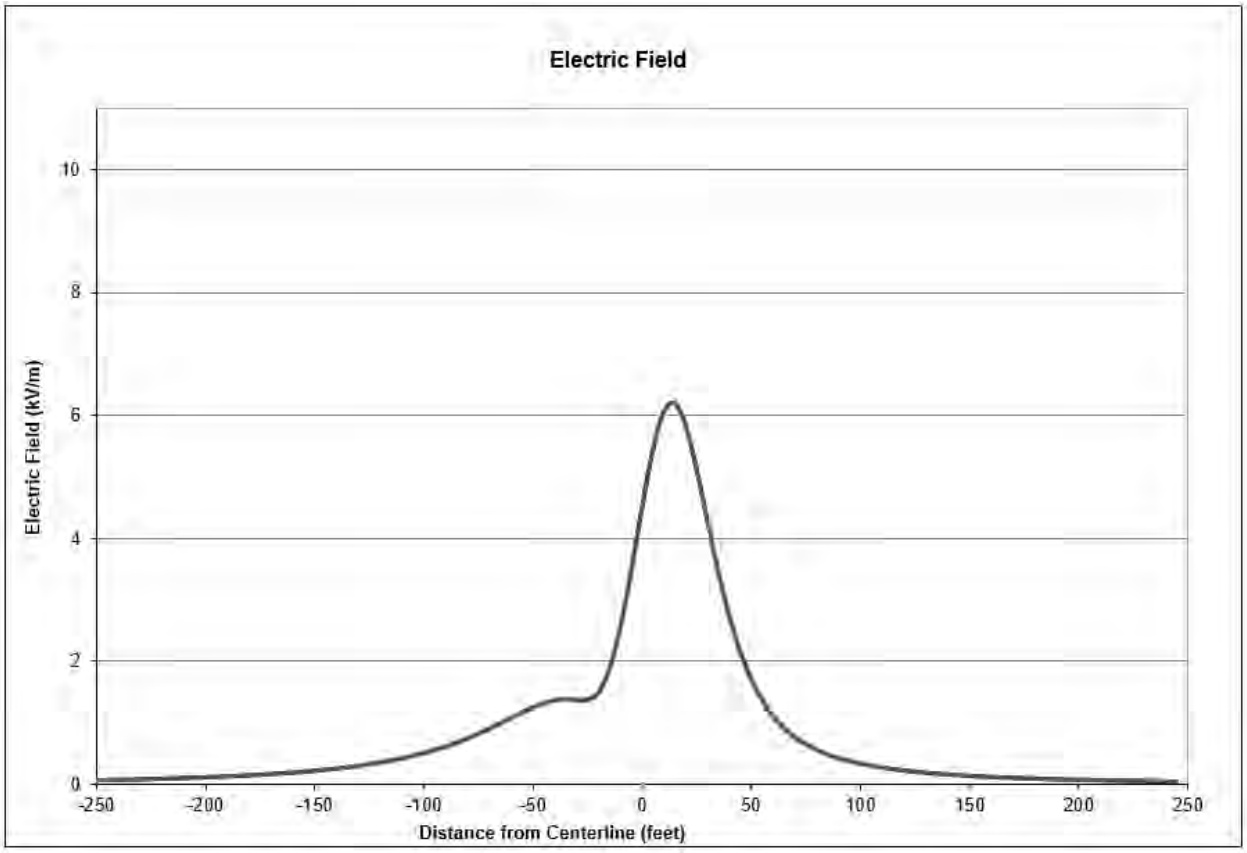


Figure 6.3-2 Calculated Electric Fields (kV/m) for Proposed Single Pole, Tangent, 345 kV Double Circuit - Wilmarth – North Rochester 345 kV, Line 979 345 kV

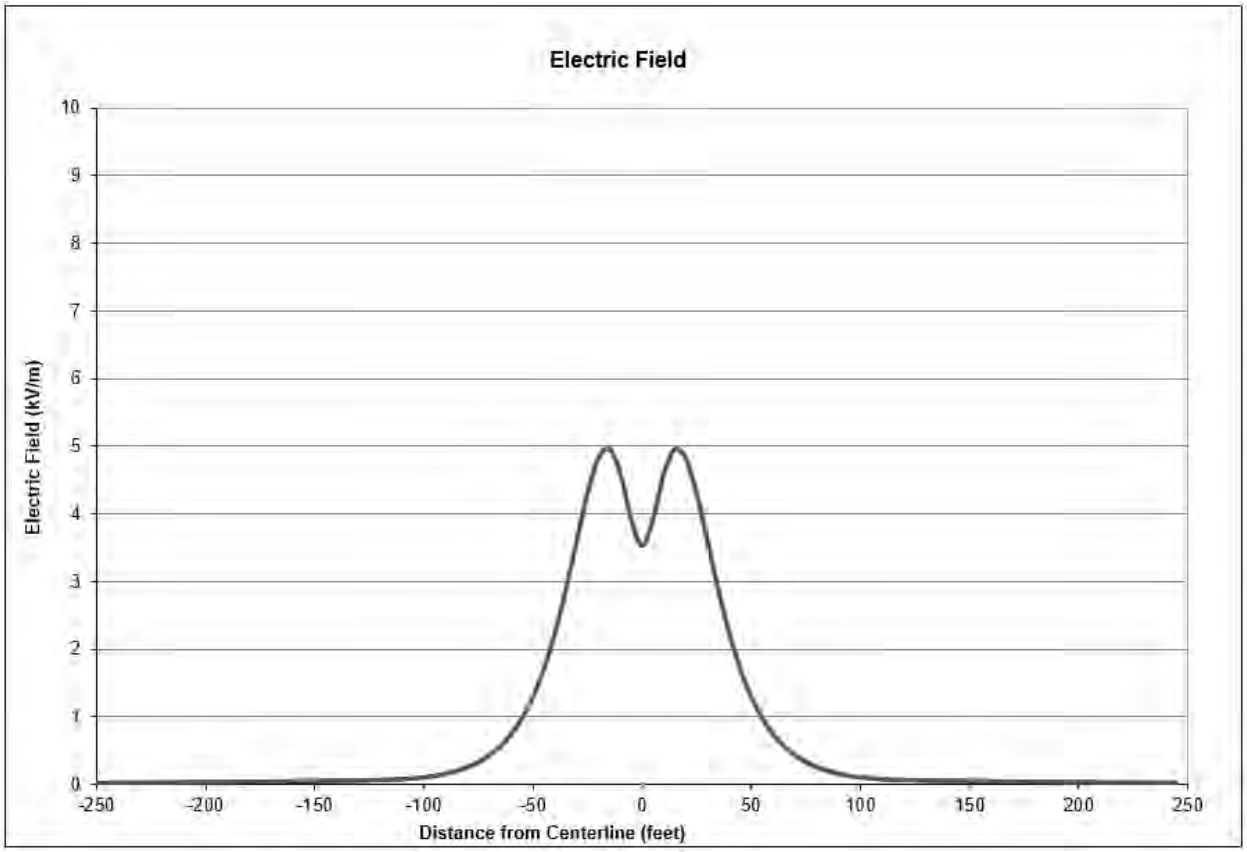


Figure 6.3-3 Calculated Electric Fields (kV/m) for Proposed Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit - North Rochester – Chester 161 kV, Line 5310 161 kV / Wilmarth – North Rochester 345 kV, Line 979 345 kV

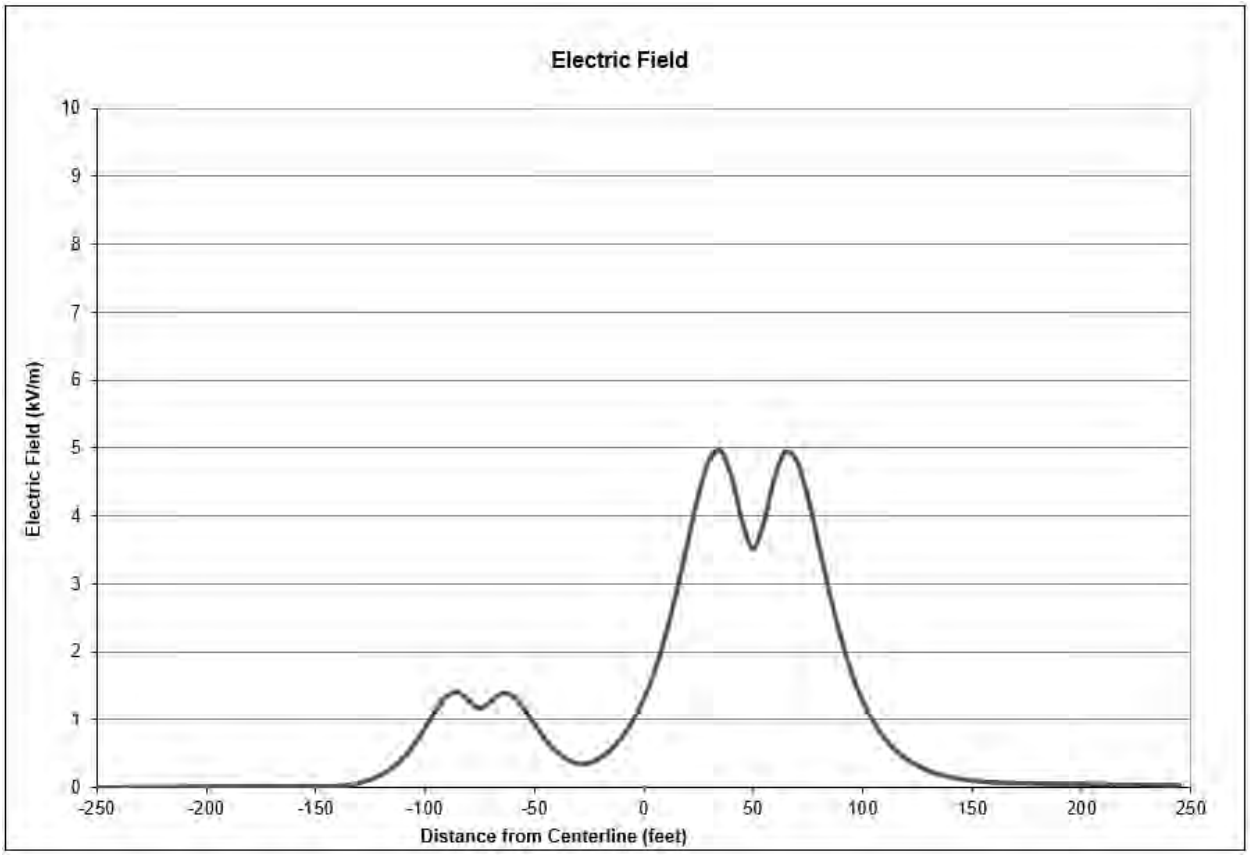


Figure 6.3-4 Calculated Magnetic Flux density (mG) for Proposed Single Pole, Tangent, 345 kV Single Circuit - Wilmarth – North Rochester 345 kV

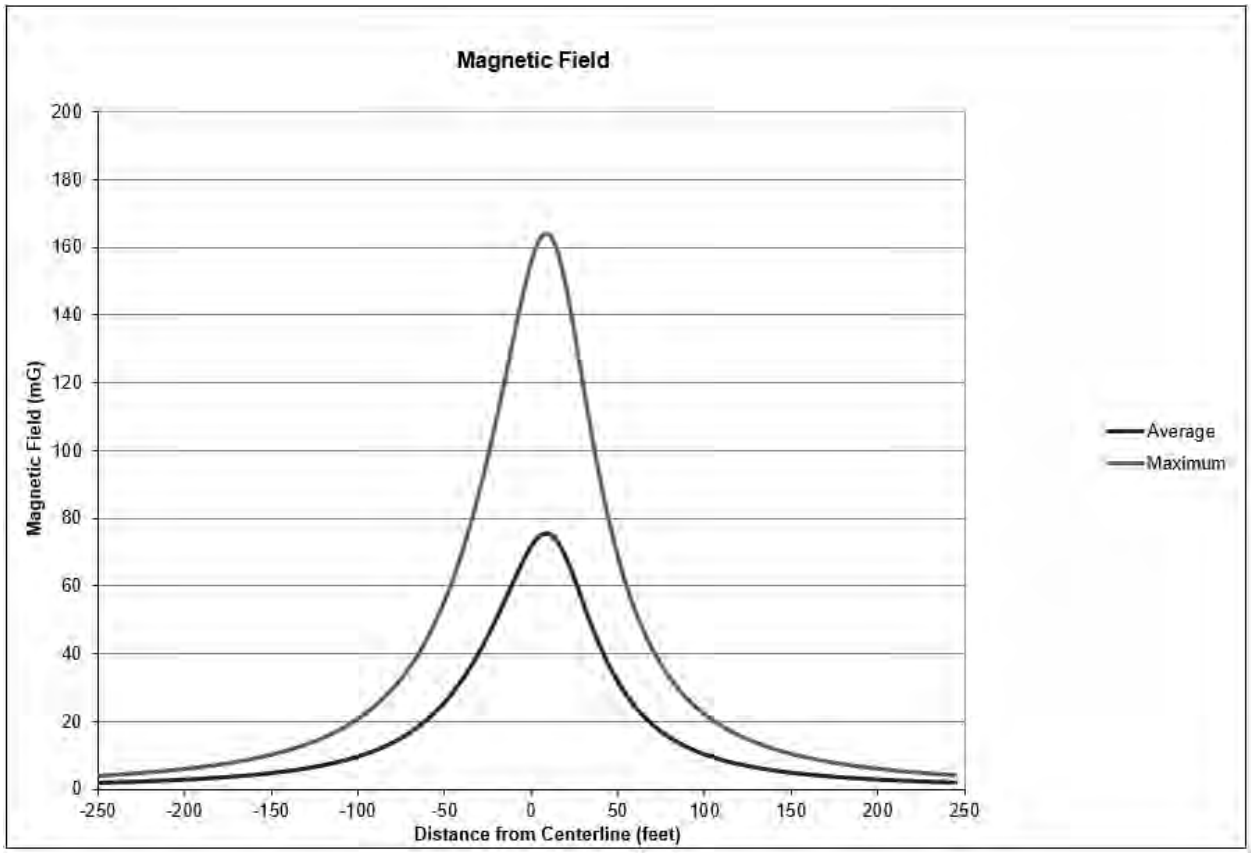


Figure 6.3-5 Calculated Magnetic Flux density (mG) for Proposed Single Pole, Tangent, 345 kV Double Circuit - Wilmarth – North Rochester 345 kV, Line 979 345 kV